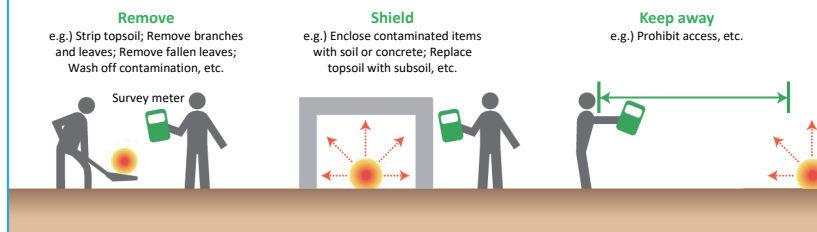


What is Decontamination?

Radioactive materials released into the air due to the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS fell onto the ground with rain, etc. and adhered to soil, vegetation, and buildings in people's living environment. Soil and vegetation, etc. thus contaminated are being removed through decontamination work. Removed soil and vegetation, etc. are shielded to prevent them from affecting the surroundings, thereby reducing radiation doses people receive from the environment.

Methods of reducing radiation doses



Prepared based on the website, "Environmental Remediation," of the Ministry of the Environment

Radioactive materials released into the air due to the accident at TEPCO's Fukushima Daiichi NPS fell onto the ground with rain, etc. and adhered to buildings, soil, and vegetation, etc. across a wide area. Therefore, the national government has been striving to reduce additional exposure doses through decontamination such as removing those released radioactive materials.

There are three methods of reducing additional exposure doses to remove, to shield, and to keep away radioactive materials. Combination of these methods can reduce additional exposure doses efficiently.

The first is to remove radioactive materials adhering to soil, vegetation or buildings, etc. from people's living environment by such means as stripping topsoil, removing tree leaves, branches and fallen leaves, and washing and cleaning the surface of buildings.

The second is to cover radioactive materials with soil, etc. thereby shielding radiation and reducing ambient doses and exposure doses accordingly.

The third is to take advantage of the characteristic of radiation that the radioactivity intensity reduces as the distance increases (in inverse proportion to the square of the distance from the relevant radioactive material) (p.47 of Vol. 1, "Characteristics of External Exposure Doses").

If radioactive materials are kept away from people, exposure doses can be reduced. Therefore, one option is to prohibit access to places where radioactive materials exist.

At present, these methods are combined and employed to reduce people's additional exposure doses.

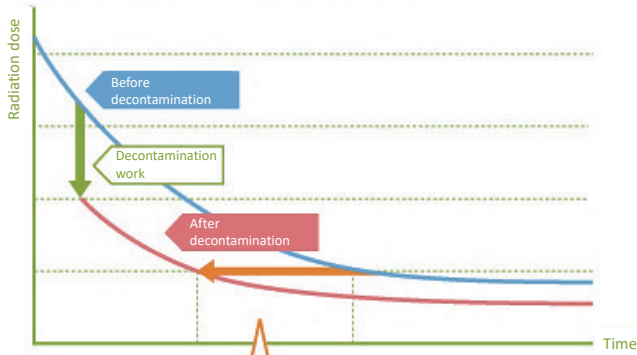
(Related to p.168 of Vol. 1, "Three Principles of Reduction of External Exposure")

Included in this reference material on March 31, 2013

Updated on February 28, 2018

Decontamination and Decreases in Radiation Doses

Decreases in doses of accident-derived radioactive materials



Compared with the level as of Aug. 2011, radiation doses naturally decreased by approx. 40% in two years and by approx. 60% in five years. Additionally, radiation doses can be reduced faster by removing radioactive materials through decontamination work.

Prepared based on the website, "Environmental Remediation," of the Ministry of the Environment

This is a conceptual figure showing decreases in doses of accident-derived radioactive materials.

Through decontamination work, radiation doses can be reduced faster, assisting the effects of physical attenuation of radioactive materials.

(Related to p.11 of Vol. 1, "Half-lives and Radioactive Decay")

Included in this reference material on March 31, 2014

Updated on January 18, 2016

Decontamination Methods

Decontamination has been conducted in accordance with the circumstances of respective areas.
Specific methods differ by location.

Effective methods differ depending on the status of contamination with radioactive materials. First, ambient dose rates are measured, and an optimal method is selected on a case-by-case basis. Radiation doses are measured before and after decontamination work to confirm the effects.



This figure explains specific decontamination methods.

Even in areas where radiation doses are relatively low, fallen leaves and dirt containing radioactive materials are apt to accumulate under the leaves or in gutters of houses or in ditches on the street, causing higher ambient doses in the surrounding areas. At such locations, fallen leaves and dirt are removed and the relevant places are washed and cleaned.

