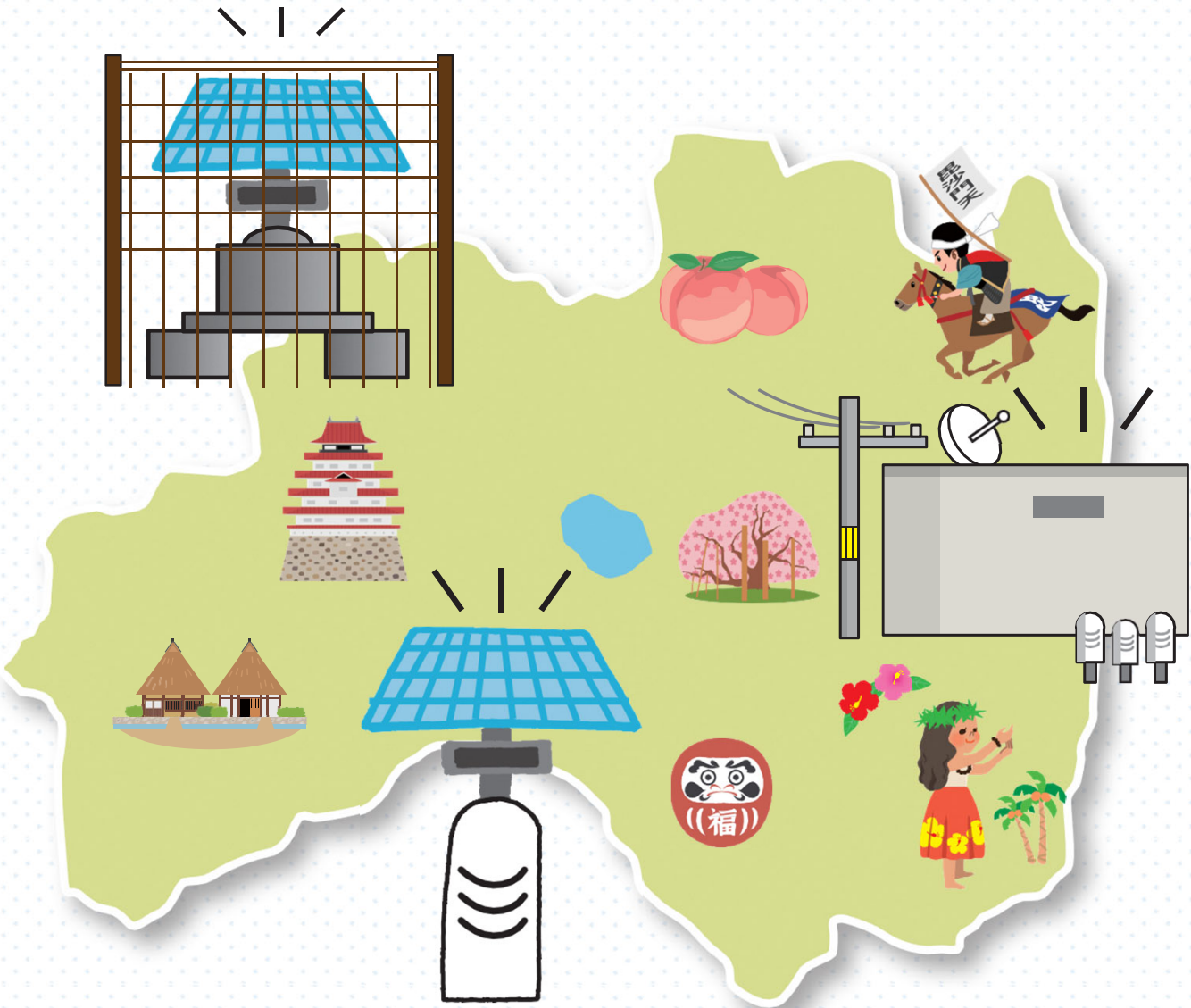


Fukushima Prefecture Newsletter on Environmental Radiation Monitoring

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 meant by radiation, radioactivity, and radioactive substances? Let's visualize them by comparing them to "bonfires."



