Chapter 2
Response to the Great East Japan Earthquake and Nuclear Power Station Accidents

At 14:46 on March 11, 2011, a massive magnitude 9.0 earthquake struck the Tohoku and Kanto regions, triggering a giant tsunami that inundated the Pacific Coast of Japan. The epicenter of the earthquake was off the Sanriku Coast at latitude 38.1° north and longitude 142.9° east. The earthquake and tsunami inflicted catastrophic damage on the country: a human toll of 15,858 dead, 3,021missing, and 6,080 injured (as of May 9, 2012); and a structural toll of 129,855 total-loss buildings and 257,739 half-loss buildings. The estimated damage caused by the disaster was enormous: approximately 16.9 trillion yen to buildings, industrial infrastructure in the agricultural and fishery sectors, social infrastructure, and utilities. Ruinous damage spread to every corner of the socioeconomic structure in the affected area.

In the severe accident that occurred at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Station (NPS) following the earthquake, a vast amount of radioactive material was discharged into the environment. Before this incident, nuclear power had been promoted as an energy source that supported economic growth. As a power source that produces none of the CO_2 emissions that accelerate global warming, there was actually great hope for the future of nuclear power. However, the enormous environmental risks borne by nuclear power stations drew public attention in the wake of this severe accident, and it became apparent that radioactive contamination brings on the most severe kind of environmental crisis.

Since the accident, the Japanese government has been implementing a variety of initiatives, including disaster restoration and reconstruction, to respond to the severe accident that occurred at the TEPCO Fukushima Daiichi NPS, including measures to tighten Japan's power supply. To cope with this, under supplementary budgets in 2011, the national government secured 4.0153 trillion yen , 1.9988 trillion yen under the second, and 11.7335 trillion yen under the third. For the 2012 initial budget, the government allocated 3.3 trillion yen as a special account budget for recovery from the Great East Japan Earthquake, including 366.9 billion yen for rapid disposal of disaster-related waste and refuse. 457.4 billion yen was allocated to the Ministry of the Environment for expenses required for decontamination and disposal of contaminated waste.

Chapter 2 primarily gives an overview of government responses in the effort to recover from the Great East Japan Earthquake (Sections 1, 2, and 3), as well as major government initiatives regarding the TEPCO Fukushima Daiichi NPS accident through mid-May 2012 (Sections 4 and 5). It also covers the overall status of contamination due to radioactive materials discharged into the environment, decontamination efforts, and changes in government activities related to nuclear regulation based on the Fukushima Daiichi NPS accident.

Table 2-1-1 The Damage Situation caused by the Great East Japan Earthquake

Damage situation	Estimated damage caused by the Great East Japan Earthquake	
	Category	Estimated damage
○ Human toll Dead 15,854 Missing 3,276 ○ Structural toll Total-loss 129,286 Half-loss 254,632	Buildings (Houses/Residential Land, Stores/Offices, Factories, Machinery)	10.4 trillion yen
	Lifeline facilities (Water, Gas, Electricity, Communication/Broadcast Facilities)	1.3 trillion yen
	Social infrastructure facilities (Rivers, Roads, Ports, Sewerage, Airports)	2.2 trillion yen
	Forestry/Fishery (Agricultural Land/Agricultural Facilities, Forests, Fisheries Facilities)	1.9 trillion yen
	Other (Educational Facilities, Medical/Welfare Facilities, Waste Disposal Facilities, Waste Disposal Facilities,Other Public Facilities)	1.1 trillion yen
	Total	16.9 trillion yen
Budget relating to the earthquake	Supplementary budgets for fiscal 2011	1st supplementary budget 4.0153 trillion yen 2nd supplementary budget 1.9988 trillion yen 3rd supplementary budget 11.7335 trillion yen
	Initial budgets for fiscal 2012	Special account budget for recovery from the Great East Japan Earthquake 3.3 trillion yen

Source: Cabinet Office, Emergency Headquarters, March 2012
Environmental Conservation Expenditures 2012

Section 1 Disposing of Disaster Waste from the Great East Japan Earthquake

The tsunami that followed the Great East Japan Earthquake brought extensive damage and created vast amounts of disaster waste in the coastal areas of Tohoku. Restoration and reconstruction from the disaster were possible without quickly disposing of the disaster waste.

To promte disposal, after the disaster the Ministry of the Environment issued basic policies, such as the Guidelines (Master Plan) for Disaster Waste Management after the Great East Japan Earthquake, for prompt disposal of disaster waste, in addition to providing financial assistance and offering necessary advice by dispatching professionals. These initiatives are being carried out with the cooperation of local governments and related groups. Also, to ensure that there are a sufficient number of workers for quickly and smoothly disposing of disaster waste in the affected areas, physical support continues to be offered from municipalities throughout Japan.

In terms of the work completed to date, delivering disaster waste to primary temporary storage areas located in the vicinity of residential areas was completed by the end of August 2011. It has almost achieved the target to complete the transportation of disaster wastes to temporary storage areas by the end of March, 2012. In a part of municipalities, another target date has been set up due to a vast number of houses needed to be demolished; however, all disaster wastes are expected to be delivered to temporary storage areas by the end of March 2013 at the latest.

The process of incineration, recycling, and landfilling waste delivered to temporary storage areas is planned for completion by around March 2014. However, the processing capacity in the affected areas has deteriorated, making it is necessary to dispose of disaster waste in other prefectures (broad-area disposal).

The following gives an overview of specific cases of broad-area disposal of disaster waste, and includes an outline of the processing system, the status of delivery to temporary storage spaces, incineration and recycling of collected waste, and the status of landfills.

Photo 2-1-1 Disaster Waste in the Temporaly Strage Space

Photo: Ministry of the Environment

1 Establishment of Guidelines for Disposal Disaster Waste

To ensure smooth and prompt disposal of the tremendous amount of disaster waste produced by the massive earthquake, the Ministry of the Environment serves as a coordinator for local governments and related groups to establish a collaboration scheme for disposal. Specific measures have included:establishing an information collection and liaison system immediately after the earthquake; dispatching Ministry officials to areas with particularly severe damage (Iwate, Miyagi, and Fukushima prefectures); and establishing a Special Countermeasures Headquarters for Disaster Waste within the Ministry of the Environment. In addition, starting from May 2011, Ministry of the Environment officials, researchers, and engineers have formed teams to visit affected areas and identify the current status of the target areas and problems, in addition to offering necessary advice.

The Ministry of the Environment further established a disaster waste disposal scheme in Iwate, Miyagi, and Fukushima prefectures and a council for disposal of disaster waste consisting of related organizations (e.g., prefectural governments, municipalities, and the central government). These efforts were made to deliberate on a swift and smoothly functioning disposal method that matched the realities of the disaster-affected areas and to further consider specific measures for disposing of disaster waste.

To further encourage the disposal of disaster waste in collaboration with the groups involved, the Ministry of the Environment establish Guidelines for the Removal of Damaged Houses and Structures after the Tohoku-Pacific Ocean Earthquake, Guidelines for the Disposal of Damaged Houses and Other Structures (Draft Outline), and Guidelines (Master Plan) for Disaster Waste Management after the Great East Japan Earthquake.

Along with measures to be taken by the central government stipulated in the Act on Special Measures for Disaster Waste Management, the following efforts have been made to dispose of disaster waste in the affected areas: (1) requesting broad-based cooperation to secure temporary storage spaces and landfill sites for the disposal of disaster waste as soon as possible; (2) promoting recycling; (3) formulating a unified policy regarding contracts related to the disposal of disaster waste; (4) preventing health hazards due to asbestos; (5) formulating a policy for the disposal of disaster waste that has flowed into ocean areas as soon as possible; and (6) preventing infectious diseases and odors caused by disaster waste such as tsunami sediment.

In the past, expenses required for the disposal of disaster waste by municipalities have been backed by governmental subsidies for disaster waste disposal projects based on the Waste Management and Public Cleansing Law (subsidizing 50% of municipal expenses). In addition, a new measure has been taken by the central government to cover expenses (on average, 95% of actual expenses) related to disposing of waste created by the recent earthquake. This measure provides support through the Green New Deal Fund for disposal of disaster waste produced by the massive earthquake based on Guidelines for Special Measures regarding Disaster Waste Disposal (Act No. 99 of 2011), and increases the percentage of national subsidies based on the Act for Extraordinary Expenditures and Assistance to Cope with the Great East Japan Earthquake (Act No. 40 of 2011). For the residual part to be borne by local administrations as well, the Ministry of the Environment took the extraordinary measure of not burdening local administrations with the full amount by allocating taxes for reconstruction.

2 Schedule for Disaster Waste

As a result of the Great East Japan Earthquake, which occurred on March 11, 2011, about 18.8 million tons of disaster waste were generated in municipalities along the coast of the three prefectures affected: Iwate Prefecture, 5.3 million tons (12 times the normal yearly amount of waste); Miyagi Prefecture, 11.5 million tons (14 times the normal yearly amount of waste); and Fukushima Prefecture, 2.0 million tons (3 times the normal yearly amount of waste).

On November 29, 2011, the Ministry of the Environment reviewed a project plan and a road map for reconstruction policy, formulated on August 26 of the same year, to promote disposal based on the three targets described below (Figure 2-1-1). The first target was to transport most of the disaster waste from nearby locations where people currently live to temporary storage spaces by the end of August 2011. This target was achieved by all municipalities except those within the alert area in Fukushima Prefecture. The second target was to transport disaster waste to temporary storage spaces by the end of March 2012. This target was achieved by almost all municipalities except those within the alert area in Fukushima Prefecture. Special goals were set for some municipalities with special circumstances (e.g., Ishinomaki City, Miyagi Prefecture), such as a particularly large volume of demolished houses. For these areas, transportation to temporary storage spaces is to be completed no later than the end of March 2013.

The third target is to complete the disposal of disaster waste by the end of March 2014, which is three years after the disaster. In Iwate and Miyagi prefectures, measures such as establishing contract-based waste disposal by block and installing makeshift incinerators have taken place. As of the end of May 2012 a total of about 2.91 million tons of waste (nearly 16 % of the estimated disaster waste overall) has been disposed of in municipalities in the coastal areas of the three affected prefectures.

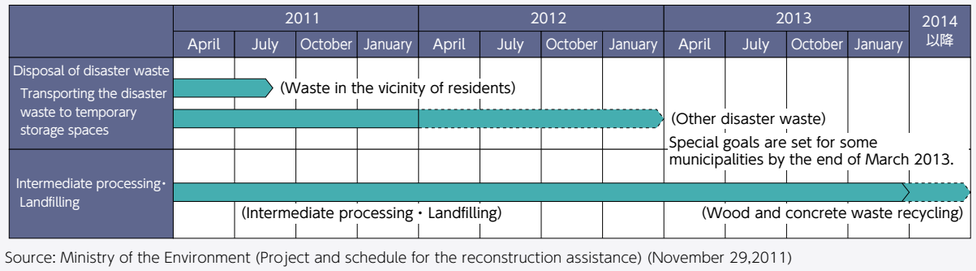
3 Disposal of Disaster Waste

Disaster waste is disposed by: demolishing the affected area; delivering the waste to temporary storage spaces; intermediate processing; recycling; and landfilling. Due to the vast amount of disaster waste, Miyagi and Iwate Prefectures have requested wide-area disposal of disaster waste in excess of their capacity.

Photo 2-1-2 The Temporaly Strage on Fire

Photo: Ministry of the Environment

Figure 2-1-1 Schedule for Disposal of Disaster Waste



Source: Ministry of the Environment (Project and schedule for the reconstruction assistance) (November 29,2011)

(1) Demolishing Disaster Waste from Affected Areas and Transporting it to Temporary Storage Spaces

Demolishing disaster waste from damaged houses in the affected area and transporting it to temporary storage spaces is a key to recovery and reconstruction.

Accumulated disaster waste may cause problems, including fires triggered by spontaneous combustion and swarms of flies and other unsanitary insects during warmer seasons (Figure 2-1-2). The following measures are being taken to prevent fires at temporary storage spaces: improved surveillance to prevent delivery of dangerous items (e.g., gas canisters and kerosene tanks); installation of fire-fighting tanks, fire extinguishers, and the like at the temporary storage spaces; regular visual checks for smoke leaking from combustible materials; monitoring temperature and carbon monoxide concentrations within combustibles, if possible; and avoiding stacking combustible materials or wood debris to heights of over five meters.

Disaster waste includes a significant quantity of houses and buildings damaged by the disaster, which need to be demolished in the near future. Demolishing the debris can only be carried out after disposal waste is stored in temporary storage spaces, so that enough space can be generated to transport the debris.

The volume of unsorted waste must be reduced as much as possible by transporting it to temporary storage spaces after roughly sorting it on location. Sorting should be done to separate out dangerous items and recyclables. It is also critical to reduce total disposal costs and landfill volume through appropriate sorting and processing according to waste characteristics. Specifically, this means sorting combustibles from incombustibles and separating out recyclables and hazardous items from waste transported to the storage space, using heavy machinery and equipment for shredding and sorting.

To ensure smooth disposal of disaster waste, the Ministry of the Environment formulated policies for demolishing and disposing of damaged houses, vehicles, ships, and vessels, and for handling precious metals, ancestral tablets, and photo albums. In addition, a policy was issued to call attention to the handling of waste asbestos, PCB waste, and infectious waste mixed in with the disaster waste, as well as vehicles and items targeted by the Law for Recycling of Specified Kinds of Home Appliances.

(2) Current Status of Intermediate Processing and Recycling of Disaster Waste

To dispose of the vast amount of disaster waste generated by the massive earthquake, it is necessary to carry out intermediate processing to reuse recyclables such as concrete debris, scrap metals, and wood waste. The Guidelines (Master Plan) for Disaster Waste Management after the Great East Japan Earthquake indicates a method for recycling disaster waste. In collaboration with related ministries, the Ministry of the Environment exchanges information through liaison meetings by establishing a cooperative structure for the effective use of disaster waste, with the purpose of promoting the reuse of disaster waste in civil engineering projects. Since disaster waste has quite different characteristics from normal waste, even in terms of items for which recycling procedures have been established (such as vehicles), the Ministry of the Environment collaborates with related parties to ensure smooth recycling.

Moreover, at the cabinet Meeting for Promoting Disposal of Disaster Waste presided by the Prime Minister, general coordination and progress management have been being carried out. For example, it was discussed that harmless items, which would be dealt with as wastes in future due to lack of market competitiveness, such as roof tile debris, should be used for road beds, tide prevention forests or upland banking materials, on the premise of quality confirmation and public construction usage. Yet, when disaster wastes are recycled, sufficient safety on environmental conservation will become essential in the same way as ordinary recycled materials.

(3) Disposal Status of Disaster Waste

The massive tsunami following the earthquake generated an enormous amount of disaster waste. Demolishing and disposing of this waste is absolutely imperative for achieving restoration and reconstruction in affected areas. Disposal of disaster waste has been promoted by installing local temporary incineration facilities; however, they have yet to be used to their full throughput capacity. Iwate and Miyagi prefectures decided to dispose of waste directly upon the request of municipalities. To do this, the prefectural governments formulated a disaster waste disposal plan that municipalities would rely on for disposal.

