

FY2016  
Results of the Radioactive Material Monitoring in the Water Environment

March 2018  
Ministry of the Environment



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Note: ND stands for “Not detectable” in this report.

# Outline

Following is an outline of the results of monitoring for radioactive material carried out in FY2016 based on the Water Pollution Control Act. Monitoring locations are as shown in Figure 1 and Figure 2.

## 1. National Radioactive Material Monitoring in the Water Environment in the Whole of Japan (FY2016)

- Monitoring commenced in FY2014 at 110 public water areas and groundwater locations in 47 prefectures in Japan for the purpose of clarifying the distribution of radioactive materials in those areas nationwide (hereinafter referred to as "Nationwide Monitoring").
- The total  $\beta$  radioactivity and the detected  $\gamma$ -ray emitting nuclides were within past measurement trends<sup>1</sup>. Detection limits differ by nuclide and sampling location, but overall were around 0.001 to 0.1 Bq/L in water and around 1 to 100 Bq/kg in sediments<sup>2</sup>. ("Bq/kg" of sediment indicates "dried sediment" in this report, and the same shall apply to Radioactive Material Monitoring performed in Fukushima prefecture and the surrounding areas, and other national radioactive material monitorings performed.).
- There were locations where the value of K-40 and total  $\beta$  radioactivity were elevated in both public water areas and groundwater, but these levels were thought to have been influenced by seawater or soil / rocks.
- As for other naturally occurring radionuclides, Pb-212 was detected in higher concentrations at some locations for groundwater than in past results. Pb-212 is in the thorium series, and generally occurs naturally in soil / rocks.
- At some public water area monitoring locations, the artificial radionuclides Cs-134 and Cs-137 were detected exceeding their detection limits, but their values were within the past measurement trends.
- It is appropriate to continue this monitoring the following fiscal year onward in order to clarify the distribution of radioactive materials in the water environment.

## 2. Radioactive Material Monitoring in the Water Environment in and around Fukushima Prefecture (FY2016)

- In response to the accident at the Tokyo Electric Power Company's Fukushima Daiichi NPS (hereinafter referred to as the "Fukushima NPS Accident"), monitoring has been conducted continuously since August 2011 at around 600 locations for public water areas and around 400 locations for groundwater in and around Fukushima prefecture for the purpose of clarifying the distribution of the accident-derived radioactive materials in the water environment (hereinafter referred to as "Post-Earthquake Monitoring").
- A summary of the radioactive cesium measurement results after the commencement of the FY2016 monitoring is as follows.

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<sup>1</sup> "Within the past measurement trends" means that the results of the latest monitoring survey are evaluated from a technical perspective as not displaying extreme deviation from the results of past similar monitoring surveys.

<sup>2</sup> See Table 3.1-1, Table 3.1-2, and Table 3.1-3 in Part 1 of this report for the details of the detection limits.

<Public water areas>

1) Water (detection limit: 1 Bq/L for both Cs-134 and Cs-137)

- At most locations, radioactive cesium was not detectable, although several locations showed a positive result for these radionuclide.

2) Sediments (detection limit: 10 Bq/kg for both Cs-134 and Cs-137)

[Rivers]

- Overall, the levels of both Cs-134 and Cs-137 were 200 Bq/kg or less at most locations, though they were detected in relatively higher levels at some limited locations, such as those within 20 km of Tokyo Electric Power's Fukushima Daiichi Nuclear Power Plant. Changes in activity concentrations were observed as a decreasing trend at most locations.

[Lakes]

- Overall, the levels of both Cs-134 and Cs-137 were 3,000 Bq/kg or less at most locations, though they were detected in relatively high levels at some limited locations, such as those within 20 km of the power plant. Activity concentrations were observed to be decreasing or unchanged, except for some locations which showed fluctuations.

[Coastal areas]

- Overall, the levels of both Cs-134 and Cs-137 were 200 Bq/kg or less at most locations. Changes in activity concentrations were observed generally as decreasing or unchanged at most locations except for several locations that showed fluctuations.

< Groundwater >

- Radioactive cesium was not detected in groundwater at any surveyed locations in FY2016 (detection limit: 1 Bq/L for both Cs-134 and Cs-137).

○ The results concerning radionuclides other than radioactive cesium were as follows.

•Sr-89: Was not detected at any surveyed groundwater locations.

•Sr-90: Was detected in collected sediments at several public water area locations, but basically remained at relatively low levels; was not detectable at any surveyed groundwater locations.

○ Measured activity concentrations have fluctuated at some locations. There is a possibility that this is due to the effects of the Fukushima nuclear accident, but the fluctuations could also be due slight differences in sampling locations and the properties of individual samples. Therefore, it is appropriate to continue this monitoring on an ongoing basis over the following fiscal years.

### 3. Other Radioactive Material Monitoring Conducted Nationwide (FY2016)

○ The results of the Monitoring of Environmental Radioactivity Levels (hereinafter referred to as "Monitoring of Levels"), which has been conducted by the Nuclear Regulation Authority for the purpose of clarifying the existence or nonexistence of the influence of nuclear facilities, etc. nationwide, were almost all within the past measurement trends.

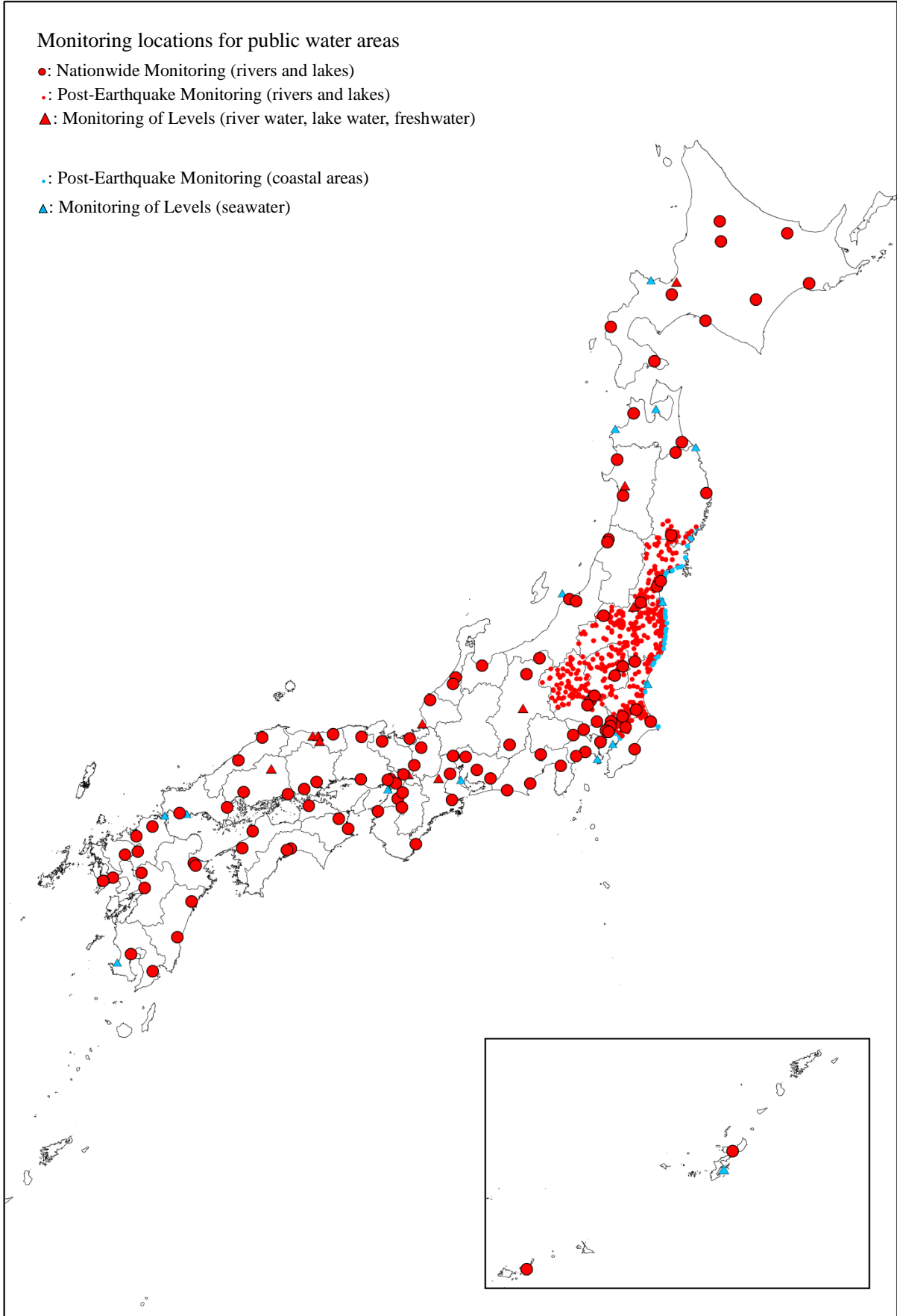


Figure 1 Locations for monitoring radioactive materials (public water areas)

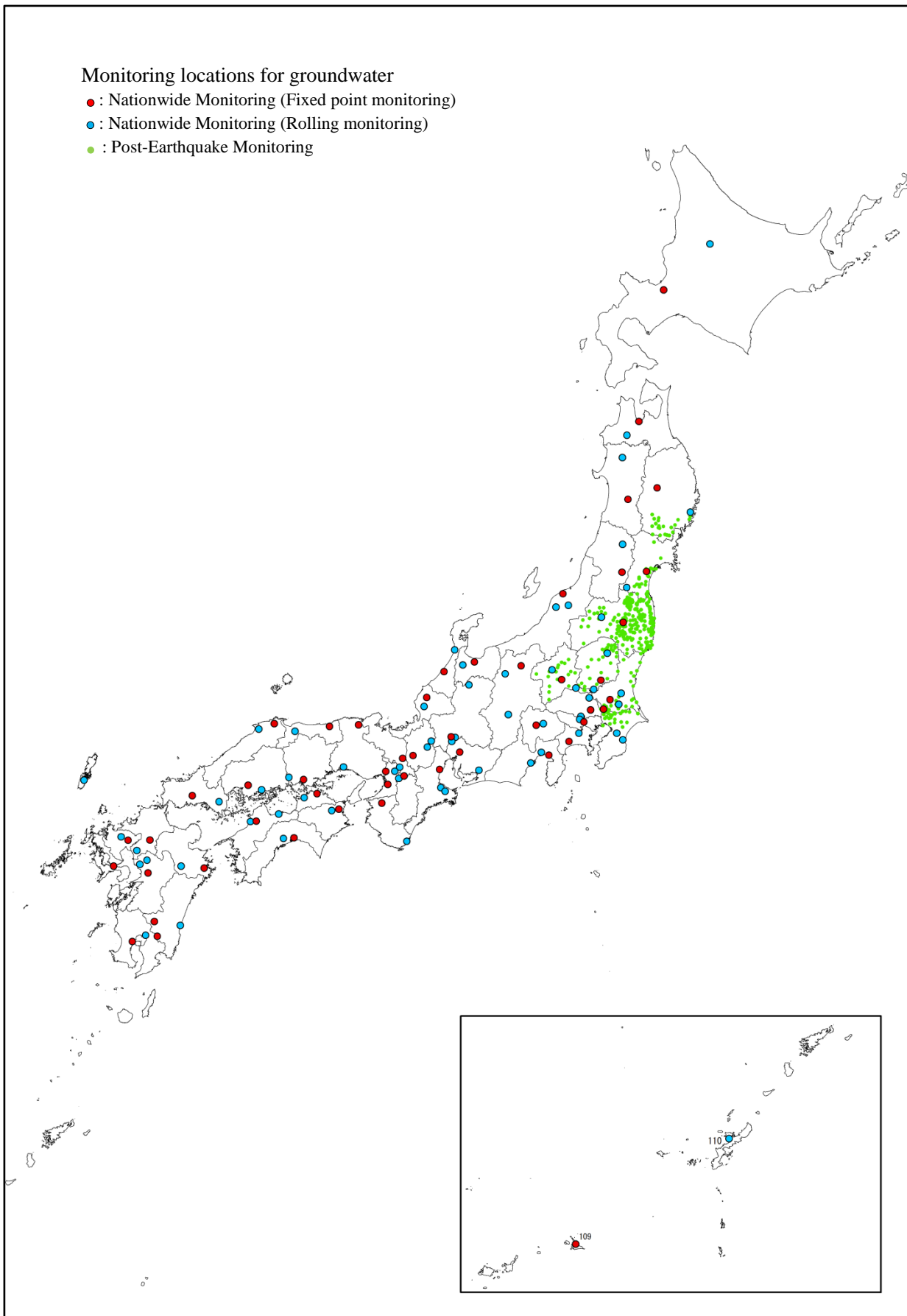


Figure 2 Locations for monitoring radioactive materials (groundwater)



# Part 1: National Radioactive Material Monitoring in the Water Environment in the Whole of Japan (FY2016)

## 1 Objective and Details

### 1.1 Objective

In response to the the Fukushima NPS Accident, during which radioactive materials were discharged causing environmental pollution, the Water Pollution Control Act was amended. It was decided that the Minister of the Environment should monitor pollution caused by radioactive materials in public water areas and groundwater and release the results from the perspective of preserving the health and living environment of the people.

Based on the above, this monitoring aims to clarify the distribution of radioactive materials in public water areas and groundwater nationwide.

### 1.2 Details

#### (1) Monitoring locations

- Public water areas: 110 locations (rivers: 107 locations; lakes: 3 locations)
- Groundwater: 110 locations

Monitoring locations were selected based on the following policy with a view to ensuring balanced nationwide monitoring (specific locations are as shown in Tables 1.2-2 and 1.2-3 and Figures 1.2-1 and 1.2-2).

#### (i) Public water areas

- At least one sampling location was selected in each prefecture, and additional locations were added according the area and population of each prefecture.
- Locations within each prefecture were selected based on the following policy:
  - a) Select representative rivers (including lakes) within each prefecture in the same numbers listed above, taking into account the area and population in their basins.
  - b) Regarding rivers selected as explained in a), select locations from among those monitored for hazardous materials, etc. conducted under the Water Pollution Control Act, selected with consideration of water utilization points. Within a single river, give priority to a location in the lower reaches (including lakes located downstream).
  - c) As this monitoring does not aim to clarify the influence of specific sources, exclude locations close to those subject to Environmental Monitoring around Nuclear Facilities, etc. (Radiation Monitoring Grants) in principle.

#### (ii) Groundwater

- Two sampling locations were chosen in each prefecture, and one more location was added for each prefecture in which the amount of groundwater utilized had been large over the past several years.
- Sampling locations for continuous monitoring of environmental standard items were selected based on the following policy:
  - a) Select regional representative wells (such as wells built for monitoring or major wells with an especially large amount of water yield) taking into consideration the amount of utilization of groundwater from

each groundwater basin and water vein (hereinafter referred to as "groundwater basins, etc.")).

- b) Prioritize wells owned or managed by local governments, etc. in consideration of the convenience of coordination in case any additional survey is required.
- c) Select one location for continuous fixed point monitoring from among the locations selected in the manner above, taking into account that location's level of utilization and the representativeness of that groundwater basin in the wider area. Perform rolling monitoring at the remaining locations (for 5 years in principle).
- d) As this monitoring does not aim to clarify the influence of specific sources, exclude locations close to those subject to Environmental Monitoring around Nuclear Facilities, etc. (Radiation Monitoring Grants), in principle.

## (2) Targets

- Public water areas: Water and sediments (for lakes, survey water both at the surface layer and bottom layers)  
(Additionally, as a reference, radioactive concentrations in soil and ambient dose rates in the environment (river beds, etc.) surrounding the sampling locations are to be measured.)
- Groundwater: Water  
(Additionally, as a reference, ambient dose rates near the sampling locations are to be measured.)

## (3) Frequencies and periods

- Public water areas : Once a year  
However, monitoring was conducted four times a year at two locations (one location in eastern and western Japan, respectively) in order to check any annual variation.
- Groundwater : Fixed point monitoring was conducted once a year, and rolling monitoring was conducted once every five years for each location in principle.

FY2016 monitoring periods are as shown in Table 1.2-4.

## (4) Conducted analyses

The following analyses were conducted for collected samples:

- Measurement of total  $\beta$  radioactivity concentrations.
- $\gamma$ -ray spectrometry measurement using a germanium semiconductor detector (In principal, all detectable radionuclides, including artificial radionuclides and major naturally occurring radionuclides, were analyzed).

## (5) Comparison with the past measurement trends

Obtained values were compared with the past measurement trends, and if any deviation was suspected, the validity of the measured values was rechecked (potential number transcription errors, incorrect calibration of equipment, etc.).

Because this monitoring has just commenced, there are no accumulated data for some locations. Therefore,

results from similar environmental monitoring surveys conducted so far will be used for comparison for the time being. Specifically, results from the Monitoring of Environmental Radioactivity Levels and Monitoring of the Surrounding Environment conducted by the Nuclear Regulation Authority, as well as the results from the Radioactive Material Monitoring in the Water Environment in and around Fukushima Prefecture conducted by the Ministry of the Environment were utilized. When making comparisons, due consideration was given to the possibility that the values of Cs-137 and other accident-derived radionuclides would have increased after the Fukushima NPS Accident.

Essentially, nationwide data for the past two decades were used for comparison. Considering the influence of the Fukushima NPS Accident and informed by actual measurements, “two years after the accident” was assumed to be a steady state, and therefore, data from between March 11, 2011 to March 10, 2013 were excluded.

#### (6) Measures to be taken when a value deviating from the past measurement trends was detected

The following measures were taken when a value deviating from the past measurement trends was detected (see Figure 1.2-3).

##### (6)-1 Release of preliminary values

Any value that is suspected to deviate from the past measurement trends should be immediately evaluated professionally by the chair and the deputy chair, and if it is judged highly urgent (when it has been confirmed that the value is highly likely to deviate from the past measurement trends, and additional detailed analyses are considered to be necessary), a preliminary report should be released as promptly as possible.

In such a case, the following related data should be compiled as basic data for professional evaluation. Members of the Evaluation Committee other than the chair and the deputy chair should be informed of the relevant information together with the professional evaluation by the chair and the deputy chair (see Table 1.2-1 for the chair and other committee members).

- (i) Results of the measurement concerning water and sediments ( $\gamma$ -ray spectrometry and total  $\beta$  radioactivity concentrations), and ambient dose rates
- (ii) Sampling dates, sampling locations (maps, water depth, river width, etc.), sampling methods, and sampling circumstances (photos)
- (iii) Weather data for about one week close to the measurement date (the amount of precipitation, in particular)
- (iv) Ambient dose rates measured for the last month or so at neighboring points
- (v) Changes in detected values of a relevant radionuclide compared to the past

##### (6)-2 Detailed analyses and release of the results

For data for which the preliminary report was released as explained in (6)-1 above, the following detailed analyses are to be conducted and the results are to be released.

- Specific analyses to identify radionuclides (including measurement of individual radionuclides through radiochemical analyses)
- Additional measurements in the surrounding areas of the relevant surveyed location

(7) Disclosure of measurement results

The measurement results data are made publicly available on the following Ministry of the Environment website:

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

Table 1.2-1 List of members of the Evaluation Committee on Radioactive Material Monitoring in the Water Environment

IIMOTO Takeshi (Deputy chair)	Professor, Division for Environment, Health and Safety, the University of Tokyo
ISHII Nobuyoshi	Principal Researcher, Environmental Transfer Parameter Research Team, The Fukushima Project Headquarters, National Institute of Radiological Sciences, National Institutes for Quantum and Radiological Science and Technology
TOKUNAGA Tomochika	Professor, Department of Environment Systems, Graduate School of Frontier Sciences, the University of Tokyo
HAYASHI Seiji	Research Group Manager & Head of Environmental Assessment Section, Fukushima Branch, National Institute for Environmental Studies
FUKUSHIMA Takehiko (Chair)	Director of the Center, Ibaraki Kasumigaura Environmental Science Center

Table 1.2-2 List of locations for the FY2016 Nationwide Monitoring (public water areas) (No. 1)

No.	Prefecture	Property	Sampling location		
			Water area	Location	Municipality
1	Hokkaido Prefecture	River	Ishikari River	Domestic water intake at Ishikari River in Asahikawa City	Asahikawa City
2		River	Ishikari River	Intake at the Shirakawa water purification plant in Sapporo City	Sapporo City
3		River	Teshio River	Nakashibetsu Bridge (Intake at the Higashiyama water purification plant in Shibetsu City)	Shibetsu City
4		River	Tokoro River	Tadashi Bridge	Kitami City
5		River	Kushiro River	Intake at the Aikoku water purification plant in Kushiro City	Kushiro City
6		River	Tokachi River	Nantai Bridge	Obihiro City
7		River	Sarugawa River	Sarugawa Bridge (Tomigawa)	Hidaka Town
8		River	Matsukura River	Mitsumori Bridge (Before the confluence with Torasawa River)	Hakodate City
9		River	Shiribeshi-toshibetsu River	Intake at the Kitahiyama simple water plant in Kitahiyama Town	Setana Town
10	Aomori Prefecture	River	Iwaki River	Tsugaru-ohashi Bridge	Nakadomari Town
11	River	Mabechi River	Shirouchi Bridge	Hachinohe City	
12	Iwate Prefecture	River	Mabechi River	Fugane Bridge	Ninohe City
13		River	Heigawa River	Miyako Bridge	Miyako City
14	River	Kitakami River	Chitose Bridge	Ichinoseki City	
15	Miyagi Prefecture	River	Abukuma River	Iwanuma (Abukuma Bridge)	Iwanuma City
16	River	Natori River	Yuriage-ohashi Bridge	Natori City	
17	Akita Prefecture	River	Yoneshiro River	Noshiro Bridge	Noshiro City
18	River	Omono River	Kurose Bridge	Akita City	
19	Yamagata Prefecture	River	Mogami River	Ryou Bridge	Sakata City
20	River	Akagawa River	Shinkawa Bridge	Sakata City	
21	Fukushima Prefecture	River	Agano River	Shingo Dam	Kitakata City
22		River	Abukuma River	Taisho Bridge (Fushiguro)	Date City
23		River	Kujigawa River	Takachihara Bridge	Yamatsuri Town
24	Ibaraki Prefecture	Lake	Lake Kasumigaura	Center of the lake	Miho Village
25	River	Kokai River	Fumimaki Bridge	Toride City	
26	Tochigi Prefecture	River	Nakagawa River	Shinnaka Bridge	Nakagawa Town
27	River	Kinugawa River	Kinugawa Bridge (Hoshakuji Temple)	Utsunomiya City	
28	Gunma Prefecture	River	Tonegawa River	Toneozeki Weir	Chiyoda Town/Gyoda City (Saitama Prefecture)
29	River	Watarase River	Watarase-ohashi Bridge	Tatebayashi City	
30	Saitama Prefecture	River	Arakawa River	Kuge Bridge	Kumagaya City
31		River	Arakawa River	Akigase Intake Weir	Saitama City/ Shiki City
32		River	Edogawa River	Nagareyama Bridge	Nagareyama City (Chiba Prefecture) / Misato City
33		River	Tonegawa River	Kakozeki Weir	Tonosho Town
34	Chiba Prefecture	River	Ichinomiya River	Nakano Bridge	Ichinomiya Town
35	Lake	Lake Inbanuma	Lower area of water supply intake	Sakura City	
36	Tokyo Metropolis	River	Edogawa River	Shinkatsushika Bridge	Katsushika City
37		River	Tamagawa River	Hajima raw water supply point	Akishima City
38		River	Sumida River	Ryogoku Bridge	Chuo City / Sumida City
39		River	Arakawa River	Kasai Bridge	Koto City / Edogawa City
40	Kanagawa Prefecture	River	Tsurumi River	Rinko Tsurumigawa Bridge	Yokohama City
41		River	Sagami River	Banyu Bridge	Hiratsuka City
42		River	Sakawa River	Sakawa Bridge	Odawara City
43	Niigata Prefecture	River	Shinano River	Heisei-ohashi Bridge	Niigata City
44	River	Agano River	Oun Bridge	Niigata City	
45	Toyama Prefecture	River	Jinzu River	Hagiura Bridge	Toyama City
46	Ishikawa Prefecture	River	Saigawa River	Okuwa Bridge	Kanazawa City
47	River	Tedori River	Hakusanogouchi Dike	Hakusan City	
48	Fukui Prefecture	River	Kuzuryu River	Fuseda Bridge	Fukui City
49	River	Kitagawa River	Takatsuka Bridge	Obama City	
50	Yamanashi Prefecture	River	Sagami River	Katsuragawa Bridge	Uenohara City
51	River	Fujikawa River	Nanbu Bridge	Nanbu Town	
52	Nagano Prefecture	River	Shinano River	Ozeki Bridge	Iiyama City
53		River	Saigawa River	Koichi Bridge	Nagano City
54		River	Tenryu River	Tsutsuji Bridge	Iida City

Table 1.2-2 List of locations for the FY2016 Nationwide Monitoring (public water areas) (No. 2)

No.	Prefecture	Property	Sampling location		
			Water area	Location	Municipality
55	Gifu Prefecture	River	Kisogawa River	Tokai-ohashi Bridge (Naruto)	Kaizu City
56		River	Nagara River	Tokai-ohashi Bridge	Kaizu City
57	Shizuoka Prefecture	River	Kanogawa River	Kurose Bridge	Numazu City
58		River	Ooi River	Fujimi Bridge	Yaizu City / Yoshida Town
59		River	Tenryu River	Kaketsuka Bridge	Iwata City / Hamamatsu City
60	Aichi Prefecture	River	Shonai River	Mizuwake Bridge	Nagoya City
61		River	Yahagi River	Iwazutenjin Bridge	Okazaki City / Toyota City
62		River	Toyogawa River	Eshima Bridge	Toyokawa City
63	Mie Prefecture	River	Suzuka River	Ogura Bridge	Yokkaichi City
64		River	Miyakawa River	Watarai Bridge	Ise City
65	Shiga Prefecture	River	Adogawa River	Joan Bridge	Takashima City
66		Lake	Lake Biwako	Karasakioki-Chuo	—
67	Kyoto Prefecture	River	Yuragawa River	Yuragawa Bridge	Maizuru City
68		River	Katsura River	Before the confluence of three tributaries of Katsura River	Oyamazaki Town
69	Osaka Prefecture	River	Inagawa River	Gunko Bridge	Itami City (Hyogo prefecture)
70		River	Yodogawa River	Sugaharashirokita-ohashi Bridge	Osaka City
71		River	Ishikawa River	Takahashi	Tondabayashi City
72	Hyogo Prefecture	River	Kakogawa River	Kakogawa Bridge	Kakogawa City
73		River	Mukogawa River	Hyakkenbi	Takarazuka City
74		River	Maruyama River	Kaminogo Bridge	Toyooka City
75	Nara Prefecture	River	Yamato River	Fujii	Oji Town
76		River	Kinokawa River	Okura Bridge	Gojo City
77	Wakayama Prefecture	River	Kinokawa River	Shinrokkaizeki Weir	Wakayama City
78		River	Kumano River	Kumano-ohashi Bridge	Shingu City
79	Tottori Prefecture	River	Sendai River	Gyotoku	Tottori City
80	Shimane Prefecture	River	Hiikawa River	Kandatsu Bridge	Izumo City
81		River	Gonokawa River	Sakurae-ohashi Bridge	Gotsu City
82	Okayama Prefecture	River	Asahikawa River	Otoite Weir	Okayama City
83		River	Takahashi River	Kasumi Bridg	Kurashiki City
84	Hiroshima Prefecture	River	Ota River	Water supply intake in Hesaka	Hiroshima City
85		River	Ashida River	Kominomi Bridge	Fukuyama City
86	Yamaguchi Prefecture	River	Nishiki River	Domestic water intake for the city	Iwakuni City
87		River	Koto River	Suenobu Bridge	Ube City
88	Tokushima Prefecture	River	Yoshino River	Takase Bridge	Ishii Town
89		River	Nakagawa River	Nakagawa Bridge	Anan City
90	Kagawa Prefecture	River	Dokigawa River	Marugame Bridge	Marugame City
91	Ehime Prefecture	River	Shigenobu River	Deai Bridge	Matsuyama City
92		River	Hijikawa River	Hijikawa Bridge	Ozu City
93	Kochi Prefecture	River	Kagami River	Kachuzeki Weir	Kochi City
94		River	Niyodo River	Hatazeki Weir (1) Center of flow	Ino Town
95	Fukuoka Prefecture	River	Onga River	Hinode Bridge	Nogata City
96		River	Nakagawa River	Shiobara Bridge	Fukuoka City
97		River	Chikugo River	Senoshita	Kurume City
98	Saga Prefecture	River	Kasegawa River	Kase Bridge	Saga City
99	Nagasaki Prefecture	River	Honmyo River	In front of Tenma Park	Isahaya City
100		River	Uragami River	Ohashizeki Weir	Nagasaki City
101	Kumamoto Prefecture	River	Kikuchi River	Shiroishi	Nagomi Town
102		River	Midori River	Uesugizeki Weir	Kumamoto City
103	Oita Prefecture	River	Oita River	Funaichi-ohashi Bridge	Oita City
104		River	Oono River	Shirataki Bridge	Oita City
105	Miyazaki Prefecture	River	Gokase River	Miwa	Nobeoka City
106		River	Oyodo River	Shinaioi Bridge	Miyazaki City
107	Kagoshima Prefecture	River	Kotsuki River	Iwasaki Bridge	Kagoshima City
108		River	Kimotsuki River	Matase Bridge	Kanoya City
109	Okinawa Prefecture	River	Genka River	Water intake	Nago City
110		River	Miyara River	Omoto water intake	Ishigaki City

Table 1.2-3 List of locations for the FY2016 Nationwide Monitoring (groundwater) (No. 1)

No.	Prefecture	Property	Municipality	District	Monitoring method
1	Hokkaido Prefecture	Groundwater	Sapporo City	Kitasanjonishi, Chuo Ward	Fixed point monitoring
2		Groundwater	Asahikawa City	Nagayama	Rolling monitoring
3	Aomori Prefecture	Groundwater	Aomori City	Shinmachi	Fixed point monitoring
4		Groundwater	Hirosaki City	Kamisukimachi	Rolling monitoring
5	Iwate Prefecture	Groundwater	Morioka City	Motomiya	Fixed point monitoring
6		Groundwater	Kamaishi City	Shinmachi	Rolling monitoring
7	Miyagi Prefecture	Groundwater	Sendai City	Honcho, Aoba Ward	Fixed point monitoring
8		Groundwater	Shichikashuku Town	Seki	Rolling monitoring
9	Akita Prefecture	Groundwater	Daisen City	Niiyaji	Fixed point monitoring
10		Groundwater	Kitaakita City	Wakigami	Rolling monitoring
11	Yamagata Prefecture	Groundwater	Yamagata City	Hatagomachi	Fixed point monitoring
12		Groundwater	Shinjo City	Torigoe	Rolling monitoring
13	Fukushima Prefecture	Groundwater	Koriyama City	Asahi	Fixed point monitoring
14		Groundwater	Aizuwakamatsu City	Kozashimachi	Rolling monitoring
15	Ibaraki Prefecture	Groundwater	Tsukuba City	Kenkyugakuen	Fixed point monitoring
16		Groundwater	Ishioka City	Higashiohashi	Rolling monitoring
17		Groundwater	Ami Town	Hanawa	Rolling monitoring
18	Tochigi Prefecture	Groundwater	Shimotsuke City	Machida	Fixed point monitoring
19		Groundwater	Ohtawara City	Honcho	Rolling monitoring
20		Groundwater	Nogi Town	Tomonuma	Rolling monitoring
21	Gunma Prefecture	Groundwater	Maebashi City	Shikishimacho	Fixed point monitoring
22		Groundwater	Ota City	Hosoyacho	Rolling monitoring
23		Groundwater	Nakanoyo Town	Isenmachi	Rolling monitoring
24	Saitama Prefecture	Groundwater	Saitama City	Mikura, Minuma Ward	Fixed point monitoring
25		Groundwater	Tokorozawa City	Miyamotocho	Rolling monitoring
26		Groundwater	Kazo City	Hanasakikita	Rolling monitoring
27	Chiba Prefecture	Groundwater	Kashiwa City	Funato	Fixed point monitoring
28		Groundwater	Chosei Village	Kaneda	Rolling monitoring
29		Groundwater	Ichihara City	Higashikuniyoshi	Rolling monitoring
30	Tokyo Metropolis	Groundwater	Koganei City	Kajinocho	Fixed point monitoring
31		Groundwater	Higashiyamato City	Nakahara	Rolling monitoring
32	Kanagawa Prefecture	Groundwater	Hadano City	Imaizumi	Fixed point monitoring
33		Groundwater	Zama City	Sagamigaoka	Rolling monitoring
34	Niigata Prefecture	Groundwater	Niigata City	Nagata, Chuo Ward	Fixed point monitoring
35		Groundwater	Gosen City	Muramatsu Ko	Rolling monitoring
36		Groundwater	Tsubame City	Akibacho	Rolling monitoring
37	Toyama Prefecture	Groundwater	Toyama City	Funashikitamachi	Fixed point monitoring
38		Groundwater	Tonami City	Saiwaicho	Rolling monitoring
39	Ishikawa Prefecture	Groundwater	Hakusan City	Kuramitsu	Fixed point monitoring
40		Groundwater	Hakui City	Asahimachi A	Rolling monitoring
41	Fukui Prefecture	Groundwater	Fukui City	Ote	Fixed point monitoring
42		Groundwater	Echizen City	Hachiman	Rolling monitoring
43	Yamanashi Prefecture	Groundwater	Showa Town	Saijyoshinden	Fixed point monitoring
44		Groundwater	Yamanashi City	Ono	Rolling monitoring
45	Nagano Prefecture	Groundwater	Nagano City	Tsurugamidoricho	Fixed point monitoring
46		Groundwater	Omachi City	Omachi	Rolling monitoring
47		Groundwater	Ina City	Nishiharuchika	Rolling monitoring
48	Gifu Prefecture	Groundwater	Gifu City	Kanoshimizucho	Fixed point monitoring
49		Groundwater	Kagamihara City	Nakasakuramachi	Rolling monitoring
50		Groundwater	Hida City	Kawaicho	Rolling monitoring
51	Shizuoka Prefecture	Groundwater	Numazu City	Hara	Fixed point monitoring
52		Groundwater	Fuji City	Iwamoto	Rolling monitoring
53		Groundwater	Shizuoka City	Kurihara, Suruga Ward	Rolling monitoring
54	Aichi Prefecture	Groundwater	Nagoya City	Kawaharatori, Showa Ward	Fixed point monitoring
55		Groundwater	Ichinomiya City	Okucho	Rolling monitoring
56		Groundwater	Toyokawa City	Hiraicho	Rolling monitoring



Table 1.2-3 List of locations for the FY2016 Nationwide Monitoring (groundwater) (No. 2)

No.	Prefecture	Property	Municipality	District	Monitoring method
57	Mie Prefecture	Groundwater	Suzuka City	Inouchi	Fixed point monitoring
58		Groundwater	Matsusaka City	Toyoharacho	Rolling monitoring
59		Groundwater	Ise City	Nakazucho	Rolling monitoring
60	Shiga Prefecture	Groundwater	Moriyama City	Miyakecho	Fixed point monitoring
61		Groundwater	Maibara City	Shiori	Rolling monitoring
62		Groundwater	Taga Town	Nakagawara	Rolling monitoring
63	Kyoto Prefecture	Groundwater	Kyoto City	Kamihonnojimaecho, Nakagyo Ward	Fixed point monitoring
64		Groundwater	Yawata City	Tozudoden	Rolling monitoring
65	Osaka Prefecture	Groundwater	Sakai City	Daisennakamachi, Sakai Ward	Fixed point monitoring
66		Groundwater	Neyagawa City	Koyamotomachi	Rolling monitoring
67	Hyogo Prefecture	Groundwater	Itami City	Kuchisakai	Fixed point monitoring
68		Groundwater	Toyooka City	Saiwaicho	Fixed point monitoring
69		Groundwater	Tatsuno City	Ibocho	Rolling monitoring
70	Nara Prefecture	Groundwater	Nara City	Sakyo	Fixed point monitoring
71		Groundwater	Ikoma City	Arisatocho	Rolling monitoring
72	Wakayama Prefecture	Groundwater	Kinokawa City	Takano	Fixed point monitoring
73		Groundwater	Nachikatsuura Town	Ichiya	Rolling monitoring
74	Tottori Prefecture	Groundwater	Tottori City	Saiwaicho	Fixed point monitoring
75		Groundwater	Hoki Town	Kobayashi	Rolling monitoring
76	Shimane Prefecture	Groundwater	Matsue City	Nishikawatsucho	Fixed point monitoring
77		Groundwater	Izumo City	Himebara(2)	Rolling monitoring
78	Okayama Prefecture	Groundwater	Kurashiki City	Fukui	Fixed point monitoring
79		Groundwater	Ibara City	Sasakacho	Rolling monitoring
80	Hiroshima Prefecture	Groundwater	Hiroshima City	Kamisenochi, Aki Ward	Fixed point monitoring
81		Groundwater	Takehara City	Shimonochi	Rolling monitoring
82	Yamaguchi Prefecture	Groundwater	Yamaguchi City	Ouchimihori	Fixed point monitoring
83		Groundwater	Iwakuni City	Shutomachi Shimokubara	Rolling monitoring
84	Tokushima Prefecture	Groundwater	Tokushima City	Fudohoncho	Fixed point monitoring
85		Groundwater	Yoshinogawa City	Kamojimacho Jocejima	Rolling monitoring
86	Kagawa Prefecture	Groundwater	Takamatsu City	Bancho	Fixed point monitoring
87		Groundwater	Marugame City	Kanakuracho	Rolling monitoring
88	Ehime Prefecture	Groundwater	Matsuyama City	Hiraimachi	Fixed point monitoring
89		Groundwater	Masaki Town	Nishikoizumi	Rolling monitoring
90		Groundwater	Niihama City	Kubotacho	Rolling monitoring
91	Kochi Prefecture	Groundwater	Kochi City	Kerako	Fixed point monitoring
92		Groundwater	Ino Town	Hakawa	Rolling monitoring
93	Fukuoka Prefecture	Groundwater	Kurume City	Tanushimarumachi Akinari	Fixed point monitoring
94		Groundwater	Miyama City	Setakanachi Shimonosho	Rolling monitoring
95	Saga Prefecture	Groundwater	Saga City	Yamatochonijji	Fixed point monitoring
96		Groundwater	Karatsu City	Kyuragimachi Amagawa	Rolling monitoring
97	Nagasaki Prefecture	Groundwater	Isahaya City	Eidamachi	Fixed point monitoring
98		Groundwater	Tsushima City	Mitsushimamachi	Rolling monitoring
99	Kumamoto Prefecture	Groundwater	Kumamoto City	Suizenji, Chuo Ward	Fixed point monitoring
100		Groundwater	Tamana City	Hanegi	Rolling monitoring
101		Groundwater	Yamaga City	Koga	Rolling monitoring
102	Oita Prefecture	Groundwater	Saiki City	Kamioka	Fixed point monitoring
103		Groundwater	Taketa City	Tamarai	Rolling monitoring
104	Miyazaki Prefecture	Groundwater	Miyakonojo City	Minamiyokoichicho	Fixed point monitoring
105		Groundwater	Kobayashi City	Minaminishikata	Fixed point monitoring
106		Groundwater	Miyazaki City	Yamasakicho Hamayama	Rolling monitoring
107	Kagoshima Prefecture	Groundwater	Kagoshima City	Tamazatocho	Fixed point monitoring
108		Groundwater	Kirishima City	Kokubukawahara	Rolling monitoring
109	Okinawa Prefecture	Groundwater	Miyakojima City	Hirahigashinakasonozoe	Fixed point monitoring
110		Groundwater	Motobu Town	Namizato	Rolling monitoring