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

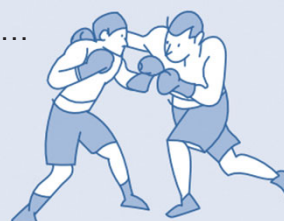
Sievert (Sv)

→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

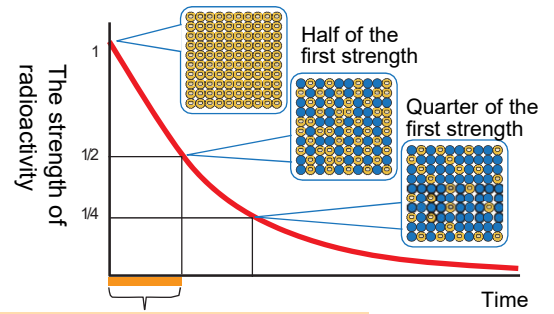
- Becquerel = The number of punches
- Gray = The power of punch
- Sievert = Body damage caused by punch



Half-life of 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."

The half-life varies depending on the type of radioactive substance, such as about eight days for iodine-131, about two years for cesium-134, and about 30 years for cesium-137.



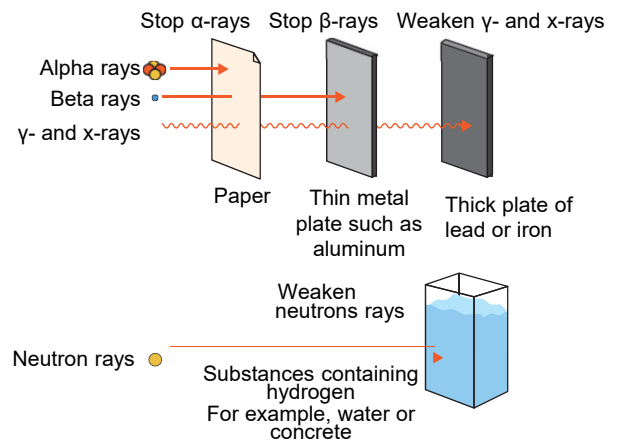
Time it takes for the amount of a radioactive substance to halve = (Physical) half-life

Created based on the "Unified Basic Material on Health Effects of Radiation (2019 Edition)" (The Ministry of the Environment)

Radiation transmission

Radiation has the power to pass through objects (penetrating power). There are various types of radiation, such as α (alpha) rays, β (beta) rays, γ (gamma) rays, X rays, and neutron rays, and the penetrating power varies depending on the type of radiation.

Alpha rays, which have the weakest penetrating power, stop at a sheet of paper, while neutron rays, which have the strongest penetrating power, are weakened by water or concrete.



Created based on the "Unified Basic Material on Health Effects of Radiation (2019 Edition)" (The Ministry of the Environment)

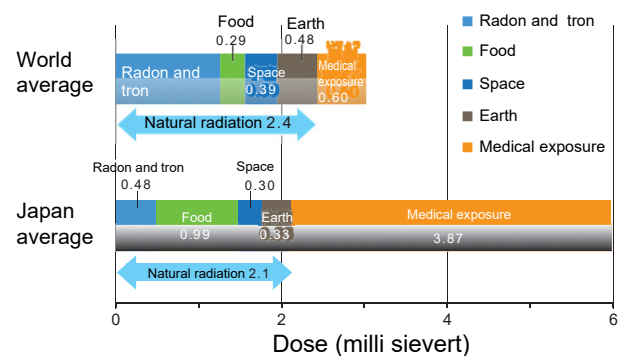
Radiation around us

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 earth, food, and so on. In Japan, people are exposed to 2.1 mSv of radiation on average annually (World average: 2.4mSv per year).

Artificial radiation refers to the radiation received from gastric X-ray examinations, CT examinations, and cancer treatments. In Japan, the proportion of medical exposure to radiation through radiological examinations is higher than that of natural radiation.

Exposure in daily life (annual)



Created based on the "Unified Basic Material on Health Effects of Radiation (2019 Edition)" (The Ministry of the Environment)



For those who want to know more

"Unified Basic Material on Health Effects of Radiation (2019 Edition)" (The Ministry of the Environment)

<https://www.env.go.jp/chemi/rhm/r1kisoshiryoy/r1kisoshiryoh.html>

Environmental radiation monitoring system 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 environmental impact of radioactive substances newly released from the nuclear power plants in the areas around them.

Prefecture-wide monitoring

Fukushima Prefecture performs monitoring in various parts of the prefecture to grasp the transition of the impact of radioactive substances released by the nuclear accident.

