Part 2: Radioactive Material Monitoring in the Water Environment in and around Fukushima Prefecture (FY2018)

1 Objective and Details

1.1 Objective

This monitoring was conducted in response to the Fukushima NPS Accident for the purpose of clarifying the distribution of the accident-derived radioactive materials in the water environment.

1.2 Details

(1) Locations

The survey was conducted mainly in and around Fukushima prefecture at around 600 locations for public water areas and at around 400 locations for groundwater. Specific locations are shown in Figure 1.2-1.

(2) Targets

For public water areas (rivers, lakes, and coastal areas), water and sediment were surveyed. Additionally, radioactivity in soil in the surrounding environment (riverbeds, etc.) near the sampling locations was also surveyed as a reference.

Radioactivity in groundwater was also measured.

(3) Frequencies and periods

The monitoring for public water areas was conducted two to 10 times a year (varying by location). The monitoring for groundwater was conducted one to four times a year (varying by location).

(4) Conducted analyses

Primarily, analyses of Cs-134 and Cs-137 were conducted for the subject samples.

Additionally, analyses on Sr-89, Sr-90 and other artificial radionuclides were also conducted for some of the samples.

(5) Compilation and evaluation of results

The results of the measurement are compiled and released sequentially as preliminary reports on the Ministry of the Environment website.

This report is the compilation of the overall monitoring results, and the details of individual monitoring surveys are available on the following website.

http://www.env.go.jp/en/water/rmms/surveys.html



Figure 1.2-1 Map showing locations for Post-Earthquake Monitoring in FY2018

2 Survey Methods and Analysis Methods

2.1 Survey methods

Samples were collected at predetermined locations (for public water areas and groundwater) and the following analyses of radioactive materials were conducted.

Samples were collected based on the following guidelines in principle, as outlined below.

- Water Quality Survey Method (Sep 30, 1971; Notice Kansuikan No. 30 issued by the Director General of the Water Quality Preservation Bureau, Ministry of the Environment)
- Sediment Survey Method (Aug 8, 2012; Notice Kansuitaisuihatsu No. 120725002 issued by the Director General of the Environmental Management Bureau, Ministry of the Environment)
- Groundwater Quality Survey Method (Sep 14, 1989; Notice Kansuikan No. 189 issued by the Director General of the Water Quality Preservation Bureau, Ministry of the Environment)
- Environmental Sample Collection Method (1983, MEXT's Radioactivity Measurement Method Series)
- Sample Pretreatment for Instrumental Analysis Using Germanium Semiconductor Detectors (1982, MEXT's Radioactivity Measurement Method Series)

2.2 Analysis methods

 γ -ray spectrometry measurements using a germanium semiconductor detector were conducted for water samples and sediment samples collected from public water areas and for groundwater samples, primarily targeting Cs-134 and Cs-137.

Additionally, analyses on Sr-89, Sr-90 and other artificial radionuclides were also conducted for some of the collected samples. Detected values were indicated with basically two significant digits in the unit of "Bq/L" in the case of water samples from public water areas and groundwater samples, and in the unit of "Bq/kg (dry weight)" in the case of sediment samples from public water areas. The measurement results were corrected for attenuation, and results were reported as activity concentrations at the time sampling was completed.

Adopted analysis methods were basically in line with the MEXT's Radioactivity Measurement Method Series. Detection limits are as shown in the table below.

Radionuc	lide	Public water areas (water)	Public water areas (sediment)	Groundwater
Radioactive of (Cs-134 and 0	cesium Cs-137)	Approx. 1 Bq/L	Approx. 10 Bq/kg	Approx. 1 Bq/L
Radioactive	Sr-90	Approx. 1 Bq/L	Approx. 1 Bq/kg (0.16 to 2.9 Bq/kg)	Approx. 1 Bq/L
strontium	Sr-89	-	-	Approx. 1 Bq/L
Other artif	icial	_	_	_
radionuclide	s (*1)	-	-	-

Table 2.2-1 Target values of detection limits for radionuclides in Post-Earthquake Monitoring

*1: Varies by type of radionuclides.

3 Outlines of the Results

The results of Post-Earthquake Monitoring conducted in FY2018 are as outlined below.

3.1 Detection of radioactive cesium

Radioactive cesium (the total of Cs-134 and Cs-137, the same hereinafter) was detected as follows.

(1) Public water areas (water)

In FY2018, radioactive cesium activity concentrations were not all detectable in river water samples and coastal area water samples; from not detectable to 5.1 Bq/L in lake water samples and had a detection rate of 1.5%.

Since FY2011, all prefectures have shown decreasing trends in the detection rate for river water samples (15,000 or more total samples) and lake water samples (9,500 or more total samples). In prefectures other than Fukushima Prefecture, radioactive cesium has not been detected since FY2013 (see Figure 4.1.1-1 and Figure 4.1.1-2). In addition, no survey has detected radioactive cesium in coastal area water samples (3,900 or more total samples) since FY2011.

(2) Groundwater

Radioactive cesium was not detected in any of the groundwater samples in FY2018.

Looking at the trend from FY2011 onward, radioactive cesium was detected in two samples from Fukushima Prefecture in FY2011 (detected values were 2 Bq/L and 1 Bq/L), but has not been detected in groundwater samples (7,400 or more total samples) since FY2012.

(3) Public water areas (sediment)

1) Overall trends

In FY2018, radioactive cesium activity concentrations ranged from not detectable to 7,160 Bq/kg and with a detection rate of 83.6% in river sediment samples, from not detectable to 349,000 Bq/kg and with a detection rate of 99.1% in lake sediment samples, and from not detectable to 437 Bq/kg and at a detection rate of 76.4% in coastal area sediment samples.

Additionally, radioactive cesium activity concentrations were less than 200 Bq/kg in 3/4 or more areas in rivers and coastal areas (river: approx. 77%, coastal area: approx. 76%), and were less than 3,000 Bq/kg in 3/4 or more areas in lakes (approx. 77%) throughout the year.

2) Status by location

Because radioactive cesium was detected at many locations, its statuses in respective locations were compared. The status in respective locations were compared and relative concentration levels for detected values and their changes were statistically compiled as shown in "4.1-2 (3) Detection of radioactive materials by location."

Detected concentration levels were compiled as shown in Table 3.1-1.

Locations of Categories A and B (top 10th percentile of the whole) were observed in Hamadori District, Fukushima Prefecture as well as in Nakadori and Aizu, Fukushima Prefecture and in Ibaraki, Gunma, Chiba (all these were for rivers), and Miyagi Prefectures (for rivers and coastal areas).

Table 3.1-1 Categorization of detected concentration levels for sediment samples from public water areas (FY2018) (rivers, lakes, and coastal areas)

<Rivers>

		Range						Ν	lumber o	f location	s				
Category	Percentile (see Figure 4.1.2-7)	[River sediments]	huoto	Mixogi	I	Fukushima	a	boroki	Toobigi	Cummo	Chiha	Saitoma	Talava	Tota	l
	(See Figure 4.1.2 7)	[Bq/kg (dry)]	iwate	wiyagi	Hamadori	Nakadori	Aizu	Daraki	rocnigi	Gunna	Chiba	Sallama	ТОКУО	Number of location	Percentage
А	Upper 5th percentile	591 or more	0	0	11	0	0	1	0	0	7	0	0	19	4.8
В	Upper 5th to 10th percentile	360 - 591	0	1	4	1	1	3	0	1	9	0	0	20	5.1
С	Upper 10th to 25th percentile	114 - 360	0	8	13	11	1	10	1	0	15	0	1	60	15.2
D	Upper 25th to 50th percentile	40 - 114	1	18	12	14	4	22	8	9	11	0	0	99	25.0
Е	Lower 50th percentile	40 or less	21	16	13	18	20	17	47	38	5	2	1	198	50.0
	Tota	al	22	43	53	44	26	53	56	48	47	2	2	396	100.0

<Lakes>

		Range					Numb	per of loca	itions			
Category	Percentile (see Figure 4.1.2-7)	[Lake sediments]	Muori	I	Fukushim	а	lhorolri	Taabiai	Cummo	Chiha	Total	
	(300 Figure 4.1.2 7)	[Bq / kg (dry)]	wiyagi	Hamadori	Nakadori	Aizu	IDaraki	Tochigi	Gunma	Chiba	Number of locations	Percentage
А	Upper 5th percentile	20,468 or more	0	8	0	0	0	0	0	0	8	4.9
В	Upper 5th to 10th percentile	8,094 - 20,468	0	8	0	0	0	0	0	0	8	4.9
С	Upper 10th to 25th percentile	1,677 - 8,094	0	11	4	7	1	0	1	1	25	15.2
D	Upper 25th to 50th percentile	408 - 1,677	3	10	5	3	4	4	11	1	41	25.0
Е	Lower 50th percentile	408 or less	18	4	3	21	14	4	12	6	82	50.0
	Tot	al	21	41	12	31	19	8	24	8	164	100.0

<Coastal areas>

		Range				Numbe	r of locatio	ns		
Category	(see Figure 4.1 2-7)	[coastal area sediments]	hwate	Miyaqi	Fukushima	baraki	Chiba	Tokyo	Tota	1
	(*** · ·g** * · · · = ·)	[Bq/kg (dry)]	iwate	wiyagi	i ukushiina	Daraki	Chiba	ТОКУО	Number of location	Percentage
А	Upper 5th percentile	294 or more	0	1	1	0	0	0	2	4.8
В	Upper 5th to 10th percentile	211 - 294	0	1	1	0	0	0	2	4.8
С	Upper 10th to 25th percentile	95 - 211	0	2	2	0	0	2	6	14.3
D	Upper 25th to 50th percentile	29 - 95	0	4	5	1	0	1	11	26.2
Е	Lower 50th percentile	29 or less	2	4	6	4	5	0	21	50.0
	Tota	al	2	12	15	5	5	3	42	100.0

Changes in detected concentration levels were compiled as shown in Figure 3.1-1, which shows Table 4.1.2-48 (described later) graphically.

For rivers, the average values including past years were 100 Bq/kg or less at approximately half of the monitoring locations, while more than 90% of the other locations showed decreasing trends. For lakes, the average values including past years were 100 Bq/kg or less at approximately 10% of the monitoring locations, while approximately 30% of the other locations showed fluctuations with approximately 70% of the monitoring locations showing either decreasing or unchanged trends. For coastal areas, the average values including past years were 100 Bq/kg or less at approximately 60% of the monitoring locations with over 80% of the other locations showing decreasing trends.



(*) " \leq 100 Bq/kg" shows the average values including past years were 100 Bq/kg or less.

Figure 3.1-1 Changes in detected concentration levels of radioactive materials in sediment samples from public water areas (rivers, lakes, and coastal areas)

3.2 Detection of radionuclides other than radioactive cesium

(1) Sr-89 and Sr-90

Sr-90 was surveyed from FY2011 to FY2018 for sediment samples (approximately 880 samples in total) from public water areas (rivers, lakes, and coastal areas) and for groundwater samples (385 samples in total) (see Figure 4.2-1 for the detection of Sr-90 in sediment). Additionally, from FY2016, water samples (45 samples in FY2016 and three samples in FY2017 and FY2018) were also surveyed at those locations where relatively high concentrations of Sr-90 were detected in sediment from public areas (1.0 Bq/kg or more in FY2016 and 10 Bq/kg or more after FY2017).

The results of the FY2018 survey were as follows: for public water area sediment samples, Sr-90 concentrations ranged from not detectable to 1.1 Bq/kg and had a detection rate of 52.6% in river sediment; from not detectable to 17 Bq/kg with a detection rate of 98.5% in lakes, and not detectable in coastal areas. As for water samples, Sr-90 was not detected in any public water areas or ground water locations (detection limit: approximately 1 Bq/L for water and approximately 1 Bq/kg for sediment).

Sr-89 was not detectable in any of the monitoring surveys conducted for sediment samples from public water areas (a total of 22 samples collected from rivers and lakes in FY2011) or for groundwater samples (a total of 385 samples surveyed from FY2011 to FY2018) (detection limit: approximately 1 Bq/L for water and approximately 2 Bq/kg for sediment).

(2) Other artificial radionuclides

None have been detected since FY 2013.

4 Results

4.1 Radioactive cesium

4.1 -1 Water

(1) Public water areas

1) Rivers

Detection of radioactive cesium in river water samples is as shown in Table 4.1.1-1 and Figure 4.1.1-1.

According to the results, all prefectures have shown decreasing trends in the detection rate since FY2011. In FY2018, radioactive cesium was not detected in any locations.

Detected values (the total of Cs-134 and Cs-137) have also shown decreasing trends since FY2011 (detection limit: 1 Bq/L for both Cs-134 and Cs-137 and the same applies to lakes, coastal areas and ground water).

2) Lakes

Detection of radioactive cesium in lake water samples is as shown in Table 4.1.1-2 and Figure 4.1.1-2.

According to the results all prefectures have shown decreasing trends in the detection rate since FY2012. Radioactive cesium has not been detected in any locations other than Hamadori District, Fukushima Prefecture since FY2013.

Detected values (the total of Cs-134 and Cs-137) have also shown decreasing trends since FY2012. The measured values in FY2018 ranged from not detectable to 5.1 Bq/L.

3) Coastal areas

Detection of radioactive cesium in coastal area water samples is as shown in Table 4.1.1-3. According to the results, including past years, radioactive cesium has not been detected in any locations.

(2) Groundwater

Detection of radioactive cesium in groundwater samples is as shown in Table 4.1.1-4.

According to the results, radioactive cesium has not been detected in any locations since FY2012 including FY2018.

<Reference>

 Specification and Standards for Food, Food Additives, etc. in Accordance with the Food Sanitation Act (Drinking Water) (Ministry of Health, Labor and Welfare Public Notice No. 130, Mar 15, 2012)

Radioactive cesium (the total of Cs-134 and Cs-137): 10 Bq/kg

Target Values for Radioactive Materials in Tap Water (Management Target for Water Supply Facilities) (March 5, 2012; 0305 Notice No. 1 from the Director of the Water Supply Division, Health Service Bureau, Ministry of Health, Labor and Welfare)

Radioactive cesium (the total of Cs-134 and Cs-137): 10 Bq/kg

				FY2018			FY2	011-2018			
Prefe	ecture	Number of samples	Number of detections	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Number of detections	Detection rate (%)	R m valu	ange easure ies (B	of ed q/L)
lw:	ate	79	0	0.0	ND	560	0	0.0		ND	
Yam	agata	0	0	-	-	10	0	0.0		ND	
Miy	/agi	196	0	0.0	ND	1,490	3	0.2	ND	-	6.3
Fukus	shima	818	0	0.0	ND	6,135	<mark>5</mark> 9	1.0	ND	-	20
	Hamadori	326	0	0.0	ND	2,493	47	1.9	ND	-	20
	Nakadori	324	0	0.0	ND	2,473	12	0.5	ND	-	8.0
	Aizu	168	0	0.0	ND	1,169	0	0.0		ND	
ba	raki	212	0	0.0	ND	1,614	0	0.0		ND	
Тос	higi	278	0	0.0	ND	2,100	1	0.0	ND	-	1.0
Gur	nma	214	0	0.0	ND	1,585	0	0.0		ND	
Sait	ama	8	0	0.0	ND	58	0	0.0		ND	
Ch	iba	200	0	0.0	ND	1,484	2	0.1	ND	-	1.3
То	kyo	8	0	0.0	ND	63	0	0.0		ND	
Тс	otal	2,013	0	0.0	ND	15,099	65	0.4	ND	-	20

Table 4.1.1-.1 Detection of radioactive cesium in river water samples





Figure 4.1-1 Detection rates of radioactive cesium in river water samples (top) and changes in detected values (lower left and lower right)

			I	FY2018					FY	2011-2018			
Prefe	ecture	Number of samples	Number of detections	Detection rate (%)	R meas	ange ured v (Bq/L)	of alues	Number of samples	Number of detections	Detection rate (%)	R meas	ange (ured v (Bq/L)	of alues
Yam	agata	0	0	-		-		4	0	0.0		ND	
Miy	/agi	115	0	0.0		ND		817	1	0.1	ND	-	3.0
Fukus	shima	841	21	2.5	ND	-	5.1	5,554	248	4.5	ND	-	100
	Hamadori	367	21	5.7	ND	-	5.1	2,437	239	9.8	ND	-	100
	Nakadori	110	0	0.0		ND		790	5	0.6	ND	-	5.0
	Aizu	364	0	0.0		ND		2,327	4	0.2	ND	-	5.1
lba	raki	144	0	0.0		ND		1,029	0	0.0		ND	
Тос	higi	64	0	0.0		ND		456	0	0.0		ND	
Gur	nma	187	0	0.0		ND		1,324	1	0.1	ND	-	1.0
Ch	niba	38	0	0.0		ND		336	0	0.0		ND	
Тс	otal	1,389	21	1.5	ND	-	5.1	9 <mark>,</mark> 520	250	2.6	ND	-	100

Table 4.1.1-2 Detection of radioactive cesium in lake water samples





Figure 4.1.1-2 Detection rates of radioactive cesium in lake water samples (top) and changes in detected values (lower left and lower right)

		F	Y2018			FY2	011-2018	
Prefecture	Number of samples	Number of detections	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Number of detections	Detection rate (B/A) (%)	Range of measured values (Bq/L)
lwate	8	0	0.0	ND	61	0	0.0	ND
Miyagi	104	0	0.0	ND	812	0	0.0	ND
Fukushima	300	0	0.0	ND	2,105	0	0.0	ND
Ibaraki	40	0	0.0	ND	347	0	0.0	ND
Chiba	46	0	0.0	ND	338	0	0.0	ND
Tokyo	36	0	0.0	ND	254	0	0.0	ND
Total	534	0	0.0	ND	3,917	0	0.0	ND

Table 4.1.1-3 Detection of radioactive cesium in coastal area water samples

Table 4.1.1-4 Detection of radioactive cesium in groundwater samples

			FY2018			FY2	2011-2018			
Prefecture	Number of samples	Number of detections	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Number of detections	Detection rate (%)	R meas	ange o ured v (Bq/L)	of alues
lwate	22	0	0.0	ND	240	0	0.0		ND	
Miyagi	24	0	0.0	ND	289	0	0.0		ND	
Yamagata	0	0	-	-	79	0	0.0		ND	
Fukushima	770	0	0.0	ND	5,709	2	0.0	ND	-	2.0
Ibaraki	27	0	0.0	ND	332	0	0.0		ND	
Tochigi	27	0	0.0	ND	319	0	0.0		ND	
Gunma	21	0	0.0	ND	227	0	0.0		ND	
Chiba	23	0	0.0	ND	261	0	0.0		ND	
Total	914	0	0.0	ND	7,456	2	0.0	ND	-	2.0

(*) Detected in FY2011. Both Cs-134 and Cs-137 were detected at one site, and only Cs-137 was detected at another site, at a level of 1 Bq/L (detection limit: 1 Bq/L) (see the main text).

4.1-2 Sediment

Detection of radioactive cesium in sediment samples from public water areas (rivers, lakes, and coastal areas) is as outlined below.

(1) Detection status

1) Rivers

Radioactive cesium detected in river sediment samples is as shown in Table 4.1.2-1 and Figure 4.1.2-1.

According to the results, including past years, the detection rate has ranged between 37.5 and 100% and has been slightly decreasing over time in many prefectures.

On the other hand, as for detected values (the total of Cs-134 and Cs-137) shown in Figure 4.1.2-1, the number of locations with high concentration levels has decreased while the number of locations with low concentration levels has increased. When the detected values for FY2018 were observed by the concentration category, radioactive cesium was not detectable at 37 locations (approx. 9%), less than 100 Bq/kg at 207 locations (approx. 52%) and 100 to less than 200 Bq/kg at 61 locations (approx. 15%). The locations where their detected values were less than 200 Bq/kg accounted for approximately 77% of the total surveyed locations.

2) Lakes

Detection of radioactive cesium in lake sediment samples is as shown in Table 4.1.2-2 and Figure 4.1.2-2.

According to the results, including past years, the detection rate has ranged between 83.3 and 100%. In FY2018, detection rates of 90% or more were still observed in all prefectures.

Detected values (the total of Cs-134 and Cs-137) have increased at locations with lower concentrations, however, this trend is relatively moderate compared to those in rivers or coastal areas. The areas with higher concentrations still exist in many locations as in Hamadori District, Fukushima Prefecture where radioactive cesium was still detected at concentrations of 100,000 Bq/kg or more in FY2018. When the detected values for FY2018 are observed by the concentration category, radioactive cesium was not detectable at one location, less than 100 Bq/kg at 17 locations (approx. 10%), 100 to less than 1,000 Bq/kg at 81 locations (approx. 49%), and 1,000 to less than 3,000 Bq/kg at 30 locations (approx. 18%). The locations where their detected values were less than 3,000 Bq/kg accounted for approximately 79% of the total surveyed locations.

Coastal areas

Detection of radioactive cesium in coastal area sediment samples is as shown in Table 4.1.2-3 and Figure 4.1.2-3.

According to the results, including past years, the detection rate ranged between 25.0 and 100% except for Iwate Prefecture where only a small number of samples were collected.

Coastal area locations showed lower detected values (the total of Cs-134 and Cs-137) than those in rivers or lakes. Radioactive cesium was not detected with a value of 1,000 Bq/kg or more in any prefectures since FY2016. When the detected values for FY2018 are observed by the concentration category, radioactive cesium was not detectable at 10 locations (approx. 24%), less than 100 Bq/kg at 16 locations (approx. 38%), and 100 to less than 200 Bq/kg at six locations (approx. 14%). The locations where their detected values were less than 200 Bq/kg accounted for approximately 76% of the total surveyed locations.