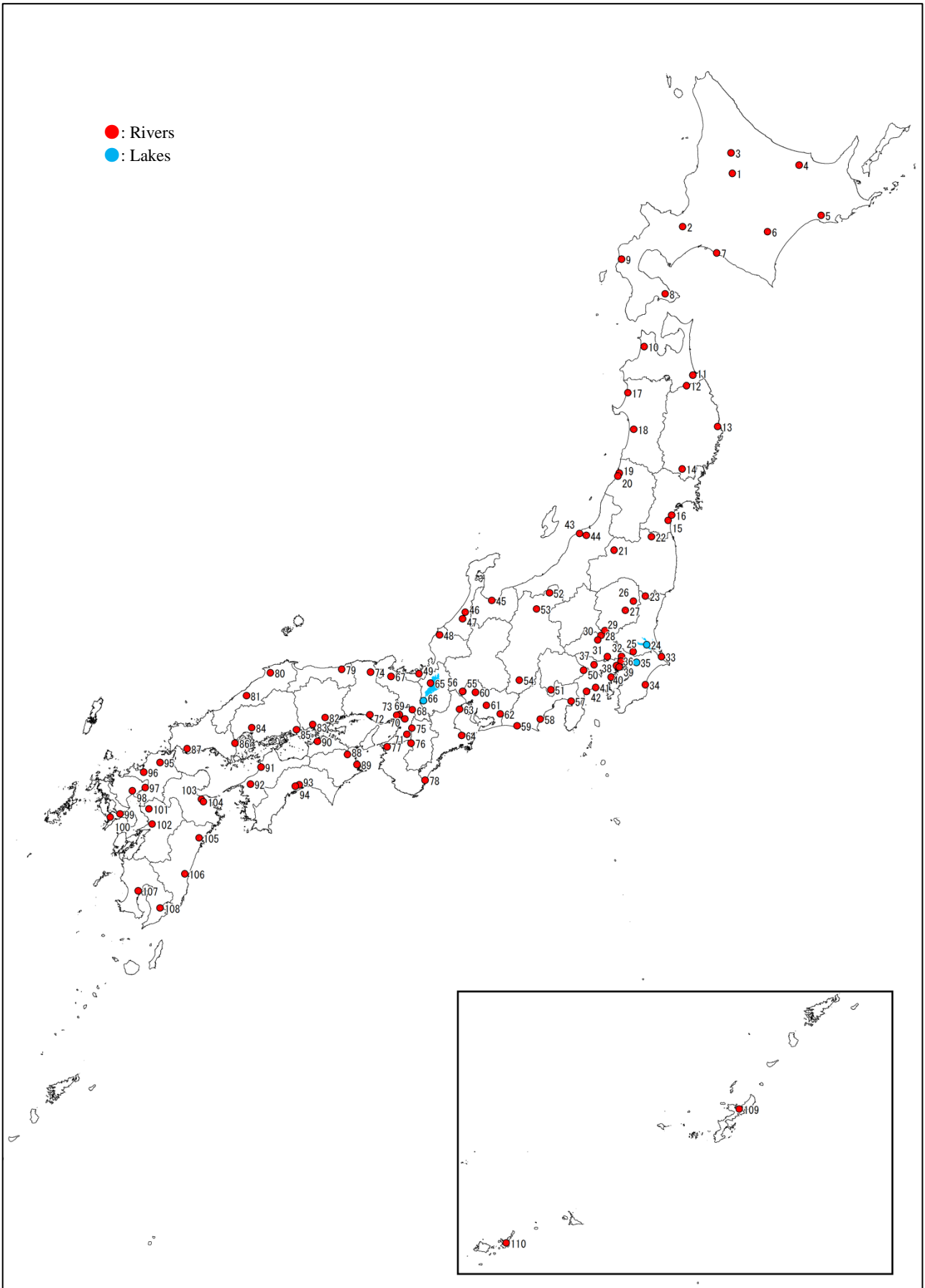


Figure 1.2-1 Map showing locations for FY2016 Nationwide Monitoring (public water areas)

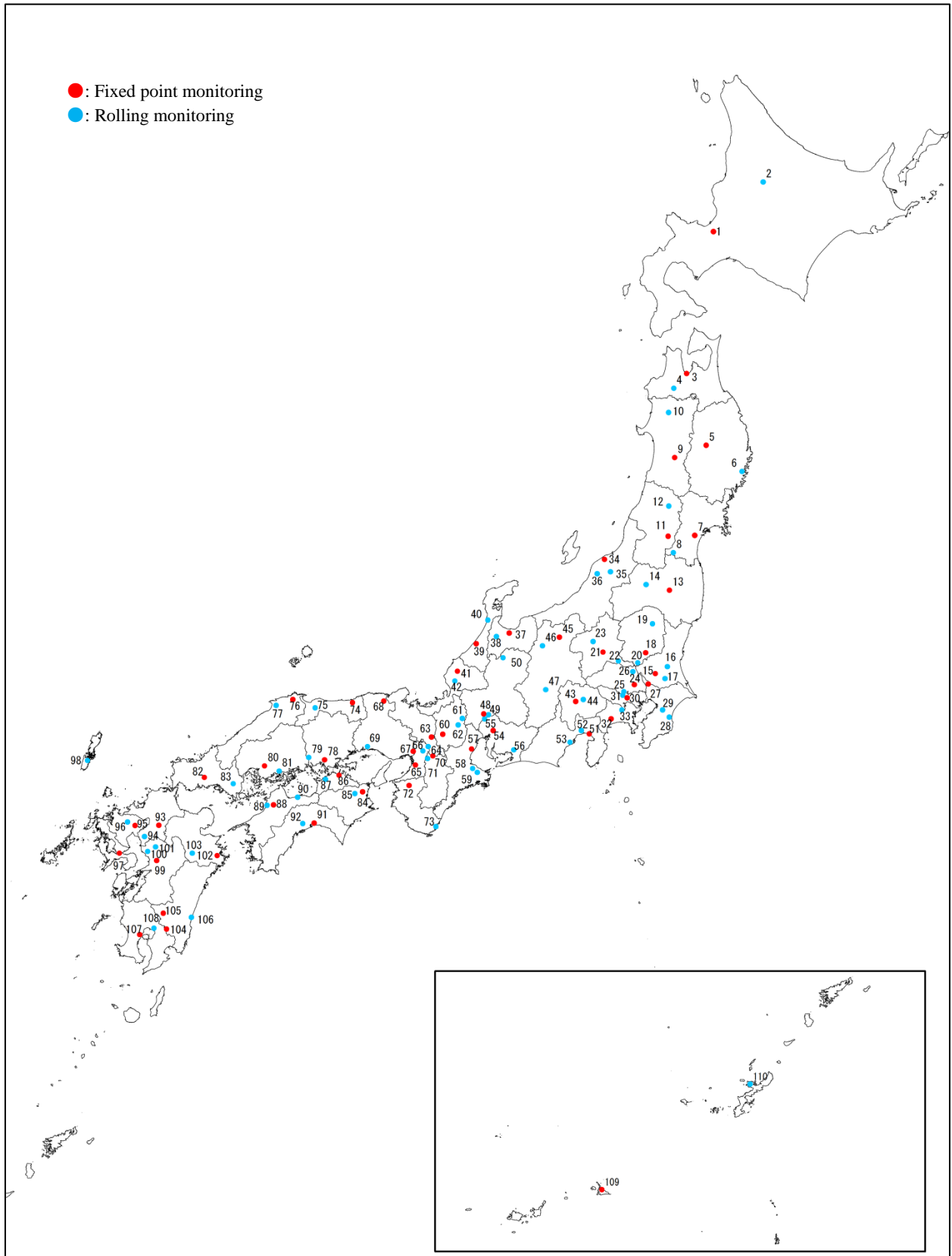


Figure 1.2-2 Map showing locations for FY2016 Nationwide Monitoring (groundwater)

Table 1.2-4 Monitoring points and period by block (FY2016)

Blocks	Prefectures	Public water areas		Groundwater	
		Number of Locations (*1)	Period	Number of locations	Period
Hokkaido block	Hokkaido	9	Aug. 23 to Nov. 7	2	Aug. 22
Tohoku block	Aomori, Iwate, Miyagi, Akita, Yamagata and Fukushima	14	Sep. 2 to Oct. 4	12	Sep 2 to Sep.29
Kanto block	Ibaraki, Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa, Niigata, Yamanashi and Shizuoka	26 (2)	Aug. 24 to Oct 21	27	Aug. 23 to Sep 16
Chubu block	Toyama, Ishikawa, Fukui, Nagano, Gifu, Aichi and Mie	15	Aug 29 to Oct. 14	18	Aug. 29 to Sep. 16
Kinki block	Shiga, Kyoto, Osaka, Hyogo, Nara and Wakayama	14 (1)	Aug. 31 to Oct. 4	14	Aug. 29 to Sep. 9
Chugoku-Shikoku block	Tottori, Shimane, Okayama, Hiroshima, Yamaguchi, Tokushima, Kagawa, Ehime and Kochi	16	Aug. 22 to Oct. 13	19	Aug. 22 to Oct. 13, Feb. 14 (*2)
Kyushu and Okinawa block	Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki, Kagoshima and Okinawa	16	Aug. 22 to Sep. 16	18	Aug. 23 to Sep. 16
Survey to check annual variation	Gunma and Okayama	2	May 24 to Jan. 27	-	-

(\*1) Numbers in parentheses designate monitoring locations for lakes; plain numbers are for rivers.

(\*2) The groundwater at No. 77 was collected on February 14, and collection from other locations finished by October 13.

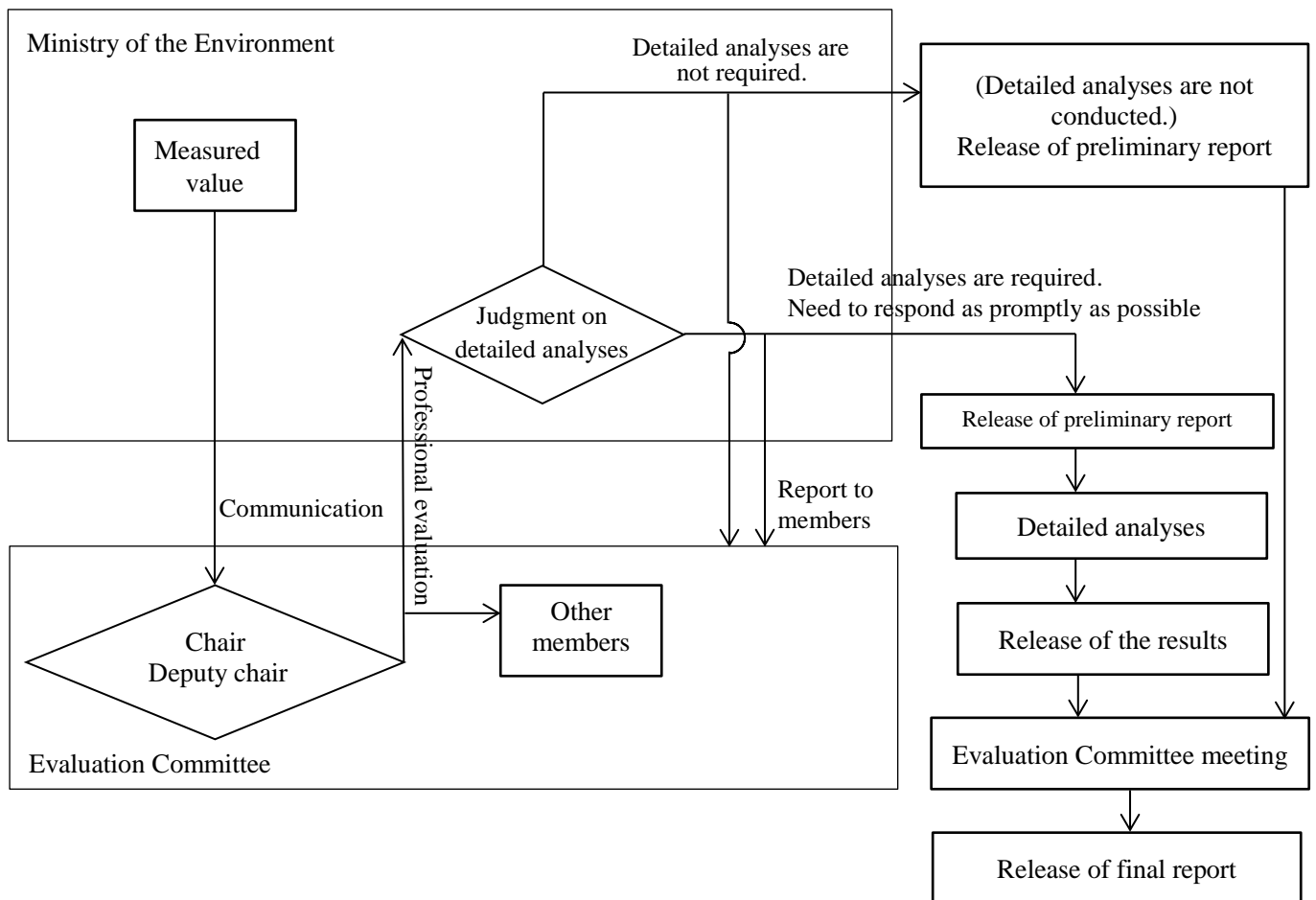


Figure 1.2-3 Procedures for professional evaluation of the results of the Nationwide Monitoring

## 2 Survey Methods and Analysis Methods

### 2.1 Survey methods

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

- Water Quality Survey Method (September 30, 1971; Notice Kansuikan No. 30 issued by the Director General of the Water Quality Preservation Bureau, Ministry of the Environment)
- Sediment Survey Method (August 8, 2012; Notice Kansuikansuuhatsu No. 120725002 issued by the Director General of the Environmental Management Bureau, Ministry of the Environment)
- Groundwater Quality Survey Method (September 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, Ministry of Education, Culture, Sports Science and Technology (hereinafter referred to as "MEXT")'s Radioactivity Measurement Method Series)
- Sample Pretreatment for Instrumental Analysis Using Germanium Semiconductor Detectors (1982, MEXT's Radioactivity Measurement Method Series)

#### (1) Public water areas

- Water:

Water samples of around 160 L (hydrochloric acid added) and around 2 L (nitric acid added) were collected at the predetermined points. From the 160 L sample (hydrochloric acid added), 80 L was used for  $\gamma$ -ray spectrometry analyses and the remaining 80 L was preserved for possible detailed analyses. From the 2 L sample (nitric acid added), 1 L was used to measure total  $\beta$  radioactivity concentrations.

Additionally, the transparency (or Secchi disk depth) was measured when collecting water samples, and in the case that transparency was thought to have been affected by rainwater based on comparison to prior measurements, or if there was no past data to compare to, the measured transparency was 50 cm or less and it was suspected that rainwater may have influenced transparency, the water was not used as samples.

- Sediments:

Bottom sediment samples of around 6 L were collected at the predetermined points at a depth of around 10 cm from the surface layer by using an Ekman-Birge grab sampler etc., and 3 L out of the 6 L was used for  $\gamma$ -ray spectrometry analyses.

- Soil:

Soil samples (around 5 cm in diameter) were collected at a depth of around 5 cm at five points within a 3 to 5 meter square (four vertices and the diagonal intersection point), or, when it was difficult to find an appropriate square to determine five such sampling locations, soil from five points in 3 to 5 meter intervals along a river were collected and were brought back separately. Samples thus collected at the five points were mixed in equal amounts respectively and were used for analyses.

- Ambient dose rates (soil sampling locations):

Ambient dose rates were measured by installing NaI (TI) scintillation survey meters at a height of 1 m from the ground surface on both banks of a river (or in the case of a lake, installing a NaI (TI) scintillation survey meter at one point on lake side) so that the meters would face the sampling location of river water (or lake

water).

## (2) Groundwater

- Water:

Groundwater samples of around 160 L (hydrochloric acid added) and 2 L (nitric acid added) were collected at the predetermined wells, etc. 80 L of the 160 L sample (hydrochloric acid added) was used for  $\gamma$ -ray spectrometry analyses and the remaining 80 L was preserved for possible detailed analyses. 1 L of the 2 L sample (nitric acid added) was used for to measure total  $\beta$  radioactivity concentrations.

When collecting water samples, it was confirmed that water temperature, transparency, pH, and electrical conductivity remained constant by letting the water pass for several minutes, and changes in the transparency, etc. thereafter were recorded as notes.

- Ambient dose rates:

Ambient dose rates were measured by installing NaI (TI) scintillation survey meters at a height of 1 m from the ground surface near the relevant wells, etc. so that they would face the sampling location of groundwater (or the groundwater layer).

## 2.2 Analysis methods

For public water areas (water, sediments and soil) and groundwater (water), total  $\beta$  radioactivity concentrations and  $\gamma$ -ray spectrometry with a germanium semiconductor detector were conducted using the methods below. As a general rule, the  $\gamma$ -ray spectrometry measurement covered all detectable radionuclides (including artificial radionuclides and naturally occurring radionuclides). Measurements were described to two significant digits, and the unit of measures were "Bq/L" for water samples from public water areas and groundwater samples, and "Bq/kg" in for sediment samples from public water areas, respectively.

The adopted analysis methods were essentially in line with the MEXT's Radioactivity Measurement Method Series, and detection limits were set around 0.001 to 0.01 Bq/L for water samples and around 1 to 30 Bq/kg for sediment samples. (However, these detection limits did not apply to radionuclides with short half-lives or those with extremely low  $\gamma$ -ray emission rates.)

- Measurement of total  $\beta$  radioactivity concentrations: The samples were concentrated and dried, and then measurements were taken using a low-background gas-flow proportional counter.
- $\gamma$ -ray spectrometry measurement: After proper pretreatment, the samples were placed in a U-8 container or a 2L Marinelli beaker and measured using a germanium semiconductor detector. The following 62 types of  $\gamma$ -ray emitting radionuclides (18 naturally occurring radionuclides and 44 artificial radionuclides) were surveyed. The measured results of  $\gamma$ -ray emitting radionuclides were corrected for attenuation, and figures were reported as activity concentration after sampling.

Table 2.2-1 Surveyed  $\gamma$ -ray emitting radionuclides

Naturally occurring radionuclides (18 radionuclides)		Artificial radionuclides (44 radionuclides)				
Ac-228	Ra-224	Ag-108m	Co-58	I-131	Np-239	Te-129m
Be-7	Ra-226	Ag-110m	Co-60	I-132	Ru-103	Te-132
Bi-212	Th-227	Am-241	Cr-51	La-140	Ru-106	Y-91
Bi-214	Th-228	As-74	Cs-134	Mn-54	Sb-124	Y-93
K-40	Th-231	Ba-140	Cs-136	Mn-56	Sb-125	Zn-63
Pa-234m	Th-234	Bi-207	Cs-137	Mo-99	Sb-127	Zn-65
Pb-210	Tl-206	Ce-141	Fe-59	Nb-95	Sr-91	Zr-95
Pb-212	Tl-208	Ce-143	Ga-74	Nb-97	Tc-99m	Zr-97
Pb-214	U-235	Ce-144	Ge-75	Nd-147	Te-129	



### 3 Results

The outline of detectable radioactive materials at each monitoring location is as follows.

#### 3.1 Detection of total $\beta$ radioactivity and $\gamma$ -ray emitting radionuclides

##### (1) Public water areas

##### 1) Water

The results of the measurements of total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in water samples from public water areas are as shown in Table 3.1-1 and Figure 3.1-1.

##### a) Total $\beta$ radioactivity

The detection rate for total radioactivity was 92.0 % with detected values ranging from not detectable to 2.6 Bq/L: all of which were within the past measurement trends.

##### b) $\gamma$ -ray emitting radionuclides

As shown in Table 3.1-1 and Figure 3.1-1, six types of  $\gamma$ -ray emitting radionuclides (four naturally occurring radionuclides and two artificial radionuclides) were detected, while other types of  $\gamma$ -ray emitting radionuclides were not detectable at any of the locations surveyed.

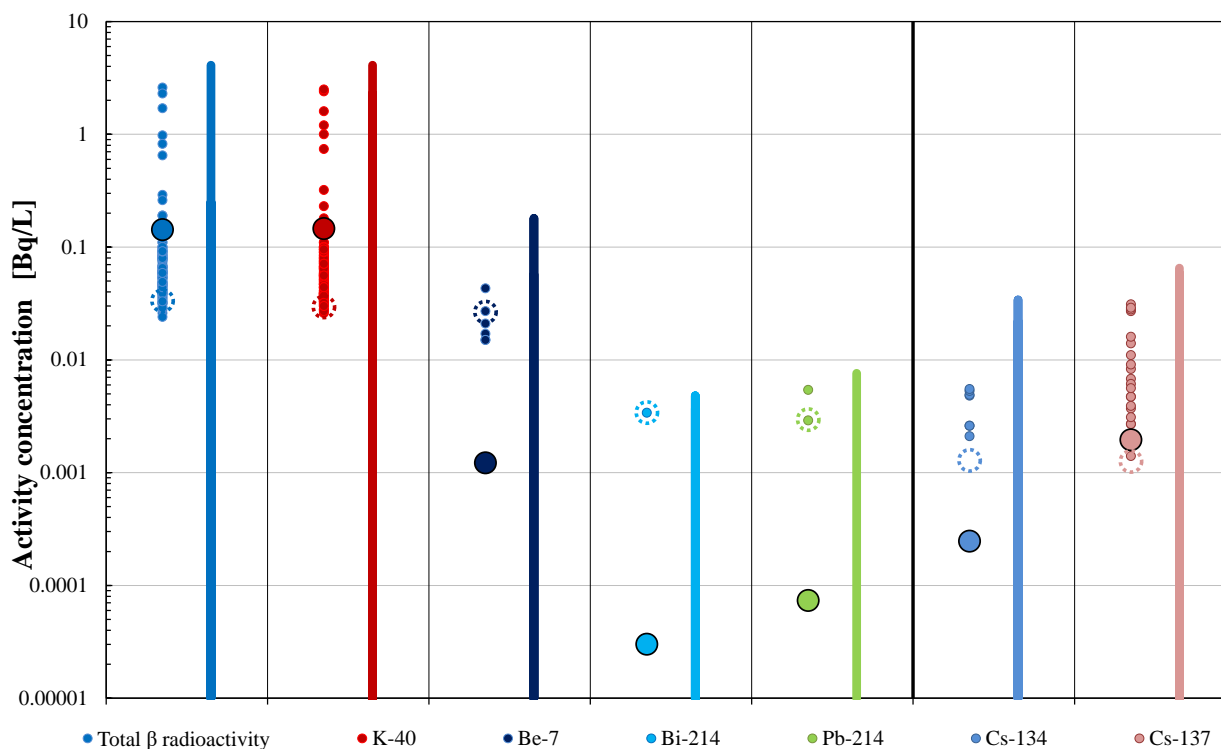
The detection rates of naturally occurring radionuclides were 10 % or less, except for K-40, for which the detection rate was 91.2 %. All of the measured values of naturally occurring radionuclides were within the past measurement trends.

Regarding artificial radionuclides, the detection rate for Cs-134 was 6.2 % and for Cs-137 it was 18.6 %, while the nuclide concentration of Cs-134 was 0.0055 Bq/L or less, Cs-137 was 0.031 Bq/L or less: all of which were within the past measurement trends.

Table 3.1-1 Detection of total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in water samples from public water areas

Radionuclides		Number of samples	Detection times	Detection rate (%)	Measured values [Bq/L]		Maximum records [Bq/L]		
					Range	Detection limits	Nationwide Monitoring in FY2014, FY2015	Monitoring of Levels (*1)	
Total $\beta$ radioactivity		113	104	92.0	ND - 2.6	0.023 - 0.36	4.1	0.25	
$\gamma$ -ray emitting radionuclides	Naturally occurring	Ag-110m	113	103	91.2	ND - 2.5	0.016 - 0.092	4.1	2.3
		Ba-140	113	6	5.3	ND - 0.043	0.0077 - 0.087	0.057	0.18
		Be-7	113	1	0.9	ND - 0.0034	0.0020 - 0.011	0.0037	0.0048
		Bi-214	113	2	1.8	ND - 0.0054	0.0016 - 0.010	0.0076	No data
	Artificial	Ce-141	113	7	6.2	ND - 0.0055	0.00078 - 0.0042	0.022	0.034
		Ce-144	113	21	18.6	ND - 0.031	0.00074 - 0.0043	0.065	0.058

(\*1) Results of the Monitoring of Environmental Radioactivity Levels and the Monitoring of the Surrounding Environment conducted in Japan nationwide from FY1997 to FY2016 (excluding data from March 11, 2011 to March 10, 2013)



(\*1) The vertical axis is logarithmically scaled because the magnitude of detected values varies widely depending on the type of radionuclide.

Figure 3.1-1 Detection of total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in water samples from public water areas

## 2) Sediments

The results for total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in sediment samples from public water areas are as shown in Table 3.1-2 and Figure 3.1-2.

### a) Total $\beta$ radioactivity

Total  $\beta$  radioactivity was detected at all locations surveyed, with detected values ranging from 170 to 1,300 Bq/kg: all of which were within the past measurement trends.

### b) $\gamma$ -ray emitting radionuclides

As shown in Table 3.1-2 and Figure 3.1-2, 11 types of  $\gamma$ -ray emitting radionuclides (nine naturally occurring radionuclides and two artificial radionuclides) were detected, while no other types of  $\gamma$ -ray emitting radionuclides were detectable.

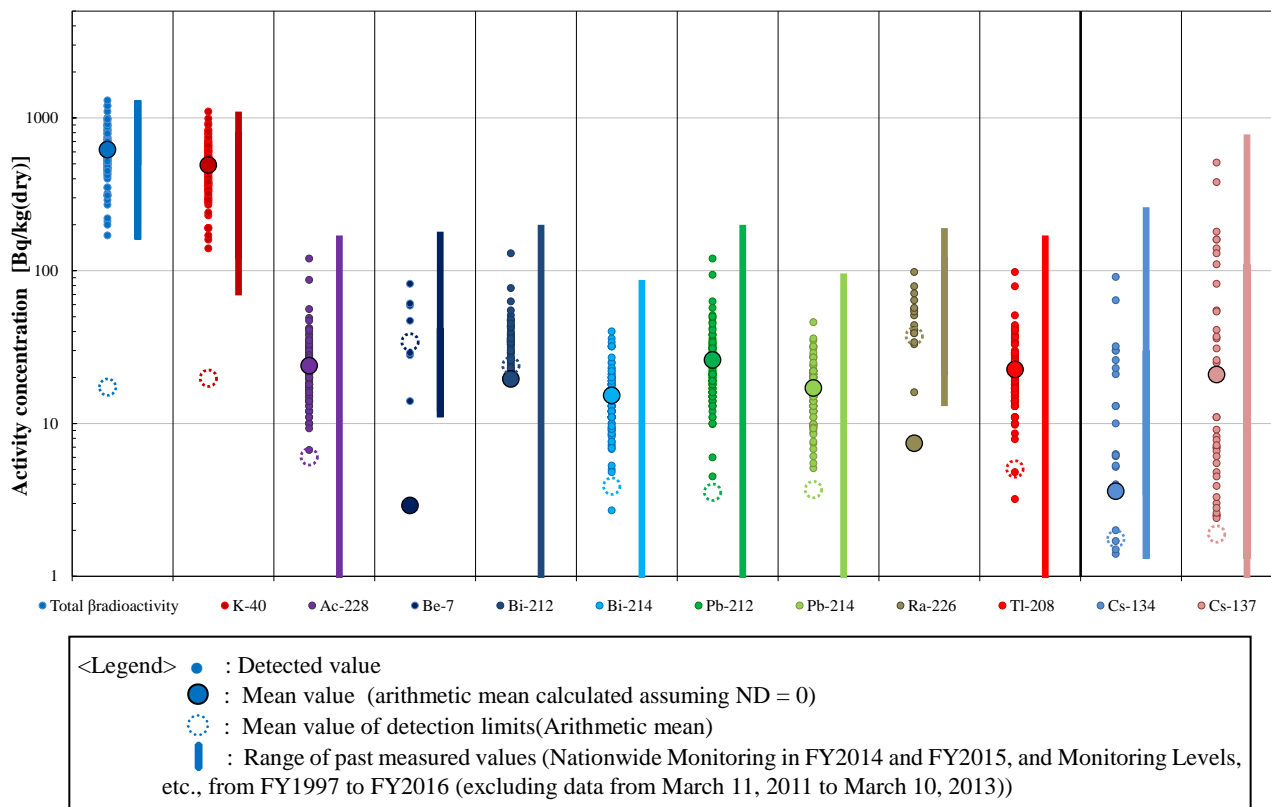
The detection rates of the six naturally occurring radionuclides other than Be-7, Bi-212, and Ra-226 exceeded 95%. All of the detected naturally occurring radionuclides were within the past measurement trends.

As for artificial radionuclides, the detection rates of Cs-134 and Cs-137 were 20.0% and 35.5% respectively, while detected values were 91 Bq/kg or less for Cs-134 and 510 Bq/kg or less for Cs-137: all of which were within the past measurement trends.

Table 3.1-2 Detection of total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in sediment samples from public water areas

Radionuclides	Number of samples	Detection times	Detection rate (%)	Measured values [Bq/kg]		Maximum records [Bq/kg]			
				Range	Detection limits	Nationwide Monitoring in FY2014, FY2015	Monitoring of Levels (*1)		
Total $\beta$ radioactivity	110	110	100.0	170 - 1,300	15 - 26	1,300	1,300		
$\gamma$ -ray emitting radionuclides	Naturally occurring	K-40	110	100.0	140 - 1100	12 - 38	1,100	800	
		Ac-228	110	107	ND - 120	3.2 - 10	170	No data	
		Be-7	110	7	6.4	ND - 82	11 - 160	180	42
		Bi-212	110	59	53.6	ND - 130	11 - 44	200	No data
		Bi-214	110	110	100.0	2.7 - 40	1.9 - 9.5	87	ND
		Pb-212	110	110	100.0	4.5 - 120	1.4 - 6.1	200	No data
		Pb-214	110	110	100.0	5.1 - 46	1.5 - 9.5	96	No data
		Ra-226	110	16	14.5	ND - 98	14 - 73	190	122
		Tl-208	110	110	100.0	3.2 - 98	2.2 - 12	170	No data
	Artificial	Cs-134	110	22	20.0	ND - 91	0.80 - 4.3	260	30
Cs-137	110	39	35.5	ND - 510	0.82 - 3.5	780	110		

(\*1) Results of the Monitoring of Environmental Radioactivity Levels and the Monitoring of the Surrounding Environment studies conducted in Japan nationwide from FY1997 to FY2016 (excluding data from March 11, 2011 to March 10, 2013)



(\* ) Details of the detection of Cs-134 and Cs-137 are explained later.

(\* ) The vertical axis is logarithmically scaled because the magnitude of detected values varies widely with the type of radionuclide.

Figure 3.1-2 Detection of total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in sediment samples from public water areas

## (2) Groundwater

The measurement results for total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in groundwater samples are as shown in Table 3.1-3 and Figure 3.1-3.

### a) Total $\beta$ radioactivity

The detection rate of total  $\beta$  radioactivity was 88.2%, with detected values ranging from not detectable to 0.54 Bq/L. Detected values exceeded the range of past measurement records at one location, but they were attributed to K-40, and was considered to be within the past measurement trends.

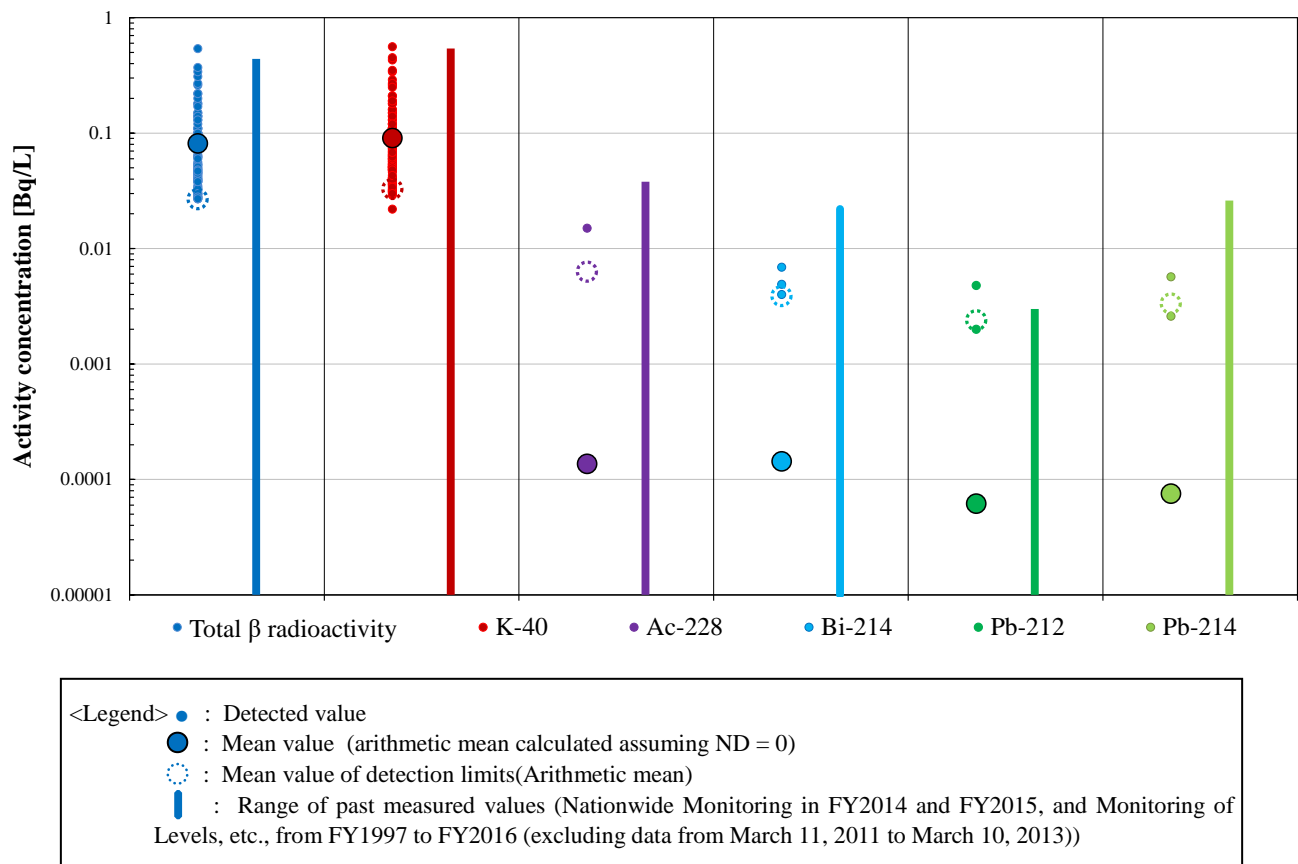
### b) $\gamma$ -ray emitting radionuclides

Five types of  $\gamma$ -ray emitting radionuclides (all naturally occurring radionuclides), as shown in Table 3.1-3 and Figure 3.1-3, were detected, while no other types of  $\gamma$ -ray emitting radionuclides were detected. For naturally occurring radionuclides, the detection rate was less than 3% except for the detection rate of K-40 which was 84.5%. At one location, K-40 slightly exceeded the range of past measurement records, but it is usually contained in natural soil rocks etc (described below). In addition, Pb-212 slightly exceeded the range of past measurement records at one point, but it is a natural species of the thorium series and is usually contained in natural soil rocks etc. Considering that the past detected cases are based on survey results from only a few areas (Shiga prefecture, Niigata prefecture, Nara prefecture; not surveyed in the Monitoring of Environmental Radioactivity Levels), Pb-212 was assumed to be within the past measurement trends.

Table 3.1-3 Detection of total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in groundwater samples

Radionuclides	Number of samples	Detection times	Detection rate (%)	Measured values [Bq/L]				Maximum records [Bq/L]				
				Range		Detection limits		Nationwide Monitoring in FY2014, FY2015	Monitoring of Levels (*1)			
Total $\beta$ radioactivity	110	97	88.2	ND	-	0.54	0.024	-	0.038	0.44	0.33	
$\gamma$ -ray emitting radionuclides Naturally occurring	K-40	110	93	84.5	ND	-	0.56	0.017	-	0.054	0.54	0.41
	Ac-228	110	1	0.9	ND	-	0.015	0.0038	-	0.0096	0.038	No data
	Bi-214	110	3	2.7	ND	-	0.0069	0.0022	-	0.0059	0.022	No data
	Pb-212	110	2	1.8	ND	-	0.0048	0.0013	-	0.0040	0.0030	No data
	Pb-214	110	2	1.8	ND	-	0.0057	0.0019	-	0.0050	0.026	No data

(\*1) Results of the Monitoring of Environmental Radioactivity Levels and the Monitoring of the Surrounding Environment conducted in Japan nationwide from FY1997 to FY2016 (excluding data from March 11, 2011 to March 10, 2013)



(\* ) The vertical axis is logarithmically scaled because the magnitude of detected values varies widely with the type of radionuclide.

Figure 3.1-3 Detection of total  $\beta$  radioactivity and  $\gamma$ -ray emitting radionuclides in groundwater samples

### 3.2 Discussion regarding detected radionuclides

#### (1) Detection of naturally occurring radionuclides

##### 1) Correlation between activity concentrations of K-40 and seawater

As explained in 3.1 above, activity concentrations of K-40 were all within the past measurement trend in water samples collected in public water areas. All the locations where relatively high concentrations of K-40 were detected were located in the tide zone and the electrical conductivity (EC) was high (1,330 mS/m at the maximum). Therefore, a comparison was made using all available data to clarify the correlation between activity concentrations of K-40 and EC (see Figure 3.2-1).

As shown in Figure 3.2-1, a positive correlation was found between them.

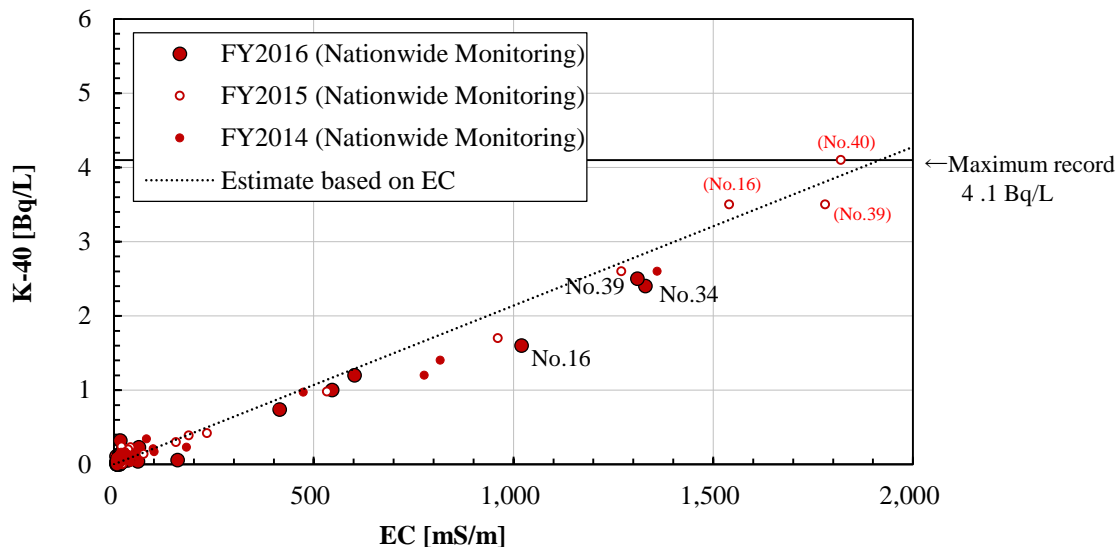


Figure 3.2-1 Correlation between K-40 concentrations and electrical conductivity(EC) in water samples from public water areas

On the other hand, according to the results of the Monitoring of Levels, conducted for 20 years from FY1997 to FY2016 (monitoring of 744 samples collected from 19 prefectures), the average concentration (average) of K-40 was approximately 9.6 Bq/L and the maximum concentration was 15 Bq/L (see Table 3.2-1).