1 Monitoring of environmental radiation

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 environmental impact of radioactive substances newly released 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 install approximately 3,000 units in schools, nursery schools, parks, etc. in the prefecture to grasp radiation rate the air in places where many 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.

● Driving 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 Environment Creation Center 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 8

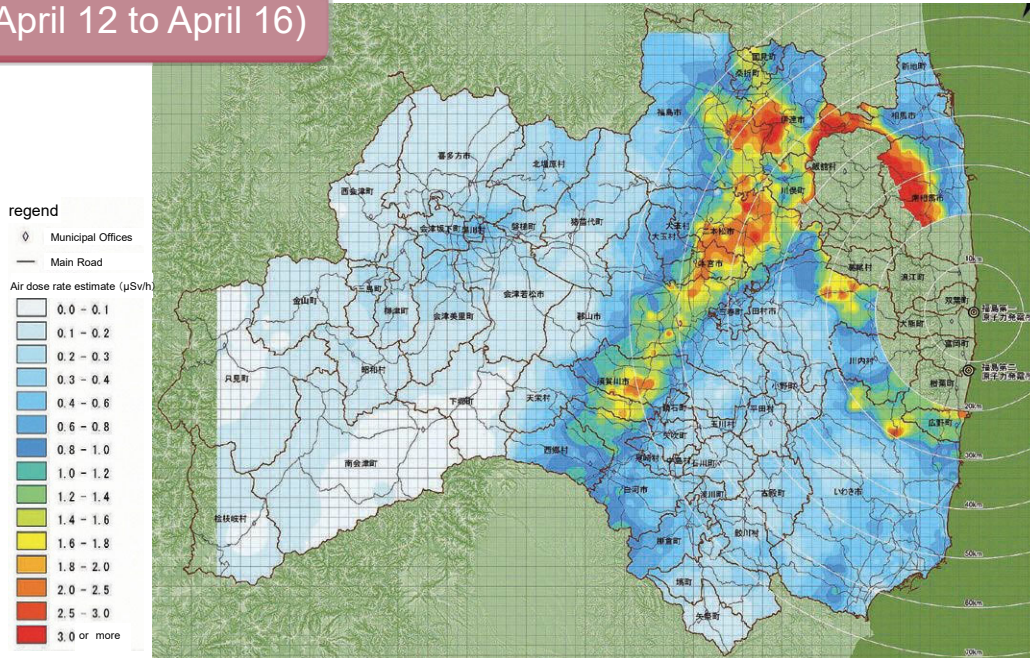
For those who want to know more

- Fukushima Prefecture "Fukushima Reconstruction Station (Reconstruction Information Portal Site)" <https://www.pref.fukushima.lg.jp/site/portal/>
- Fukushima Prefectural Center for Environmental Creation <https://www.fukushima-kankyosozo.jp/>
- "Fukushima Prefecture Environmental Radioactivity Monitoring Telemeter System" <http://www.atom-moc.pref.fukushima.jp/public/map/MapMs.html>

