

Fukushima Prefecture Newsletter on Environmental Radiation Monitoring

Fukumoni

- We will tell you about the current state of
radiation in Fukushima Prefecture -



Fukushima Prefecture

Introduction

The Great East Japan Earthquake, which occurred on March 11, 2011 severely damaged the TEPCO Fukushima Daiichi Nuclear Power Station due to onslaught of a large tsunami that accompanied the earthquake. As a result, the fuel could not be cooled, and hydrogen, a flammable gas, which was generated, produced an explosion releasing radioactive substances, such as cesium and iodine, into the atmosphere.

Fukushima Prefecture monitored environmental radiation before the Great East Japan Earthquake. After the earthquake, we have additionally installed measurement equipment, such as monitoring posts, added measurement points, and expanded the measurement area to enhance and strengthen our monitoring system.

What is radiation/radioactivity?

Heat/light = Radiation (Particles and electromagnetic waves emitted from radioactive substances)

Fire = Radioactivity (Ability to emit radiation)

Firewood = Radioactive substance
(Substance with the ability to emit radiation (radioactivity))



What are radiation, radioactivity, and radioactive substances? Let's imagine them as a "campfire."



Unit

Becquerel (Bq)

→A unit that expresses the level of the ability of radioactive substances to emit radiation (radioactivity)

Gray (Gy)

→A unit that expresses how much radiation energy is absorbed by a substance

Sievert (Sv)

→A unit that expresses the impact on human body when exposed to radiation

0.001Sv

||

1mSv

||

1,000μSv

If you compare these units of radiation to boxing

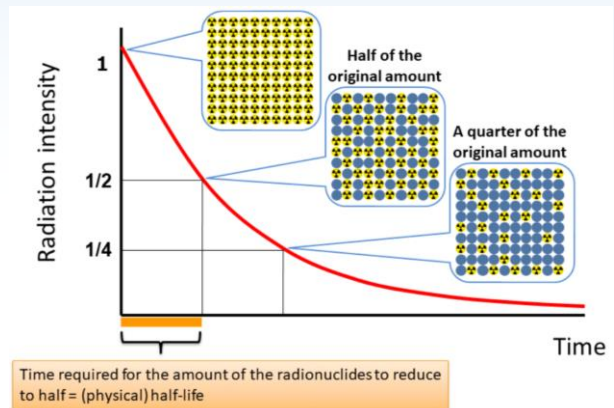
- Becquerel = The number of punches
- Gray = The power of punch
- Sievert = Body damage caused by punch



What is the half-life of a radioactive substance?

Radioactive substances emit radiation, and over time, they turn into stable substances and do not emit radiation any longer and their radioactivity gradually weakens. The period it takes for the radioactivity to halve (reduce by 50%) is called the “half-life.”

Half-life varies depending on the type of radioactive substance. It can be about eight days for iodine-131, two years for cesium-134, and 30 years for cesium-137.

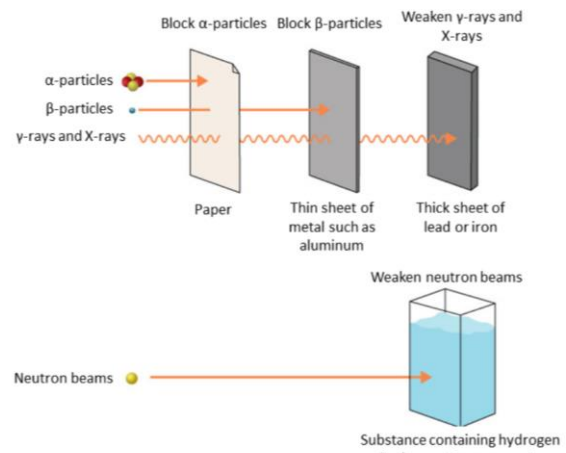


Source: “BOOKLET to Provide Basic Information Regarding Health Effects of Radiation (2020 Edition)” (The Ministry of the Environment)

Can radiation pass through things?

Radiation has the power to pass through objects; this is known as penetrating power. There are various kinds of radiation, such as α (alpha) particles, β (beta) particles, γ (gamma) rays, X rays, and neutron beams, and each one has a different level of penetrating power.