Table 3.2-1 Results of the Monitoring of Levels, etc., concerning K-40 in seawater (\*1)

Number of surveys	Detection times	Detection rate (%)	Average (Bq/L)	Maximum (Bq/L)
744	717	96.4	9.6	15

(\*1) Results of the Monitoring of Environmental Radioactivity Levels and the Monitoring of the Surrounding Environment conducted in Japan nationwide from FY1997 to FY2016

EC of seawater is generally around 4,500 mS/m, and the estimated activity concentrations of K-40 with possible influence of seawater were obtained by using the following formula based on the measurement results of EC for the relevant river water.

$$\text{(Activity concentration of K-40 in river water)} = \text{(Average activity concentration of K-40 in seawater)} \times \frac{\text{(Measured EC in the river water)}}{\text{(Ordinary values of EC in seawater)}}$$

The estimated activity concentrations of K-40 in the river water are indicated with a dotted line (.....) in Figure 3.2-1, and the estimated values agree very well with the measured activity concentrations of K-40. Therefore, the relatively high activity levels of K-40 obtained in the latest measurements are considered to have been caused by the intrusion of seawater.

In the same manner, the correlation between K-40 concentration and EC was also investigated with regard to groundwater samples (see Figure 3.2-2, scales of the vertical and horizontal axes differ from those for Figure 3.2-1). However, no clear correlation was found from the groundwater samples. The concentrations of K-40 in groundwater samples from Site No. 77 (Himebara, Izumo City, Shimane Pref.: 0.56 Bq/L) slightly exceeded the range of past measured values (maximum value: 0.54 Bq/L). This result is considered to reflect the geological characteristics of the monitoring area, which exhibits relatively high potassium concentrations in the soil (Figure 3.2-3). Accordingly, the K-40 concentration for groundwater samples in the latest monitoring is considered to fall within the past measurement trends.

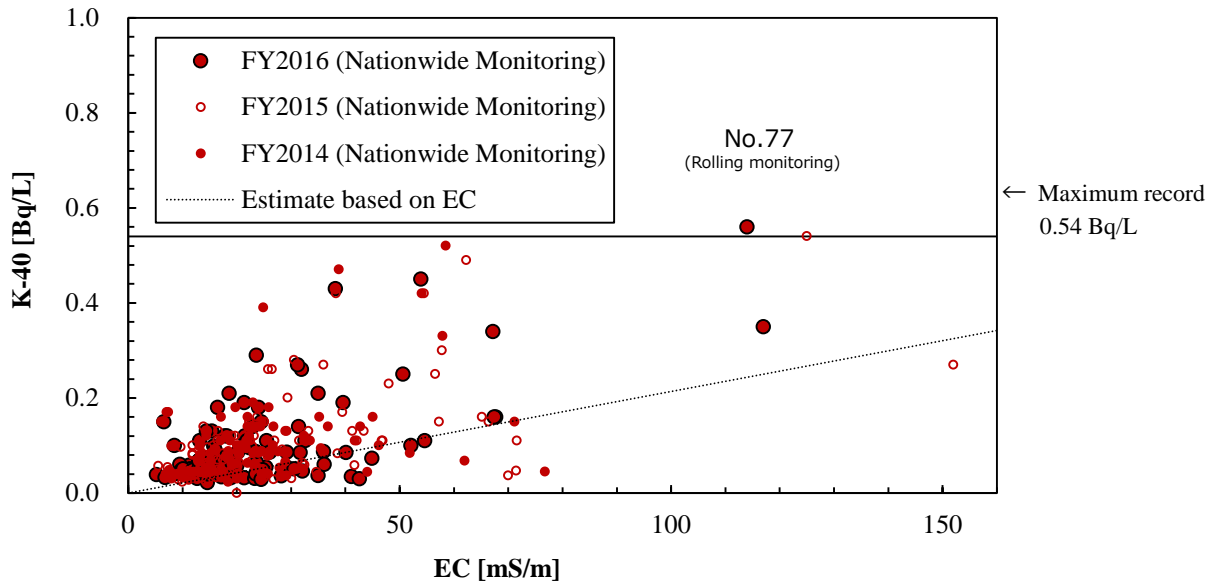
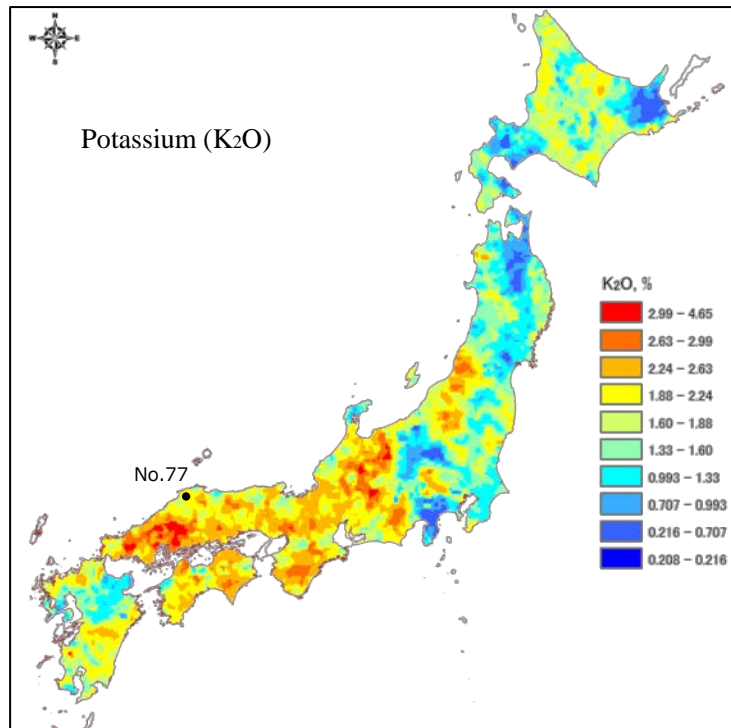


Figure 3.2-2 Correlation between the K-40 concentration and electrical conductivity (EC) in groundwater sample





Reference: Website of the Geological Survey of Japan, AIST  
<https://gbank.gsj.jp/geochemmap/setumei/radiation/setumei-radiation.htm>

Figure 3.2-3 Distribution of potassium (K<sub>2</sub>O) in soil in Japan

## 2) Uranium and thorium series radionuclides

As explained in 3.1 above, uranium and thorium series radionuclides were detected at relatively high concentration levels in sediment samples from public water areas. The detection status is shown in Table 3.2-2.

These naturally occurring radionuclides exist widely within the earth's crust and belong to the same decay series, which implies the existence of some correlations among detected values.

Table 3.2-2 Detection of uranium and thorium series naturally occurring radionuclides

Radionuclides		Number of samples	Detection times	Detection rate (%)	Measured value [Bq/kg]						
					Range			Detection limit			
γ-ray emitting radionuclides	Uranium series	Ra-226	110	16	14.5	ND	-	98	14	-	73
		Pb-214	110	110	100.0	5.1	-	46	1.5	-	9.5
		Bi-214	110	110	100.0	2.7	-	40	1.9	-	9.5
	Thorium Series	Ac-228	110	107	97.3	ND	-	120	3.2	-	10
		Pb-212	110	110	100.0	4.5	-	120	1.4	-	6.1
		Bi-212	110	59	53.6	ND	-	130	11	-	44
		Tl-208	110	110	100.0	3.2	-	98	2.2	-	12

Figure 3.2-4 and Figure 3.2-5 show the correlation among uranium series radionuclides and among thorium series radionuclides, respectively, based on the radionuclides with high detection rate (with instances of non-detection excluded). Figure 3.2-4 and Figure 3.2-5 reveals high correlations among uranium series or among thorium series radionuclides. From this information it can be inferred that the radionuclides of the two series reflected the geology of the locations at which they had been detected.

Note that it is generally accepted that granite contains larger amounts of naturally occurring radionuclides than other kinds of rocks and that natural radiation doses correlate to some extent with uranium and thorium series radionuclides (both according to the Geological Society of Japan<sup>3</sup>). For reference, Figure 3.2-6 shows the distribution map of granite in Japan, while Figure 3.2-7 shows the distribution map of natural radiation doses in Japan.

<sup>3</sup> <http://www.geosociety.jp/hazard/content0058.html>

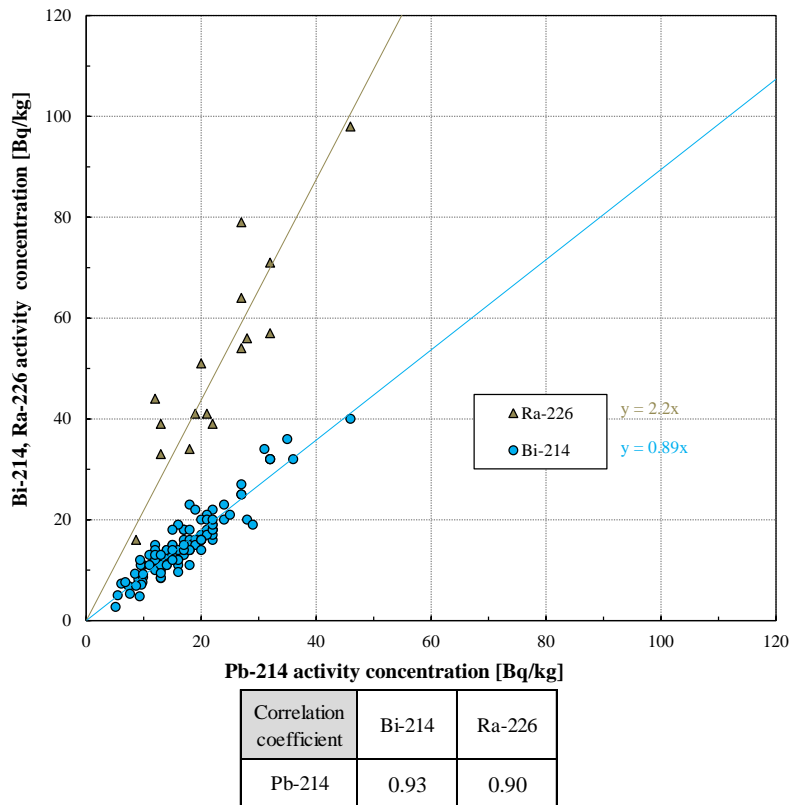


Figure 3.2-4 Correlations among uranium series radionuclides

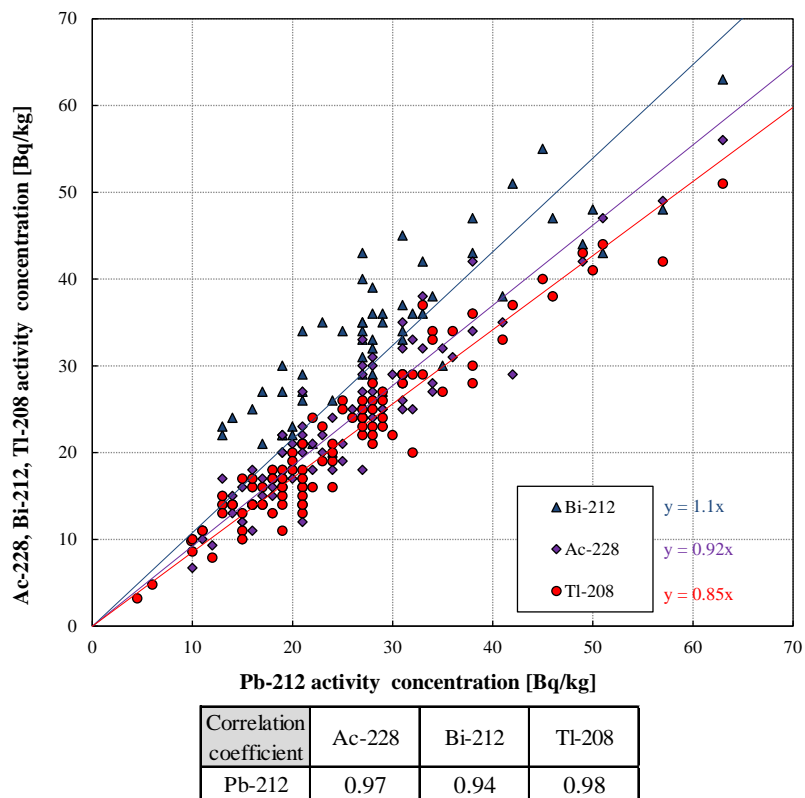
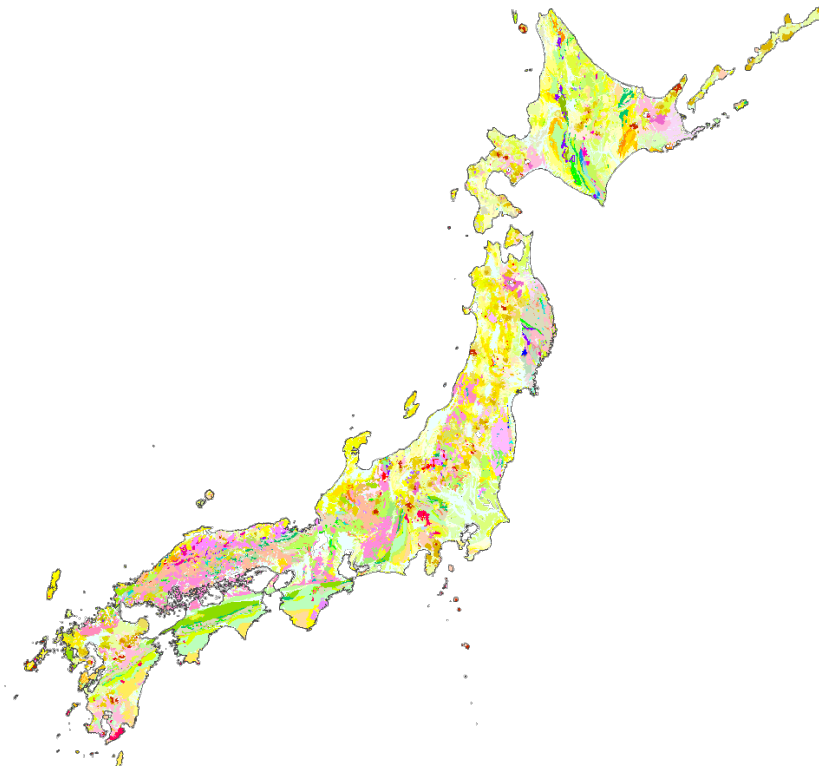


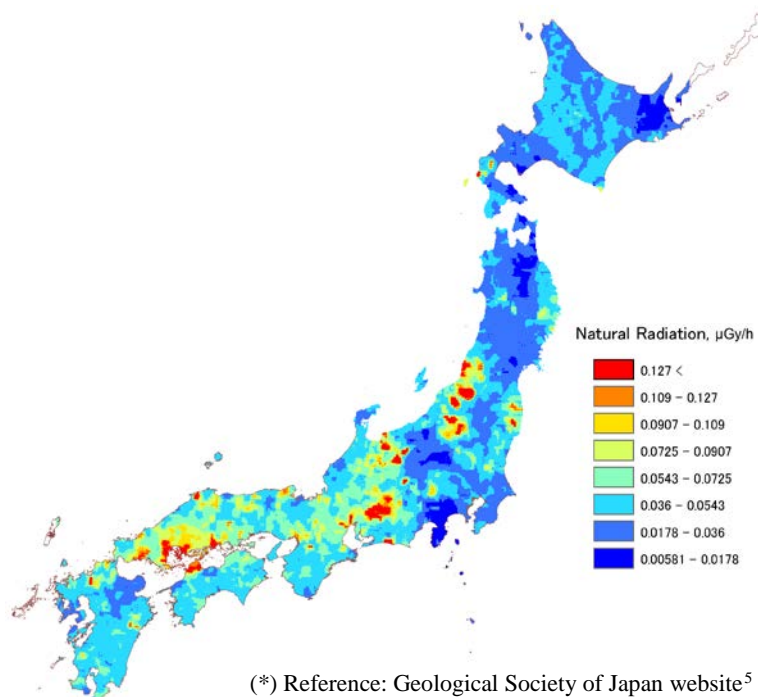
Figure 3.2-5 Correlations among thorium series radionuclides



(\*) Reference: Seamless Digital Geological Map of Japan (1:200,000) © ; AIST website<sup>4</sup>

Figure 3.2-6 Distribution of granite in Japan

(parts highlighted in pink in the Figure are locations where granite exists)



(\*) Reference: Geological Society of Japan website<sup>5</sup>

Figure 3.2-7 Natural radiation doses in Japan (Gy = Sv for  $\gamma$ -rays and  $\beta$ -rays)

<sup>4</sup> <https://gbank.gsj.jp/seamless/>

<sup>5</sup> <http://www.geosociety.jp/hazard/content0058.html>

## (2) Detection of artificial radionuclides

### 1) Cs-134 and Cs-137 in sediments

Radioactive cesium was detected in sediment samples from public water areas in Hokkaido, Tohoku, Kanto, Chubu, Kinki, and Kyushu blocks (39 locations in total; both Cs-134 and Cs-137 were detected at 22 locations (all in Tohoku and Kanto Blocks); only Cs-137 was detected at 17 locations).

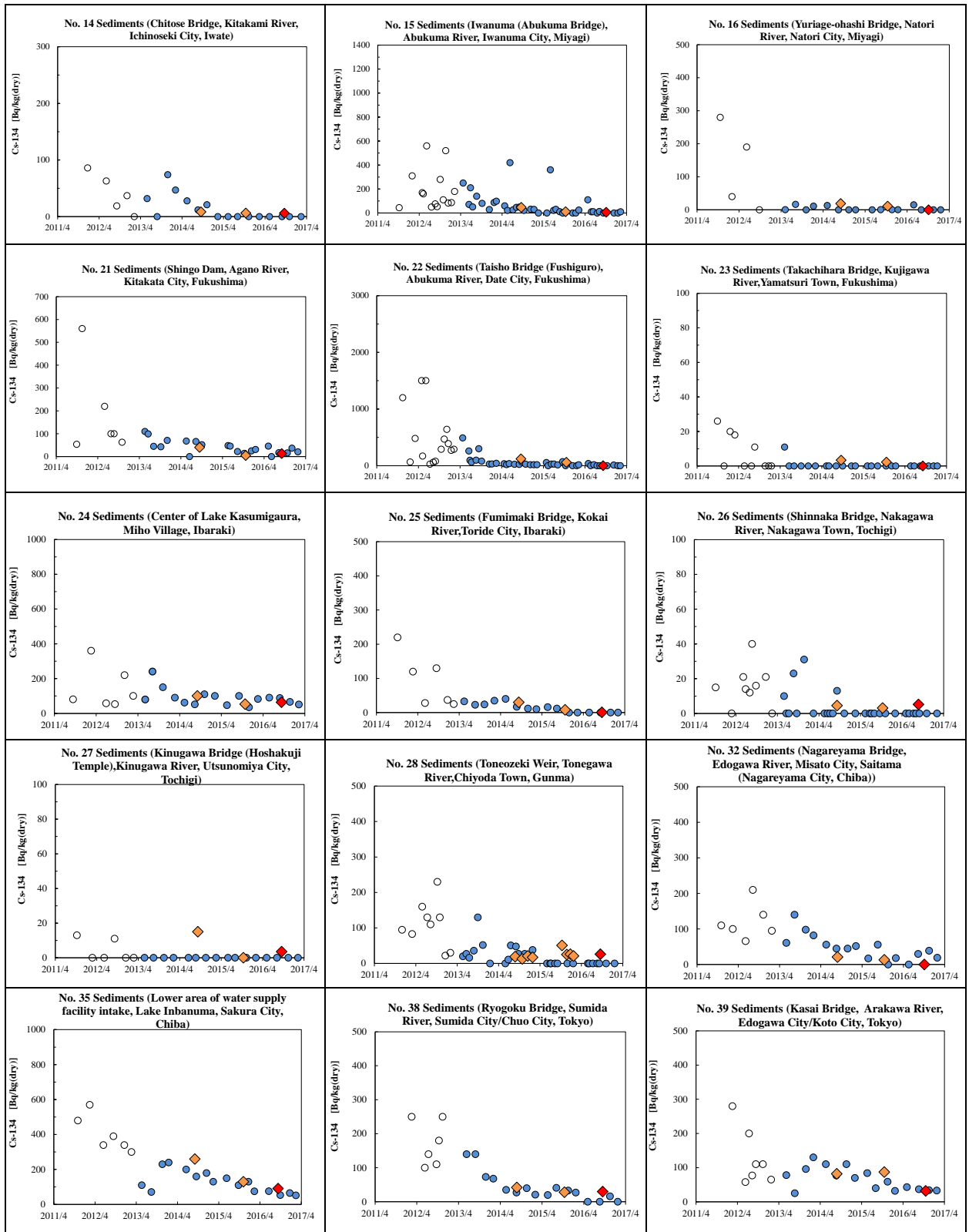
To better clarify the concentration levels of the detected radioactive cesium species, the following comparisons were made:

- (i) Wherever Post-Earthquake Monitoring is carried out at the same locations, a direct comparison between data was carried out.
- (ii) For locations that do not fall under the category of (i) above but are within the Tokyo Metropolitan Area or other prefectures where Post-Earthquake Monitoring is conducted, collected data was compared with that from other locations in the same prefecture.
- (iii) For locations that do not fall under the categories of (i) and (ii) above, collected data was compared to data from nearby locations obtained via Post-Earthquake Monitoring.
- (iv) For locations where measured values did not exceed the range of past measurement records, collected data was compared with data obtained through the Monitoring of Levels and other reports.

#### (i) Comparison with the past Post-Earthquake Monitoring results for the same locations

Regarding locations where Post-Earthquake Monitoring was also conducted, the measured values in the latest monitoring were compared with the past measurement records for the same locations (see Figure 3.2-8).

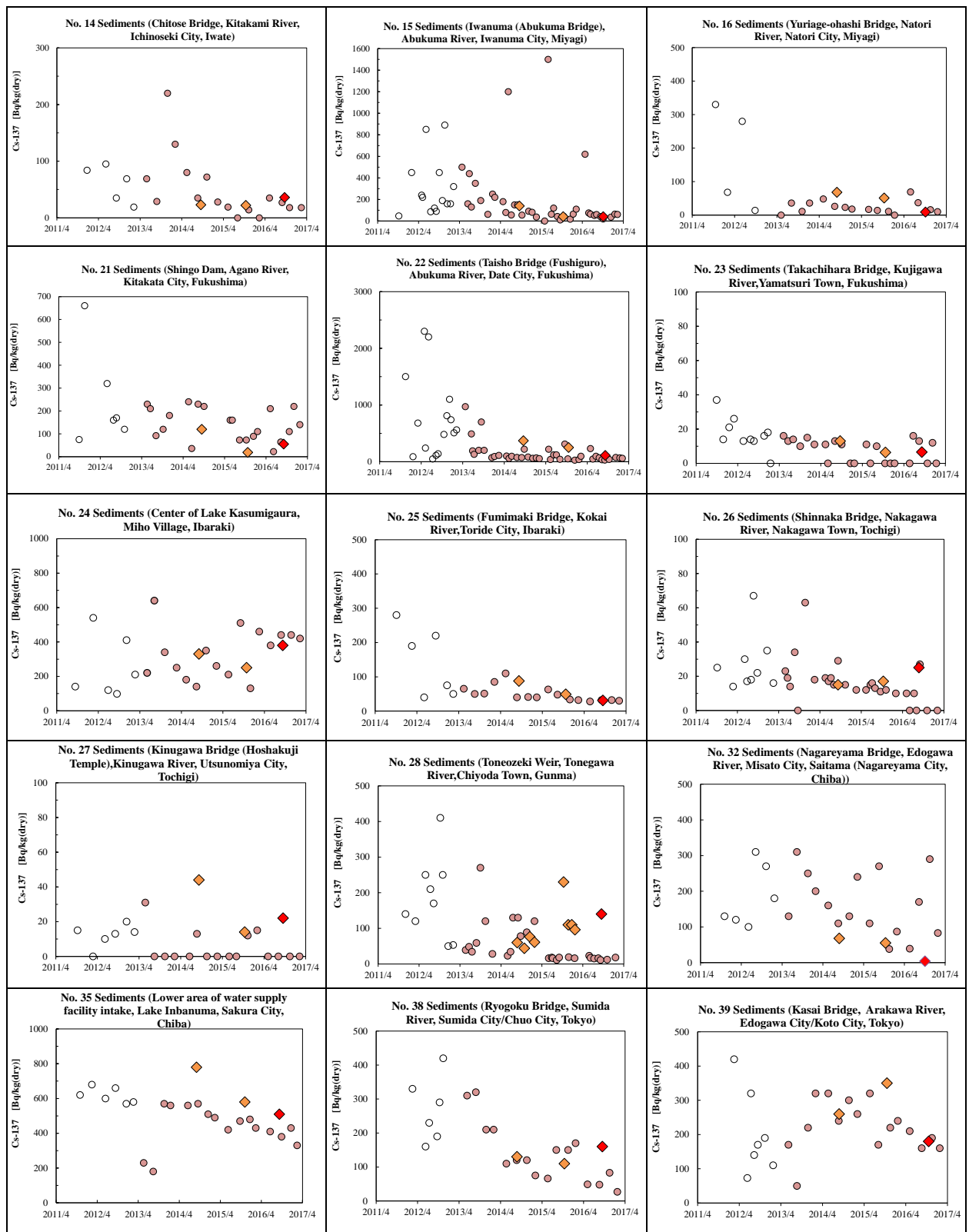
All the results of the latest monitoring were found to be within the past measurement trends.



<Legend>

- ◆: FY2016 Nationwide Monitoring results
- ◇: FY2014-FY2015 Nationwide Monitoring results
- : Post-Earthquake Monitoring results
- : Post-Earthquake Monitoring results (measurement results from March 11, 2011 to March 10, 2013 which were excluded from the past measured values used as reference data)

Figure 3.2-8 (1) (i) Comparison with past Post-Earthquake Monitoring results for the same locations [Cs-134]



<Legend>

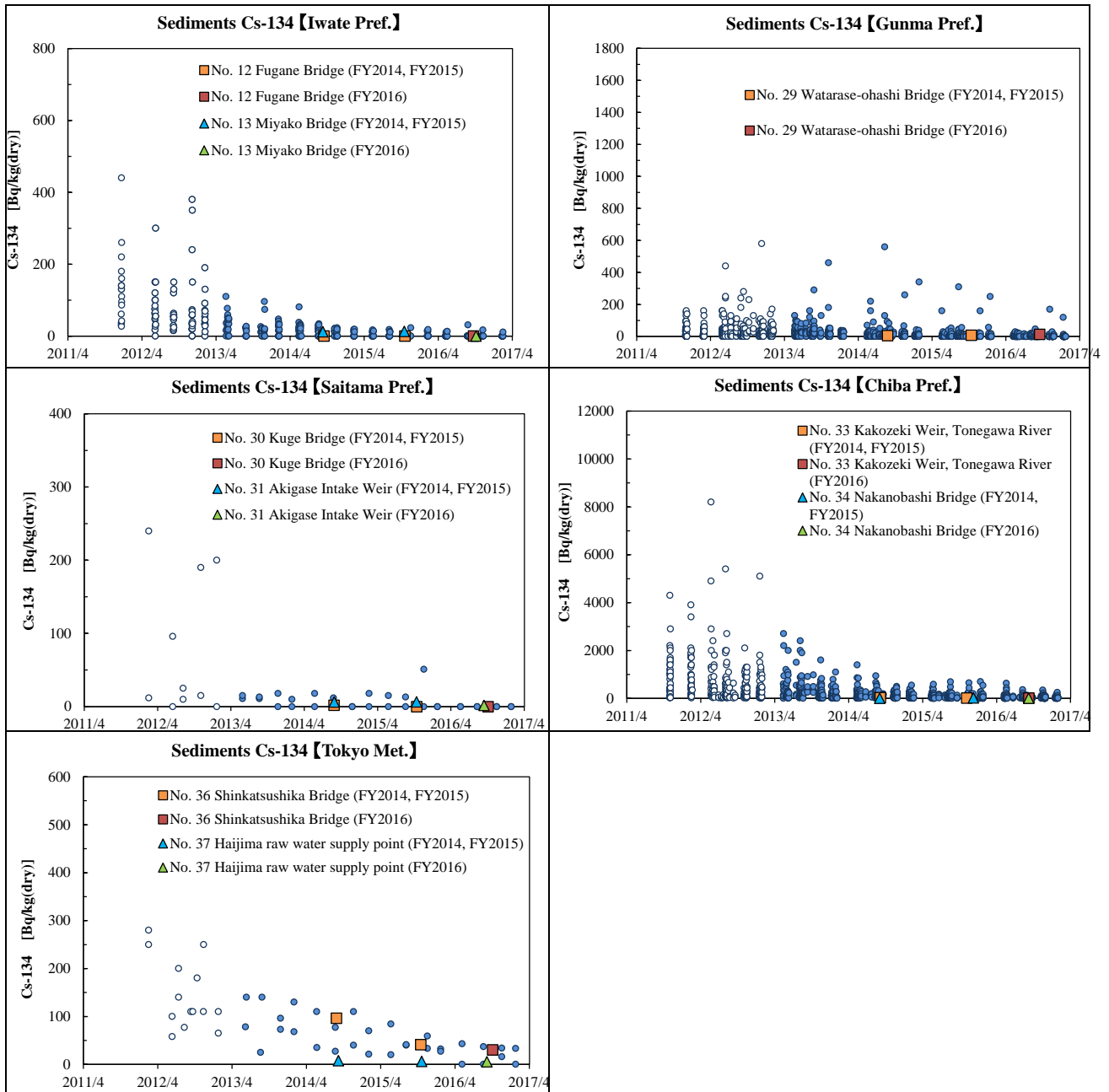
- ◆: FY2016 Nationwide Monitoring results
- ◇: FY2014-FY2015 Nationwide Monitoring results
- : Post-Earthquake Monitoring results
- : Post-Earthquake Monitoring results (measurement results from March 11, 2011 to March 10, 2013, which were excluded from the past measured values used as reference data)

Figure 3.2-8 (2) (i) Comparison with the past Post-Earthquake Monitoring results for the same locations [Cs-137]

(ii) Comparison with the past Post-Earthquake Monitoring results in the same prefectures

For locations that have not been surveyed by Post-Earthquake Monitoring, the measured values obtained in the latest monitoring were compared with the past Post-Earthquake Monitoring results for locations in the same prefectures (see Figure 3.2-9).

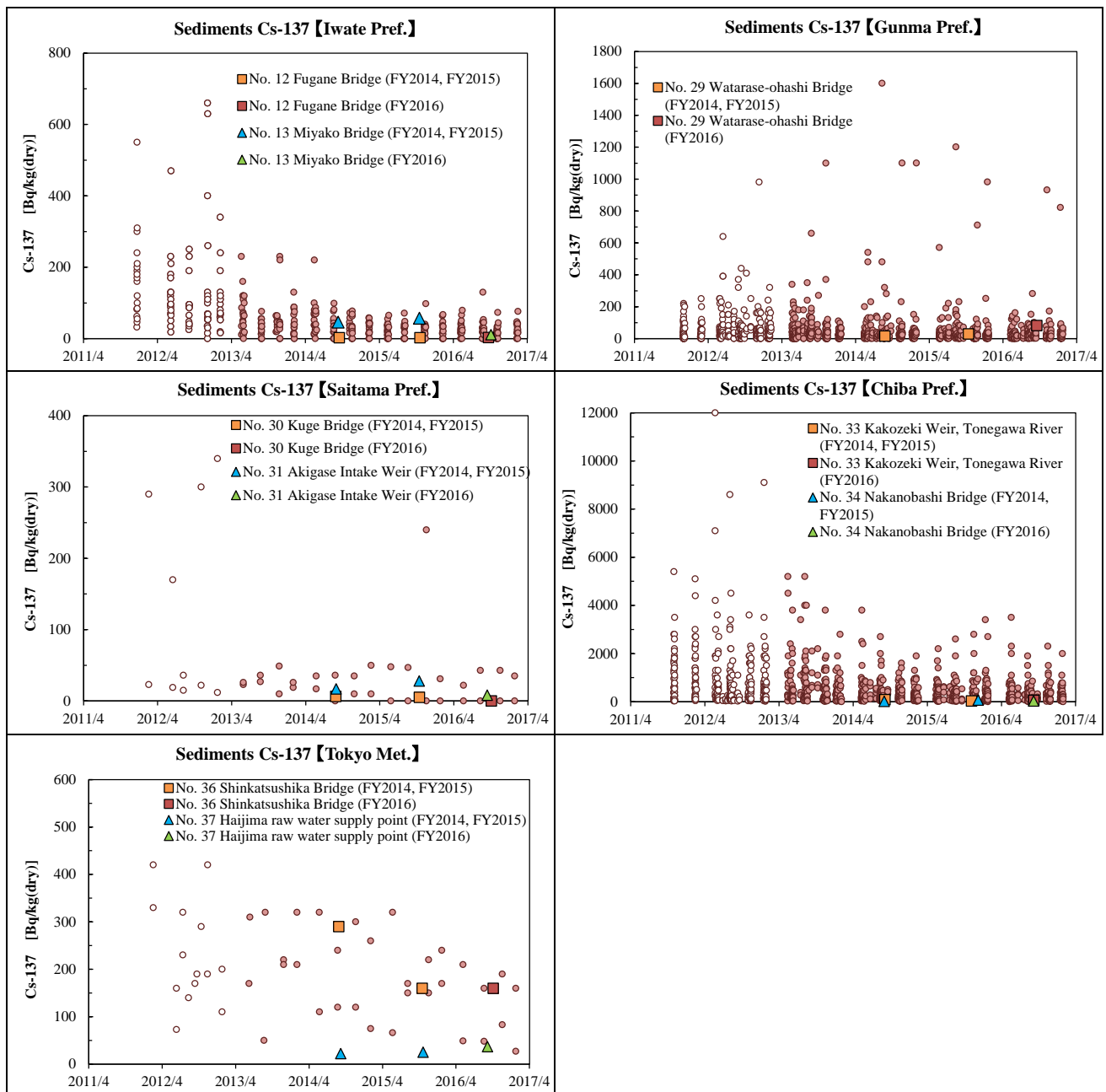
The measured values from the latest monitoring were all found to be within the past measurement trends.



- : Post-Earthquake Monitoring results
- : Post-Earthquake Monitoring results (measurement results from March 11, 2011 to March 10, 2013 which were excluded from the past measured values used as reference data)

Figure 3.2-9 (1) (ii) Comparison with past Post-Earthquake Monitoring results in the same prefectures [Cs-134]



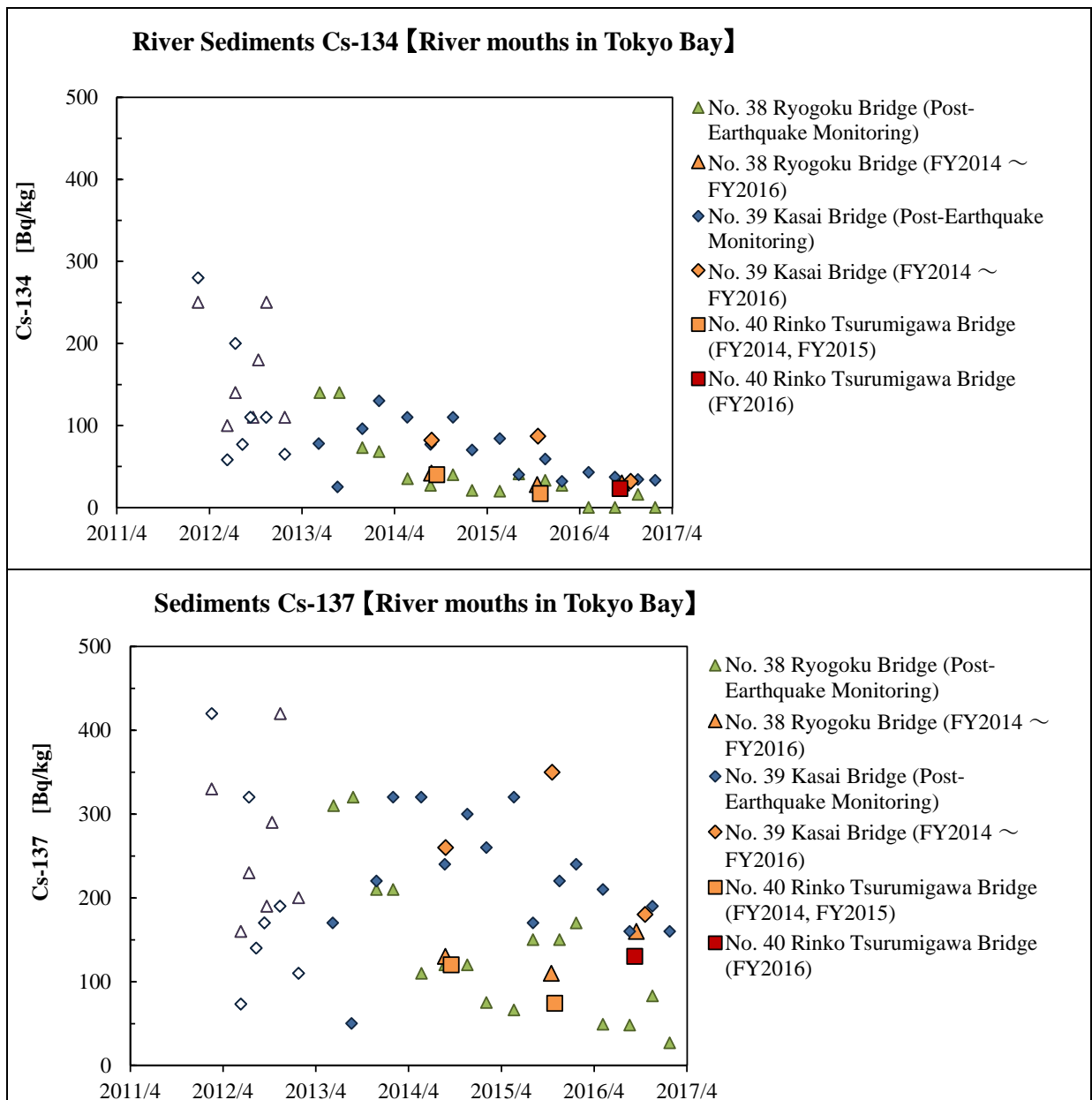


- : Post-Earthquake Monitoring results
- : Post-Earthquake Monitoring results (measurement results from March 11, 2011 to March 10, 2013 which were excluded from the past measured values used as reference data)

Figure 3.2-9 (2) (ii) Comparison with past Post-Earthquake Monitoring results in the same prefectures [Cs-137]

(iii) Comparison with past Post-Earthquake Monitoring results for nearby locations

Regarding Location No. 40 (Rinko Tsurumigawa Bridge, Tsurumi River, Yokohama City, Kanagawa Prefecture), it was considered reasonable to make a comparison with the past data for nearby locations although Post-Earthquake Monitoring had not been conducted in Kanagawa Prefecture. Therefore, a comparison was made with the past data for Location No. 38 (Ryogoku Bridge, Sumida River, Chuo City/Sumida City, Tokyo Metropolis) and Location No. 39 (Kasai Bridge, Arakawa River, Koto City/Edogawa City, Tokyo Metropolis), both of which are located at the mouths of the Sumida River and the Arakawa River to Tokyo Bay (see Figure 3.2-10). As a result, it was found that the measured values for Location No. 40 were within the past measurement trends.