			F Y201 8				FY2011	1-2018	
Prefecture	Number of samples	Number of detections	Detection rate (%)	Range of measure values (Bq/kg)	d Number of samples	Number of detections	Detection rate (%)	Range of measured values (Bq/kg)	Range of detection rate (%)
wate	79	59	74.7	ND - 5	9 560	466	83.2	ND - 1,040	74.7 - 100.0
Yamagata	0	0	-	-	10	6	60.0	ND - 132	60.0 - 60.0
Miyagi	196	178	90.8	ND - 68	5 1,483	1,368	92.2	ND - 11,100	87.7 - 98.2
Fukushima	818	737	90.1	ND - 7,16	6,126	5,685	<mark>92.8</mark>	ND - 165,000	90.1 - 95.5
Hamadori	326	314	96.3	ND - 7,16) 2,515	2,466	98.1	ND - 165,000	96.3 - 99.5
Nakadori	324	314	96.9	ND - 82	2 2,466	2,417	98.0	ND - 30,000	95.4 - 100.0
Aizu	168	109	64.9	ND - 71	5 1,145	802	70.0	ND - 25,000	63.9 - 80.3
baraki	212	199	93.9	ND - 1,41) 1,614	1,554	96.3	ND - 5,800	93.9 - 98.6
Tochigi	278	182	65.5	ND - 25	2,096	1,668	79.6	ND - 4,900	65.5 - 97.1
Gunma	214	120	56.1	ND - 72	5 1,578	1,177	74.6	ND - 2,160	56.1 - 87.2
Saitama	8	3	37.5	ND - 2	5 <mark>58</mark>	40	69.0	ND - 540	37.5 - 100.0
Chiba	200	198	99.0	ND - 1,96) 1,482	1,475	99.5	ND - 20,200	99.0 - 100.0
Tokyo	8	7	87.5	ND - 14	6 <mark>6</mark> 2	61	98.4	ND - 700	87.5 - 100.0
Total	2,013	1,683	83.6	ND - 7,16	15,069	13,500	89.6	ND - 165,000	37.5 - 100.0

Table 4.1.2-1 Detection of radioactive cesium in river sediment samples



*Number of locations for each category at the maximum concentration values for FY2018;

ND: 37 locations (approx. 9%), 10 to less than 100 Bq/kg: 207 locations (approx. 52%), and 100 to less than 200 Bq/kg: 61 locations (approx. 15%)

Figure 4.1.2-1 Detection of radioactive cesium in river sediment samples (changes)

			FY2018					FY.	2011-20	18	_		
Prefecture	Number of samples	Number of detections	Detection rate (%)	Range o value	of measured s (Bq/kg)	Number of samples	Number of detections	Detection rate (%)	Range (value	of measured es (Bq/kg)	Ra detecti	ange on r	e of ate (%)
Yamagata	0	0	-		-	2	2	100.0	34	- 470	1	100	.0
Miyagi	74	73	98.6	ND	- 1,980	532	523	98.3	ND	- 9,700	94.5	-	100.0
Fukushima	538	531	98.7	ND	- 349,000	3,610	3,570	98.9	ND	- 920,000	95.9	-	99.6
Hamadori	259	258	99.6	ND	- 349,000	1,782	1,780	99.9	ND	- 920,000	99.6	-	100.0
Nakadori	76	76	100.0	11	- 5,460	545	542	99.4	ND	- 35,000	97.4	-	100.0
Aizu	203	197	97.0	ND	- 7,610	1,283	1,248	97.3	ND	- 15,400	88.4	-	98.9
baraki	76	76	100.0	26	- 2,190	525	523	99.6	ND	- 5,400	98.7	-	100.0
Tochigi	32	32	100.0	38	- 1,079	228	226	99.1	ND	- 8,700	83.3	-	100.0
Gunma	96	96	100.0	18	- 2,850	670	666	99.4	ND	- 5,100	84.6	-	100.0
Chiba	32	32	100.0	121	- 2,400	240	240	100.0	66	- 8,200	1	100	.0
Total	848	840	99.1	ND	- 349,000	5,807	5,750	99.0	ND	- 920,000	83.3	-	100.0

Table 4.1.2-2 Detection of radioactive cesium in lake sediment samples



Yamagata Prefecture, where only a small number of samples were collected, was omitted.

*Number of locations for each category at the maximum concentration values for FY2018;

ND: one location, 10 to less than 100 Bq/kg: 17 locations (approx. 10%), 100 to less than 1,000 Bq/kg: 81 locations (approx. 49%), and 1,000 to less than 3,000 Bq/kg: 30 locations (approx. 18%)

Figure 4.1.2-2 Detection of radioactive cesium in lake sediment samples (changes)

			FY2018				-	FY	2011-201	8			
Prefecture	Number of samples	Number of detections	Detection rate (%)	Range o value	f measure s (Bq/kg)	d Number of samples	Number of detections	Detection rate (%)	Range o value	of measured s (Bq/kg)	Ra detectio	nge on r	⊧of ate (%)
lwate	4	2	50.0	ND	- 32	31	12	38.7	ND	- 46	0.0	-	50.0
Miyagi	52	42	80.8	ND	- 418	411	321	78.1	ND	- 2,040	65.4	-	92.2
Fukushima	150	129	86.0	ND	- 437	1,077	993	92.2	ND	- 2,950	86.0	-	96.7
Ibaraki	20	5	25.0	ND	- 170	179	93	52.0	ND	- 230	25.0	-	96.4
Chiba	23	8	34.8	ND	- 37	169	88	52.1	ND	- 315	34.8	-	64.5
Tokyo	18	18	100.0	61	- 232	127	124	97.6	ND	- 780	89.5	-	100.0
Total	267	204	76.4	ND	- 437	1,994	1,631	81.8	ND	- 2,950	0.0	-	100.0

Table 4.1.2-3 Detection of radioactive cesium in coastal area sediment samples



* Number of locations for each category at the maximum concentration values for FY2018;

ND: 10 locations (approx. 24%), 10 to less than 100 Bq/kg: 16 locations (approx. 38%) and 100 to less than 200 Bq/kg: six locations (approx. 14%)

Figure 4.1.2-3 Detection of radioactive cesium in coastal area sediment samples (Changes)

(2) Changes in concentration levels

Changes in overall concentration levels were evaluated based on the following method shown below by using data obtained at locations where continuous monitoring has been conducted.

 Obtain the average value for each location where continuous monitoring has been conducted in order to evaluate changes in overall concentration levels of radioactive cesium each fiscal year (arithmetic average calculated by assuming ND to be zero; hereinafter referred to as the "average for each location").

The analyzation of data from FY2011 was excluded, concerning a small number of samples and locations collected compared to those in other years.

- Arrange all such averages for each location (separately for samples from rivers, lakes, and coastal areas) for each fiscal year in descending order and set the following five categories depending on upper percentile ranges.
 - · Upper 5th percentile of the entirety
 - Upper 10th percentile of the entirety
 - · Upper 25th percentile of the entirety
 - Upper 50th percentile of the entirety
 - Upper 75th percentile of the entirety

(Incidentally, a correlation between the average for each location and the maximum value by fiscal year revealed a good correlation. Therefore, considering that the evaluation of the average for each location covers that of large detected values (maximum values) that emerge occasionally, the evaluation was conducted by using only the average for each location.)

1) Rivers

Interannual changes in the percentile values of the averages for each location in river sediment samples are as shown in Figure 4.1.2-4.

Since FY2012, all percentile values have been on a decreasing trend, and in FY2018, they had declined to a level of about 20% of FY2012.



In FY2018, 95% of the total (locations no more than the upper 5th percentile) was less than 1,000 Bq/kg.

Figure 4.1.2-4 Interannual changes in the percentile values of the averages for each location in river sediment samples

2) Lakes

Interannual changes in the percentile values of the averages for each location in lake sediment samples are as shown in Figure 4.1.2-5.

Since FY2012, most of the percentile values have been on a decreasing trend, and in FY2018, they had declined to the level of about half of Y2012.

In FY2018, 90% of the total (locations no more than the top 10th percentile) was less than about 8,000 Bq/kg,

and 75% of the total (locations no more than the upper 25th percentile) was less than 2,000 Bq/kg.



Figure 4.1.2-5 Interannual changes in the percentile values of the averages for each location in lake sediment samples

3) Coastal areas

Interannual changes in the percentile values of the averages for each location in coastal area sediment samples are as shown in Figure 4.1.2-6.

Since FY2012, the percentile values have generally been decreasing with some variations. In FY2018, they declined to about half of those in FY2012 (In coastal areas, the concentration levels were relatively lower than those in rivers or lakes, and the number of survey locations was very small. Therefore, the percentile values showed variations. Of these, the increase in the 25th percentile from FY2012 to FY2013 was due to the addition of three survey locations with relatively high concentration. Another partial increase of percentile values in FY2015 was considered to be affected by the torrential rainfall in the Kanto and Tohoku regions in September 2015. This increase was a transient trend and the percentile values have continuously seen decreasing trends since FY2016 as they used to be previously.

In FY2018, 95% of the total (locations no more than the upper 5th percentile) declined to approximately 300 Bq/kg.





(3) Detection of radioactive materials in sediment by location

1) Evaluation policy

Circumstances where radioactive materials were detected were compiled in further detail by sampling location, while separately considering the property such as rivers, lakes and coastal areas.

Circumstances for each location were statistically analyzed from the following two perspectives by using all available data for each location. Locations where the survey was completed in a single fiscal year (including Yamagata Prefecture) and where the survey has not been conducted since FY2013, were excluded from the evaluation.

i) Relative detected concentration levels

- i. Obtain the average value for each location in FY2018 by using all survey results concerning concentrations of radioactive cesium (the total of Cs-134 and Cs-137) (arithmetic average calculated by assuming ND to be zero).
- ii. Arrange all such averages for each location (separately for samples from rivers, lakes, and coastal areas) in descending order and set the following five categories depending on upper percentile ranges (see Figure 4.1.2-7).
 - Category A: Upper 5th percentile of the entirety
 - Category B: Upper 5th to 10th percentile of the entirety
 - Category C: Upper 10th to 25th percentile of the entirety
 - Category D: Upper 25th to 50th percentile of the entirety
 - Category E: Upper 50th to 100th percentile of the entirety (lower 50th percentile)

(Incidentally, a comparison between the average and the maximum value for each location in FY2018 revealed a good correlation (see lower right of Figure 4.1.2-7). Therefore, considering that the evaluation of the average for each location covers that of large detected values (maximum values) that emerge occasionally, the evaluation was conducted by using only the average for each location.)

ii) Changes in detected values

- i. Changes in detected values were categorized based on the following policy in order to evaluate their changes over the years. In addition, locations with average values of 100 Bq/kg or less, including those in past years, were excluded from evaluation on changes assuming they had no significant changes.
 - (i) Based on graphs showing changes in detected values of each location over the years, those negatively sloped are categorized as "decreasing" and those positively sloped are categorized as "increasing" respectively by visual estimation.
 - (ii) When visual estimation is difficult, a regression analysis is conducted to check the trend. Specifically, when the lower and upper 95% of the slope are both negative, it is judged as "decreasing," and when the lower and upper 95% of the slope are both positive, it is judged as "increasing."
 - (iii) When increasing or decreasing tendencies are unclear (either the lower or upper limit of 95% of the

slope is negative or the other is positive), a coefficient of variation of 0.5 is used as a reference. When the coefficient of variation is less than 0.5, it is judged as "unchanged," and when the coefficient of variation is 0.5 or higher, it is judged as "fluctuations."

ii. However, data may show fluctuations, depending on minor differences in sampling locations or properties of the samples, and it is considered to be too early to make judgments on changes in detected values at this point in time. Even if a certain location is categorized as an "increasing trend" based on the above-mentioned policy, whether or not the trend is increasing in a particular location requires further continuous collection of data in order to make an informed judgment.



Figure 4.1.2-7 Categories based on the average for each location (left: picture showing means of categorization; upper right: results of categorization¹¹; lower right: correlation between average and maximum value for each location) *1: Locations where the maximum value on the horizontal axis is exceeded are not shown.

¹¹ Method of setting categorization boundary value: The boundary value of adjacent categories is the average value of the minimum value of the upper categorization and the maximum value of the lower categorization.

- Concentration levels in sediment samples from rivers, lakes, and coastal areas and their changes by prefecture
- 2)-1 Rivers
- i) Iwate Prefecture

In Iwate Prefecture, surveys were conducted 15 to 29 times from December 2011 to February 2019 for river sediment samples collected at 22 locations (this analysis excludes the survey results from one location where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized as Category D and 21 locations were categorized as Category E (see Table 4.1.2-4 and Table 4.1.2-5).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 80% (17 locations), while decreasing at all five remaining locations.

Table 4.1.2-4 Categorization of detected values at respective locations (Iwate Prefecture: river sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	0	(None)
D	Upper 25th to 50th percentile	1	No.22
E	Lower than upper 25th to 50th percentile (lower 50%)	21	No.1, No.2, No.3, No.4, No.5, No.6,No.7, No.8, No.9, No.10, No.11, No.12, No.13, No.14, No.15, No.16, No.17, No.18, No.19, No.20, No.21



Figure 4.1.2-8 Changes in concentration levels over the years at respective locations (Iwate Prefecture: river sediment)

		L	ocation			FY2018		FY.	2011 - FY2	018		Coefficient	
No.		Water area	Loca ion	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	of variation	(*3)
1	Sa	akai River Lower Reaches	Sano Bridge	Ofunato City	0	12	6.0	0	176	35	\sim	1.39	
2		Kesen River	Aneha Bridge	Rikuzentakada City	0	0	0	0	143	23		1.58	
3		Okawa River	Prefectural border with Miyagi	Ichinoseki City	25	45	32	23	990	118	h	1.58	/
4	T	suyagawa River	Chiyogahara Bridge	Ichinoseki City	19	41	30	19	520	113	L	1.05	/
5		Kurosawa River	Kawarada Bridge	Kanegasaki Town	18	24	21	17	99	43	N	0.65	
6		Isowo Divor	Oago Bridge	Oshu City	0	0	0	0	27	3.0	M	2.38	
7		ISawa Rivel	Saijin Bridge	Oshu City	0	0	0	0	14	0.6	_Λ	4.90	
8		Kitakami River	Fuji Bridge	Oshu City	0	16	7.8	0	210	26	h	1.62	
9		Shiratori River	Shiratori Bridge	Oshu City	15	28	23	15	215	62	×	0.80	
10		Koromo River	Koromogawa Bridge	Hiraizumi Town	26	39	31	24	570	90	2	1.28	
11		Ota River	Hitosuji Bridge	Hiraizumi Town	25	35	31	20	770	92		1.70	
12	/stem	lwai River Middle Reaches	Kamino Bridge	Ichinoseki City	20	36	26	20	370	60		1.20	
13	ver S)	lwai River Lower Reaches	Kozenji Bridge	Ichinoseki City	19	37	26	12	326	61	Μ	1.34	
14	ami Ri	Kitakami River	Chitose Bridge (Kozenji)	Ichinoseki City	0	53	22	0	294	57	when	1.21	
15	Kitak	Sokei River	Unada Bridge	Ichinoseki City	0	25	16	0	640	77	J.	1.79	
16		Sarusawa River	Kannon Bridge	Ichinoseki City	23	49	40	23	1,040	128	λ	1.64	\mathbb{Z}
17		Satatsu River	Oide Bridge	Ichinoseki City	0	21	11	0	149	23	hum	1.26	
18		Saletsu Mer	Kanzaki Bridge	Ichinoseki City	0	40	20	0	330	39	5	1.93	
19		Senmaya River Upper Reaches	Miyata Bridge	Ichinoseki City	31	49	40	18	380	101	~~~	0.96	/
20		Kitakami River	Kitakamigawa Bridge	Ichinoseki City	0	17	7.3	0	85	23	M	1.11	
21		Kinomi River	Higuchi Bridge	Ichinoseki City	0	18	7.8	0	980	80	4	2.37	
22		Kinryu River	Tenjin Bridge	Ichinoseki City	34	59	46	34	400	110	M	0.92	/
1	Fota 9	I number of samples	559		0	59	21	0	1,040	64		<i></i>	ocreasing
Nur	nbe	r of detections	465]	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)							>> :D ∧\\¶ :F ~~▲ :U :≦	ecreasing luctuations Inchanged ≦ 100 Bq/kg
						5			-				

Table 4.1.2-5 Detection of radioactive cesium at respective locations

(Iwate Prefecture: river sediment)

ii) Miyagi Prefecture

In Miyagi Prefecture, surveys were conducted 28 to 73 times from October 2011 to February 2019 for river sediment samples collected at 43 locations (this analysis excludes the survey results from 38 locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized as Category B, eight locations as Category C, 18 locations as Category D, and 16 locations as Category E (see Table 4.1.2-6 and Table 4.1.2-7).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 40% (19 locations), while decreasing at 21 locations and fluctuations at three locations.

Table 4.1.2-6 Categorization of detected values at respective locations (Miyagi Prefecture: river sediment)

Category	Percentile (percentile in all detected values)	Number of loca ions	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	1	No.42
С	Upper 10th to 25th percentile	8	No.5, No.14, No.23, No.24, No.31, No.32, No.41, No.43
D	Upper 25th to 50th percentile	18	No.1, No.2, No.4, No.6, No.7, No.8, No.9, No.17, No.18, No.20, No.21, No.27, No.28, No.33, No.34,No.36, No.37, No.39
Е	Lower than upper 25th to 50th percentile (lower 50%)	16	No.3, No.10, No.11, No.12, No.13, No.15, No.16, No.19, No.22, No.25, No.26, No.29, No.30, No.35, No.38, No.40



Notes: For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

Figure 4.1.2-9 Changes in concentration levels over the years at respective locations (Miyagi Prefecture: river sediment)

				Location		FY2018			F	Y2011 - 20	18		Coefficient	Tart
No.		V	Vater area	Location	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	of variation	(*3)
1		0	hishiori River	Kinzan Bridge		51	57	54	36	211	84	m	0.52	
2				Namiita Bridge		53	74	65	28	1,220	209	L	1.15	1
3				Tateyama-ohashi Bridge	Kesennuma City	16	24	20	16	750	67	L	1.97	—
4		C)kawa River	Kamiyama Bridge	Resemuna Oky	22	94	42	22	990	197	han	1.26	1
5				Okawa River Estuary		184	291	228	0	1,660	137	Λ	2.26	\sim
6		0	mose River	Ozaki Bridge		29	97	72	29	2,500	345	L	1.66	1
7			Arima River	Unanda Bridge		79	94	88	28	1,000	225	h	0.99	1
8			Kinryu River	Obata Bridge		51	95	78	51	1,190	244	han	1.00	1
9			Kitakami River	Tome-ohashi Bridge (Tome)		28	93	47	17	199	74	m	0.65	
10			Sanhasama River	Doman Bridge (Kurikoma Dam)	Kurihara City	11	12	12	0	260	35	A	1.44	
11		8 8	Nihasama River	Kajiya Bridge		25	32	29	0	750	131	L	1.37	1
12	-	asam ver An		Hanayama Dam, inflow area		0	17	4.3	0	135	12	1	2.32	
13	ami ysten	Ξ	Hasama River	Wakayanagi		22	27	26	22	670	88	1	1.58	—
14	Kital iver S			Yamayoshida Bridge	Tome City	25	299	131	25	1,730	298	hum	1.24	1
15	R		C-1 Direct	Todoroki Bridge (Todoroki)		17	35	25	0	970	98	Λ	1.99	—
16		vea	Eal River	Shimizu Komon Lock	Osaki City	0	0	0	0	330	29	Δ	2.25	—
17		tiver /	In Furukawa District,Osaki City	Shinborisaihon, entrance		100	132	110	88	2,700	449	A	1.21	1
18		EaiR	Dekigawa River	Kogota Bridge	Misato Town	53	144	89	49	930	222	him	0.86	1
19			Eai River	Oikawa Bridge (Tandai)	Wakuya Town / Ishinomaki Town	0	18	10	0	260	40	here	1.36	—
20		k	(yu-Kitakami River	Kadonowaki	Ishinomaki City	53	110	77	0	240	87	1 Mm	0.79	—
21		N	aruse River	Onobashi Bridge (Ono)	Higashi-Matsushima City	17	66	44	0	153	48	mm	0.68	—
22				Tagajozeki Weir		22	49	36	20	1,530	243	M	1.62	$\overline{}$
23		Su	inaoshi River	Nenbutsu Bridge	Tagajo City	150	187	162	17	2,900	336	L	1.56	
24		Teiz Kvu-	an-unga Canal sunaoshi River)	Teizan Bridge	Shiogama City / Shichigahama Town / Tagaio City	160	180	175	95	2,280	453	1hrm	0.99	
25				Nanakita Bridge		18	39	29	0	450	98	M.	1.20	
26	ikita ystem		Nanakita River	Fukuda-ohashi Bridge	1	0	11	2.8	0	60	10	M_	1.56	—
27	Nana ver S		Umeda River	Fukuda Bridge	Sendai City	36	88	56	36	1,350	189	W	1.49	
28	8		Nanakita River	Takasago Bridge		42	55	51	0	11,100	502	1	4.00	
29			Natori River	Yuriage-ohashi Bridge	Sendai City / Natori City	14	51	34	0	610	64	N	2.16	—
30	River em			Yakushi Bridge		0	25	15	0	220	35	Λ	1.11	—
31	Vatori Syst		Masuda River	Koyama Bridge	Natori City	100	230	187	0	5,200	355		2.63	>
32	-			Bishamon Bridge		235	336	278	235	3,700	898	A.	0.88	/
33				Hadeniwa Bridge	Marumori Town	50	184	103	50	1,120	247	hermohrm	0.71	1
34			Abukuma River	Marumori Bridge	Marumori Town	29	84	45	27	3,400	315	Manuan	1.56	1
35				Higashine Bridge	Kakuda City	20	43	31	20	301	84	hour	0.81	—
36			Shiroishi River	Before the confluence with Kawaragosawa River (Sunaoshi Bridge)	Shiroishi City	40	60	47	30	1,730	162	L	1.93	1
37	em em	.j. 88	Saikawa River	Etsubo Bridge	Shiroishi City	72	131	106	45	590	166	m	0.79	1
38	ukum r Syst	hiroist ar Aar	Matsukawa River	Miya-ohashi Bridge	Zao Town	0	16	4.0	0	119	22	hann	1.18	—
39	Rive	N N	Arakawa River	Niragami Bridge	Murata Town / Ogawara Town	0	168	45	0	222	42	mm	1.31	—
40			Shiroishi River	Shirahata Bridge	Shibata Town	0	24	16	0	68	25	Minor	0.72	—
41				Tsukinoki-ohashi Bridge	Kakuda City / Shibata Town	89	200	151	24	2,470	247	Laura	1.52	~
42			Abukuma River	ukuma River Abukuma-ohashi Bridge (Iwanuma) Iwanuma City / Watari Tow		326	686	485	0	1,860	314	Mandlarm	1.21	NM•
43		Abukuma River Estuary (Watariohashi Bridge)		28	369	122	21	2,450	258	-hen.	1.76	NM.		
Γ	Total number of samples 1,439			0	686	92	0	11,100	201		<u>~</u> ;	ncreasing		
Number of detections 1,325]	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)						>> :: >> 	Decreasing Fluctuations Unchanged ≦ 100 Bq/kg	
1						А	В	с	D	E				

Table 4.1.2-7 Detection of radioactive cesium at respective locations (Miyagi Prefecture: river sediment)

iii) Fukushima Prefecture

i. Hamadori

In Hamadori, Fukushima Prefecture, surveys were conducted 41 to 75 times from September 2011 to February 2019 for river sediment samples collected at 53 locations.