Alpha particles, the one with the weakest penetrating power, won't even pass through a sheet of paper, while it takes something like water or concrete to weaken neutron beams, the one with the strongest penetrating power.



Source: “BOOKLET to Provide Basic Information Regarding Health Effects of Radiation (2020 Edition)” (The Ministry of the Environment)

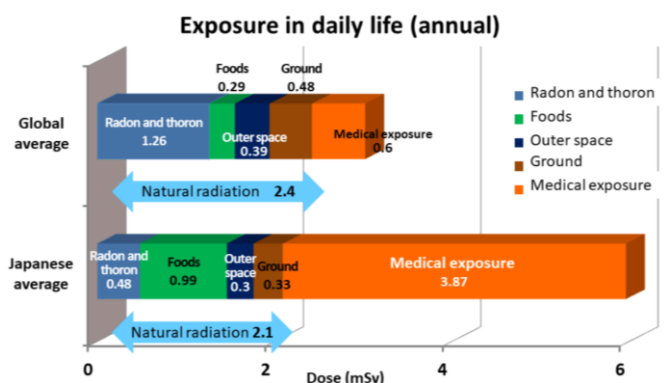
How are we exposed to radiation?

Radiation originally exists in nature and is not unique to nuclear power plants or hospitals. There are two types of radiation that we receive from our surroundings: “natural radiation” and “artificial radiation.”

Natural radiation refers to radiation received from space, air, the ground, food, and so on. In Japan, people are exposed to 2.1mSv of radiation on average annually (World average: 2.4mSv per year).

The higher levels of radiation contained in food are related to high consumption of fish, which contain a lot of natural radionuclides※.

Artificial radiation refers to the radiation received from abdominal (stomach, intestines, etc.) X-ray examinations, CT scans, and cancer treatments. The figure shows that, in Japan's population, the main contributor to radiation exposure comes from medical examinations and treatments, and this is related to Japan's long life expectancy and extensive medical care.



Source: “BOOKLET to Provide Basic Information Regarding Health Effects of Radiation (2020 Edition)” (The Ministry of the Environment)

※The type of atom and nucleus based on the number of atomic particles (protons and neutrons).

Monitoring of radiation in the environment in Fukushima Prefecture

Fukushima Prefecture measures the air dose rate※, analyzes radioactive substances contained in environmental samples (air, water, soil, etc.) and publishes the measurement results to ensure the safety and security of everyone concerned.

Monitoring the areas around the power plants

Fukushima Prefecture monitors the types, locations and levels of radioactive substances in the environment that came from nuclear power plants in the area.

Prefecture-wide monitoring

Fukushima Prefecture monitors various parts of the prefecture to keep track of the trends in contamination caused by the nuclear accident.

1 Monitoring of radiation in the environment

Measurement of environmental samples

We analyze radioactive substances contained in environmental samples, such as air, water and soil collected in the prefecture.

Measurement of air dose rate

● Station-type monitoring post

To monitor the radioactive substances newly released into the environment from the nuclear power plants, we have installed 42 monitoring posts in the areas within approximately 30 km from the nuclear power plants.



Measurement of air dose rate

● Real-time dosimetry system

We installed about 3,000 units in schools, nursery schools, parks, etc. in the prefecture to understand air radiation dosage rates the where children gather.



● Portable monitoring post

We installed approximately 600 units in public facilities in the prefecture to grasp changes in the radiation level in the air.



● Mobile monitoring

We use survey meters to measure the air radiation dose rate in places where many people gather, such as tourist spots and meeting places.

● Car-borne survey

We installed radiation measuring devices in cars to measure the dose of radiation in the air along the driving route. We also installed the radiation measuring devices in some fixed-route buses for ease of radiation measurements.

2 Monitoring, analysis, evaluation and confirmation of data

● Monitoring and analysis

Fukushima Prefectural Centre for Environment Creation (FPCEC) constantly monitors the air dose rate, and analyzes the collected and accumulated environmental radiation data.

● Evaluation and confirmation

Fukushima Prefecture has set up an "Environment Monitoring Evaluation Subcommittee" to evaluate the monitoring data collected from around the nuclear power plants. The subcommittee is composed of experts in radiation management, environmental radioactivity and water resources studies, and the members from national, prefectural, and municipal governments who meet on a quarterly basis.

