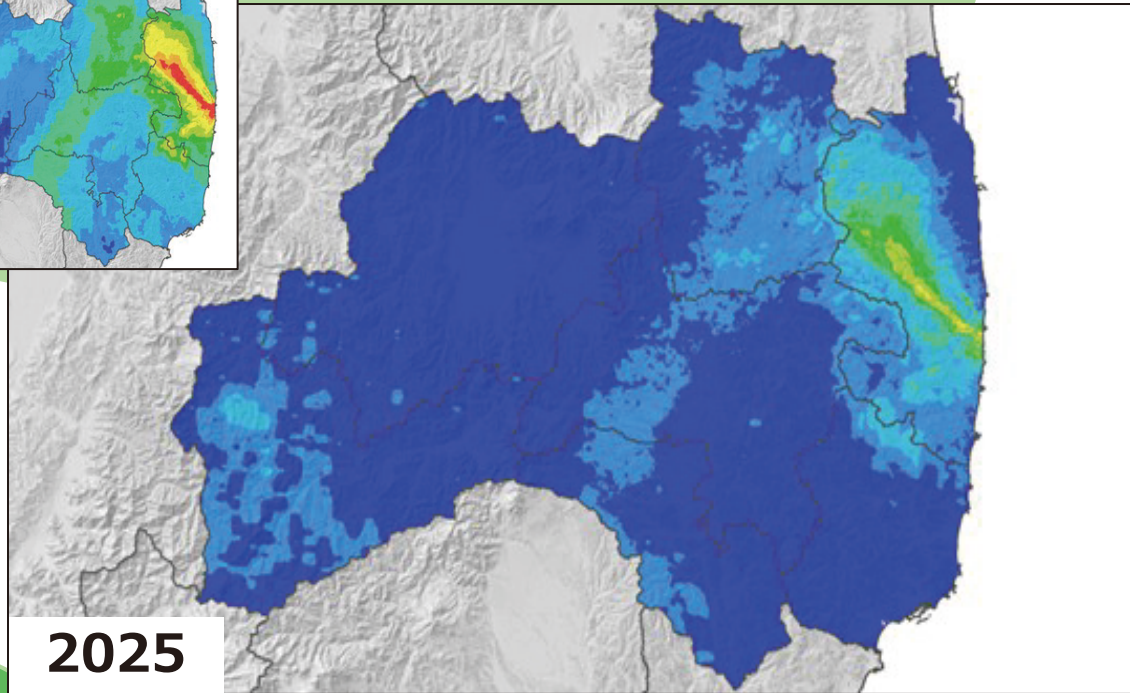
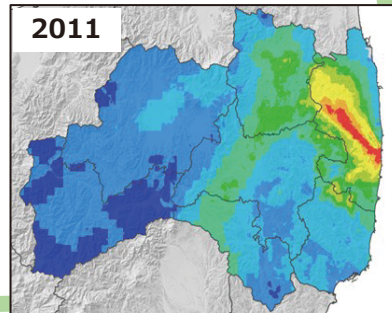


Environmental Radiation Monitoring in Fukushima : Past and Future

15 Years of Environmental Radiation Monitoring in Fukushima Prefecture

Following the Fukushima Daiichi Nuclear Power Station Accident



Introduction

March 11, 2026 marked 15 years since the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Station accident.

Over the past 15 years, the Nuclear Regulation Authority (NRA), together with relevant ministries and agencies, Fukushima Prefecture, the Japan Atomic Energy Agency (JAEA), and other organizations, has continued environmental radiation monitoring using a wide range of approaches.

In this leaflet, we introduce the status of environmental radiation monitoring conducted from 2011 to 2025, along with what has been learned, using measured data.

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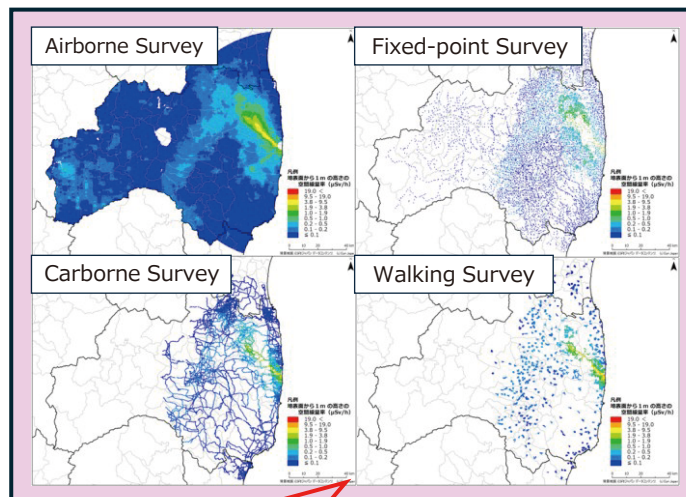
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Fukushima's Past and Future from the Perspective of Environmental Radiation Monitoring

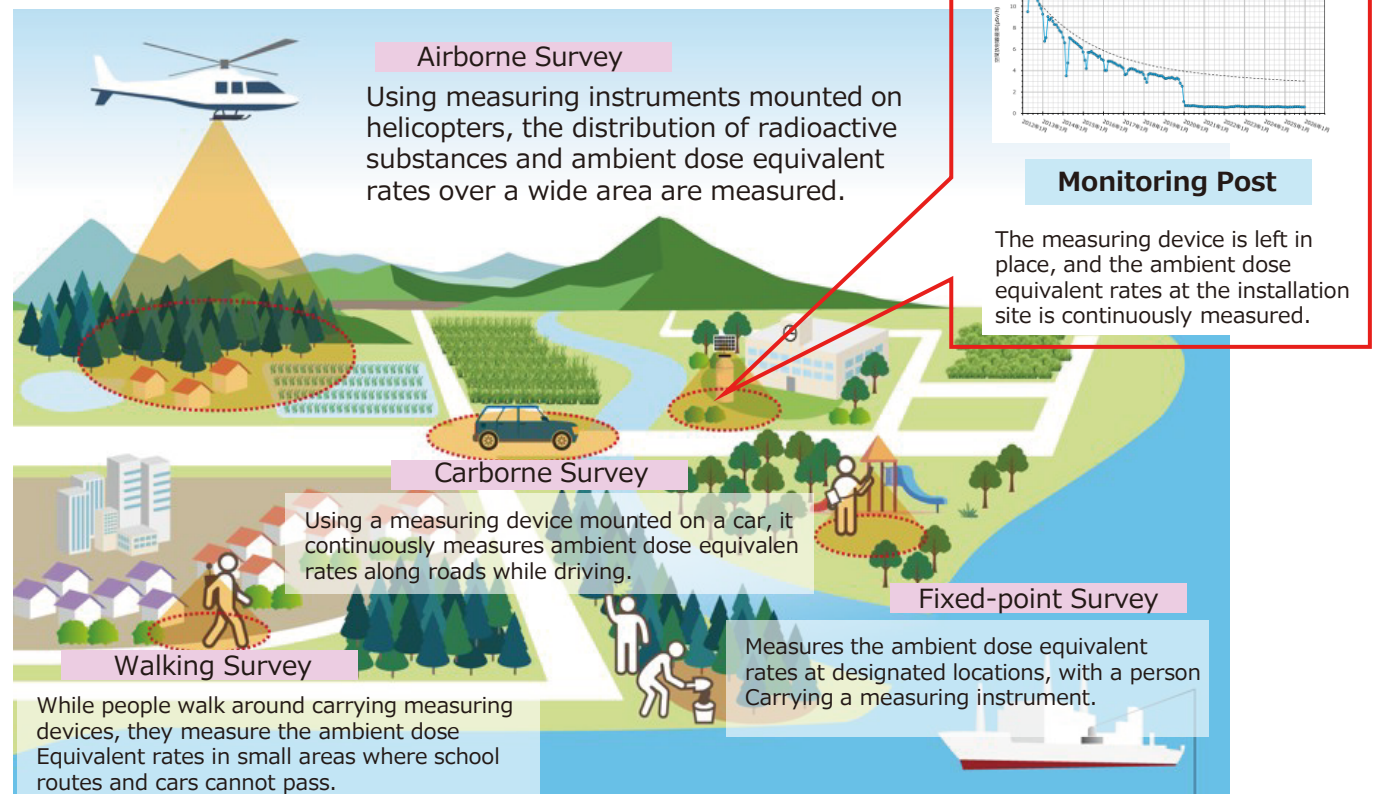
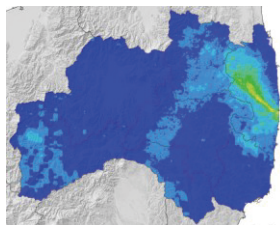
Monitoring of Land Areas