For example, Iwate Prefecture formulated a plan according to the national government's Master Plan. The plan's policy was to reuse recyclables as reconstruction materials whenever possible and minimize the amount of disaster waste to be incinerated or landfilled. The first step was to collect the disaster waste in primary temporary storage spaces after dismantling and demolishing the debris at the affected areas. The debris is then sorted into rough categories, such as house posts and square logs, combustible unsorted materials, and concrete debris. It is then transported to a secondary temporary storage space for further sorting into sub-categories such as combustible unsorted materials and incombustible unsorted materials, to ensure further recycling. Non-recyclables should be disposed of within the prefecture whenever possible, using existing and newly installed incinerators. Accordingly, Iwate Prefecture plans to introduce two temporary incinerators, while Miyagi Prefecture plans to install 29 temporary incinerators.

(4) Broad-Area Disposal of Disaster Waste

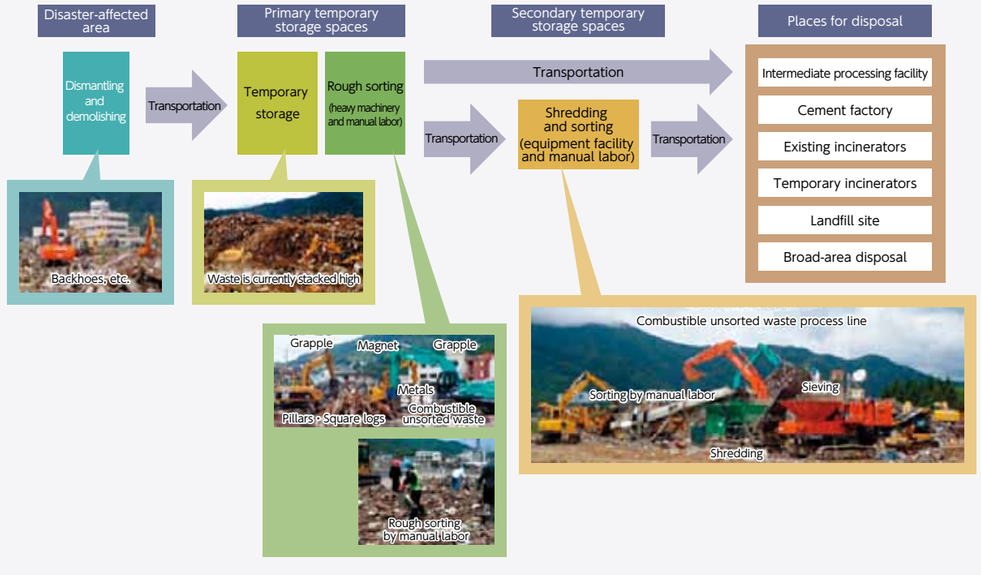
Currently, vigorous efforts are ongoing in Iwate and Miyagi Prefectures to dispose of disaster waste through maximum use of local facilities, including installing temporary incinerators and promoting recycling, but broad-area disposal is needed to cover deteriorated throughput in the disaster-affected area. However, promoting broad-area disposal involves concerns over disaster waste that is contaminated with radioactive materials. In August 2011, the Ministry of the Environment formulated guidelines for promoting broad-area disposal of disaster waste and notified the prefectural governments involved. The guidelines indicate modalities for measuring the radioactive concentration of disaster waste in temporary storage spaces and air dose rate measurements when transferring the waste to places outside of the prefecture. Through revisions that took place in October, November 2011,and January 2012 the guidelines added safety concepts for recycling as well as new data, to indicate a safety check method for broad-area disposal. Moreover, in April 2012, Guidelines for Special Measures regarding Disaster Waste Disposal (Act No. 99 of 2011) was announced as the guidelines for broad-area disposal. The Ministry of the Environment conducts intensive public relations activities, including creating Q&A guidelines, explanatory leaflets for broad-area disposal, pamphlets, and video images, in addition to launching a website to spread information on broad-area disposal. Furthermore, the Ministry of the Environment is taking initiatives to build consensus among local communities by dispatching Ministry officials and professionals to give presentations to municipalities that are motivated to engage in broad-area disposal.

As it is necessary for the central government to make enhanced efforts to promote broad-area disposal and recycling of the disaster waste, the first assembly of the Cabinet Meeting for Promoting Disposal of Disaster Waste was held by the Prime Minister on March 13, 2012. Also, based on the Guidelines for Special Measures regarding Disaster Waste Disposal (Act No. 99 of 2011), on March 23 and 30, 2012, Prime Minister Noda and Minister of the Environment Hosono issued a request to relevant local governments for assistance with disaster waste disposal.

As of May 2012, these efforts resulted in Yamagata, Aomori and Akita prefectures and the Tokyo Metropolitan Government accepting disaster waste (Figure2-1-3). In August 2011, the Basic Concept for Accepting Disaster Waste in Yamagata Prefecture was publically announced. The Tokyo Metropolitan Government planned to make an agreement with each prefecture in September and November 2011 to accept 500,000 tons of disaster waste from Iwate and Miyagi Prefectures over a three-year period. Since February 2012, Aomori Prefecture has accepted disaster waste from Kesennuma City and Ishinomaki City, Miyagi Prefecture. Akita Prefecture also started to accept wood debris on a large scale. Since further expansion of broad-area disposal is needed, the government of Japan as a whole is vigorously working to spread the movement, asking local governments to accept disaster waste.

For example, Toyama and Mie Prefecture established a memorandum and a confirmation with prefectural government which was affected by the disaster. In

Figure 2-1-3 Schedule for Disaster Waste Disposal in Iwate Prefecture



Source: Detailed plan for disaster waste disposal in Iwate Prefecture

Shizuoka, Gunma and Saitama Prefecture, test incineration was carried out to prepare for disaster waste acceptance. So far, the movement is consistently spreading throughout the country, and many prefectural governors explained his position to local residents. The Ministry of the Environment will continue to devote its utmost efforts towards establish nationwide consent for broad-area disposal.

The disaster waste targeted in the broad-area disposal project is limited to that produced in the coastal areas of Iwate and Miyagi prefectures. The measurement results for radiation air dose rates in the target area are almost the same as those in other areas, including the Kanto region (Table 2-1-2). Furthermore, looking at the results of actual measurements of radiation levels in the disaster waste in the target areas shows insignificant or zero concentrations of radioactivity, meaning that the disaster waste in these area is basically the same as normal general waste.

In line with the above efforts, carrying-out of waste, transportation, on-site management, incineration, landfill disposal, and other actions have been undertaken based on procedures determined by local governments and guidelines for promoting broad-area disposal (Figure 2-1-4). At the same time, radioactive concentrations or radiation at critical points (carrying-out and incineration of waste are measured) and the results of the survey are made public. For test melting and other such operations, safety is ensured by allowing local residents to measure the dose themselves.

Ordinary incineration facilities are equipped with high-end exhaust-gas treatment equipment, such as a bag filters to prevent dioxin leaks.

Regarding cesium in incineration ash, which becomes concentrated with the incineration of combustibles, it has been determined that if the radioactive cesium concentration in combustibles is 240-480 Bq/kg or less, the radioactive cesium concentration in the ash should be less than 8,000 Bq/kg even when only disaster wastes are incinerated. Regarding cesium in exhaust gas, the following have been confirmed: at least 99.9% of the cesium is eliminated by incinerators with bag filters; and at least 96.6 % of the cesium is eliminated by incinerators with electric precipitators. With these kinds of high-end exhaust-gas treatment equipment that can eliminate tiny particles of ash in exhaust gas, radioactive cesium discharge can be prevented.

Measurements have demonstrated that radioactive cesium is eliminated through the actual incineration procedures implemented in Tokyo and other prefectures. The incineration ash is disposed of in landfills at landfill sites for ordinary waste (controlled landfill sites) using the same procedure as for normal waste. After covering the ash with soil under 50cm deep to prevent scattering, radiation exposure doses to local residents drop to a minor level of below 0.01 mSv per year, which is considered harmless to health. Actually, this is about 1/150 of the radiation dose that the average Japanese person is exposed to in nature (1.48 mSv per year).

In order to ensure smooth restoration and reconstruction, a certain level of broad-area disposal of disaster waste is imperative, as are independent efforts made in affected areas. From the perspective of having the nation as a whole support affected areas, it is essential to build consensus for broad-area disposal and to look at mechanisms for mutually accepting disaster waste even during ordinary times in the years to come, now that we know that disasters can happen to anyone at any time.

Table 2-1-2 Air Dose Rate in Areas Targeted for Broad-Area Disposal Project

Air doses (measured 1 meter above the ground)

	Prefecture	Name of municipality	Air radiation dose Unit: μSv/hour
Tohoku coastal area	Iwate Prefecture	Kuji City	0.06
		Noda Village	0.06
		Miyako City	0.10
		Rikuzentakata City	0.05
	Miyagi Prefecture	Kesennuma City	0.10
		Ishinomaki City	0.09
		Natori City	0.08
Kanto region	Ibaraki Prefecture	Mito City	0.09
	Tochigi Prefecture	Utsunomiya City	0.11
	Gunma Prefecture	Maebashi City	0.09
	Saitama Prefecture	Saitama City	0.05
	Tokyo Metropolitan Area	Shinjuku City	0.07
Other regions	Aichi Prefecture	Nagoya City	0.04
	Osaka Prefecture	Osaka City	0.06

Kanto region: Ministry of Education, Culture, Sports, Science and Technology website: radiation monitoring information, measurement results for November 30, 2011.
Iwate Prefecture: Iwate Prefecture website: Measurement results of radiation dose rate near land surface.
Miyako City, Rikuzentakata City: Measurement results on November 4-11, 2011.
Kuji City, Noda Village: Measurement results on November 2-11, 2011.
Miyagi Prefecture: Miyagi Prefecture radiation information website: November 30, 2011.
Source: Ministry of the Environment

Table 2-1-3 Status of Accepting Disaster Waste at Local Government

Tokyo Metropolitan Area		
Decided to accept 500,000 tons of disaster waste from Iwate and Miyagi prefectures within three years	Iwate Prefecture	○ September 28, 2011: Announced that it would accept disaster waste from Iwate Prefecture (1,000 tons for initial disposal and another 10,000 tons for full-scale disposal). First case of full-scale broad-area disposal. ○ November 2-30, 2011: Transported and disposed of about 920 tons of disaster waste from Miyako City (Iwate Prefecture) as an initial disposal effort. ○ December 21, 2011: Transported 10,000 tons of disaster waste from Miyako City, Iwate Prefecture to Tokyo as part of full-scale disposal.
	Miyagi Prefecture	○ November 24, 2011: Announced that it would accept disaster waste from Miyagi Prefecture. Plans to accept 100,000 tons of disaster waste from Onagawa Town by March 2013. ○ December 7-19, 2011: Transported and disposed of disaster waste from Onagawa Town, Miyagi Prefecture toTokyo as a trial. On January 31, trial incineration results were announced (the radioactive material concentration of the incineration ash was below the national criteria). After a meeting to explain the efforts to local residents in February 2012, full-scale disposal began in March 2012.
Yamagata Prefecture		
○ On August 2011, "the Basic Concept for Accepting Disaster Waste to Yamagata Prefecture" was announced. ○ Accepted disaster waste from Kesennuma City at a private facility in Yamagata Prefecture (about50,000 tons).		
Aomori Prefecture		
○ The disaster waste from Kesennuma City and Ishinomaki City has been disposed since February 17, 2012.		
Akita Prefecture		
○ Full-scale acceptance of wood waste in Miyako City started in May 2012.		

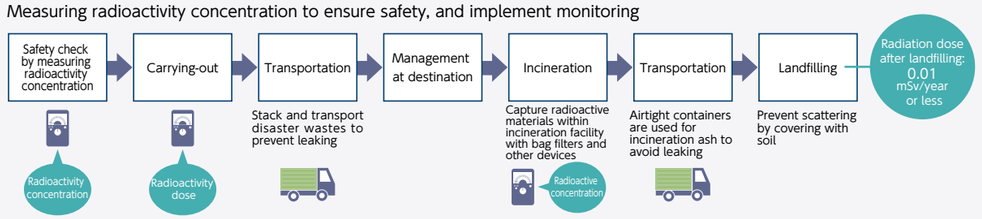
Source: Ministry of the Environment

Figure 2-1-4 Processing Disaster Waste (Procedure)

(1) Primary temporary storage spaces	Check safety by measuring radioactivity concentration (radioactivity concentration measurement using data on the kind and composition of the radioactivity).
(2) Secondary temporary storage spaces	Measure air dose rate for disaster waste as a whole and in peripheral areas using a dosimeter to check for air dose rates significantly higher than background radiation.
(3) Transportation	Preventing leaking while transporting disaster waste.
(4) Management at destination	(1) Recycling for reuse: Measure radioactivity concentration after processing, in exhaust gas, in incineration ash, in products (monthly basis). (2) Landfill of non-combustibles: Measure radioactivity concentration after sorting and shredding (monthly basis). (3) Incineration process: Measure radioactivity concentration in exhaust gas and incineration ashes (monthly basis).
(5) Incineration	Remove ash microparticles in exhaust gas using high-end exhaust-gas treatment equipment (e.g., bag filters) to prevent radioactive cesium discharge into the air.
(6) Transportation	Transport incineration ash in airtight containers to prevent leaking.
(7) Landfill disposal	Considering the radioactive concentration level in disaster waste over a broad area disposal and mixed combustion ratio with waste excluding disaster waste at the incineration facilities, the disaster waste can be disposed at landfill sites without additional measures. That is why the concentration of incineration ash has proved to be considerably low when compared with the level of 8000Bq/kg is allowed in normal waste disposal at controlled landfill sites.

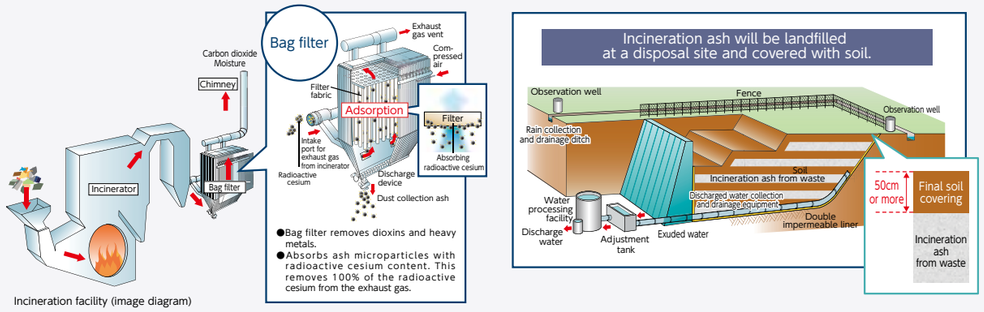
Note: Clearance level for recycling
Consider a clearance level of 100 Bq/kg for radioactive cesium in products made from recycled disaster waste.
Also, target is not for disaster waste itself but for products.