3 Publication of data

- Fukushima Prefecture website
- Fukushima Prefecture Radioactivity Measurement Map, etc.

See page 7

※ Air radiation dosage rate: Air radiation dosage is the amount (strength) of radiation in the air.

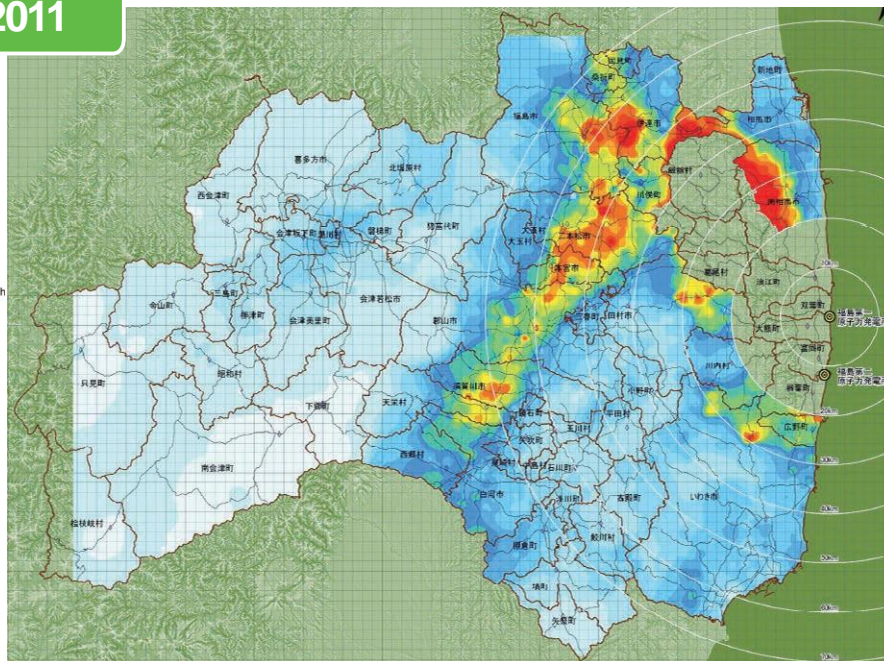
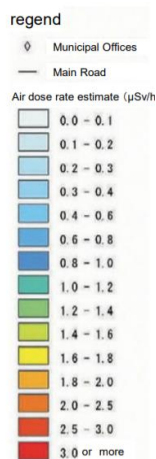
This includes gamma radiation from the ground, cosmic radiation, etc.

The air radiation dosage per unit of time (years, months, weeks, days, etc.) measured in a certain airspace is called the air radiation dosage rate.

Changes in air radiation dosage rate in Fukushima Prefecture

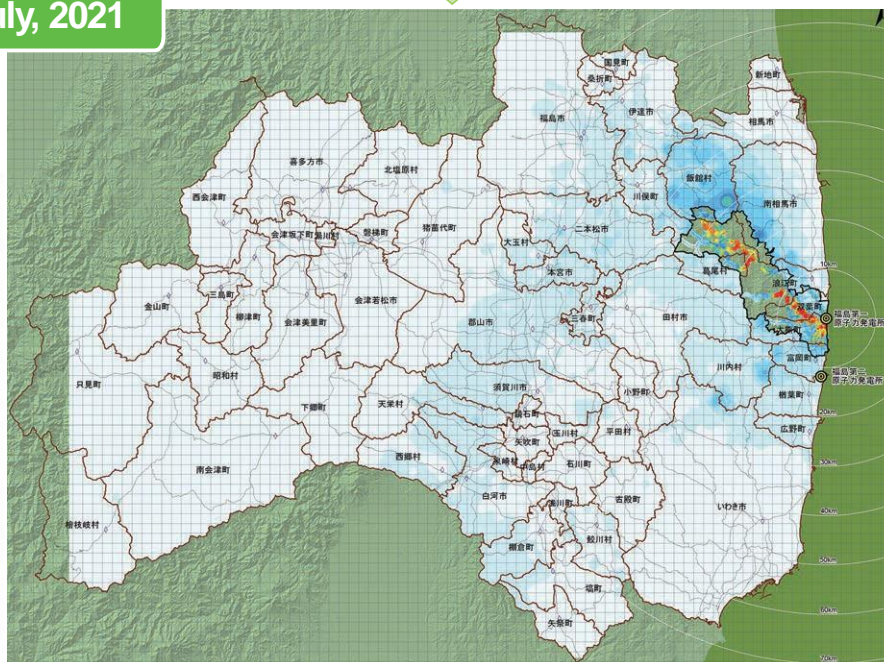
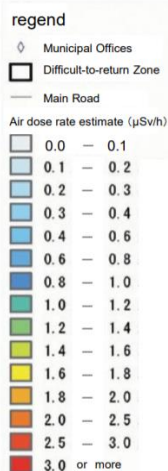
The air radiation dosage rate in Fukushima Prefecture has decreased significantly from that as of April 2011.