During the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Station accident, many radioactive materials were released into the environment. The Nuclear Regulation Authority has continuously monitored the status of radioactive materials and radiation through various methods in cooperation with relevant ministries and agencies. Here, we introduce the results of the "Integrated Map" and "Monitoring Post" surveys created based on extensive data obtained from the vast land areas of Fukushima Prefecture regarding changes in ambient dose equivalent rates.



Integrated Map

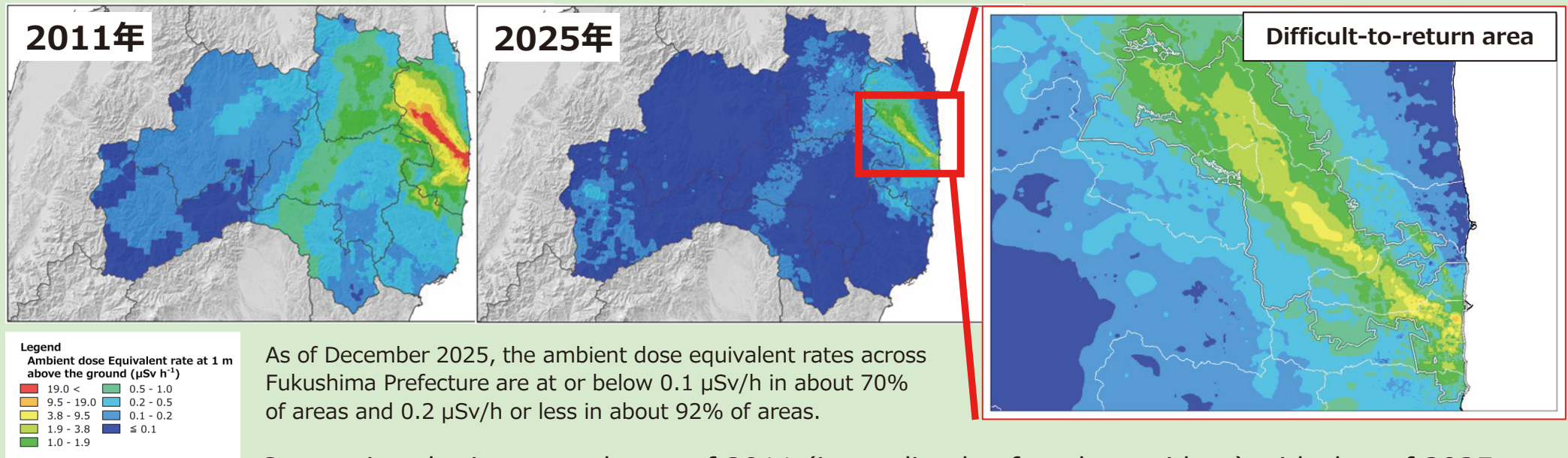
Data from Airborne Surveys is integrated and corrected with data from ground measurements from Carborne Surveys, Walking Surveys, and Fixed-point Surveys, enabling more accurate display of ambient dose equivalent rates.



The measurement of data used in the integrated map is coordinated with the cooperation of the Japan Atomic Energy Agency (JAEA), Fukushima Prefecture, the Forestry Agency, and Tokyo Electric Power Company Holdings, with JAEA coordinating the data.

1. Visible changes over time – What we can learn from the integrated map from 2011 to 2025 –

In 2011, when the accident occurred, areas showing high ambient dose equivalent rates were observed, mainly northwest of TEPCO's Fukushima Daiichi Power Station, but these rates have decreased over time, and these areas have now shrunk.



Comparing the integrated map of 2011 (immediately after the accident) with that of 2025, it is clear that overall ambient dose equivalent rates have been decreasing over time. Some areas with high ambient dose equivalent rates are still observed, but areas exceeding the threshold of $3.8 \mu\text{Sv/h}$ for lifting evacuation orders (red, orange, yellow) have shrunk from about 608 km^2 in 2011 to about 7.4 km^2 in 2025.

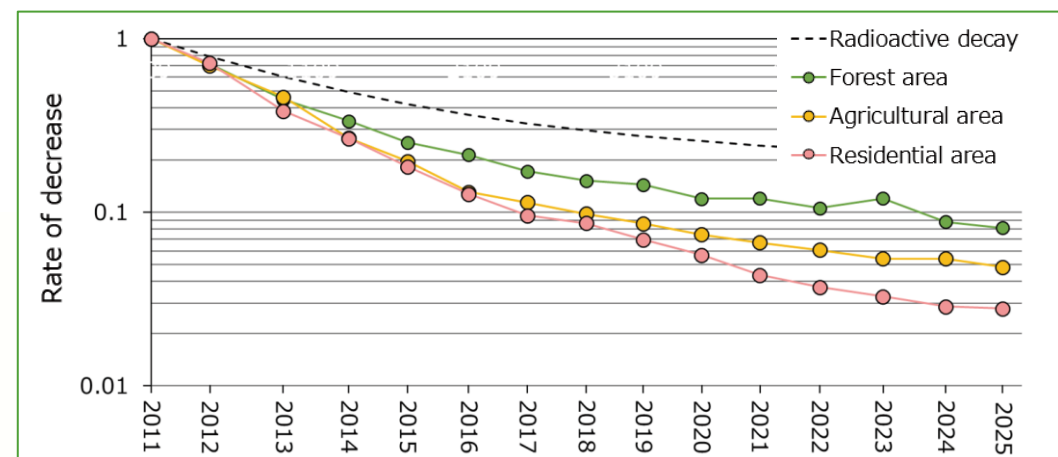
2. Does it vary depending on the location? Changes in land use and ambient dose equivalent rates

Surveys using integrated maps have revealed that the way ambient dose equivalent rates decrease varies depending on how the land is used.

Compared to forests, the ambient dose equivalent rates are rapidly decreasing in residential and agricultural areas.

- Divide the integrated map into 1 km meshes and classify each mesh by land use status (forest, agricultural area, residential area).
- Evaluate changes in ambient dose equivalent rates (average mesh) for each category when the 2011 value is set to 1.