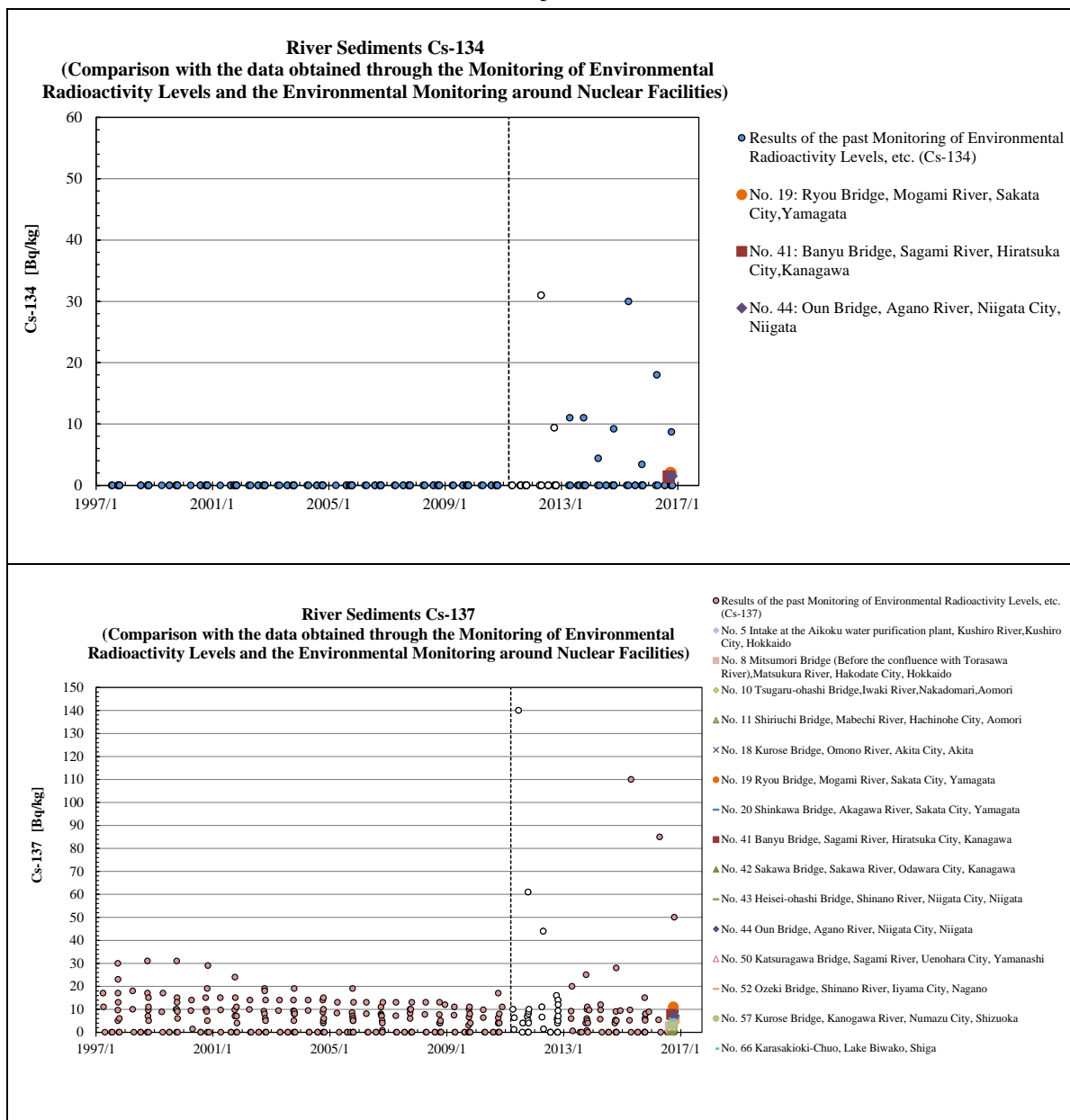
(\*) Small white diamonds and triangles show the measurement results from March 11, 2011 to March 10, 2013, which were excluded from the past measured values used as reference.

Figure 3.2-10 (iii) Comparison with past Post-Earthquake Monitoring results for nearby locations

(iv) Comparison with the data obtained from the Monitoring of Levels, etc.

For locations where measured values did not exceed the range of past measurement records, the measured values obtained during the latest monitoring were compared with the data obtained through the Monitoring of Environmental Radioactivity Levels, etc. to validate the concentration levels (see Figure 3.2-11).

Cs-134 and Cs-137 were detected at Location No. 19 (Ryou Bridge, Mogami River, Sakata City, Yamagata Prefecture), Location No. 41 (Banyu Bridge, Sagami River, Hiratsuka City, Kanagawa Prefecture), and Site No.44 (Oun Bridge, Agano River, Niigata City, Niigata Prefecture). At other locations, only Cs-137 was detected and the measured values all fell within the past measurement trends.



(\*) Upper: Cs-134, Lower: Cs-137

(\*) A dotted line shows the day the Great East Japan Earthquake occurred (March 11, 2011). White small circles show the measurement results from March 11, 2011 to March 10, 2013, which excluded from the past measured values used as reference.

Figure 3.2-11 (iv) Comparison with the data obtained through the Monitoring of Environmental Radioactivity Levels, etc.

As a reference, a good correlation was confirmed in the activity concentration ratios of Cs-137 and Cs-134 in locations where both Cs-134 and Cs-137 were detected (all in the Tohoku and Kanto blocks). The calculated activity concentration ratio was approximately 5.6 (Cs-137/Cs-134). Assuming that detected Cs-134 and Cs-137 are those discharged due to the Fukushima NPS Accident, this ratio should be approximately equal to the theoretical ratio (approx. 5.6) as of September 2016 after the discharge in March 2011 (see Figure 3.2-12). This suggests that Cs-134 and Cs-137 detected in sediment samples collected in the Tohoku and Kanto blocks were indeed derived from the Fukushima NPS Accident.

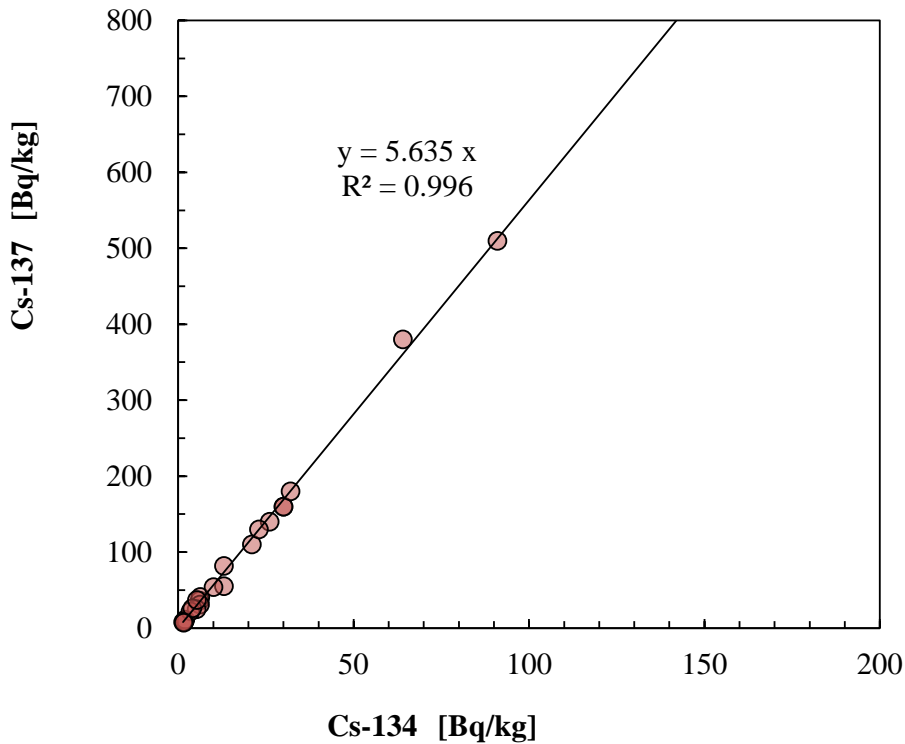


Figure 3.2-12 Concentration ratio (Cs-137/Cs-134) [Sediments (public water areas)]

(Reference: Changes in concentration ratios (Cs-137/Cs-134) over time, accounting for half-life periods)

Radionuclide	Half-life (years)	2011/3	2012/3	2013/3	2014/3	2015/3	2015/11	2016/9
Cs-134	2.0648	1	0.71	0.51	0.36	0.26	0.21	0.16
Cs-137	30.1671	1	0.98	0.96	0.93	0.91	0.90	0.88
<b>Cs137/Cs134</b>		1	1.37	1.87	2.56	3.50	4.28	<b>5.62</b>

(\*) The concentration ratio at the time of the latest monitoring (around September 2016) is estimated to be approximately 5.6 (highlighted in yellow in the table above).

Given these facts, Cs-134 and Cs-137 detected in sediment samples from public water areas were mostly derived from the Fukushima NPS Accident, except for some locations for which causal relations were unclear, but the detected values were all within the past measurement trends.

## 2) Cs-134 and Cs-137 in water

Cs-134 or Cs-137 were detected at 21 out of the 110 locations where water samples from public water areas were collected (a total of 21 locations: both Cs-134 and Cs-137 were detected at seven locations (all in the Tohoku and Kanto blocks) and only Cs-137 was detected at 14 locations). The maximum values were 0.0055 Bq/L for Cs-134 and 0.031 Bq/L for Cs-137. Moreover, these values fell within the range of past measured values from the Monitoring of Environmental Radioactivity Levels (max. 0.034 Bq/L for Cs-134, and max 0.058 Bq/L for Cs-137).

At the seven locations (all in the Tohoku and Kanto blocks) where both Cs-134 and Cs-137 were detected, the concentration ratio (Cs-137/Cs-134) was calculated in the same manner as with the sediment samples and also showed a good correlation. The obtained concentration ratio was approximately 5.6. Assuming that detected Cs-134 and Cs-137 were those discharged due to the Fukushima NPS Accident, this ratio should be close to the theoretical ratio (approx. 5.6) as of September 2016 after the discharge in March 2011 (see Figure 3.2-13). This suggests that Cs-134 and Cs-137 detected in water samples collected in the Tohoku and Kanto blocks were indeed derived from the Fukushima NPS Accident.

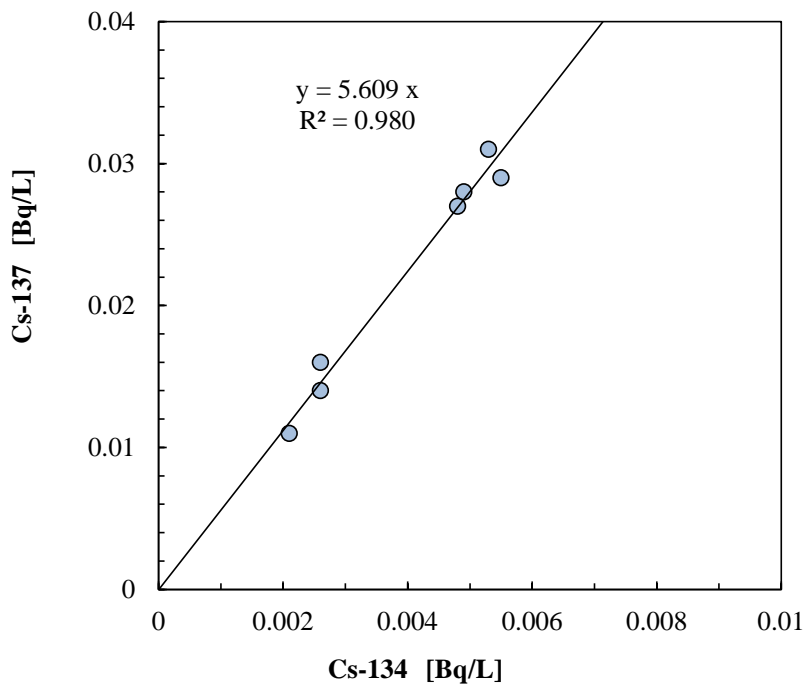


Figure 3.2-13 Concentration ratio (Cs-137/Cs-134) [Water (public water areas)]

## 3) Cs-134 and Cs-137 in groundwater

Cs-134 and Cs-137 were not detected in groundwater samples collected at any of the 110 locations (detection limit: approx. 0.001 to 0.002 Bq/L).

### 3.3 Survey to check annual variation

At two locations<sup>6</sup> (both in rivers), namely, Location No. 28 (Toneozeki Weir, Tonegawa River, Chiyoda Town, Gunma Prefecture) and Location No. 83 (Kasumi Bridge, Takahashi River, Kurashiki City, Okayama Prefecture), surveys were conducted four times during the period from May 24, 2016 to January 27, 2017. These two locations had been previously surveyed four times each in FY2014 and in FY2015, and the current analysis includes the results from those prior years.

Radionuclides were detected as shown in Table 3.3-1 and Table 3.3-2. Figure 3.3-1 and 3.3-2 show the changes in radionuclides detected in and after FY2014. Table 3.3-1 and Table 3.3-2 also show the coefficients of variation<sup>7</sup> (= sample standard deviation / average) indicating for the variations in detected values.

The coefficients of variation in water samples ranged from 15% to 26% for total  $\beta$  radioactivity and K-40, and stood at 36% for Cs-137, respectively<sup>8</sup>.

The coefficients of variation in sediment samples ranged from 5.2% to 27% for total  $\beta$  radioactivity and naturally occurring radionuclides (Ac-228, Bi-212, Bi-214, Pb-212, Pb-214, Tl-208, and K-40), and from 47 to 51% for radioactive cesium.

For reference, sediment grain size distribution and CS-137 concentration change for Location No. 28 are shown in Figure 3.3-3, and sediment grain size distribution for Location No. 83 is shown in Figure 3.3-4.

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<sup>6</sup> It was decided that one location each would be selected in eastern and western Japan. To make the selection, all 110 locations were first divided into two areas for convenience (Locations No. 1 to No. 55 were classified as eastern Japan and Locations No. 56 to No. 110 were classified as western Japan) and the middle number in each area was selected.

<sup>7</sup> In this report: coefficient of variation = sample standard deviation divided by the average; hereinafter the same shall apply.

<sup>8</sup> Fluctuations in measured radioactivity were reported when sites were sampled multiple times. For instance, the FY2012 survey shows 12 to 16 % fluctuations in the amount of radioactive cesium contained in riverbed sediments (nine samples collected during the same period). At River Site No. 28, radioactive cesium was detected in sediment, and a drop in water transparency probably due to sludge disturbance caused by pleasure boats or winds in the vicinity was observed. This changed the water and bottom sampling locations slightly, and changes in the distribution of sediment grain size was observed. Because the changes in sediment grain size distribution might have affected the concentration of radioactive cesium, the changes in sediment grain size distribution and Cs-137 concentration at River Site No. 28 are graphically summarized in Figure 3.3-3. This revealed that sediment samples with high clay and silt contents tend to have higher Cs-137 concentrations. Accordingly, it was inferred that the fluctuations in the amount of radioactive cesium in samples from River Site No. 28 had occurred due to the changes in the grain size distribution in the sediment samples.

Table 3.3-1 Detection trends for radioactive materials at the same location [River No. 28]

	Radionuclides	FY2014				FY2015				FY2016				Coefficient of variation [%]
		Aug 25	Oct 27	Dec 15	Jan 26	Oct 13	Nov 24	Dec 25	Jan 22	May 24	Sep 15	Nov 14	Jan 20	
Water [Bq/L]	Total β radioactivity	0.068	0.12	0.12	0.11	0.090	0.099	0.071	0.10	0.062	0.061	0.13	0.084	26
	K-40	0.097	0.11	0.078	0.094	0.12	0.11	0.096	0.11	0.059	0.078	0.095	0.083	18
	Cs-134	0.0015	0.0020	<0.0010	0.0018	<0.0022	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014	<0.0017	<0.0013	-
	Cs-137	0.0074	0.0072	0.0048	0.0049	0.0029	0.0035	0.0043	0.0052	0.0030	0.0061	0.0035	0.0025	36
Sediment [Bq/kg]	Total β radioactivity	410	350	350	380	720	460	490	430	410	460	400	450	22
	K-40	290	330	280	280	290	370	320	320	280	300	250	260	11
	Ac-228	15	9.8	12	15	23	18	22	20	15	21	18	12	26
	Be-7	<24	<36	<38	<25	<76	<68	<44	<28	<54	59	<66	<29	-
	Bi-212	<32	<17	<28	<23	<46	<30	<21	<23	37	29	<30	<30	-
	Bi-214	<12	11	13	13	14	15	16	12	12	13	16	18	15
	Pb-212	18	16	21	16	28	18	16	18	17	21	19	19	18
	Pb-214	11	11	16	11	14	15	17	13	19	17	18	13	19
	Tl-208	16	12	13	14	18	11	15	17	14	21	14	13	19
	Cs-134	19	13	21	17	51	25	26	21	15	26	19	11	47
	Cs-137	60	44	76	61	230	110	110	96	74	140	96	72	51

(\*) The coefficients of variation are shown only for radionuclides detected five times or more.

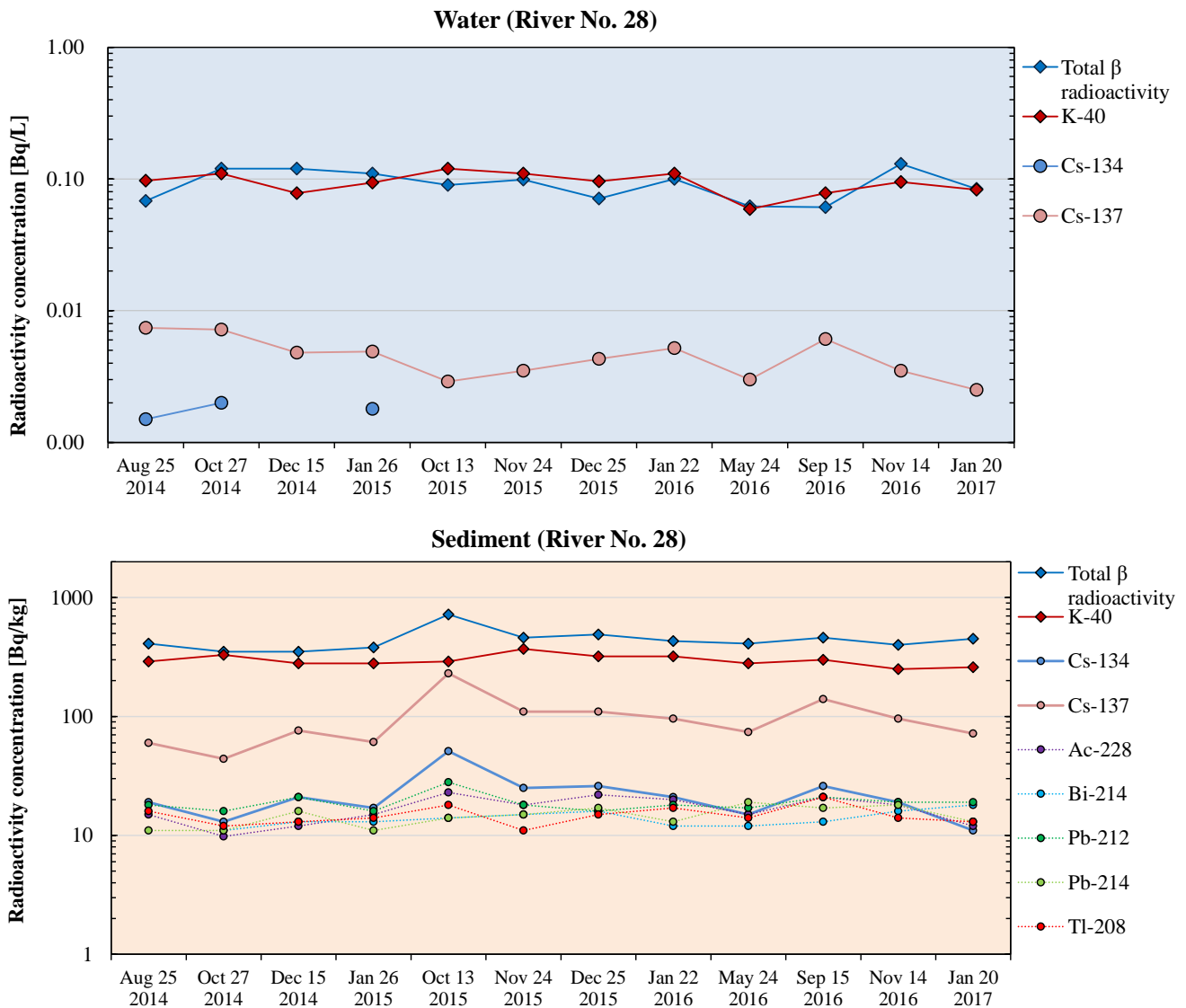


Figure 3.3-1 Changes in detection trends for radioactive materials at the same location [River No. 28]

Table 3.3-2 Detection trends for radioactive materials at the same location [River No. 83]

	Radionuclides	FY2014				FY2015				FY2016				Coefficient of variation [%]
		Aug 30	Oct 28	Dec 15	Jan 26	Oct 16	Nov 30	Dec 22	Jan 25	May 30	Aug 23	Nov 15	Jan 27	
Water [Bq/L]	Total β radioactivity	0.046	0.064	0.037	0.038	0.048	0.047	0.041	0.035	0.039	0.045	0.030	0.041	20
	K-40	0.034	0.045	<0.028	0.034	0.045	0.042	0.038	0.031	0.050	0.043	0.046	0.036	15
	Be-7	<0.024	0.012	<0.0073	<0.0073	<0.024	<0.018	<0.013	<0.0085	<0.011	<0.040	<0.022	<0.0078	-
	Pb-212	<0.0019	<0.0021	<0.0019	0.0013	<0.0019	<0.0015	<0.0015	<0.0014	<0.0017	<0.0015	<0.0015	<0.0014	-
Sediment [Bq/kg]	Total β radioactivity	1000	980	890	920	1000	1000	950	940	930	1100	940	990	5.6
	K-40	870	830	910	770	920	920	840	840	840	900	840	840	5.2
	Ac-228	13	25	12	19	25	21	29	25	17	18	24	15	27
	Bi-212	42	34	23	28	28	<33	37	<34	<35	34	<28	<29	20
	Bi-214	15	21	17	17	16	19	16	19	19	14	18	14	13
	Pb-212	28	28	24	27	28	26	26	27	24	21	22	23	9.7
	Pb-214	21	23	19	15	21	20	22	18	24	16	17	17	15
	Ra-226	50	<42	36	<39	<37	<46	<44	<41	<42	<38	<42	<39	-
	Th-234	<30	<41	30	42	<31	<47	<45	<47	<160	<140	<150	<140	-
	Tl-208	25	20	21	25	23	24	15	19	23	21	21	17	15

(\*) The coefficients of variation are shown only for radionuclides detected five times or more.

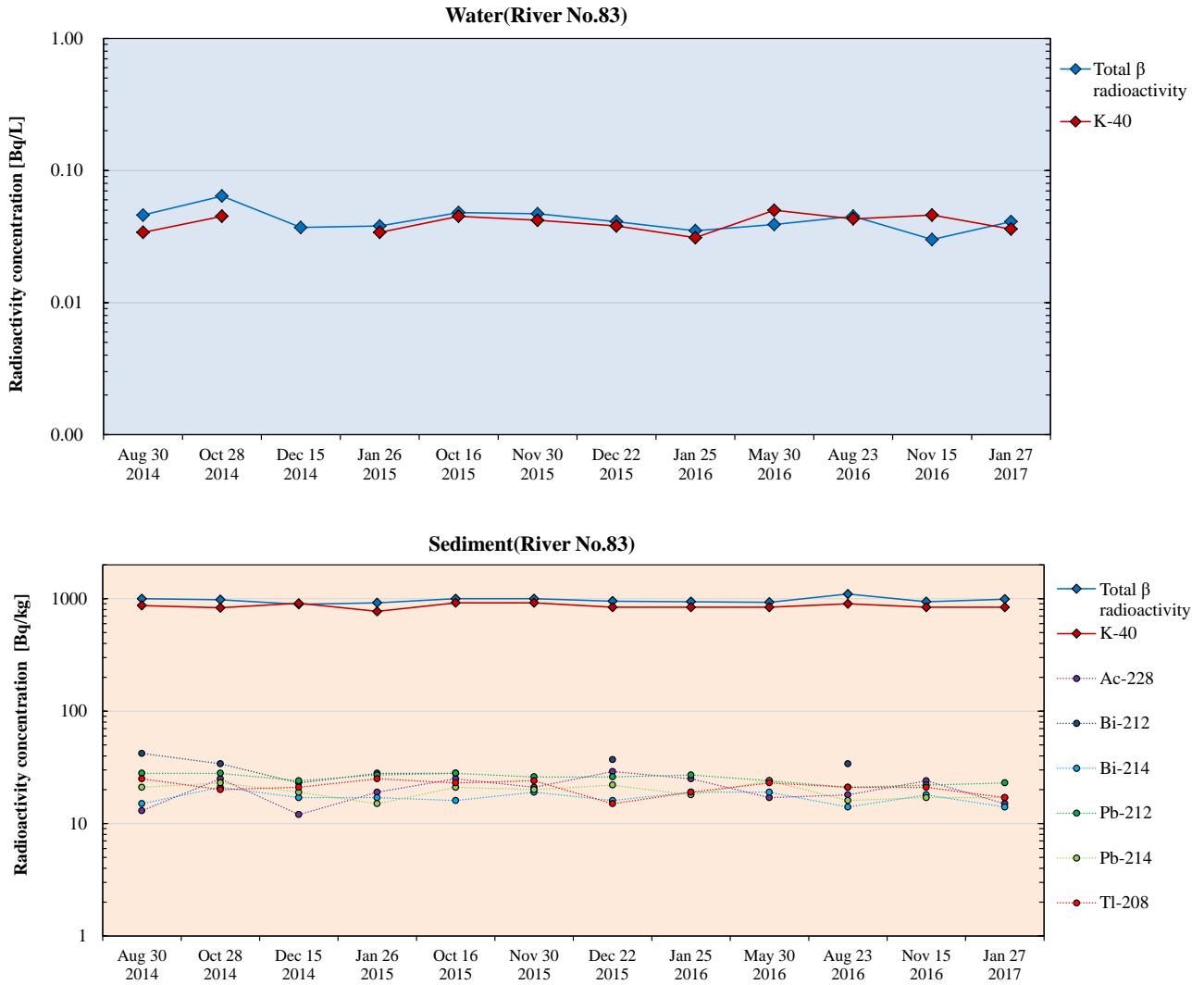


Figure 3.3-2 Changes in detection trends for radioactive materials at the same location [River No. 83]



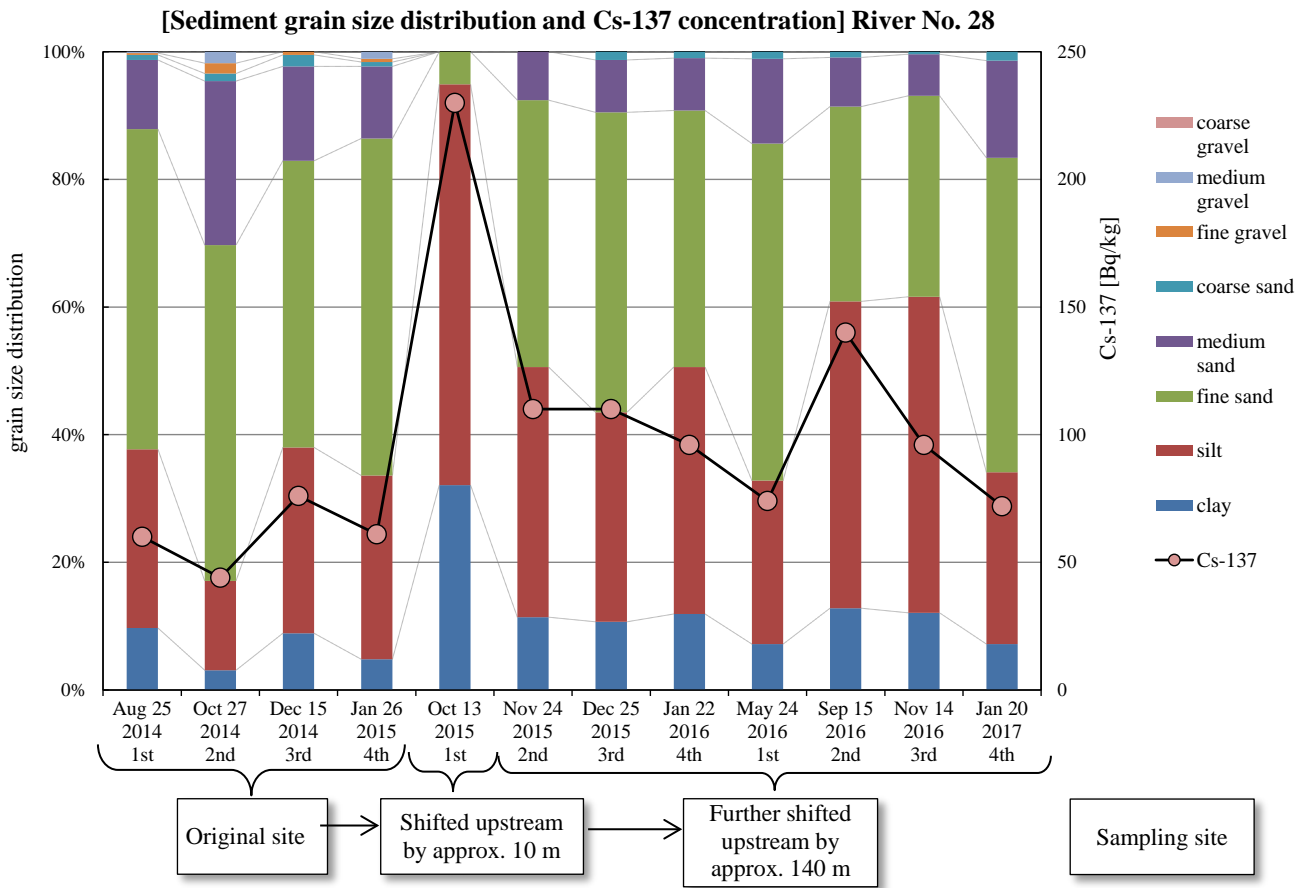


Figure 3.3-3 Changes in sediment grain size distribution and Cs-137 concentration [River No. 28]

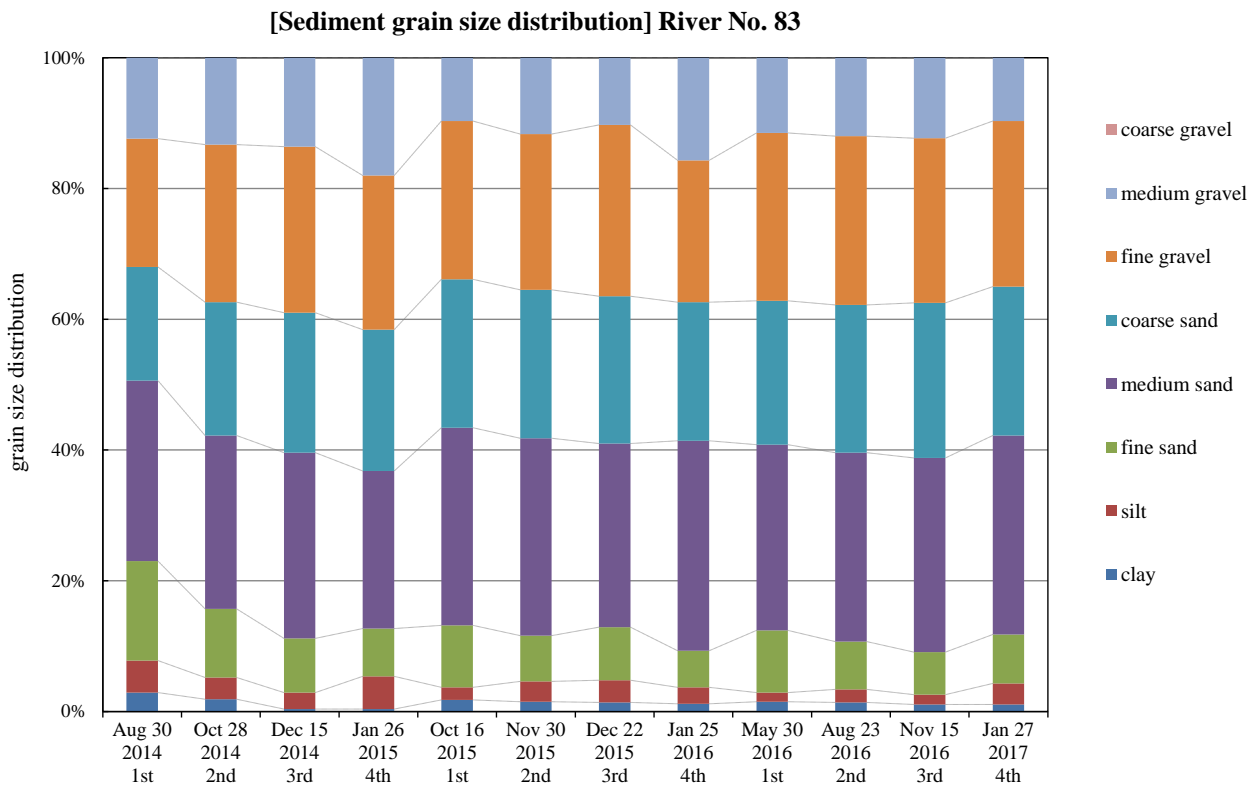


Figure 3.3-4 Changes in sediment grain size distribution [River No. 83]

## Part 2: Radioactive Material Monitoring in the Water Environment in and around Fukushima Prefecture (FY2016)

### 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 the Tohoku and Kanto districts 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 sediments were surveyed. Additionally, radioactivity in soil in the surrounding environment (river beds, etc.) near the sampling locations was also surveyed as reference.

Radioactivity in groundwater was also measured.

##### (3) Frequencies and periods

The monitoring for public water areas was conducted 2 to 10 times a year (varying by location).

The monitoring for groundwater was conducted 1 to 4 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.

Public water area: <http://www.env.go.jp/en/water/rmms/surveys.html>

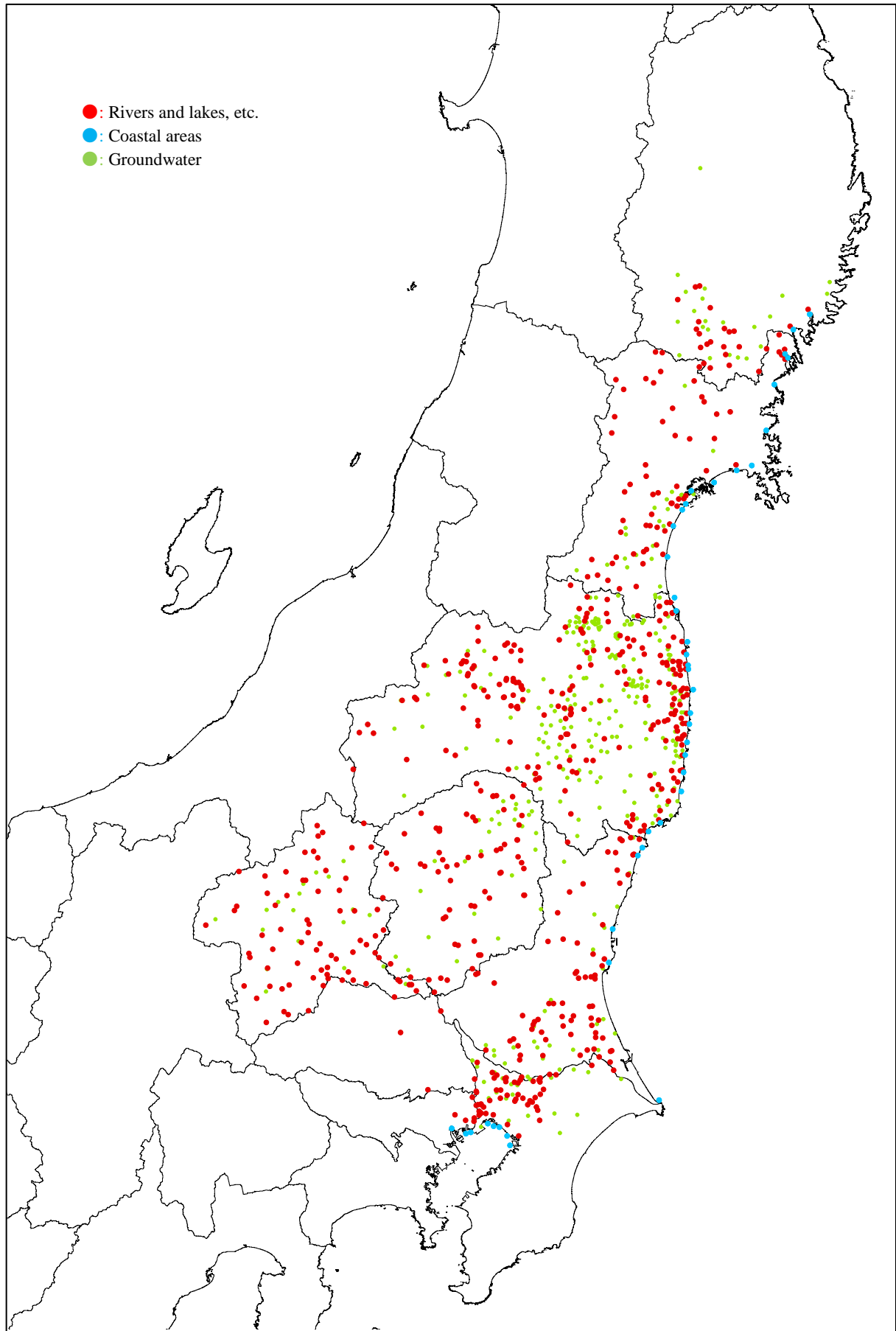


Figure 1.2-1 Map showing locations for the Post-Earthquake Monitoring

## 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 (September 30, 1971; Notice Kansuikan No. 30 issued by the Director General of the Water Quality Preservation Bureau, Ministry of the Environment)
- Sediment Survey Method (August 8, 2012; Notice Kansuikansuihatsu No. 120725002 issued by the Director General of the Environmental Management Bureau, Ministry of the Environment)
- Groundwater Quality Survey Method (September 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

$\gamma$ -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 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" 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.

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

Radionuclide		Public water areas (water)	Public water areas (sediments)	Groundwater
Radioactive cesium (Cs-134 and Cs-137)		Approx. 1 Bq/L	Approx. 10 Bq/kg	Approx. 1 Bq/L
Radioactive strontium	Sr-90	Approx. 1 Bq/L	Approx. 1 Bq/kg (0.16 to 2.9 Bq/kg)	Approx. 1 Bq/L
	Sr-89	-	-	Approx. 1 Bq/L
Other artificial radionuclides (*1)		-	Ag-110m: 7 to 180 Bq/kg Sb-125: 130 to 330 Bq/kg	-

\*1: Varies by type of radionuclides; the above table shows detection limit targets for Ag-110m and Sb-125, which were detected during monitoring (see Chapter 5.2 of the main text).

### 3 Outlines of the Results

The results of the Post-Earthquake Monitoring conducted in Tokyo Metropolis and nine other prefectures in FY2016 are as outlined below.

#### 3.1 Detection of radioactive cesium

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

##### (1) Public water areas (water)

In FY2016, radioactive cesium activity concentrations ranged from not detectable to 1.7 Bq/L and had a detection rate of less than 0.1% in river water samples; from not detectable to 27 Bq/L and with a detection rate of 2.1% in lake water samples; and were not detectable in any coastal area water samples.

Since FY2011, all prefectures have shown decreasing trends in the detection rate for river water samples (11,000 or more total samples) and lake water samples (6,800 or more total samples). In prefectures other than Fukushima Prefecture, radioactive cesium has not been detected since FY2013 (see Figure 4.1-1 and Figure 4.1-2). In addition, no survey detected radioactive cesium in coastal area water samples (2,800 or more total samples).

##### (2) Groundwater

Radioactive cesium was not detected in any of the groundwater samples in FY2016.