April, 2011



Created based on "Basic Map Information (Digital Elevation Model)", (The Geographical Survey Institute) and "National Land Numerical Information (Administrative Areas, Roads)" (The Ministry of Land, Infrastructure, Transport and Tourism National Land Policy Bureau)

April ~ July, 2021



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※The results of the car-borne survey conducted in "Difficult-to-Return zone" from August 29 to October 3, 2021 were added.

In the Nakadori and Hamadori regions, the effects of natural attenuation and decontamination of radioactive substances are definitely appearing. The Aizu region has been restored to the air radiation dosage level which existed before the nuclear accident.

Let's look at the numbers

Air dose rate in Fukushima Prefecture

Unit: $\mu\text{Sv/h}$

Measurement date Measurement point ※1	Measurement point ※2	Fukushima City	Koriyama City	Shirakawa City	Aizu-wakamatsu City	Minamiaizu Town	Minamisoma City	Iwaki City
Before the accident (2009) ※3		0.04	0.04	0.04	0.05	0.04	0.05	0.06
April 2011		1.91	1.83	0.67	0.19	0.08	0.63	0.37
September 2011		1.00	0.88	0.42	0.13	0.08	0.42	0.18
September 2012		0.69	0.51	0.21	0.09	0.06	0.37	0.10
September 2013		※4 0.33	※4 0.17	0.12	0.07	0.05	0.15	0.09
September 2014		0.24	0.14	0.10	0.07	0.05	0.12	0.08
September 2015		0.20	0.12	0.09	0.06	0.04	0.09	0.07
September 2016		0.18	0.10	※4 0.08	0.06	0.04	0.08	0.07
September 2017		0.15	0.09	0.07	0.05	0.04	※4 0.08	0.06
September 2018		0.14	0.09	0.07	0.05	0.04	0.07	0.06
September 2019		0.13	0.08	0.06	0.05	0.04	0.07	0.06
September 2020		0.13	0.07	0.06	0.05	0.04	0.06	0.06
September 2021		0.12	0.07	0.06	0.05	0.04	0.06	0.06

※1 Monthly averages are listed (except for 2009).

※2 Fukushima City is measured at Ken-poku Public Health and Welfare Office, and others are measured at the prefectural joint government building. (except for 2009)

※3 2009 figures are the results of the radiation level survey.

Fukushima City : August 18, 2009 (Ken-tou Branch Office)
Shirakawa City: August 11, 2009 (Shirakawa Joint Government Building)
Minamiaizu Town: August 11, 2009 (Maruyama Park)
Iwaki City: August 18, 2009 (Iwaki Joint Government Building)

※4 Decontamination was conducted in Fukushima City and Koriyama City from April to May 2013, Shirakawa City in June 2016, and Minamisoma City in December 2016.

