

Progress on Off-Site Cleanup Efforts in Fukushima

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In 2011, the accident that occurred at the Fukushima Daiichi Nuclear Power Plant, which is operated by the Tokyo Electric Power Company (TEPCO), led to the release of radioactive materials and extensive environmental pollution in Fukushima Prefecture and its surrounding areas. The Japanese government and other stakeholders have been conducting cleanup efforts pursuant to the Act on Special Measures Concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by the Nuclear Power Plant Accident Associated with the Tohoku District – Off the Pacific Ocean Earthquake That Occurred on 11 March 2011 enacted in August of that year. To date, extensive decontamination work has been completed in four of eleven municipalities in Fukushima Prefecture through operations carried out directly by the Japanese government. Coordination is also underway to prepare interim facilities for the storage of the soil removed during the decontamination work. This commentary provides an overview of the cleanup efforts conducted so far and reports on the challenges ahead.

KEYWORDS: *Off-site cleanup, decontamination, radioactive pollution, Fukushima*

I. Implementation System for the Cleanup Efforts Led by the Japanese Government

In 1999, the Act on Special Measures Concerning Nuclear Emergency Preparedness was enacted to implement special measures pursuant to the Basic Act on Disaster Control Management. The enactment of the Act on Special Measures Concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by the Nuclear Power Plant Accident Associated with the Tohoku District – Off the Pacific Ocean Earthquake That Occurred on 11 March 2011 (hereinafter referred to as the “Special Measures Act”) was necessary because the cleanup of pollution caused by radioactive materials as stipulated in Article 26 of the Act on Special Measures Concerning Nuclear Emergency Preparedness was not applicable beyond the site of a nuclear utility. This section provides an overview of this Special

Measures Act, its basic principles, and the Fukushima Office for Environmental Restoration, which was established for the performance of cleanup efforts.

1. Implementation System for Cleanup Efforts

(1) Special Measures Act

In 2011, the accident that occurred at the Fukushima Daiichi Nuclear Power Plant, which is operated by the Tokyo Electric Power Company (TEPCO), led to the release of radioactive materials and extensive environmental pollution in Fukushima Prefecture and its surrounding areas. In response, lawmakers passed legislation in the form of the Special Measures Act in August 2011. Having been passed and enacted, the Special Measures Act was fully enforced in January 2012.

Pursuant to the Special Measures Act, Special Decontamination Areas were designated for the cleanup efforts that were carried out directly by the Japanese government, while Intensive Contamination Survey Areas were designated for the cleanup efforts led by municipal governments. In addition, areas for the contaminated waste treatment in Countermeasure Areas were assigned for designated types of waste that had a contamination level in excess of a certain threshold.

(2) Basic principles of the Special Measures Act

The basic principles of the Special Measures Act were approved by the Cabinet in November 2011. Cleanup and other efforts made pursuant to the Act are intended to ensure the swift mitigation of the impact on human health and living environments. These principles also established the following targets in the basic approach to cleanup efforts.

- Swiftly reduce the size of areas that have an additional annual exposure dose of 20 mSv or more in a phased manner.
- Pursue a long-term target of securing an additional annual exposure dose of no more than 1 mSv in areas that currently have an additional annual exposure dose of less than 20 mSv.

According to these principles, Special Decontamination Areas for the cleanup efforts carried out by the Japanese government are designated keeping in mind areas with restricted access. Decontamination and other measures were to be pursued until the end of March 2014. As an exception, the Japanese government was to conduct a pilot project to establish a suitable decontamination method before applying it in their cleanup efforts in areas with particularly high additional exposure doses.

Meanwhile, Intensive Contamination Survey Areas, where the additional exposure dose was 1 mSv or more, were designated for the cleanup efforts led by municipal governments.

The Japanese government was assigned the responsibility to install and ensure the safety of the Interim Storage Facilities needed for the treatment of the removed soil and so forth.

2. Establishment of the Fukushima Office for Environmental Restoration

Following the enactment of the Special Measures Act in August 2011, the Japanese Ministry of the Environment (MOE) deployed a team to facilitate cleanup efforts based in Fukushima City. This team is in charge of communicating and coordinating with the prefectural government and relevant municipalities of Fukushima. In January 2012, the Fukushima Office for Environmental Restoration was established in Fukushima City to

conduct decontamination work and other measures with the aim of keeping pace with the full enforcement of the Act. The office was positioned under the Tohoku Regional Environment Office (Headquarters in Sendai) as a regional branch of the MOE.