Regarding the concentration levels of detected values, 11 locations were categorized as Category A, four locations as Category B, 13 locations as Category C, 12 locations as Category D, and 13 locations as Category E (see Table 4.1.2-8 and Table 4.1.2-9).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 20% (11 locations), while decreasing at 40 locations, fluctuations at one location, and increasing at one location.

Table 4.1.2-8 Categorization of detected values at respective locations (Hamadori, Fukushima Prefecture: river sediment)

Category	Percentile (percentile in all detected values)	Number of loca ions	Locations
Α	Upper 5th percentile	11	No.3, No.11, No.12, No.13, No.14, No.20, No.21, No.24, No.25, No.26, No.27
В	Upper 5th to 10th percentile	4	No.9, No.17, No.30, No.31
С	Upper 10th to 25th percentile	13	No.2, No.4, No.6, No.7, No.8, No.10, No.18, No.23, No.28, No29, No.32, No.44, No.48
D	Upper 25th to 50th percentile	12	No.15, No.22, No.33, No.35, No.36, No.37, No.38, No.39, No.45, No.50, No.52, No.53
E	Lower than upper 25th to 50th percentile (lower 50%)	13	No.1, No.5, No.16, No.19, No.34, No.40, No.41, No.42, No.43, No.46, No.47, No.49, No.51



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-10 Changes in concentration levels over the years at respective locations (Hamadori, Fukushima Prefecture: river sediment)

		Location			FY2018		F	Y2011-201	8		Coefficient	Trada
No.	Water area	Location	Municipality	Minimum	Maximum	Average	Minimum	Maximum	Average	Changes	of variation	(*3)
1	Jizogawa River	Hamahata Bridge	Shinchi	value 0	0	0	value 0	4.400	337	۸	2.38	ļ
2	-	Koizumi Bridae	Iown	100	150	126	100	5 300	467	min	1.69	/
3	Koizumi River	Hvakken Bridge		510	1.032	831	48	2 900	084	his Have	0.61	VVV
4		Ubricaka Bridge	Soma City	78	220	150	78	2,000	459	h war	0.02	· • • •
5	Udagawa River	Hakkan Brides		14	200	20		400	02	·	1.01	>>
0				14	405	20	24	4000	02	han	1.01	_
•	Manogawa River	Ochiai Brioge	Minamisoma City	00	195	140	34	4,000	328	L	1.08	>
1		Majima Bridge	-	58	338	14/	58	28,000	2,3//	Um	1.96	~
8		Kusano	litate Village	120	216	168	120	5,700	1,039	Mhan	1.12	~
9	Nida River	Komiya		260	866	553	187	7,900	1,893	White	0.93	~
10		Kidouchi Bridge		110	266	176	110	11,200	1,699	han	1.11	~
11		Sakekawa Bridge		41	5,660	2,761	41	13,100	3,111	lvM_~~	1.04	/
12		Ishiwatado Bridge		1,090	1,500	1,253	890	61,000	7,103	han	1.34	1
13		Kaminouchi Bridge		730	1,049	824	662	33,000	5,900	war	1.12	/
14	Ota River	Masuda Bridge	Minamisoma	1,310	1,960	1,652	620	60,000	7,520	hn_	1.42	\nearrow
15		JR Tetsudo Bridge	City	70	122	88	70	3,000	714	my	1.08	\swarrow
16		Maruyama Bridge		11	32	24	0	230	50	Unim	0.85	—
17		Shimokawara Bridge		326	746	523	326	3,800	853	L	0.69	V
18	Odaka River	Zencho Bridge		98	252	135	98	3,600	405	ala	1.34	~
19		Hatsukara Bridge		0	21	5.8	0	1,500	95	l	2.42	
20		Murohara Bridge		3.400	4.920	4.281	2.480	165.000	14,418	A	1.62	<u>``</u>
21	Ukedo River	Ukedo Bridge	Namie Town	384	2.540	1.041	341	45 000	6 375	N. N.	1.54	<u> </u>
22	Furumichi River	Before the confluence with Takasegaw a	Tamura City	50	122	94	32	1 4 10	107	1.	1.27	~
22	Takase River	River (Kodoshimohira, Myakoj Town) Keio Bridne	Namie Town	104	545	244	104	24,000	2.848	In the second	1.04	/
20	Takase Niver	National Pouto & unct	Futaba	104	7.400	0.000	1.490	24,000	2,040	Uh	1.84	~
24	Maeda River	National Route 0, west	Town	1,850	7,160	3,023	1,460	18,300	4,064	1 1	0.88	>
25		Nakahama Bridge	Namie Iown	513	1,410	1,142	132	23,900	3,224	mm	1.22	~
26	Kumagawa River	National Route 6, west	Okuma	404	1,192	613	270	7,100	1,786	mulm	0.90	~>
27		Mikuma Bridge		710	1,192	967	697	41,000	4,246	A	1.64	~
28		Nabekura Bridge	Kawauchi	93	151	126	70	570	196	theman	0.52	/
29	Tomioka River	Sakaigawa Bridge	Village	220	334	278	195	830	461	MMM	0.33	\nearrow
30		National Route 6, west	Tomioka	90	807	537	90	3,600	1,319	Moundary	0.69	\searrow
31		Kobama Bridge	Town	71	537	379	71	40,000	3,391	Lamo	1.88	\swarrow
32	Idegawa River	Motogama Bridge	Naraha Town	143	211	179	94	3,500	419	٨	1.40	1
33	Kawauchi River	Before the confluence with Kidogawa River (Futamata Bridge)	Kawauchi	62	141	101	39	290	137	homen	0.43	
34		Nishiyama Bridge	Village	14	58	40	14	690	87	hours	1.20	
35	Kidogawa River	Nagatoro Bridge	Nacaba	23	103	48	22	970	195	Ant.	1.01	
36		Kidokawa Bridge	Town	69	122	95	68	2,500	345	here	1.28	~
37	Asami River	Boda Bridge	Hirono Town	30	58	45	23	1 370	202	1	143	<u>``</u>
38	Ohisa River	Kageiso Bridge		36	131	81	36	3 100	421	he has	1.53	~
30	Kohisa River	Ranno Bridge		50	07	72	50	480	170	w	0.62	1
40		Karumida Bridao	lwaki City	32	44	20		460	55	1 Maria	1.40	>
-10	Niida River	Materia Drides		23	-+4	28	0	400	00	~~~~ Λ	1.40	_
41		Marsuba bridge	0 T	30	40	40	20	1,200	108	h-h-	1.91	>
42	Notes i Di	rvtanouchi Bridge	Uno Iown	0	14	8.7	0	400	46	^/\\	1.81	
43	natsui River	kyudayu Bridge		12	32	19	0	440	48	M	1.83	_
44		Rokujumai Bridge		78	164	119	17	546	138	Munh	0.73	_
45	Yoshima River	Maanatsuri Bridge		38	67	58	28	620	140	· ~~	1.02	\searrow
46		River		23	44	35	0	480	73	Ma	1.40	—
47	Fujiwara River	Shima Bridge		12	32	20	12	1,280	109	rlu	2.01	1
48		Minato-ohashi Bridge	lwaki City	207	323	251	20	2,220	416	Mr	0.98	/
49	Samenawo River	ldosawa Bridge		14	26	20	0	278	43	M	1.41	
50	samgana ruvel	Samegawa Bridge		30	67	49	0	440	68	humman	0.93	
51	Shitoki River	Komuro Bridge Kobana Bridge		15	31	26	11	300	59	M	1.07	—
52	Dia da Di			32	73	41	20	450	122	~Whame	0.88	1
53	binda Kiver	Binda Bridge		38	71	51	38	2,020	388	MM	1.34	~
٦	fotal number of	2,515		0	7,160	504	0	165,000	1,769		<i>≥</i> :	ncreasing
	Number of	2,466		*1 Detected	l values are	the total of (Cs-134 and	Cs-137 (Bq/	kg-dry).		<u>ا: لا</u> ر	Decreasing
	vetecions		•	*2 Average categories	values are a according to	rithmetic; c 1) (i)	alculated by	assuming N	ID=0; Color	codes show	MM :	Inchanged
			*3 Results in 1) (ii)	of the analys	is of trends	at respectiv	e locations (using the me	ethod explained		≦ 100 Bq/ka	
				A	В	C	P	E				

Table 4.1.2-9 Detection of radioactive cesium at respective locations

(Hamadori, Fukushima Prefecture: river sediment)

ii. Nakadori

In Nakadori, Fukushima Prefecture, surveys were conducted 45 to 77 times from September 2011 to February 2019 for river sediment samples collected at 44 locations.

Regarding the concentration levels of detected values, one location was categorized as Category B, 11 locations as Category C, 14 locations as Category D, and 18 locations as Category E (see Table 4.1.2-10 and Table 4.1.2-11).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 40% (16 locations), while decreasing at 27 locations and fluctuations at one location.

Category	Percentile (percentile in all detected values)	Number of loca ions	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	1	No.87
С	Upper 10th to 25th percentile	11	No.56, No.59, No.70, No.76, No.77, No.80, No.81, No.82, No.86, No.88, No.93
D	Upper 25th to 50th percentile	14	No.63, No.64, No.65, No.69, No.71, No.72, No.74, No.78, No.79, No.85, No.90, No.91, No.92, No.94
E	Lower than upper 25th to 50th percentile (lower 50%)	18	No.54, No.55, No.57, No.58, No.60, No.61, No.62, No.66, No.67, No.68, No.73, No.75, No.83, No.84, No.89, No.95, No.96, No.97

Table 4.1.2-10 Categorization of detected values at respective locations (Nakadori, Fukushima Prefecture: river sediment)



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-11 Changes in concentration levels over the years at respective locations (Nakadori, Fukushima Prefecture: river sediment)

		Location			FY2018		F	Y2011 - 20 ⁴	18			
No.	Water area	Location	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)
54		Habuto Bridge	Nishigo Village	17	28	20	10	262	47	Aman	1 02	—
55	Abukuma Rover	Tamachi-ohashi Bridge		0	47	25	0	1,010	83	h	1 68	
56	Yanta River	Before the confluence	Shirakawa City	91	139	116	43	8,100	649	M	2 09	1
57	Yashiro River	Yashirogawa Bridge	Tanagura	23	43	34	23	870	99	1	1 39	
58	Kitasu River	Yanagi Bridge	Hirata Village	14	22	18	0	165	27	his	1 01	
59	Imade River	Nekonaki Bridge		84	170	117	0	1,450	206	N	1 52	/
60	Yashiro River	Oji Bridge	Ishikawa Town	13	37	21	11	145	42	MA	0.78	
61		Kawanome Bridge	Tamakawa	0	49	21	0	450	53	M	1 31	
62	Abukuma River	Emochi Bridge	vinage	14	41	21	0	390	56	M	1 83	
63		Sukagawa City water	Sukagawa City	21	61	41	11	182	66	14 Marin	0 65	
64	Shakado River	Before the confluence		24	134	63	14	3,600	160	I.	2.75	/
65	Sasahara River	Shinbashi Bridge		42	220	98	17	2,600	300	Mrs.	1.71	<u> </u>
66	Yatagawa River	Yatagawa Bridge	Koriyama City	12	20	16	0	400	66	A.	1 28	
67	_	Funehiki Bridge	Tamura City	0	95	34	0	270	62	Ann	0 93	
68	Otakine River	Before the confluence		16	30	25	0	6,400	317	L	3 06	/
69		Before the confluence		25	100	50	18	1,290	172	1.	1.74	/
70	Ouse River	Makunouchi Bridge		84	281	157	84	1,340	279	Loren l	0 84	
71	-	Before the confluence	Koriyama City	75	161	112	39	13,500	455	1 sunda	3.40	/
72	Abukuma River	Akutsu Bridge		44	210	73	25	7,800	497	he	2 60	/
73		After the confluence		15	21	18	15	1,210	71	UNOL	2.49	
74	Gohyaku River	With Ishimuro River Kamisekishita Bridge		53	111	82	18	22,000	867	<u> </u>	3.73	<u> </u>
75		Before the confluence	Motomiya City	24	63	35	18	1.320	129	<u>м</u>	1 69	~
76	Abukuma River	with Abukuma River Takada Bridge		50	360	189	50	30,000	905	Manna	3.80	~
77	Kuchibuto River	Kuchibutogawa	Nihonmatsu	85	200	117	65	1 880	511	Mr	0.95	/
78	Utsushi River	Bridge Osegawa Bridge	City	69	135	97	24	2,380	289		1 36	/
79	Mizuhara River	Getouchi Bridae		73	154	106	73	6 400	434	When	2 19	/
80	Megami River	Tsurumaki Bridge		81	235	135	81	1,870	421	ha	0.96	/
81	Abukuma River	Horai Bridge		100	248	169	28	6 500	343		2 12	/
82	Nigori River	Before the confluence		110	486	283	110	2,880	560	h	0.85	/
83	Arakawa River	with Omori River		0	10	13	0	1 160	63	1	2.74	~
84	Sukawa River	Sukawa Bridge	Fukushima	17	27	21	14	700	74	<u> </u>	1.63	
85	Arakawa River	Containe Enlage	City	10	310	69	19	9.500	290	him	3.82	
86	Matsukawa River	Before the confluence with Abukuma River		32	301	154	14	15 200	718		2.60	/
87	Hattanda River	Hattanda Bridge		281	822	484	135	4 300	885	Wann	0.94	~
88		Totsuna Bridge		173	356	238	94	8,300	654	1	198	$\Lambda \Lambda \Lambda$
89	Surikami River	Before the confluence		12	67	36	11	2 150	137	mhr.m.	2.03	
90	Abukuma River	with Abukuma River Taisho Bridge	Date City	33	96	65	26	14 200	566	Mannan	3.07	1
01		Tatenokoshi Bridao	Kawamata	48	00	73	48	1.030	2/11	hu .	0.00	7
02	Hirose River	. Izonawara Bridoo	Town	40	99	52	17	2 300	241	1	1 38	/
02	Quuni River	Before the confluence	Date City	71	403	173	71	9.200	1 109	W.	144	/
04	Hirose River	with Hirose River Before the confluence	-un ony	49	490	04	25	20.000	634	ht muliderer	3.62	/
05	Kurakawa Piyor	with Abukuma River	Shirakawa Citu	40	27	34	21	20,000		-lana l	0.04	7
00	naronawa niver	Matsuoka Bridao	Tanagura	21	37	29	21	150	10	~~	1 24	
07	Kujigawa River	Takachibara Bridar	Town Yamatsuri	0	12	5.0	0	100	19	k.	1 34	
81	Total number of	2 /cc	Town	0	14 833	97	0	30,000	330	WW WW	 	creasing
Nh-	samples	2,400	1 Detected values are the total of Cs-134 and Cs-137 (Parketon)									
NU	more of detections	2,41/	I	*2 Average	values are	arithmetic; c	alculated by	assuming N	ID=0; Color	codes show		luctuations
				*3 Results	of the analy	is of trends	at respectiv	e locations i	using the m	ethod explained	···•• :1	incnanged ≦100 Bq/kg
				ın 1) (ii)					I			
1				A	в	С	D	E				

Table 4.1.2-11 Detection of radioactive cesium at respective locations

(Nakadori, Fukushima Prefecture: river sediment)

iii. Aizu

In Aizu, Fukushima Prefecture, surveys were conducted 36 to 69 times from September 2011 to February 2019 for river sediment samples collected at 26 locations.

Regarding the concentration levels of detected values, one location was categorized as Category B, one location was categorized as Category C, four locations as Category D, and 20 locations as Category E (see Table 4.1.2-12 and Table 4.1.2-13).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 70% (17 locations), while decreasing at eight locations and fluctuations at one location.

Table 4.1.2-12 Categorization of detected values at respective locations

(Aizu, Fukushima Prefecture: river sediment)

Category	Percentile (percentile in all detected values)	Number of loca ions	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	1	No. 106
С	Upper 10th to 25th percentile	1	No.121
D	Upper 25th to 50th percentile	4	No.100, No.116, No.120, No.123
E	Lower than upper 25th to 50th percentile (lower 50%)	20	No.98, No.99, No.101, No.102, No.103, No.104, No.105, No.107, No.108, No.109, No.110, No.111, No.112, No.113, No.114, No.115, No117, No.118,No.119, No122



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-12 Changes in concentration levels over the years at respective locations (Aizu, Fukushima Prefecture: river sediment)

		Location			FY2018		F	Y2011 - 20	18			
No.	Water area	Location	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)
98	Agono River	Tajima Bridge	Minamiaizu Town	0	0	0	0	50	1.5	A	5 22	
99	Agano Niver	Okawa Bridge		0	0	0	0	27	1.8	VL-	3 38	
100		Takimi Bridge	Aizuwakamatsu	31	53	46	31	320	104	Manhan	0 80	Ĺ
101	Yukawa River	Shinyukawa Bridge	City	23	41	31	20	8,700	413	L	3 28	Ĺ
102		Before the confluence with Agano River		0	37	23	0	2,300	166	h	2 20	1
103	Miyakawa River	Saikuna Bridge	Ain the new Town	0	49	19	0	530	62	hmm_	1.42	
104	Agano River	Miyako Bridge	Alzubange Town	0	0	0	0	380	18	L	3 62	_
105	Nippashi River	Minami-ohashi Bridge	Kitakata City	11	57	32	0	1,300	128	An	1.79	/
106	Kyu-yukawa River	Awanomiya Bridge	Yugawa Village	279	445	381	40	25,000	1,363	1	3 04	/
107	Kyu-miyakawa River	Josuke Bridge	Aizubange Town	13	31	23	0	610	131	Lama-	1 04	Ĺ
108	Toteuki Piver	Ohashi		16	29	24	0	670	68	human	1 67	
109		Shimokawara Bridge	Kitakata Citu	11	20	15	0	730	88	M	<mark>1</mark> 81	
110	Nigori River	Nigorigawa Bridge	ritakata City	0	0	0	0	249	19	mul	2 20	
111	Nigon Niver	Yamazaki Bridge		0	13	38	0	350	38	M	2.17	
112	Inagawa River	Aoyagi Bridge	Minamiaizu Town	0	0	0	0	10	0.2		6 56	
113	inayawa Nivei	Kurosawa Bridge	Tadami Town	0	0	0	0	44	1.4	1	5.19	
114	Tadami River	Nishitani Bridge	Kaneyama Town	0	0	0	0	19	0.5		6.40	
115		Fuji Bridge	Aizubange Town	23	71	40	0	241	36	Mala	1 60	
116	Agano River	Shingo Dam	Kitakata City	17	150	72	17	1,220	192	Annon	1 0 6	/
117	Sukawa River	Sukawano		11	36	20	11	218	46	Mmil	0 98	
118	Nagase River	Kogane Bridge		0	36	18	0	360	45	Mun	1.40	
119	Takahashi River	Shinbashi Bridge	Inawashiro Town	15	36	27	15	267	61	Mun	1 05	
120	Koguro River	Umeno Bridge		75	144	101	42	2,330	224	Am	1 68	1
121	Hishinuma River	Sekido District		76	715	244	28	2,090	270	human	1 34	\mathbb{N}
122	Funatsu River	Funatsu Bridge	Koriyama City	0	0	0	0	104	15	whent	1 60	
123	Haragawa River	Estuary, front	Aizuwakamatsu City	0	254	53	0	670	37	L	3 03	
Tota	Total number of samples 1,145		0	715	44	0	25,000	135		<i>≫</i> :Ir	creasing	
Number of detections 802					*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii) A B C D E							lecreasing luctuations Inchanged ≦ 100 Bq/kg

Table 4.1.2-13 Detection of radioactive cesium at respective locations

(Aizu, Fukushima Prefecture: river sediment)

iv) Ibaraki Prefecture

In Ibaraki Prefecture, surveys were conducted 27 to 33 times from August 2011 to February 2019 for river sediment samples collected at 53 locations (this analysis excludes the survey results from 40 locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized as Category A, three locations as Category B, 10 locations as Category C, 22 locations as Category D, and 17 locations as Category E (see Table 4.1.2-14 and Table 4.1.2-15).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 20% (12 locations), while decreasing at 40 locations and fluctuations at one location.