Changes in ambient dose equivalent rates by land use at locations where the ambient dose equivalent rate was greater than $3.8 \mu\text{Sv/h}$ as of July 2011



Forest area

Radioactive substances tend to remain in fallen leaves and soil, and the ambient dose equivalent rates slowly decrease.

Agricultural area

Radioactive substances are absorbed into the soil, but ambient dose equivalent rates decrease faster than in forest areas and more gradually than in residential areas.

Residential area

On paved surfaces, radioactive substances do not enter the soil and flow easily, so ambient dose equivalent rates decrease relatively quickly.

3. Changes in ambient dose equivalent rates visible from monitoring posts

Since 2011, approximately 3,700 monitoring posts* have been installed, mainly centered in Fukushima Prefecture to understand ambient dose equivalent rates. We continuously monitor at many locations representing our living area, such as facilities and schools where people gather, You can check the ambient dose equivalent rates in real time.

*Transportable monitoring post and real-time dose measurement system

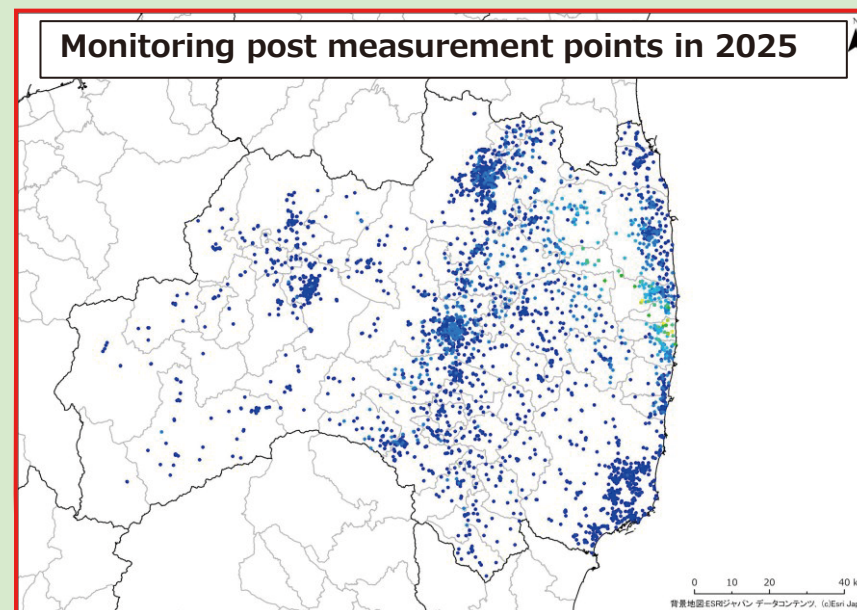
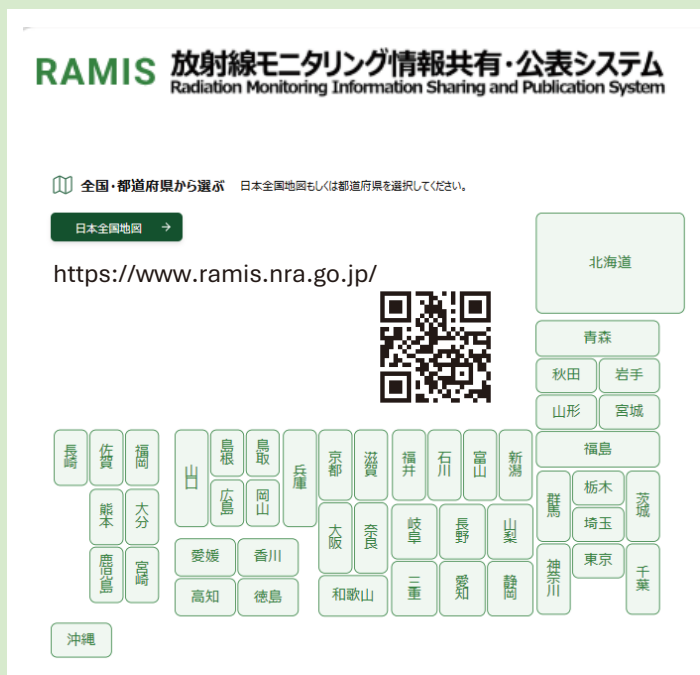
Measurement results can be checked in real time via the internet via RAMIS (RAMIS: Radiation Monitoring Information Sharing and Publication System).



Transportable type Monitoring Post



Real-time Dosimetry system

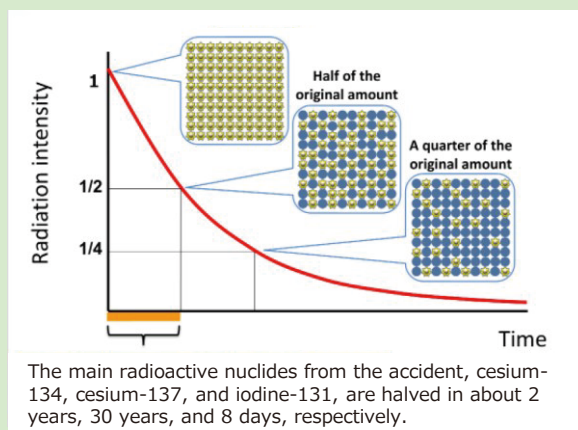


How did the ambient dose equivalent rates decrease?

- Three reasons for changes in Fukushima radiation levels -

(1) Physical attenuation

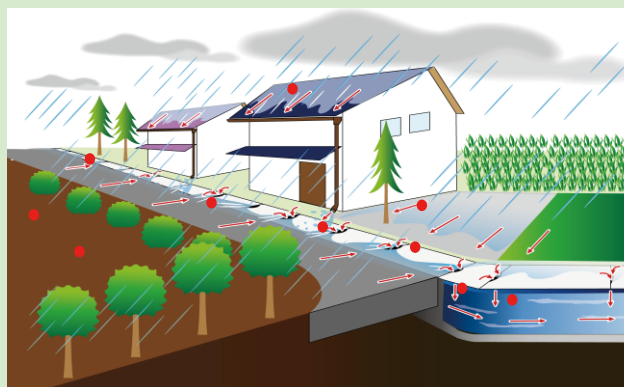
Radioactive materials decrease over time.



Ministry of the Environment: BOOKLET to Provide Basic Information Regarding Health Effects of Radiation Created by processing 'half-life and radioactivity decay'

(2) Weathering effect

Radioactive substances in the environment move and decrease due to natural phenomena such as rainfall.



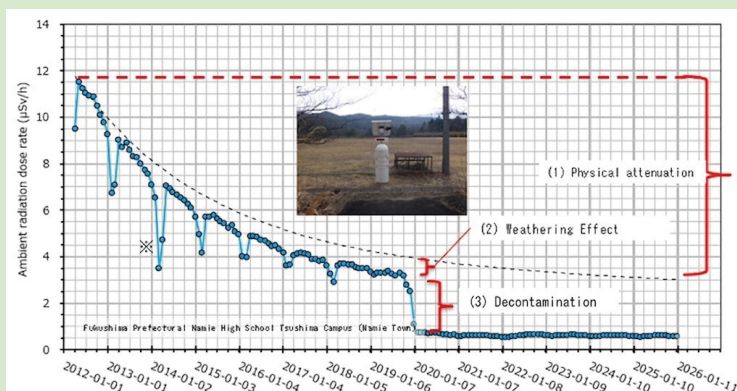
Yoshimura K., Air dose rates and cesium-137 in urban areas—deposition, migration, and time dependencies after nuclear power plant accidents. Journal of Nuclear Science and Technology, 2021, 59, 25-33. Created from

(3) Decontamination

As part of environmental restoration efforts, "decontamination" was carried out to remove radioactive substances.