Measuring radioactivity concentration to ensure safety, and implement monitoring



Source: Ministry of the Environment

Figure 2-1-5 Measures for Incineration and Landfill Disposal



Source: Ministry of the Environment, broad-area disposal information <http://kouikishori.env.go.jp/>

Column

Frequently Asked Questions on Broad-area Disposal of Disaster Waste

(1) Even if radioactive concentration is low, is landfilling a large amount of disaster waste safe?

Evaluations of the impact of landfilling incineration ash containing radioactive cesium on local residents and workers have been thoroughly conducted to ensure full safety. Specifically, the evaluations assume completely landfilling incineration ash at 8,000 Bq/kg in a disposal field with a capacity of 400,000 square meters (200 × 200 × 10 meters). Even in this situation, the impact on the health of local residents remains insignificant (less than 0.01 mSv per year) after completion of the landfill. Of course, the amount of incineration ash that will actually be landfilled is far smaller than this and the concentration far less.

(2) When disaster waste is incinerated at an incineration facility, does radioactive cesium turn into a gas and leak out?

To prevent dioxin leaks, incineration facilities are equipped with high-end exhaust-gas treatment equipment (e.g., bag filters). These consist of a cooling system to keep exhaust gas temperatures under 200 °C and a device to remove ash microparticles (soot dust) in the exhaust gas. Cesium gasifies at around 650 °C, but the exhaust gas is cooled before being discharged into the air by the cooling system, so cesium cannot remain in a gaseous state. Cesium clumps together or is absorbed by the soot dust. The exhaust-gas treatment equipment can remove almost 100% of the soot dust containing radioactive cesium.

In fact, no elevated levels of radioactive cesium in exhaust gas have been detected even at incineration facilities for waste excluded from broad-area disposal due to high radioactive cesium content. Even in rare cases where it has been detected, its concentration remained within a level far below the concentration limit for monitoring criteria.

Section 2 Response to the Limited Electric Power Supply

1 Response to the Limited Electric Power Supply Immediately after the Earthquake

(1) Response to the limited electric power supply immediately after the earthquake

With the effects of the Great East Japan Earthquake, power plants generating about 21 million kW were halted immediately following the disaster. This resulted in a sharp drop in power supply capability versus ordinary times, resulting in an extremely tight power supply in areas serviced by the Tokyo Electric Power Company (TEPCO) and Tohoku Electric Power Company.

Before the earthquake, Tohoku Electric Power was capable of generating 13.36 million kW (excluding temporary stoppages due to inspections before the earthquake). After the earthquake, an installed capacity of about 6.28 million kW (including 1.35 million kW of nuclear power and 4.93 million kW of thermal/geothermal power) went out of operation. TEPCO's installed capacity before the disaster was 50.04 million kW (excluding temporary stoppages due to inspections before the earthquake), but 14.90 million kW (including 6.43 million kW of nuclear power and 8.48 million kW of thermal power) was halted immediately after the earthquake.

In response, the government confirmed that projects defined as reconstruction projects under the disaster recovery plan are exempted from the Environmental Impact Assessment Law (the provisions of Article 52). The project target is installation of new generators which is implemented by either TEPCO or Tohoku Electric Power under the restoration program, with the aim of supplementing the enough power supply, except the power stations which are so damaged to be no longer restorable due to the earthquake.

The government has offered the following guidance: avoid or minimize the environmental impact of project implementation; make every feasible effort to minimize the environmental impact caused by a project to ensure accurate consideration of environmental conservation; and implement measures such as organizing presentations or collecting opinions from local governments.

(2) Energy-saving efforts

The tight power supply caused partial planned outages in the TEPCO service area. In response, there was an increased need for new initiatives that targeted people's lifestyles and business operations.

The government called for energy conservation efforts in the industry as well as in households. At the end of March, the Ministry of Economy, Trade and Industry, and the Cabinet Secretariat carried out an extensive collaborative media campaign calling for energy-saving efforts. The Ministry then launched an energy-saving website introducing specific energy-saving measures and their predicted results.

The Ministry of the Environment called for energy-saving lifestyles, listing seven specific actions that were easy for people to implement at home: (1) turning off home electrical appliances after each use; (2) reducing standby electricity consumption by home appliances when they are not in use; (3) adjusting the thermostat or fan direction of air conditioners; (4) effectively using refrigerators (for example, by opening the door for shorter periods); (5) adjusting lighting and lengthening lights-out times; (6) effectively using home appliances, such as by adjusting the main switch and brightness of TVs; and (7) making lifestyle changes, such as reducing nighttime activities.

On May 13, 2011, the government's emergency countermeasures headquarters for the power supply publicly announced summer countermeasures. Specifically, the announcement defined the peak season and times (09:00-20:00 on weekdays between July and September) and a target demand-management rate of -15% from the previous year for areas supplied by TEPCO and Tohoku Electric Power. To ensure that the set goals would be achieved, this target of -15% from the previous year was uniformly given to all users: commercial-scale utility customers (operators with contract demands of 500 kW or more), individual consumers (operators with contract demands of less than 500 kW), and households. The national government hammered out voluntary programs for each ministry to reduce maximum power consumption during the peak season and times by at least 15%, based on the Basic Policy for Government Energy-Saving Initiatives.

On November 1, 2011, the basic policy for the supply and demand of electricity in the coming winter was made public. It stated that more continuous efforts should be made for the supply of electricity, and that this could be achieved by the electrical companies cooperating with each other depending on supply and demand conditions. In addition to this, a balanced supply and demand was to be maintained in regions where there was a shortage of electricity for the smooth operation of the electrical power system. However, the regulation of demand for electrical power under the provisions of the Electricity Business Act will not be implemented, aiming to minimize the influence on society and economy due to the energy saving. The sensitive response was also expected to save energy in accordance with business activities and the lives of Japanese citizens.

The situation placed a severe burden on the lives of Japanese citizens and on business activities; however, this incident can be considered to be an opportunity to recognize the scarcity and importance of energy.

(3) The results of energy-saving efforts

Follow-up measures on power supply and demand implemented by the Ministry of Economy, Trade and Industry in the summer of 2011 verified initiatives by commercial-scale utility customers, individual consumers, and households.

Due to the widely-encouraged energy-saving efforts and relatively low temperatures in TEPCO and Tohoku Electric Power service areas, the target (15% reduction in maximum peak demand) was achieved. Compared to performance in the previous year on days with the same temperature, the reduction rate in the TEPCO area reached 27% for commercial-scale utility customers, 19% for individual consumers, and 11% for households, while the Tohoku Electric Power area achieved 18% reductions for commercial-scale utility customers, 17% for individual consumers, and 18% for households. Most results were much better than the targets (Table 2-2-1).In addition, both TEPCO and Tohoku Electric Power service areas achieved a

Table 2-2-1 Achievement of Targets for Maximum Peak Demand

Commercial-scale utility customers

Maximum peak demand (kW) (Peak for 9:00 a.m. to 8:00 p.m. on weekdays)	TEPCO area (about 14,800 orporations)	Tohoku Electric Power Co. area (about 3,700 porations)	Kansai Electric Power Co. area	Kyushu Electric Power Co. area
Target	▲15%	▲15%	▲10% or more	No numerical target set
Versus maximum value the previous year	▲29%	▲18%	▲9%	▲6%
Versus days with the same temperature	▲27% (exceeded the target)	▲18% (exceeded the target)	▲9% (same as target)	▲2%

Individual consumers

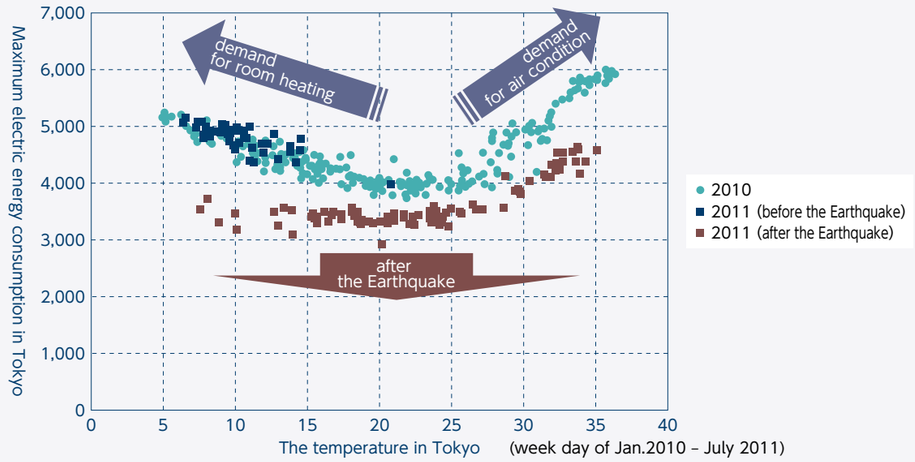
Maximum peak demand (kW)	TEPCO area	Tohoku Electric Power Co. area	Kansai Electric Power Co. area	Kyushu Electric Power Co. area
Target	▲15%	▲15%	▲10% or more	No numerical target set
Versus maximum value the previous year	▲19%	▲20%	▲10%	▲13%
Versus days with the same temperature	▲19% (exceeded the target)	▲17% (exceeded the target)	▲10% (same as target)	▲7%

Households

Maximum peak demand (kW)	TEPCO area	Tohoku Electric Power Co. area	Kansai Electric Power Co. area	Kyushu Electric Power Co. area
Target	▲15%	▲15%	▲10% or more	No numerical target set
Versus maximum value the previous year	▲6%	▲22%	▲14%	▲14%
Versus days with the same temperature	▲11% (below the target)	▲18% (exceeded the target)	▲4% (below the target)	▲7%
Electric power sales (kwh in August) the previous year	▲17%	▲17%	▲17%	▲9%

Source: Press release data from the Ministry of Economy, Trade and Industry (October 14, 2011)

Figure 2-2-1 Relationship between the Temperature and Electric Consumption of TEPCO Area in 2010 and 2011



Resource: Central Research Institute of Electric Power Industry

17% reduction (in August) for households. Most results were far below the target consumption levels.

During the same period, unavoidable demand restrictions regardless of temperature were imposed on commercial-scale utility customers. The extra cost was borne by these customers, since they had to use private electric generators to avoid curtailing or adjusting production. For many industries, the allowable range of energy savings forced them to primarily cut back consumption in their business operations (for example, by limiting the use of air-conditioning and lighting) to avoid affecting production. It is therefore likely that corporations with more of their business activities focused on production, or industries that constant require energy for production facilities, had difficulty achieving the target by focusing their power-saving efforts only on lighting, air-conditioning, or shifting operation days.

A significant portion of individual consumers enjoyed the benefits brought by reduced costs, which came from an increased awareness of energy conservation and savings on electricity expenses. However, an increasing number of corporations are suffering disadvantages in terms of higher costs, impacts on production volume, increasing burdens on employees, and impacts on service.

In addition to these two sectors, a vast number of households also made energy-saving efforts, including adjusting lighting and air-conditioning (set to 28°C and using an electric fan). It is likely that most households were able to save electricity while maintaining a comfortable lifestyle.

The figure shows the relationship between the maximum temperature and electric energy consumption of TEPCO Area in 2010 and 2011(Figure2-2-1). In 2010, the plots show the V shape because of increasing the demand of electric consumption for air-condition around in 25℃ and the demand of room-heating around in 15℃. In 2011, we can see the trend of less demand than that of 2010 as a whole, while the data just before the Earthquake is overlapping with the data in 2010.

2 Changes in People's Behavior as a Result of the Limited Electric Power Supply

The changes in Japan's socioeconomic situation, including the tight power supply, actually raised awareness of disaster prevention, lifestyle choices, and personal values for a vast number of people. To understand the changes in people's values in terms of the environment, the Ministry of the Environment carried out an online survey of attitudes in the form of a questionnaire in February 2012.

Figure 2-2-2 shows the results of the survey for individual behavior: "What I tried before the earthquake," and "What I am trying now or what I am going to try in the future." It demonstrates people's attitudes towards continuing their efforts even after the earthquake. In particular, after the disaster there was a dramatic increase in the number of people who wanted to introduce devices for "improving the insulation efficiency of windows and walls" and to "introduce renewable energies (e.g., solar power) or high-efficiency water heaters."

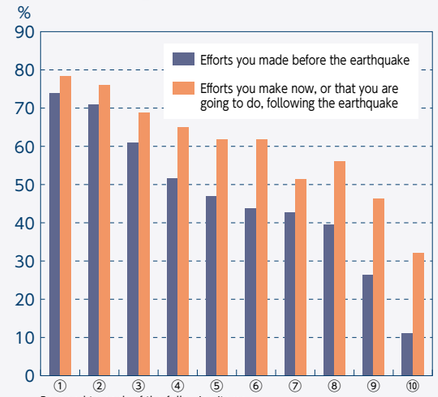
Figure 2-2-3 shows the efforts made at public facilities to save energy. A number of people began to adopt casual clothing such as going without jackets as part of the "Cool Biz" dress code, as well as changes in people's working styles, not only just after the disaster but also in ordinary times. More than half of those surveyed accepted reducing outdoor neon advertisements, advertising displays, and lighting in public facilities such as subways to some extent. However, more people accepted stopping vending machines and escalators only as emergency measures than those who would accept these measures in normal times. Also, a relatively high proportion of people did not think that reducing the brightness of streetlights or other safety-related measures were acceptable even during emergencies.

Changes in public awareness can be considered influential on consumer behavior. With the hope of remedying inconveniences caused by energy-saving initiatives after the earthquake, overall light bulb sales indicated a dramatic growth in the proportion of LED light bulbs sold after March 2011, immediately following the earthquake, backed by an increased awareness of energy conservation among the population (Figure 2-2-4).

Also after the earthquake, the idea of growing climbing plants over a window, which is called a "green curtain," rapidly gained popularity as it could shield the sun. Figure 2-2-5 shows a spike in the growth of bottle gourds, bitter gourds, luffa, and the like. June 2010-May 2011 results are shown, with the June 2008-May 2009 sales of trailing plants set as 100.

The recent heightened awareness of energy saving and conservation can be considered beneficial in terms of promoting anti-global warming initiatives as well. To make these initiatives sustainable and rooted in daily activities, it is vital to dramatically enhance energy conservation and electricity saving, while taking into consideration behavior patterns of users and innovations in the social infrastructure.