Table 4.1.2-14 Categorization of detected values at respective locations (Ibaraki Prefecture: river sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	1	No.36
В	Upper 5th to 10th percentile	3	No.34, No.38, No.50
С	Upper 10th to 25th percentile	10	No.13, No.28, No.30, No.31, No.32, No.37, No.39, No40, No.42, No.49
D	Upper 25th to 50th percentile	22	No.1, No.2, No.4, No.6, No.7, No.17, No.18, No.19, No.20, No.21, No.22, No.23, No.24, No.25, No.26, No.27, No.29, No.33, No.41, No.44, No.48, No.52
E	Lower than upper 25th to 50th percentile (lower 50%)	17	No.3, No.5, No.8, No.9, No.10, No.11, No.12, No.14, No.15, No.16, No.35, No.43, No.45, No.46, No.47, No.51, No.53



Notes: For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

Figure 4.1.2-13 Changes in concentration levels over the years at respective locations (Ibaraki Prefecture: river sediment)

				Location			EV2018		EV	011 - EV2	018			
\vdash				Location		Minimum	Maximum		Minimum	Maximum		Changes	Coefficient	Trends
No.		Water	area	Location	Municipality	value	value	Average	value	value	Average		or variation	(*3)
1			Satone	Yamagoya Bridge		31	108	66	23	2,000	170	\	2.18	/
2			River	Murayama Bridge		34	77	56	32	710	155	W	1.06	$\overline{\}$
2				Kurabeishi	Kitaibaraki City	18	40	28	18	250	57	\	0.83	
L.	Taga	a River	Hanazono River	hannes Brides		10	-10	20	10	200		\	0.00	
-	Sy	stern		Sonare Bridge		40	92	50	12	300	03	han	0.80	
5			Okita River	Sakae Bridge	Takahagi C ty	0	27	18	0	3,100	144	<u> </u>	3.90	>>
6				Sakai Bridge	Kitaibaraki City	32	81	53	24	2,200	168	L	2.42	~
7			Hananuki River	Shinhananuki Bridge	Takahagi C ty	22	76	50	18	650	120	Lan	1.04	\searrow
8	Kuji	gawa	Kujigawa	Yamagata	Hitachiomiya City	11	17	14	0	1,040	65	L	2.89	—
9	River	System	River	Sakaki Bridge	Hitachi City / Tokai Village	14	39	25	0	290	47	m	1.30	
10		rea		Noguchi	Hitachiomiya City /	0	17	4.3	0	169	24	Ň	1.77	
11		Wer A	Nakagawa	Shimokunii	Shirosato Town Mito City	21	78	36	12	5 500	274	\	3.61	<u> </u>
12		Ma R	River	Katauta Bridan	Mito City /		100	07		4,400	005	1	0.01	~
12	۲.	veđev	Nakamanu	Katsuta Brioge	Hitachinaka City	0	100	3/	U	4,400	335	L~	2.31	~
13	έe	Nal	River	Yanagisawa Bridge	Hitachinaka City	89	158	117	53	4,400	661	ha-	1.23	~
14	Syste		Hinumama e River	Nagaoka Bridge		31	42	37	20	510	118	M.	1.08	/
15	Nako	8W8 68	Hinuma River	Takahashi	lbaraki Town	0	18	11	0	480	44	\sim	2.29	—
16		im ag er Ar	Kansei River	Kansei Bridge		13	54	33	13	167	63	V.M.	0.72	—
17		Hur	Daiya Rivor	Oya Bridge	Hokota City	78	99	84	48	810	191	Mr.	0.94	
18			Hinuma	Hinuma Bridge	Mito City / Oarai	29	86	55	29	1,260	282	Am	0.93	\sim
10			Hokota	Asahi Bridne	rown	58	110	82	58	420	183	VN.	0.65	~
20			River Tomoe	Shintomoegawa	Linkata City					420	100	AAA	0.00	7
20			River	Bridge	Plokota City	34	57	43	34	690	182	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	1.01	~
21		Area	River Takada	Tazuka Bridge		58	97	76	37	720	150	w.	0.90	>>
22		River	River	Bridge		55	185	106	55	630	188	V	0.68	>
23		ura F	Yamada River	Nioroshi Bridge	Namenata City	24	57	45	24	600	139	Vinne	0.87	~
24		Kūs	Kurakawa River	Kurakawa Bridge	run gata ony	51	100	65	48	1,020	160	hm	1.13	\searrow
25	1		Gantsu River	JA Yokohashi Bridae		67	160	92	53	320	130	mon	0.56	/
26			Nagare	Suhoi Bridge	Kashima City	39	100	81	39	1,260	263	m	1.00	~
27			Sonobe	Sonobeshin Bridge		49	143	78	11	1 370	248	Ann	1.25	~
20			River Sanno	Takasa Bridas	Omitama City	-10	070			1,070	705		0.75	~
20			River Koise	Tokoro briuge		304	370	337	17	1,950	725	M	0.75	>
29			River Kajinashi	Heiwa Bridge	Ishioka City	86	132	107	27	830	195	/ Lun	1.06	~
30			River	Kamishuku Bridge	Namegata City	33	232	126	33	270	113	Vmms	0.63	///\
31			Hishiki River	Hishiki Bridge	Kasumigaura City	152	175	166	152	1,320	411	have	0.70	/
32			lchinose River	Kawanaka Bridge		194	326	228	194	1,870	547	m	0.72	~
33		gaun	Sakai River	Sakal Bridge / National Route 354	T 11 01	31	142	86	0	2,300	275	L	1.57	1
34	1	aver.	Shinkawa	Shinten Bridge	I suchiura City	531	589	573	531	5,500	1,803	M	0.78	
35	iver	2 -	Sakura	Eiri Bridge	Tsuchiura City /	0	32	14	0	270	62	A.	0.97	
36	wa R		Bizen	Bizengawa Bridge	I SUKUDA City	1.090	1.410	1 255	31	4 800	1.613	A	0.64	<u> </u>
27	onega Syr		River Hanamuro	Chinum Bridge	Tsuchiura City	1,000	205	242	20	1,000	404	V ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.70	~
	T 0		River Seimei			155	305	212	28	1,380	484	1	0.70	>
38			River	rvatsuhashi Bridge Okuhara-ohashi	Amillown RyugasakiCity/	428	540	491	428	5,800	1,209	~~~~	1.00	>
39			River	Bridge	Ushiku City	250	317	292	220	990	468	5 mm	0.48	~
40			River	Shintone Bridge	Inashiki City	89	272	199	11	440	254	~~~n	0.38	\searrow
41		wa Yea	Yorokoshi River	Horinouchi Bridge	Itako Citv	55	134	102	22	530	184	-lum	0.67	1
42		Htad 98	Maekawa River	Ayame Bridge		91	209	171	16	630	294	mm	0.58	>
43		över	Kinuqawa	Kawashima Bridge	Ch kusei City	0	0	0	0	32	4.5	An 1	1.94	
44	1	awa F	River	Takishita Bridge	Moriya City	57	130	86	11	380	101	Am	0.82	<u>\</u>
45		A	Tagawa	Tagawa Bridge		p	12	83	D	1,080	69	1	2,85	3
40		¥	River	Kuroko Dride-	Ch kusei City	46		0.0	40	.,000	447	\	0.00	~
40		A ea	Kokai River	Curries 110.11	Testin Ci	10	51	29	13	020	14/	mun	0.82	7
47		äver	Vatacauc	r-ummakı Bridge	ronde City	27	33	31	26	500	88	N	1.23	
48		awa	River	Maruyama Bridge		62	160	110	61	1,800	415	/ VI	1.22	1
49		ok alge	River	Sakaimatsu Bridge	Tsukuba City	32	419	243	30	1,160	293	Mun	1.01	\searrow
50		×	Inari River	Oguki Bridge		382	417	400	264	2,150	762	hum	0.73	\searrow
51		g a		Kurihashi Bridge	Koga City	0	41	20	0	1,440	95		2.58	
52		egaw r Arei	Tonegawa	Fukawa	Tone Town	15	110	44	14	820	130	\	1.25	<u> </u>
53		T on.	rover	Sawara	hashiki City	19	30	22	11	1 220	111	1	104	~
To	tal num	nber of	4.574		- only	" ⁰	30	20		1,220	200	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	1.84 2.1	~
-	sampl	les er of	1,5/4			U 11 Detect	1,410	128	U Ce-124 1	0,800 Ce_127 /C	293 Marchai	I	→ :De	areasing acreasing
	detecti	ons	1,515			*2 Average	values are values are a	arithmetic; c	alculated by	assuming	ND=0; Color	r codes show	∧∧A :Fi	uctuations
						categories '3 Results	according to of the analys	o 1) (i) sis of trends	at respectiv	e locations	using the m	ethod	~~• :Un	changed 100 Bo/ko
						explained in	n 1) (ii)							.au byng
						Α	В	С	D	E				

Table 4.1.2-15 Detection of radioactive cesium at respective locations

(Ibaraki Prefecture: river sediment)

v) Tochigi Prefecture

In Tochigi Prefecture, surveys were conducted 27 to 51 times from October 2011 to February 2019 at 56 locations (rivers) in public water areas (this analysis excludes the survey results from 49 locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized as Category C, eight locations were categorized as Category D and 47 locations were categorized as Category E (see Table 4.1.2-16 and Table 4.1.2-17).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 80% (45 locations), while decreasing at all 11 remaining locations.

Table 4.1.2-16 Categorization of detected values at respective locations (Tochigi Prefecture: river sediment)

Category	Percentile (percen ile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	1	No.39
D	Upper 25th to 50th percentile	8	No.5, No.7, No.8, No.12, No21, No.32, No.38, No.50
E	Lower than upper 25th to 50th percentile (lower 50%)	47	No.1, No.2, No.3, No.4, No.6, No.9, No.10, No.11, No.13, No.14, No.15,No.16, No.17, No.18, No.19, No.20, No.22, No.23, No.24, No.25, No.26, No.27, No.28, No.29, No.30, No.31, No.33, No.34, No.35, No.36, No.37, No.40, No.41, No.42, No.43, No.44, No.45, No.46, No.47, No.48, No.49, No.51, No.52, No.53, No.54, No.55, No.56



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-14 Changes in concentration levels over the years at respective locations (Tochigi Prefecture: river sediment)

location						FY2018			FY2011 - FY2018						
							Minimum	Maximum		Minimum	Maximum		Changes	Coefficient	Trends
No. Watera		rea	Location	Municipa ity	value	value	Average	value	value	Average	-	or variation	(-3)		
1				Nakagawa	kuyobashishita		11	21	15	0	96	23	V	1.12	
2	1			River	Komel Bridge	Nasushlobara City	14	26	20	11	250	44	h.	1.10	
	1			Takaomata	Takaomata Bridae		47	58	27	12	1 200	121	~~	1.00	/
-	3 4 5 6 7			River	rakaomata bridge	Nasu Town		50	31	12	1,280	131	h	1.80	1
4			Yukawa River	Yukawa Bridge		13	36	21	13	240	54	mar	0.96	—	
5			Nakagawa River	Kamikurolso	Nasumachi Town	19	80	47	11	178	63	WWWW	0.55	—	
6				Yosasa River	Yosasa Bridge		0	36	17	0	1,160	142	۱.M.	1.88	1
7			Kurokawa	Shinden Bridge	NasuTown	35	93	55	30	500	91	٨.	0.94		
-				River Vecaca Rheer	Kawada Bridae		20	407			810	400	1	0.75	/
°.	-			Nakanawa	Kawada Dridge	-	39	187	80	21	010	120	he have	U./9	1
9	1			River	Kurobane		15	33	23	15	102	33	When	0.56	—
10	10 11 12 Nakagawa River 3 System 13 14 15 16 17			Matsuba River	Tr butary	Otawara City	18	48	34	18	780	80	haven	1.42	—
11				Sabigawa River	Udagawa Bridge		10	34	21	10	660	108	M	1.34	ļ
12				Momura River	Momuranaka Bridge		27	94	51	21	290	93	Ang .	0.73	
13			a Rover		Vunohara	Nasushlobara City		12	5.5	0	100	20	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	1.00	
					Turionara		v	12	0.0	v	100	30	m	1.08	
14			Hokigawa	Sek ba Bridge		13	50	29	13	410	71	~^	1.07	—	
15				rover	Iwai Bridge	Obviora City	0	0	0	0	204	33	~!	1.25	—
16				Hokigawa Bridge	Otawara City	0	31	7.6	0	165	24	hours	1.19		
17				Nakagawa	Shinnaka Bridge		0	16	8.4	0	107	20	shile	1.07	
1.9	1			Mumogawa	Kosel Bridge	Nakagawa Town	0	18	7.4	0	43	12	Maria	0.78	
-	-			River	Note: Dridge		v	10	18	v	70	15	* TANK	0.70	~
19	9			Arakawa River	saikachi Bridge	snioya Town	23	34	29	14	1,020	135	~L	1.44	1
20					Renjo Bridge	Sakura City	0	15	3.8	0	63	13	Ann	1.21	
21				Uchikawa	Tanaka Bridge	Ya ta City	53	97	66	26	1,440	127	L	1.98	1
22			River	Asahi Bridge	Sakura City	26	47	34	18	279	57	m	0.88		
	1			Analysis Diver	Mahada Deldas		0	47	0.4	0	740	40	1	2.61	
23				ALGRAWA RIVER	Mukada bridge	Nasu Karasuyama Citv	U	17	8.4	U	740	40	/	2.01	
24	4			Egawa River	Trbutary	0.9	13	37	20	0	520	67	Man	1.69	
25				Kinugawa River	Station, front		23	48	39	0	75	29	Muni	0.59	—
26	11			Yunishi River	Maesawa Bridge		0	0	0	0	25	5.4	JANNA A	1.43	_
27	1			Olika River	Trbutary	Nikko C ty	0	12	58	0	240	19	A A	2.33	
-	1			Kinugawa	Variation			25	47	10	900	442	^J~	2.00	/
20	1			River	ковадое		10	30	17	10	000	115	/\	2.00	1
29				Itaana River	Tr butary		13	33	20	12	4,900	154		4.51	1
30	30 31			Yukawa River	Tr butary	-	0	0	0	0	137	22	VL	1.88	—
31				Dalya River	Shinkyo Bridge		0	15	6.3	0	123	24	A.	1.10	—
32	11			Shidobuchi	Sulichigal Bridge	-	43	83	64	43	400	135	^	0.63	ĺ
	1			River Datus Phone	Kalshin Bridge (Linden)							40	al	4.00	~
33	4			Kinugawa	Kalshin biloge (nangal)		U	17	2.4	U	09	12	mmu	1.20	
34		Kinu	igawa	River	Sanuki	Shioya Town	0	89	31	0	470	58	mm	1.57	—
35		RNe	er System	Nishi-Kinugawa River	Nishi-Kinugawa Bridge	I frunomica City	10	59	34	0	2,290	239	W.	2.27	1
36	11			Ki Kinugawa (H	Kinugawabashi Bridge (Hoshakuli Temple)	olaulomya City	0	12	3.0	0	31	6.0	MAA	1.60	_
37	1			River	Daidolzumi Bridge	Mooka City	0	36	15	0	95	16	1	1.31	
29	1			Ecouro River	Trhutan	Shimotouka City		251	82	0	650	74	11	1.65	
30	۶			Cyawa rover	Trodaly	Shimolouke City	v	201	03	v	550		/b	1.55	_
39	S	aver Syste		Akabori River	Nikko City Ha I, front	Nikko C ty	89	230	176	49	1,780	353	~L~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.99	1
40	Mer				Kiwadajima	-	13	68	35	13	380	64	- <u>h</u>	1.13	—
41	BW			Tagawa River	Ozobashi Bridge		0	16	3.7	0	150	24	Mu	1.47	
42	12 10 13			Kamagawa Rhar	Tsukushi Bridge	Utsunomiya City	25	40	33	14	182	59	hh	0.75	
43				- arei	Melji Bridge	Kaminokawa Town	n	0	0	n	122	21	Δ. Δ	1,62	
H				Tagawa River	Vapabachi Pridee	Ouema Citri	~				200) ~~~/	100	
44	┥┝	_			ranabasni brioge	Oyama Oitý	22	51	34	12	360	65	~~~~~	1.09	
45	11			Kurokawa	Kaljima Bridge	Kanuma City	0	0	0	0	109	13	hm_1_	2.08	—
46	JI			rover	Onari Bridge	Mibu Town	0	0	0	0	75	10	Mr. A	1.95	—
47	1		Omol	Oashi River	Akaishi Bridge		0	0	0	0	53	4.7	m ell	2.26	
48	1	River Area 87 John 88 River 89 River Area	River Area	Koyabu River	Kovabu Bridge	Kanuma City	13	20	17	n	940	99	λ	2.32	
H.	11				Tampicu Bridge	Tochial City				-	440			255	
49				Omol River	ramoisu Bridge	Turingi City	U	U	U	U	119	11	~~u	2.55	
50				Otome-ohashi Bridge	Oyama City	0	240	42	0	540	42	will	2.12	—	
51			Uzuma River	Uzuma Bridge	Tochigi City	0	28	7.7	0	530	78	Moren	1.34		
52	11			atarase Ver River ea	Watarasegawa River Intake weir at Sort Rower Station	Nikko C ty	0	15	11	0	90	20	wilm -	0.92	
53	11				Hajika Bridge		0	11	2.8	0	80	17	M	1.17	
-	11		Watarase River		Nakahachi Bridee	Ash kaga City	-	44	2.0	-	200	10	1	2.40	
-4			Area		manabashi bhoge		U	- 11	2.8	u	300	18	<u>~</u>	3.18	
55	11				Watarase-ohashi Bridge	Tatebayashi City	0	11	5.3	0	310	61	MWL_	1.56	—
56		L		L	Shinkal Bridge	Tochigi City	0	13	3.7	0	164	24	hall	1.44	—
To	tal nun I samol	nber les	2,047				0	251	24	0	4,900	61		🥕 :h	creasing
N	umber	of	1,624	1	*1 Detected values are the total of Cs-134 and Cs-137 (Bg/kg-dry).							-) : D	ecreasing	
	eleciio	n 16		1			*2 Average values are arithmetic; calculated by assuming ND 0; Color codes show categories according to 1) (i)								nchanged
							*3 Results	of the analys	is of trends	at respective	locations us	sing the met	hod explained	:≦	100 Bq/kg
1							in 1) (i)								
1							A	В	C	D	F				

Table 4.1.2-17 Detection of radioactive cesium at respective locations

(Tochigi Prefecture: river sediment)

vi) Gunma Prefecture

In Gunma Prefecture, surveys were conducted 16 to 51 times from November 2011 to January 2019 at 48 locations (rivers) in public water areas (this analysis excludes the survey results from eight locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized as Category B, nine locations as Category D, and 38 locations as Category E (see Table 4.1.2-18 and Table 4.1.2-19).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 90% (43 locations), while decreasing at four locations and fluctuations at one location.