The office initially consisted of 40 members, but this number was increased to about 200 in April 2012 when five branches were opened throughout the prefecture (north: Fukushima; central and south: Koriyama; Aizu: Aizu-Wakamatsu; northern Hamadoori: Minamisoma; southern Hamadoori: Hirono). From that April, municipal governments with designated Special Decontamination Areas began planning their cleanup efforts, seeking consensus from residents on the planned decontamination, and discussing the acquisition of land for use as Temporary Storage Sites for the removed soil and so forth. In April 2013, the number of staff had been increased to 300 to engage in the full decontamination and waste treatment and develop Interim Storage Facilities. In April 2014, the office was expanded to 390 members, with about one-third of these members coming from the respective ministries. Some of them were land improvement specialists from the Ministry of Agriculture, Forestry and Fisheries, while some others were field engineers for roads and rivers from local offices of the Ministry of Land, Infrastructure, Transport and Tourism. The remaining two-thirds were publicly recruited from among citizens from different parts of Japan, although about half of them were from Fukushima Prefecture. In April 2015, the office is expected to expand to have about 500 members.

II. Progress on Off-Site Cleanup Efforts

1. Special Decontamination Areas

Special Decontamination Areas were assigned for the decontamination work carried out directly by the Japanese government in eleven municipalities, mostly from the Hamadoori region in Fukushima Prefecture. By summer in 2013, plans had been developed for the cleanup efforts carried out by the Japanese government in ten of these municipalities, excluding Futaba. The plans all aimed to complete the decontamination work by the end of March 2014. In September 2013, the progress made in relation to decontamination was reviewed in all of the municipalities in Special Decontamination Areas. As a result, the plans for some municipalities were revised in December 2013 to move away from the prior target of completing the decontamination and transportation of contaminated soil to Temporary Storage Sites across the board within two years (FY2012–2013).

Decontamination was completed in Tamura (Miyakoji District) by June 2013. The original plan for the completion of the decontamination work was maintained in Kawauchi, Naraha, and Okuma. The planned completion was postponed to the end of FY2015 in two municipalities (Kawamata and Katsurao) and to the end of FY2016 in four municipalities (Minamisoma, Iitate, Namie, and Tomioka). A plan for decontamination work in Futaba was developed in July 2014 with the intention of completing the work by the end of FY2015.

Table 1 presents the progress that had been made in carrying out decontamination work in eleven municipalities in Special Decontamination Areas as of November 2014. Further cleanup efforts will be conducted in larger municipalities that have relatively higher doses.

Follow-up monitoring will be conducted with municipalities that have completed the decontamination work to verify that the effects of their efforts are maintained. Other follow-up tasks will be considered as necessary in coordination with the local community members.

Table 1 Progress made in cleanup efforts conducted in Special Decontamination Areas ¹⁾

Municipality	Approx. population in decontamination target area (persons)	Approx. area of decontamination target (ha)	Revision of target area	Decontamination progress (as of Nov. 30, 2014, in municipalities with unfinished cleanup efforts)				Schedule ^{a)}		Lifting of Evacuation Order
				Decontamination plan	Temporary Storage Sites, etc.	Consent from local communities	Decontamination work	Completion in residential areas	Completion in other areas	
Tamura	400	50	Apr. 2012	Apr. 2012	Secured	Gained	Completed Jun. 2013	FY2013 (already completed)		Apr. 2014
Kawauchi	400	500	Apr. 2012	Apr. 2012	Secured	Gained	Completed Mar. 2014	FY2013 (already completed)		Oct. 2014 in zones preparing to lift evacuation order
Naraha	7,700	2,100	Aug. 2012	Apr. 2012	Secured	Gained	Completed Mar. 2014	FY2013 (already completed)		To be determined
Okuma	400	400	Dec. 2012	Dec. 2012	Secured	Gained	Completed Mar. 2014	FY2013 (already completed)		To be determined
Katsurao	1,400	1,700	Mar. 2013	Sept. 2012	Secured	Almost gained	Underway	Summer 2014 (already completed)	Within 2015	To be determined
Kawamata	1,200	1,600	Aug. 2012	Aug. 2012	Approx. 90%	Almost gained	Underway	Summer 2014 (already completed)	Within 2015	To be determined
Minamisoma	13,300	6,100	Apr. 2012	Apr. 2012	Approx. 80%	Approx. 50%	Underway	FY2015	FY2016	To be determined
Iitate	6,000	5,600	Jul. 2012	May 2012	Secured	Approx. 90%	Underway	Within 2014	Within 2016	To be determined
Namie	18,800	3,300	Apr. 2013	Nov. 2012	Approx. 30%	Approx. 50%	Underway	FY2015	FY2016	To be determined
Tomiooka	11,300	2,800	Mar. 2013	Jun. 2013	Approx. 90%	Approx. 90%	Underway	FY2015	FY2016	To be determined
Futaba	300	200	May 2013	Jul. 2014	Under coordination	In preparation	Preparations underway	FY2015		To be determined

2. Pilot Decontamination Demonstration Project in Difficult-to-Return Zones

In Special Decontamination Areas, decontamination work was to be conducted in Habitation Restricted Areas and Preparation Areas for Lifting of Evacuation Order. In Difficult-to-Return Zones with an annual total dose rate of 50 mSv or more, a pilot demonstration project was to be carried out to investigate what approach should be adopted to deal with the contamination. In FY2013, a pilot decontamination demonstration project was carried out in six districts in Namie and Futaba. In every target district, the air dose rates at a height of 1 m above the ground surface in habitation zones (residential areas, farmland, and roads) were reduced by around 50 to 70%. These areas had initially had high dose rates. Even after this reduction, the average dose rates per hour at a height of 1 m exceeded 8 μ Sv in some residential areas.