Ministry of the Environment: BOOKLET to Provide Basic Information Regarding Health Effects of Radiation Created by processing 'radiation dose reduction'



* It is estimated that the ambient dose equivalent rate regularly decreases due to the shielding effect of snow accumulation.

< Actual changes in data of monitoring posts >

- The measurement in the monitoring post (blue) is below the calculated decrease due to physical attenuation (dotted line).
- In addition to the predicted physical decay, it can be inferred that the reduction in radioactive materials due to the weathering effect occurred.
- Around January 2020, ambient dose equivalent rates decreased by about 80%. This is believed to be due to the effects of decontamination carried out during this period.

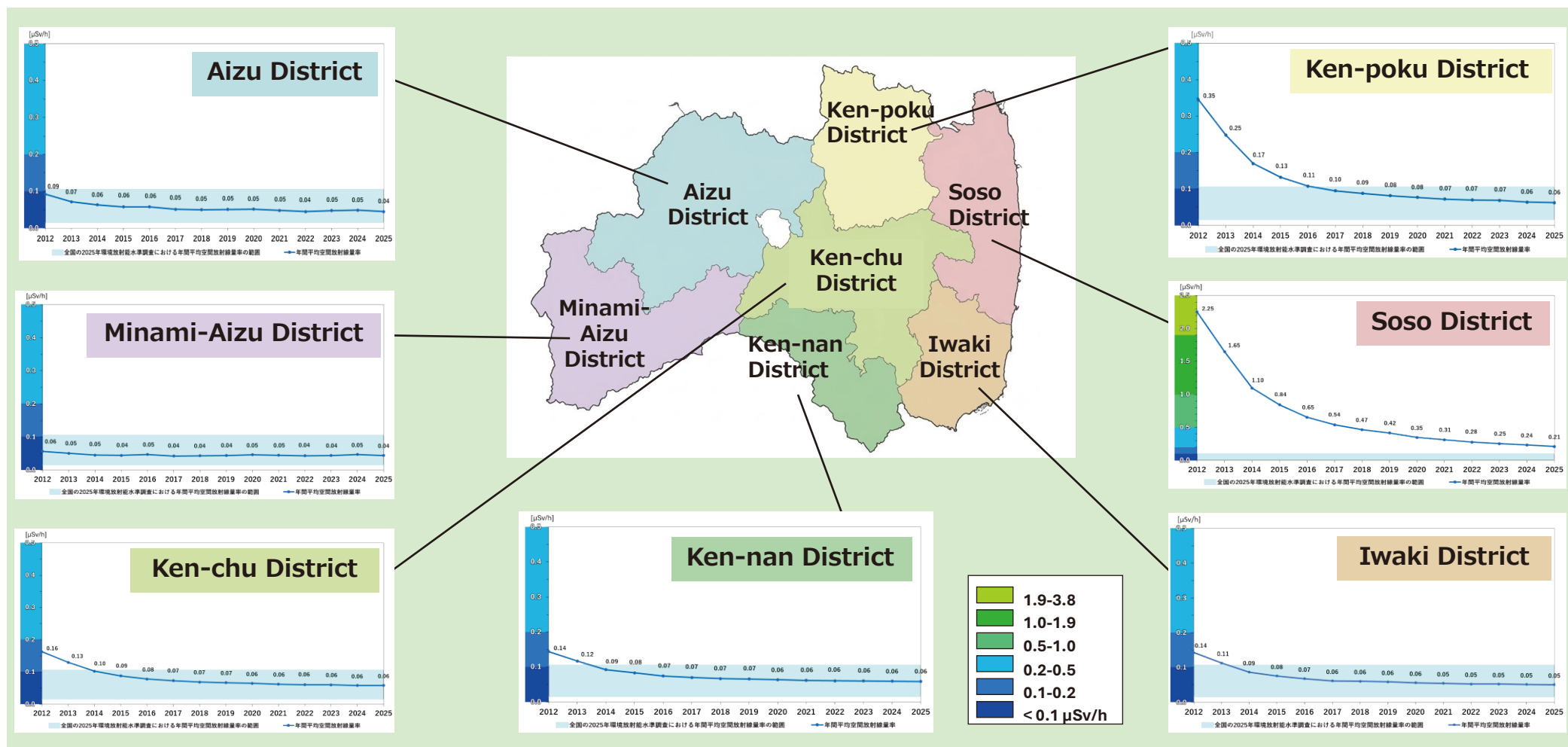
The ambient dose equivalent rates in Fukushima Prefecture decreased over time after the accident.

Currently, many regions are showing the same level as the national level.

The graph shows the average values for ambient dose equivalent rates measured by 544 portable monitoring posts in Fukushima Prefecture by region.

The blue band represents the range of the maximum and minimum ambient dose equivalent rates nationwide※, and the average values for regions other than the Soso District (which includes difficult-to-return areas) fall within this range.

* Nationwide environmental radiation level survey range: 0.015μSv/h ~ 0.106μSv/h



4. What will happen next? Future Forecasts of Ambient Dose Equivalent Rates

In the long term, a further decline in ambient dose equivalent rates within Fukushima Prefecture is expected.

By 2041, 30 years after the accident, about 80% of the prefecture is expected to reach ambient dose equivalent rates* at levels comparable to the national average

* Ranges of maximum and minimum values based on environmental radiation level surveys conducted in 47 prefectures nationwide

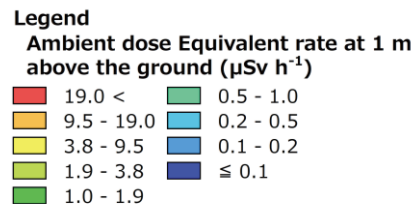
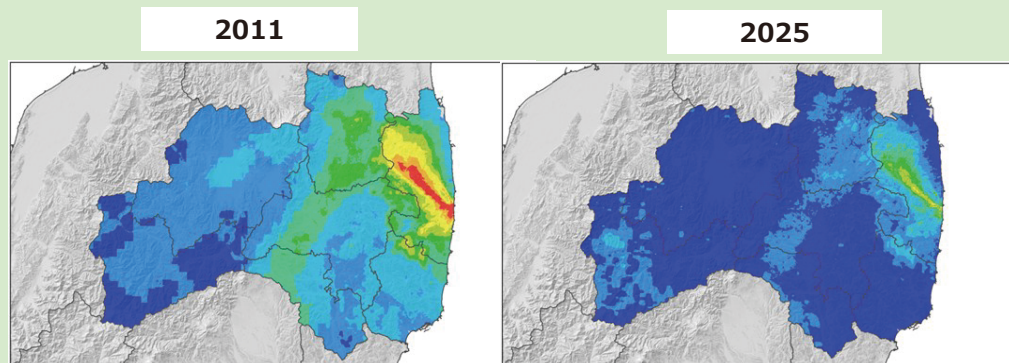
Based on the results of previous surveys, we have predicted the future ambient dose equivalent rates in Fukushima Prefecture using two methods.