Table 4.1.2-18 Categorization of detected values at respective locations

Category	Percentile (percentile in all detected values)	Number of loca ions	Locations					
Α	Upper 5th percentile	0	(None)					
В	Upper 5th to 10th percentile	1	No.47					
С	Upper 10th to 25th percentile	0	(None)					
D	Upper 25th to 50th percentile	9	No.1, No.4, No22, No.27, No.39, No.41, No.44, No.45, No.48					
E	Lower than upper 25th to 50th percentile (lower 50%)	38	No.2, No.3, No.5, No.6, No.7, No.8, No.9, No.10, No.11, No.12, No.13, No.14, No.15, No.16, No.17, No.18, No.19, No.20, No.21, No.23, No.24, No.25, No.26, No.28, No.29, No.30, No.31, No.32, No.33, No.34, No.35, No.36, No.37, No.38, No.40, No.42, No.43, No.46					



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-15 Changes in concentration levels over the years at respective locations

(Gunma Prefecture: river sediment)

Location					FY2018			FY	2011 - FY20)18				
No. Water area			ater area	Location	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)
1			Tonegawa	Hirose Bridge		32	80	51	18	350	90	Lin	0.90	—
2			River	Tsukiyono Bridge	Minakami Town	11	17	15	11	115	35	Thomas	0.71	
3			Akaya River	Kosode Bridge		10	16	14	10	113	33	Mun	0.83	—
4			Sakura River	In Ooaza Yachi	Kawaba Village	65	96	77	65	500	165	Ambre	0.57	V
5				Kirinoki Bridge	Katashina Village	0	14	7.0	0	159	23	A	1.34	
6			Katashina	Tonemachitakatova	Numata City	0	23	5.9	0	58	69	11.	1.90	
-		8	River	Futze Bridge		-		0.0	-		5.0	to l ll	0.77	
H		er Are	Agatsuma			U	140	34		101	04	1 March	0.77	
8		a Rw	River	Shinto Bridge	Naganohara Town	0	0	0	0	187	14	Ann	2.69	
8		vegav	River	Shuttatsu Bridge	Nakanojo Town	0	0	0	0	19	3.4		1.74	
10		Tor	River	Bridge	Town	0	0	0	0	22	1.8	<u>All</u>	2.65	
11			Nakuta River	Tonoda Bridge	Takayama Village	0	16	7.8	0	215	43	han	1.06	—
12			Agatsuma River	Agatsuma Bridge	Shihukawa City	0	15	2.1	0	610	32	L	2.80	
13			Tonegawa River	Taisho Bridge	Sinbukana Oky	0	20	7.0	0	147	24	Alma	1.05	—
14			Takizawa River	Shintakizawa Bridge	Shibukawa City / Yoshioka Town	0	15	9.5	0	245	41	V.	1.36	
15			Торедзир	Gunma-ohashi Bridge	Maebashi City	0	16	4.0	0	410	60	handa	1.46	
16			River	Fukushima Bridge	Tamamura Town	0	0	0	0	112	25	broken	1.19	
17			Nagai River	Kamigonda Bridge		22	59	39	15	310	81	M	0.93	
19			Karasu Piyor	Karasugawa Bridge	Takasaki City		18	44			24	L	0.00	
10				Nalasugawa Drideo	Annaha Citu	0	10			00	24	~~~~	0.09	
18			Usui River	Nakase Bridge	Annaka City	10	41	23	U	370	90	m	1.28	
20				Hanataka Bridge	Takasaki City	12	19	15	0	82	23	Mun	1.10	—
21	ε		Kabura River	Tadakawa Bridge	Shimonita Town	0	0	0	0	56	6.2	~~	1.96	
22	Byste			Kaburagawa Bridge	Fujioka City	21	196	89	0	214	56	~~~~~	1.07	—
23	Biver	er Are	Ogawa River	Kinzan Bridge	Kanra Town	0	17	4.3	0	90	21	Lan	1.11	—
24	gawa	n Rv	Nanmoku River	Ozawa Bridge	Nanmoku Village	0	13	6.0	0	68	7.1	han	1.92	
25	Tone	Karas	Someya River	Yakushi Bridge	Shinto Village	10	17	13	10	142	38	M	0.94	—
26		×	Inogawa River	Kamakura Bridge	Takasaki City	0	10	2.5	0	125	17	Ann	1.55	
27			Karasu River	lwakura Bridge	Takasaki City / Tamamura Town	0	130	41	0	950	163	Mun	1.33	Į
28			Kanna River	Shinkaname Bridge	Ueno Village	0	0	0	0	37	5.4	hn	1.99	
29			Kanna River	Morito Bridge	Kanna Town	0	0	0	0	13	0.7		4.24	—
30			Kanna River	Tobukyo Bridge	Fujioka City / Kamikawa Town	0	0	0	0	43	3.2	1 .	3.31	
31			Kanna River	Kannagawa Bridge	Kamisato Town	0	0	0	0	107	18		1.61	
32			Tonegawa	Bando-ohashi Bridge	Honjo City	0	0	0	0	252	49	M. A	1.53	
33			Akagishirakaw	In Shimohosoi Town		0	13	8.8	0	108	26	ma	0.96	
34			a River Momonoki	Utsuboi Bridge	Maehashi City	0	0	0	0	75	10	A.	1.58	
25		Tonegawa River Area	River Arato River	Okubara Bridge		0	0	0	0	49	4.0	N.	2.58	
30			Kasukawa	Ukarai Bridan		•		0			4.9		2.00	
30			River	nozumi bridge	korski Cite	•	0	0		413	43		2.13	
31			Hirose River	Nakajima brioge	Sesaki City	U	U	U	U	83	21	Wh-m	1.03	
38			Hayakawa River	nayakawa Bridge	01.01	24	45	33	21	370	84	Mun.	1.05	
39			Топедана	Maejima Bridge	Ota City Chivoda Town /	22	70	43	22	183	75	· un	0.58	
40		\vdash	River	Ione-ozeki Weir	Gyoda City	0	12	1.7	0	640	91	Mm	1.50	—
41			Koguro River	Kayano Bridge	Kiryu City	30	51	41	26	340	89	Whan	0.77	—
42		Watarase River Brea	Watarase	Takatsudo	Midori City	18	30	24	16	89	43	www	0.53	—
43				water channel	Kiryu City	22	47	34	15	121	49	marken	0.50	—
44			Tatara River Kiryu River	Ejiri Bridge	Oura Town	0	145	55	0	640	152	When	1.24	\searrow
45				Kannon Bridge	Kiryu City	36	46	42	25	240	83	Mum	0.67	—
46				Sakai Bridge	Kiryu City / Ashikaga City	0	47	21	0	243	64	han	0.99	—
47	47		Tsuruuda River	Lake Jonuma	Tatebayashi City	91	725	535	91	2,160	852	www	0.61	\sim
48	48		Yatagawa River	Togoda Bridge	Meiwa Town / Itakura Town	55	130	89	0	640	133	Mann	1.29	\swarrow
Tot of	Total number of samples 1,570		1,570			0	725	29	0	2,160	62		; ir	creasing
Nu	Number of 1,171					*1 Detected	ected values are the total of Cs-134 and Cs-137 (Bq/kg-dry).					-	:⊡ ∧∿/≊:F	lecreasing luctuations
						2 Average categories a	values are a according to	1) (i)	ioulated by a	ssuming NL	-u, Color C	oues snow	~~• :U	Inchanged
						*3 Results (in 1) (ii)	of the analysi	is of trends a	at respective	locations us	ing the met	hod explained	:≦	a 100 Bq/kg
						А	в	С	D	E				
-														

Table 4.1.2-19 Detection of radioactive cesium at respective locations

(Gunma Prefecture: river sediment)
vii) Chiba and Saitama Prefectures and Tokyo Metropolis

In Chiba and Saitama Prefectures and Tokyo Metropolis, surveys were conducted 28 to 50 times from October 2011 to January 2019 at 51 locations (rivers) in public water areas (47 locations in Chiba Prefecture, two locations in Saitama Prefecture, and two locations in Tokyo Metropolis).

Regarding the concentration levels of detected values, seven locations were categorized as Category A, nine locations as Category B, 16 locations as Category C, 11 locations as Category D, and eight locations as Category E (see Table 4.1.2-20 and Table 4.1.2-21).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 10% (five locations), while decreasing at 43 locations and fluctuations at three locations.

Category	Percen ile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	7	No.1, No.8, No.10, No.15, No.19, No.26, No.28
В	Upper 5th to 10th percentile	9	No.7, No.11, No.12, No.14, No.17, No.18, No.20, No.29, No.44
С	Upper 10th to 25th percentile	16	No.3, No.9, No.13, No.16, No.21, No.24, No.30, No.36, No.38, No.39, No.40, No.41, No.42, No.43, No.46, No.50
D	Upper 25th to 50th percentile	11	No.4, No.5, No.22, No.23, No.25, No.27, No.31, No32, No.37, No.45, No.47
Е	Lower than upper 25th to 50th percentile (lower 50%)	8	No.2, No.6, No.33, No.34, No.35, No.48, No.49, No.51

Table 4.1.2-20 Categorization of detected values at respective locations(Chiba and Saitama Prefectures and Tokyo Metropolis: river sediment)



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-16 Changes in concentration levels over the years at respective locations

(Chiba and Saitama Prefectures and Tokyo Metropolis: river sediment)

		Location					FY2018			FY2011 - FY2018			Coefficient	
No.	Prefecture	v	/ater area	Location	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	of variation	(*3)
1			Shagan Biyer	Fukama-ohashi Bridge	Inzai City / Sakae	740	797	766	590	1,910	1,136	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.36	Ļ
2			Shogen River	Shinbei Bridge	Town	21	24	23	0	149	38	L	0.76	_
3		-		Intake at Maeshinden Water Purification Plant		261	307	283	171	1,230	437	1	0.57	Ļ
4		Tonegawa River	Nagato River	Nagato Bridge	Sakae Town	62	90	79	62	660	229	~~~~	0.63	\checkmark
5		System		Fujimi Bridge	1	85	105	93	85	920	273	1	0.71	/
6			Ryudai River	Ryumatsuno Bridge		31	46	40	25	350	107	MAR.	0.86	/
7			Nekona River	Shinkawa Floodgate	Narita City	280	466	377	69	2,300	782	Mr.	0.65	$\overline{\ }$
8			Obori River	Kitakashiwa Bridge	Kashiwa City	1.087	1 870	1 4 1 3	747	12 000	3 184	No.	0.87	<u>``</u>
0				Sanno Bridge under	Kamadaya City	105	257	287	105	2,000	720	1.	1.02	<u>`</u>
10			Otsu River	Kaminuma Bridae	nanagaya oky	105	307	207	105	3,900	120	A.	1.05	~
10		Feeder rivers of	Completenti	Caminuma bruge	Kashiwa City	997	1,900	1,040	300	20,200	4,1/1	1	1.10	/
		Lake Teganuma	Someinotosni	Downstream of	Kamagaya City /	2/0	044	419	24	5,700	1,230	1	1.24	1
12		-	Kanayamaotoshi	Karuizawasakai Bridge	Shiroi City	328	616	4/2	305	7,200	1,159	1	1.47	~
13				Nauchi Bridge	Shiroi City	238	355	307	129	2,400	737	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.79	>
14			Kamenari River	Kamenari Bridge	Inzai City	58	787	422	58	5,300	775	<u></u>	1.47	~
15			lgusasuiro Channel	Channel	Kamagaya City	671	1,041	843	671	4,100	1,541	Man	0.67	~
16			Futae River	Tomigaya Bridge	Funabashi City / Shiroi City	245	340	297	245	3,300	819	~	0.90	/
17			Kanzaki River	Kanzaki Bridge	Yachiyo City / Inzai City	316	560	425	97	2,800	806	man	0.87	1
18			Kanno River	Kanno Bridge	Yachiyo City	411	553	504	58	5,000	975	h	1.17	\searrow
19		Feeder	Inba Discharge Channel (upperreaches)	Yachiyo Bridge		617	1,046	880	106	7,800	1,489	ham	0.97	\checkmark
20		rivers of Lake	Teguri River	Mumei Bridge	Sakura City	419	594	523	419	3,600	1,324	~~~~	0.71	V
21		Inbanuma	Moroto River	Moroto Bridge	Inzai City	71	240	168	71	2,330	671	M.	1.00	\checkmark
22			Kashima River	lwatomi Bridge		43	58	50	43	307	124	m	0.61	/
23			Takasaki River	Ryuto Bridge	Sakura City	81	121	94	81	890	223	Maria	0.77	/
24	Chiba		Kashima River	Kashima Bridge		12	269	162	0	1,080	197	1	1.02	$\Lambda\Lambda\Lambda$
25	Prefecture		Inbasuiro Channel	Tsurumaki Bridge	Inzai Citv	66	165	95	20	470	149	2000	0.79	\sim
26			Toneunga Canal	Unga Bridge	Nagareyama City /	281	1.610	1.046	281	4 130	1 004	w.A	0.50	<u>`</u>
27		Edogawa River		Nagarevama Bridge	Noda City Nagareyama City /	24	130	72	24	520	204	Maar	0.63	<u>``</u>
20			Sakagawa Piwor	Poston Bridge	Misato City	524	855	500	524	4 000	1 970	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.00	~
20			Sakagawa River	Sakasa Brides	Matsudo City	545	000	500	524	4,000	1,070	~	0.70	
28			Shirisaka River	Chieketeuskike Dridee	Matsudo City /	515	02/	082	515	4,000	1,978	50	0.77	/
30				Shinkatsushika Bhoge	Katsushika City	94	170	142	94	1,360	543		0.68	
31				ichikawa Bridge	lchikawa City / Edogawa City	81	196	111	33	629	196	mh	0.73	/\/
32			Edogawa River	Vicinity of Keiyo Road		17	62	42	17	380	122	-min	0.75	/
33				(upperreaches)	Ichikawa City	21	28	24	21	1,140	300	Mun_	1.00	>
34		Edogawa		Shingyotokubashi Bridge		0	15	7	0	104	24	· · · · · · · · · · · · · · · · · · ·	0.94	—
35		River System		down	labikawa Citu /	17	21	19	15	850	73		2.12	
36			Kyu-Edogawa River	8 km Point to the estuary	lchikawa City / Edogawa City	45	217	145	30	368	148	MM	0.68	$\mathcal{N}\mathcal{N}$
37				lmai Bridge		18	81	52	18	323	76	~hm	0.86	—
38				Urayasu Bridge	Urayasu City / Edogawa City	160	276	211	29	2,050	514	Ann	0.77	/
39			Mamagawa River	Nemoto Floodgate		120	152	136	120	1,100	359	~~~~~	0.80	\nearrow
40			Kokubu River	Suwada Bridge	Ichikawa City	243	316	273	223	5,400	783	Λ	1.31	\checkmark
41			Haruki River	Before the confluence with Kokubu River		163	215	187	134	1,380	437	~	0.82	1
42			Hasen-okashiwa River	Downstream of Nakazawashinbashi Bridge	Kamagaya City / Ichikawa City	55	201	159	55	1,220	299	Lam	0.80	\checkmark
43			Okashiwa River	Sengen Bridge	labilana Cita	109	155	126	109	970	289	Y	0.92	\checkmark
44			Mamagawa River	Mitomae Bridge	ichikawa City	395	718	515	34	5,900	1,070	M	1.45	\searrow
45		Ebigawa Rive	er en	Yachiyo Bridge	Funabashi City	45	116	70	21	6,400	601	M	2.57	
46		Inba Dischar	ge Channel	Shinhanamigawa Bridge	-	60	385	201	60	2,900	472	My.	1.30	
47		Miyako River	<i>a</i> /	Miyako Bridge	Chiba City	38	63	45	37	750	156	M	1.12	1
48	0-3		Arakawa River Middle Onari Bridge Konosu City Reaches Sasame Bridge Toda City		0	0	0	0	38	9.2	Mr.	1.43		
49	Prefecture	Arakawa			0	26	14	0	540	105	M .	1.49	$\overline{}$	
50		River Reaches Kasai Bridge Koto City / Edogaw		100	148	127	75	700	261	how	0.53	~		
51	токуо Metropolis	olis Sumida River Ryogoku Bridge Chuo Citv		0	91	35	0	870	202	Wh.	0.88	~		
T	Total number of samples 1.802		0	1 080	208	0	20,200	700	· ~		Creasing			
\vdash	Number of d	etections	1,002			*1 Detected	values are	the total of (Cs-134 and	Cs-137 (Bn/	kg-dry).	I	× :	ecreasing
\vdash			1,010	I		*2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i)					///∎:F	luctuations Inchanced		
						*3 Results	of the analys	is of trends	at respectiv	e locations (using the me	ethod explained		≦ 100 Bq/kg
							P	<u> </u>	P	F				
1						^	5		5	-				I

Table 4.1.2-21 Detection of radioactive cesium at respective locations (Chiba and Saitama Prefectures and Tokyo Metropolis: river sediment)

2)-2 Lakes

i) Miyagi Prefecture

In Miyagi Prefecture, surveys were conducted 15 to 29 times from October 2011 to December 2018 for lake sediment samples collected at 21 locations.

Regarding the concentration levels of detected values, three locations were categorized as Category D and 18 locations were categorized as Category E (see Table 4.1.2-22 and Table 4.1.2-23).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 10% (two locations), while decreasing at 15 locations, unchanged at two locations, and fluctuations at two locations.

Table 4.1.2-22 Categorization of detected values at respective locations

Category	Percentile (percentile in all detected values)	Number of locations	Locations				
Α	Upper 5th percentile	0	(None)				
В	Upper 5th to 10th percentile	0	(None)				
С	Upper 10th to 25th percentile	0	(None)				
D	Upper 25th to 50th percentile	3	No. 9, No. 16, No. 17				
E	Upper 50th to 100th percentile(lower 50%)	18	No. 1, No. 2, No. 3, No. 4, No. 5, No. 6, No. 7, No. 8, No. 10, No. 11, No. 12, No. 13, No. 14, No. 15, No. 18, No. 19, No. 20, No. 21				





Figure 4.1.2-17 Changes in concentration levels over the years at respective locations (Miyagi Prefecture: lake sediment)

		Loca ior	1			FY2018		FY.	2011 - FY2	018			
No.	Wate	er area	Location	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)
1		Kurikoma Dam	Dam site	-Kurihara Citv	11	45	25	10	1,100	170	Lula	1.49	/
2		Hanayama Dam	Dam site	internation only	140	180	158	123	2,290	330	Λ	1.49	\mathbb{Z}
3	Kitakami River System	Narugo Dam	Dam site	Osaki City	80	223	127	80	1,190	345	Ann	0.74	/
4		Lake Naganuma	Dam site	Coald Oily	180	235	201	133	1,180	332	h	0.67	/
5		Shukunosawa tameike Pond	Pond exit	Kurihara City	16	142	84	10	1,260	174	1	1.36	/
6		Futatsuishi Dam	Dam site	Kami Town	69	130	92	69	2,300	393	Lon	1.12	/
7	Naruse River System	Urushizawa Dam	Dam site	Namerown	46	69	60	46	700	232	m	0.67	
8		Minamikawa Dam	Dam site	Taiwa Town	100	224	166	100	2,600	692	JA	0.96	/
9	Sunaoshi River System	Sonoseki Dam	Dam site	Rifu Town	420	1,397	868	88	2,640	1,369	\sum	0.46	\sim
10	Nanakita River System	Nanakita Dam	Dam site		13	120	46	0	400	92	M	1.25	
11	Marutazawatameike Pond		Pond exit	Sendai Citv	56	219	167	56	1,100	235	man	1.02	/
12	Natori River System Okura Dan	Okura Dam	Dam site		12	33	18	0	1,150	111	$\Lambda_{-\Lambda-}$	2.09	/
13	Lake A	manuma	Lake exit		271	328	299	271	9,700	1,739	Ann	1.06	/
14	Natori River System	Kamafusa Dam	Dam site	Kawasaki Town	120	165	139	85	1,090	352	Man	0.65	\nearrow
15	Abukuma	Kawarago Dam	Dam site	Shiroishi City	165	709	354	36	5,700	598	-	1.68	$\wedge \wedge \checkmark$
16	River System	Shichikashuku Dam	Dam site	Shichikashuku Town	904	1,980	1,456	840	3,680	1,999	mm	0.38	~~~*
17	Lake Ba	igyunuma	Lake exit	Shiroishi City	780	1,035	886	160	4,200	1,007	- Mo	0.79	$\wedge \wedge \checkmark$
18	Abukuma River System	Murata Dam	Dam site	Murata Town	28	41	35	0	430	125	\mathcal{M}_{\sim}	1.03	\backslash
19	Kitakami River System	Lake Izunuma	Lake exit	Tome City	140	160	150	48	900	240	\sim	0.80	\checkmark
20	Natori River System	Tarumizu Dam	Dam site	Natori City	103	162	133	34	460	198	An	0.56	/
21	Naruse River System	Miyatoko Dam	Dam site	Taiwa Town	0	13	6.5	0	195	49	Am	1.20	
То	tal number of samples	532			0	1,980	285	0	9,700	554		חו: ת< ∖:D	creasing ecreasing
Number of detections 523					*1 Detecter *2 Average categories *3 Results explained in	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)							uctuations nchanged 100 Bq/kg
					А	В	С	D	Е				

Table 4.1.2-23 Detection of radioactive cesium at respective locations

(Miyagi Prefecture: lake sediment)

ii) Fukushima Prefecture

i. Hamadori

In Hamadori, Fukushima Prefecture, surveys were conducted 31 to 74 times from September 2011 to February 2019 for lake sediment samples collected at 41 locations.

Regarding the concentration levels of detected values, eight locations were categorized as Category A, eight locations as Category B, 11 locations as Category C, 10 locations as Category D, and four locations as Category E (see Table 4.1.2-24 and Table 4.1.2-25).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were not observed, while decreasing at 25 locations, unchanged at two locations, fluctuations at 13 locations, and increasing at one location.