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), and has not been detected in groundwater samples (5,600 or more total samples) since FY2012.

##### (3) Public water areas (sediments)

###### 1) Overall trends

In FY2016, radioactive cesium activity concentrations ranged from not detectable to 8,600 Bq/kg and were detected with a detection rate of 86.3% in river sediment samples, from not detectable to 528,000 Bq/kg and with a detection rate of 99.3% in lake sediment samples, and from not detectable to 780 Bq/kg and at a detection rate of 78.7% in coastal area sediment samples.

## 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 detected concentration levels and their changes were statistically compiled as shown in "4.3 Detection of radioactive materials in sediments by location."

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

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

Table 3.1-1 Categorization of detected concentration levels for sediment samples from public water areas (FY2016) (rivers, lakes, and coastal areas)

### <Rivers>

Category	Percentile (see Figure 4.3-1)	Range [coastal area sediments] [Bq/kg (dry)]	Number of locations											Total	
			Iwate	Miyagi	Fukushima			Ibaraki	Tochigi	Gunma	Chiba	Saitama	Tokyo	Number of location	Percentage
					Hamadori	Nakadori	Aizu								
A	Upper 5 percentile	839 or more	0	0	11	0	0	2	0	0	6	0	0	19	4.8
B	Upper 5 to 10 percentile	436 ~ 839	0	0	7	2	1	1	0	1	8	0	0	20	5.1
C	Upper 10 to 25 percentile	159 ~ 436	0	5	14	9	1	13	1	0	17	0	1	61	15.4
D	Upper 25 to 50 percentile	51 ~ 159	3	17	11	14	4	19	10	7	12	0	1	98	24.7
E	Lower 50 percentile	51 or less	19	21	10	19	20	18	45	40	4	2	0	198	50.0
Total			22	43	53	44	26	53	56	48	47	2	2	396	100.0

### <Lakes>

Category	Percentile (see Figure 4.3-1)	Range [Lake sediments] [Bq/kg (dry)]	Number of locations								Total		
			Miyagi	Fukushima			Ibaraki	Tochigi	Gunma	Chiba	Number of locations	Percentage	
				Hamadori	Nakadori	Aizu							
A	Upper 5 percentile	20,516 or more	0	8	0	0	0	0	0	0	0	8	4.9
B	Upper 5 to 10 percentile	9,265 ~ 20,516	0	8	0	0	0	0	0	0	0	8	4.9
C	Upper 10 to 25 percentile	2,085 ~ 9,265	1	11	4	7	1	0	0	1	25	15.2	
D	Upper 25 to 50 percentile	530 ~ 2,085	3	9	5	2	5	3	13	1	41	25.0	
E	Lower 50 percentile	530 or less	17	5	3	22	13	5	11	6	82	50.0	
Total			21	41	12	31	19	8	24	8	164	100.0	

### <Coastal areas>

Category	Percentile (see Figure 4.3-1)	Range [coastal area sediments] [Bq/kg (dry)]	Number of locations						Total	
			Iwate	Miyagi	Fukushima	Ibaraki	Chiba	Tokyo	Number of location	Percentage
A	Upper 5 percentile	420 or more	0	1	1	0	0	0	2	4.8
B	Upper 5 to 10 percentile	347 ~ 420	0	1	1	0	0	0	2	4.8
C	Upper 10 to 25 percentile	197 ~ 347	0	2	3	0	0	1	6	14.3
D	Upper 25 to 50 percentile	36 ~ 197	0	3	5	0	1	2	11	26.2
E	Lower 50 percentile	36 or less	2	5	5	5	4	0	21	50.0
Total			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 4.3-45 (described later) graphically.

At most monitoring locations for rivers, a decreasing trend was observed. For lakes, a decreasing or unchanged trend was generally observed with some locations showing fluctuations. For coastal areas, a decreasing or unchanged trend was observed at most locations with some locations showing fluctuations.

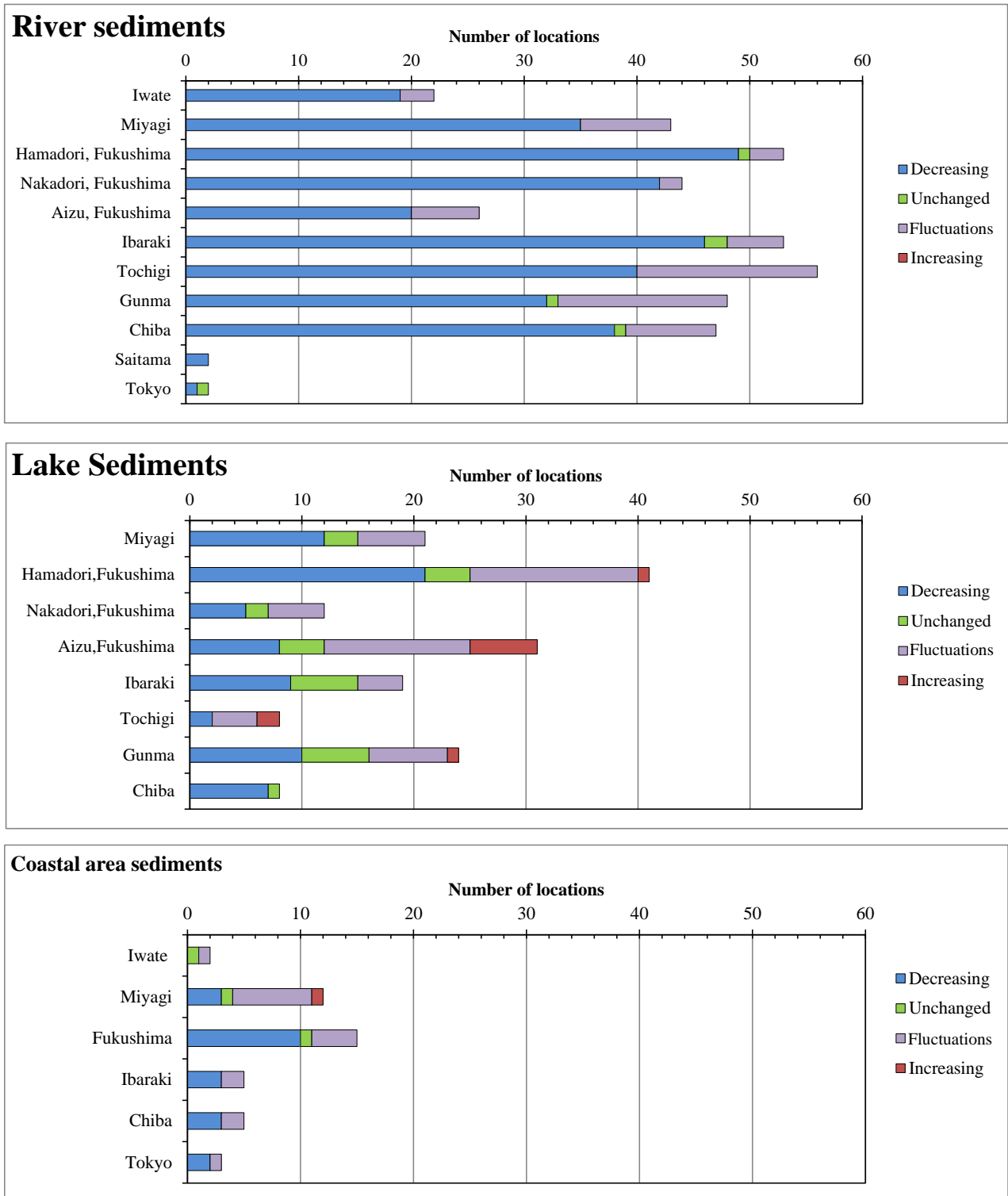


Figure 3.1-1 Changes in detected concentration levels of radioactive materials in sediment samples from public water areas (rivers, lakes, and coastal areas)

## 3.2 Detection of radionuclides other than radioactive cesium

### (1) Sr-89 and Sr-90

Sr-90 was surveyed from FY2011 to FY2016 for sediment samples (approximately 640 samples in total) from public water areas (rivers, lakes, and coastal areas) and for groundwater samples (approximately 290 samples in total) (see Figure 5.1-1). Additionally, in FY2016, water samples (45 samples mainly targeting lakes) were also surveyed at those locations where relatively high concentrations were detected in sediment.

The results of the FY2016 survey were as follows: for public water area sediment samples, Sr-90 concentrations ranged from not detectable to 0.69 Bq/kg and had a detection rate of 52.2% in river sediments; from not detectable to 100 Bq/kg with a detection rate of 98.5% in lake sediments, and from not detectable to 0.38 with a detection rate of 6.3% in coastal area sediments. As for water samples, Sr-90 was not detected in any public water areas or ground water locations.

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 approx. 290 samples surveyed from FY2011 to FY2016) (detection limit: 1 Bq/L for water and approximate 2 Bq/kg for sediments).

### (2) Other artificial radionuclides

None have been detected since FY 2013.



## 4 Results (Radioactive cesium)

### 4.1 Water

#### (1) Public water areas

##### 1) Rivers

Detection of radioactive cesium in river water samples is as shown in Table 4.1-1 and Figure 4.1-1.

According to the results, most prefectures have shown decreasing trends in the detection rate since FY2011. In FY2016, radioactive cesium was not detected in any locations other than Hamadori District, Fukushima Prefecture.

Detected values (the total of Cs-134 and Cs-137) have also shown decreasing trends since FY2011. The measured values in FY2016 ranged from not detectable to 1.7 Bq/L (detection limit: 1 Bq/L for both Cs-134 and Cs-137).

##### 2) Lakes

Detection of radioactive cesium in lake water samples is as shown in Table 4.1-2 and Figure 4.1-2.

According to the results most 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 shown decreasing trends since FY2012. The measured values in FY2016 ranged from not detectable to 27 Bq/L (detection limit: 1 Bq/L for both Cs-134 and Cs-137).

##### 3) Coastal areas

Detection of radioactive cesium (Cs-134 and Cs-137) in coastal area water samples is as shown in Table 4.1-3.

According to the results, including the past fiscal years, radioactive cesium has not been detected in any locations (detection limit: 1 Bq/L for both Cs-134 and Cs-137).

#### (2) Groundwater

Detection of radioactive cesium in groundwater samples is as shown in Table 4.1-4.

According to the results, radioactive cesium has not been detected in any locations since FY2012 including FY2016.

#### <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, March 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

Table 4.1-1(1) Detection of radioactive cesium in river water samples (from FY2011 to FY2013)

Prefecture	FY2011				FY2012				FY2013			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)
Iwate	18	0	0.0	ND	64	0	0.0	ND	80	0	0.0	ND
Yamagata	10	0	0.0	ND	0	0	-	-	0	0	-	-
Miyagi	114	0	0.0	ND	204	3	1.5	ND - 6.3	193	0	0.0	ND
Fukushima	452	28	6.2	ND - 20	854	18	2.1	ND - 4.6	801	7	0.9	ND - 5.5
Hamadori	192	23	12.0	ND - 20	342	12	3.5	ND - 4.6	325	7	2.2	ND - 5.5
Nakadori	176	5	2.8	ND - 8.0	355	6	1.7	ND - 1.9	322	0	0.0	ND
Aizu	84	0	0.0	ND	157	0	0.0	ND	154	0	0.0	ND
Ibaraki	128	0	0.0	ND	214	0	0.0	ND	212	0	0.0	ND
Tochigi	161	1	0.6	ND - 1.0	277	0	0.0	ND	276	0	0.0	ND
Gunma	90	0	0.0	ND	216	0	0.0	ND	214	0	0.0	ND
Saitama	2	0	0.0	ND	8	0	0.0	ND	8	0	0.0	ND
Chiba	82	0	0.0	ND	202	2	1.0	ND - 1.3	200	0	0.0	ND
Tokyo	3	0	0.0	ND	12	0	0.0	ND	8	0	0.0	ND
Total	1,060	29	2.7	ND - 20	2,051	23	1.1	ND - 6.3	1,992	7	0.4	ND - 5.5

Table 4.1-1(2) Detection of radioactive cesium in river water samples (from FY2014 to FY2016)

Prefecture	FY2014				FY2015				FY2016				Total		
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Range of measured values (Bq/L)
Iwate	80	0	0.0	ND	80	0	0.0	ND	80	0	0.0	ND	402	0	ND
Yamagata	0	0	-	-	0	0	-	-	0	0	-	-	10	0	ND
Miyagi	196	0	0.0	ND	196	0	0.0	ND	196	0	0.0	ND	1099	3	ND - 6.3
Fukushima	770	3	0.4	ND - 1.6	819	2	0.2	ND - 1.3	809	1	0.1	ND - 1.7	4,505	59	ND - 20
Hamadori	326	3	0.9	ND - 1.6	330	1	0.3	ND - 1.3	326	1	0.3	ND - 1.7	1,841	47	ND - 20
Nakadori	324	0	0.0	ND	324	1	0.3	ND - 1.1	324	0	0.0	ND	1,825	12	ND - 8.0
Aizu	120	0	0.0	ND	165	0	0.0	ND	159	0	0.0	ND	839	0	ND
Ibaraki	212	0	0.0	ND	212	0	0.0	ND	212	0	0.0	ND	1190	0	ND
Tochigi	274	0	0.0	ND	278	0	0.0	ND	278	0	0.0	ND	1,544	1	ND - 1.0
Gunma	210	0	0.0	ND	214	0	0.0	ND	213	0	0.0	ND	1157	0	ND
Saitama	8	0	0.0	ND	8	0	0.0	ND	8	0	0.0	ND	42	0	ND
Chiba	200	0	0.0	ND	200	0	0.0	ND	200	0	0.0	ND	1084	2	ND - 1.3
Tokyo	8	0	0.0	ND	8	0	0.0	ND	8	0	0.0	ND	47	0	ND
Total	1,958	3	0.2	ND - 1.6	2,015	2	0.1	ND - 1.3	2,004	1	0.0	ND - 1.7	11,080	65	ND - 20

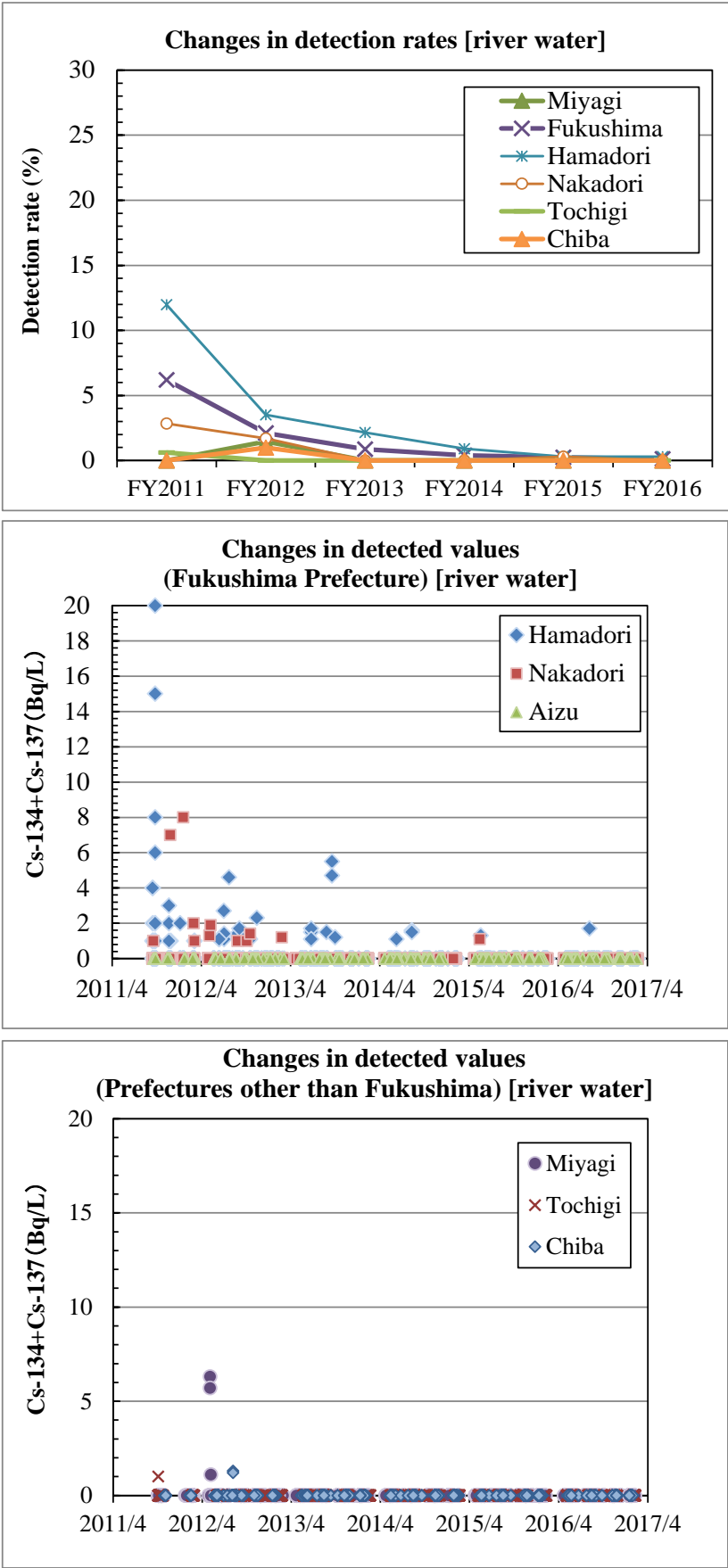


Figure 4.1-1 Detection rates of radioactive cesium in river water samples (top) and changes in detected values (middle and bottom)

Table 4.1-2(1) Detection of radioactive cesium in lake water samples (from FY2011 to FY2013)

Prefecture	FY2011				FY2012				FY2013				
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	
Yamagata	4	0	0.0	ND	0	0	-	-	0	0	-	-	
Miyagi	34	1	2.9	ND - 3.0	90	0	0.0	ND	118	0	0.0	ND	
Fukushima	211	11	5.2	ND - 27	581	72	12.4	ND - 100	761	36	4.7	ND - 47	
	Hamadori	76	9	11.8	ND - 27	272	65	23.9	ND - 100	321	36	11.2	ND - 47
	Nakadori	56	2	3.6	ND - 5.0	83	3	3.6	ND - 1.2	109	0	0.0	ND
	Aizu	79	0	0.0	ND	226	4	1.8	ND - 5.1	331	0	0.0	ND
Ibaraki	48	0	0.0	ND	93	0	0.0	ND	152	0	0.0	ND	
Tochigi	24	0	0.0	ND	54	0	0.0	ND	62	0	0.0	ND	
Gunma	51	0	0.0	ND	144	1	0.7	ND - 1.0	188	0	0.0	ND	
Chiba	32	0	0.0	ND	50	0	0.0	ND	53	0	0.0	ND	
Total	404	12	3.0	ND - 27	1,012	73	7.2	ND - 100	1,334	36	2.7	ND - 47	

Table 4.1-2(2) Detection of radioactive cesium in lake water samples (from FY2014 to FY2016)

Prefecture	FY2014				FY2015				FY2016				Total			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Range of measured values (Bq/L)	
Yamagata	0	0	-	-	0	0	-	-	0	0	-	-	4	0	ND	
Miyagi	114	0	0.0	ND	118	0	0.0	ND	117	0	0.0	ND	591	1	ND - 3.0	
Fukushima	799	29	3.6	ND - 34	807	29	3.6	ND - 52	797	28	3.5	ND - 27	3,956	205	ND - 100	
	Hamadori	342	29	8.5	ND - 34	350	29	8.3	ND - 52	357	28	7.8	ND - 27	1,718	196	ND - 100
	Nakadori	113	0	0.0	ND	115	0	0.0	ND	105	0	0.0	ND	581	5	ND - 5.0
	Aizu	344	0	0.0	ND	342	0	0.0	ND	335	0	0.0	ND	1,657	4	ND - 5.1
Ibaraki	152	0	0.0	ND	149	0	0.0	ND	147	0	0.0	ND	741	0	ND	
Tochigi	64	0	0.0	ND	64	0	0.0	ND	64	0	0.0	ND	332	0	ND	
Gunma	187	0	0.0	ND	192	0	0.0	ND	190	0	0.0	ND	952	1	ND - 1.0	
Chiba	50	0	0.0	ND	37	0	0.0	ND	37	0	0.0	ND	259	0	ND	
Total	1,366	29	2.1	ND - 34	1,367	29	2.1	ND - 52	1,352	28	2.1	ND - 27	6,835	207	ND - 100	

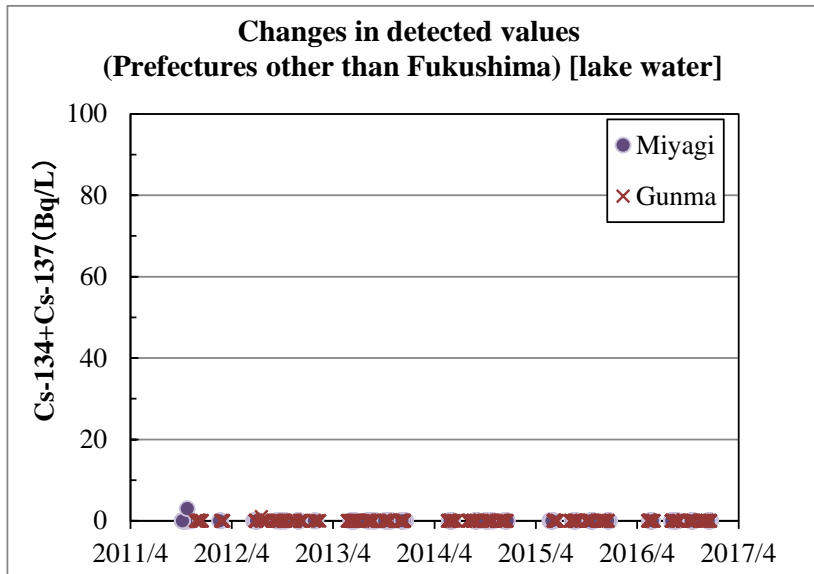
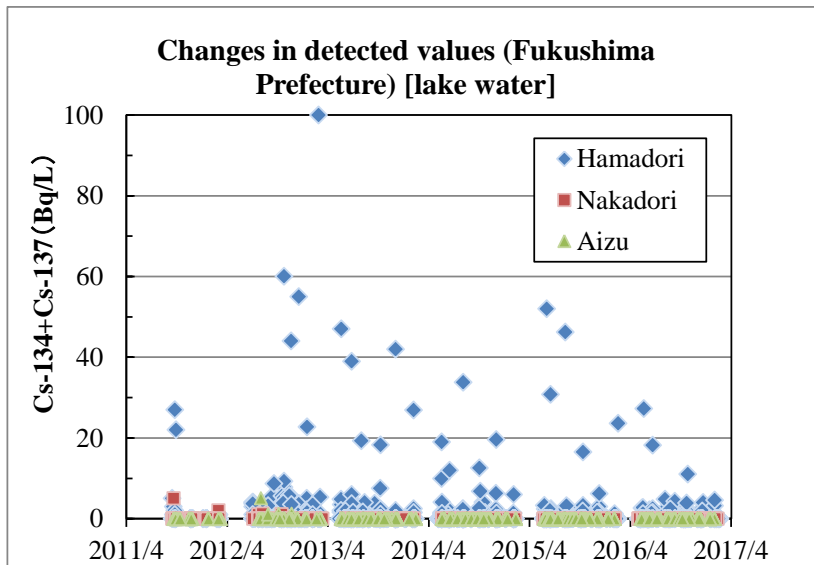
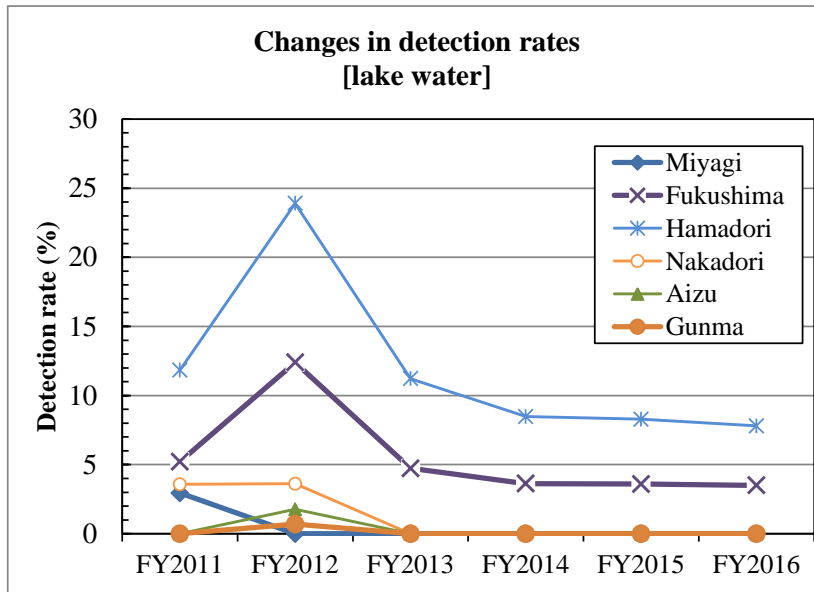


Figure 4.1-2 Detection rates of radioactive cesium in lake water samples (top) and changes in detected values (middle and bottom)

Table 4.1-3(1) Detection of radioactive cesium in coastal area water samples (from FY2011 to FY2013)

Prefecture	FY2011				FY2012				FY2013			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)
Iwate	5	0	0.0	ND	8	0	0.0	ND	8	0	0.0	ND
Miyagi	94	0	0.0	ND	96	0	0.0	ND	102	0	0.0	ND
Fukushima	116	0	0.0	ND	189	0	0.0	ND	300	0	0.0	ND
Ibaraki	45	0	0.0	ND	62	0	0.0	ND	40	0	0.0	ND
Chiba	0	0	-	-	62	0	0.0	ND	46	0	0.0	ND
Tokyo	0	0	-	-	38	0	0.0	ND	36	0	0.0	ND
Total	260	0	0.0	ND	455	0	0.0	ND	532	0	0.0	ND

Table 4.1-3(2) Detection of radioactive cesium in coastal area water samples (from FY2014 to FY2016)

Prefecture	FY2014				FY2015				FY2016				Total		
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Range of measured values (Bq/L)
Iwate	8	0	0.0	ND	8	0	0.0	ND	8	0	0.0	ND	45	0	ND
Miyagi	104	0	0.0	ND	104	0	0.0	ND	104	0	0.0	ND	604	0	ND
Fukushima	300	0	0.0	ND	300	0	0.0	ND	300	0	0.0	ND	1,505	0	ND
Ibaraki	40	0	0.0	ND	40	0	0.0	ND	40	0	0.0	ND	267	0	ND
Chiba	46	0	0.0	ND	46	0	0.0	ND	46	0	0.0	ND	246	0	ND
Tokyo	36	0	0.0	ND	36	0	0.0	ND	36	0	0.0	ND	182	0	ND
Total	534	0	0.0	ND	534	0	0.0	ND	534	0	0.0	ND	2,849	0	ND

Table 4.1-4(1) Detection of radioactive cesium in groundwater samples (from FY2011 to FY2013)

Prefecture	FY2011				FY2012				FY2013			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)
Iwate	42	0	0.0	ND	44	0	0.0	ND	44	0	0.0	ND
Miyagi	79	0	0.0	ND	44	0	0.0	ND	48	0	0.0	ND
Yamagata	79	0	0.0	ND	0	0	-	-	0	0	-	-
Fukushima	540	2	0.4	ND - 2.0	543	0	0.0	ND	766	0	0.0	ND
Ibaraki	89	0	0.0	ND	54	0	0.0	ND	54	0	0.0	ND
Tochigi	76	0	0.0	ND	54	0	0.0	ND	54	0	0.0	ND
Gunma	40	0	0.0	ND	40	0	0.0	ND	42	0	0.0	ND
Chiba	54	0	0.0	ND	46	0	0.0	ND	46	0	0.0	ND
Total	999	2	0.2	ND - 2.0	825	0	0.0	ND	1,054	0	0.0	ND

Table 4.1-4(2) Detection of radioactive cesium in groundwater samples (from FY2014 to FY2016)

Prefecture	FY2014				FY2015				FY2016				Total		
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L)	Number of samples	Detection times	Range of measured values (Bq/L)
Iwate	22	0	0.0	ND	22	0	0.0	ND	22	0	0.0	ND	196	0	ND
Miyagi	24	0	0.0	ND	24	0	0.0	ND	24	0	0.0	ND	243	0	ND
Yamagata	0	0	-	-	0	0	-	-	0	0	-	-	79	0	ND
Fukushima	771	0	0.0	ND	775	0	0.0	ND	773	0	0.0	ND	4,168	2	ND - 2.0
Ibaraki	27	0	0.0	ND	27	0	0.0	ND	27	0	0.0	ND	278	0	ND
Tochigi	27	0	0.0	ND	27	0	0.0	ND	27	0	0.0	ND	265	0	ND
Gunma	21	0	0.0	ND	21	0	0.0	ND	21	0	0.0	ND	185	0	ND
Chiba	23	0	0.0	ND	23	0	0.0	ND	23	0	0.0	ND	215	0	ND
Total	915	0	0.0	ND	919	0	0.0	ND	917	0	0.0	ND	5,629	2	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).

## 4.2 Sediments

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

### (1) Public water areas (rivers)

Radioactive cesium detected in river sediment samples is as shown in Table 4.2-1 and Figure 4.2-1.

According to the results, including the past fiscal years, the detection rate has ranged between 50 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 4.2-1, the number of locations with high concentration levels has decreased while number of locations with low concentration levels has increased.

### (2) Public water areas (lakes)

Detection of radioactive cesium in lake sediment samples is as shown in Table 4.2-2 and Figure 4.2-2.

According to the results, including the past fiscal years, the detection rate has ranged between 83 and 100%. In FY2016, detection rates of 90% or more were observed in all prefectures.

Detected values (the total of Cs-134 and Cs-137) have generally decreased or unchanged with some locations showing fluctuations. In Hamadori District, Fukushima Prefecture, however, radioactive cesium was still detected at concentrations of 100,000 Bq/kg or more in FY2016.

### (3) Public water areas (coastal areas)

Detection of radioactive cesium in coastal area sediment samples is as shown in Table 4.2-3 and Figure 4.2-3.

According to the results, including the past fiscal years, the detection rate ranged between 30 and 100% and slightly decreased in FY2016, except for a small number of samples from Iwate Prefecture.

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 in FY2016.

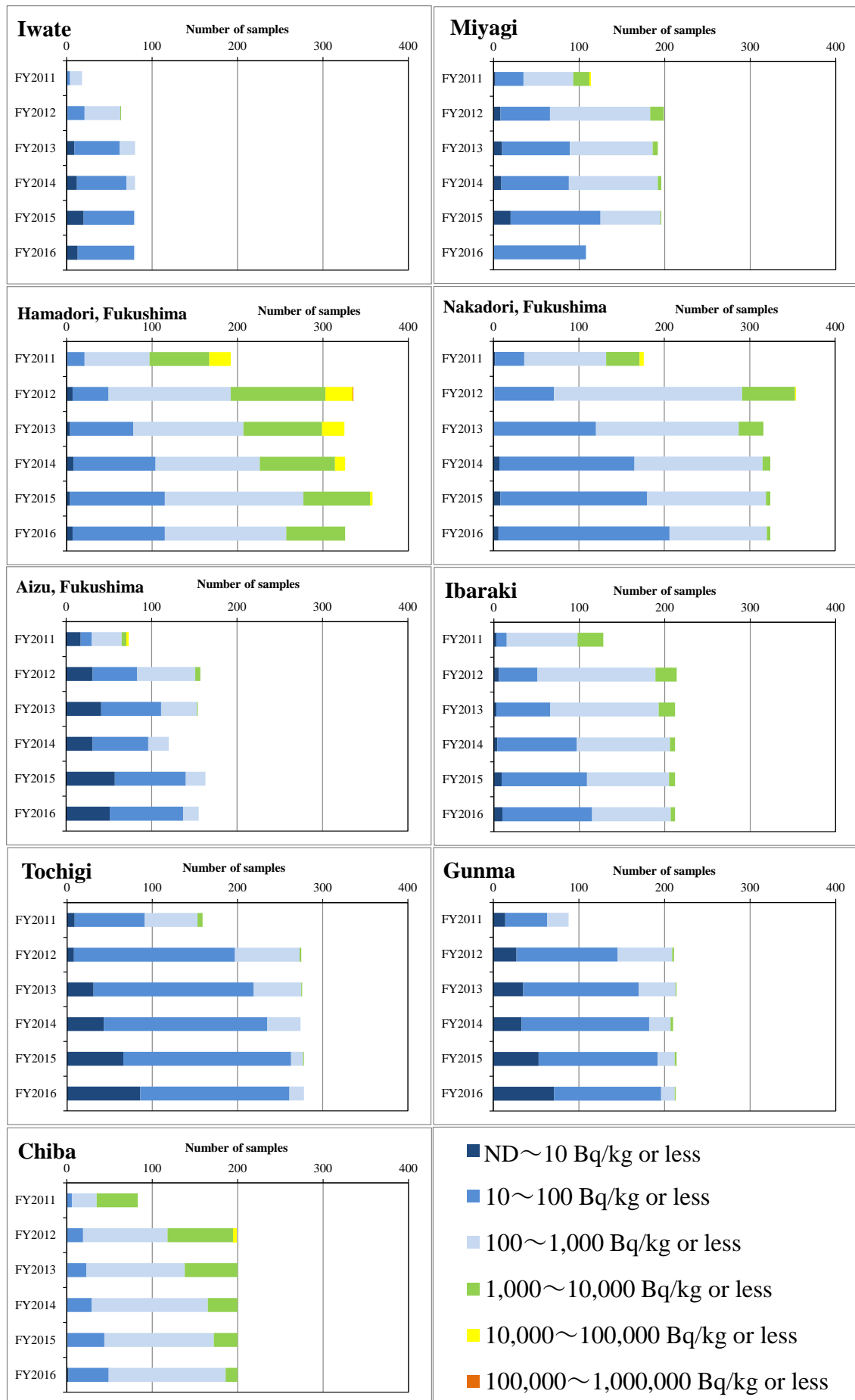


Table 4.2-1(1) Detection of radioactive cesium in river sediment samples (from FY2011 to FY2013)

	FY2011				FY2012				FY2013			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)
Iwate	18	18	100.0	62 - 990	64	63	98.4	ND - 1,040	80	71	88.8	ND - 340
Yamagata	10	6	60.0	ND - 132	0	0	-	-	0	0	-	-
Miyagi	113	111	98.2	ND - 11,100	199	191	96.0	ND - 3,700	192	182	94.8	ND - 2,450
Fukushima	441	421	95.5	ND - 92,000	847	808	95.4	ND - 165,000	795	750	94.3	ND - 45,000
Hamadori	192	191	99.5	ND - 92,000	336	329	97.9	ND - 165,000	325	321	98.8	ND - 45,000
Nakadori	176	174	98.9	ND - 30,000	354	353	99.7	ND - 20,000	316	316	100.0	10 - 8,300
Aizu	73	56	76.7	ND - 25,000	157	126	80.3	ND - 2,590	154	113	73.4	ND - 1,410
Ibaraki	128	125	97.7	ND - 5,800	214	208	97.2	ND - 4,800	212	209	98.6	ND - 4,200
Tochigi	159	150	94.3	ND - 4,900	275	267	97.1	ND - 1,780	276	245	88.8	ND - 1,540
Gunma	88	74	84.1	ND - 410	211	184	87.2	ND - 1,560	214	179	83.6	ND - 1,560
Saitama	2	2	100.0	35 - 530	8	8	100.0	12 - 540	8	8	100.0	10 - 67
Chiba	83	83	100.0	50 - 9,700	199	199	100.0	17 - 20,200	200	199	99.5	ND - 7,900
Tokyo	2	2	100.0	580 - 700	12	12	100.0	131 - 670	8	8	100.0	75 - 460
Total	1,044	992	95.0	ND - 92,000	2,029	1,940	95.6	ND - 165,000	1,985	1,851	93.2	ND - 45,000

Table 4.2-1(2) Detection of radioactive cesium in river sediment samples (from FY2014 to FY2016)

	FY2014				FY2015				FY2016				Total		
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Range of measured values (Bq/kg)
Iwate	80	68	85.0	ND - 301	80	60	75	ND - 121	80	67	83.8	ND - 161	402	347	ND - 1,040
Yamagata	0	0	-	-	0	0	-	-	0	0	-	-	10	6	ND - 132
Miyagi	196	187	95.4	ND - 1,620	196	176	90	ND - 1,860	196	172	87.8	ND - 1,070	1,092	1,019	ND - 11,100
Fukushima	770	724	94.0	ND - 24,700	845	776	92	ND - 20,100	805	741	92.0	ND - 8,600	4,503	4,220	ND - 165,000
Hamadori	326	318	97.5	ND - 24,700	358	354	99	ND - 20,100	326	319	97.9	ND - 8,600	1,863	1,832	ND - 165,000
Nakadori	324	317	97.8	ND - 3,060	324	316	98	ND - 3,270	324	318	98.1	ND - 1,510	1,818	1,794	ND - 30,000
Aizu	120	89	74.2	ND - 720	163	106	65	ND - 810	155	104	67.1	ND - 810	822	594	ND - 25,000
Ibaraki	212	208	98.1	ND - 1,640	212	203	96	ND - 2,160	212	202	95.3	ND - 1,900	1,190	1,155	ND - 5,800
Tochigi	274	231	84.3	ND - 820	278	212	76	ND - 1,010	278	192	69.1	ND - 245	1,540	1,297	ND - 4,900
Gunma	210	177	84.3	ND - 2,160	214	161	75	ND - 1,510	213	142	66.7	ND - 1,100	1,150	917	ND - 2,160
Saitama	8	7	87.5	ND - 68	8	4	50	ND - 291	8	4	50.0	ND - 43	42	33	ND - 540
Chiba	200	200	100.0	11 - 5,200	200	199	100	ND - 4,100	200	198	99.0	ND - 4,130	1,082	1,078	ND - 20,200
Tokyo	8	8	100.0	96 - 430	8	8	100	86 - 404	8	8	100.0	27 - 253	46	46	27 - 700
Total	1,958	1,810	92.4	ND - 24,700	2,041	1,799	88.1	ND - 20,100	2,000	1,726	86.3	ND - 8,600	11,057	10,118	ND - 165,000



Prefectures where only a small number of samples were collected are omitted.