Figure 2-2-2 Efforts Made before the Earthquake and Efforts being Made Now

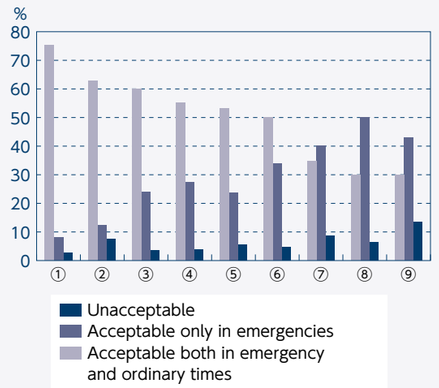


Respond to each of the following items
(Number of respondents: 4,000 nationwide) (February 2012)

① Energy-saving efforts related to home appliances, such as adjusting the thermostat.
② Bringing your own shopping bags or refraining from buying unnecessary items.
③ Energy-saving efforts related to clothing, such as following the "Cool Biz" and "Warm Biz" initiatives.
④ Water-saving efforts such as taking shorter showers.
⑤ Energy-saving efforts related to interior, such as bed cloth, carpet and curtain etc.
⑥ Purchasing energy-saving products, such as energy-efficient air-conditioners, TVs, refrigerators.
⑦ Actively using public transportation or bicycles (to reduce the use of automobiles).
⑧ Using greenery to block sunlight and reduce air-conditioner use.
⑨ Improving insulation efficiency of windows and walls.
⑩ Introducing renewable energies (e.g., solar power) or high-efficiency water heaters.

Source: Ministry of the Environment

Figure 2-2-3 Energy-Saving Efforts by Public institutions

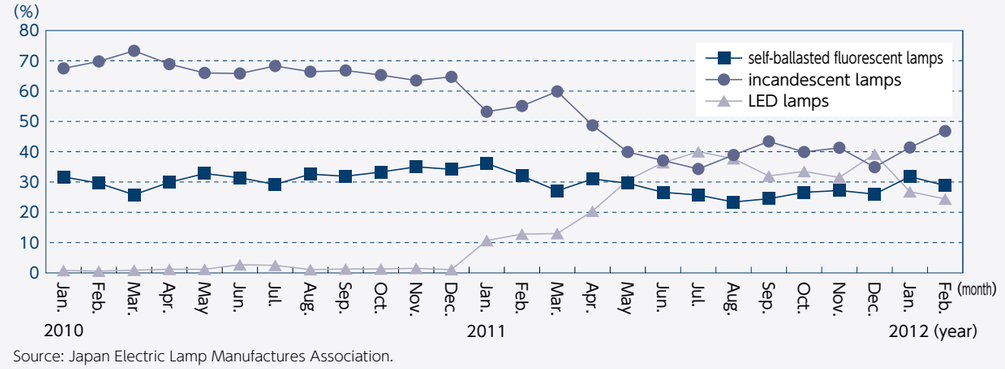


Categorize each of the following items (Number of respondents: 4,000 nationwide) (February 2012)

① Have staff at public facilities go without ties.
② Have staff at public facilities wear Hawaiian or Okinawan-style shirts.
③ Turn off outdoor neon advertisements and advertising displays.
④ Lower light levels in public facilities such as subways.
⑤ Revise work shifts, such as by working weekends to stagger days off.
⑥ Increase or lower temperatures (according to the season) in public facilities such as subways to reduce air-conditioning use.
⑦ Turn off vending machines.
⑧ Stop escalators.
⑨ Lower light levels for streetlights.

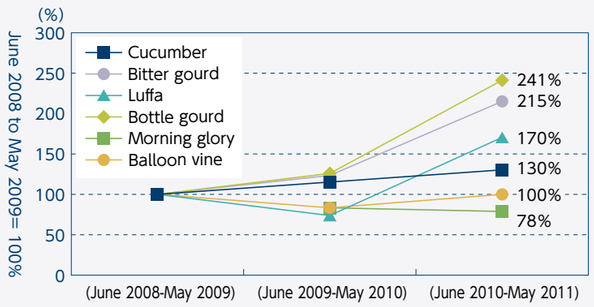
Source: Ministry of the Environment

Figure 2-2-4 Rate of Change in the Sales Ratios of LED Lamps, Incandescent Lamps, and Self-Ballasted Fluorescent Lamps



Source: Japan Electric Lamp Manufactures Association.

Figure 2-2-5 Trends in Sales of Climbing Plants



Note: Sales performance at Sakata Seed Corporation's Garden Center Yokohama

Source: Sakata Seed Corporation
Photo: Ministry of the Environment

Section 3 Responses to Various Environmental Issues

The Great East Japan Earthquake not only brought problems in terms of the disposal of disaster waste and electricity supply and demand, but also in areas beyond environmental sectors. Concerns included: the spread of seafloor sludge to land areas due to the tsunami; the release of asbestos into the air in demolishing collapsed buildings; and the spread of hazardous substances into the air, the public water supply, groundwater, and soil, as well as the flow of wastes and oil into the ocean, which have deleterious effects on people's health and living environment. In addition, the prolonged evacuation period requires that we take steps to properly dispose of human and other waste, care for affected pets, and ensure that the government acts in a way that respects the rights those who affected by the disaster.

This section gives an overview of countermeasures based on laws that are designed to cope with the environmental issues stemming from the Great East Japan Earthquake. It also gives the current status of the recovery effort as achieved through these countermeasures. Environmental issues related to the nuclear power station accident will be described particularly in following section.

1 Disposal of Human Waste, Sewage Water, and Other Kinds of Waste in Affected Areas

Affected areas must take critical measures to dispose of the human waste and normal waste generated not only in local communities but also in evacuation shelters. The Ministry of the Environment asked various groups involved in providing emergency support to quickly dispose of waste and to collect and transport disaster waste immediately after the disaster. In response to these requests, workers, equipment, and other kinds of supports were dispatched from local governments and domestic waste disposal operators, in addition to numerous other forms of free assistance.

Specifically, this meant dispatching personnel from municipalities nationwide to municipalities in the affected area. Even now, personnel are being dispatched to local governments in the affected area. To ensure public health and sanitation, Gvernment checked the drainage function of all sewage pipes in affected urban areas immediately after the disaster. When damaged sewage water pipes and pumps were detected, temporary pumps or piping were installed as an emergency measure to eliminate foul water. For the sewage treatment plants damaged by the tsunami, further efforts have been continuing for reintegration to their original condition, including recovery for the gradual improvement of treatment water quality as well as primary water treatment in temporary facilities and so on.

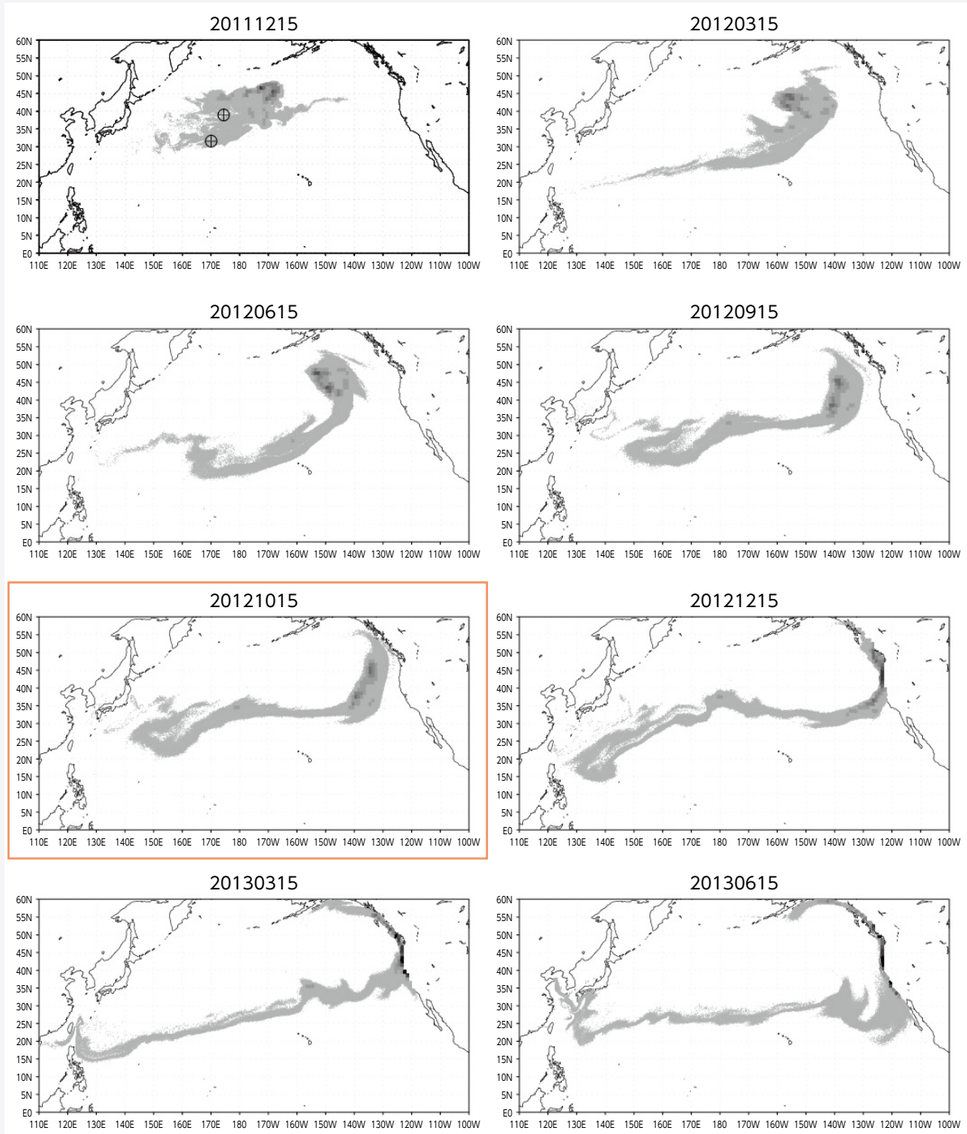
2 Status of Environmental Pollutant Discharge

(1) Status of water and soil environments

Following the Great East Japan Earthquake, there was concern over the negative impact on people's lives and the deterioration of living environments due to leakage of hazardous materials into the public water supply and groundwater, as well as due to the flow of waste and oil into the ocean due to the tsunami. To cope with these potential hazards, an emergency monitoring survey was conducted to observe water conditions.

The survey took place over an area extending from Aomori Prefecture to Ibaraki Prefecture, which was badly affected

Figure 2-3-1 Predicted Results of General Drifting Objects (December 2011 to June 2013)



Source: Ministry of the Environment " The announcement of the prediction for the drifting objects on the sea caused by the Great East Japan Earthquake" (April 6, 2012)

by the earthquake and tsunami. The survey checked environmental limits and detected dioxins and other substances under the environmental standard to measure water quality in rivers, the ocean, bottom sediment, and groundwater.

No significant contamination due to the earthquake was found in the environment of the affected area. At the same time, the response of the local governments was appropriate, since they collaborated with other municipalities involved to continue careful monitoring at locations where hazardous materials exceeded environmental limits. For drinking water, guidance was provided to the owners of targeted wells.

In addition, surveys on water quality, bottom sediment, and living substances were conducted to understand the situation after the earthquake, targeting enclosed coastal seas (five marine regions) in disaster-affected areas. These areas had serious concerns over deterioration in water quality due to pollutants flowing from land areas after the disaster.

Furthermore, although the environmental standard has not yet been established, a survey was conducted targeting substances with high residual content and hazardousness in the coastal region of the affected area.

Another survey was conducted on the seafloor using sonar to detect submerged rubble and waste. The device detected waste deposited on the sea bottom and took pictures with underwater cameras. No large rubble (collapsed buildings or vehicles) was detected. Also, the total amount of waste that flowed into the ocean was estimated, in addition to a survey conducted to predict the drifting route, location, and timing of arrival of objects of disaster-related waste drifting on the sea. This estimate was calculated by classifying the drifting objects into general driftage (boards caused by collapse of houses, fishing vessels flooded with water); driftage on the sea surface (floats and buoys for cultivation and fixed netting, undamaged floating fishing vessels); and driftage below the sea surface (timber including driftwood exposed to sea water). As a result, the general drifting objects category was predicted to reach the coastal area of the west coast of North America around October 2012 (Figure 2-3-1).

As to the soil environment, an emergency monitoring survey was conducted to observe the environment to investigate negative influences on human health due to the spread of chemical materials from industrial facilities and dioxin emissions from fires.

The survey was conducted over a wide area of public land from Aomori Prefecture to Chiba Prefecture, targeting dioxin and specified toxic substances specified in the Soil Contamination Countermeasures Act.

The results of the survey showed that four materials including lead and arsenic exceeded the standard eluted amount level or in the amount contained in the soil in some investigation spots. As to the spots where the eluted amount had been exceeded, an additional survey was conducted on the utilization situation of groundwater in the immediate area. In cases where such water was used as drinking water, groundwater quality was investigated and it was verified that the eluted amount did not exceed the environmental limit. As to the spots where the specified amount contained in the soil was exceeded, the usage situation of the land was surveyed and it was confirmed that access to these areas is being restricted.

(2) Status of the spread of asbestos

The Ministry of the Environment has addressed asbestos issues by defining three core elements: measures to prevent the spread of asbestos; measures to prevent exposure to asbestos (including alleviating the concerns of affected people); and feedback on verification and results of these two preventative measures through surveys on the concentration of airborne asbestos.

Surveys on the concentration of airborne asbestos in affected areas were conducted at 505 locations in 2011, and will be continued in the years to come. In addition, the results of surveys conducted so far showed that no asbestos spread to peripheral areas, except some worksites where asbestos was being removed from buildings. Although asbestos spread was confirmed at one site, there was no significant concern regarding the issue.

Upon request from local governments, the Ministry of the Environment conducted airborne environment monitoring at thirty locations, including areas where a large number of affected people are living (e.g., shelters) in Iwate, Miyagi, Fukushima, and Ibaraki prefectures. The results showed that arsenic and its compounds were in excess of established criteria at one location; however, an additional survey carried out in September verified that there was no significant problem. Also, the results of a monitoring survey conducted later in December further verified that there was no significant concern.

Photo 2-3-1 Disposing of Rotting Fishery Products

(Miyagi Prefecture)

(Iwate Prefecture)

Photo: Ministry of the Environment

3 Disposing of Rotting Fish

Vast amounts of fishery products rotted in cold storage warehouses installed at fishery harbors in Miyagi and Iwate prefectures, resulting in odor and noxious insects including flies. This raised concerns over environmental deterioration in the surrounding areas.

After the earthquake, measures were taken to bury the rotting products. However, the Miyagi and Iwate prefectural governments began to have problems securing enough land for the disposal, so they requested permission to dispose of some of the putrid products at sea.

In response to the situation, standards specified by the minister of the environment with regard to waste, waters in which to dispose of waste, and methods of disposal were announced on April 7, 2011 regarding emergency marine disposal. The standards were based on the Act on Prevention of Marine Pollution and Maritime Disaster, and targeted the rotting fish in Miyagi Prefecture. On June 17, 2011, another notification, on rotting fish in Iwate Prefecture, was issued. Disposal of fishery products in the sea was completed around July 2011(Photo 2-3-1).

4 Responses Targeting Affected Pets

The Great East Japan Earthquake brought enormous damage, not only to residents in the affected areas, but also to animals, including pets. In particular, the TEPCO Fukushima Daiichi NPS accidents in Fukushima Prefecture forced people to seek shelter without any belongings, and they were forced to leave a number of animals in the alert zone.