Table 4.1.2-24 Categorization of detected values at respective locations (Hamadori, Fukushima Prefecture: lake sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	8	No. 4, No. 5, No. 6, No. 15, No. 18, No. 20, No. 24, No. 25
В	Upper 5th to 10th percentile	8	No. 7, No. 9, No. 10, No. 16, No. 22, No. 27, No. 29, No. 32
С	Upper 10th to 25th percentile	11	No. 1, No. 3, No. 8, No. 11, No. 13, No. 21, No. 26, No. 28, No. 30, No. 33, No. 35
D	Upper 25th to 50th percentile	10	No. 2, No. 17, No. 23, No. 31, No. 34, No. 36, No. 38, No. 39, No. 40, No. 41
E	Upper 50ht to 100th percentile (lower 50%)	4	No. 12, No. 14, No. 19, No. 37



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-18 Changes in concentration levels over the years at respective locations (Hamadori, Fukushima Prefecture: lake sediment)

		ocation			EV2010		EV2011 EV2019						
		ocauon		Minimum	1 12010		Minimum			Changes	Coefficient	Trends	
No.	Water	area	Location	value	value	Average	value	value	Average	Changes	of variation	(*3)	
		Tabat	Shinchi	4.500	4 000	4.755	400	0.000	0.450	ALLAN L	0.50	٨٨٨	
1	Soso (farm pond)	lakei	Town	1,530	1,890	1,755	129	6,300	2,452	M	0 58	////*	
2	(iann pond)	Uchizawa	Soma City	393	926	715	45	2,140	580	Muntur	0.71	$\wedge \wedge \uparrow$	
3	Matsugabo Dam	(Lake Utagawa)	Some City	5,890	8,150	6,958	3,600	59,000	15,994	home	0.72	/	
4	Mano Dam			25 100	55.400	36 270	42	90,000	31 073		0.52	~	
	Soso			23,100	33,400	30,210	72	30,000	51,015	V VVVI VMIN H	0.52		
5	(farm pond)	Ainosawa		2,640	55,400	21,347	334	103,000	27,502	Mundu	0 92	/\/\	
6	Ganbe Dam Rese	ervoir	litate Village	18,500	62,800	33,000	8,200	123,000	56,137	ma	0 53	\searrow	
7	Conc	Fugane Dam		3,930	14,300	9,460	1,930	41,000	15,066	1 Mahan	0 66	/	
	(farm pond)	Fanataga		2 100	10.050	6 7 4 7	204	20,200	4 205	11110111001	1.02	<u>×</u>	
•		Sasaloye		3,100	10,550	0,141	304	20,200	4,203	min	102	/ / / *	
9	Takanokura Dam	Reservoir		13,300	24,300	19,233	960	39,000	21,558	Murrow	0.41	~~~	
10	Yokokawa Dam R	eservoir		11,970	25,400	19,590	1,240	125,000	24,683	home	0 83	$\Lambda \Lambda \Lambda$	
11		Tarayachi	Minamisoma	3,300	5,400	3.808	420	20,500	3.866	L	0 93	ĺ	
42	-	Takashiyashi	City	22	50	42	0	1.240	400	MAL 1	0.00	/	
12	-	Takesniyachi		23	96	42	U	1,340	420	"Mulh_	0.88	7	
13		Ryugasaku		1,540	7,500	4,173	900	47,000	9,785	Whan	0 96	/	
14	Soso (farm pond)	Uwatashiro	Kawamata Town	0	346	195	0	5,100	596	1	1 83	/	
15	,	Koakuto	Namie Town	10,800	76,300	39,533	1,380	76,300	22,629	MA AM	0.98	AAA	
H	4			7.040	20,500	40.577	.,000	04,000	45,400	11	4.4-7	/ V V ¶	
16	4	Yosouchi	Intate Village	7,040	26,500	16,577	520	84,000	15,469	VImm	1.17	>	
17		Nyobusaku No. 2	Minamisoma City	740	2,600	1,600	294	14,000	3,240	Mann	0 90	/	
18	Ogaki Dam		Namie Town	6,760	121,000	48,562	740	260,000	32,761	1 when	1 38	AAA	
19		Llenokawa	Katsurao	120	494	275	114	21 200	1 544	1	2.24		
	4	CONTRACTOR	Village	150	404	215	114	21,200	1,044	h-	2 34		
20	Soso	Heigoiri	litate Village	21,000	40,400	32,950	1,910	58,800	22,953	LA_AM'	0.76	////	
21	(farm pond)	Mekurasawa No. 2		209	3,990	2,227	209	24,800	8,267	malle	0.72	\searrow	
22	1	Joroku	Namie Town	7,370	13,100	10,727	6,100	439,000	74,007	M	1 25	ΛΛĄ	
22	Eurumichigaun D	abigoup Doups Plant Dop		446	1 750	1 102	. 07	11,000	2 726	T1	1 10	<u> </u>	
25	r urumicnigawa P		Futaba	440	1,750	1,102	0/	11,000	2,720	1 mm	1.19		
24		Sawairi No. 1	Futaba Town Okuma Town	177,000	349,000	267,167	20,500	920,000	321,108	WWW.	0 63	////	
25	Soso(farm pond)	Suzunai No. 4		44,900	75,500	53,550	27,700	123,000	72,220	nmm	0 32	~~^	
26	1	Nishihaguro	Futaba	2.540	8.090	6.807	1.880	87.000	18,952	W	0 99	ĺ	
27	Cakaabita Dam		Iown	2,070	42,400	0.000	250	,	46.042	1	0.70	/	
21	Sakashita Dam		Okuma	2,070	12,100	9,230	300	09,000	10,013	Lyman	0.70		
28	Soso	Atamamori 2		217	8,390	5,305	54	13,300	3,938	munt	0 85	////	
29	(farm pond)	Yonomori	Tomioka Town	8,540	11,890	10,240	8,200	62,000	27,277	www. War	0 62	~	
30	Takikawa Dam		Kawauchi	2.080	6,150	3,584	630	110,000	12,752	Δ	1.42	ĺ	
24		Takinosaun	Village Tomioka		1 650		02	12 200	4 002	MAR	0.07	/	
31	Soso	Kamisigaoka	Town	99	1,000	414	92	13,200	4,002	1 mm	0.97		
32	(farm pond)	No. 1	Naraha	9,760	17,600	13,860	590	67,000	14,247	Juha	0 90	////	
33		Shimoshigeoka	Iown	3,520	5,510	4,632	650	77,000	9,364	hum	1 31	~	
34	Komachi Dam		Ono Town	368	1,190	885	142	8,200	2,278	M	0 81	<u> </u>	
25	Kido Dom			2.470	6.500	4.005	2000	40.700	0.507	1 ANMA .	0.50	/	
35	Soeo		Naraha Town	3,170	0,590	4,285	290	18,700	8,597	WIMW	0.56	1	
36	(farm pond)	Otsutsumi		763	1,420	1,131	763	19,300	4,201	hom	0 89	/	
37	waki (farm pond)	Shinike		19	197	135	18	1,780	278	Am	1.11	~	
38	Kodama Dam Re	servoir		344	1.960	1,170	213	4.000	1.558	furn an	0 58	<u> </u>	
20	(Lake Kodama) Iwaki	Kanoritsutsumi	hundri Olin	070	700	400		E 000	.,	11 1	4.24	<u> </u>	
39	(farm pond)	shita	Waki City	2/8	790	490	28	5,000	998	Mrhn	1 21	/∨\¥	
40	I akashiba Dam Reservoir (Lake Takashiba)			460	990	600	460	1,940	902	Under	0 37	\nearrow	
41	1 Shitoki Dam Reservoir			458	879	655	458	6,400	1,443	Ann	0 67	/	
	otal number of	1.782		0	349.000	17.453	0	920.000	21.927			creasing	
Ner	samples	1 700		*1 Detector	d values are	the total of	Cs-134 apr	Cs-137 (P	a/ka-dov)	1	Decreasing		
- Auto	and of detections	1,780	I	*2 Average	values are	arithmetic;	calculated b	y assuming	ND=0; Col	or codes show	//√ar :Flu	uctuations	
				*3 Results	according to	o 1) (i) sis of trende	s at respect	ive locations	using the r	method	~~ :Ur	nchanged	
explained in 1) (ii)									:≦	100 Bq/kg			
				А	В	С	D	E					

Table 4.1.2-25 Detection of radioactive cesium at respective locations

(Hamadori, Fukushima Prefecture: lake sediment)

ii. Nakadori

In Nakadori, Fukushima Prefecture, surveys were conducted 38 to 63 times from September 2011 to February 2019 for lake sediment samples collected at 12 locations.

Regarding the concentration levels of detected values, four locations were categorized as Category C, five locations as Category D, and three locations as Category E (see Table 4.1.2-26 and Table 4.1.2-27).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were not observed, while decreasing at six locations, unchanged at two locations, fluctuations at three locations, increasing at one location.

Table 4.1.2-26 Categorization of detected values at respective locations
(Nakadori, Fukushima Prefecture: lake sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations						
Α	Upper 5th percentile	0	(None)						
В	Upper 5th to 10th percentile	0	0 (None)						
С	Upper 10th to 25th percentile	4	No. 42, No. 47, No. 52, No. 53						
D	Upper 25th to 50th percentile	5	No. 43, No. 45, No. 49, No. 50, No. 51						
E	Upper 50th to 100th percentile (lower 50%)	3	No. 44, No. 46, No. 48						



Notes: For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

Figure 4.1.2-19 Changes in concentration levels over the years at respective locations (Nakadori, Fukushima Prefecture: lake sediment)

	Lo	cation			FY2018		FY	2011 - FY2	018			_		
No.	Water	area	Location	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)		
42	Surikamiga Reservoir	wa Dam	Fukushima City	1,520	2,420	1,772	104	4,800	2,540	WAMAM	0.43	~~~*		
43	Lake Handa (farm pond	anuma)	Kori Town	217	3,470	1,282	176	35,000	2,654	Manne	2.29	\swarrow		
44	44 Oike Pond (farm pond)		Motomiya City	62	569	365	62	5,700	1,063	When	1.13	\swarrow		
45	Miharu Dar	n	Miharu Town	701	1,530	1,126	0	7,500	2,401	Mhulumm	0.69			
46	46 Hounokusa (farm pond)		Koriyama City	11	116	42	0	4,000	675	M	1.72	\bigwedge		
47	47 Lake Hatori		Tenei Village	1,980	5,240	3,613	1,270	6 <mark>,640</mark>	3,193	-Mala	0.40	$\stackrel{\scriptstyle <}{\overset{\scriptstyle }{\overset{\scriptstyle }}}$		
48	48 Hirodaira (farm pond)		Sukagawa City	50	110	73	0	570	167	hum	0.77	$\bigwedge \!\! \bigwedge \!\! \bigwedge$		
49	49 Sengosawa Dam Reservoir		lshikawa Town	474	781	594	17	7,300	1,922	Man	0.85	\bigwedge		
50	Watariike P (farm pond	'ond)	Yabuki Town	1,004	1,420	1,225	17	4,100	1,062	Mon	0.74	~		
51	lzumikawa (farm pond)	Shirakawa City	111	2,530	1,199	111	14,200	2,198	Umrmm	1.34	\swarrow		
52	Hokkawa D	am	Nishigo Village	2,290	5,460	3,545	1,210	13,300	4,966	Murm	0.56	$\bigwedge \!\!\!\bigwedge$		
53	Lake Nanko	þ	Shirakawa City	2,310	3 <mark>,670</mark>	2,792	580	10,900	4,249	Impuh	0.64	$\bigwedge \bigwedge \bullet$		
Total number of samples 545			11	5,460	1,433	0	35,000	2,245		>7 : In ∖ : D	creasing ecreasing			
Number of detections 542]	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)								M : Fluctuations → :Unchanged _ :≦100 Bq/kg		
				А	В	С	D	Е						

Table 4.1.2-27 Detection of radioactive cesium at respective locations

(Nakadori, Fukushima Prefecture: lake sediment)

iii. Aizu

In Aizu, Fukushima Prefecture, surveys were conducted 28 to 68 times from September 2011 to February 2019 for lake sediment samples collected at 31 locations.

Regarding the concentration levels of detected values, seven locations were categorized as Category C, three locations were categorized as Category D and 21 locations were categorized as Category E (see Table 4.1.2-28 and Table 4.1.2-29).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 20% (five locations), while decreasing at six locations, unchanged at three locations, fluctuations at 11 locations, and increasing at six locations.

Table 4.1.2-28 Categorization of detected values at respective locations (Aizu, Fukushima Prefecture: lake sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations						
Α	Upper 5th percentile	0	(None)						
В	Upper 5th to 10th percentile	0	(None)						
С	Upper 10th to 25th percentile	7	No. 54, No. 55, No. 56, No. 57, No. 58, No. 59, No. 60						
D	Upper 25th to 50th percentile	3	No. 62, No. 74, No. 78						
E	Upper 50th to 100th percentile (lower 50%)	21	No. 61, No. 63, No. 64, No. 65, No. 66, No. 67, No. 68, No. 69, No. 70, No. 71, No. 72, No. 73, No. 75, No. 76, No. 77, No. 79, No. 80, No. 81, No. 82, No. 83, No. 84						



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

Figure 4.1.2-20 Changes in concentration levels over the years at respective locations (Aizu, Fukushima Prefecture: lake sediment)

No.					1 12010		1 1 2	2011-112	010			
		Water area		Minimum	Maximum	Average	Minimum	Maximum	Average	Changes	Coefficient of variation	Trends (*3)
54	Nicchu Dam		Kitakata City	1,410	2,090	1,790	43	3,280	1,524	malm	0.50	~~~
55	Lake Sohara			1,001	2,600	1,857	130	6,100	1,700	L.M.	0.70	~
56	Lake Hibara		Kitashiobara Village	2,840	5,810	4,000	192	8,400	2,554	manth	0.70	~
57	Lake Onogawa	I		761	4,950	2,981	57	5,370	1,721	month	0.81	~
58	Lake Akimoto		Inawashiro Town	3,300	7,610	5,309	177	15,400	3,284	-unertra	0.91	~
59	Lake Bishamor	inuma	Kitashiobara	1,770	6,510	3,380	0	13,400	2,488	there	1.04	\sim
60	Lake Oguninur	na	Village	2,270	5,500	4,023	198	10,200	3,029	Imm	0.69	\sim
61	Aizu (farm pond)	Lake Onuma	Nishiaizu Town	37	437	220	0	2,740	417	men	1.25	\sim
62		Center	Aizuwakamatsu City	160	962	439	0	1,260	275	manthey	0.90	~
63		Takahashi River Estuary		56	105	71	56	300	138	MM	0.49	1
64		Oguro River Estuary		33	56	46	33	245	90	Mun	0.49	
65		Tenjinhama Beach	Inawashiro Town	47	75	57	39	208	93	Marin	0.46	
66		Hishinuma River Estuary		13	29	19	12	108	40	more	0.63	
67	Lake	Intake of Asakasosui		56	134	104	56	440	170	malun	0.44	/
68	Inawashiro	Hamajihama Beach		75	130	104	75	242	162	www	0.26	1
69		Funatsu Port	Koriyama City	77	110	92	77	382	160	halan	0.42	/
70		Offshore of Funatsu River Estuary	Konyama City	13	28	21	13	800	92	Lum	1.42	
71		Seishogahama Beach		183	429	348	174	620	397	Wwwww	0.28	${\sim}$
72		Haragawa River Estuary	vizuwakamatsu Dity	47	370	161	45	2,560	464	homen	0.90	/
73		Koishigahama Floodgate	Inawashiro Town	95	339	207	22	389	204	MANNER	0.38	$\sim \sim$
74	Higashiyama D	am Reservoir	Aizuwakamatsu City	770	1,770	1,244	18	3,800	1,315	warder	0.71	\
75		Center		93	889	346	45	2,210	304	Intrus	1.45	\sim
76	Lake Numazawa	Midpoint between the center of the lake and off the estuary	Kaneyama Town	91	628	291	37	1,350	336	Unit	1.03	\sim
77		Offshore of Maenosawa River Estuary		43	230	134	15	430	135	~~~h	0.57	\sim
78	Aizu (farm pono	1)	Aizumisato Town	78	1,530	796	41	12,300	1,273	mh	1.85	\sim
79	Okawa Dam Re	eservoir	Aizuwakamatsu City	35	71	53	14	1,450	277	Mm	1.29	/
80	Tagokura Rese	ervoir	Tadami Town	200	324	268	90	1,290	395	him	0.68	\sim
81	Minamiaizu (farm pond)	Fukui		0	0	0	0	270	15	lun	3.18	
82	Tajima Dam Re	eservoir (Lake Funehana)	Minamiaizu Town	160	330	244	0	1,000	366	Mour	0.69	\sim
83	Okutadami Reservoir		Tadami Town	33	110	69	18	980	152	Lun	1.01	\sim
84	Lake Ozenuma		Hinoemata Village	86	1,040	404	0	1,380	288	white	1.15	$\wedge \wedge \wedge$
Т	Total number of 1,283 samples			0	7,610	979	0	15,400	764		🤊 : Inc	reasing
	Number of detections	1,248		*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)						∖⊴ :De ∭nr :Flu ~ns :Ur :≦	ecreasing uctuations uchanged 100 Bq/kg	

Table 4.1.2-29 Detection of radioactive cesium at respective locations

(Aizu, Fukushima Prefecture: lake sediment)

iii) Ibaraki Prefecture

In Ibaraki Prefecture, surveys were conducted 21 to 30 times from September 2011 to February 2019 for lake sediment samples collected at 19 locations.

Regarding the concentration levels of detected values, one location was categorized as Category C, four locations as Category D, and 14 locations as Category E (see Table 4.1.2-30 and Table 4.1.2-31).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 10% (two locations), while decreasing at 12 locations, unchanged at two locations, fluctuations at two locations, and increasing at one location.

Table 4.1.2-30 Categorization of detected values at respective locations
(Ibaraki Prefecture: lake sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	1	No. 13
D	Upper 25th to 50th percentile	4	No. 12, No. 14, No. 15, No. 16
E	Upper 50th to 100th percentile (lower 50%)	14	No. 1, No. 2, No. 3, No. 4, No. 5, No. 6, No. 7, No. 8, No. 9, No. 10, No. 11, No. 17, No. 18, No. 19



Figure 4.1.2-21 Changes in concentration levels over the years at respective locations (Ibaraki Prefecture: lake sediment)

		Loca ion			FY2018		FY	2011 - FY2	018				
No.	Wat	er area	Loca ion	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)	
1		Hiroura		58	71	65	54	320	126	V~	0.52	\swarrow	
2	Hinuma	Miyamae	Ibaraki Town	26	160	99	23	319	113	malin	0.62	\sim	
3		Oyazawa		110	441	272	110	810	441	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.34	\swarrow	
4		Offshore of Tamatsukuri	Namegata City	310	430	342	201	1,300	500	M	0.43	\swarrow	
5	Lake	Offshore of Kakeuma	Ami Town	74	132	98	62	610	200	Lunn	0.65	\swarrow	
6	Kasumigaura	Center	Miho Village	240	410	343	151	900	400	Mar	0.46	~~~▲	
7		Offshore of Aso	Inashiki City	70	80	76	70	330	135		0.42	\swarrow	
8	Lake	Offshore of Kamaya	Namegata City	200	260	245	90	1,000	391	Mm	0.43	\checkmark	
9	Kitaura	Jingu Bridge	Itako Citv	62	87	74	53	220	112	J.	0.34	\searrow	
10	Hitachitone	Lake Sotonasakaura	itako Oity	36	46	42	34	184	80	mm	0.45		
11	River	kisu	Kamisu City	43	60	49	43	290	97	~~~~	0.56		
12	Lake Ushikunuma	Center of Lake Ushikunuma	Ryugasaki City	166	595	479	166	1,840	783	Luny	0.41	\checkmark	
13	Mizunuma Dam		Kitaibaraki City	1,700	2,190	1,923	1,540	5,400	2,728	have	0.37	\checkmark	
14	Koyama Dam		Takahagi	563	1,590	874	220	1,750	830	MM	0.46	~~~*	
15	Hananuki Dam		City	530	969	662	530	2,730	1,397	hm	0.42	\checkmark	
16	Jyuou Dam	Center	Hitachi City	290	969	649	290	<mark>2,540</mark>	1,058	Mm	0.55	$\bigwedge \! \bigwedge \! \! \bigwedge$	
17	Ryuji Dam		Hitachiota City	230	490	318	0	1,110	537	M	0.56	\searrow	
18	Fujiigawa Dam		Shirosato Town	246	256	251	117	650	363	W~~_	0.36	\nearrow	
19	lida Dam		Kasama City	69	603	318	0	603	148	M	0.98	~	
Tota	al number of samples	525		26	2,190	378	0	5,400	514		>7 ∶Ino ∖ ;De	creasing ecreasing	
N	lumber of	523		*1 Detected	d values are	the total of	Cs-134 and calculated b	Cs-137 (Bo v assuming	q/kg-dry). ND=0: Colo	nr codes show	MA∳:FI	ANA : Fluctuations	
			I	categories *3 Results	according to of the analy	o 1) (i) sis of trends	s at respect	ive loca ions	using the r	nethod	~~• :Ur	100 Balka	
				explained in	n 1) (ii)		-		-		:≧	тоо вфид	
				А	В	С	D	E					

Table 4.1.2-31 Detection of radioactive cesium at respective locations

(Ibaraki Prefecture: lake sediment)

iv) Tochigi Prefecture

In Tochigi Prefecture, surveys were conducted 26 to 30 times from October 2011 to December 2018 for lake sediment samples collected at eight locations.

Regarding the concentration levels of detected values, four locations were categorized as Category D, and four locations as Category E (see Table 4.1.2-32 and Table 4.1.2-33).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were not observed, while decreasing at four locations, unchanged at one location, fluctuations at two locations, and increasing at one location.

Table 4.1.2-32 Categorization of detected values at respective locations

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	0	(None)
D	Upper 25th to 50th percentile	4	No. 1, No. 3, No. 6, No. 7
E	Upper 50th to 100th percentile (lower 50%)	4	No. 2, No. 4, No. 5, No. 8

(Tochigi Prefecture: lake sediment)





		Location				FY2018		FY	2011 - FY2	018			
No.	Water area	Loca ion	l	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	(*3)
1	Nakagawa	Miyama Dam Reservoir	Center	Nasushiobara	561	1,023	787	11	1,230	654	MM	0.50	V
2	River System	Shiobara Dam Reservoir	Center	City	84	413	213	84	2,700	756	Land	0.74	Ļ
3		Kawaji Dam Reservoir	Center		190	1,079	434	25	1,790	509	Muh	0.83	\gtrsim
4		kari Dam Reservoir	Center		61	150	107	61	8, 70 0	2,136	M	1.06	\mathbf{I}
5	Kinugawa River System	Kawamata Dam Reservoir	Center	Nikko City	38	85	70	0	370	167	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.66	\swarrow
6		Lake Yuno	Center		240	585	417	0	1,500	470	MAA	0.77	\gtrsim
7		Lake Chuzenji	Center		440	713	546	115	1,180	681	M	0.46	$\stackrel{\scriptstyle }{\overset{\scriptstyle }}$
8	Watarase River System	Watarase Reservoir	Center	Tochigi City	77	126	101	77	460	156	M	0.56	
Т	otal number of samples	228			38	1,079	334	0	8, 70 0	688		_≉ :lno	creasing
	Number of detections	226			*1 Detecter	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry).							
						2 Average values are an unneuc, calculated by assuming ND=0, Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)							
					А	В	С	D	Е				

Table 4.1.2-33 Detection of radioactive cesium at respective locations

(Tochigi Prefecture: lake sediment)

v) Gunma Prefecture

In Gunma Prefecture, surveys were conducted 24 to 30 times from November 2011 to December 2018 for lake sediment samples collected at 24 locations.