[Prerequisites for Future Forecasts]

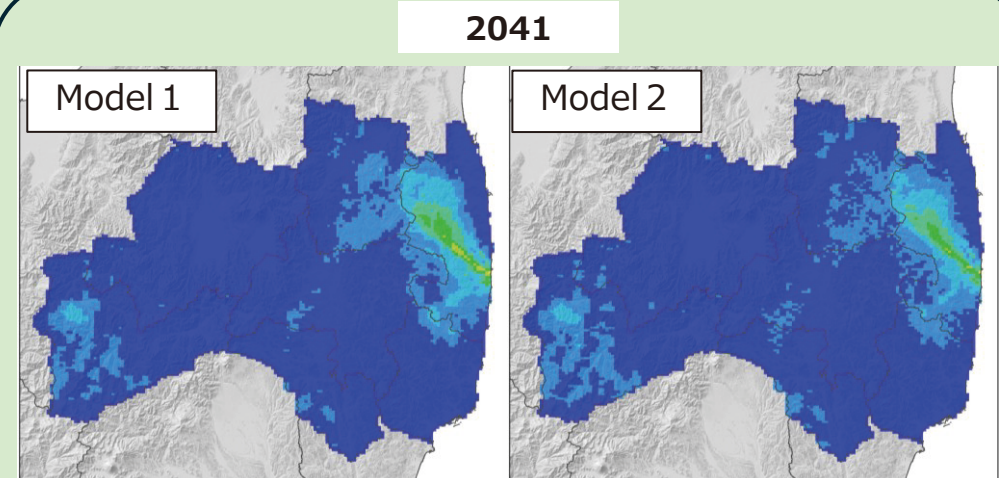
Model 1: Calculated according to the physical attenuation of radioactive cesium (considering natural radiation levels present before the accident)

Model 2: In addition to Model 1, a mathematical model is constructed based on monitoring results obtained to date (including decontamination and weathering effects).

Future rates are calculated under the assumption that this model remains applicable in the future.



*The displayed ambient dose equivalent rates include not only the accident but also the effects of natural radionuclides. It is known that the Minami-Aizu region contains many natural radionuclides.



With both methods, it is predicted that about 80% of the area will have an ambient dose equivalent rate of $0.1\mu\text{Sv/h}$ or lower, and about 95% of the area will be $0.2\mu\text{Sv/h}$ or lower.

Monitoring of Sea Areas

Some of the radioactive material released by the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Station accident has flowed into the sea.

The Nuclear Regulation Authority, in addition to domestic relevant agencies, has been conducting sea area monitoring in cooperation with the International Atomic Energy Agency (IAEA) and continuously checking the status of radioactive substances in seawater and sediment.

Here, we introduce the results of previous investigations regarding changes in radioactive substances in seawater.

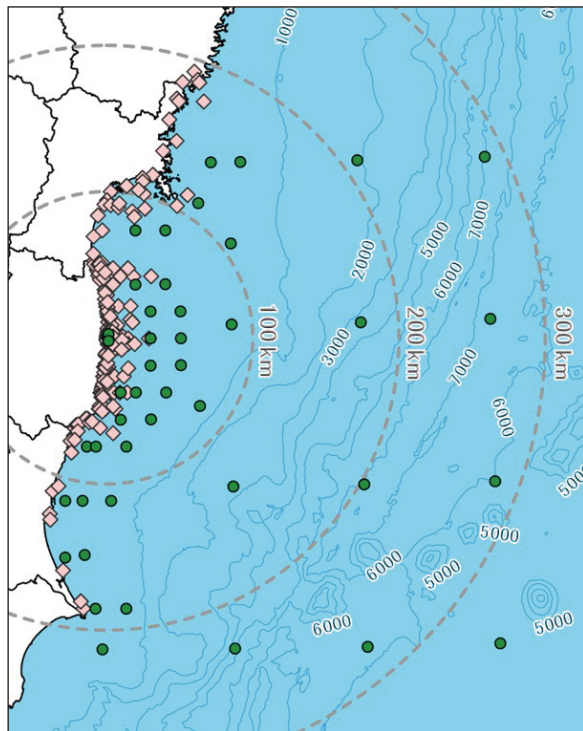
Sea Area Monitoring Points

In cooperation with relevant agencies, surveys have been conducted at 46 locations based on the "Comprehensive Radiation Monitoring Plan."

Nearshore sea area : Approximately 3 km from Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station

Offshore sea area : Approximately 30~90 km from the coastline

Open sea area : Approximately 90 km or more from the coastline



● Nuclear Regulation Authority

◆ Agencies other than the Nuclear Regulation Authority

Seawater sample collection



Sediment sample collection

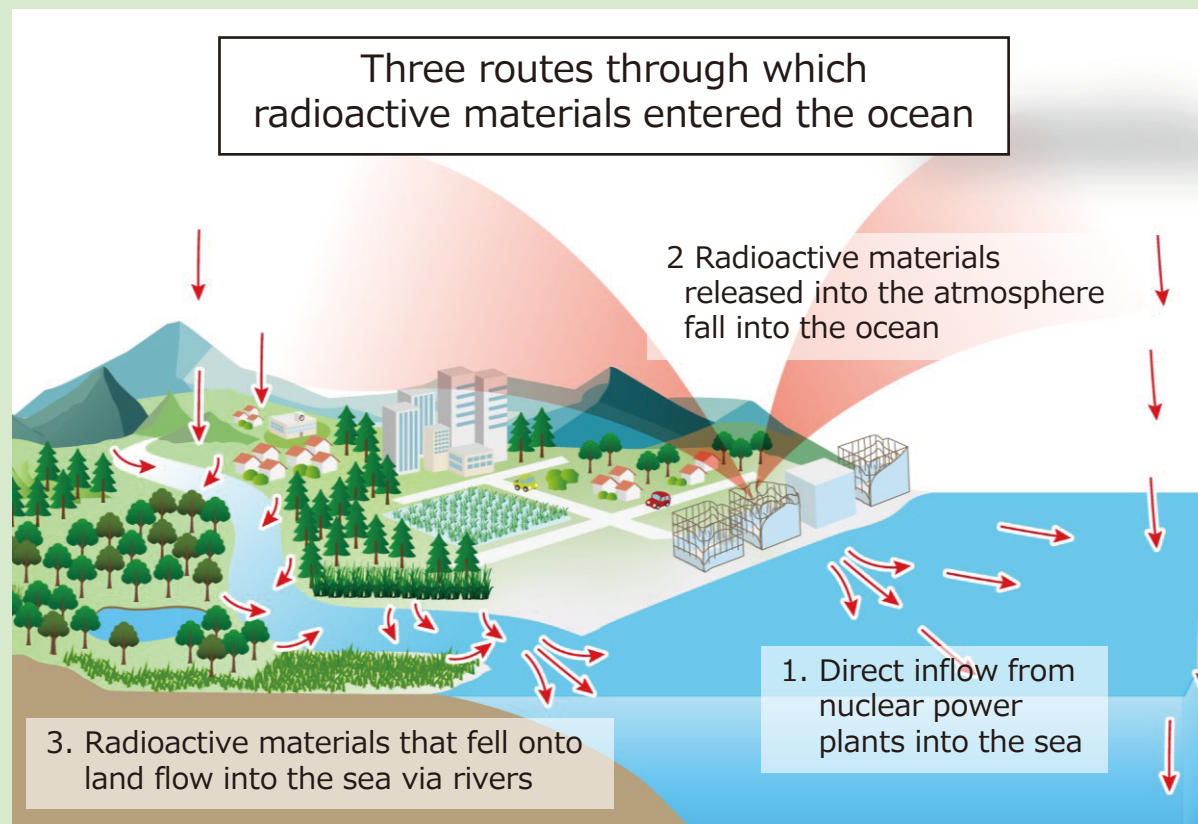


1. Routes of cesium-137 entering the ocean

During the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Station accident, various radioactive substances were released into the environment.