After the accident, assistance to rescue affected pets was provided with the help of certain groups, including local public authorities, the Emergency Disaster Animal Rescue Headquarters (consisting of the Japan Society for the Prevention of Cruelty to Animals, the Japan Animal Welfare Society, the Japan Pet Care Association, and the Japan Veterinary Medical Association). These groups provided material support, supplying items such as pet food and collecting and distributing monetary donations.

Activities to protect affected pets left behind in the alert zone were carried out by the Ministry of the Environment and Fukushima Prefecture in full cooperation with the help of other local governments, Headquarters for the relief of Animals in Emergencies , and veterinarians.

Column

Response Targeting Affected Pets

When the massive earthquake occurred, one of the critical issues at evacuation centers was avoiding potential problems due to the pets accompanying evacuees. Countermeasures actually taken at evacuation centers included: separating spaces for those with and without pets (i.e., providing designated areas for pet owners); using posters to notify those who suffered from animal allergies; and having veterinarians provide medical treatment and health consultations.

Iwate Prefecture helped evacuees with pets, providing cages, other pet items, and consultations, while Rikuzentakata City and Kamaishi City (Iwate Prefecture) allowed evacuees to keep their pets in the temporary housing.

Sendai City (Miyagi Prefecture) established the Sendai City Victim Animal Aid Station in consultation with the City Animal Management Center, Sendai Veterinary Medical Association, and NPOs to further ensure the effectiveness of animal protection. Various efforts have been made at the station to provide services, including medical information on animal hospitals, temporary custody and medical treatment at the animal hospital for affected dogs and cats with unknown owners due to the disaster, aid for affected animals at shelters, temporary custody of animals with affected owners, and efforts to protect or return affected animals.

Photo : Ministry of the Environment

5 Changes in the Natural Environment

The tsunami and other catastrophe situations caused by the Great East Japan Earthquake substantially altered the natural environment on the Pacific coast of the Tohoku region. An analysis of the coastal range inundated by the tsunami (extending from Misawa-City, Aomori Prefecture to Kitaibaraki City, Fukushima Prefecture) and a vegetation map (National Survey on the Natural Environment by the Ministry of the Environment) suggests that most of the inundated lands were either arable (54%, or 25,646 hectares) or urban (30%, or 14,375 hectares). Natural vegetation along the coast was also affected, and includes: (1) Japanese black pine and red pine plantations (5%, or 2,501 hectares); (2) vegetation in marshlands, rivers, and ponds (2%, or 942 hectares); (3) secondary grasslands (2%, or 887 hectares); and (4) dune vegetation (1%, or 657 hectares).

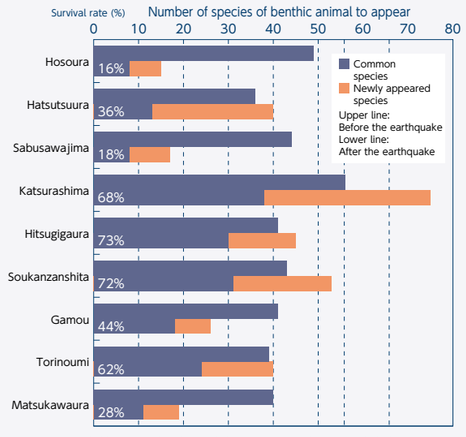
The severity of the impact seems to have varied according to the location. For example, although the overall situation has not yet been fully understood, seaweed or algae beds (including brown seaweed and kelp, which grow directly on bedrock) disappeared in some locations, while other locations suffered virtually no impact. It is thought that seaweed or algae beds such as eelgrass (which grows in sandy areas) disappeared with the impact in most areas and shrunk significantly in others. On the other hand, some eelgrasses have been found that are thought to have sprouted from seeds after the tsunami. There are some areas where fish habitat density in the eelgrass beds is reduced, but there are insignificant changes in the number of species. It is therefore necessary to carry out long-term monitoring of the recovery progress of eelgrass in the coming years.

With 1,000 eelgrass bed monitoring sites, Funakoshi Bay, Iwate Prefecture, was selected for a continuing study by the Ministry of the Environment. The ocean area shown in the photo had been covered with six-meter-tall eelgrass before the tsunami. However, most of it disappeared after the tsunami, leaving scattered eelgrass with heights of a few dozen centimeters.

Photo 2-3-2 Eelgrass in Funakoshi Bay, Iwate Prefecture (Photo taken on October 18, 2011)

Photo: Ministry of the Environment

Figure 2-3-2 Change in the Number of Species of Benthic Animals Appearing on Dry Beach along the Pacific Coast in the Tohoku Area



Source: Provided by Dr. Suzuki Takao, Tohoku University Graduate School of Life Sciences

Figure 2-3-3 Aerial Photo of the Gamou Mudflats, Miyagi Prefecture

(Left photo taken sometime between 1984 and 1986; right photo taken March 12, 2011.)
Photo: Geographical Survey Institute

Mudflat distribution was observed on the southern coasts of Sanriku, particularly in areas where the coastline is deeply indented, in closed sections of the bay, in Matsushima Bay, and on the coast of Sendai Bay. Most of these areas were also damaged by the tsunami, which modified geological formations. Some mudflats continue to change their configuration, while the species composition in others has significantly changed due to modifications in bottom sediment. In addition, some mudflats are no longer above sea level due to sinking caused by the earthquake, and some sand beaches have disappeared or narrowed. The sand beach between this mudflat and the ocean disappeared after the mudflat was buried with earth and sand. The geologic formation of the Gamou Mudflats, in Miyagi Prefecture, is significantly changing even now.

Sanganjima and Hidejima islands off the Sanriku coast are known as breeding grounds for treasured seabirds, including the Madeiran Storm Petrel (designated as critically endangered by the Ministry of the Environment) and the vulnerable Swinhoe's Storm Petrel. Today, seabird breeding is taking place as usual, since the breeding season did not overlap with the earthquake and tsunami, and the breeding grounds suffered virtually no direct effects. However, changes in the feeding environment for these species are expected to be ongoing, making it necessary to carry out careful monitoring in the future to identify the effects on migrant birds and others using the mudflats.

Section 4 The Situation of Radioactive Contamination and Responses to the Nuclear Power Station Accident

Massive amounts of radioactive materials were released into the environment as a result of the accident that occurred at TEPCO Fukushima Daiichi NPS, and on April 12, 2011, this severe accident was temporary evaluated as being Level 7 by the central government according to the International Nuclear Event Scale (INES).

Japan's government summarized the "Report of the Japanese Government to the IAEA Ministerial Conference on Nuclear Safety – The Accident at TEPCO's Fukushima Nuclear Power Stations" (June 2011) on radioactive contamination caused by the accident at Fukushima Daiichi NPS, and in the same month reported to the Ministerial Conference on Nuclear Safety held at International Atomic Energy Agency (IAEA).

"This nuclear accident has turned out to be a major challenge for Japan," said the report to the IAEA, "with numerous relevant domestic organizations working together to respond to the situation while also receiving support from many countries around the world. The fact that this accident has raised concerns around the world about the safety of nuclear power generation is a matter which Japan takes with the utmost seriousness and remorse. Above all, Japan sincerely regrets causing anxiety for people all over the world about the release of radioactive materials." As the report states, the large-scale environmental contamination brought about by radioactive materials discharged into the environment following the accident is a cause for major concern, not only for our Japanese homeland, but also for countries around the world.

This section primarily describes the response to

contamination and similar challenges posed by the radioactive materials derived from the accident. For further details on the accident and its development, see June 2011 *Report of the Japanese Government to the IAEA Ministerial Conference on Nuclear Safety* covering the situation through May 31, 2011, and *Additional Report of the Japanese Government to the IAEA – The Accident at TEPCO's Fukushima Nuclear Power Stations (Second Report)*, published September in of the same year, covering the situation through August 31, 2011.

In this section, the term "radioactive cesium" is used to refer to cesium 134 and cesium 137, which are radioactive materials involved in the accident.

1 Evacuation in Response to the NPS Accident and the Situation Immediately Following the Accident

In response to the loss of all AC power, the inability to inject water in the emergency core cooling system, and other dire concerns at the TEPCO Fukushima Daiichi NPS, then Prime Minister Naoto Kan declared a nuclear emergency at 19:03 on March 11 and established the Nuclear Emergency Response Headquarters in the Office of the Prime Minister. At the Fukushima Nuclear Emergency Response Headquarters, the Fukushima prefectural governor issued an evacuation order for Okuma-machi and Futaba-cho. The order was issued in response to the declaration of a nuclear emergency in Fukushima at the Fukushima Daiichi NPS at 20:50 of the same day, and urged residents of the two towns within a two-kilometer radius of Fukushima Daiichi NPS to evacuate.

At 21:23 on the same day, the Nuclear Emergency Response Headquarters (NERHQ) instructed the Fukushima prefectural governor and relevant local governments to call for the evacuation of residents living within a three-kilometer radius of the Fukushima Daiichi NPS and issued a "stay indoors" order for residents within a 10-kilometer radius.

Ministerial colleagues then reviewed the evacuation area. At 05:44 on the following day, March 12, the NERHQ and the Fukushima prefectural governor instructed local governments to call for an evacuation of residents within 10 kilometers of the Fukushima Daiichi NPS. In response to an explosion that occurred at 15:36 on the same day (March 12) at the Unit 1 nuclear reactor building, NERHQ instructed the Fukushima prefectural governor and local governments to call for an evacuation of residents within 20 kilometers at 18:25.

After a series of incidents, the NERHQ Director-General instructed the Fukushima prefectural governor and relevant local governments to issue a "stay indoors" order to residents within 20-30 kilometers of the Fukushima Daiichi NPS at 11:00 on March 15. The incidents leading up to this order included: an explosion at Unit 3 at 11:01 on March 14; an impulsive sound generated from the direction of Unit 4 around 06:00 on March 15; confirmation of damage in the vicinity of the fifth-floor roof of the Unit 4 nuclear reactor building around 08:11 that same day; and a fire outbreak in the northwest vicinity of the third floor of the same nuclear reactor building at 09:38 on the same day.

Furthermore, to further ensure the safety of residents within 20 kilometers of the TEPCO Fukushima Daiichi NPS, the NERHQ Director-General instructed the Fukushima prefectural governor and heads of local governments to designate the area as an alert zone on April 21.

Meanwhile, environmental monitoring data had revealed that there were areas where radioactive materials had accumulated at high levels even outside a 20-kilometer radius from the TEPCO Fukushima NPS. As a result, heads of local governments were instructed on April 22 to newly designate two specific areas: an area within a 20-kilometer radius, which was designated as an Emergency Planning Zone (EPZ); and an area between a 20-kilometer and 30-kilometer radius (which had been set as a "stay indoors" evacuation area, excluding the areas within it qualifying as deliberate evacuation areas), which was renamed as an Evacuation-Prepared Area in Case of Emergency, since the residents there could possibly be instructed to stay indoors or evacuate in case of future emergencies. In this way, residents inside the deliberate evacuation area were directed to evacuate in a systematic manner, and residents inside the area were prepared for evacuation in case of emergency, and directed to prepare for evacuation or in-house evacuation in case of an emergency. Among these evacuation directives, the Evacuation-Prepared Area in Case of Emergency was lifted on September 30, 2011.

Furthermore, since there were some areas with a predicted accumulated per-year exposure dose of 20 mSv or higher in the year following the accident—even outside the EPZ— the NERHQ on June 16 issued a policy to designate the areas in question as Specific Spots Recommended for Evacuation. The aim of this move was to call attention to the situation and provide support for and encourage residents to evacuate.

As these evacuation directives had a major impact on the livelihood of residents, on August 9, 2011, the NERHQ issued their perspective on reviewing the evaluation areas. Their approach was based on the idea that evacuation directives should be reviewed as soon as possible if there were major changes in the situation. Assessment of changes should be based on an understanding of reduced radiation dosages identified via safety checks of nuclear reactor installations and the accumulation of detailed monitoring results.

On December 16, the NERHQ concluded that comprehensive safety in the entire Fukushima Daiichi NPS had been secured and the Step 2 goal had been accomplished, which meant that the radiation leak was under control and the amount of radiation was kept extremely low, judging from the following circumstances: the reactors were reaching cold shutdown (CSD) conditions; the spent fuel pools were being kept in a stably cool condition; there was a decreasing amount of stagnant water; and radiation leaks from reactors were being controlled. On March 30, 2012, as the Step 2 goal had been achieved, the NERHQ decided to review the designation of evacuation zones and emergency evacuation preparation zones.

2 Monitoring for Radioactive Contamination

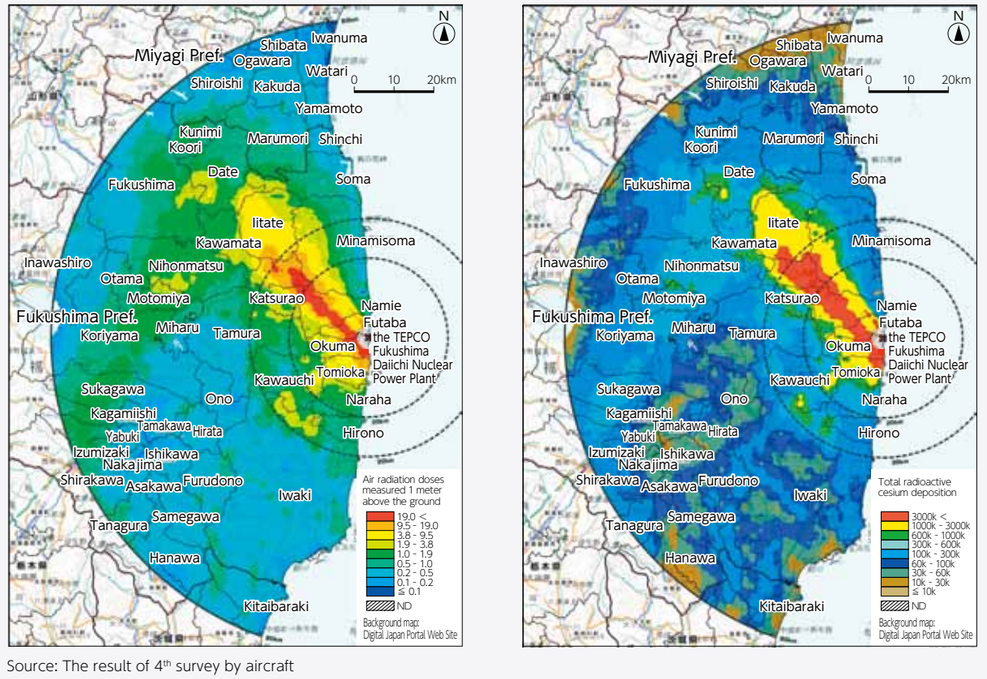
From the accident that occurred at TEPCO Fukushima Daiichi NPS, massive amounts of radioactive materials were discharged into the air, which lead to concern about their influence on the nation's health. To cope with this situation, a number of measures were considered regarding healthcare for small children and other citizens and decontamination to be done in future. Also, in order to provide well-organized information, a Monitoring Plan in the Area was mapped out at a monitoring coordination meeting held by the government in August 2011. In this plan, monitoring related to radioactive materials is clarified with respect to the division of roles to each governmental department, and each department conducts monitoring according to the plan. In addition, the results of the monitoring conducted by the related ministries and agencies are integrated, and are being provided on the radiation monitoring portal site.