Regarding the concentration levels of detected values, one location was categorized as Category C, 11 locations as Category D, and 12 locations as Category E (see Table 4.1.2-34 and Table 4.1.2-35).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were not observed, while decreasing at 12 locations, unchanged at five locations, and fluctuations at seven locations.

Table 4.1.2-34 Categorization of detected values at respective locations (Gunma Prefecture: lake sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	1	No. 2
D	Upper 25th to 50th percentile	11	No. 1, No. 3, No. 5, No. 6, No. 7, No. 9, No. 10, No. 15, No. 17, No. 20, No. 22
E	Upper 50th to 100th percentile (lower 50%)	12	No. 4, No. 8, No. 11, No. 12, No. 13, No. 14, No. 16, No. 18, No. 19, No. 21, No. 23, No. 24





	Location				FY2018			FY2011 - FY2018					
No.	Water area	Location		Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)
1		Lake Okutone (Yagisawa Dam)	Center		635	998	870	635	2,260	1,120	Mun	0.35	\nearrow
2		Lake Naramata (Naramata Dam)	Center	Minakami Town	1,260	2,850	2,008	0	3,900	1,916	Mour	0.46	\sim
3		Lake Dogen (Sudagai Dam)	Center		432	761	583	409	1,490	651	man	0.35	
4		Lake Marunuma (Marunuma Dam)	Center	Katashina Village	110	470	240	0	540	189	Ann	0.73	$\wedge \! \wedge \! \wedge$
5	Tonegawa River	Lake Fujiwara (Fujiwara Dam)	Center	Minakami Town	893	938	925	548	4,600	1,451	W. m	0.62	\swarrow
6		Lake Tanbara (Tanbara Dam)	Center	Numata City	66	1,095	553	33	1,930	726	MAN	0.69	\sim
7		Lake Akaya (Aimata Dam)	Center	Minakami Town	808	1,220	943	750	3,800	1,732	Mm	0.50	\checkmark
8		Lake Sonohara (Sonohara Dam)	Center	Numata City	87	271	155	87	590	283	hm	0.46	\mathbb{Z}
9		Lake Akagionuma	Center	Maebashi City	43	1,840	1,081	43	5,100	1,373	mbry	0.66	\sim
10		Lake Okushima (Shimagawa Dam)	Center	Notono in Torra	1,085	1,340	1,202	380	4,570	1,389	Mm	0.73	$\wedge \! \wedge \! \wedge$
11	Agatsuma River Area	Lake Shimako (Nakanojo Dam)	Center	Nakanojo Town	339	449	402	94	1,350	478	Mm	0.69	\swarrow
12		Lake Tashiro (Kazawa Dam)	Center	Tsumagoi Village	300	485	403	110	1,420	706	Mr.	0.48	\backslash
13		Lake Haruna	Center	Takasaki City/Higashi- Agatsuma Town	110	690	393	0	1,440	344	m	0.87	$\wedge \! \wedge \! \wedge$
14		Lake Kirizumi (Kirizumi Dam)	Center		140	509	402	38	3,700	744	Am	1.04	
15		Lake Usui (Sakamoto Dam)	Center	Annaka City	588	738	687	215	4,100	1,374	M	0.75	\bigwedge
16	Karasu River	Lake Arafune (Dodairagawa Dam)	Center	Shimonita Town	85	421	270	37	840	469	M	0.47	~~~*
17		Lake Oshio (Oshio Dam)	Center	Tomioka City	275	601	446	196	1,170	548	m.	0.38	\sim
18		Lake Kanna (Shimokubo Dam)	Center	Fujioka City / Kamikawa Town	78	199	127	26	410	179	rhym	0.46	\sim
19		Lake Hebikami (Shiozawa Dam)	Center	Kanna Town	144	336	228	111	1,670	482	War	0.66	1
20	Watarase	Lake Kusaki (Kusaki Dam)	Center	Midori City	296	462	409	115	2,400	567	An	0.92	/
21	Area	Lake Umeda (Kiryugawa Dam)	Center	Kiryu City	18	337	150	0	1,420	480	MM	0.83	$\wedge \! \wedge \! \wedge$
22	Nakatsu River	Lake Nozori (Nozori Dam)	Center	Nakanojo Town	362	1,750	928	82	2,210	1,019	MM	0.59	$\wedge \! \wedge \! \wedge$
23	Watarase	Lake Jonuma	Center		230	690	407	230	720	486	NVml	0.33	~~~*
24	Area	Lake Tataranuma	Center	l atebayashi City	160	270	213	160	1,440	567	Win	0.65	/
т	otal number of samples	670			18	2,850	584	0	5,100	803		_7 :hn ∖	creasing
Number of detections 666					*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)							luctuations nchanged 100 Bq/kg	
A B C D E													

Table 4.1.2-35 Detection of radioactive cesium at respective locations

(Gunma Prefecture: lake sediment)

vi) Chiba Prefecture

In Chiba Prefecture, surveys were conducted 30 times from November 2011 to February 2019 for lake sediment samples collected at eight locations.

Regarding the concentration levels of detected values, one location was categorized as Category C, one location as Category D, and six locations as Category E (see Table 4.1.2-36 and Table 4.1.2-37).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were not observed, while decreasing at all eight locations.

Table 4.1.2-36 Categorization of detected values at respective locations
(Chiba Prefecture: lake sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10ht percentile	0	(None)
С	Upper 10th to 25th percentile	1	No. 4
D	Upper 25th to 50th percentile	1	No. 3
E	Upper 50th to 100th percentile (lower 50%)	6	No. 1, No. 2, No. 5, No. 6, No. 7, No. 8





		Location			FY2018		FY	2011 - FY2	018				
No.	I	∟ocation	Municipality	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)	
1		Fusashita	In mai Citu	339	400	361	283	1,090	575	\mathcal{N}	0.41	\swarrow	
2	Lake	Shimoteganuma Chuo	inzai Oity	268	439	373	197	1,350	468	W~~~~~	0.57	\swarrow	
3	Teganuma	Teganuma Chuo	Abiko City /	652	828	750	420	1,670	1,083	M	0.27	\swarrow	
4		Nedoshita	Kashiwa City	2,090	2,400	2,288	2,090	8,200	3,914	M~~~~	0.47	\swarrow	
5		Kita-Inbanuma Chuo	Inzai City / Narita City	240	341	296	151	910	424	Jun	0.41	\swarrow	
6	Lake	Ipponmatsushita	Inzai City	272	335	307	152	1,160	498	· m.	0.45	\swarrow	
7	Inbanuma	Lower area of Josuido water intake	Sakura City	370	419	391	251	1,250	621		0.41	\swarrow	
8		Asobashi Bridge	Yachiyo City	121	218	163	66	1,160	368	M	0.87	\swarrow	
Tot of	al number samples	240		121	2,400	616	66	8,200	994		_7 ∶Inci	reasing	
Number of detections 240				*1 Detecter	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry).								
				categories *3 Results explained in	categories according to 1) (i) *3 Results of he analysis of trends at respec ive locations using he me hod explained in 1) (ii)							<pre></pre>	
				A	В	С	D	Е					

Table 4.1.2-37 Detection of radioactive cesium at respective locations

(Chiba Prefecture: lake sediment)

2)-3 Coastal areas

i) Iwate Prefecture

In Iwate Prefecture, surveys were conducted 15 times from January 2012 to November 2018 for coastal area sediment samples collected at two locations (this analysis excludes the survey results from one location where the survey was conducted only in FY2011).

Regarding the concentration levels of detected values, both locations were categorized as Category E (see Table 4.1.2-38 and Table 4.1.2-39).

As for the trends of detected values, mean values were 100 Bq/kg or less including past years at both two locations.

Table 4.1.2-38 Categorization of detected values at respective locations

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	0	(None)
D	Upper 25th to 50th percentile	0	(None)
E	Upper 50th to 100th percentile (lower 50%)	2	No. 1, No. 2





Figure 4.1.2-25 Changes in concentration levels over the years at respective locations (Iwate Prefecture: coastal area sediment)

Table 4.1.2-39 Detection of radioactive	cesium at respective locations
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Loca	ation		FY2018		FY	2011 - FY2	018									
No.	Location	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)						
1	Ofunato Bay (A)	16	32	24	0	46	19	$\bigwedge \\ \land \\ $	0.79							
2	Hirota Bay	0	0	0	0	0	0		_							
Total number of samples	30	0	32	12.0	0	46	9.4		→ : Increasing → : Decreasing							
Number of detections	12	*1 Detecter	d values are	the total of	Cs-134 and	d Cs-137 (B	q/kg-dry).		///≹ :Fi ~~► :U	: Fluctuations : Unchanged						
*2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii)										100 Bq/kg						
		А	В	С	D	Е										

(Iwate Prefecture: coastal area sediment)

ii) Miyagi Prefecture

In Miyagi Prefecture, surveys were conducted 15 to 67 times from October 2011 to February 2019 for coastal area sediment samples collected at 12 locations (this analysis excludes the survey results from 28 locations where the survey was conducted only in FY2011).

Regarding the concentration levels of detected values, one location was categorized as Category A, one location as Category B, two locations as Category C, four locations as Category D, and four locations as Category E (see Table 4.1.2-40 and Table 4.1.2-41).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were approximately 60% (seven locations), while decreasing at three locations and fluctuations at two locations.

Table 4.1.2-40 Categorization of detected values at respective locations (Miyagi Prefecture: coastal area sediment)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	1	No. 8
В	Upper 5th to 10th percentile	1	No. 9
С	Upper 10th to 25th percentile	2	No. 2, No. 7
D	Upper 25th to 50th percentile	4	No. 1, No. 3, No. 6, No. 11
E	Upper 50th to 100th percentile (lower 50%)	4	No. 4, No. 5, No. 10, No. 12



Notes: 1) For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

2) Scales of the vertical axes differ in the left and right figures.

Figure 4.1.2-26 Changes in concentration levels over the years at respective locations (Miyagi Prefecture: coastal area sediment)

	Locatio	on		FY2018		FY	2011 - FY2	D18			
No.	Loca	ation	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)
1	Kesennuma Bay (B)	Offshore of Hachigasaki	67	87	76	0	191	81	Ann-	0 54	
2	Kesennuma Bay (C)	Offshore of Oshimakita	120	220	170	0	740	267	Am	0.66	\sim
3	All other neighboring sea areas	Oppa Bay (Jyusanhama Beach)	43	112	73	0	390	86	min	1 25	
4	Neighboring sea area of Ishinomaki (C)	Lake Mangokuura, M-6 (center)	20	29	25	0	145	54	phi-	0.63	
5	Neighboring sea area of Ishinomaki (B-3)	Offshore of Kitakami River Estuary	0	0	0	0	148	14		2.72	
6	Neighboring sea area of Ishinomaki (C)	Offshore of Naruse	16	41	29	0	205	75	Mm	0.73	
7	Matsushima Bay (B)	Nishihama Beach	110	282	153	110	830	280	Mun	0.61	/
8	Neighboring sea area of Sendai Port (A)	Naiko Inner Port, <mark>4</mark> -Nai	190	418	329	54	2,040	624	M	0.78	/
9	Neighboring sea area of Sendai Port (B)	Gamo-3	46	408	265	0	910	252	n.Mw	1 08	\sim
10	All other neighboring sea areas	ldo-5	0	0	0	0	140	17	M	2 01	
11	Offshore of Abukuma River Estuary		29	82	59	0	2,030	156	h	1.73	$\Big/$
12	Offshore of Tsuyagawa River Estuary		0	0	0	0	0	0		-	
	Total number of samples	382	0	418	97	0	2,040	165		in ⊱∕ بن	creasing
	Number of detections	306	*1 Detecte	d values are	the total of	Cs-134 and	I Cs-137 (B	q/kg-dry).		 MAr:Fl	uctua ions
			*2 Average values are ari hmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of he analysis of trends at respective locations using the method explained in 1) (ii)								100 Bq/kg
			А	В	С	D	Е				

Table 4.1.2-41 Detection of radioactive cesium at respective locations

(Miyagi Prefecture: coastal area sediment)

iii) Fukushima Prefecture

In Fukushima Prefecture, surveys were conducted 60 to 73 times from October 2011 to February 2019 for coastal area sediment samples collected at 15 locations (this analysis excludes the survey results from 11 locations where the survey was conducted only once in FY2011).

Regarding the concentration levels of detected values, one location was categorized as Category A, one location as Category B, two locations as Category C, five locations as Category D, and six locations as Category E (see Table 4.1.2-42 and Table 4.1.2-43).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were 40% (six locations), while decreasing at eight locations and fluctuations at one location.

Table 4.1.2-42 Categorization of detected values at respective I	ocations
(Fukushima Prefecture: coastal area sediment)	

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	1	No. 14
В	Upper 5th to 10th percentile	1	No. 9
С	Upper 10th to 25th percentile	2	No. 7, No. 8
D	Upper 25th to 50th percentile	5	No. 2, No. 4, No. 10, No. 11, No. 15
E	Upper 50th to 100th percentile (lower 50%)	6	No. 1, No. 3, No. 5, No. 6, No. 12, No. 13



Notes: For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

Figure 4.1.2-27 Changes in concentration levels over the years at respective locations (Fukushima Prefecture: coastal area sediment)

		ocation		EV2018		EV'	2011 - EV2	018		1	
No.		Location	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	Trends (*3)
1	Neighboring sea area of Soso	Approx. 2,000 m offshore of Tsurushihama Fishing Port	0	0	0	0	1,240	29	h	5.21	
2	Matsukawaura sea area	Around center of Fishing Right Area-1 in Matsukawaura sea area	0	110	36	0	2,950	186	mah	2.53	$\wedge \! \wedge \! \wedge$
3	Neighboring sea area of Soso	Approx. 2,000 m offshore of Manogawa River	0	77	19	0	300	30	Marchant	1.44	
4	Neighboring sea area of Haramachi	Approx. 1,000 m offshore of N iida River	27	187	70	0	610	104	Marna	1.11	\mathcal{I}
5	City	Approx. 1,000 m offshore of Ota River	0	31	14	0	81	27	Muhmu	0.60	
6		Approx. 1,000 m offshore of Odaka River	12	61	29	0	380	48	1 Junilande	1.20	
7	Neighboring sea	Approx. 2,000 m offshore of Ukedo River	67	369	149	12	1,240	236	Mulporn	0.87	\nearrow
8	area of Soso District	Approx. 1,000 m offshore of Kumagawa River	85	220	132	85	700	311	month	0.51	\nearrow
9		Approx. 1,000 m offshore of Tomioka River	122	320	245	122	1,600	397	Munda	0.55	\mathcal{I}
10	Neighboring sea area of Naraha Town	Approx. 1,000 m offshore of Kidogawa River	0	238	89	0	1,740	249	whatman	1.04	\mathcal{I}
11	Approx. 1,000 m offsh	ore of Asami River Estuary	42	73	56	41	1,110	203	M	1.06	\mathcal{I}
12	Approx. 1,000 m offsh	nore of Ohisa River Estuary	25	34	29	22	520	88	Wmm	1.05	
13	Neighboring sea area of Iwaki City	Approx. 1,500 m offshore of Natsui River	0	18	12	0	590	64	han	1.31	
14	Onahama Port	Approx. 400 m north of Nishibouhatei No. 2	248	437	323	156	830	449	WWWWW	0.30	\nearrow
15	Joban coastal sea area	Approx. 1,000 m offshore of Binda River	29	91	53	29	800	112	hamen	0.97	\nearrow
	Total number of samples	1,033	0	437	84	0	<mark>2,950</mark>	165		lnc: ∕⊇ :De	reasing creasing
N	umber of detections	952	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithme ic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of he analysis of trends at respec ive locations using the me hod explained in 1) (ii)								ictuations ichanged 100 Bq/kg
			А	В	С	D	Е				

Table 4.1.2-43 Detection of radioactive cesium at respective locations

(Fukushima Prefecture: coastal area sediment)

iv) Ibaraki Prefecture

In Ibaraki Prefecture, surveys were conducted 31 to 33 times from October 2011 to February 2019 for coastal area sediment samples collected at five locations (this analysis excludes the survey results from 18 locations where the survey was conducted only once in FY2011).

Regarding the concentration levels of detected values, one location was categorized as Category D and four locations as Category E (see Table 4.1.2-44 and Table 4.1.2-45).

As for the trends of detected values, mean values including past years were 100 Bq/kg or less at all the five locations.

Table 4.1.2-44 Categorization of detected values at respective locations

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	0	(None)
D	Upper 25th to 50th percentile	1	No. 1
E	Upper 50th to 100th percentile (lower 50%)	4	No. 2, No. 3, No. 4, No. 5

(Ibaraki Prefecture: coastal area sediment)



Notes: For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

Figure 4.1.2-28 Changes in concentration levels over the years at respective locations (Ibaraki Prefecture: coastal area sediment)

	Location		FY2018		FY	2011 - F Y 2	018			- ·		
No.	Location	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	(*3)		
1	Offshore of Satone River Estuary	0	170	63	0	170	39	m	0.84			
2	Offshore of Okita River Estuary	0	0	0	0	173	21		2.01			
3	Offshore of Momiya River/Kujigawa River Estuaries	0	43	14	0	230	40	Innha	1.35			
4	Neighboring water body of Ken- o Offshore of Nakagawa River	0	0	0	0	14	1.4	11	2.76			
5	Offshore of Tonegawa River Estuary	0	0	0	0	25	2.3	V	2.84			
Total number of samples	161	0	170	15	0	230	20		>7 : Ine >1 : De	creasing ecreasing		
Number of detections	76	*1 Detected	d values are	the total of	Cs-134 and	l Cs-137 (Be	q/kg-dry).		///∤r:Fli ~~≽:Un	NM : Fluctuations ∧→ : Unchanged		
		*2 Average categories *3 Results explained in	 *2 Average values are anthmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method explained in 1) (ii) 									
		А	В	С	D	Е						

Table 4.1.2-45 Detection of radioactive cesium at respective locations (Ibaraki Prefecture: coastal area sediment)

v) Chiba Prefecture and Tokyo Metropolis

т

In Chiba Prefecture and Tokyo Metropolis, surveys were conducted 29 to 50 times from May 2012 to February 2019 for coastal area sediment samples collected at eight locations in total.

Regarding the concentration levels of detected values, two locations were categorized as Category C, one location was categorized as Category D and five locations were categorized as Category E (see Table 4.1.2-46 and Table 4.1.2-47).

As for the trends of detected values, locations with mean values of 100 Bq/kg or less, including past years, were 75% (six locations), while decreasing at the two remaining locations.

Table 4.1.2-46 Categorization of detected values at respective locations										
(Chiba Prefecture	and Tokyo Metropolis: coastal area sediment)									
Percentile	Number of									

Category	Percentile (percentile in all detected values)	Number of locations	Locations
Α	Upper 5th percentile	0	(None)
В	Upper 5th to 10th percentile	0	(None)
С	Upper 10th to 25th percentile	2	No. 6, No. 7
D	Upper 25th to 50th percentile	1	No. 8
E	Upper 50th to 100th percentile (lower 50%)	5	No. 1, No. 2, No. 3, No. 4, No. 5



Notes: For locations where surveys were conducted multiple times in one month, their average value is used in the figures.

Figure 4.1.2-29 Changes in concentration levels over the years at respective locations (Chiba Prefecture and Tokyo Metropolis: coastal area sediment)

Table 4.1.2-47 Detection of radioactive cesium at respective locations

(Chiba Prefecture and Tokyo Metropolis: coastal area sediment)

	Location			FY2018			FY.	2011 - FY2	018		Confficient	Trends
No.	Prefecture	Lo	cation	Minimum value	Maximum value	Average	Minimum value	Maximum value	Average	Changes	Coefficient of variation	(*3)
1		Tokyo Bay 7	Offshore of Yorogawa River Estuary	0	0	0	0	21	3.3	M	1.88	
2		Tokyo Bay 5	Offshore of Miyako River Estuary	0	0	0	0	59	15	L	0.87	
3	Chiba Prefecture	Coastal sea area of Makuhari	Offshore of Inbanuma Discharge Channel	0	37	20	0	71	20	Monthy	0.81	
4		Approx. 1 km offshore of Ebigawa River Estuary	Constal area of Kaina Bart	0	11	2.8	0	134	7.4	L	3.50	
5		Approx. 1 km offshore of Edogawa River Estuary	Coastal area of Kelyo Port	0	24	6.0	0	315	30	mha	2.07	
6		Approx. 1 km offshore of Kyu-Edogawa River Estuary	Offshore of Kyu-Edogawa River Estuary	130	232	177	0	780	311	Myron	0.58	/
7	Tokyo Metropolis	St-8	Offshore of Arakawa River / Kyu-Edogawa River Estuaries	91	110	101	91	490	246	myner m	0.45	1
8		Southwestern area of Toyosu Wharf	Offshore of Sumida River Estuary	61	120	80	0	129	65	MM	0.59	
Tot of	al number samples	296		0	232	59	0	780	105		/7 :ln ∕> :D	creasing ecreasing
N de	umber of etections	212	*1 Detected values are the total of Cs-134 and Cs-137 (Bq/kg-dry). *2 Average values are arithmetic; calculated by assuming ND=0; Color codes show categories according to 1) (i) *3 Results of the analysis of trends at respective locations using the method									
			explained in 1) (ii)									
				А	В	С	D	Е				

2)-4 Conclusion

The concentration levels of detected values for sediment samples from public water areas (rivers, lakes, and coastal areas) from FY2011 to FY2018 and their changes shown so far are summarized as follows (see Figure 4.1.2-30 and Table 4.1.2-48).

i) Concentration levels of detected values

Rivers

Out of all surveyed locations (396 locations), the locations categorized as Categories A or B, which fall under the upper 10%, were found in Miyagi Prefecture, Nakadori and Aizu in Fukushima Prefecture, Ibaraki Prefecture, Gunma Prefecture and Chiba Prefecture, as well as in Hamadori in Fukushima Prefecture.