Among these, cesium-137 is released into the environment in large quantities and has a half-life of about 30 years, making it an important subject of evaluation because it continues to be observed in the environment for a long time even after the accident.

To investigate the long-term effects of radioactive substances on the ocean, it is necessary to examine the spatial spread of cesium-137 in seawater and seabed soil and its changes over time.



2. Ocean cesium-137 changes over time

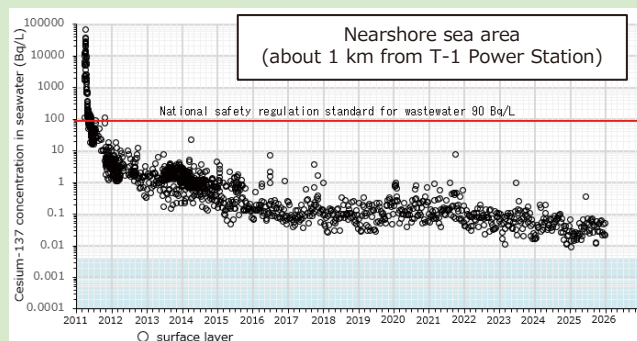
Immediately after the accident, the concentration of cesium-137 in seawater increased, but has since decreased over time.

The concentration of cesium-137 in seawater decreases when it moves away from TEPCO's Fukushima Daiichi Power Station.

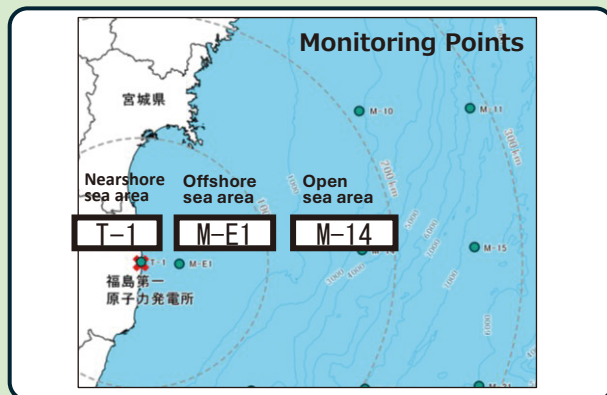
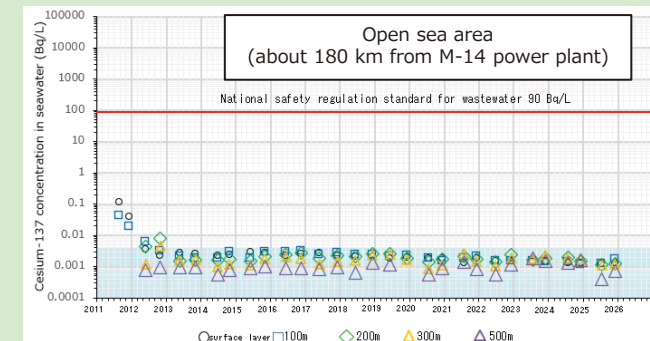
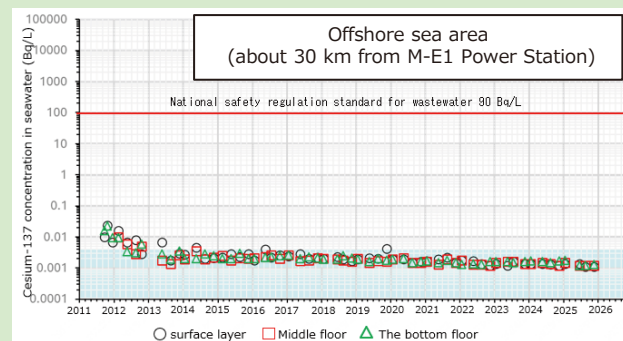
As of 2025, in all areas of Fukushima, the concentration is below the national safety regulation standard for wastewater (90 Bq/L), and in offshore and open sea areas, concentrations are reaching levels similar to those before the accident.

※  Width of cesium-137 concentration in the national sea area before the accident (ND~0.0041 Bq/L)

Trends in cesium-137 concentrations in seawater from September 2011 ~ December 2025



T-1 is a measurement point for TEPCO, and it uses TEPCO data

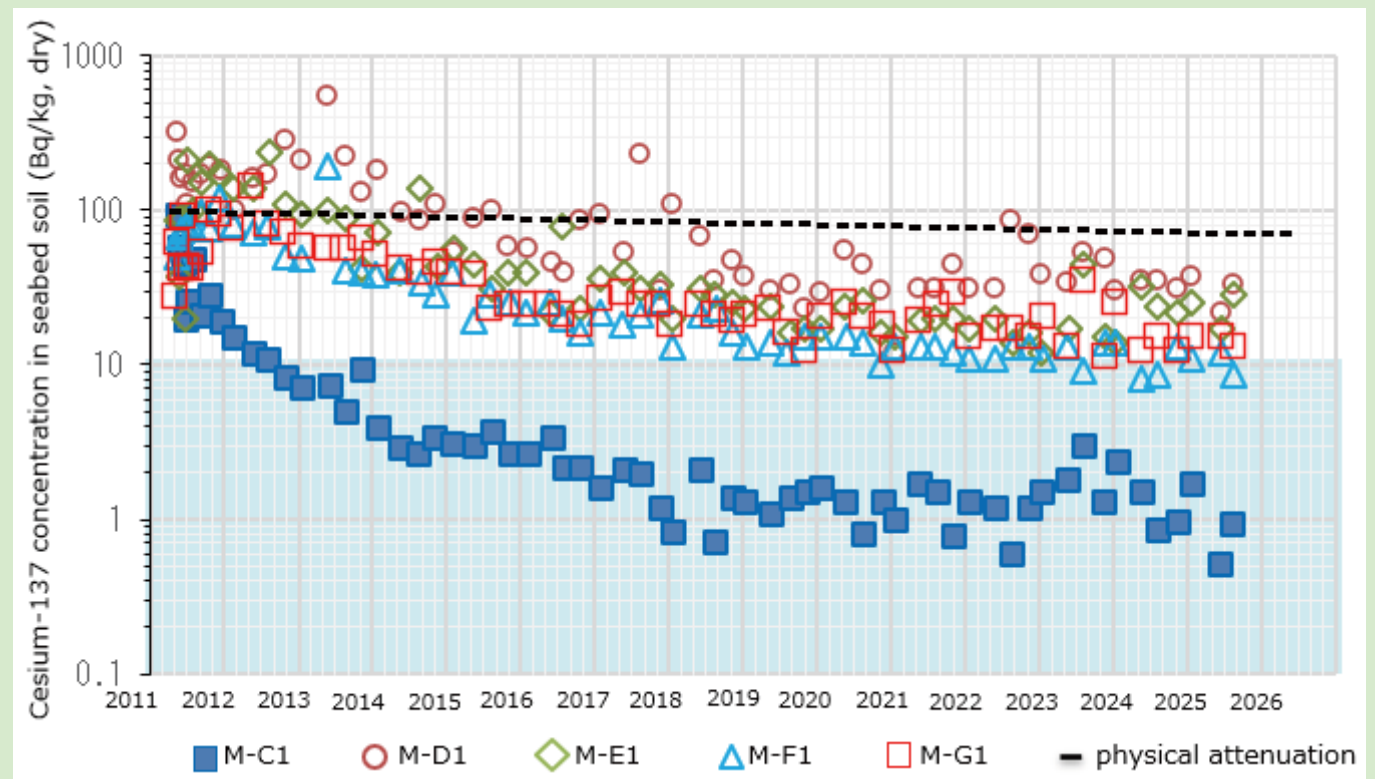
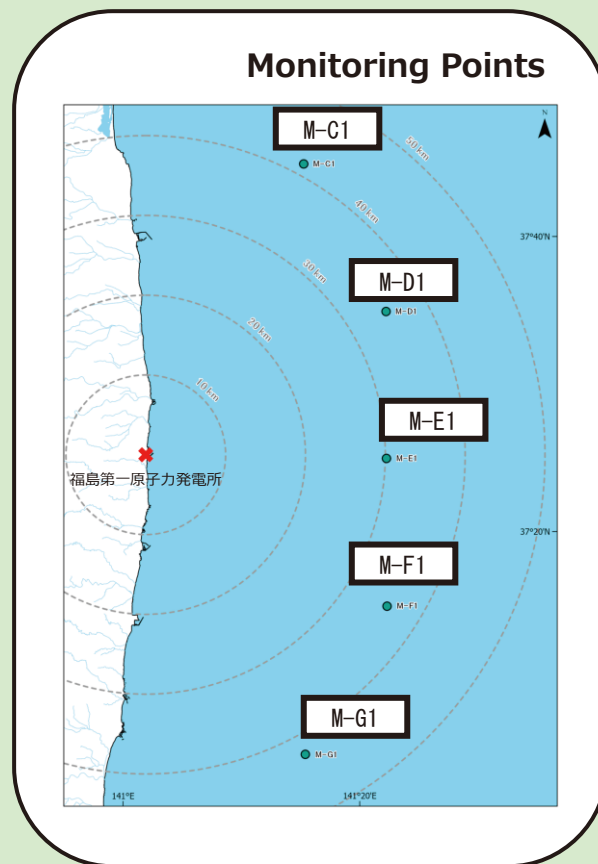