(1) Environmental monitoring in general, airborne monitoring, marine areas, schools and public facilities.

Air dose rates were measured by each prefecture and an environment improvement sample analyzer was made, which is to be used to analyze radioactive materials contained in the soil and so on. Also, in the area surrounding TEPCO Fukushima Daiichi NPS, the air dose rate has been measured continuously using monitoring vehicles, transportable monitoring posts, and integrating dosimeters (glass badges) since March 2011. In emergency evacuation preparation zones, in order to support restoration, detailed monitoring, in addition to regular monitoring, was conducted, including surface monitoring, such as a vehicle-borne survey, or monitoring of well water and rivers, focused on living areas in response requests from local government, and a radiation distribution map was produced. In Alert zones and Emergency Planning Zones, detailed monitoring of the air dose rate, such as vehicle-borne surveys, was conducted. In addition, Tokyo and 21 prefectures in eastern Japan were monitored by aircraft; specifically, for the area within an 80-kilometer radius of TEPCO Fukushima NPS, the monitoring was conducted five times (one time of them conducted only in the Emergency Planning Zone and the Evacuation-Prepared Area in Case of Emergency) to detect the air dose rate and radiocesium level.

With regard to the ocean, the level of radioactive material was measured in ocean water, on the ocean floor, and

Figure 2-4-1 A Part of Survey by Aircrafts



Source: The result of 4th survey by aircraft

in marine species in Fukushima Prefecture and other prefectures in the vicinity. As a result, the seawater dose rates continue to be lower than that of immediately after the accident at TEPCO Fukushima Daiichi NPS. On the other hand, ocean soil dose rate is still mostly higher than that of before the accident. Also, it is seen that the ocean soil dose rates vary with time and place, and spread over large areas. Because of the rise of public concern over the impact of radioactive materials on ocean soil and marine organisms in the area where rivers flow into ocean and in the vicinity, it is scheduled that ocean motoring will be strengthened and expanded in FY 2012.

Schools were also monitored by installing compact-size-dosimeters equipped with a data transfer function. A real time radiation monitoring system in which measured data could be transferred to relevant organizations via the Internet was newly established. Furthermore, the air dose rate was measured in schools where relatively high levels of radiation doses had been observed previously in Fukushima Prefecture. In addition, integrating dosimeters were distributed to all schools in Fukushima Prefecture, which made it possible to ascertain the amount of radiation effecting school officials including students.

(2) Ports, airports, parks, and sewerage

The central government, local governments, and other related organizations measured air dose rates in ports and harbors and also in major airports, as well as radioactive concentrations in the ocean, in the Tohoku and Kanto regions. The density of radioactive iodine and radioactive cesium was also measured in Tokyo Bay, the Uraga Channel, and in the vicinity of the Channel, and the results were analyzed.

The radioactive materials contained in drainage, sludge, and so on were also measured by municipalities and subsequently analyzed. Fukushima Prefecture measured the air dose rate in all parks in the prefecture and tourist facilities including mountain districts.

Table 2-4-1 Monitoring and Measurement System for Radioactive Materials

Monitoring target	Ministry in charge of summarizing information[1]	Measurement conducted and help offered[2]		Analysis conducted[3]
Environmental monitoring, (e.g., soil, water, air, etc.), airborne, ocean area, schools, and public facilities	Ministry of Education, Culture, Sports, Science and Technology	Responding to areas around the TEPCO Fukushima Daiichi NPS ○ Nuclear Emergency Response Headquarters (Participation by ministries, local governments, and nuclear business operators)		Independent corporations under the Ministry of Education, Culture, Sports, Science and Technology Japan Coast Guard Meteorological Research Institute*, Japan Meteorological Agency, Technical Research and Development Institute, Ministry of Defense Local governments Nuclear business operators Public inspection institutes Private inspection institutes
		Responding to areas other than the above	○ Ministry of Education, Culture, Sports, Science and Technology, Ministry of the Environment, Ministry of Economy, Trade and Industry, Fisheries Agency (ocean area), Japan Coast Guard (ocean area), Meteorological Research Institute(ocean area), Local governments	
			Defense (airborne, ocean area)[4] Reconstruction Agency[5], Nuclear business operators	
Ports, airports, parks, sewage water, etc.	Ministry of Education, Culture, Sports, Science and Technology (summarize while obtaining information from the Ministry of Land, Infrastructure, Transport and Tourism)	Responding to areas around the TEPCO Fukushima Daiichi NPS ○ On-site countermeasures headquarters (Participation by ministries, local governments, and nuclear business operators)		Independent corporations under the Ministry of Education, Culture, Sports, Science and Technology Local governments Nuclear business operators Public inspection institutes Private inspection institutes
		Responding to areas other than the above	○Local governments etc.	
			Ministry of Land Infrastructure, Transport and Tourism	
Water environments (rivers, ponds, reservoir areas, groundwater etc., natural parks (springs, wild plants and animals, zoological and botanical gardens), waste etc.	Ministry of the Environment	Responding to areas around theTEPCO Fukushima Daiichi NPS ○ Nuclear Emergency Response Headquarters (Participation by ministries, local governments, and nuclear business operators)		Independent corporations under the Ministry of Education, Culture, Sports, Science and Technology Independent corporations under the Ministry of the Environment Local governments Nuclear business operators Public inspection institutes Private inspection institutes
		Responding to areas other than the above	○ Ministry of the Environment ○ Local governments	
			Nuclear business operators, etc.	
Agricultural land, soil, forest land, and pasture etc.	Ministry of Agriculture, Forestry and Fisheries of Japan	Responding to areas around theTEPCO Fukushima Daiichi NPS ○ Nuclear Emergency Response Headquarters (Participation by ministries, local governments, and nuclear business operators)		Independent corporations under the Ministry of Agriculture, Forestry and Fisheries of Japan Independent corporations under the Ministry of Education, Culture, Sports, Science and Technology Local governments Nuclear business operators Public inspection institutes Private inspection institutes
		Responding to areas other than the above ○ Ministry of Agriculture, Forestry and Fisheries of Japan ○ Local governments		
Foods (agricultural, forestry, pasture, fishery etc.)	Ministry of Health, Labour and Welfare	Responding to areas around the TEPCO Fukushima Daiichi NPS ○ Nuclear Emergency Response Headquarters (Participation by ministries, local governments, and nuclear business operators)		Independent corporations under the Ministry of Health, Labour and Welfare Independent corporations under the Ministry of Agriculture, Forestry and Fisheries of Japan Local governments Public inspection institutes, etc.
		Responding to areas other than the above	○ Ministry of Agriculture, Forestry and Fisheries of Japan ○ Local governments, etc.	
			National Tax Agency.[6] etc.	
Water	Ministry of Health, Labour and Welfare	Responding to areas around the TEPCO Fukushima Daiichi NPS ○ Nuclear Emergency Response Headquarters (Participation by ministries, local governments, and nuclear business operators)		Local governments Water business operators Public inspection institutes, etc.
		Responding to areas other than the above ○ Local governments ○ Water and other business operators		

※Meteorological Research Institute works in close cooperation with relevant ministries as an analytical institute.
1 As to implement monitoring at monitoring target , organized research and analysis and integrated announcement and planning are required.2 Radiation dose measurement, taking samples, entrusting transportation and measurements to the private sector.
3 Institutes able to analyze nuclides.
4 Ministry of Defense provides support as necessary by using aircraft and ships in cooperation with relevant ministries and agencies.
5 The Reconstruction Agency works in close cooperation with relevant ministries and agencies for the reconstruction of infrastructure and general coordination for the returning home of residents in evacuation directive areas.
6 National Tax Agency works in close cooperation with relevant ministries for alcoholic beverage monitoring among food monitoring since they are responsible for the office work to secure alcoholic beverage safety.
Note: Groups marked with "○" are implementation groups.
Source: Comprehensive Monitoring Project (August 2, 2011)

(3) Aquatic environments, natural parks, and waste

Since the end of August 2011, water quality and bottom sediment in aquatic environments including rivers, lakes, swamps, water source areas, and bathing areas have been surveyed periodically to measure radioactive materials, in Fukushima Prefecture and nearby prefectures such as Iwate, Yamagata, Miyagi, Ibaragi, Tochigi, Gunma, and Chiba. The quality of groundwater has also been monitored in the same area since October of the same year. The results were as follows: radioactive iodine was not detected both in water and in bottom sediment; in water, radioactive cesium was not detected in almost all area (maximum value was 2Bq/L in surveys carried out on February and March 2012); and, in bottom sediment, radioactive cesium was detected in the wide area. Radioactive cesium in bottom sediment was mostly less than about 2,000Bq/kg; however, high values, exceeding 100,000 Bq/kg (dried mud) were detected in some areas, such as rivers, lakes or water source within a 20-kilometer radius TEPCO Fukushima NPS. Rivers mostly showed the downward trend of measured value, while a small number of areas, such as river mouths, showed upward trend. In lakes and coasts, the rise and fall of measured value did not show any trend.

Also, since October 2011, radioactive material in groundwater has been monitored periodically in these areas. In October and November 2011, surveys were carried out at 433 locations in Miyagi, Yamagata, Fukushima and Tochigi Prefecture. The results were as follows: radioactive iodine was not detected at any locations; and radioactive cesium was also not detected except Fukushima Prefecture where 1Bq/L was detected at two locations. From January to March 2012, surveys were carried out at 588 locations in eight prefectures, which were Iwate Prefecture, Gunma Prefecture, Chiba Prefecture and five prefectures described above. As the result of these, both radioactive iodine and radioactive cesium were not detected.

Furthermore, in order to dispel uncertainties regarding radioactive level in the bathing beach areas, a guideline for bathing areas was established which should guide municipality to determine the possibility of opening the bathing areas to the public by indicating the level of the water quality.

In order to investigate the radiation effect on wild fauna and flora, Ministry of the Environment will continuously keep obtaining samples of plant seeds and rats in vicinity of TEPCO Fukushima Daiichi NPS, and will analyze the result collaborating with research institutions. As long-time research over several generations is required, considering better means of monitoring is necessary in cooperation with research institutes and academic experts.

(4) Monitoring plans for agricultural land, forests, and pasturage

On August 30, 2011, under the initiative of the Ministry of Agriculture, Forestry and Fisheries, the density of radioactive cesium was measured at 580 farmland locations in six prefectures including Fukushima, and a density distribution map based on the results was made public. Furthermore, on March 23, 2012, another map was made public, which covered a wider area, including an increase in the number of measured locations up to 3,400 in 15 prefectures. For forestry areas, the air dose rate, disposition of organic materials, and radioactive cesium density in soil were measured at 391 locations in Fukushima Prefecture and the results were publicly disclosed in the form of a distribution chart on March 1, 2012. The Ministry of Agriculture, Forestry and Fisheries will make effective use of the chart in farmland and forestry decontamination, as well as in agricultural production fields.

(5) Monitoring food products

On March 11 2011, the declaration of a nuclear emergency situation was issued. On March 17, in response to the situation, notification was sent to prefectural governors, mayors of cities with health centers, and mayors of special wards regarding guidelines for handling food products contaminated with radiation. In terms of the Food Sanitation Act, the index value stated in the disaster-prevention measures for nuclear facilities from the Nuclear Safety Committee was adopted as a provisional standard. Food products that exceeded the standard were to be handled based on Article 6 Item 2 of the Food Sanitation Act. Sufficient initiatives were ordered to ensure that such food products were not to be sold for human consumption.

Food products in which radioactive materials were detected in excess of the standard were withdrawn and disposed of. Also, in the event that the spread of radioactive contamination was found in any given area, the shipment and consumption of foods produced in that area were restricted by the Nuclear Emergency Response Headquarters based on nuclear emergency response special countermeasures. After the first restriction of shipments on March 21, other shipments of food (e.g., milk, vegetables, grains, fishery products, and meats) contaminated with excessive levels of radiation were strictly blocked based on the policy, and were detected by the monitoring that was implemented.

This temporary regulation values had been formulated as an emergency response immediately after the accident; therefore, from the perspective of further safety and security of food, new regulation values were figured in order to secure long term. It has come into effect as from April 1, 2012.

(6) Monitoring tap water

In response to the accident at the TEPCO Fukushima Daiichi NPS, the index values for radioactive materials in tap water during an emergency were defined based on an index for intake restrictions of food and drink as defined by the Nuclear Safety Commission of Japan, and the index regulated by the Food Sanitation Act, on March 19 and March 21, 2011. Notice was given to prefectural governments of the countermeasures in the event that radioactive materials exceeded the index values. The guidelines for monitoring and starting or stopping intake restrictions based on examination results were released on April 4, 2011 (and were partially revised on June 30, 2011). Thus far, 20 water suppliers have enforced restrictions of water intake, and all restrictions were removed by May 10, 2011. From that time on, no water suppliers have enforced restriction on water intake caused by a situation in which radioactive iodine or radioactive cesium in the water exceeded the index values. In addition, from April 2011, almost none of these substances were detected.

The Ministry of the Health, Labour and Welfare reached an interim conclusion in June 2011 concluding that the possibility of restrictions on tap water intake was considered to be low unless vast amounts of radioactive materials were to be emitted from the TEPCO Fukushima Daiichi NPS. Based on a new standard for radioactive materials in food, on March 5, 2012 a new target was settled. Notice was given to prefectural governments and water suppliers on the same day regarding monitoring methods, and countermeasures in the event that radioactive materials exceeded the target value (10 Bq/kg for the total of cesium 134 and 137).

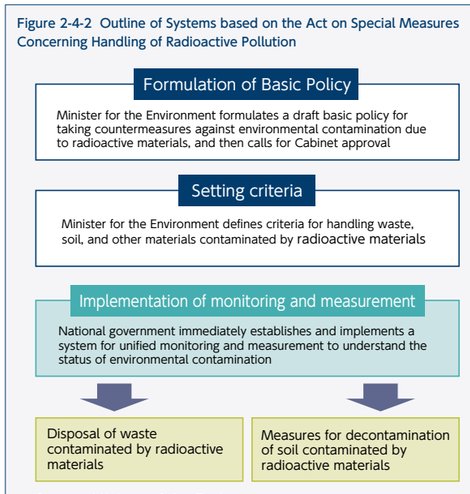
3 Initiatives to Eliminate Contamination from Radioactive Materials based on the Act on Special Measures Concerning Handling of Radioactive Pollution

(1) Act on Special Measures Concerning Handling of Radioactive Pollution

Mitigating the impact of radioactive contamination discharged as a result of the NPS accident on health and the living environment is a pressing issue. In response to this situation, Japan enacted the Act on Special Measures Concerning Environmental Contamination Due to Radioactive Materials Discharged by Accident at Nuclear Power Plants in Association with Tohoku Region Pacific Coast Earthquake on March 11, 2011 (Act No. 110 of 2011). This act will be referred to as the Act on Special Measures Concerning Handling of Radioactive Pollution(Act on SMCHRP) below (Figure 2-4-2).