Figure 4.2-1 Detection of radioactive cesium in river sediment samples (changes)

Table 4.2-2(1) Detection of radioactive cesium in lake sediment samples (from FY2011 to FY2013)

Prefecture	FY2011				FY2012				FY2013			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)
Yamagata	2	2	100.0	34 - 470	0	0	-	-	0	0	-	-
Miyagi	24	24	100.0	31 - 3,000	58	57	98.3	ND - 9,700	76	76	100.0	18 - 4,200
Fukushima	147	141	95.9	ND - 260,000	389	386	99.2	ND - 780,000	501	499	99.6	ND - 460,000
Hamadori	62	62	100.0	45 - 260,000	201	201	100.0	42 - 780,000	239	239	100.0	68 - 460,000
Nakadori	42	41	97.6	ND - 35,000	58	58	100.0	63 - 24,900	77	77	100.0	68 - 11,100
Aizu	43	38	88.4	ND - 2,020	130	127	97.7	ND - 10,200	185	183	98.9	ND - 13,400
Ibaraki	24	24	100.0	37 - 1,840	48	48	100.0	93 - 1,300	76	75	98.7	ND - 5,400
Tochigi	12	10	83.3	ND - 6,700	27	27	100.0	11 - 4,100	31	31	100.0	106 - 5,100
Gunma	26	22	84.6	ND - 4,600	72	72	100.0	16 - 4,100	95	95	100.0	21 - 4,300
Chiba	16	16	100.0	440 - 7,400	32	32	100.0	460 - 8,200	32	32	100.0	151 - 5,700
Total	251	239	95.2	ND - 260,000	626	622	99.4	ND - 780,000	811	808	99.6	ND - 460,000

Table 4.2-2(2) Detection of radioactive cesium in lake sediment samples (from FY2014 to FY2016)

Prefecture	FY2014				FY2015				FY2016				Total		
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Range of measured values (Bq/kg)
Yamagata	0	0	-	-	0	0	-	-	0	0	-	-	2	2	34 - 470
Miyagi	75	74	98.7	ND - 2,220	76	74	97.4	ND - 4,490	76	76	100.0	12 - 3,680	385	381	ND - 9,700
Fukushima	501	496	99.0	ND - 297,000	541	535	98.9	ND - 920,000	509	503	98.8	ND - 528,000	2,588	2,560	ND - 920,000
Hamadori	243	243	100.0	18 - 297,000	278	278	100.0	16 - 920,000	252	251	99.6	ND - 528,000	1,275	1,274	16 - 920,000
Nakadori	76	74	97.4	ND - 10,900	78	78	100.0	44 - 6,200	71	71	100.0	23 - 7,700	402	399	ND - 35,000
Aizu	182	179	98.4	ND - 7,800	185	179	96.8	ND - 12,300	186	181	97.3	ND - 15,400	911	887	ND - 15,400
Ibaraki	76	75	98.7	ND - 3,170	73	73	100.0	61 - 3,070	76	76	100.0	23 - 2,750	373	371	ND - 5,400
Tochigi	32	32	100.0	134 - 8,700	32	32	100.0	103 - 1,760	32	32	100.0	44 - 1,790	166	164	ND - 8,700
Gunma	94	94	100.0	38 - 5,100	96	96	100.0	47 - 4,570	96	96	100.0	26 - 2,510	479	475	ND - 5,100
Chiba	32	32	100.0	121 - 5,700	32	32	100.0	187 - 4,240	32	32	100.0	66 - 2,520	176	176	121 - 8,200
Total	810	803	99.1	ND - 297,000	850	842	99.1	ND - 920,000	821	815	99.3	ND - 528,000	4,169	4,129	ND - 920,000

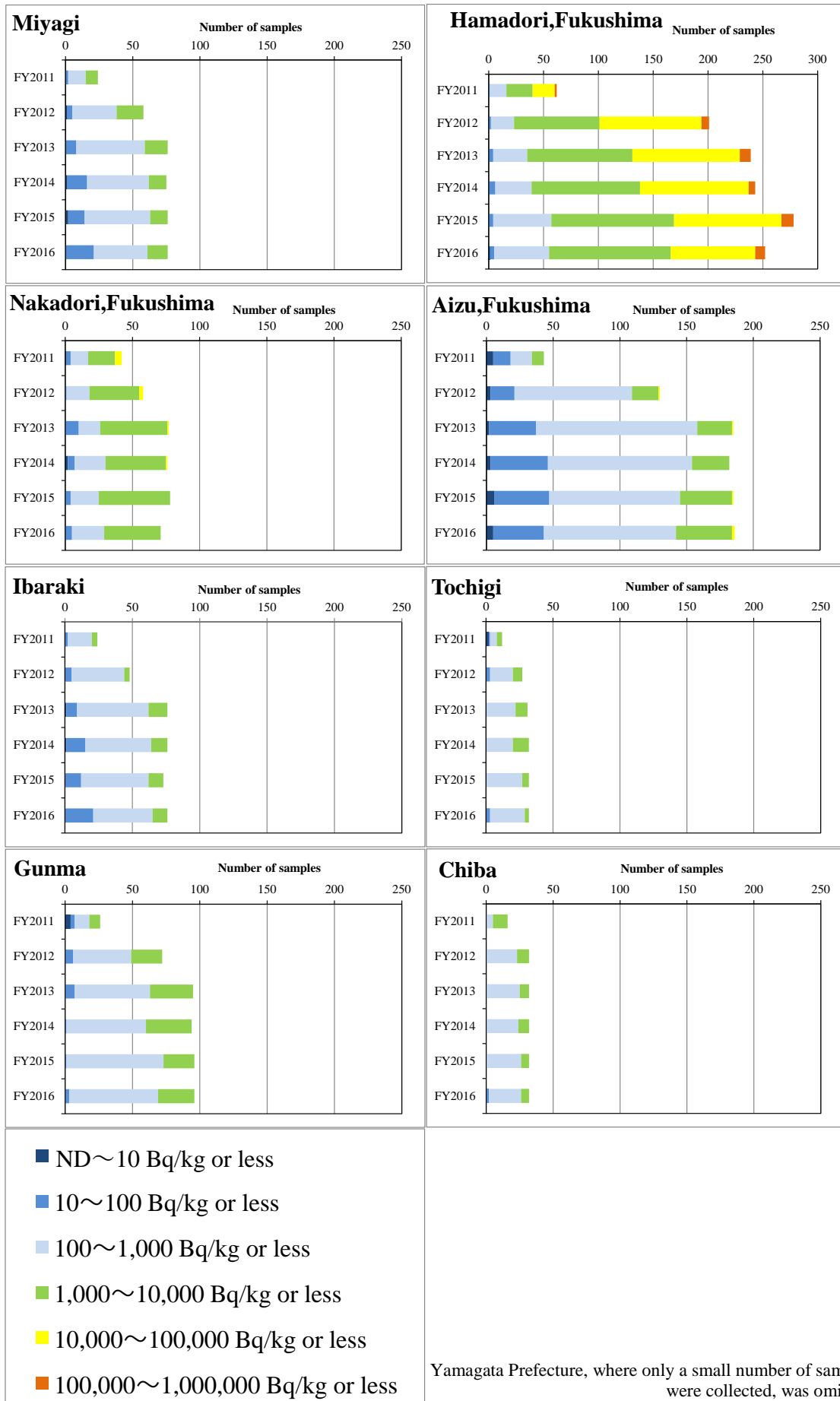


Figure 4.2-2 Detection of radioactive cesium in lake sediment samples (changes)

Table 4.2-3(1) Detection of radioactive cesium in coastal area sediment samples (from FY2011 to FY2013)

Prefecture	FY2011				FY2012				FY2013			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)
Iwate	3	0	0.0	ND	4	2	50.0	ND - 39	4	2	50.0	ND - 46
Miyagi	52	34	65.4	ND - 830	48	38	79.2	ND - 1,530	51	47	92.2	ND - 2,040
Fukushima	80	77	96.3	ND - 1,240	97	93	95.9	ND - 1,110	150	145	96.7	ND - 1,600
Ibaraki	28	27	96.4	ND - 230	31	17	54.8	ND - 69	20	11	55.0	ND - 67
Chiba	0	0	-	-	31	20	64.5	ND - 134	23	14	60.9	ND - 54
Tokyo	0	0	-	-	19	17	89.5	ND - 780	18	18	100.0	12 - 780
Total	163	138	84.7	ND - 1,240	230	187	81.3	ND - 1,530	266	237	89.1	ND - 2,040

Table 4.2-3(2) Detection of radioactive cesium in coastal area sediment samples (from FY2014 to FY2016)

Prefecture	FY2014				FY2015				FY2016				Total		
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Range of measured values (Bq/kg)
Iwate	4	2	50.0	ND - 16	4	1	25.0	ND - 10	4	1	25.0	ND - 12	23	8	ND - 46
Miyagi	52	42	80.8	ND - 1,090	52	41	78.8	ND - 910	52	38	73.1	ND - 710	307	240	ND - 2,040
Fukushima	150	139	92.7	ND - 830	150	140	93.3	ND - 2,950	150	136	90.7	ND - 780	777	730	ND - 2,950
Ibaraki	20	11	55.0	ND - 67	20	8	40.0	ND - 178	20	6	30.0	ND - 49	139	80	ND - 230
Chiba	23	14	60.9	ND - 21	23	11	47.8	ND - 315	23	11	47.8	ND - 71	123	70	ND - 315
Tokyo	18	17	94.4	ND - 630	18	18	100.0	83 - 410	18	18	100.0	81 - 304	91	88	ND - 780
Total	267	225	84.3	ND - 1,090	267	219	82.0	ND - 2,950	267	210	78.7	ND - 780	1,460	1,216	ND - 2,950

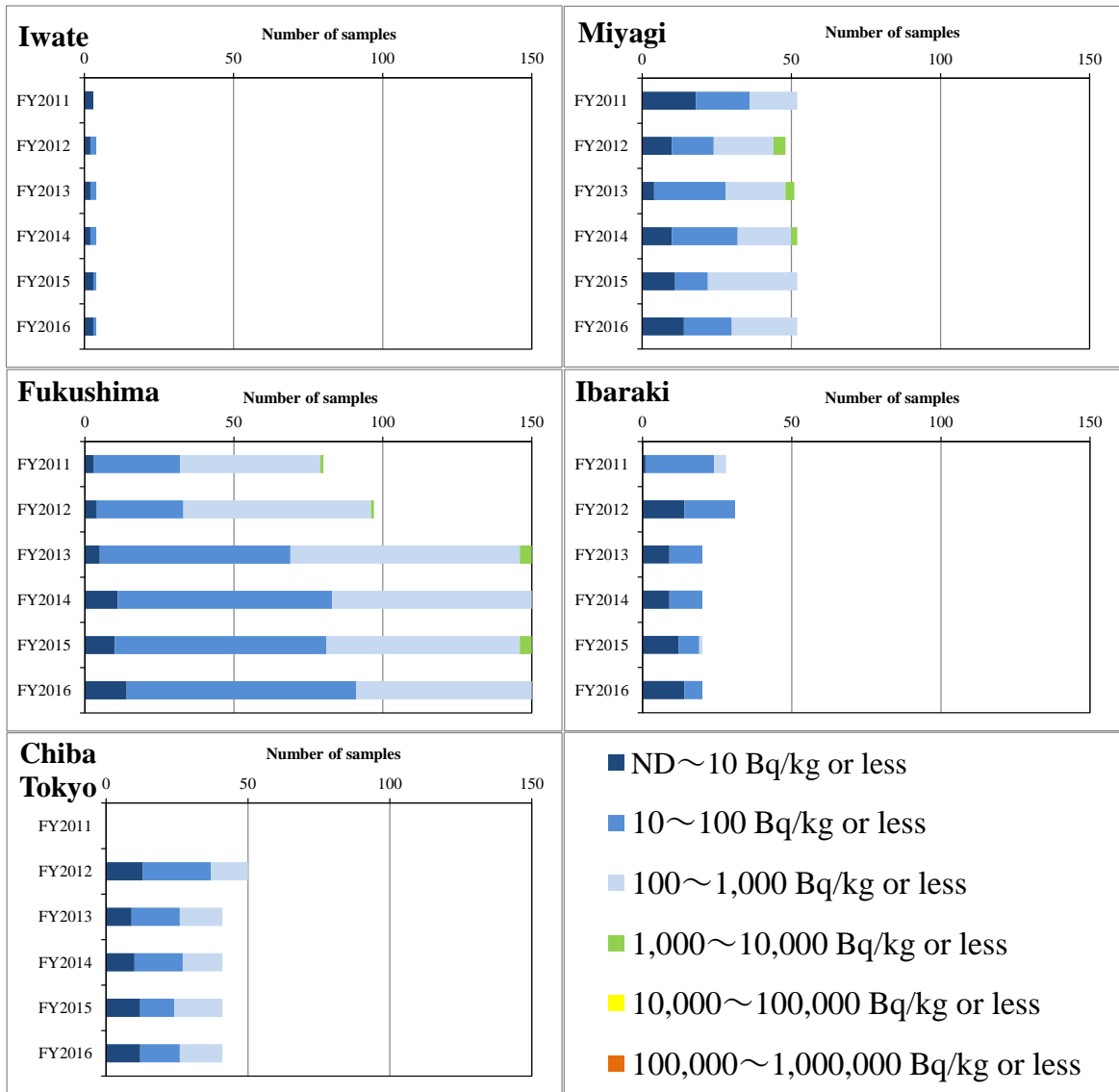


Figure 4.2-3 Detection of radioactive cesium in coastal area sediment samples (Changes)

### 4.3 Detection of radioactive materials in sediments 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 and Yamagata Prefecture, where the survey has not been conducted since 2012, were excluded from the evaluation.

#### 1) Relative detected concentration levels

- i. Obtain the average value for each location in FY2016 by using all survey results concerning concentrations of radioactive cesium (the total of Cs-134 and Cs-137) (arithmetic average calculated by assuming ND (not detectable) to be zero; hereinafter referred to as the "average for each location").
- 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 4.3-1).
  - Category A: Upper 5 percentile of the entirety
  - Category B: Upper 5 to 10 percentile of the entirety
  - Category C: Upper 10 to 25 percentile of the entirety
  - Category D: Upper 25 to 50 percentile of the entirety
  - Category E: Upper 50 to 100 percentile of the entirety (lower 50 percentile)

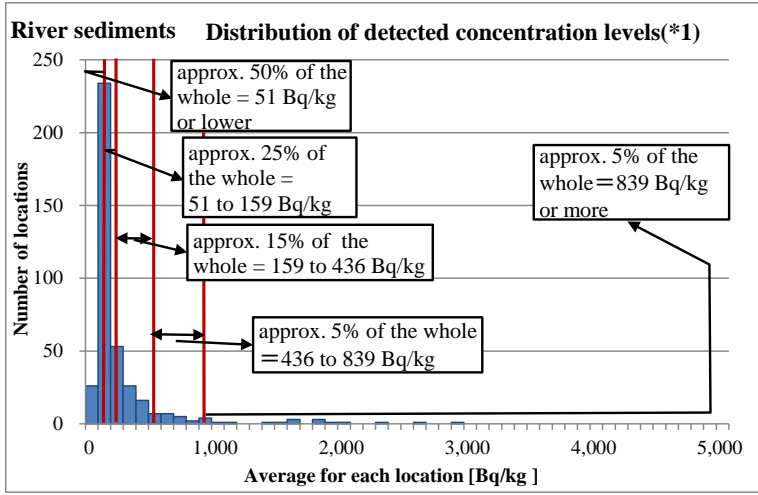
(Incidentally, a comparison between the average and the maximum value for each location for FY2016 revealed a good correlation (see right below of Figure 4.3-1). Therefore, considering that the evaluation of the average for each location covers that of large detected values (maximum values) that emerge occasionally, the evaluation was conducted by using only the average for each location.)

#### 2) Changes in detected values

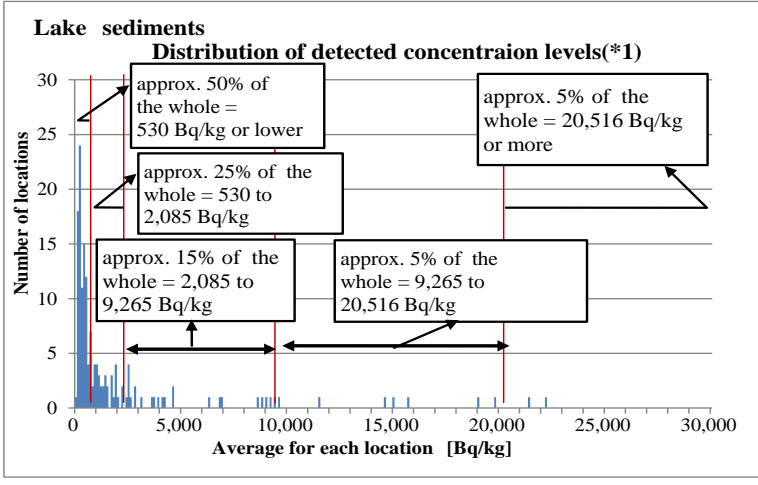
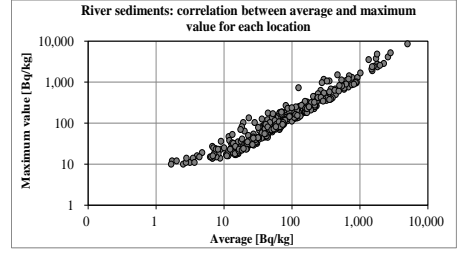
- i. Changes in detected values were categorized based on the following policy in order to evaluate their changes over the years.
  - (i) Based on graphs showing changes in detected values of each location over the years, those negatively sloped are set as "decreasing" and those positively sloped are set as "increasing" respectively by eye measurement.
  - (ii) When eye measurement 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 was 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 abovementioned 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.

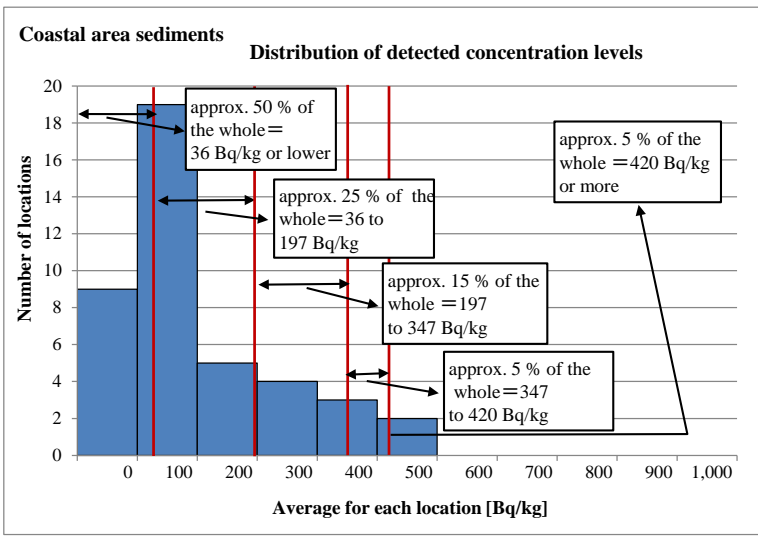
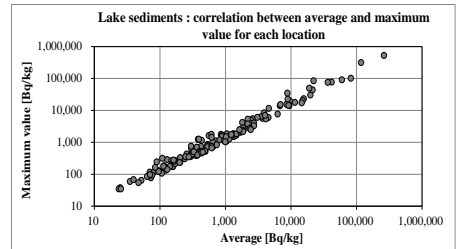




Category	Percentile	Range [River sediments] [Bq/kg (dry)]	Number of locations	Same as on the left. [%]
A	Upper 5 percentile	839 or more	19	4.8
B	Upper 5 to 10 percentile	436 ~ 839	20	5.1
C	Upper 10 to 25 percentile	159 ~ 436	61	15.4
D	Upper 25 to 50 percentile	51 ~ 159	98	24.7
E	Lower 50 percentile	51 or less	198	50.0
Total			396	100.0



Category	Percentile	Range [Lake sediments] [Bq/kg (dry)]	Number of locations	Same as on the left. [%]
A	Upper 5 percentile	20,516 or more	8	4.9
B	Upper 5 to 10 percentile	9,265 ~ 20,516	8	4.9
C	Upper 10 to 25 percentile	2,085 ~ 9,265	25	15.2
D	Upper 25 to 50 percentile	530 ~ 2,085	41	25.0
E	Lower 50 percentile	530 or less	82	50.0
Total			164	100.0



Category	Percentile	Range [Coastal area sediments] [Bq/kg (dry)]	Number of locations	Same as on the left. [%]
A	Upper 5 percentile	420 or more	2	4.8
B	Upper 5 to 10 percentile	347 ~ 420	2	4.8
C	Upper 10 to 25 percentile	197 ~ 347	6	14.3
D	Upper 25 to 50 percentile	36 ~ 197	11	26.2
E	Lower 50 percentile	36 or less	21	50.0
Total			42	100.0

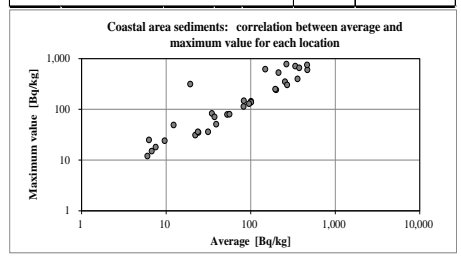


Figure 4.3-1 Categories based on the average for each location (left: picture showing means of categorization; upper right: results of categorization<sup>9</sup>; lower right: correlation between average and maximum value for each location)

\*1: locations where the maximum value on the horizontal axis is exceeded are not shown.

<sup>9</sup>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.

(2) Concentration levels in sediment samples from rivers, lakes, and coastal areas and their changes by prefecture

(2)-1 Rivers

1) Iwate Prefecture

In Iwate Prefecture, surveys were conducted 11 to 21 times from December 2011 to February 2017 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, three locations were categorized into Category D and 19 locations were categorized into Category E (see Table 4.3-1 and Table 4.3-2).

Concentration levels were generally decreasing at 19 locations and were fluctuating at three locations.

Table 4.3-1 Categorization of detected values at respective locations (Iwate Prefecture: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	0	(None)
B	Upper 5 to 10 percentile	0	(None)
C	Upper 10 to 25 percentile	0	(None)
D	Upper 25 to 50 percentile	3	No. 4, No. 16, No. 22
E	Lower than upper 25 to 50 percentile (lower 50%)	19	No. 1, 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. 17, No. 18, No. 19, No. 20, No. 21

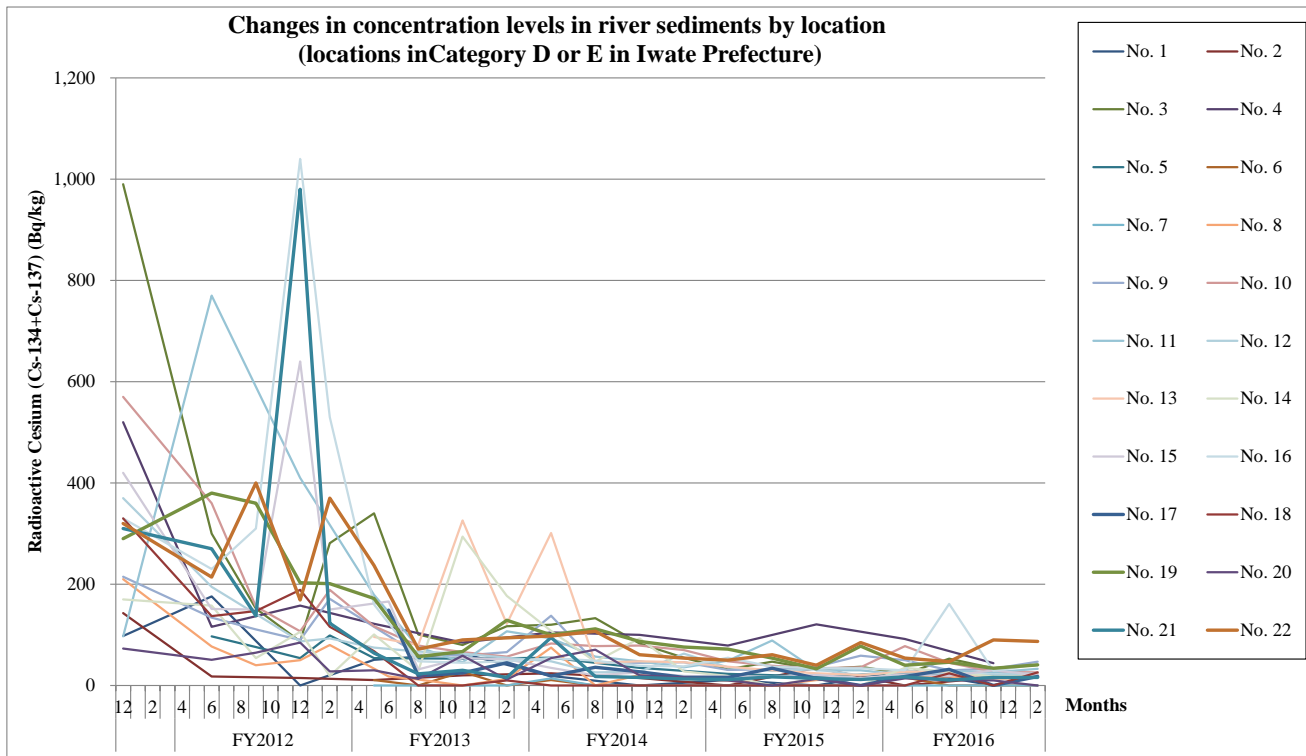


Figure 4.3-2 Changes in concentration levels over the years at respective locations (Iwate Prefecture: river sediments)

Table 4.3-2 Detection of radioactive cesium at respective locations  
(Iwate Prefecture: river sediments) (1)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																				
	Water area	Location	Municipality	FY2011									FY2012											
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Sakari River Lower Reaches	Sano Bridge	Ofunato City					98							176						0			
2	Kesen River	Aneha Bridge	Rikuzentakada City					143							18						15			
3	Okawa River	Prefectural border with Miyagi	Ichinoseki City					990							300				152		87		281	
4	Tsuyagawa River	Chiyogahara Bridge	Ichinoseki City					520							116						158			
5	Kurosawa River	Kawarada Bridge	Kanegasaki Town												97			76			54		99	
6	Isawa River	Oago Bridge	Oshu City																					
7		Sajin Bridge	Oshu City																					
8	Kitakami River	Fuji Bridge	Oshu City					210							77			40			50		80	
9	Shiratori River	Shiratori Bridge	Oshu City					215							134			111			90		171	
10	Koromo River	Koromogawa Bridge	Hiraizumi Town					570							360			156			107		189	
11	Ota River	Hitosuji Bridge	Hiraizumi Town					97							770						410			
12	Iwai River Middle Reaches	Kamino Bridge	Ichinoseki City					370							195			141			87		93	
13	Iwai River Lower Reaches	Kozenji Bridge	Ichinoseki City																					
14	Kitakami River	Chitose Bridge(Kozenji)	Ichinoseki City					170							158			54			106		19	
15	Sokei River	Unada Bridge	Ichinoseki City					420							151			150			640		150	
16	Sarusawa River	Kannon Bridge	Ichinoseki City					330							230			310			1,040		530	
17	Satetsu River	Oide Bridge	Ichinoseki City																					
18		Kanzaki Bridge	Ichinoseki City					330							137			147			189		116	
19	Senmaya River Upper Reaches	Miyata Bridge	Ichinoseki City					290							380			360			203		201	
20	Kitakami River	Kitakamigawa Bridge	Ichinoseki City					73							51			65			85		28	
21	Kinomi River	Higuchi Bridge	Ichinoseki City					310							270			138			980		123	
22	Kinryu River	Tenjin Bridge	Ichinoseki City					320							214			400			169		370	
				Total number of samples	401			Detection times	346															
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																								

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
	Water area	Location	Municipality	FY2013									FY2014												
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1
1	Sakari River Lower Reaches	Sano Bridge	Ofunato City			51							63							19				0	
2	Kesen River	Aneha Bridge	Rikuzentakada City			11							20						24				15		
3	Okawa River	Prefectural border with Miyagi	Ichinoseki City			340			101				80			117			120		133		83		55
4	Tsuyagawa River	Chiyogahara Bridge	Ichinoseki City			122							85						105				100		
5	Kurosawa River	Kawarada Bridge	Kanegasaki Town			54							53						55				35		
6	Isawa River	Oago Bridge	Oshu City			11			0				27			0			11		0		0		0
7		Sajin Bridge	Oshu City			0			0				0			0			14		0		0		0
8	Kitakami River	Fuji Bridge	Oshu City				18		12				0			13			75		0		21		13
9	Shiratori River	Shiratori Bridge	Oshu City				98		61				59			66			138		46		45		46
10	Koromo River	Koromogawa Bridge	Hiraizumi Town			117			79				66			57			83		78		79		70
11	Ota River	Hitosuji Bridge	Hiraizumi Town			179			76				46			107			93		57		48		36
12	Iwai River Middle Reaches	Kamino Bridge	Ichinoseki City			75			67				63			55			48		26		27		63
13	Iwai River Lower Reaches	Kozenji Bridge	Ichinoseki City			96			80				326			122			301		45		48		46
14	Kitakami River	Chitose Bridge(Kozenji)	Ichinoseki City			101			29				294			177			108		47		93		28
15	Sokei River	Unada Bridge	Ichinoseki City				166		32				54			52			35		20		26		19
16	Sarusawa River	Kannon Bridge	Ichinoseki City			160			48				45			48			54		49		39		38
17	Satetsu River	Oide Bridge	Ichinoseki City				149		19				25			45			19		36		27		16
18		Kanzaki Bridge	Ichinoseki City			68			0				0			10			0		0		0		0
19	Senmaya River Upper Reaches	Miyata Bridge	Ichinoseki City			172			57				67			129			100		112		87		76
20	Kitakami River	Kitakamigawa Bridge	Ichinoseki City			30			13				59			12			54		71		20		16
21	Kinomi River	Higuchi Bridge	Ichinoseki City			64			23				30			16			95		18		16		13
22	Kinryu River	Tenjin Bridge	Ichinoseki City			237			72				90			94			98		107		61		54
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																									

**Table 4.3-2 Detection of radioactive cesium at respective locations  
(Iwate Prefecture: river sediments) (2)**

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																		Changes	Average of FY2016 (*2)	No.	Coefficient of variation	Trends (*3)			
	Water area	Location	Municipality	FY2015									FY2016																
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Sakan River Lower Reaches	Sano Bridge	Otinato City		11						0					30						0							
2	Kesen River	Aneha Bridge	Rikuzentakada City	0							35					0						16							
3	Okawa River	Prefectural border with Miyagi	Ichinoseki City	32			47				32			37		23			53			34			41				
4	Tsuayagawa River	Chiyogahara Bridge	Ichinoseki City	79							121					92						44							
5	Kurosawa River	Kawarada Bridge	Kanegasaki Town	23							18					25						17							
6	Isawa River	Oago Bridge	Oshu City	0			0				0				0	16				0		0			0				
7		Sajin Bridge	Oshu City	0			0				0				0	0				0		0			0				
8	Ktakami River	Fuji Bridge	Oshu City	10			0				11			13		18			18			13			16				
9	Shiratori River	Shiratori Bridge	Oshu City	31			32				37			59		50			30			33			47				
10	Koromo River	Koromogawa Bridge	Hirainuma Town	48			39				34			36		78			45			27			26				
11	Ota River	Hitosuji Bridge	Hirainuma Town	49			89				30			30		21			29			26			33				
12	Iwai River Middle Reaches	Kamino Bridge	Ichinoseki City	36			29				32			20		30			22			22			24				
13		Iwai River Lower Reaches	Kozenji Bridge	Ichinoseki City	37			30				24			21		27			28			12			23			
14	Chirosu River	Ktakami Bridge(Kozenji)	Ichinoseki City	19			0				14			0		35			27			18			18				
15		Sokei River	Unada Bridge	Ichinoseki City	18			18				21			15		22			19			30			21			
16	Sarusawa River	Kannon Bridge	Ichinoseki City	55			37				34			34		30			161			29			42				
17	Satetsu River	Ode Bridge	Ichinoseki City	16			34				14			0		18			32			0			18				
18		Kanzaki Bridge	Ichinoseki City	0			0				0			0		0			24			0			26				
19	Senmaya River Upper Reaches	Miyata Bridge	Ichinoseki City	72			54				33			78		40			46			34			41				
20	Ktakami River	Ktakamigawa Bridge	Ichinoseki City	10			0				13			0		14			11			10			0				
21	Kinomi River	Higuchi Bridge	Ichinoseki City	12			17				14			12		17			11			16			16				
22	Kiryu River	Tenjin Bridge	Ichinoseki City	50			61				40			85		54			47			90			87				
				*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																		A	B	C	D	E	27	Average	
				*2: Aritmetic Average; calculated by assuming ND=0. Color codes show categories (see the right).																									
				*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2)																									

## 2) Miyagi Prefecture

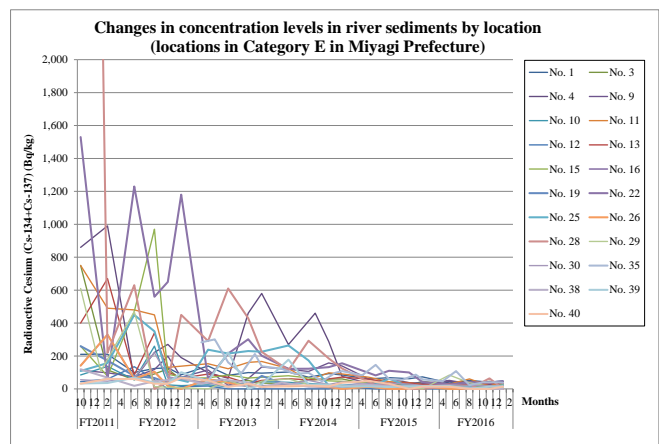
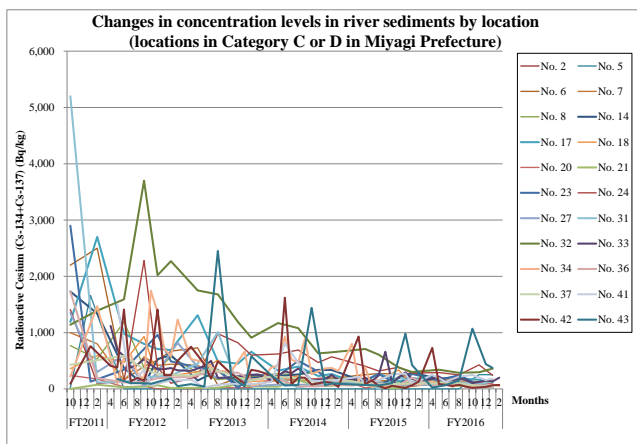
In Miyagi Prefecture, surveys were conducted 20 to 53 times from October 2011 to February 2017 for river sediment samples collected at 43 locations (this analysis excludes the survey results from 37 locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, five locations were categorized into Category C, 17 locations into Category D, and 21 locations into Category E (see Table 4.3-3 and Table 4.3-4).

Concentration levels were generally decreasing at 35 locations and were fluctuating at eight locations.

Table 4.3-3 Categorization of detected values at respective locations (Miyagi Prefecture: river sediments)

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



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 4.3-3 Changes in concentration levels over the years at respective locations (Miyagi Prefecture: river sediments)

Table 4.3-4 Detection of radioactive cesium at respective locations  
(Miyagi Prefecture: river sediments) (No.1)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)																					
	Water area	Location	Municipality	FY2011									FY2012												
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Shishiori River	Kinzan Bridge	Kesennuma City			210				211					100			124		128	86				
2		Namiita Bridge				1,220				810					189			165		370	262				
3	Okawa River	Tateyama-obashi Bridge				750				115					56			91		121	56				
4		Kamiyama Bridge				860				990					59			222		271	190				
5		Okawa River Estuary				23			1,660							0			0		0	0			
6	Omose River	Ozaki Bridge			2,200				2,500					159			400		510	670					
7	Kitakami River System	Arima River	Unanda Bridge	Kurihara City			1,000			800				146			570		420	440					
8		Kinryu River	Obata Bridge				770			530					1,190			380		340	570				
9		Kitakami River	Tome-obashi Bridge (Tome)				113			98					74			118		199	71				
10		Hiscama River Area	Sanhasama River	Doman Bridge (Kurikoma Dam)	Tome City			85			137				55			260		24	20				
11			Nihassama River	Kajiya Bridge				750			490					480			450		131				
12			Hasama River	Hanayama Dam, inflow area				44			60					135			56		0	14			
13				Wakayamagi				400			670						84			340		104	65		
14		Eai River Area	Yamayoshida Bridge			1,730				1,340					370			69		530	600				
15			Eai River	Todoroki Bridge (Todoroki)	Osaki City			260			77				470			970		89		66			
16	In Furukawa District, Osaki City		Shimizu Komon Lock				141			330					63			104		18	0				
17			Shinborisaihon, entrance			1,190			2,700						980			800		710	690				
18			Dokigawa River	Kogota Bridge	Misato Town			360			590				470			930		195	233				
19	Eai River	Oikawa Bridge (Tandai)	Wakuya Town /Ishinomaki Town			260			172					79			66		37	73					
20	Kyu-Kitakami River	Kadonowaki	Ishinomaki City			240			175					36			49		0	10					
21	Naruse River	Onobashi Bridge (Ono)	Higashi-Matsushima City			0			74					28			41		65	17					
22	Sunaoshi River	Tagajozaki Weir	Tagajo City			1,530			62					1,230			560		650	1,180					
23		Neibutsu Bridge				2,900			129						340			710		960	490				
24	Teizan-unga Canal (Kyu-sunaoshi River)	Teizan Bridge	Shiogama City/Shichigahama Town/Tagajo City			1,410			95					141			2,280		380	101					
25	Nanakita River System	Nanakita Bridge	Sendai City			109			157					450			350		71		43				
26		Fukuda-obashi Bridge				10			60						14			60		17		17			
27		Umeda River		Fukuda Bridge			1,350			300					600			53		300		820			
28		Nanakita River		Takasago Bridge			11,100			220					630			0		42		450			
29	Natori River	Yuriage-obashi Bridge	Sendai City /Natori City			610			108					470			14								
30	Natori River System	Yakushi Bridge	Natori City			56			47					68			220		73						
31		Koyama Bridge				5,200			116						124			202		221	236				
32		Bshamon Bridge				1,140			1,390							1,590			3,700		2,020	2,270			
33	Abukuma River System	Hadeniwa Bridge	Marumori Town											1,120	690	580	380	430	530	520	330	350	350	370	330
34		Abukuma River	Marumori Bridge	Marumori Town			220			1,470			570	101	560	610	280	162	3,400	90	1,360	710	580	1,230	
35			Higashine Bridge	Rakuda City																					
36			Shiroishi River	Before the confluence with Kawaragosawa River (Sunaoshi Bridge)	Shiroishi City			1,730			191					116			123		190				
37		Saikawa River	Eisubo Bridge	Shiroishi City			430								590			350		270					
38		Matsukawa River	Miya-obashi Bridge	Zao Town			119								19			47		54		66			
39		Arakawa River	Niragami Bridge	Murata Town/Ogawara Town			33			36					68			38		32		101			
40		Shiroishi River	Shirahata Bridge	Shibata Town			32			61					60			32		31		68			
41		Abukuma River	Tsukinoki-obashi Bridge	Rakuda City/Shibata Town											2,470	540		88		340	63		154	152	
42			Abukuma-obashi Bridge (Iwanuma)	Iwanuma City/Watari Town			91			760			410	380	1,410	136	196	143	730	300	1,410	243	247	500	
43			Abukuma River Estuary (Watariobashi Bridge)	Iwanuma City/Watari Town												103	249		104		102	91		187	49
				Total number of samples	1,048	Detection times		976																	