The concentration of cesium-137 in seawater in Nearshore sea area is higher than the range of cesium-137 in the national seawater before the accident, but remains below the national standard.

The concentration of cesium-137 in seawater in offshore and open sea areas is below national standards and falls within the range of cesium-137 concentration in seawater nationwide before the accident.

Changes in cesium-137 in sediment

Some of the cesium-137 that entered the sea settled on the seabed and remained in the sediment. The concentration of cesium-137 in the sediment rose in some places for 1~2 years after the accident, Since then, the overall trend has been declining.

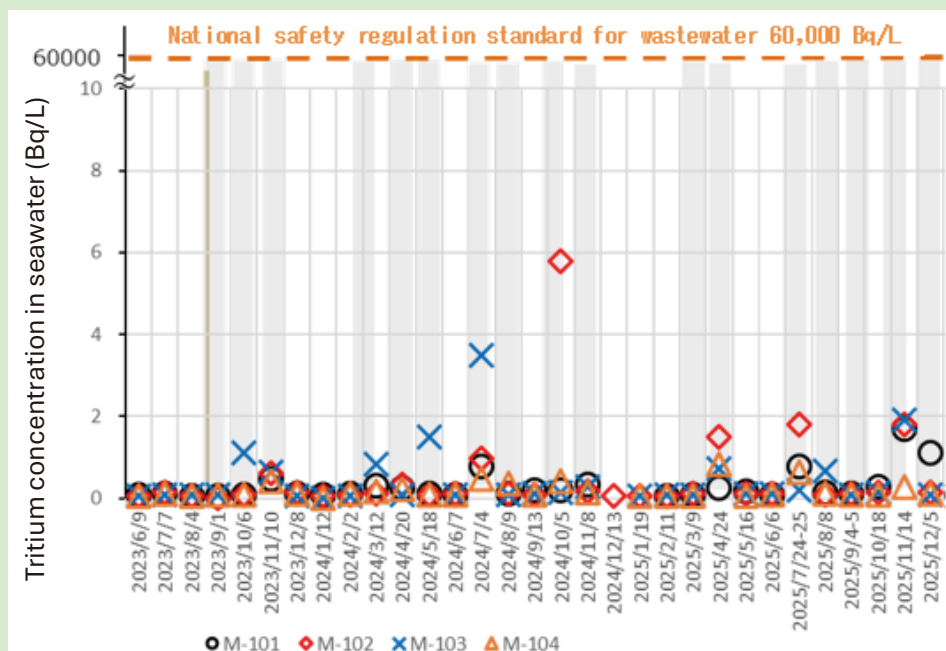


3. Monitoring ALPS Treated Water

In the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Station accident, the water used to cool the fuel and groundwater came into contact with radioactive substances, resulting in contaminated water. Contaminated water is treated with Multi-nuclide Removal Equipment (ALPS), and many radioactive substances are removed, but tritium exists as part of water molecules and cannot be removed by ALPS.

Since August 2023, based on the plan, the discharge of treated water stored within the power plant site into the ocean has been carried out in stages. Tritium concentrations and other levels are managed to fall below national standards, and we confirm that they are well below these standards.

From June 2023 ~ December 2025, in the Nearshore sea area Trend graph of tritium concentration in seawater



Standards for Tritium Concentration, etc.

- (1) National Safety Regulation Standard for Wastewater: 60,000 Bq/L
- (2) WHO Drinking Water Guidance Level: 10,000 Bq/L
- (3) Discharge Limit Based on the Basic Policy on Disposal of ALPS Treated Water at Tokyo Electric Power Holdings Co., Ltd. Fukushima Daiichi Nuclear Power Station: 1,500 Bq/L

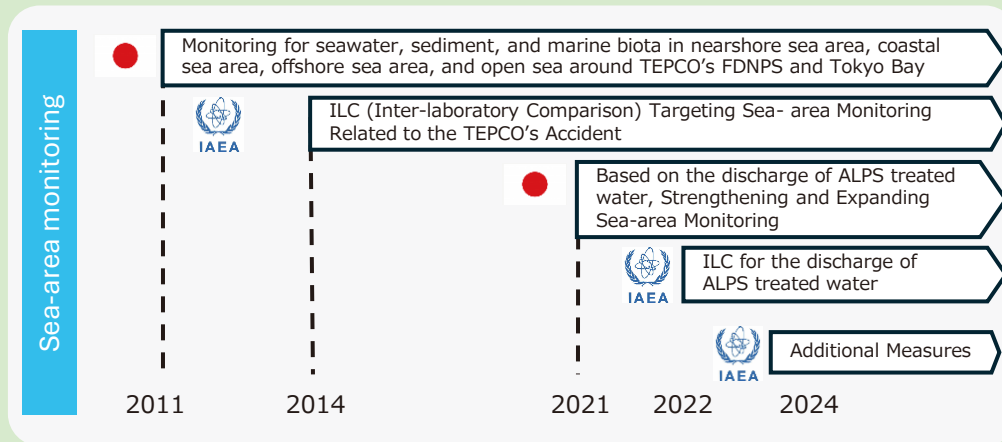
Information site disseminating ALPS treated water