3. Intensive Contamination Survey Areas

Pursuant to the Special Measures Act, areas with an additional annual exposure rate of 1 mSv or more other than Special Decontamination Areas were designated as Intensive Contamination Survey Areas. In these areas, cleanup efforts are led by municipal governments.

As of January 2015, 36 of the 39 designated municipalities in Fukushima Prefecture have developed plans for their cleanup efforts. The three remaining municipalities of Yanaizu, Yamatsuri, and Hanawa have no prospects of planning any decontamination work. Leaving aside these three municipalities, decontamination work has been conducted for about 60% of residential areas, 40% of roads, and 80% of schools and other public facilities.

^{a)} Planned completion of decontamination work (residential and other areas).

4. Waste Treatment in Countermeasure Areas for the Direct Treatment of Contaminated Waste

Countermeasure Areas where contaminated waste was to be treated directly by the Japanese government were designated in eleven municipalities with an overlapping designation as Special Decontamination Areas. The total amount of disaster waste from these areas is estimated to be around 802,000 tons. By January 2015, 25 Temporary Storage Sites had been put into service as a provision measure for meeting the storage needs.

In seven municipalities (other than Okuma, Futaba, Kawamata, and Tamura), plans were formulated for the construction of temporary incinerators to treat the combustible part of the disaster waste from these areas. By March 2015, their construction had been begun at seven places in six municipalities: Tomioka, Minamisoma, Namie, Katsurao, Kawauchi, and Iitate (Warabidaira District and Komiya District). Four of these incinerators were put into service in Kawauchi, Iitate (Komiya District), Tomioka, and Minamisoma.

5. Treatment of Designated Waste

Beyond the designated areas, waste with a radioactivity level in excess of 8,000 Bq/kg is treated by the Japanese government as designated waste. In Fukushima Prefecture, the estimated amount of designated waste amounted to roughly 130,000 tons. Efforts to reduce the volume of combustible waste have been pursued by incineration and drying. With facilities for reducing the volume of sewage sludge having been constructed in the cities of Fukushima and Koriyama so far (completed in FY2014), the treatment such sludge is now underway. In addition, a facility in Samegawa is being used to treat agricultural and forestry waste. Plans have also been formulated for the treatment of combustible designated waste at the volume reduction incinerator that is under construction in the Warabidaira District, Iitate.

6. Fukushima Eco-Tech Clean Center

Plans are in place for the landfill disposal of designated waste with a radioactivity level of no more than 100,000 Bq/kg at the existing controlled disposal site (Fukushima Eco-tech Clean Center). The intended targets are waste in the designated areas, designated waste, and household garbage from the Futaba District with a radioactivity level of 100,000 Bq/kg or less. The estimated amount of waste to be disposed of is about 650,000 m³. The disposal plan is being coordinated with the target municipalities.

7. Interim Storage Facilities

The construction of Interim Storage Facilities with a combined area of roughly 16 km² is planned in Okuma and Futaba. These facilities will store soil removed during decontamination work in Fukushima Prefecture, waste in the designated areas and designated waste with a radioactivity level of over 100,000 Bq/kg. The total amount of waste to be stored is estimated to be between 16 and 22 million m³ (after the incineration of combustible waste). The main steps that have been taken for the completion of this construction work are as follows.

2012 Mar.: The Japanese government requests that the prefectural government and eight municipalities in the Futaba District investigate the feasibility of the construction work.

Nov.: The prefectural government agrees to conduct a field survey.

- 2013 Apr.: The field survey (boring survey, etc.) is begun.
 Jun.: The Japanese government begins investigating safety measures at the facilities.
 Dec.: The Japanese government requests that the prefectural government and relevant municipalities host the facilities.
- 2014 May: The Japanese government begins organizing briefings for members of the community in Okuma and Futaba.
 Sept.: The prefectural government agrees to conduct the construction work and confirms five key conditions.
 Sept.: The two host towns agree to begin giving due explanations to landowners.
 Nov.: The JESCO Act ^{b)}, which stipulates the final disposal of waste outside of Fukushima Prefecture, is enacted.
 Nov.: A basic plan is developed for the transportation of waste to the Interim Storage Facilities.
 Dec.: Okuma agrees to the construction.
- 2015 Jan.: Futaba agrees to the construction.
 Jan.: A plan for the transportation of waste to the Interim Storage Facilities is formulated.
 Feb.: The construction of the Interim Storage Facilities is begun.
 Feb.: The Japanese government explains to the prefectural government how the five key conditions are being addressed.
 Feb.: The prefectural government and the two towns agree to accept the transported waste.
 Mar.: Transportation of the waste to the Interim Storage Facilities is begun.