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-4 Detection of radioactive cesium at respective locations  
(Miyagi Prefecture: river sediments) (No.2)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)																																	
	Water area	Location	Municipality	FY2013											FY2014																						
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3										
1	Shishiori River	Kinzan Bridge	Kesennuma City	139				83				99	96				103											71			93	85					
2		Namita Bridge		245				28						186	268				300										150			231	265				
3	Okawa River	Tateyama-ohashi Bridge		39				43					51	35				33										54			60	61					
4		Kamiyama Bridge		99				65					460	580				269										460			288	76					
5		Okawa River Estuary		0				0					0	0				0											0			0	0				
6	Omose River	Ozaki Bridge		730				64					194	63				158										158			185	182					
7	Kitakami River System	Arima River		Unanda Bridge	420				173				229	210				225										152			145	131					
8		Kiryu River		Obata Bridge	289				165				196	221				271										250			304	184					
9		Kitakami River		Tome-ohashi Bridge (Tome)	115				22				63	133				119										106			158	139					
10		Hasama River Area		Sanhasama River	Doman Bridge (Kurikoma Dam)	25				13				38	45				40									33			26	22					
11				Nhasama River	Kaiya Bridge	153				123				161	167				124									54			98	91					
12					Hanyama Dam, inflow area	17				0				0	0				0									0			0	10					
13				Hasama River	Wakayanagi	90				71				33	52				62										55			61	72				
14				Yamayoshida Bridge	Tome City	150				327				68	197				225									258			339	337					
15		Eai River Area	Todoroki Bridge (Todoroki)	67				85				66					80										67			49	46						
16				Eai River	59				37				17	17				16									18			11	0						
17				In Furukawa District,Osaki City	1,310				490				450	660				324									398			229	265						
18				Dekigawa River	305				510				134	133				153										232			95	101					
19			Eai River	56				41				21	79				20										19			13	18						
20			Kyu-Kitakami River	Kadonowaki	0				27				18	26			221										171			184	212						
21	Naruse River	Onobashi Bridge (Ono)	Higashi-Matsushima City	19				19				82	44				40									153			53	54							
22	Sunaoishi River	Tagajozeki Weir	Tagajo City	61				215				302	202				122									123			132	156							
23		Nenbutsu Bridge	380				340					17	255				225									500			307	87							
24	Tetzan-unga Canal (Kyu-sunaoishi River)	Tetzan Bridge	Shiogama City/Shichigahama Town/Tagajo City	218				980				820	600			620										690			470	570							
25	Nanakita River System	Nanakita River	Nanakita Bridge	238				215				230	226			264										173			20	18							
26			Fukuda-ohashi Bridge	13				12				16	13			18										22			16	0							
27		Umeda River	Fukuda Bridge	390				186				233	47			76										71			84	124							
28		Nanakita River	Takasago Bridge	291				610				430	225			114										293			185	124							
29	Natori River	Yuriage-ohashi Bridge	Sendai City /Natori City	0				52				11	47			61										26			23	18							
30	Natori River System	Masuda River	Yakushi Bridge	35				23				17	20			28										52			27	43							
31			Koyama Bridge	450				1,010				81	168			208										21			112	74							
32			Bishamon Bridge	1,750				1,680				1,190	910			1,170										1,080			630	650							
33	Abukuma River System	Abukuma River	Hadeniwa Bridge	320		310	500	500	196		203	236	247	259		153	236	312	280	363	272	157			165	251	155										
34			Marumori Bridge	530		700	253	390	320		312	660	59	75		380	420	930	520	470	890	262				364	373	318									
35		Higashine Bridge	283		301			161		96		212	138			122		91		98	46				98	108											
36		Shiroishi River Areas	Shiroishi River	Before the confluence with Kawaragosawa River (Sunaoishi Bridge)	218				302				286	165			212									45			46	71							
37			Saikawa River	Eisubo Bridge	234				360				206	146			225									188			137	153							
38			Matsukawa River	Miya-ohashi Bridge	31				58				39	10			39									13			15	14							
39			Arakawa River	Niragami Bridge	47				222				0	27			178									26			26	14							
40		Shiroishi River	Shirahata Bridge	52				12				31	12			19										20			16	37							
41		Abukuma River	Tsukinoki-ohashi Bridge	Kakuda City/Shibata Town	166			24		74		88	94	84			123		810	463	137				145	143											
42			Abukuma-ohashi Bridge (Iwamura)	Iwamura City/Watari Town	750		231	650	181	490		270	91	338	318		240	101	1,620	82	197	200	77			123	111	37									
43			Abukuma River Estuary (Watariohashi Bridge)	Iwamura City/Watari Town	85			41		2,450		209		45	580			237		60		70				1,440			65	98							

Table 4.3-4 Detection of radioactive cesium at respective locations  
(Miyagi Prefecture: river sediments) (No.3)

No.	Water area	Location		River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration/Bq/kg(**)																									Changes	Average of FY2016 (**)	No.	Coefficient of variance	Trends(*)			
		Location	Municipality	FY2015										FY2016																						
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3									
1	Shibitori River	Kusan Bridge	Kesennuma City	61			68			62	73			36			52			41	48								44	1	0.49	↘				
2		Nanata Bridge		164			178			138	127			132			114			112	74								108	2	1.02	↘				
3	Okawa River	Tateyama-obashi Bridge	Kesennuma City	27			30			22	46			24			29			46	31							33	3	1.83	↘					
4		Kamiyama Bridge		34			62			38	35			44			43			44	45							44	4	1.16	↘					
5		Okawa River Estuary		0			0			0	0			0			0			255	252						127	5	3.58	↘						
6	Omose River	Ozaki Bridge		242			273			266	111			178			127			44	179						132	6	1.48	↘						
7	Kakami River System	Arima River	Kesennuma City	156			146			149	45			103			139			134	125						125	7	0.88	↘						
8		Kiryu River		Ohta Bridge	188			119			125	103			129			87			114	103						108	8	0.88	↘					
9		Kakami River	Tome-obashi Bridge (Tome)	60			27			31	33			52			31			28	30						35	9	0.61	↘						
10		Sanbasama River	Donnan Bridge (Karkoma Dam)	20			27			19	22			16			16			19	13						16	10	1.26	↘						
11	Hasama River Area	Nihasama River	Kariyama City	71			44			38	26			29			61			18	43						38	11	1.15	↘						
12				Hasama Dam, inflow area	0			0			15	0			0			0			0	0						0.0	12	2.03	↘					
13	Kakami River System	Hasama River	Tome City	59			36			36	26			30			24			33	34						30	13	1.42	↘						
14				Wakayama	165			89			191	288			179			217			38	34						117	14	1.18	↘					
15	Eai River Area	Eai River	Osaki City	37			21			26	0			15			18			12	27						18	15	1.82	↘						
16				Shimizu Komen Lock	13			0			0	12			0			0			0	0						0	16	1.92	↘					
17		In Furukawa District, Osaki City	Osaki City	88			271			138	191			157			185			164	113						155	17	1.04	↘						
18		Shimoborobon, entrance		153			157			336	78			149			194			95	159							149	18	0.79	↘					
19		Okawa River (Tanda)	Wakuya Town / Ashimomaki Town	33			17			16	13			19			0			13	18						13	19	1.23	↘						
20		Katonowaki		Ishinomaki City				21			50	70	92		112			90			106	89						99	20	0.85	↘					
21	Nanase River	Obushiki Bridge (Ono)	Higashi-Matsushima City	122			17			13	74			78			54			49	38						55	21	0.71	↘						
22	Samazishi River	Tajigasaki Weir	Tajiri City				82			110			100			42			27			39	46				38	22	1.38	↘						
23				Nebutsu Bridge	145			264			71	267			151			246			68	51						129	23	1.49	↘					
24	Tetsu-ouga Canal (Kyu-Sumitani River)	Tsutan Bridge	Shiogama City/Shiogama Town/Tajiri City	403			319			384	283			291			251			428	241						303	24	0.91	↘						
25	Nanaka River System	Nanaka River	Sendai City	26			63			13	14			0			13			0	23						9.0	25	1.04	↘						
26				Fukuda-obashi Bridge	0			0			0	0			0			0			0	0						0	26	1.30	↘					
27		Utsuda River		69			113			64	76			65			96			46	44						63	27	1.34	↘						
28		Nanaka River	Takasago Bridge	21			30			0	0			16			0			64	0						20	28	3.46	↘						
29		Natori River	Yuriga-obashi Bridge	17			14			11	0			84			37			16	10						37	29	1.98	↘						
30	Natori River System	Yakushi Bridge		26			35			29	21			25			22			18	19						21	30	1.02	↘						
31		Miyada River	Koyama Bridge	123			0			215	125			110			118			83	135						112	31	2.62	↘						
32		Ishinomaki Bridge		710			608			381	300			341			286			297	360						321	32	0.75	↘						
33	Abukuma River System	Halenwa Bridge	Muratori Town	176			144			199	137	238	660	113			294	177	143	177	219	140	152	184	162	103	147	134	200	162	33	0.63	↘			
34				Muratori Bridge	800			130			384	27	84	42	69			87	113	73	130	65	109	35	91	41	39	52	75	53	69	34	1.31	↘		
35		Higashino Bridge	Sakado City	83			146			60	55			87			58			47	108						49	35	0.69	↘						
36	Abukuma River System	Shiroishi River	Shiroishi City	61			97			67				198			48			71							67	43	36	1.73	↘					
37				Sakawa River	136			80			89	102			92			116			51	45						76	37	0.70	↘					
38		Matsukawa River	Zao Town	28			19			15	11			15			10			0	0						6.3	38	0.94	↘						
39		Arakawa River	Negami Bridge	16			12			15	17			18			0			14	16						12	39	1.28	↘						
40		Shiroishi River	Shirahata Bridge	48			31			0	14			13			0			0	14						6.8	40	0.74	↘						
41		Fukinoki-obashi Bridge	Kakada City/Shibata Town	214			105			149	261			273			76			252	128						198	41	1.61	↘						
42	Abukuma River System	Abukuma-obashi Bridge (Iwamura)	Iwamura City/Watani Town	0	1,860	85	151	53	10	54			17	64	134			730	85	75	52	73	41	19			36	64	71	125	42	1.33	↘			
43				Abukuma River Estuary (Watarohashi Bridge)	75			71			60	103			980	424			23			68	150				1,070	441	373	354	43	1.59	↘			
				*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																									A B C D E					84	Average	
				*2: Arithmetic Average: calculated by assuming ND=0. Color codes show categories (see the right).																																
				*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1)2: ↘ Decreasing ↗ Increasing ↔ Unchanged 📉 Fluctuations																																



### 3) Fukushima Prefecture

#### (i) Hamadori

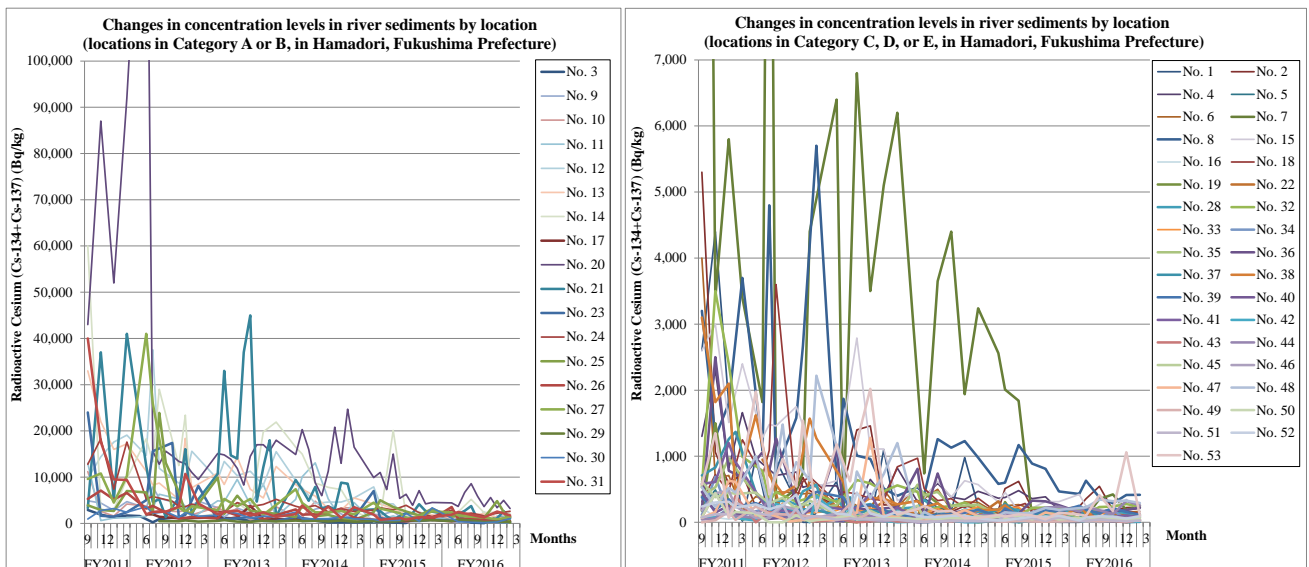
In Hamadori, Fukushima Prefecture, surveys were conducted 29 to 55 times from September 2011 to February 2017 for river sediment samples collected at 53 locations.

Regarding the concentration levels of detected values, 11 locations were categorized into Category A, seven locations into Category B, 14 locations into Category C, 11 locations into Category D, and 10 locations into Category E (see Table 4.3-5 and Table 4.3-6).

Concentration levels were generally decreasing at 49 locations, were unchanged at one location, and were fluctuating at three locations.

Table 4.3-5 Categorizations of detected values at respective locations  
(Hamadori, Fukushima Prefecture: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	11	No. 3, No. 12, No. 13, No. 14, No. 20, No. 21, No. 24, No. 25, No. 26, No. 27, No. 31
B	Upper 5 to 10 percentile	7	No. 9, No. 10, No. 11, No. 17, No. 23, No. 29, No. 30
C	Upper 10 to 25 percentile	14	No. 2, No. 4, No. 6, No. 7, No. 8, No. 15, No. 18, No. 28, No. 32, No. 36, No. 39, No. 44, No. 48, No. 53
D	Upper 25 to 50 percentile	11	No. 5, No. 22, No. 33, No. 34, No. 35, No. 37, No. 38, No. 41, No. 45, No. 50, No. 52
E	Lower than upper 25 to 50 percentile (lower 50%)	10	No. 1, No. 16, No. 19, No. 40, 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 4.3-4 Changes in concentration levels over the years at respective locations  
(Hamadori, Fukushima Prefecture: river sediments)

Table 4.3-6 Detection of radioactive cesium at respective locations  
(Hamadori, Fukushima Prefecture: river sediments) (No.1)

No.	Water area	Location		River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
		Location	Municipality	FY2011									FY2012												
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Jizogawa River	Hamahata Bridge	Shimchi Town	2,600	4,400	1,790	18	980		54	940			320	0	0									
2	Koizumi River	Koizumi Bridge	Soma City	5,300	1,060	580	740	231		460	142			470	680	480									
3		Hyakken Bridge		2,900	1,880	1,280	1,700	1,570		240	920			1,350	1,070	1,330									
4	Udagawa River	Horisaka Bridge		1,300	2,300	820	1,660	970		800	710			760	530	560									
5		Hyakken Bridge	240	490	155	155	109		55	143			84	23	290	0									
6	Manogawa River	Ochiai Bridge	Minamisoma City	4,000	660	710	180	390		310	460			450	430	440									
7		Majima Bridge		28,000	3,400	5,800	3,400			1,820	15,900	280		500	750	4,400									
8	Nida River	Kusano	Iitate Village	3,200	1,290	1,800	3,700		1,090	4,800	770		1,580	2,670		5,700									
9		Komiya		4,900	4,400	2,800	4,700		3,300	7,900	5,400		4,300	2,900		4,800									
10		Kidouchi Bridge		11,200	2,600	1,570	4,200		3,800	2,250	2,600	2,800		2,520	2,800	1,850									
11	Ota River	Sakekawa Bridge	Minamisoma City	13,000	610	1,140	1,230		1,530	3,300	3,400	6,300		5,300	3,700	1,070									
12		Ishiwatado Bridge		9,700	14,400	17,600	19,100		14,700	61,000	14,100	11,900		8,700	9,300	15,600									
13		Kaminouchi Bridge		33,000	22,000	16,000	17,200		11,300	8,000	8,600	8,700		5,200	18,400	7,700									
14		Masuda Bridge		60,000	2,900	2,900	9,700		18,300	3,800	22,800	29,000		12,500	23,400	1,270									
15		JR Tetsudo Bridge		2,600	3,000	1,510	2,400		1,280	1,750	1,210	1,460		1,750	1,470	510									
16	Odaka River	Maruyama Bridge	Namie Town	230	71	48	72		121	180	123	92		48	53	45									
17		Shimokawara Bridge							1,940	1,950	1,430		1,080	1,020	1,140										
18		Zencho Bridge		310	720	470	1,250		700	1,090	3,600		360	620	690										
19	Ukedo River	Hatsukara Bridge	Namie Town	173	1,500	260	44		108	410	54	78		18	42	17									
20		Murohara Bridge		43,000	87,000	52,000	92,000		165,000	13,400	17,800	12,800	15,600	14,600	13,400	11,600	14,200	11,000	9,500						
21	Ukedo Bridge	3,300	37,000	5,000	41,000		12,400	5,600	3,700	5,200	1,370	5,600	23,700	8,400	1,870	5,200									
22	Furumichi River	Before the confluence with Takasagawa River(Kodoshimohira,Mivakoji Town)	Tamura City						950	162	1,410	80	165	176	640										
23	Takase River	Keio Bridge	Namie Town	24,000	1,650	1,460	2,400		5,000	15,800	15,400		17,400	1,370	1,830									8,100	
24	Maeda River	National Route 6, west	Futaba Town	12,800	18,300	7,400	17,600		5,300	5,800		4,800	3,700	3,600	4,200										
25		Nakahama Bridge		3,900	2,900	2,700	7,000		6,700	2,900	1,310	23,900	13,100	6,800	2,260	2,310									
26	Kumagawa River	National Route 6, west	Okuma Town	5,300	7,100	5,200	6,600		3,200	3,800		1,610	1,070	1,200	1,380										
27		Makuma Bridge		9,600	10,800	4,500	10,200		41,000	26,000		2,900	3,500	2,460	3,700										
28	Tomioka River	Nabekura Bridge	Kawauchi Village									330	310	270	470							570	242		
29		Sakaigawa Bridge											490		440	710	560							400	
30		National Route 6, west		Tomioka Town	930	2,800	3,200	2,400		3,600	2,150		2,530	1,300	2,330	1,540									
31	Kobama Bridge	40,000	17,600		9,500	9,400		1,940	2,470		2,530	3,600	10,700	4,300											
32	Idegawa River	Motogama Bridge	Naraha Town	530	3,500	2,400	990		780	320	460		310	340	410										
33	Kawauchi River	Before the confluence with Kidogawa River(Futumata Bridge)	Kawauchi Village									181	290	83	194	142							149		
34	Kidogawa River	Nishiyama Bridge	Naraha Town	111	690	139	99		198	81		86	137	130	271										
35		Nagatoro Bridge		400	530	970	670		320	121	178		236	280	217										
36	Asami River	Kidokawa Bridge	Hirono Town	200	2,500	780	680		1,060	780	1,270		320	154	192										
37		Boda Bridge		710	830	1,260	1,370		450	240	230		153	200	183										
38	Ohisa River	Kageiso Bridge	Iwaki City	3,100	1,820	2,100	450	1,620		710		430	560		1,570	1,270									
39	Kohisa River	Rengo Bridge		380	184	350	240	290		202		149	127		400	460									
40	Nida River	Kasumida Bridge		460	148	250	123	156		52	68		75	92		85									
41		Matsuba Bridge	580	610	1,200	910		460	161		181	151	122		250										
42	Natsui River	Kitanouchi Bridge	Ono Town	66	76	206	61	29		155	280		172		0	400									
43		Kyudayu Bridge		80	440	117	400		0	159		116	149		22	14									
44		Rokujimai Bridge		43	58	210	96	66	350	47	72		63	72											
45	Yoshima River	Iwaanatsuri Bridge	Iwaki City	620	380	450	430	450		290		370	206		330	276									
46		Before the confluence with Natsui River		182	440	480	237	69	63	246		191	34	48											
47	Fujiwara River	Shima Bridge	Iwaki City	64	157	630	610	102		126		55	13		46										
48		Minato-ohashi Bridge		530	239	520	450	1,000	214	1,480	580	910				630	2,220								
49	Samegawa River	Idosawa Bridge	Iwaki City	0	30	161	36	238		134															
50		Samegawa Bridge		78	440	91	157	136	0	0	106				16	33									
51	Shitoki River	Komuro Bridge	Iwaki City	74	121	122	300	149		103		265	78	208	48									96	
52	Bnda River	Kobana Bridge		237	300	310	226	270		198		259	420	137	330										
53		Bnda Bridge		570	1,350	66	260	1,980	420	960	540	1,540	156												
				Total number of samples	1,863	Detection times	1,832																		

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-6 Detection of radioactive cesium at respective locations  
(Hamadori, Fukushima Prefecture: river sediments) (No.2)

No.	Water area	Location		River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																				
		Location	Municipality	FY2013									FY2014											
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	Jizogawa River	Hamahata Bridge	Shinchi Town		620	95		151		0	1,100	24			13	361		224	170	980	245			
2	Koizumi River	Koizumi Bridge	Soma City	235	540		1,400		1,460		261	273			333	114		181	158	247	214			
3		Hyakken Bridge		1,490	1,200		1,040		510	750	840					970	500		560	209	206	194		
4	Udagawa River	Horisaka Bridge	Minamisoma City	550	370		165		650	390	820			308	390		590	382	344	470				
5		Hyakken Bridge		100	70		84		60	64	65				83	46		149	24	28	60			
6	Manogawa River	Ochihi Bridge	Minamisoma City	224	380		250		236	490	225			560	360		500	183	309	300				
7		Majima Bridge		6,400	161		6,800		3,500	5,100	6,200				2,140	740		3,650	4,400	1,940	3,240			
8	Näda River	Kusano	Iitate Village	630	1,870		1,010		960	510	400			530	420		1,260	1,130	1,230	980				
9		Komiya		3,400	1,370		3,300		2,280	1,810	2,050				1,270	1,620		3,070	3,680	2,050	990			
10	Ota River	Kidouchi Bridge	Minamisoma City	3,500	2,500		3,040		760	1,560	3,600			1,320	1,270		4,800	2,240	3,360	3,350				
11		Sakekawa Bridge		4,900	4,700		9,500		4,100	8,400	1,420				5,200	10,100		13,100	5,300	1,080	4,480			
12	Ota River	Ishiwatado Bridge	Minamisoma City	9,500	13,400		10,300		11,300	8,300	15,800			9,300	7,700		4,300	4,600	4,600	5,500				
13		Kaminouchi Bridge		10,900	8,400		14,300		7,400	5,500	12,300				8,400	7,400		5,900	3,150	2,860	5,500			
14	Ota River	Massuda Bridge	Minamisoma City	2,090	2,520		4,500		2,400	19,800	21,900			16,500	15,000		8,700	7,800	7,300	2,590				
15		JR Tetsudo Bridge		630	1,460		2,790		1,110	1,110	327				480	368		620	381	630	570			
16	Odaka River	Maruyama Bridge	Namiie Town	53	60		84		50	16	36			27	68		46	53	21	16				
17		Shimokawara Bridge		1,270	890		1,310		3,800	940	860				900	1,020		760	830	790	970			
18	Odaka River	Zencho Bridge	Namiie Town	307	460		430		359	325	840			970	510		329	358	220	365				
19		Hatsukara Bridge		48	19		0		71	52	20				65	443		289	133	21	0			
20	Ukedo River	Murohara Bridge	Namiie Town	15,100	14,800	13,900	11,900	8,300	14,500	17,000	17,000	15,700	18,000		14,900	20,300	16,000	8,800	6,000	11,300	20,800	13,000	24,700	16,500
21		Ukedo Bridge		10,700	33,000	14,700	14,000	37,000	45,000	4,700	12,100	18,000	1,510			9,400	7,300	4,900	7,900	3,190	3,690	3,020	8,800	8,600
22	Furumichi River	Before the confluence with Takasegawa River (Kodoshimohira, Miyakoji Town)	Tamura City	231	220		182		171	316				111	175		95	54	80	103				
23	Takase River	Keio Bridge	Namiie Town	770	860		1,140		1,370	510	520			1,370	1,100		800	660	1,110	1,140				
24	Maeda River	National Route 6, west	Futaba Town	2,500	2,510		4,500		3,600	4,100	5,200			3,690	3,350		3,860	2,510	3,210	2,560				
25		Nakahama Bridge	Namiie Town	9,900	2,040		6,000		2,740	2,380	2,060			1,360	3,770		1,560	1,830	1,110	690				
26	Kumagawa River	National Route 6, west	Okuma Town	1,070	2,640		1,740		2,280	830	1,780			3,010	1,880		1,970	2,360	3,120	1,230				
27		Mikuma Bridge	2,850	5,300		3,700		5,300	1,870	4,000				7,400	4,400		2,400	2,340	2,690	1,960				
28	Tomioka River	Nabekura Bridge	Kawauchi Village	350	235		239		276	144	205			230	339		172	100	196	156				
29		Sakaigawa Bridge		550	690		400		340	580	430				600	500		570	430	610	366			
30	Tomioka River	National Route 6, west	Tomioka Town	1,780	2,580		2,170		1,150	1,540	1,400			2,450	970		990	1,020	1,430	980				
31		Kobama Bridge		1,970	2,460		2,730		1,720	2,390	1,390				2,020	3,870		1,220	3,660	1,180	3,520			
32	Idegawa River	Motogama Bridge	Naraha Town	310	370		640		590	470	560			460	168		228	244	297	197				
33	Kawauchi River	Before the confluence with Kidogawa River (Futamata Bridge)	Kawauchi Village	177	224		154		217	170	148			182	137		208	126	171	235				
34		Nishiyama Bridge		16	38		108		111	67	49				113	78		82	100	64	62			
35	Kidogawa River	Nagatoro Bridge	Naraha Town	259	390		110		58	117	94			570	410		460	249	252	267				
36		Kidokawa Bridge		1,100	218		226		174	210	230				810	74		740	150	167	83			
37	Asami River	Boda Bridge	Hirono Town		93	380	128		187	138	169			77	124		87	95	93	93				
38	Ohisa River	Kageiso Bridge	Iwaki City		610	260	235		370	360	273			321	229		286	159	92	182				
39		Kohisa River		Rengo Bridge		380	204	243		262	191	96			112	98		113	130	144	191			
40	Näda River	Kasumida Bridge	Ono Town		14	57	41		100	17	47			0	0		12	29	71	56				
41		Matsuba Bridge		195	228		211		430	80	224				61	54		71	58	41	66			
42	Natsui River	Kitanouchi Bridge	Iwaki City		31	219	12		42	21	0			10	0		15	29	0	0				
43		Kyudayu Bridge		42	13		0		14	36	10				12	11		23	12	42	20			
44	Yoshima River	Rokujumai Bridge	Iwaki City	99	94	65		91	59	45			21	26		17	56	182	109					
45		Iwaanatsuri Bridge		79	164		47		175	80	85				254	53		63	59	34	49			
46	Fujwara River	Before the confluence with Natsui River	Iwaki City		157	63	163		37	17	38			0	50		15	20	16	18				
47		Shima Bridge		38	96	144		1,280		100	78				37	22		97	102	187	92			
48	Samegawa River	Minato-ohashi Bridge	Iwaki City		790	139	770		369	730	1,200			41	159		54	83	20	53				
49		Idosawa Bridge		68	278		41		148	48	45				19	0		26	18	70	36			
50	Shitoki River	Samegawa Bridge	Iwaki City	64	109	46		59	58	65			48	71		48	68	55	91					
51		Komuro Bridge		40	59		52		41	48	41				14	11		12	25	21	20			
52	Bnda River	Kobana Bridge	Iwaki City	134	113	450		132	83	161			98	81		77	99	100	60					
53		Bnda Bridge		1,180		620	1,210		2,020	349	117				201	246		162	174	63	64			

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."



(ii) Nakadori

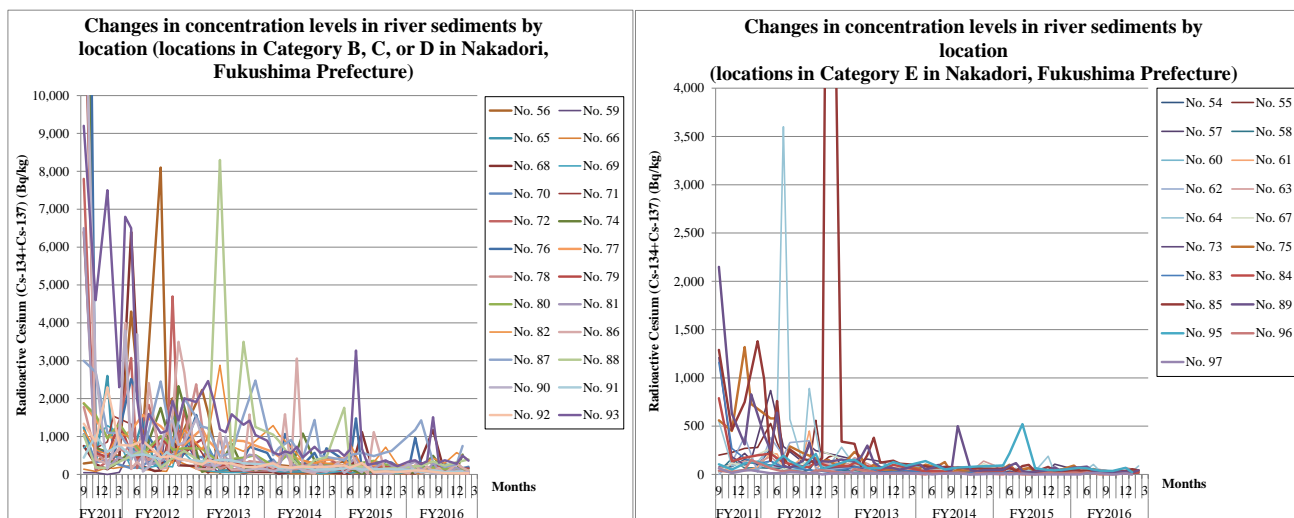
In Nakadori, Fukushima Prefecture, surveys were conducted 33 to 57 times from September 2011 to February 2017 for river sediment samples collected at 44 locations.

Regarding the concentration levels of detected values, two locations were categorized into Category B, nine locations into Category C, 14 locations into Category D, and 19 locations into Category E (see Table 4.3-7 and Table 4.3-8).

Concentration levels were generally decreasing at 42 locations and were fluctuating at two locations.

Table 4.3-7 Categorizations of detected values at respective locations  
(Nakadori, Fukushima Prefecture: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	0	(None)
B	Upper 5 to 10 percentile	2	No. 87, No. 93
C	Upper 10 to 25 percentile	9	No. 59, No. 68, No. 71, No. 74, No. 76, No. 79, No. 80, No. 82, No. 88
D	Upper 25 to 50 percentile	14	No. 56, No. 65, No. 66, No. 69, No. 70, No. 72, No. 77, No. 78, No. 81, No. 86, No. 90, No. 91, No. 92, No. 94
E	Lower than upper 25 to 50 percentile (lower 50%)	19	No. 54, No. 55, No. 57, No. 58, No. 60, No. 61, No. 62, No. 63, No. 64, No. 67, No. 73, No. 75, No. 83, No. 84, No. 85, No. 89, No. 95, No. 96, No. 97



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 4.3-5 Changes in concentration levels over the years at respective locations  
(Nakadori, Fukushima Prefecture: river sediments)

Table 4.3-8 Detection of radioactive cesium at respective locations  
(Nakadori, Fukushima Prefecture: river sediments) (No.1)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
	Water area	Location	Municipality	FY2011									FY2012												
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
54	Abukuma River	Habuto Bridge	Nishigo Village		66		81		155		96		262		44		31	49	144	89					
55		Tamachi-ohashi Bridge	Shirakawa City		200		228		270		280		1,010	46	330	184	56	107	60	85	560	125	180	203	
56	Yanta River	Before the confluence with Abukuma River				290		330		530		490		4,300		1,050			8,100	1,720	2,010	860			
57	Yashiro River	Yashirogawa Bridge	Tanagura Town		77		108		218	150			870		290			129	300	246					
58	Kitasu River	Yanagi Bridge	Hirata Village		27		165		66	70			64		65			14	57	19	72				
59	Imade River	Nekonaki Bridge	Ishikawa Town		45		47		0	55			680		610			105	1,450	1,150	1,180				
60	Yashiro River	Oji Bridge				35		36		51	52			145		50			55	98	100	98			
61	Abukuma River	Kawanome Bridge	Tamakawa Village		71		34		37	77			330	105	213	84	53	73	180	450	49	120	130	138	
62		Emochi Bridge	Sukagawa City		0		124		390	24			380		193	330			350	72	48				
63	Shakado River	Sukagawa City water intake point				72		97		138	126			182		77			83	168	94	108			
64		Before the confluence with Abukuma River	Koriyama City		550		89		124	129			540	41	600	3,600	93	1,050	117	890	440	96	85	75	
65	Sasahara River	Shinbashi Bridge				1,240		260		2,600	480			380		1,470			237	200	1,540	1,300			
66	Yatagawa River	Yatagawa Bridge			137		79		184	160			236		140			99	81	400	340				
67	Otake River	Funehiki Bridge	Tamura City		27		119		87	173			270		52			96		133	120	239			
68		Before the confluence with Abukuma River	Koriyama City		750		270		134	360			6,400		215			89	108		1,340	242			
69		Before the confluence with Babagawa River				700		960		1,290	1,190			183		164			110	370		199	700		
70	Ouse River	Makunouchi Bridge				1,060		330		360	310			163		240			440	209		420	610		
71		Before the confluence with Abukuma River				13,500		690		860	1,540			2,020	640	690	610	290	189	820	330	360	290	420	550
72	Abukuma River	Akutsu Bridge	Motomiya City		7,800		116		350	350			6,000	148	169	1,410	269	3,400	610	400	4,700	740	2,880	520	
73		After the confluence with Ishimuro River				1,210		184		99	122			96		74			50	116		158	63		
74	Gobyaku River	Kamisekishita Bridge				22,000		700		590	230			590		450			1,780	1,730		590	2,330		
75		Before the confluence with Abukuma River			560		450		1,320	730			960	201	580	89	111	470	330	114	167	137	150	99	
76	Abukuma River	Takada Bridge	Nihonmatsu City		30,000		610		600	440			3,200	1,840	2,160	1,280	720	1,260	490	268	770	250	268	970	
77	Kuchibuto River	Kuchibutogawa Bridge				1,880		1,440		990	950			1,160		1,570			1,620	920		790	780		
78	Utsushi River	Osegawa Bridge				1,780		550		330	670	610		860	640	580	234	530	610	1,260	750	250	1,130	720	
79	Mizuhara River	Getouchi Bridge				6,400		570		460	1,410			520		410			980	800	450		620		
80	Megami River	Tsurumaki Bridge	Fukushima City		1,870		1,570		950	1,340			880		550			1,010	900	650		690			
81	Abukuma River	Horai Bridge				6,500		176		171	460	370		660	290	500	242	255	340	440	530	370	330	440	
82	Nigori River	Before the confluence with Omori River				1,160		650		530	1,090			980		590			610	410	300		1,180		
83	Arakawa River	Hinokura Bridge				1,160		270		167	114			139		77	79		45	42			22		
84	Sukawa River	Sukawa Bridge				790		137		173	199			216		125			82	74	132		84		
85	Arakawa River	Before the confluence with Abukuma River				1,290		460		750	1,380	990		142	760	119	280	237	161	145	117	119	220	9,500	
86	Matsukawa River					15,200		400		280	690	4,000		144	330	175	920	3,900	145	173	1,560	3,500	1,070	4,300	
87	Hattanda River	Hattanda Bridge				3,000		2,700		1,100	1,090			620		520			4,300	610		750		2,010	
88	Surikami River	Totsuna Bridge				1,040		186		167	260					630		400	170		430		620		
89		Before the confluence with Abukuma River			2,150		630		310	830		410	250	640	92	50	86	140	330	96	110	163	131		
90	Abukuma River	Taisho Bridge	Date City		14,200		2,700		153	1,160	3,800		410	3,700	73	172	219	770	1,280	1,740	1,130	780	850		
91	Hirose River	Tatenokoshi Bridge	Kawamata Town		440		1,030		590	770			490		530			410	590	480		390			
92		Jizogawara Bridge	Date City		1,340		870		2,300	780			760		890			330	580		480	410	390		
93	Ogumi River	Before the confluence with Hirose River				9,200		4,600		7,500	2,300	6,800		6,500	2,000	820	1,390	1,800	890	1,290	1,150	3,000	880	1,430	2,010
94	Hirose River	Before the confluence with Abukuma River				740		1,280		980	710	2,700		20,000	650	650	430	640	720	890	300	590	610	440	
95	Kurokawa River	Tochigisakai	Shirakawa City		105		50		114	133			82		194	138		73		213	56				
96	Kujigawa River	Matsuoka Bridge	Tanagura Town		39		23		48	150			63		31	42			12	39	43				
97		Takachihara Bridge	Yamatsuri Town		63		14		41	44			13		14	24			16	18	0				
				Total number of samples	1,818			Detection times	1,794																

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-8 Detection of radioactive cesium at respective locations  
(Nakadori, Fukushima Prefecture: river sediments) (No.2)

No.	Water area	Location		River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																											
		Location	Municipality	FY2013												FY2014															
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
54	Abukuma River	Habuto Bridge	Nishigo Village		51	135		80		14		53		25				36	28		17			23			33	52			
55		Tamachi-obashi Bridge	Shirakawa City	77		113	57	51	46	59	39		33	53	22			40	47	17	54	30		53	24		22	12	36		
56	Yanta River	Before the confluence with Abukuma River			2,230	1,630		43		380		212		234			243	244		215			279	240	241						
57	Yashiro River	Yashirogawa Bridge	Tanagura Town		170	132		159		135		66		71			81	52		71			51	45	51						
58	Kitasu River	Yanagi Bridge	Hirata Village		37	40		29		40		11		21			21	17		19			16	0	17						
59	Imade River	Nekonaki Bridge			116	248		42		179		15		120			78	0		139			14	63	203						
60	Yashiro River	Oj Bridge	Ishikawa Town		71	80		46		127		64		54			16	24		24			22	23	78						
61	Abukuma River	Kawanome Bridge	Tamakawa Village	108		57	63	40	31	38	50		72	69	69		15	57	78	18	49		24	58	33	64	58				
62		Emochi Bridge			68	19		13		35		13		17			39	12		10			11	12			27				
63	Shakado River	Sukagawa City water intake point	Sukagawa City		109	175		113		47		63		51			37	58		28			11	27			138				
64		Before the confluence with Abukuma River		282		107	80	88	51	59	58		18	73	67		80	66	57	42	18		31	51	26	52	80				
65	Sasahara River	Shinbashi Bridge			240	730		102		106		114		199			75	148		99			114	85	131						
66	Yatagawa River	Yatagawa Bridge	Koriyama City		85	57		49		66		39		61			49	61		25			17	25	19						
67	Otake River	Funehiki Bridge	Tamura City		132	98		35		69		110		75			38	65		53			42	25			112				
68	Ouse River	Before the confluence with Abukuma River	Koriyama City		213	49		370		73		66		64			69	21		64			60	51	60						
69		Before the confluence with Babagawa River			106	96		60		50		56		87			90	71		64			66	49	18						
70	Makanouchi Bridge			450	660		241		298		174		178			390	206		139			237	202	264							
71	Before the confluence with Abukuma River			800		241	390	232	224	295	129		194	233	187		165	263	194	208	186		272	126	180	154	199				
72	Abukuma River	Akutsu Bridge		220		197	280	400	233	251	113		114	90	103		101	145	177	146		344	136	114	179	107	444				
73		After the confluence with Ishimuro River			83	85		42		21		40		39			24	38		24			32	33	28						
74	Gohyaku River	Kamisekishita Bridge			67	130		222		810		134		116			181	134		124			1,080	362	174						
75		Before the confluence with Abukuma River	Motomiya City		88		157	310	179	59	101	49		51	18	97		58	102	86	91	129	19	48	25	36	30				
76	Abukuma River	Takada Bridge		1,570		540	285	360	1,020	256	380		400	730			570	305	229	1,070		387	305	250	570	264	690				
77	Kuchibuto River	Kuchibutogawa Bridge	Nihonmatsu City		1,210	900		570		900		880					590	470		490			365	283	363						
78	Utsushi River	Osegawa Bridge		2,380		191	144	360	154	212	229		244	350			300	118	179	134		132	149	246	130	162	122				
79	Mizuhara River	Getouchi Bridge			930	430		229		302		321					169	141		171			268	165			187				
80	Megami River	Tsurumaki Bridge			680	540		330		410		440		510			233	317		600			169	200			238				
81	Abukuma River	Horai Bridge		320		235	250	259	242	440	318		390	520	490		198	341	219	600	310		185	220	278	166	216				
82	Nigori River	Before the confluence with Omori River			650	1,030		2,880		740		610					1,290	1,050		720			370	299	322						
83	Arakawa River	Hinokura Bridge			61	77		72		22		29		38			24	45		16			17	23	18						
84	Sukawa River	Sukawa Bridge	Fukushima City		87	119		87		44		99					33	38		31			75	60	40						
85	Arakawa River	Before the confluence with Abukuma River		340		500	135	85	200	380	122		143	112			96	85	70	71	79		76	66	67	67	61				
86	Matsukawa River			149		119	152	137	1,100	277	129		137	1,580	105		257	167	305	1,590	71		3,060	98	25	287	75				
87	Hattanda River	Hattanda Bridge			1,260	1,220		470		570		1,560		2,480			510	700		910			420	1,440	490						
88	Surikami River	Totsuna Bridge			300	510		8,300		176		3,500		1,250			1,050	880		440			94	381			450				
89		Before the confluence with Abukuma River		154		108	157	179	300	124	76		66	50	63		112	52	68	99	58		33	500	44	33	44				
90	Abukuma River	Taisho Bridge	Date City	1,460		750	285	193	297	1,000	280		98	123	152		135	78	132	100		95	287	110	77	85	71				
91	Hirose River	Tatenokoshi Bridge	Kawamata Town		350	319		390		370		300					241	165		168			213	125	130						
92		Jizogawara Bridge			257	370		296		289		197		193			297	211		177			207	196			200				
93	Oguni River	Before the confluence with Hirose River	Date City		1,910	2,860	2,070	1,930	1,190	1,110	1,590		1,310	1,420	1,040		890	580	520	610	560		730	450	730	570	620				
94	Hirose River	Before the confluence with Abukuma River			790	520	540	910	278	470	360		490	510	550		560	530	530	710		1,140	246	254	344	153	152				
95	Kurokawa River	Tochigisakai	Shirakawa City		143	153		65		64		127		89			138	109		52			71	78	82						
96	Kujigawa River	Matsuoka Bridge	Tanagura Town		11	55		40		12		12		18			0	13		12			22	0	14						
97		Takachhara Bridge	Yamatsuri Town		27	13		14		10		15		11			11	0		13			11	0	0						

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."