Information Dissemination Agency	Website URL	QR code
Nuclear Regulation Authority (Seawater, sediment)	(Repost) Environmental Radiation Monitoring Information RAMDAS Nuclear Regulation Authority	
Ministry of the Environment (Seawater, Seabed, Aquatic Life)	Marine Area Monitoring Information Related to ALPS Treated Water Ministry of the Environment	
Fisheries Agency (Fishery Products)	(Repost) Results of the Radioactive Substances Investigation in Fisheries Products: Fisheries Agency	
Agency for Natural Resources and Energy (Reference: ALPS treated water before release)	Monitoring of ALPS Treated Water ALPS Treated Water (METI / Ministry of Economy, Trade and Industry)	
Fukushima Prefecture (Seawater)	Marine Area Monitoring Results Related to ALPS Treated Water - Fukushima Reconstruction Information Portal Site - Fukushima Prefecture Homepage	
Tokyo Electric Power Company (seawater, seabed soil, aquatic organisms)	Results of Marine Area Monitoring Tokyo Electric Power Company	
International Atomic Energy Agency (IAEA) (Confirmation and Evaluation of Japanese Monitoring)	Marine Monitoring: Confidence Building and Data Quality Assurance - Reports International Atomic Energy Agency 1) Fukushima Daiichi ALPS Treated Water Discharge - Reports IAEA (Comparison between analytical institutions) 2) Fukushima Daiichi ALPS Treated Water Discharge - Reports IAEA(Additional Measures) 3)	1) 2) 3)

4. Collaboration with International Organizations

We collaborate with the International Atomic Energy Agency (IAEA) and other countries to compare and evaluate monitoring data.

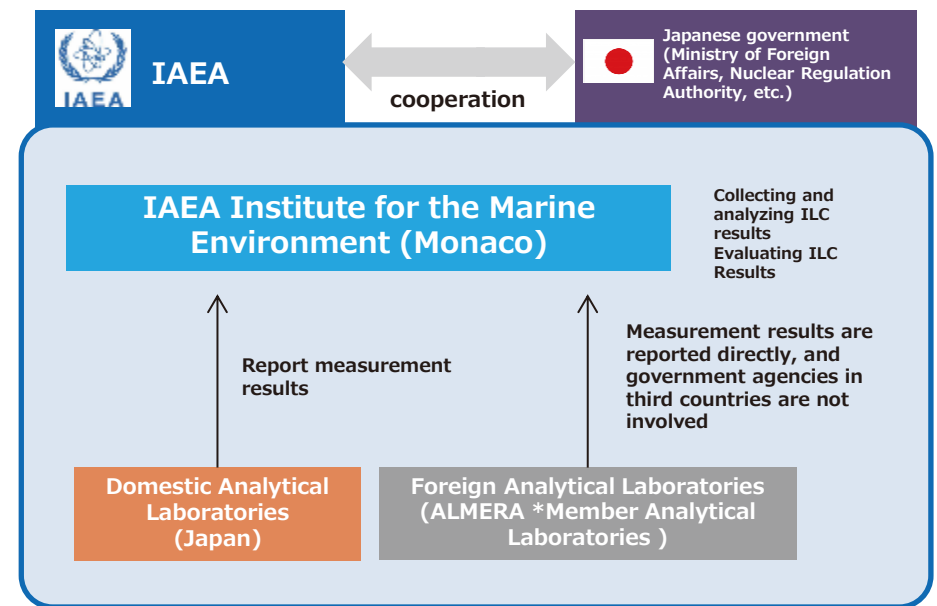
By comparing the analysis results of the same seawater and other samples jointly collected by the IAEA and Japan, it has been confirmed that Japanese analytical laboratories possess high capabilities and that their analyses are accurate.



- ◆ Since 2014, the IAEA and relevant Japanese agencies (Nuclear Regulation Authority, Ministry of Foreign Affairs, Ministry of the Environment, Fisheries Agency) have collaborated to conduct inter-laboratory comparisons (ILC) and similar analyses for marine areas.
- ◆ Since 2022, the IAEA has been conducting comparative evaluations using methods similar to those of the ILC to support the results of marine area monitoring of ALPS treated water.
- ◆ Furthermore, starting in 2024, in addition to the IAEA, experts from other countries have been conducting additional monitoring by directly collecting samples.

The release of ALPS treated water is continuously evaluated by the IAEA to ensure it meets international standards.

ILC Implementation Structure



*ALMERA (Analytical Laboratories for the Measurement of Environmental Radioactivity)
A global network of analytical institutions coordinated by the IAEA for environmental radioactivity measurement.

Fukushima's Past and Future from the Perspective of Environmental Radiation Monitoring

< Land Areas >

- ◆ The high ambient dose equivalent rates after the accident have decreased over time due to physical attenuation, weathering, and decontamination effects, and have now reached the same level as the national average in many regions.
- ◆ In the long term, a further decline in ambient dose equivalent rates is expected.

< Sea Areas >

- ◆ The concentration of radioactive substances detected in seawater decreases over time and with distance from the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station. At present, it is well below the national standard.
- ◆ Although there is a temporary increase in tritium concentration in seawater due to the release of ALPS-treated water, it has been confirmed that it is not at a level that would affect people or the environment.
- ◆ The International Atomic Energy Agency (IAEA) has confirmed the accuracy of the findings of Japan.

The Nuclear Regulation Authority will continue to monitor changes in radiation and radioactive substances while conducting necessary monitoring.

Visible, safe environmental radiation monitoring - Information dissemination from the Nuclear Regulation Authority

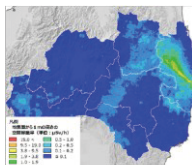
Contents

For those who want to know more...

Nuclear Regulation Authority Materials 2D Code

After the Great East Japan Earthquake, Environmental Radiation Monitoring Information

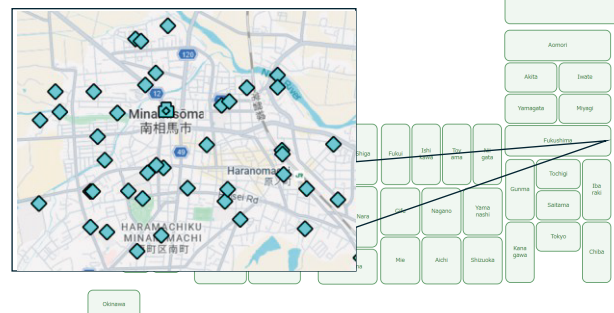
RAMDAS



For those who want to know about the environmental radiation impact of the Fukushima Daiichi Nuclear Power Station accident, [click here](#).

Radiation Monitoring Information Sharing and Publication System

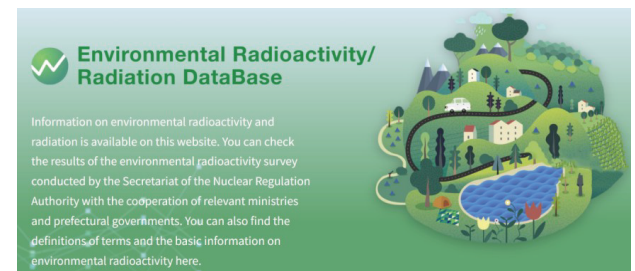
RAMIS



If you want to check the current radiation dose rates around you, [click here](#).

Environmental Radioactivity and Radiation Database

ENVRADDB



If you want to know the environmental radioactivity levels across Japan from the 1960s to the present, or learn more about radiation, [click here](#).





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2026.08

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