Fukushima Prefecture Newsletter on Environmental Radiation Monitoring

Fukumoni

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

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

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
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.

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.

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.

※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.

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

**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.

### 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.

### 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

※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

<table>
<thead>
<tr>
<th>Measurement date</th>
<th>Fukushima City</th>
<th>Koriyama City</th>
<th>Shirakawa City</th>
<th>Aizu-wakamatsu City</th>
<th>Minamiaizu Town</th>
<th>Minamisoma City</th>
<th>Iwaki City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the accident (2009)</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td>0.05</td>
<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>April 2011</td>
<td>1.91</td>
<td>1.83</td>
<td>0.67</td>
<td>0.19</td>
<td>0.08</td>
<td>0.63</td>
<td>0.37</td>
</tr>
<tr>
<td>September 2011</td>
<td>0.69</td>
<td>0.51</td>
<td>0.21</td>
<td>0.09</td>
<td>0.06</td>
<td>0.37</td>
<td>0.10</td>
</tr>
<tr>
<td>September 2012</td>
<td>0.33</td>
<td>0.17</td>
<td>0.12</td>
<td>0.07</td>
<td>0.05</td>
<td>0.15</td>
<td>0.09</td>
</tr>
<tr>
<td>September 2013</td>
<td>0.24</td>
<td>0.14</td>
<td>0.10</td>
<td>0.07</td>
<td>0.05</td>
<td>0.12</td>
<td>0.08</td>
</tr>
<tr>
<td>September 2014</td>
<td>0.19</td>
<td>0.12</td>
<td>0.09</td>
<td>0.06</td>
<td>0.04</td>
<td>0.09</td>
<td>0.07</td>
</tr>
<tr>
<td>September 2015</td>
<td>0.18</td>
<td>0.10</td>
<td>0.08</td>
<td>0.06</td>
<td>0.04</td>
<td>0.08</td>
<td>0.07</td>
</tr>
<tr>
<td>September 2016</td>
<td>0.15</td>
<td>0.09</td>
<td>0.07</td>
<td>0.05</td>
<td>0.04</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td>September 2017</td>
<td>0.14</td>
<td>0.09</td>
<td>0.10</td>
<td>0.07</td>
<td>0.05</td>
<td>0.04</td>
<td>0.08</td>
</tr>
<tr>
<td>September 2018</td>
<td>0.13</td>
<td>0.08</td>
<td>0.07</td>
<td>0.05</td>
<td>0.04</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>September 2019</td>
<td>0.13</td>
<td>0.07</td>
<td>0.06</td>
<td>0.05</td>
<td>0.04</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>September 2020</td>
<td>0.12</td>
<td>0.07</td>
<td>0.06</td>
<td>0.05</td>
<td>0.04</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>September 2021</td>
<td>0.12</td>
<td>0.07</td>
<td>0.06</td>
<td>0.05</td>
<td>0.04</td>
<td>0.07</td>
<td>0.06</td>
</tr>
</tbody>
</table>

※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) Koriyama City: August 11, 2009 (Hayama Park)
Shirakawa City: August 11, 2009 (Shirakawa Joint Government Building) Aizu-wakamatsu City: August 19, 2009 (Aizu Tsurugajo Castle Park)
Minamiaizu Town: August 11, 2009 (Maruyama Park) Minamisoma City: August 19, 2009 (Nishiki 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.

### Let’s look at the graph

#### Air radiation dosage rate in Fukushima Prefecture

![Graph showing 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.

![Graph showing changes in air radiation dosage rate] (December 26, 2021 to January 25, 2022)
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: μSv/h

Paris: October 15, 2017
London: January 24, 2018
New York: January 18, 2019
Beijing, Seoul: September 24, 2019
Singapore: September 26, 2019
Berlin, Hong Kong: September 27, 2019

[Source] Japan National Tourism Organization

Various parts of Japan

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

Sapporo 0.04
Osaka City 0.06
Shinjuku Ward 0.04
Fukuoka City 0.06

World

London 0.11
Paris 0.04
Singapore 0.10
Hong Kong 0.14
Seoul 0.12

Fukushima Prefecture

Fukushima 0.12
Koriyama 0.07
Minamisoma 0.06
Aizuwakamatsu 0.05
Koriyama 0.07
Shirakawa 0.06
Fukushima Daiichi Nuclear Power Station
Minamisoma 0.06
Fukushima Prefecture Disaster Countermeasures Headquarters (provisional value)

Averages in September 2021

Averages in September 2021
Fukushima Prefecture Disaster Countermeasures Headquarters (provisional value)
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.”

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/

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

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

Displays a graph of air radiation dosage rate.

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

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

Published in March 2022