Lakes

Out of all surveyed locations (164 locations), locations categorized as Category A or B were found in Hamadori in Fukushima Prefecture.

Coastal areas

Out of all surveyed locations (42 locations), locations categorized as Category A or B were found in Miyagi and Fukushima Prefectures.





(* Figure 4.1.2-30 shows the aforementioned Table 3.1-1 graphically.)

ii) Changes in detected values

• Rivers

The average values including past years were 100 Bq/kg or less at approximately a half of the locations, while a decreasing trend was observed at over 90% of the remaining locations.

Lakes

The average values including past years were 100 Bq/kg or less at 10% of the monitoring locations. For the remaining locations, fluctuations were observed at approximately 30% of them and decreasing or an unchanged trend was observed at approximately 70% of them.

Coastal areas

The average values including past years were 100 Bq/kg or less at approximately 60% of the locations, while a decreasing trend was observed at over 80% of the remaining locations.

Table 4.1.2-48 Changes in detected values for sediment samples from public water areas (rivers, lakes, and coastal areas)

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locations
 | Percentage | |
| ≦100 Bq/kg | 17 | 19

 | 11
 | 16

 | 17

 | 12 | 45
 | 43 | 4 | 1 | 0 | 185
 | 46.7 | |
| Decreasing | 5 | 21

 | 40
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 | 8

 | 40 | 11
 | 4 | 40 | 1 | 2 | 199
 | 50.3 | |
| Unchanged | 0 | 0

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 | 0.0 | |
| Fluctuations | 0 | 3

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 | 1 | 3 | 0 | 0 | 11
 | 2.8 | |
| Increasing | 0 | 0

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 | 0 | 0 | 0 | 0 | 1
 | 0.3 | |
| Total | 22 | 43

 | 53
 | 44

 | 26

 | 53 | 56
 | 48 | 47 | 2 | 2 | 396
 | 100.0 | |
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locations | Percenta | ge |
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| ≦100 Bq/kg | 2 | 0

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 | | |
| Decreasing | 15 | 25

 | 6
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 | 4 | 12
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| Unchanged | 2 | 2

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 | 1 | 5
 | 0 | 17 | 10.4 | |
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| Fluctuations | 2 | 13

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| Total | 21 | 41

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| Unchanged | 0 | 0

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 | 7. | 1 | | |
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| Increasing | 0 | 0

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 | | |
| Total | 2 | 12

 | 15
 | 5

 | 5

 | 3 | 42
 | 100 | 0.0 | | | | | | | | | | | | | |
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(*) "100 Bq/kg or less" shows the average values including past years was 100 Bq/kg or less.

iii) Summary by prefecture

Concentration levels of detected values and their changes are summarized by prefecture as follows (see Figures 4.1.2-31 to 4.1.2-33).

i. Iwate Prefecture

- For rivers, all the 22 surveyed locations were categorized as either Category D or E. The average values including past years were 100 Bq/kg or less at approximately 80% of the locations. For all the remaining locations, a decreasing trend was observed.
- For coastal areas, the two surveyed locations were both categorized as Category E. The average values including past years were 100 Bq/kg or less at both locations.
- ii. Miyagi Prefecture
 - For rivers, of the 43 surveyed locations, a number of locations in the lower reaches were categorized as Category B or C, while approximately 80% of the surveyed locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at approximately 40% of the locations. For the remaining locations, a decreasing trend was observed at approximately 90% of the locations.
 - For lakes, of the 21 surveyed locations, all locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at approximately 10% of the locations. For the remaining locations, a decreasing trend was observed at approximately 80% of the locations.
 - For coastal areas, approximately 70% of the 12 surveyed locations were categorized as Category D or E, rest of them were categorized as Category A, B or C. One location categorized as Category A was seen in Sendai Port. The average values including past years were 100 Bq/kg or less at approximately 60% of the locations. For the remaining locations, a decreasing trend was observed at approximately 60% of the locations, while fluctuations were observed at 40% of them.
- iii. Hamadori, Fukushima Prefecture
 - For rivers, approximately 50% of the 53 surveyed locations were categorized as Category A, B or C. Many locations categorized as Category A or B were found near or between the north-northwest side of Fukushima Daiichi NPS, while locations categorized as Category C were seen in the southern parts of the district. The average values including past years were 100 Bq/kg or less at approximately 20% of the locations. For the remaining locations, a decreasing trend was observed at over 90% of the locations.
 - For lakes, approximately 70% of the 41 surveyed locations were categorized as Category A, B or C. Many locations categorized as Category A or B were found northwest of Fukushima Daiichi NPS. A decreasing trend was observed at approximately 60% of the locations, while fluctuations were observed at approximately 30% of them.
 - For coastal areas, approximately 70% of the 15 surveyed locations were categorized as Category D or E, while the remaining locations were categorized as Category A, B, or C. One location categorized as Category A was seen in Onahama Port. The average values including past years were 100 Bq/kg or less at 40% of the locations. For the remaining locations, a decreasing trend was observed at approximately 90% of the locations.
- iv. Nakadori, Fukushima Prefecture
 - For rivers, more than 70% of the 44 surveyed locations were categorized as Category D or E, and the rest

were categorized as Category B or C. Many locations categorized as Category B or C were found between the center and the northern part of the Abukuma River system. The average values including past years were 100 Bq/kg or less at approximately 40% of the locations. For the remaining locations, a decreasing trend was observed at over 90% of the locations.

 For lakes, eight of the 12 surveyed locations were categorized as Category D or E, and the remaining four locations were categorized as Category C. The locations categorized as Category C were seen in the upper and lower reaches of the Abukuma River basin. A decreasing or an unchanged trend was observed at approximately 70% of the locations, while 25 % of them showed fluctuations.

v. Aizu, Fukushima Prefecture

- For rivers, two of the 26 surveyed locations were categorized as Category B or C, and all the remaining locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at approximately 70% of the locations, while a decreasing trend was observed at approximately 90% of the remaining locations.
- For lakes, seven of the 31 surveyed locations were categorized as Category C, and approximately 80% of the locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at approximately 20% of the locations. For the remaining locations, concentration levels were fluctuating at approximately 40% of the locations, while the remaining locations showed a variation of trends.

vi. Ibaraki Prefecture

- For rivers, approximately 70% of the 53 surveyed locations were categorized as Category D or E, while the remaining were categorized as Category A, B, or C. The locations categorized as Category A or B were found in rivers flowing into Lake Kasumigaura. The average values including past years were 100 Bq/kg or less at approximately 20% of the locations. For the remaining locations, a decreasing trend was observed at over 90% of the locations.
- For lakes, out of the 19 surveyed locations, one in the northern part of the prefecture was categorized as Category C, and the other locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at approximately 10% of the locations. For the remaining locations, a decreasing trend was observed at approximately 70% of the locations.
- For coastal areas, all the five surveyed locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at all locations.

vii. Tochigi Prefecture

- For rivers, one of the 56 surveyed locations was categorized as Category C, and the remaining locations were all categorized as Category D or E. The average values including past years were 100 Bq/kg or less at approximately 80% of the locations, while a decreasing trend was observed at all the remaining locations.
- For lakes, all the eight locations were categorized as Category D or E. Concentration levels showed fluctuations at 25% of the locations, and approximately 60% of the locations showed a decreasing or an unchanged trend.

viii. Gunma Prefecture

• For rivers, out of the 48 surveyed locations, one location in the lower reaches of the Watarase River basin

was categorized as Category B, and all the remaining locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at approximately 90% of the locations, while a decreasing trend was observed at 80% of the remaining locations.

- For lakes, one of the 24 surveyed locations was categorized as Category C, and the remaining locations were all categorized as Category D or E. Although approximately 30% of the locations showed fluctuations, a decreasing or an unchanged trend was observed at approximately 70% of the locations.
- ix. Chiba and Saitama Prefectures and Tokyo Metropolis
 - For rivers, over 60% of the 51 surveyed locations were categorized as Category A, B, or C. The locations categorized as Category A or B were found in rivers flowing into Lake Teganuma or Lake Inbanuma, the Edogawa River system and a part of the Tonegawa River system. The average values including past years were 100 Bq/kg or less at approximately 10% of the locations, while a decreasing trend was observed at over 90% of the remaining locations.
 - For lakes, one of the eight surveyed locations, in Lake Teganuma, was categorized as Category C, and all the remaining locations were categorized as Category D or E. A decreasing trend was observed at all the locations.
 - For coastal areas, two of the eight surveyed locations, at the mouth of the Kyuedogawa River, were categorized as Category C, and all the remaining locations were categorized as Category D or E. The average values including past years were 100 Bq/kg or less at 75% of the locations, while a decreasing trend was observed at all the remaining locations.



Figure 4.1.2-31 Categorization of and changes in concentration levels for river sediment samples from public water areas

- (*1) Categories A to E show relative concentration levels for river sediment samples and cannot be compared with those for lake sediment samples or coastal area sediment samples.
- (*2) "100 Bq/kg or less" shows the average values including past years was 100 Bq/kg or less.



Figure 4.1.2-32 Categorization of and changes in concentration levels for lake sediment samples from public water areas

- (*1) Categories A to E show relative concentration levels for lake sediment samples and cannot be compared with those for river sediment samples or coastal area sediment samples.
- (*2) "100 Bq/kg or less" shows the average values including past years was 100 Bq/kg or less.


Figure 4.1.2-33 Categorization of and changes in concentration levels for coastal area sediment samples from public water areas

- (*1) Categories A to E show relative concentration levels for coastal area sediment samples and cannot be compared with those for river sediment samples or lake sediment samples.
- (*2) "100 Bq/kg or less" shows the average values including past years was 100 Bq/kg or less.

4.2 Results (Radionuclides other than radioactive cesium)

4.2-1 Radioactive strontium (Sr-90 and Sr-89)

(1) Public water areas

In principle, radioactive strontium was measured at locations where the radioactive cesium concentration in the sediment was high. (detection limit: approx.1 Bq/kg for Sr-90 and approx. 2 Bq/kg for Sr-89, both for sediment samples).

From FY2016, Sr-90 was surveyed (detection limit: approx. 1 Bq/L for Sr-90 for water samples) for the water samples collected on the same day from the same public water area (lakes) sediment samples where Sr-90 concentration levels were relatively high (1.0 Bq/kg or more in FY2016 and 10 Bq/kg or more in FY2017 and thereafter). On the other hand, a survey was conducted for Sr-89 on 22 samples (13 river sediment samples and nine lake sediment samples) in FY2011, Sr-89 was not detectable in any of them, and the survey has not been conducted since FY2012.

1) Sediment

i) River sediment

Sr-90 was detected at 10 out of 19 river sediment samples surveyed in FY2018 (detection rate: 52.6%). Detected value was approximately 1 Bq/kg for each (see Table 4.2-1).

Sr-90 had been continuously detected at some locations in the Ota River and Ukedo River in Fukushima Prefecture, but the detected values have gradually decreased to fall below 2 Bq/kg from FY2014 on (see Figure 4.2-1).

ii) Lake sediment

In FY2018, 66 lake sediment samples were surveyed for Sr-90; Sr-90 was detected at 65 samples (detection rate: 98.5%) (see Table 4.2-1).

Sr-90 has been continuously detected until FY2018 in each prefecture surveyed.

When reviewed location by location, detected values have basically been at relatively low levels, and the range of measured values in FY2018 was from not detectable to 17 Bq/kg (see Figure 4.2-1).

iii) Coastal area sediment

In FY2018, 32 coastal area sediment samples were surveyed; Sr-90 was not detectable in any of them (see Table 4.2-1).

2) Water

Surveys for Sr-90 on three samples collected from water areas (lakes) were conducted in FY2018. Sr-90 was not detectable at any surveyed locations even in measurements at the lower limit values (0.037 to 0.039 Bq/L) which were even lower than 1 Bq/L.

	Prefecture			FY2018		FY2011 - FY2018			
Property		Number of samples	Number of detections	Detection rate (%)	Range of measured values [Bq/kg]	Number of samples	Number of detections	Detection rate (%)	Range of measured values [Bq/kg]
	Miyagi	2	2	100.0	0.38 - 0.62	26	13	50.0	ND - 1.2
	Fukushima	6	2	33.3	ND - 0.44	98	53	54.1	ND - 12
	Ibaraki	4	3	75.0	ND - 1.1	33	18	54.5	ND - 1.8
Rivers	Tochigi	N/A	N/A	N/A	N/A	8	3	37.5	ND - 1.3
	Gunma	N/A	N/A	N/A	N/A	6	2	33.3	ND - 0.70
	Chiba	7	3	42.9	ND - 0.41	40	17	42.5	ND - 1.1
	Total	19	10	52.6	ND - 1.1	211	106	50.2	ND - 12
	Miyagi	5	5	100.0	0.57 - 1.2	43	38	88.4	ND - 2.2
	Fukushima	37	37	100.0	1.0 - 17	273	272	99.6	ND - 150
	Ibaraki	7	6	85.7	ND - 2.3	46	37	80.4	ND - 7.0
Lakes	Tochigi	4	4	100.0	0.45 - 0.86	16	15	93.8	ND - 2.2
	Gunma	9	9	100.0	0.49 - 1.8	48	47	97.9	ND - 2.6
	Chiba	4	4	100.0	0.51 - 0.69	27	21	77.8	ND - 4.4
	Total	66	65	98.5	ND - 17	453	430	94.9	ND - 150
Coastal areas	Miyagi	2	0	0.0	ND	16	0	0.0	ND
	Fukushima	30	0	0.0	ND	201	8	4.0	ND - 0.78
	Tokyo	N/A	N/A	N/A	N/A	2	0	0.0	ND
	Total	32	0	0.0	ND	219	8	3.7	ND - 0.78

Table 4.2-1 Detection of Sr-90 in sediment samples from public water areas (rivers, lakes, and coastal

areas)





Figure 4.2-1 Detection of Sr-90 in sediment samples from public water areas (upper: rivers; lower: lakes)

(2) Groundwater

Surveys for Sr-89 and Sr-90 were conducted on 385 groundwater samples collected in Fukushima Prefecture between January 2012 and November 2018.

An outline of these survey results is as shown in Table 4.2-2. Detected values of Sr-89 and Sr-90 were all below the detection limit (1 Bq/L).

Table 4.2-2 Detection of Sr-89 and Sr-9	0 in groundwater samples	(all collected in Fukushima	Prefecture)
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Year			Sr-90		Sr-89			
	Number	Number	Detection	Range of	Number	Number	Detection	Range of
(FY)	of	of	rate	measured values	of	of	rate	measured values
	samples	detections	(%)	(Bq/L) (*1)	samples	detections	(%)	(Bq/L) (*1)
FY2011	8	0	0.0	ND	8	0	0.0	ND
FY2012	60	0	0.0	ND	60	0	0.0	ND
FY2013	77	0	0.0	ND	77	0	0.0	ND
FY2014	48	0	0.0	ND	48	0	0.0	ND
FY2015	48	0	0.0	ND	48	0	0.0	ND
FY2016	48	0	0.0	ND	48	0	0.0	ND
FY2017	48	0	0.0	ND	48	0	0.0	ND
FY2018	48	0	0.0	ND	48	0	0.0	ND
Total	385	0	0.0	ND	385	0	0.0	ND

*1: Results were compiled by setting the detection limit at 1 Bq/L.

Additionally, the detection limit of Sr-90 was 0.0002 Bq/L in FY2011, and 1 Bq/L thereafter, and similarly, the detection limit of Sr-89 was 0.001 Bq/L in FY2011, and 1 Bq/L thereafter.

In FY2011 survey (calendar year 2012), Sr-90 was detected in all eight samples, with detected values ranging from 0.0004 to 0.0029 Bq/L. Similarly, while the detection limit for Sr-89 was 0.001 Bq/L in FY2011 (calendar year 2012), Sr-89 in all eight samples was below the detection limit.

4.2-2 Other γ-ray emitting radionuclides

Apart from the aforementioned radionuclides (Cs-134, Cs-137, Sr-89 and Sr-90), measurement results for water samples and sediment samples using a germanium semiconductor detector were analyzed from FY2011 to FY2018 to obtain activity concentrations of accident-derived radionuclides (Ag-110m, Te-129m, Nb-95, Sb-125 and Ce-144, etc.¹²) and major naturally occurring radionuclides such as K-40. The summary of the results is as shown in Table 4.2-3 and Table 4.2-4.

Among the detected radionuclides, no artificial radionuclides were detected in water samples for FY2011 and FY2012, while two types of radionuclides, Ag-110m and Sb-125, were detected in sediment samples with detection rates of 1% or less. Since FY2013, neither radionuclide has been detected.

Although six naturally occurring radionuclides (K-40, Pb-212, Pb-214, Tl-208, Ac-228 and Bi-214) were detected, K-40 is a naturally occurring radionuclide entrained during the Earth's formation, while other species are all either uranium series or thorium series radionuclides, which are widely distributed in nature including the Earth's crust.

Veer (EV)	Number	Major dete	cted artificial radionuclide	Major detected naturally occurring radionuclide		
rear (FT)	of samples	Nuclide	Detection rate and detected values	Nuclide	Detection rate	
FY2011	1,755	-	-	K-40	10%	
FY2012	3,518	-	-	K-40	6%	
FY2013	3,860	-	-	K-40	13%	
FY2014	3,856	-	-	K-40	10%	
	3,916	-	-	K-40	7%	
FY2015				Pb-212	7%	
				Pb-214	9%	
	3,890	-	-	K-40	8%	
FY2016				Pb-212	17%	
				Pb-214	10%	
EV2017	3,836	-		K-40	7%	
			-	Pb-214	8%	
EV2019	3,936	-	-	K-40	8%	
F12010				Pb-214	7%	

Table 4.2-3 Detection of other radionuclides (Water)

¹² Among the accident-derived radionuclides, I-131 was investigated in water samples from public water areas (3,111 river water samples, 1,416 lake water samples, and 715 coastal area water samples) and sediment samples (3,073 river sediment sample, 877 lake sediment samples, and 393 coastal area sediment samples) from FY 2011 to FY 2012, and in groundwater samples (3,793 samples) from FY 2011 to FY 2014. In none of these samples was I-131 detected (detection limit values: 1 Bq/L for water and 10 Bq/kg for sediment).

			i - Cristal de Para de la	Major detected naturally		
	Number	Major detecte	a artificial radionuciide	occurring radionuclide		
Year (FY)	of samples	Nuclide	Detection rate and detected values	Nuclide	Detection rate	
				K-40	79%	
EV2011	1 550	Ag-110m	4 samples (0.26%)	Pb-212	41%	
FIZUII	1,559	Ag-110m	46 - 170 Ba/ka	Pb-214	16%	
				TI-208	14%	
			26 samples (0.00%)	Ac-228	41%	
		Ag-110m	20 samples (0.90 %)	Bi-214	43%	
EV2012	2 885	_	7.9 - 350 Bq/kg	K-40	97%	
112012	2,005		3 samples (0.10%)	Pb-212	75%	
		Sb-125	3 samples (0.10%)	Pb-214	44%	
			140 - 420 Bq/kg	TI-208	39%	
				Ac-228	25%	
				Bi-214	25%	
EV2012	3 062			K-40	91%	
F12013	3,002	-	-	Pb-212	49%	
				Pb-214	23%	
				TI-208	23%	
				Ac-228	24%	
				Bi-214	24%	
EV2014	3,035	-	-	K-40	91%	
F12014				Pb-212	48%	
				Pb-214	24%	
				TI-208	24%	
	3,158	-	-	Ac-228	32%	
				Bi-214	60%	
EV2015				K-40	88%	
112013				Pb-212	63%	
				Pb-214	67%	
				TI-208	37%	
				Ac-228	35%	
FY2016	3,088	-		Bi-214	66%	
				K-40	92%	
			-	Pb-212	64%	
				Pb-214	75%	
				TI-208	40%	
	3,056	-	-	Ac-228	45%	
FY2017				Bi-214	35%	
				K-40	92%	
				Pb-212	73%	
				Pb-214	80%	
				TI-208	46%	
				Ac-228	41%	
			-	Bi-214	37%	
EV2018	3,128			K-40	93%	
112010		-		Pb-212	71%	
				Pb-214	83%	
				TI-208	44%	

Table 4.2-4 Detection of other radionuclides (Sediment)

Note: Detection limits of artificial radionuclides (detected radionuclides): 7 - 180 Bq/kg for Ag-110m, and 130 - 330 Bq/kg for Sb-125