Furthermore, on November 11, 2011, a basic policy based on the Act on SMCHRP was endorsed by the Cabinet. It outlines concepts such as monitoring and measurement of environmental contamination, disposing of waste contaminated by radioactive materials discharged in the wake of the accident, and soil decontamination. Based on this, initiatives to eliminate contamination from radioactive materials was scheduled to be promoted in order to reduce promptly the effects of radioactive contamination caused by the accident on people's health and living environment.

Figure 2-4-2 Outline of Systems based on the Act on Special Measures Concerning Handling of Radioactive Pollution



Source: Ministry of the Environment

(2) Measures including soil decontamination

A) The framework based on The Act on SMCHRP

The Act on SMCHRP designates specified areas for decontamination and key areas for contamination surveys. For areas specified as Emergency Planning Zone and Evacuation-Prepared Area in Case of Emergency, where special decontamination is necessary, the central government must implement decontamination programs based on the decontamination plans established by the Minister.

Furthermore, the Minister of the Environment shall designate key areas for contamination surveys where the per-year additional exposure dose is 1 mSv or higher. Specified municipalities shall establish decontamination plans, for areas where there are additional per-year exposure dose levels of 1 mSv or higher within the contamination survey key areas. Based on these plans, the central government, prefectural governments, and local municipalities must implement decontamination programs.

The areas designated as decontamination special areas include 11 municipalities in Fukushima Prefecture. A total of 104 municipalities (in Iwate, Miyagi, Fukushima, Ibaraki, Tochigi, Gunma, Saitama, and Chiba prefectures) are designated as key areas for contamination surveys (as of May 2012).

Table 2-4-2 Framework based on the Act on Special Measures Concerning Handling of Radioactive Pollution

	Specifying criteria	Decontamination project	Decontamination implemented by
Decontamination by central government (Decontamination specified area)	Areas that have been specified as alert zones or EPZ	Minister of the Environment formulates decontamination projects for special areas	Central government
Decontamination mainly by local municipalities (Decontamination implementation area)	Where additional per-year exposure dose is 1 mSv or more in key area for contamination survey	Local municipal mayors formulate decontamination implementation projects	Central and prefectural governments as well as local municipalities

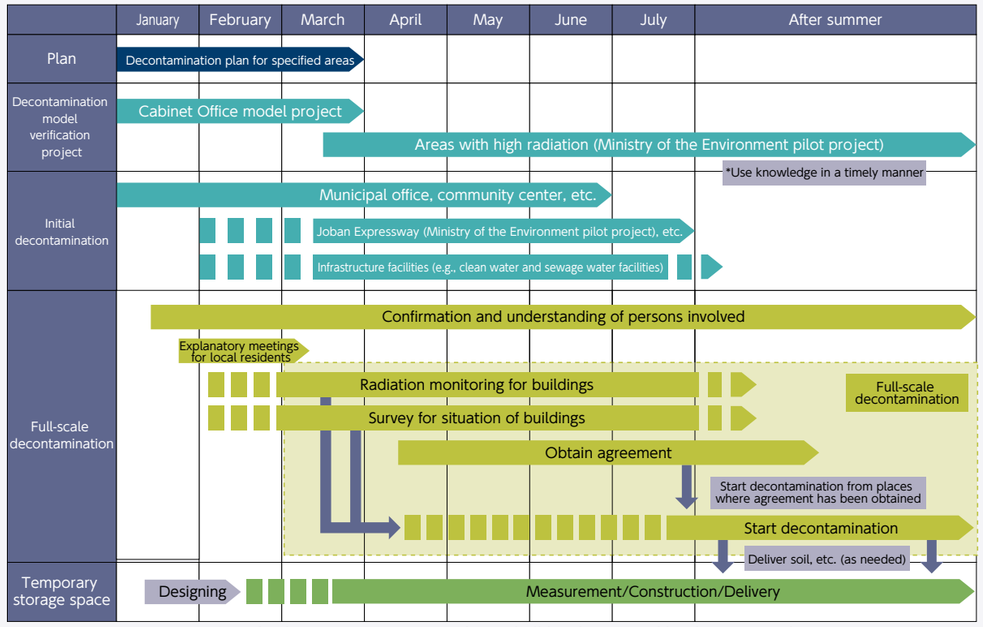
Materials: Ministry of the Environment

Table 2-4-3 Targets for Measures including Decontamination of Soil

Area	Target		Remarks
Additional exposure dose (per year) 20 mSv or higher	Swiftly and steadily minimize target areas		Areas with particularly high exposure dose require measures that take a long-term perspective
Additional exposure dose (per year) Less than 20 mSv	Long-term target	Additional exposure dose shall be 1 mSv or less per year	
	Target through August 2013	Achieve 50% reduction in additional exposure dose per year for the general public versus levels at the end of August 2011 (including physical attenuation of radioactive materials)	
		Achieve 60% reduction in additional exposure dose per year for children versus levels at the end of August 2011 (including physical attenuation of radioactive materials)	

Materials: Created by the Ministry of the Environment, based on the Basic Policy for the Act on Special Measures Concerning Handling of Radioactive Pollution (November 11, 2011)

Figure 2-4-3 Schedule for Decontamination in the Specified Decontamination Area



Note: Specific decontamination procedures shall be determined by the municipality.

Source: Policy for decontamination in specified decontamination areas (Road Map) (Ministry of the Environment January 26, 2012)

B) The basic policy for decontamination of soil and other targets

The basic policy based on the Act on SMCHRP clearly identifies the priority on establishing decontamination plans from the perspective of public health, especially considering children, and implementing programs according to exposure levels.

C) Decontamination in specified decontamination areas

The Minister of the Environment shall formulate "Decontamination Plan for Specified Areas", with establishing concepts based on each classification of

evacuation areas, which was reviewed in the "Basic Concept for Reviewing Alert and Evacuation Areas in Response to the Completion of Step 2 and Issues to be Reviewed in the Future" (Nuclear Emergency Response Headquarters, December 26, 2011). Since the formulation procedure closely relates to actual reviews of the evacuation areas, the Decontamination Plan for Specified Areas will be formulated in close collaboration with the stakeholders including related municipalities, while implementing pilot verification programs and initial decontamination programs.

Under the Decontamination Plan for Specified Areas, decontamination programs will start with enough preparation, including surveys of buildings and obtaining agreements.

① Pilot verification projects (collecting technical knowledge)

From November 2011, a decontamination experiment as a pilot verification project was implemented in the Emergency Planning Zone and the Evacuation-Prepared Area in Case of Emergency to verify techniques needed for effective decontamination. Pilot verification projects have been conducted in all respective planned decontamination areas except Futaba-cho since November 2011, and the results of the dose reduction project were reported at the end of March. The main points of this project are as follows below.

○In the areas where the air dose rate was less than an annual accumulated dose of 30 mSv, air dose rates were reduced to less than an annual accumulated dose of 20 mSv after decontamination.

○On the other hand, where the experiment was performed in an area where the air dose rate was more than an annual accumulated dose of 40 mSv after decontamination, 40% to 60% of the air dose rate was reduced; however, the air dose rate did not fall to less than an annual accumulated dose of 20 mSv.

○In the areas where the dose rate was low, a method minimizing the removed objects was tried, but the rate of reduction in the air dose rate was lower than it was in the areas where the air dose rate was high, while the quantity of removed objects was reduced relatively well.

○In each area, flowing water (including water collected in side ditches) or water that had collected before the accident (pool water) was processed with filtering, adsorption, agglomeration, and sedimentation depending on the degree of contamination. All methods resulted in all wastewater satisfying the standard regulated by the Nuclear Reactor Regulation Law.

○Volume reduction with high temperature incineration did not result in dispersion of radioactive materials to outside with smoke, which had stuck to branches and leaves, and this method was also highly efficient in volume reduction. Moreover, with the process using bag filters and HEPA filters, concentrations of radioactive cesium in smoke exhaust was confirmed to be such that it is possible to achieve concentrations of radioactive material in the air that are sufficiently lower than is regulated by law.

○Regardless of the annual accumulated dose or land use classification, in almost all areas, more than 80% of radioactive materials could be reduced by removing at most 5 centimeters of topsoil. However, the thickness of removed soil that directly relates to the quantity of removed radioactive material needs to be determined in consideration of the depth and direction of the concentration of radioactivity, and the decontamination goal.

Implementation of the model project will continue both in the present and future, and knowledge on the effects and applicability of the decontamination techniques will be accumulated; the knowledge acquired at this point will be applied to future decontamination projects.

Photo 2-4-1 Pilot Decontamination Project

Photo: Ministry of the Environment

Column

Decontamination and other efforts

Effective decontamination methods vary according to the radioactive material. Before starting decontamination, radiation is measured to select the optimal decontamination method. Radiation dose is also measured after completion of decontamination to check efficacy.

Examples of decontamination methods in places with relatively low radiation include: cleaning rain gutters installed under the eaves of local homes, mowing grass and cutting back wooded areas, and removing sludge in street gutters.

Examples of decontamination methods for places with relatively high radiation include: scraping surface soil in schoolyard with heavy machinery and removing thin layers of leaf mold by hand. Examples of decontamination for roofs and similar places include pressure-washing and watershoot decontamination.

Cleaning space under eaves and in rain gutters

Removing sludge in street gutters (photo: Fukushima City)

Mowing grass and wooded areas (photo: Date City)

Photo: Ministry of the Environment
Source: Ministry of the Environment, Radioactive contamination information website

② Initial decontamination (prerequisites for full-scale decontamination)

To implement full-scale decontamination in the future, it is necessary to implement initial decontamination at key decontamination facilities (e.g., municipal offices and community centers), roads accessing the area, and infrastructure facilities supplying water and other materials needed for decontamination.

From December 2011, the Self Defense Forces and other parties had already begun decontamination efforts, such as decontamination of the Joban Expressway. Initial decontamination will be continued in the future for locations such as public facilities (e.g., municipal offices and community centers) and infrastructure facilities (e.g., facilities for clean water and sewage water).

③ Full-scale decontamination

Full-scale decontamination is scheduled for soil in residential areas as well as for offices, public buildings, roads, agricultural land, and forests around living areas by the end of March 2014, in order to gradually deliver the removed soil to properly managed temporary storage spaces.

The Ministry of the Environment stated its Basic Concept of Interim Storage Facilities That are Required as an Initiative to Address Environmental Contamination by Radioactive Materials Caused by the Accident at the TEPCO Fukushima Daiichi Nuclear Power Plant in October 2011, and requested discussions to site it in Futaba, Fukushima Prefecture at the end of 2011. In March 2012, discussions were held among Futaba municipality, Fukushima Prefecture, and the national government, and the national government proposed a plan to site it in multiple areas. The national government will make maximum efforts to start operations in three years after the beginning of full-scale emplacement into temporary storage areas.

④ Decontamination of specified areas

The Minister of the Environment has specified municipalities that need intensive surveys and measurement of environmental contamination due to accident-based radioactive materials. The specified areas are those that have an average radiation dose of at least 0.23 μSv per hour (areas with at least 1 mSv of annual additional exposure). The specified municipalities shall determine areas where actual decontamination measures will be taken.

The concept for implementing decontamination indicates that it is appropriate to take measures while making due consideration of the actual situation in each location, and to take measures that focus on the lives of children, since even places with relatively low additional exposure sometimes have higher radiation than peripheral areas. Under this concept, decontamination shall be implemented according to the basic policy formulated under the Act on Special

Measures Concerning Handling of Radioactive Pollution. The specified policy for decontamination methods for soil and other materials in places with relatively high additional exposure includes scraping soil surfaces, cleaning buildings, cleaning street gutters, artificial pruning, and removing deciduous leaves.

(3) Disposal of Wastes Contaminated by Accident-Based Radioactive Materials

As a rule, waste potentially contaminated by accident-based radioactive materials will be disposed of according to the Act on Special Measures Concerning Handling of Radioactive Pollution and the Waste Disposal and Public Cleansing Law. In addition to methods for disposing of waste contaminated by radioactive materials, the Act on SMCHRP indicates the following classifications: specified waste, specified general waste, and specified industrial waste.

a) Specified Waste

Based on the Act on Special Measures Concerning Handling of Radioactive Pollution, specified waste is classified into: waste in areas where measures for contaminated waste are to be taken (referred to as “waste in areas subject to countermeasures”); and specified waste.

The waste in areas subject to countermeasures is the waste to be disposed of by the central government based on the disposal plans for those areas.

Specified waste is defined as waste contaminated by radioactive materials at a level that requires special management. Specified waste is disposed of by the central government. The designation procedure is as follows: a facility manager conducts a survey on the contamination of waste discharged from facilities that satisfy certain requirements (water facilities, sewage water pipes, industrial water facilities, waste disposal facilities, and village drainage facilities); a report is delivered to the Minister of the Environment; and specifications are issued based on the survey report in the above. Specifically, the concentration of radioactive cesium in waste designated as specified waste by the Minister of the Environment must exceed 8,000 Bq/kg (Table 2-4-4). Also, when the owner of the waste believes that the concentration of radioactive cesium is over 8,000 Bq/kg as a result of a contamination survey performed on it, the owner can apply to Minister of the Environment to receive the designation of specified waste.

The specified waste described above will be disposed of according to certain standards, including collection and disposal standards, storage standards, intermediate processing standards, and landfill standards, based on Article 20 of the Act on Special Measures Concerning Handling of Radioactive Pollution. These standards are defined to limit radiation exposure to local residents to not more than 1 mSv per year in the course of disposal to ensure their safety. The necessary measures (specifically, shielding radiation, preventing contamination of public water and groundwater, managing exhaust gas from facilities, and managing drained water) are accurately checked to ensure that the standards are met (Figure 2-4-4).

b) Waste Contaminated by Accident-Based Radioactive Materials Other than Specified Waste

Article 23 of the Act on Special Measures Concerning Handling of Radioactive Pollution stipulates that parties disposing of waste contaminated or potentially contaminated by accident-based radioactive materials (specified general waste and specified industrial waste) must observe specific disposal standards, in addition to waste disposal standards from the Waste Disposal and Public Cleansing Act.

Waste materials defined as specified general waste and specified industrial waste are:

(1) Waste produced as a result of measures for soil decontamination in specified decontamination areas or areas to be decontaminated;

(2) Sludge and incineration ash discharged from water facilities, sewage terminal treatment facilities, incineration facilities, and so on;

(3) Paddy straw or compost turned into waste as a result of contamination from accident-based radioactive materials; and

(4) Materials used to dispose of the waste in (1) through (3) above that do not fall into any of the above categories.

These specified disposal standards are designed as precautionary measures to further secure safety by applying the Waste Disposal and Public Cleansing Act also to disaster waste containing 8,000 Bq/kg or less of radioactive cesium.