There are areas where radioactive materials adhere to the shrubbery, underbrush or fallen leaves. Radioactive materials are removed through mowing of vegetation, pruning and removal of fallen leaves.

In areas where radiation doses are relatively high, other decontamination methods, in addition to those employed at areas with relatively low radiation doses, may need to be employed. For example, as radioactive materials mostly exist within a layer a few centimeters below the ground surface, effects of radioactive materials can be mostly diminished by stripping topsoil (for example, to a depth of 5cm) or replacing topsoil with subsoil.

Areas where radioactive materials adhere to roofs and walls of buildings or on the paved road, relevant parts are washed and cleaned but such method may not be effective in cases where radioactive materials adhere firmly depending on the nature of their raw materials.

For farmland, proper methods need to be selected in consideration of the effects on agricultural products, as well as the effects on people due to exposure. In farmland plowed after the accident, radioactive materials exist little deeper from the ground surface. However, if all contaminated soil is removed, the farmland becomes unsuitable for farming. Therefore, at such farmland, various methods such as deep tillage (plowing soil as deep as 30 cm in principle) or inversion tillage (replacing topsoil with subsoil) (p.57 of Vol. 2, "Measures for Reducing Transfer of Radioactive Materials to Crops (1/5) - Decontamination of Farmland -") are being employed.

Included in this reference material on March 31, 2013

Updated on February 28, 2018

Decontamination

Special Decontamination Areas and Intensive Contamination Survey Areas

In line with the Act on Special Measures Concerning the Handling of Environment Pollution by Radioactive Materials enforced in full on January 1, 2012, and the Basic Policy based thereon, decontamination has been carried out. Areas especially necessary from the perspective of protecting human health were prioritized.

Soil, etc. removed through decontamination work is collected, transported to Temporary Storage Sites, and disposed of safely.

Special Decontamination Areas

- Areas where the national government directly conducts decontamination work; Basically, 11 municipalities* in Fukushima Prefecture which were once designated as a Restricted Area or a Deliberate Evacuation Area are designated.
- A decontamination plan should be formulated for each Special Decontamination Area, while taking into account respective municipalities' needs, and decontamination should be conducted in line with the plan.

* The entire areas of Naraha Town, Tomioka Town, Okuma Town, Futaba Town, Namie Town, Katsurao Village and Iitate Village, and parts of Tamura City, Minamisoma City, Kawamata Town and Kawauchi Village which were once designated as a Restricted Area or a Deliberate Evacuation Area

Intensive Contamination Survey Areas

- Areas where municipalities take the initiative in decontamination work; 92 municipalities in eight prefectures* are designated as Intensive Contamination Survey Areas (as of the end of December 2017) from among municipalities including areas where measured ambient dose rates were 0.23 $\mu\text{Sv/h}$ or higher.
- Each municipality should carry out a measurement and survey, formulate a decontamination plan based on the results thereof, and conduct decontamination in line with the plan.
- The national government takes financial measures and technical measures to assist these municipalities.

* Iwate Prefecture, Miyagi Prefecture, Fukushima Prefecture, Ibaraki Prefecture, Tochigi Prefecture, Gunma Prefecture, Saitama Prefecture and Chiba Prefecture

Prepared based on the website, "Environmental Remediation," of the Ministry of the Environment"

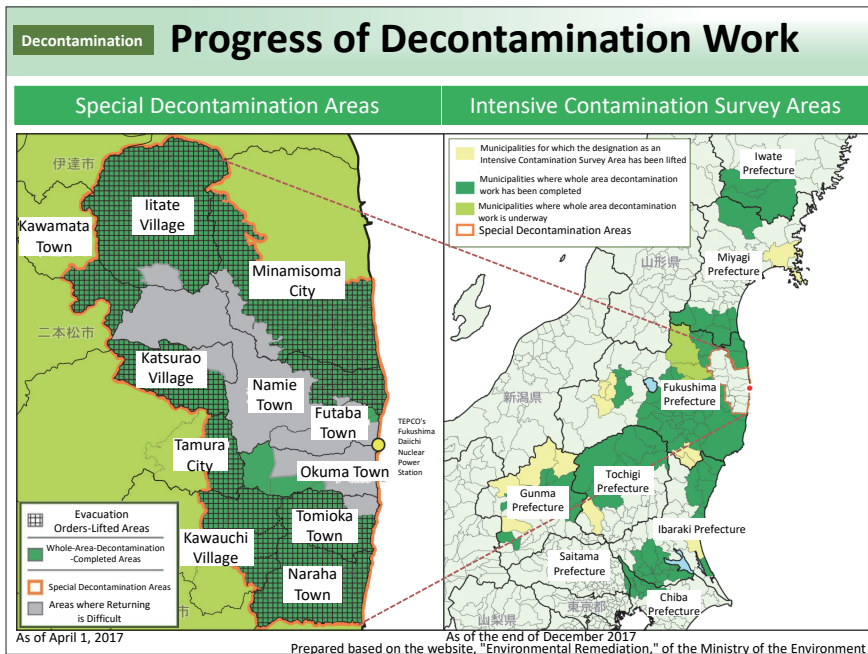
After the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS, the Diet enacted the Act on Special Measures Concerning the Handling of Environment Pollution by Radioactive Materials in August 2011.