Changes in air radiation dosage rate in Fukushima Prefecture

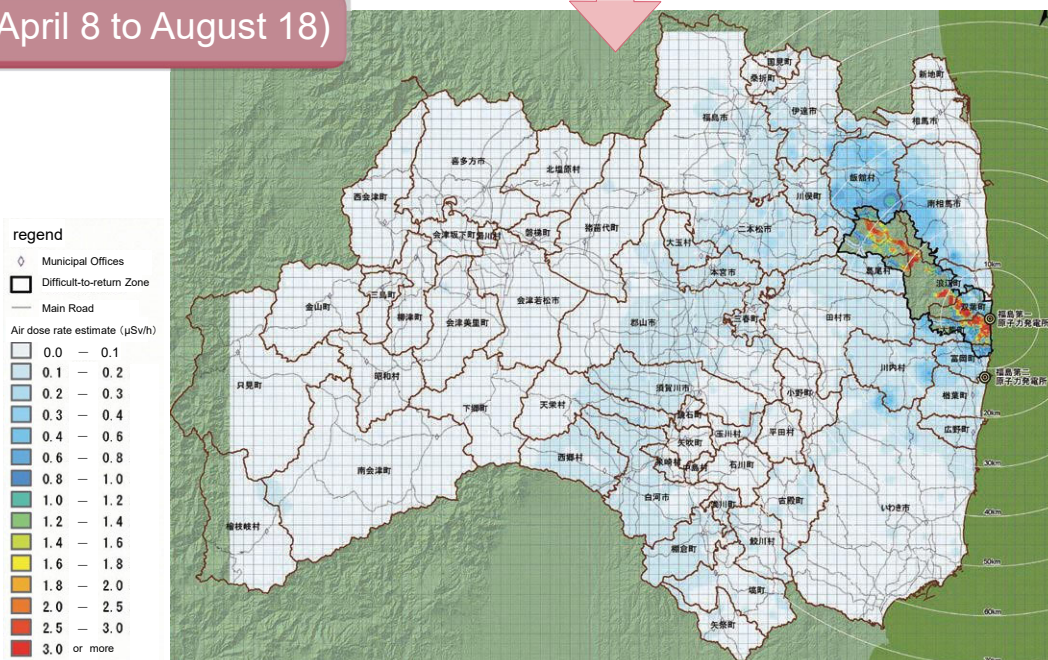
The air radiation dosage rate in Fukushima Prefecture has decreased significantly from that as of April 2011.

2011 (April 12 to April 16)



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)

2020 (April 8 to August 18)



Created based on the “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)

* The measurement results of the driving survey conducted in the difficult-to-return areas from August 24 to September 16, 2020 were added

Changes in air radiation dosage rate in Fukushima Prefecture

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 point Measurement date	Fukushima City	Koriyama City	Shirakawa City	Aizu-wakamatsu City	Minamiaizu Town	Minamisoma City	Iwaki City
Before the accident (2009)	0.04	0.04~0.06	0.04~0.05	0.04~0.05	0.02~0.04	0.05	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	0.33	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	0.08	0.06	0.04	0.08	0.07
September 2017	0.15	0.09	0.07	0.05	0.04	0.03	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

* Monthly averages are listed. However, the figures for FY2009 are those from the radiation level survey.

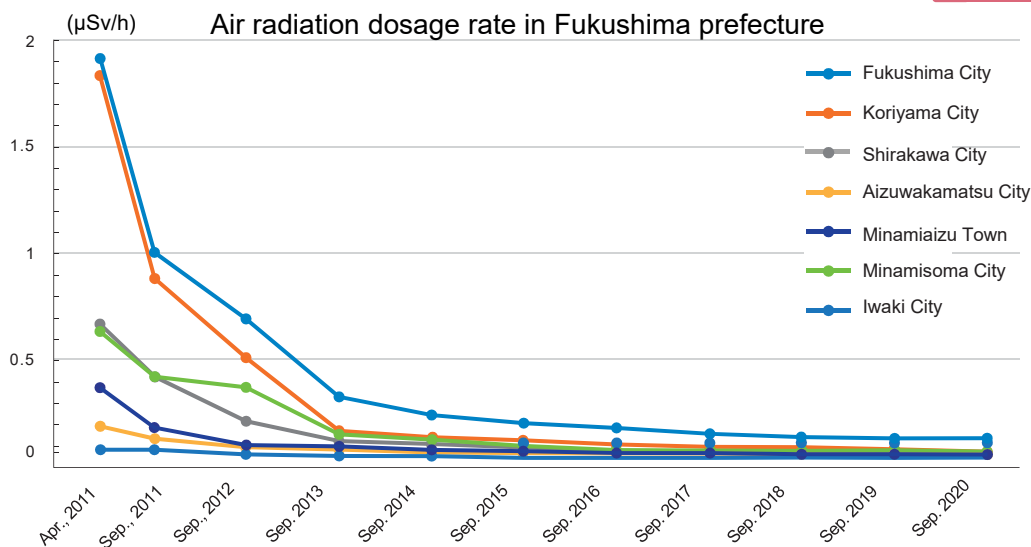
* For measurement locations (after April 2011), prefectural north health and welfare office for Fukushima City, and prefectural joint government buildings for other cities.

* Fukushima and Koriyama Cities conducted decontamination from April to May 2013.



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

Let's look at the graph



* Monthly averages are listed.