In February 2015, the Interim Storage Facilities were constructed in parts of some industrial complexes in Okuma and Futaba. The trial transportation of soil removed from municipalities in the prefecture is planned for 2015.

The planned sites for the Interim Storage Facilities are owned by over 2,300 landowners. These landowners should obviously be duly briefed and efforts must be made before the development of these facilities to gain their understanding with respect to the planned usage of their land. In tandem with the decontamination and waste treatment work, continued efforts must be made to provide the necessary explanations to the relevant municipalities and evacuees to gain their understanding of the intended cleanup project.

III. Risk Communication Involved in Decontamination Work and Other Measures

The cleanup efforts can be carried out provided there is sufficient understanding and support from the affected residents, local municipalities, and relevant organizations. For this reason, the relevant municipalities and the prefectural government communicated the associated risks to local residents from right after the disaster. In January 2012, at almost the same time as the Special Measures Act came into full enforcement, the Decontamination Information Plaza was opened in Fukushima City to serve as a center for communicating the risks involved in decontamination work and other measures. Sometime later in May 2014, Support

^{b)} JESCO Act stands for the revised Act on Japan Environmental Storage & Safety Corporation.

Center for Social Workers Engaged in Recovery from the Nuclear Disaster (hereinafter referred to as the “Support Center for Social Workers”) was established in Iwaki City to support consultants appointed to work closely with evacuees who decide to return to their homes while communicating the associated radiation risks.

1. Decontamination Information Plaza

The Decontamination Information Plaza was opened in January 2012 to serve as an information hub on decontamination work and radiation. Run jointly by the MOE and the prefectural government of Fukushima, the plaza dispatches registered decontamination and radiation experts to conduct risk communication work as requested by the municipalities. The Atomic Energy Society of Japan and other related groups provided the necessary support for the opening and operation of the plaza as well as the dispatching of experts²⁾. The plaza exhibits information and models that facilitate a greater understanding of decontamination work and radiation. Upon request by a municipality, the content of these exhibitions is brought to an event held by the municipality to organize a mobile exhibition.

From February 2012 to January 2015, the plaza dispatched about 700 experts to workshops that were organized by the municipalities and attended by over 25,000 participants. Mobile exhibitions were held at 320 locations for a total of about 440 days, hosting almost 40,000 participants. The plaza hosted over 17,000 visitors.

2. Support Center for Social Workers

To provide close support for returnees and address their concerns about radiation, a system for the deployment of consultants was established in line with NRA recommendations issued on November 20, 2013 (“Basic Approach to Ensuring Safety and Providing Reassurance for Returnees with Specific Protective Measures According to the Dose Level”) and Cabinet approval issued on December 20, 2013 (“Accelerating the Restoration of Fukushima in the Wake of the Nuclear Accident”). The Support Center for Social Workers was established by the MOE in Iwaki City to provide scientific and technical support to consultants through training and other such measures.

IV. Future Challenges

As of February 2015, about 6 million m³ of removed soil contained in bags (about 1 m³ each) and the like are being managed temporarily at approximately 1,000 Temporary Storage Sites and directly in over 80,000 storage sites. This soil will be transported to keep pace with the development of the Interim Storage Facilities. In anticipation of further cleanup efforts and the time that will be required for their completion, affected residents who wish for the restoration of their daily lifestyles and a return to their homes should be kept informed. This communication remains vital in addition to the steady implementation of decontamination work and other measures.

V. Conclusions

Ever since the nuclear accident took place in 2011, the Japanese and municipal governments have been conducting cleanup efforts while seeking the understanding and support of affected residents. This commentary presents a summary of their efforts by focusing on Fukushima Prefecture. These cleanup efforts are a necessary step toward the restoration of Fukushima Prefecture. Unfortunately, some people from Difficult-to-Return Zones and other affected areas are still stranded in evacuation shelters. The nuclear accident has shattered the trust that citizens had in the Japanese government and power utilities, which used to have a strong influence on the daily lives of people in their communities. People have suffered great pain and been left dazed with grief over the loss of their livelihoods and a homeland filled with memories. Their despair defies our imagination. Even so, we must steadily carry out our efforts to restore their communities given their strong feelings of attachment.

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