Special Decontamination Areas and Intensive Contamination Survey Areas were designated as areas where decontamination is to be conducted under this Act on Special Measures. The decontamination has been conducted in these areas in line with the Act and the Basic Policy based thereon. Areas especially necessary from the perspective of protecting human health were prioritized. Soil, etc. removed through decontamination work is collected, transported to Temporary Storage Sites, and disposed of safely.

Special Decontamination Areas are areas where the national government directly conducts decontamination work. 11 municipalities in Fukushima Prefecture which were once designated as a Restricted Area or a Deliberate Evacuation Area are designated. In these areas, a decontamination plan is to be formulated for each area, while taking into account respective municipalities' needs, and decontamination is conducted in line with the plan.

Intensive Contamination Survey Areas are areas where municipalities take the initiative in decontamination work. 92 municipalities in 8 prefectures are designated (as of the end of December 2017) from among municipalities including areas where measured ambient dose rates were 0.23 $\mu\text{Sv/h}$ or higher. In these areas, each municipality carries out monitoring, formulates a decontamination plan based on the results thereof, and conducts decontamination in line with the plan. The national government takes financial measures and technical measures to assist these municipalities.

Included in this reference material on March 31, 2013
Updated on February 28, 2018



In the 11 municipalities in Fukushima Prefecture designated as Special Decontamination Areas, the Ministry of the Environment conducted decontamination and whole area decontamination work was completed in all designated municipalities by the end of March 2017 (excluding Areas where Returning is Difficult). Decontamination was completed for approx. 22,000 housing sites, approx. 8,400 ha of farmland, approx. 5,800 ha of forests and approx. 1,400 ha of roads.

In municipalities where whole area decontamination work was completed, radiation monitoring after decontamination has been carried out for such purposes as confirming the maintenance of the effects of decontamination. As a result of such measures, evacuation orders were all lifted by April 1, 2017, for Habitation Restricted Areas and Preparation Areas for Lift of Evacuation Order except for Futaba and Okuma.

Each municipality in Intensive Contamination Survey Areas formulated a decontamination plan in light of the circumstances of the respective areas, priorities and feasibility, and has conducted decontamination work based thereon. As of the end of December 2017, decontamination work was underway in three cities in Fukushima Prefecture.

Additionally, it was confirmed that radiation doses decreased to below 0.23 $\mu\text{Sv/h}$ in 12 municipalities by the end of March 2017, and the designation as Intensive Contamination Survey Areas was removed for these 12 municipalities. Accordingly, the number of municipalities designated as Intensive Contamination Survey Areas decreased from 104 to 92.

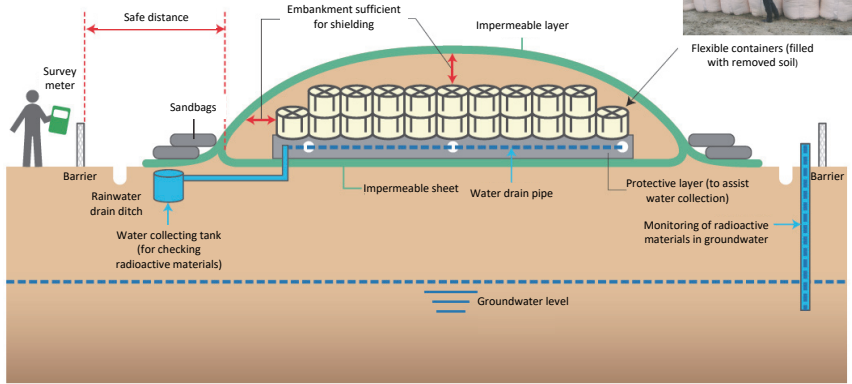
Included in this reference material on February 28, 2018

Storage of
Removed Soil, etc.

Storage in Temporary Storage Sites (When Storing Removed Soil above Ground)

Soil removed through decontamination work is stored safely on site or at Temporary Storage Sites for a certain period of time.

In case of storing removed soil above ground
(in such cases as where the groundwater level is high)



Prepared based on the website, "Environmental Remediation," of the Ministry of the Environment

Soil, etc. removed through decontamination work is stored and managed temporarily on site or at Temporary Storage Sites.