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

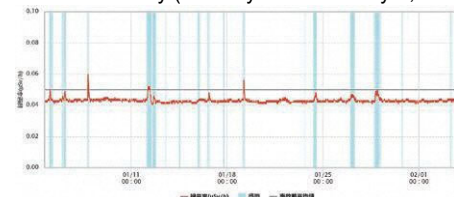
* Fukushima and Koriyama Cities conducted decontamination from April to May 2013.

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.

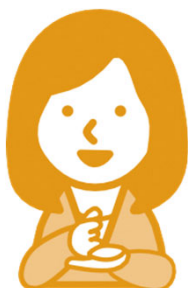
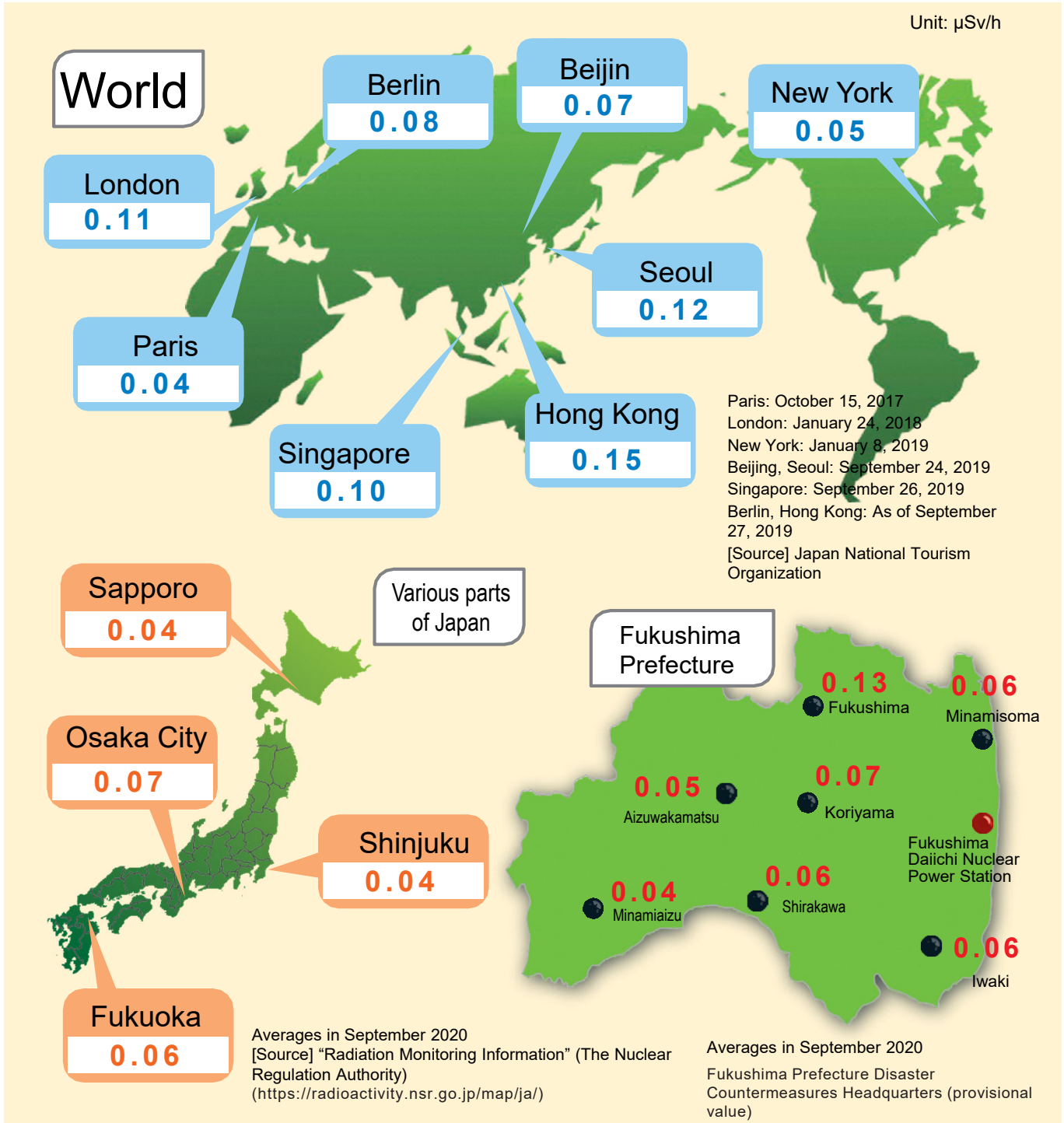
Air radiation dosage rate at Kaibama Bureau, Minamisoma City (January 4 to February 3, 2021)



↑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).