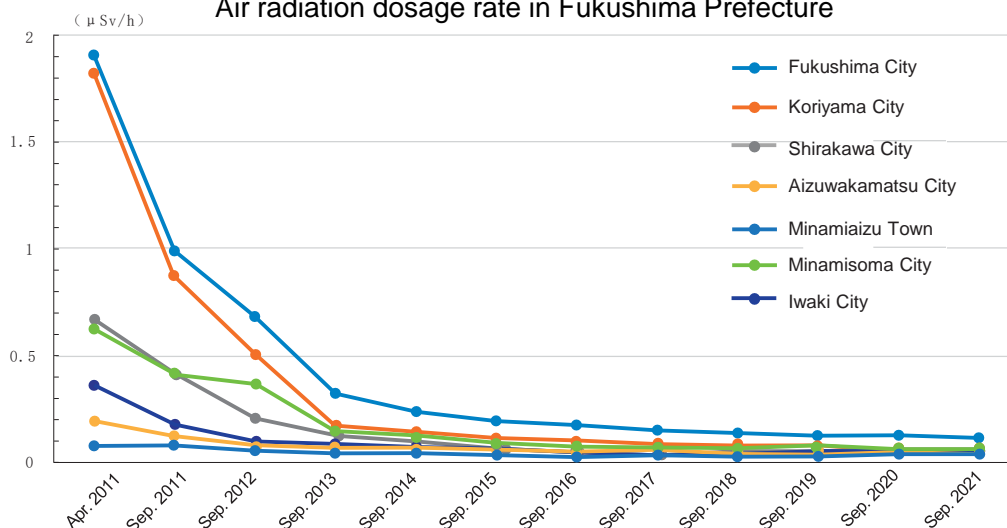
Koriyama City: August 11, 2009 (Hayama Park)
Aizuwakamatsu City: August 19, 2009 (Aizu Tsurugajo Castle Park)
Minamisoma City: August 19, 2009 (Nishiki Park)

Currently, the entire prefecture is stable at a low value!



Let's look at the graph

Air radiation dosage rate in Fukushima Prefecture



※ Monthly averages are listed.

※ For measurement locations, prefectural north health and welfare office for Fukushima City, and prefectural joint government buildings for other cities.

※ Decontamination was conducted in Fukushima City and Koriyama City from April to May 2013, Shirakawa City in June 2016, and Minamisoma City in December 2016.

Trivia

Changes in radiation dose due to weather

The radiation dose varies depending on the weather.

For example, when it rains, naturally occurring radioactive substances in the atmosphere can fall to the ground, increasing the radiation dose. When snow accumulates, the radiation dose may fall because the radiation from the ground is blocked.

Air radiation dosage rate at Kaibama Bureau, Minamisoma City (December 26, 2021 to January 25, 2022)