Specifically, removed soil is put in a container (flexible container, etc.) and placed on an impermeable layer (impermeable sheet, etc.), and is shielded sufficiently by such methods as placing sandbags filled with uncontaminated soil around the site to reduce ambient dose rates at the boundary to the same level as that in the surrounding areas.

Additionally, the site is covered with an impermeable sheet, etc., thereby preventing scattering and leakage of removed soil and further preventing infiltration of rainwater and resulting contamination of groundwater, etc.

Radiation doses at the site and radioactivity concentrations in groundwater are measured regularly.

Furthermore, from the perspective of keeping the site away from the public (securing distance), public access to the site is prohibited, and shortening of working hours and other measures are also considered from the perspective of reducing workers' exposure to radiation (p.168 of Vol. 1, "Three Principles of Reduction of External Exposure").

Included in this reference material on March 31, 2013

Updated on February 28, 2018

Comprehensive Efforts toward Regeneration of Forests and Forestry in Fukushima

Others

○ In order to ensure safe and secure lives of the residents and regenerate forests and forestry in Fukushima, relevant ministries and agencies carry out the following measures comprehensively in collaboration with the prefecture and municipalities, while obtaining the understanding of the people in Fukushima.

I. Efforts toward regeneration of forests and forestry

1. Efforts for ensuring safe and secure living environment

- Steadily continue decontamination work for forests near people's houses, etc.
- For residential areas surrounded by forests on three sides, taking measures as necessary, such as decontaminating forests 20m or further from the border or installing barriers to prevent soil runoff

3. Efforts for regenerating forestry in mountainous areas, etc.

- Promote a project to conduct tree thinning or other forest maintenance work together with measures concerning radioactive materials, and a demonstration project aiming for regeneration of forestry
- Newly prepare a guidebook on radiation safety that is easy to understand for workers

II. Future-oriented efforts for research and studies

- Continuously engage in research and studies for monitoring radiation doses in the forest, understanding behavior of radioactive materials and reducing radiation doses; Continue efforts for regeneration of forests and forestry into the future while utilizing the outcomes of such research and studies in formulating further measure

III. Information provision and communication

- Meticulously provide the latest information regarding knowledge on radioactive materials in forests and the national government's efforts toward regeneration of forests and forestry, using such media as relevant ministries' websites and PR magazines
- Continue efforts for ensuring safe and secure lives of the people in Fukushima through maintaining good communication, including dispatching experts

2. Efforts for restoring *Satoyama* forests close to residential houses

- Based on needs of local people, properly conduct decontamination work at places in the forest where residents enter or take rest; Make efforts for regenerating forestry in broad leaf forests and bamboo groves, etc.
- Select model districts in and around Areas under Evacuation Orders (including areas where evacuation orders have been lifted), comprehensively promote efforts for restoring *Satoyama* forests in those model districts, and reflect the outcomes of such efforts in carrying out further measures in an appropriate manner

Picture of *Satoyama* Forest Restoration Model Project

Prepared by the Ministry of the Environment

In addition to decontamination work, comprehensive efforts for regenerating forestry and ensuring safe and secure lives of the residents are indispensable for the regeneration of forests and forestry in Fukushima Prefecture. Based on the guideline, "Comprehensive Efforts toward Regeneration of Forests and Forestry in Fukushima," relevant ministries and agencies have been carrying out measures comprehensively in collaboration with the prefecture and municipalities, while obtaining the understanding of the people in Fukushima.

According to the knowledge obtained at the Environment Restoration Panel established in the Ministry of the Environment, it is found that removal of sedimentary organic materials at locations 20m or further from the edge of the forest has little effect in reducing ambient dose rates at the forest edge. Removal of sedimentary organic materials broadly in forests may even make things worse, in ways such as increasing bad effects on trees due to causing erosion of dirt, etc. containing radioactive cesium or impoverishing the soil. Accordingly, under the basic policy to prioritize areas especially necessary from the perspective of protecting human health, decontamination of forests has been conducted within approx. 20m from the edges of the forests adjacent to houses or farmland, etc.

Additionally, it was determined to implement a model project to comprehensively facilitate efforts for restoring *Satoyama* forests including decontamination work. In September and December 2016, the Reconstruction Agency, the Ministry of Agriculture, Forestry and Fisheries, and the Ministry of the Environment jointly selected a total of 10 municipalities as model districts (Kawamata Town, Hirono Town, Kawauchi Village, Katsurao Village, Soma City, Nihonmatsu City, Date City, Tomioka Town, Namie Town and Iitate Village).

Included in this reference material on March 31, 2017
 Updated on February 28, 2018