World and national air radiation dosage rates and Fukushima Prefecture

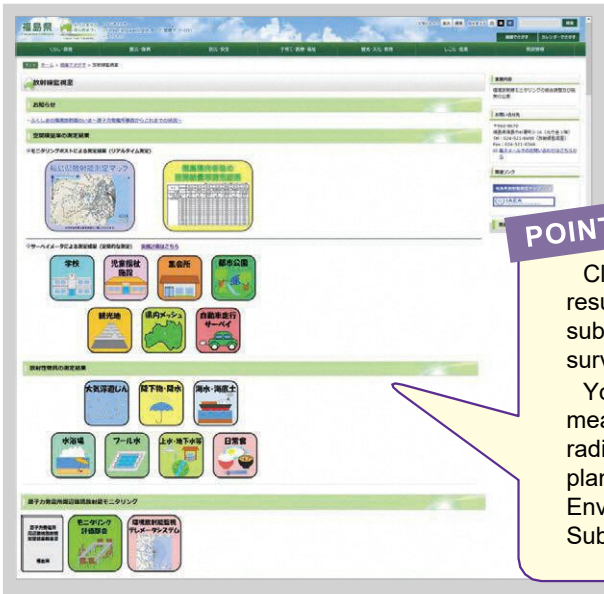
The air radiation dosage rate in Fukushima Prefecture (excluding the areas where evacuation was ordered) is now about the same level as that of major cities in the world.



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/>



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.”

POINT

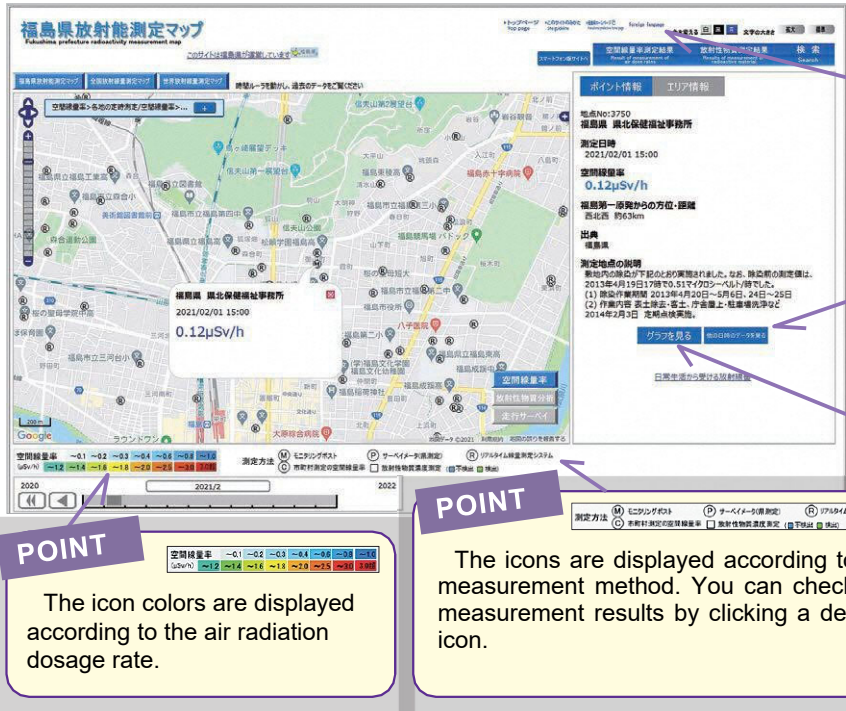
Click the desired icon and check the results of measurement of radioactive substances with monitoring posts or survey meters.

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.



Fukushima Prefecture Radioactivity Measurement Map

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



POINT

foreign language

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

POINT

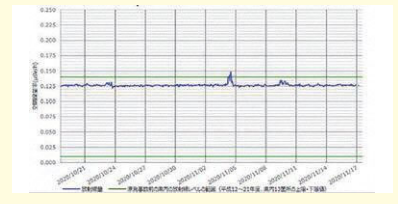
View data for other dates and times

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

POINT

View 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