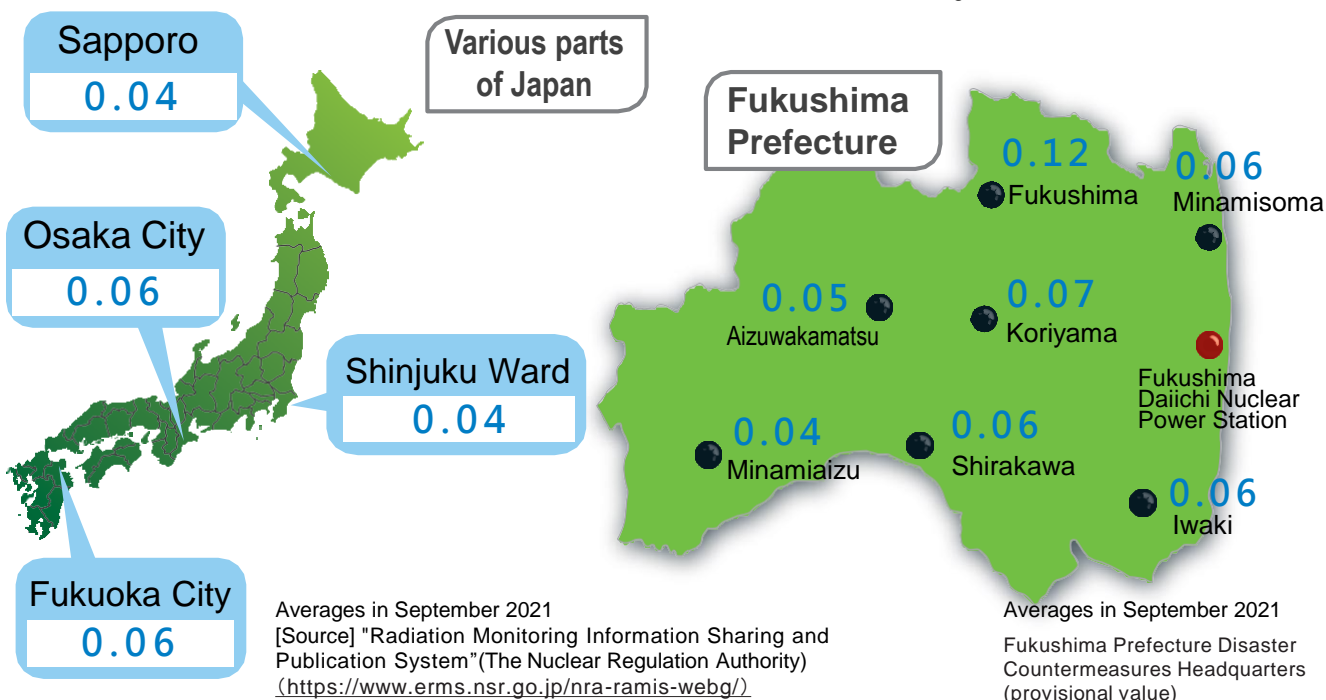
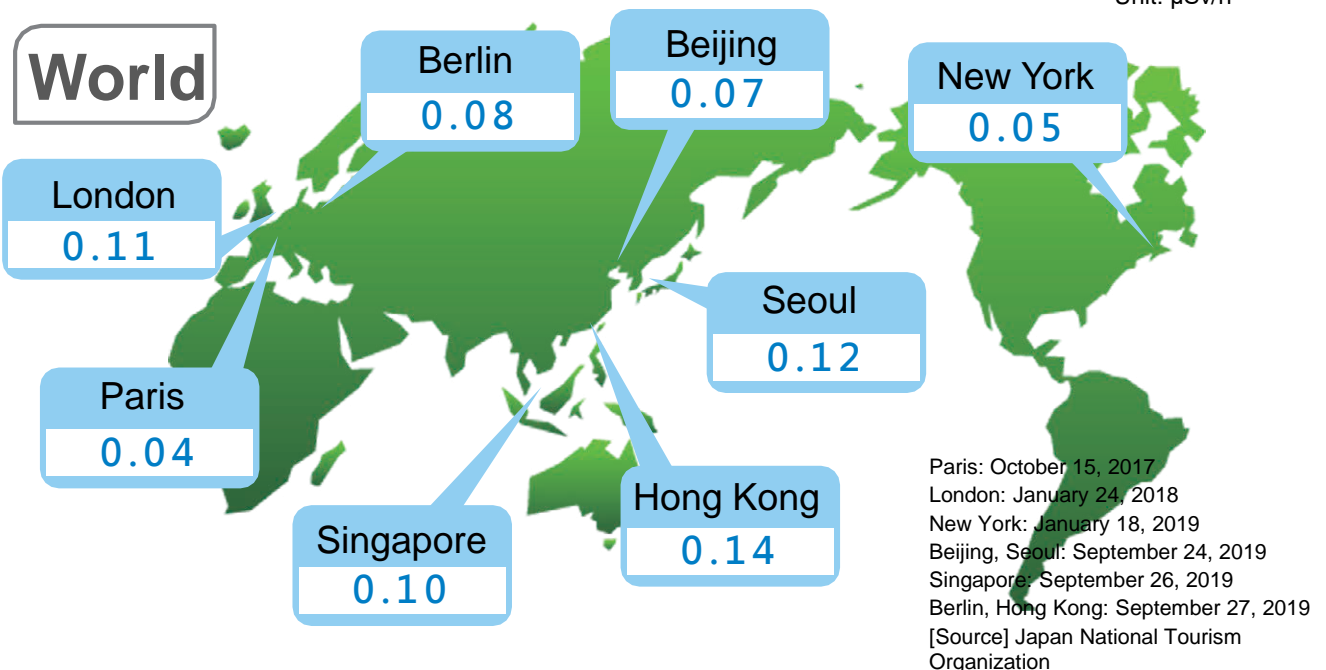


↑ The light blue lines indicate the time when it rained.
It can be seen that the rain increases the air radiation dosage rate (red line).

Comparison of Air Radiation Dosage rates in Fukushima Prefecture to major cities in the world

The air radiation dosage rate in Fukushima Prefecture (excluding the areas where evacuation was ordered) is now about the same level as that of major cities in the world.