The specified disposal standards consist of collection and transportation standards, intermediate processing standards, and landfill standards as follows;

The specified disposal standards for collection and transportation stipulate that in cases of transshipment or storage of specified general waste or specified industrial waste, the waste must be stored in a location that displays a notice board satisfying the necessary requirements.

Specified disposal standards are stipulated for intermediate processing such as incineration and other treatments for specified general waste or specified industrial waste (incineration, melting, thermal decomposition, and calcination). The treatments include high-end exhaust gas treatment facilities, such as filter dust collection devices.

Landfill disposal standards stipulate landfill methods for specified general waste and specified industrial waste, such as installing soil layers or stratified landfill.

The standards further stipulate that specific maintenance standards based on Article 24 of the Act on Special Measures Concerning Handling of Radioactive Pollutant must be applied in incineration facilities for disposal of specified general waste and specified industrial waste in certain areas, whether they are actually used for waste disposal or not. In this way, radioactive material concentrations in exhaust gas or drained water can be measured at least once a month, and air dose rates at the boundary of the sites can be measured at least once a week.

In addition, specific maintenance standards shall be applied to landfill sites for specified general waste and specified industrial waste. Accordingly, radioactive material concentrations in groundwater and discharged water shall be measured at least once a month, and air dose rates shall be measured once a week or more.

(4) Institutional Improvement for Decontamination and Polluted Waste Disposal

Decontamination and disposal of contaminated waste must be implemented while further improving the system in collaboration with the Reconstruction Agency and Nuclear Emergency Response Headquarters.

The Ministry of the Environment has established the Fukushima Environment Rehabilitation Office to promote decontamination and disposal of contaminated waste in Fukushima Prefecture, associated with full-scale enforcement of the Act on Special Measures Concerning Handling of Radioactive Pollution on January 1, 2011.

Fukushima Prefecture and the Ministry of the Environment dispatch decontamination professionals when requested to do so by municipalities. Furthermore, a Decontamination Information Plaza was established as a base for gathering and disseminating information on the activities of decontamination volunteers. The plaza is jointly operated by the central government, Fukushima Prefecture, and other institutions and groups involved. Service at the plaza began on January 20, 2012, accepting requests for the dispatch of decontamination professionals via telephone or email. These decontamination professionals consist of volunteers supported by institutions and groups involved in radiation, such as academic societies.

Moreover, since December 2011, the Ministry of the Environment and Fukushima Prefecture have been holding workshops on decontamination operations, in order to ensure that the operators of decontamination businesses and people in related organizations acquire the rules and basic knowledge for safe and appropriate operations, and can provide special education or instruction as necessary in the respective operational areas. Untill April 2012, workshops were held 60 times; and 13,000 people completed.

4 Response to Low Dose Exposure

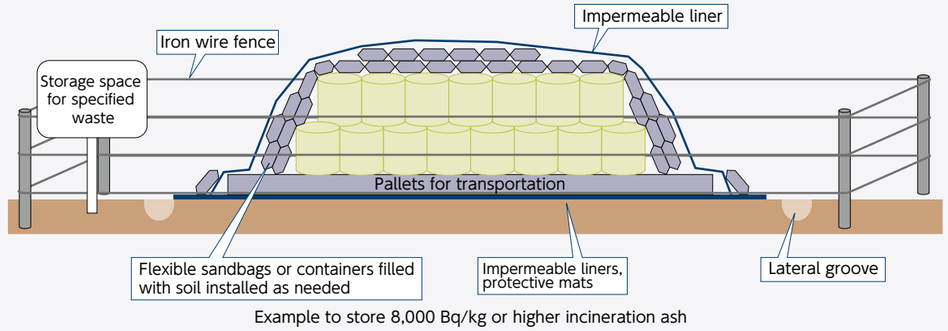
(1) Organizing and Reviewing the Knowledge about Risk Management of Low Dose Exposure

In the radioactive pollution countermeasures taken after the accident at the TEPCO Fukushima Daiichi NPS, it is necessary to appropriately manage the risk associated with low dose exposure. In order to deal with this risk, the Working Group for Low Dose Exposure Risk Management under an advisory conference for radioactive material measures was established based on a request from the Minister for the Restoration from and Prevention of Nuclear Accidents as a place to arrange scientific knowledge and assessment from home and abroad, to find problems in the affected area, and to discuss future directions regarding countermeasures. During eight public sessions, professionals and experts from Japan and abroad, with broad and competing opinions on the impact of a low dose exposure, and administration officials held public in-depth discussions regarding the three topic areas noted below. The proceedings were published on December 22, 2011.

a) The impact on health of low dose exposure of 20 mSv/year or less (criteria to review evacuation areas)

It is considered difficult to verify significant increases

Figure 2-4-4 Examples of Storage of Specified Waste and Transportation Vehicles



Example to store 8,000 Bq/kg or higher incineration ash

Source: Ministry of the Environment, “Guidelines for specified waste” (December 2011, first edition) Partially revised edition

Table 2-4-4 Ministry of the Environment Origin of Specified Waste and Assumed Waste

Source	Assumed waste
Water facility	Sediments such as sludge, created sludge, soot dust, incineration ash, burned embers, etc.
Waste disposal facility	Soot dust, incineration ash, and other burned embers
Operator, etc.	Waste paddy straw, waste compost, etc.
Land to be decontaminated	Grass and wood, metals, plastics, etc.

Source: Ministry of the Environment,
"Guidelines for specified waste" (December 2011, first edition)

when the exposure dose is 100 mSv or less. This is because the carcinogenic risk of radiation is overshadowed by carcinogenic risks due to other factors. At the present time, our scientific knowledge is not sufficient to identify these risks. However, regardless of scientific verification, we must adopt measures to reduce risks, even at exposure levels as low as 100 mSv or less.

Even though the health effects of low dose exposure of 20 mSv per year (the numerical criteria set for an evacuation order) cannot be simply compared to other randomly chosen risk factors affecting people's health, it can be said that the effect of low dose exposure is sufficiently low compared to other carcinogenic factors (e.g., smoking, obesity, insufficient vegetable intake, and so on). In terms of radiation protection, risks can be avoided by carrying out decontamination and by thoroughly managing food security. Therefore, the numerical value of 20 mSv per year can be deemed adequate as a "scratch line" for further pursuing reduction of radiation doses.

b) Considerations for children and pregnant women

Top priority should be given to children and pregnant women, as it is known that exposure to over 100 mSv is more harmful to children than to adults in terms of the carcinogenic risk of radiation exposure. At the same time, it is difficult to verify significant increases in carcinogenic risk due to low radiation exposures of 100 mSv or less. Placing top priority on children and pregnant women is still critical, however, even when their radiation exposure is low (100 mSv or less), to assuage the great anxiety felt by local residents.

Detailed responses are required for children, as children are more sensitive to the life stress arising from avoiding exposure to radiation.

c) Communications regarding risk

As to risk communication, it is important to clearly present risk assessments to residents based on scientific knowledge relating to the current situation in Fukushima. Consequently, the residents should devise voluntary countermeasures with reference to proper information they have obtained on radiation and radioactivity.

Also, in order to implement radiation protection and health management effectively in the long term, voluntary participation of the residents is essential. Therefore, the government shall provide residents with the means of obtaining information to help them understand their own current situation, as it is important to create circumstances in which residents can act spontaneously and continuously toward restoration and reconstruction.

Furthermore, the government and experts should provide information to the residents clearly, by discussing it with them directly through improved communications, and this should help residents implement measures including reducing exposure doses and health management, with everyone adopting the same perspective on the issues.

(2) The Survey for Health Care of Residents in Fukushima Prefecture

Fukushima prefecture has conducted the survey for health care so as to implement middle-long term health care targeted all people living in Fukushima prefecture. This survey includes monitoring radiation dose, and physical examination of the thyroid gland with medical ultrasonography and medical checkup targeted the young who were under 18 years old when the earthquake occurred.

The central government has taken efforts, including providing supports by technical and financial assistance, making public and educational efforts about the scientific knowledge of radiation and impact on health by low dose exposure, and conducting basic research about the impact of health, combined with United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and International Commission on Radiological Protection (ICRP).

Section 5 Turning Point for the Nuclear Safety Regulation

1 Reconsidering the nuclear safety reflecting the nuclear accident

The nuclear power plant has been expected so far as energy source that would support economic growth, and as power source that would not emit greenhouse gas. Before the Great East Japan Earthquake, the relationship between environmental concerns and nuclear disasters was rarely discussed as a political matter.

Regarding the above, the accident at the TEPCO Fukushima Daiichi NPS shed light on another aspect of NPSs: the enormous environmental impact that NPSs can cause in a nuclear disaster. Environmental contamination due to radioactive materials is now highlighted as an unprecedented environmental concern. Similarly, overall energy policy including nuclear policy has become a hot topic in the wake of the earthquake. For example, the Annual Reports on the Environment before the massive earthquake indicate that nuclear power generation should be encouraged with top priority given to safety issues. However, after the earthquake, the 2011 Annual Report on the Environment mentioned that deliberations on energy policy as a whole including nuclear policy should be carried out while verifying the causes of accidents.

An issue for nuclear safety measures is how to define potential risks, since nuclear accidents can cause serious environmental contamination. The Great East Japan Earthquake has forced us to confront the difficulty of assessing risk with probability theory, and of deciding on the permissible level of risk from natural disasters and tsunami. In the meantime, it has also revealed that risks must be considered in terms of multiple aspects: the environmental risk of radioactive contamination; the social risk of evacuating residents; the economic risk of damaging; for the productive activities accompanied by power shortages; and the health risk of low dose exposure.

It is difficult to assess all of these risks. However, to fully face them, it is desirable to decide on the permissible level of risks for serious accidents through open and highly transparent discussions. Risk can be defined in various ways by various experts, civil groups, and residents. Thus it is necessary to disclose the related risk information and invite various kinds of information, and to have highly transparent forms of communication, in order for policy-makers and citizens to make rational choices. Developing science literacy also helps to acknowledge and determine the current situation.

Avoiding severe accidents and improving facility safety will be achieved through ceaseless effort, and it is essential to reassess the risks from the perspective of the latest scientific knowledge to improve existing facilities.

It is vital that we accept the fact that absolute safety is impossible and natural disasters and accidents are fundamentally unavoidable. Needless to say, the occurrence of severe accidents at nuclear-related facilities is intolerable. Despite this, it is reasonable to think that responsibility and a sense of urgency are truly required in the administration of nuclear regulations, since nuclear accidents directly lead to irremediable problems for the environment, society, and the economy, including environmental contamination by radioactive materials, dangers to human health, loss of local livelihood accompanied by evacuation and tight power supply and demand.

2 Discussion towards the revision of Nuclear Safety Regulation

As is pointed out in the Report of the Japanese Government to the IAEA Ministerial Conference on Nuclear Safety published in June 2011, the primary responsibility of Japan's nuclear regulation and monitoring before the Great East Japan Earthquake was not clearly defined. The proposal from the Advisory Committee for Prevention of Nuclear Accidents (December 13, 2011) mentioned later notes that "public trust in administrative safety of atomic energy has reached its nadir," and that "both the government and the operator were overconfident and conceited of the security measures, which lead to the devastating accident that released massive amounts of radioactive materials and destroyed the daily life and community of many people as a result." The Report also stated, "the government must promptly rebuild the nuclear safety regulation system engaged in the mission of preventing the recurrence of similar accidents."

The government made an announcement on its Basic Policy for Restructuring Organizations Related to Nuclear Safety Regulation (approved by the Cabinet on August 15, 2011; hereinafter referred to as the "Basic Policy"). As a "Temporary policy for review of organizations related to safety regulations," it stated five revisions: "separation of regulation and use"; "unification of related work concerning nuclear safety regulation"; "risk management"; "securing qualified human "resources from the public and private sectors"; and review of the ideal regulation and related institution." It also included the preparation of a bill for a law to establish the new organization by April 2012, and noted that a flexible response would be required when verification results were provided from the accident investigation and verification commission organized after the TEPCO Fukushima Daiichi NPS accident. Furthermore, nuclear and energy policy in the mid and long term shall be reviewed and consideration should be advanced broadly, taking the verification results based on the investigation committee on the accident. A final draft is to be submitted near the end of 2012 regarding the assignment of the role adopted by the

new organization and on how to establish a more effective and strong system of safety regulation.

Furthermore, based on the Basic Policy, an Advisory Committee for Prevention of Nuclear Accidents was established to deliberate on the ideal organization for nuclear safety regulations and on reinforcing nuclear safety regulations. In the committee meeting, the minister in charge called for those with professional knowledge in related fields to participate in the meeting and present their opinions. Four sessions of the Advisory Committee for Prevention of Nuclear Accidents were held between October 4, 2011 and December 2, 2011. At these sessions, a proposal for an Advisory Committee for Prevention of Nuclear Accidents was adopted and seven principals were determined for restructuring organizations related to nuclear safety regulations. The seven reform concepts are: (1) separation of regulation and use; (2) unification; (3) risk management; (4) developing human resources; (5) new safety regulations; (6) transparency; and (7) internationality.

On the basis of the discussions, the Law for Partial Revision of the Act for Establishment of the Ministry of the Environment for Reforming Organizations and Institutions Regarding Nuclear Safety (draft) and the Act for Establishment of the Nuclear Safety Research Committee (draft) were adopted to establish organizations and institutions for ensuring nuclear safety and approved by the Cabinet on January 31, 2012 and submitted to the Diet.

These amended laws aim to regain lost confidence and reinforce administrative function concerning nuclear safety. Under these laws, the Nuclear Safety Division of the Nuclear and Industrial Safety Agency is separated from the Ministry of the Economy, Trade and Industry to fully implement "the separation of regulation and use." In addition to that, they also aim to reorganize the unification of the related work concerning ensuring safe nuclear energy and organize a new nuclear safety regulation system for taking prompt measures in case of accident.

Considering the current international situation, as a basic rule, the purpose of the revised Atomic Energy Basic Act protects people's health and environment from the harmful effects of radiation. And the revised Basic Environment Act includes formerly excluded protective measures for air pollution caused by radioactive materials.

Furthermore, to reconsider regulations concerning ensuring safe nuclear energy and other institutions, the laws enable the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors to change into the institutions that adopt authorized nuclear plant to the standards based on the latest scientific and social knowledge. In addition to that, above mentioned laws reinforce measures against the serious accidents and restrict the operating period. At the same time, they adjust the relationship with Electricity Business Act and review safety regulations for the nuclear power plant. Regarding the Special Measure of Nuclear Disaster Act, fully protective measures for the nuclear disaster is fully implemented. And this act serves to further strengthen countermeasures against nuclear disaster provided by the Nuclear Emergency Response Headquarters set up on the occurrence of nuclear emergency. Even after the nuclear emergency situation is cancelled, measures after the accident should be definitely implemented.

In the Diet at present, discussion is held from various points of view to reinforce the organizations and institutions concerning the nuclear safety regulation . (As of May 16, 2012)