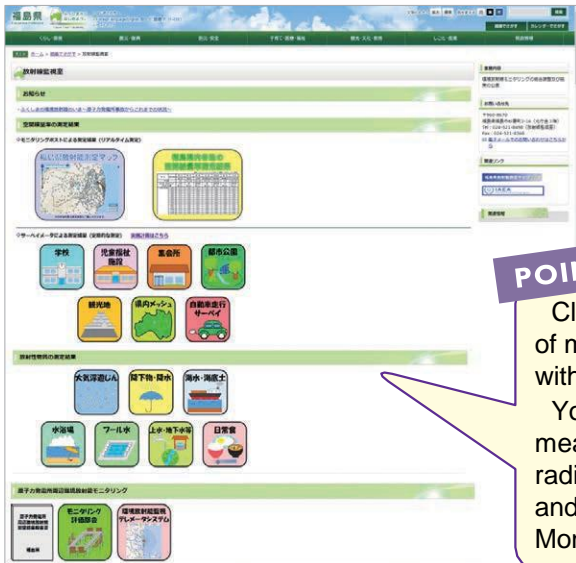
Unit: $\mu\text{Sv/h}$



Environmental radiation monitoring work was carried out all over Japan even before the nuclear accident.
 Monitoring posts are also installed all over the country.

Fukushima Prefecture website

<https://www.pref.fukushima.lg.jp/sec/16025d/>



POINT

Click the desired icon and check the results of measurement of radioactive substances with monitoring posts or survey meters.

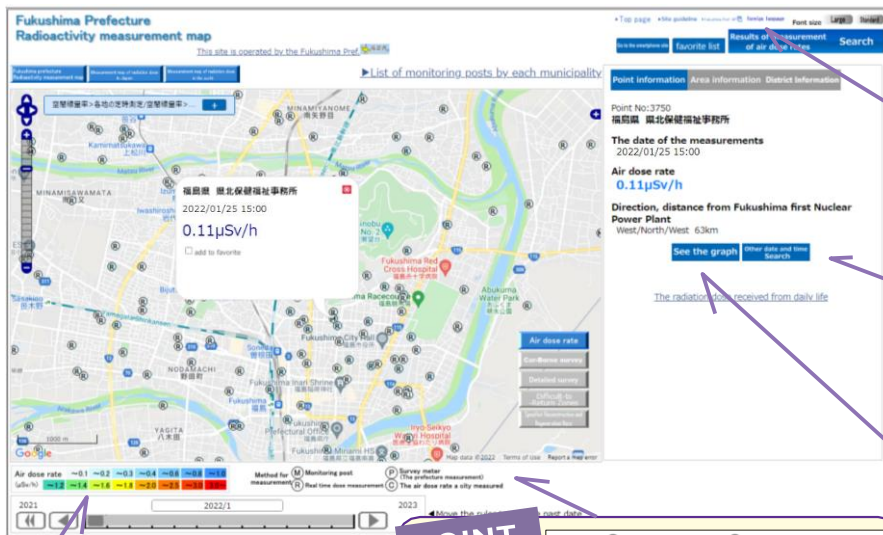
You can also see the report on the measurement results of environmental radioactivity around the nuclear power plants and the materials of the Environmental Monitoring Evaluation Subcommittee.

You can see the results of measurement by the monitoring posts and measurement of environmental samples on the “Fukushima Prefecture website” and “Fukushima Prefecture Radioactivity Measurement Map.”



Fukushima Prefecture Radioactivity Measurement Map

<http://fukushima-radioactivity.jp/pc/>



POINT

foreign language

Information is also available in English, Chinese, and Korean.

POINT

Other date and time Search

You can search for measurement results for other dates and times.

POINT

See the graph

Displays a graph of air radiation dosage rate.



POINT

The icon colors are displayed according to the air radiation dosage rate.

POINT

The icons are displayed according to the measurement method. You can check the measurement results by clicking a desired icon.

Edited and published by: Radiation Monitoring Unit, Risk Management Department, Fukushima Prefecture

2-16 Sugitsuma-cho, Fukushima City,
Fukushima Prefecture 960-8670

TEL 024-521-8498 / FAX 024-521-8368