(iii) Aizu

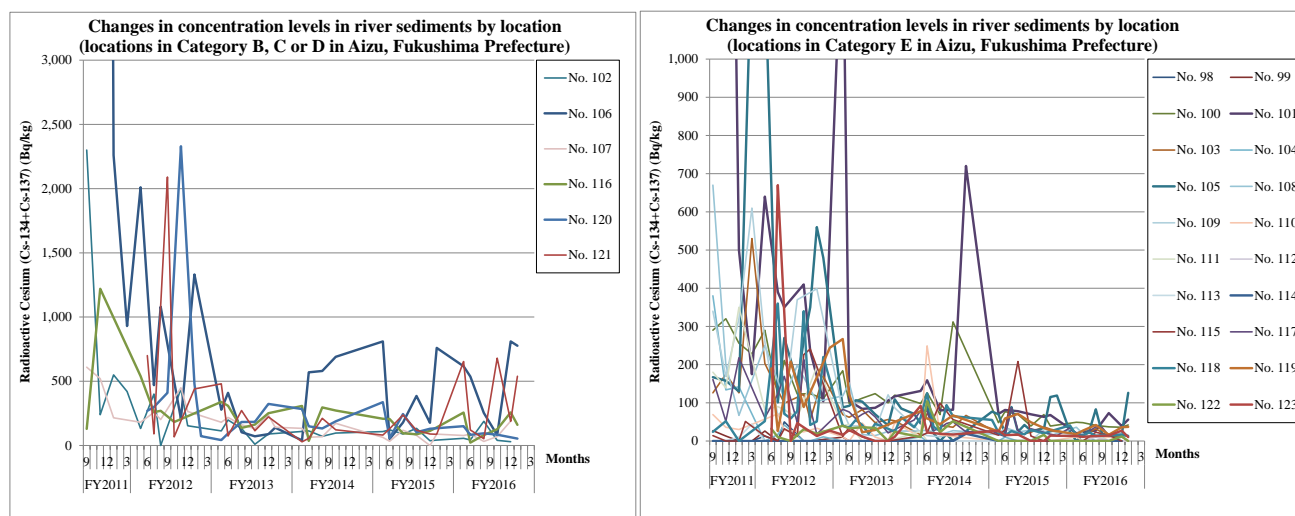
In Aizu, Fukushima Prefecture, surveys were conducted 25 to 50 times from September 2011 to January 2017 for river sediment samples collected at 26 locations.

Regarding the concentration levels of detected values, one location was categorized into Category B, one location into Category C, four locations into Category D, and 20 locations into Category E (see Table 4.3-9 and Table 4.3-10).

Concentration levels were generally decreasing at 20 locations and fluctuating at six locations.

Table 4.3-9 Categorizations of detected values at respective locations  
(Aizu, Fukushima Prefecture: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	0	(None)
B	Upper 5 to 10 percentile	1	No. 106
C	Upper 10 to 25 percentile	1	No. 121
D	Upper 25 to 50 percentile	4	No. 102, No. 107, No. 116, No. 120
E	Lower than upper 25 to 50 percentile (lower 50%)	20	No. 98, No. 99, No. 100, No. 101, No. 103, No. 104, No. 105, No. 108, No. 109, No. 110, No. 111, No. 112, No. 113, No. 114, No. 115, No. 117, No. 118, No. 119, No. 122, No. 123



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 4.3-6 Changes in concentration levels over the years at respective locations  
(Aizu, Fukushima Prefecture: river sediments)

Table 4.3-10 Detection of radioactive cesium at respective locations  
(Aizu, Fukushima Prefecture: river sediments) (No.1)

No.	Water area	Location	Municipality	River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																				
				FY2011									FY2012											
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
98	Agano River	Tajima Bridge	Minamiaizu Town		0		0		0		0		13		0	50			0					
99		Okawa Bridge	Aizuwakamatsu City		27		13		0		0		26		0	0			0	0				
100	Takimi Bridge			290		320		256		228		290		120	211		123		124		111			
101	Yukawa River	Shinyukawa Bridge			8,700		3,000		500		175		640		390	350			410	236		104		
102		Before the confluence with Agano River			2,300		240		550		420		132		400	0			440	153				
103	Miyakawa River	Saikuna Bridge	Aizubange Town		126		175		126		530		203		133	99			122	55		170		
104	Agano River	Miyako Bridge			380		134		142				0		17	42			0	0		11		
105	Nippashi River	Minami-ohashi Bridge	Kitakata City		167		158		130		1,300		1,240		101	270		173	132	263	350	530	590	480
106	Kyu-yukawa River	Awanomiya Bridge	Yugawa Village		13,000		25,000		2,260		930		2,010		470	1,080			207		72	2,590		
107	Kyu-miyakawa River	Josuke Bridge	Aizubange Town		610		520		216				181		257	202			450	265				
108	Tatsuki River	Ohashi	Kitakata City		670		199		67				250		157	112			198			86	121	
109		Shimokawara Bridge			340		169		320		610		260		66	87			370			67	730	
110		Nigori River		Nigorigawa Bridge		69		36		30				57		71	28			24			16	51
111	Yamazaki Bridge				180		139		350				82		90	82			61			40	350	
112	Inagawa River	Aoyagi Bridge	Minamiaizu Town		0		0		0		0		0		0	0			0	0			0	
113		Kurosawa Bridge	Tadami Town		0		0		10		44		0		0	0			0			0		
114	Tadami River	Nishitani Bridge	Kaneyama Town		0		0					0		0	0			0			0	0		
115		Fuji Bridge	Aizubange Town		14		0		0	51			13		0	32			12	226	241			
116	Agano River	Shingo Dam	Kitakata City		129		1,220						540		260	270			183					
117	Sukawa River	Sukawano	Inawashiro Town		161		52		218				61		123	169		58	39	213	86		18	
118	Nagase River	Kogane Bridge			24		52		0				52		360	71	59		78	340	42	47	55	220
119	Takahashi River	Shinbashi Bridge												190	26		208			89				244
120	Koguro River	Umeno Bridge												270	300		410			2,330			480	73
121	Hishinuma River	Sekido District												700	90		2,090		67				520	360
122	Funatsu River	Funatsu Bridge	Koriyama City										32	10		0			31		17	21		
123	Haragawa River	Estuary, front	Aizuwakamatsu City										0	670		0		47				13		27
				Total number of samples	822		Detection times	594																

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-10 Detection of radioactive cesium at respective locations  
(Aizu, Fukushima Prefecture: river sediments) (No.2)

No.	Water area	Location	Municipality	River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)																														
				FY2013														FY2014																
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3							
98	Agano River	Tajima Bridge	Minamiaizu Town		0	0		0		0		0		0										0	0	0	0	0	0	0				
99		Okawa Bridge	Aizuwakamatsu City		10	0		0		0		0		0										0	0	0	0	0	0	0				
100	Takini Bridge			184	98		112		124		100	120											98	126	69		312							
101	Yukawa River	Shiyukawa Bridge			1,410	105		84		87		106	117										131	159	80		82	720						
102		Before the confluence with Agano River		114	199		132		10		89											109	114	72		97								
103	Miyakawa River	Saikuna Bridge	Aizubange Town	69	62		82		48		56	53										16	72	41		36	67							
104	Agano River	Miyako Bridge			0	0		0		0		0	0										11	0	0	0	0	0						
105	Nippashi River	Minami-ohashi Bridge	Kitakata City	88	92	108	105	103	87	70		41	109	85		71	46	92	20	0	18	0												
106	Kyu-yukawa River	Awanomiya Bridge	Yugawa Village	279	410			103		72		88	139									40	570	580		690								
107	Kyu-miyakawa River	Josuke Bridge	Aizubange Town	181	219			161		131		236	142									134	64	68		172								
108	Tatsuki River	Ohashi	Kitakata City	118	152			17		14		25	26									26	29	16		27								
109		Shimokawara Bridge			80	40			39		28		121	87									23	14	11		21							
110	Nigori River	Nigorigawa Bridge	Kitakata City	11	0			47		10		0	48									10	249	16		12								
111		Yamazaki Bridge			41	43			0		0		0										25	0	0	0	0							
112	Inagawa River	Aoyagi Bridge	Minamiaizu Town	0	0			0		0		0										0	0	0	0	0								
113		Kurosawa Bridge	Tadami Town	0	0			0		0		0										0	0	0	0	0								
114	Tadami River	Nishitani Bridge	Kaneyama Town	0	0			0		0		0	0									0	0	0	0	0			19					
115		Fuji Bridge	Aizubange Town	12	36			11		0		0										13	21	99		56								
116	Agano River	Shingo Dam	Kitakata City	340	309			137		163		251										308	36	296		272								
117	Sukawa River	Sukawano	Inawashiro Town	83	76	44	73	70	78	63		21										55	79	78	27	34	46	50		24				
118	Nagase River	Kogane Bridge		40	35	87	23	42	19	45		32	24	62								36	61	125	37	26	94	65						
119	Takahashi River	Shimbashi Bridge		267	122			23		29													78	59	44		67							
120	Koguro River	Umehara Bridge		42	94			183		184		324											284	149	133		188							
121	Hishinuma River	Sekido District		480	74			272		115		223											28	56	211		122							
122	Funatsu River	Funatsu Bridge	Koriyama City	40	33			36		34		0	24									10	104	23		52								
123	Haragawa River	Estuary, front	Aizuwakamatsu City	16	28			12		0		0	11									92	22	19		17								

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."



#### 4) Ibaraki Prefecture

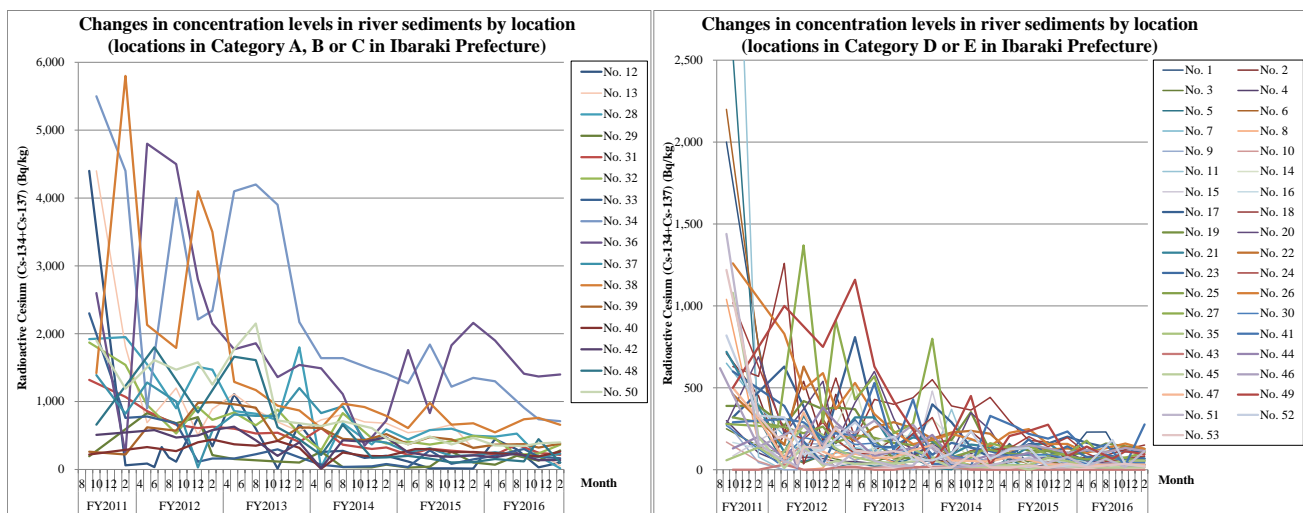
In Ibaraki Prefecture, surveys were conducted 19 to 25 times from August 2011 to February 2017 for river sediment samples collected at 53 locations (this analysis excludes the survey results from 39 locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, two locations were categorized into Category A, one location into Category B, 13 locations into Category C, 19 locations into Category D, and 18 locations into Category E (see Table 4.3-11 and Table 4.3-12).

Concentration levels were generally decreasing at 46 locations, were unchanged at two locations and were fluctuating at five locations.

Table 4.3-11 Categorizations of detected values at respective locations  
(Ibaraki Prefecture: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	2	No. 34, No. 36
B	Upper 5 to 10 percentile	1	No. 38
C	Upper 10 to 25 percentile	13	No. 12, No. 13, No. 28, No. 29, No. 31, No. 32, No. 33, No. 37, No. 39, No. 40, No. 42, No. 48, No. 50
D	Upper 25 to 50 percentile	19	No. 1, No. 2, No. 11, No. 17, No. 18, No. 19, No. 21, No. 22, No. 23, No. 24, No. 25, No. 26, No. 27, No. 30, No. 41, No. 46, No. 49, No. 51, No. 52
E	Lower than upper 25 to 50 percentile (lower 50%)	18	No. 3, No. 4, No. 5, No. 6, No. 7, No. 8, No. 9, No. 10, No. 14, No. 15, No. 16, No. 20, No. 35, No. 43, No. 44, No. 45, No. 47, No. 53



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 4.3-7 Changes in concentration levels over the years at respective locations  
(Ibaraki Prefecture: river sediments)

Table 4.3-12 Detection of radioactive cesium at respective locations  
(Ibaraki Prefecture: river sediments) (No.1)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(#1)																						
	Water area	Location	Municipality	FY2011									FY2012													
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
1	Taga River System	Satone River	Yamagoya Bridge		2,000							760			166				121			153			105	
2			Murayama Bridge							450					125					540			176			460
3		Hanazono River	Kurabeishi	Kitaibaraki City		250							144			102				42			88			66
4			Isonare Bridge			300							103			53				76			68			50
5		Okita River	Sakae Bridge	Takahagi City		3,100							310			101				50			87			14
6			Sakai Bridge	Kitaibaraki City		2,200							750			109				103			310			186
7		Hananuki River	Shinhananuki Bridge	Takahagi City		650							400			248				82			82			102
8	Kujigawa River System	Kujigawa River	Yamagata	Hitaomiya City		1,040						157			62				0			10			111	
9			Sakaki Bridge	Hitaomiya City/Shirosato Town		290							44			11	0	0	0	161			156			135
10	Nakagawa River System	Nakagawa River Area	Noguchi	Hitaomiya City/Shirosato Town		169						52			13				163			88			13	
11			Shimokuni	Mito City		5,500							78			16				128			116			246
12			Katsuta Bridge	Mito City/Hitachinaka City		4,400							60			86	34	330	176	114			760			340
13			Nakamaru River	Yamagisawa Bridge	Hitachinaka City			4,400					1,810			690				1,200			510			890
14		Hinumagawa River Area	Hinumamae River	Nagaoka Bridge			460										158					109				
15				Takahashi	Ibaraki Town			84										270					57			
16			Kansei River	Kansei Bridge			167											92					139			
17		Daiya River	Oya Bridge	Hokota City			320										630					143				
18		Hinuma River	Hinuma Bridge	Mito City/Ourai Town			630						570				1,260			36		330			560	
19		Kinaura River Area	Hokota River	Asahi Bridge			390						390				270			420			370			380
20	Shintomoegawa Bridge			Hokota City			280						690				220			370			540			159
21	Taiyo River		Tazuka Bridge			720										108			330			159			172	
22	Takeda River		Uchijuku-ohashi Bridge				460										152			630			380			230
23	Yamada River		Nioroshi Bridge	Namegata City			600										390			174			35			190
24					Kurakawa River	Kurakawa Bridge			1,020										239			187			290	
25	Gantsu River		JA Yokohashi Bridge				320										260			223			264			166
26	Nagare River		Suhoi Bridge	Kashima City			1,260										830			490			590			370
27	Tonegawa River System	Kasumigaura River Area	Sonobe River	Sonobeshin Bridge		280									260				1,370			290			910	
28			Sanno River	Tokoro Bridge	Omitama City		1,920						1,950			1,550				900			1,510			1,470
29			Koise River	Heiwa Bridge	Ishioka City		194									830				680			770			210
30			Kajinashi River	Kamishuku Bridge	Namegata City		270									42				197			172			226
31			Hshiki River	Hshiki Bridge			1,320						1,070			860				660			610			630
32			Ichinose River	Kawanaka Bridge	Kasumigaura City		1,870						1,540			950				530			920			730
33			Sakai River	Sakai Bridge/National Route 354			2,300						760			780				680			112			160
34			Shinkawa River	Shinten Bridge	Tsuchiura City			5,500					4,400			900				4,000			2,210			2,340
35			Sakura River	Eiri Bridge	Tsuchiura City/Tsukuba City		58						136			62				270			213			128
36			Bizen River	Bizengawa Bridge			2,600						228			4,800				4,500			2,800			2,150
37			Hanamura River	Shinwa Bridge	Tsuchiura City			1,390					820			1,280				1,000			29			570
38			Seimei River	Katsuhashi Bridge	Ami Town			1,420					5,800			2,130				1,790			4,100			3,500
39			Onogawa River	Okuhara-ohashi Bridge	Ryugasaki City/Ushiku City		260						220			620				570			980			990
40			Shintone River	Shintone Bridge	Inashiki City		220									330				270			400			440
41			Hitachitonegawa River Area	Yorokoshi River	Horinouchi Bridge			290										310			290			196		
42	Maekawa River	Ayame Bridge			Itako City			510									580			470			500			580
43	Kinugawa River Area	Kinugawa River	Kawashima Bridge	Chikusei City							0				32			0			0			14		
44			Takishita Bridge	Moriya City			130						202			100	40	119	11	196			380			289
45		Tagawa River	Tagawa Bridge				1,080					201			10				146			24			54	
46	Kokaigawa River Area	Kokai River	Kuroko Bridge	Chikusei City		620						142			213				269			153			262	
47			Fumimaki Bridge	Toride City			500					310				68				350			112			75
48		Yatagawa River	Maruyama Bridge			660										1,800						840				
49		Nishiyata River	Sakaimatsu Bridge	Tsukuba City			500									1,000						750				
50	Inari River	Oguki Bridge				1,900					1,190				1,610				1,470			1,580			1,250	
51	Tonegawa River Area	Tonegawa River	Kurhashi Bridge	Koga City		1,440						159			52	48	42	18	123			39			22	
52			Fukawa	Tone Town			820						330				320			95			122			
53			Sawara	Inashiki City			1,220						330			195	202	181	39	140			133			256
				Total number of samples	1,150	Detection times	1,116																			

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-12 Detection of radioactive cesium at respective locations  
(Ibaraki Prefecture: river sediments) (No.2)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																				
	Water area	Location	Municipality	FY2013									FY2014											
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	Taga River System	Satone River	Yamagoya Bridge	Kitabaraki City		97			81			52			49	3		55		44		66		23
2		Murayama Bridge				126			116			187			128			137		81		234		137
3		Hanazono River	Kurabeishi			36			45			91			94			56		89		60		21
4		Isonare Bridge				50			38			47			89			54		57		112		155
5		Okita River	Sakae Bridge	Takahagi City		42			21			30			73			12		0		92		11
6		Sakai Bridge	Kitabaraki City		101			68			98			83			50		50		24		61	
7		Hananuki River	Shinhanuki Bridge	Takahagi City		135			115			140			101			141		108		182		151
8	Kujigawa River System	Kujigawa River	Yamagata	Hitachiomiya City		60			94			45			20			16		24		12		15
9		Sakaki Bridge	Hitachi City/Tokai Village		55			111			92			0			49		18		14		14	
10	Nakagawa River System	Nakagawa River	Noguchi	Hitachiomiya City/Shirosato Town		11			15			18			12			15		11		12		0
11			Shimokumii	Mito City		101			131			76			249			73		369		62		142
12		Katsuta Bridge	Mito City/Hitachinaka City		1,110			600			13			670			258		274		170		202	
13		Nakamaru River	Yamagisawa Bridge	Hitachinaka City		1,110			880			700			560			730		810		700		680
14		Hinumamae River	Nagaoka Bridge	Ibaraki Town		510			90			226			193			312		188		61		126
15	Hinuma River	Takahashi			19			39			16			18			480		55		16		13	
16	Kansei River	Kansei Bridge			159			82			79			86			51		24		113		31	
17	Daiya River	Oya Bridge	Hokota City		810			310			204			68			400		290		137		77	
18	Hinuma River	Hinuma Bridge	Mito City/Oarai Town		190			430			400			440			550		390		364		442	
19	Kitaura River Area	Hokota River	Asahi Bridge	Hokota City		370			182			68			73			163		182		352		113
20		Tomoe River	Shintomogawa Bridge			410			600			314			87			156		99		348		242
21		Taiyo River	Tazuka Bridge			320			320			136			198			174		93		154		141
22		Takeda River	Uchijuku-ohashi Bridge	Namegata City		177			260			291			254			190		228		238		220
23		Yamada River	Nioroshi Bridge			304			143			137			217			92		165		135		114
24		Kurakawa River	Kurakawa Bridge			98			100			105			222			319		58		117		121
25		Gantsu River	JA Yokohashi Bridge			211			195			164			151			185		77		110		122
26		Nagare River	Suhoi Bridge		Kashima City		530			340			236			156			182		219		188	
27		Sonobe River	Sonobeshin Bridge	Omitama City		430			570			223			281			800		11		97		162
28		Sanno River	Tokoro Bridge			860			820			730			1,800			31		680		368		590
29		Koise River	Heiwa Bridge	Ishioka City		153			135			116			101			263		34		31		70
30		Kajinashi River	Kamishuku Bridge	Namegata City		154			163			97			120			57		88		55		68
31		Hishiki River	Hishiki Bridge	Kasumigaura City		600			530			540			405			610		364		301		324
32		Ichinose River	Kaw anaka Bridge			840			650			880			530			284		830		460		382
33		Sakai River	Sakai Bridge/National Route 354	Tsuchiura City		160			224			296			178			70		37		46		80
34		Shinkawa River	Shinten Bridge			4,100			4,200			3,900			2,170			1,640		1,640		1,480		1,410
35		Sakura River	Eiri Bridge	Tsuchiura City/Tsukuba City		76			52			39			126			73		79		21		37
36	Bizen River	Bizengawa Bridge	Tsuchiura City		1,770			1,860			1,360			1,540			1,490		1,110		350		720	
37	Hanamuro River	Shinwa Bridge			810			790			790			1,200			830		930		432		396	
38	Seimei River	Katsubashi Bridge	Ami Town		1,290			1,170			940			870			610		970		920		790	
39	Onogawa River	Okuhara-ohashi Bridge	Ryugasaki City/Ushiku City		960			910			420			620			610		450		432		520	
40	Shintone River	Shintone Bridge	Inashiki City		370			350			420			318			11		249		199		194	
41	Hitachitonegawa River Area	Yorokoshi River	Horinouchi Bridge	Itako City		210			530			117			430			34		36		22		329
42		Mackawa River	Ayame Bridge			630			430			200			400			16		430		409		473
43	Kinugawa River Area	Kawashima Bridge	Chikusai City		18			0			0			16			17		20		0		0	
44		Kinugawa River	Takishita Bridge	Moriya City		187			83			113			133			213		75		56		90
45		Tagawa River	Tagawa Bridge	Chikusai City		35			40			36			52			65		16		17		16
46	Kokai River	Kuroko Bridge			226			300			186			275			131		13		23		76	
47	Kokaigawa River Area	Fumimaki Bridge	Toride City		98			73			75			120			150		57		53		50	
48		Yatagawa River	Maruyama Bridge	Tsukuba City		1,660			1,610			620			440			212		660		171		177
49		Nishiyata River	Sakaimatsu Bridge			1,160			630			420			244			37		208		450		30
50		Inari River	Oguki Bridge		1,770			2,150			720			680			640		710		610		460	
51	Tonegawa River Area	Kurihashi Bridge	Koga City		109			55			23			26			149		42		20		29	
52		Tonegawa River	Fukawa	Tone Town		290			171			202			62			57		100		236		65
53		Sawara	Inashiki City		117			101			115			88			11		14		90		15	

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."





### 5) Tochigi Prefecture

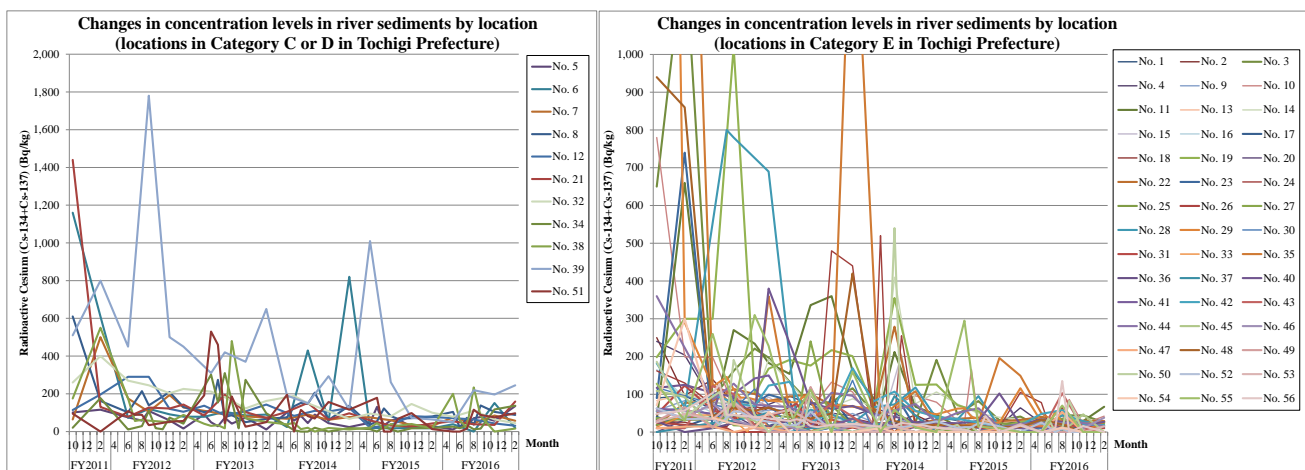
In Tochigi Prefecture, surveys were conducted 19 to 37 times from October 2011 to February 2017 at 56 locations (rivers) in public water areas (this analysis excludes the survey results from 49 locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized into Category C, 10 locations were categorized into Category D and 45 locations were categorized into Category E (see Table 4.3-13 and Table 4.3-14).

Concentration levels were generally decreasing at 40 locations and fluctuating at 16 locations.

Table 4.3-13 Categorizations of detected values at respective locations  
(Tochigi Prefecture: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	0	(None)
B	Upper 5 to 10 percentile	0	(None)
C	Upper 10 to 25 percentile	1	No. 39
D	Upper 25 to 50 percentile	10	No. 5, No. 6, No. 7, No. 8, No. 12, No. 21, No. 32, No. 34, No. 38, No. 51
E	Lower than upper 25 to 50 percentile (lower 50%)	45	No. 1, No. 2, No. 3, No. 4, 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. 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. 50, 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 4.3-8 Changes in concentration levels over the years at respective locations  
(Tochigi Prefecture: river sediments)

Table 4.3-14 Detection of radioactive cesium at respective locations  
(Tochigi Prefecture: river sediments) (No.1)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
	Water area	Location	Municipality	FY2011									FY2012												
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Nakagawa River System	Nakagawa River	Ikuyobashishita	Nasushiobara City			90										42	93				19	15		
2		Komei Bridge					250				97					139			78				43	64	
3		Takaomata River	Takaomata Bridge	Nasu Town			650				1,290				89				162				221	197	
4		Yukawa River	Yukawa Bridge				240				204					79				75				54	73
5		Nakagawa River	Kamikuroiso	Nasushiobara City/Nasumachi			101				116				64	87		44	72	109			59	16	
6		Yosasa River	Yosasa Bridge				1,160				610					73				120				91	79
7		Kurokawa River	Shinden Bridge	Nasu Town			64				500					175				105			194	128	
8		Yosasa River	Kawada Bridge				610				162				102	102		189	239	139			209	130	
9		Nakagawa River	Karobane	Otawara City			57				83				40	35		54	34	102			53	58	
10		Matsuba River	Tributary				780				199				75	320		114	115	62			82	69	
11		Sabigawa River	Udagawa Bridge				32				660					34					270			234	183
12		Momura River	Momuranaka Bridge				114				196					290					290			120	105
13		Hokigawa River	Yunohara	Nasushiobara City			83				100							84	98				58	36	
14			Sekiba Bridge				126				101					76				81				82	193
15			Iwai Bridge	Otawara City			16				50					66				79				62	93
16			Hokigawa Bridge				165				89					30	72		54	34	52			52	53
17		Nakagawa River	Shinnaka Bridge	Nakagawa Town			40				14				51	31		30	107	38			56	16	
18		Mumogawa River	Kosei Bridge				28				26				12	12	14		14	34			43	30	
19		Arakawa River	Sakachi Bridge	Shioya Town			198				300				300				1,020			102	168		
20		Arakawa River	Renjo Bridge	Sakura City			0				33				32				44			15	33		
21		Uchikawa River	Tanaka Bridge	Yata City			1,440				130				78				127			122	143		
22			Asahi Bridge	Sakura City			18				77					82				114			101	82	
23		Arakawa River	Mukada Bridge	Nasu Karasuyama City			90				740				11	12	49	30	84			75	99		
24		Egawa River	Tributary				162				130					58	85	52	51	58			66	63	
25	Kinugawa River System	Kinugawa River	Kawaji Daichi Power Station, front	Nikko City			19				40						36	75			19	45			
26		Yunishi River	Maesawa Bridge				25											10	0					0	
27		Ojika River	Tributary				37				32							36	18				16	15	
28		Kinugawa River	Kosogoe				55				63							800	780					690	
29		Iitama River	Tributary				4,900				290					120		146	113	91	91	86			
30		Yukawa River	Tributary				118											63	60				114	72	
31		Daiya River	Shinkyo Bridge				47				123					58				37			54	38	
32		Shidobuchi River	Sujichigai Bridge				260				400					270				245			203	226	
33		Daiya River	Kaishin Bridge (Harigai)				13				45					45		24	69	15	0	57	13		
34		Kinugawa River	Sanuki		Shioya Town			20				177				11		29	109	18	12	74	42		
35		Nishi-Kinugawa River	Nishi-Kinugawa Bridge		Utsunomiya City			1,520				2,290				126				65			45	360	
36		Kinugawa River	Kinugawabashi Bridge(Hoshakujji Temple)					28				0					10			24				20	14
37		Kinugawa River	Daidoizumi Bridge		Mooka City			0				12				24			30				42	51	
38		Egawa River	Tributary		Shimotsuke City			175				550				137	214	56	62	58			49	88	
39	Akabori River	Nikko City Hall, front	Nikko City			510				800				450				1,780			500	450			
40		Kw adajima					117				125					104			93			40	380		
41	Tagawa River	Ozobashi Bridge	Utsunomiya City			62				57				28	69	104	28	101			142	150			
42	Kamagawa River	Tsukushi Bridge				182				65					99			78				68	123		
43	Tagawa River	Meiji Bridge	Kaminokawa Town			10				10				122			101				18	29			
44	Tagawa River	Yanabashi Bridge	Oyama City			360				223				86			128				73	69			
45	Kurokawa River	Kajima Bridge	Kanuma City			109				93				11			46				30	0			
46		Onari Bridge	Mibu Town			56				38					75			32				15	0		
47	Oushi River	Akaishi Bridge	Kanuma City			10				14				15			0				11	11			
48		Koyabu River		Koyabu Bridge			940				860					42			65				56	65	
49	Omori River	Tamotsu Bridge	Tochigi City			30				66				12			79				10	0			
50		Otome-ohashi Bridge	Oyama City			186				40					154	34	106	27	191			46	0		
51	Uzuma River Area	Uzuma River	Tochigi City			95				0				82	135	89	89	34			52	56			
52		Uzuma River	Watarasegawa River intake weir at Sori Power Station	Nikko City			63				34				36	20	38	55	53			34	27		
53	Watarase River Area	Hajika Bridge	Ashikaga City			26				48				34			80				36	46			
54		Nakabashi Bridge					71				300				37			22				12	53		
55		Watarase-ohashi Bridge	Tatebayashi City			128				30					260			67				310	228		
56		Shinkai Bridge	Tochigi City			48				57					43	164	127	46	45			40	36		
				Total number of samples	1,491	Detection times	1,253																		
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																									

Table 4.3-14 Detection of radioactive cesium at respective locations  
(Tochigi Prefecture: river sediments) (No.2)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(#1)																							
	Water area	Location	Municipality	FY2013												FY2014											
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Nakagawa River System	Nakagawa River	Ikayobashishita	Nasushiobara City		13			12			14			23				18		26		12				
2			Komei Bridge			51			97				38			36			24			24		45			19
3		Takaomata River	Takaomata Bridge		Nasu Town	133			76			79			116			52			20		25			191	
4		Yukawa River	Yukawa Bridge			95			73				50			43			62			49		25			43
5		Nakagawa River	Kamikuroiso		Nasushiobara City/Nasumachi	91	49	28	73	42		74			11			102	58	83	45	90	44			24	
6		Yosasa River	Yosasa Bridge			78			105				85			90			24			430		55			820
7		Kurokawa River	Shinden Bridge		Nasu Town		104		90			80			74			68			90		62			77	
8		Yosasa River	Kawada Bridge			103	109	274	77	87		50			67			75	134	152	146	206	61			137	
9		Nakagawa River	Kurobane		Otwara City	59	61	42	31	16		33			49			26	38	63	23	31	19			25	
10		Matsuba River	Tributary			68	36	80	119	84		132			106			19	73	61	59	80	96			79	
11		Sabigawa River	Udagawa Bridge			154			336			360			162				66		212		67			46	
12		Momura River	Momuranaka Bridge			137			87			107			143				83		110		106			125	
13		Hokigawa River	Yunohara		Nasushiobara City		72	56			42							12		16		11					
14				Sekiba Bridge			111		64			67			88			60		410			75			106	
15				Iwai Bridge		Otwara City	55			53			51			19			14		204		12			15	
16				Hokigawa Bridge			17	21	46	18	11		36			25			11	17	22	15	24	11			17
17		Nakagawa River	Shinaka Bridge		Nakagawa Town	33	19	14	57	0		94			18			19	17	19	15	42	15		12		
18		Mumogawa River	Kosei Bridge			31	22	20	19	16		14			15			16	11	18	0	20	16			15	
19		Arakawa River	Saikachi Bridge		Shioya Town	191			176			217			201			65		355		125			126		
20				Renjo Bridge			63			0			12			14			13		0		13			11	
21		Uchikawa River	Tanaka Bridge		Yaizu City	85			195			103			72			105		152		63			97		
22				Asahi Bridge			94			100			72			68			54		279		19			33	
23		Arakawa River	Mukada Bridge		Nasu Karasuyama City	84	27	30	85	58		19			35			16	10	20	39	73	12		21		
24			Egawa River	Tributary			45	18	84	24	20		480			440			21	520	36	28	255	20			18
25	Kinugawa River System	Kinugawa River	Kawaji Duichi Power Station, front	Nikko City		38		33			71			17			21		13		17			13			
26		Yunishi River	Maesawa Bridge				13		0			0			12			0		11		21					
27		Ojika River	Tributary				14		240			17			35			11		14		20			11		
28		Kinugawa River	Kosagoe				35		59			47			23			66		73		118			36		
29		Itana River	Tributary			75	81	94	86	43		73						62	41	72	53	75	55	43		47	
30		Yukawa River	Tributary				0		0			11			137			0		10		0					
31		Daiya River	Shinkyo Bridge				75		21			33			15			12		20		17			20		
32		Shidobuchi River	Sujichigai Bridge				212		182			123			162				189		150		108			67	
33		Daiya River	Kaishin Bridge (Harigai)				16	15	0	15	11		18			12			24	11	13	0	12	0		0	
34		Kinugawa River	Sanuki			Shioya Town	470	134	154	310		17	274			97			14	0	0	0	20	0		19	
35		Nishi-Kinugawa River	Nishi-Kinugawa Bridge				56			0			31			1,540			32		69		108			18	
36		Kinugawa River	Kinugawabashi Bridge(Hoshakujji Temple)			Usunomiya City	31		0	0		0			0			0		13		0			0		
37		Kinugawa River	Daidozumai Bridge				0			10			11			0			22		95		43			0	
38		Egawa River	Tributary			Shimosuke City	41	30	34	17	480		70			51			38	46	13	20	0	19		11	
39		Akabori River	Nikko City Hall, front					310		420			370			650			191		150		293			117	
40		Tonogawa River System	Kiwadajima			Nikko City		187		78			61			69			48		41		26			25	
41			Tagawa River		Ozobashi Bridge			64	23	18	13	36		17			35			20	12	27	12	13	14		16
42		Kamagawa River	Tsukushi Bridge			Usunomiya City	133			27			50			169			81		107		56			40	
43			Tagawa River		Meiji Bridge			32			31			76			41			0		17		14			0
44		Tagawa River	Yanabashi Bridge			Oyama City	66			43			104			96			42		57		74			27	
45			Kurokawa River		Kajima Bridge			19			0			15			0			10		14		0			0
46		Omori River Area	Onari Bridge			Mibu Town	13			0			0			17			0		0		0			0	
47			Osashi River		Akashi Bridge			0			0			0			0			0		0		18			0
48			Koyabu River		Koyabu Bridge		Kanuma City	46			36			49			420			60		29		19			18
49	Omori River		Famotsu Bridge		0				119			0			0			0		0		0			0		
50	Watarase River Area	Otome-ohashi Bridge		Oyama City	62	13	15	101		53	0			0			15	43	65	540	0	0		0			
51		Uzuma River	Uzuma Bridge			192	530	460	44	186		26			50			195	0	115	82	69	157		116		
52	Watarase River Area	Watarasegawa River intake weir at Sori Power Station		Nikko City	18	19	32	54		20	15			21			15	90	18	15	13	18		28			
53		Hajika Bridge			59			28			16			15			0		15		0			14			
54		Nakabashi Bridge			0			0			0			0			10		0		0				0		
55		Watarase-ohashi Bridge			21			112				0			160			0		59		12			0		
56	Shinkai Bridge		29	34	30	16	13			19			22				17	11	77	16	24			18			

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."



## 6) Gunma Prefecture

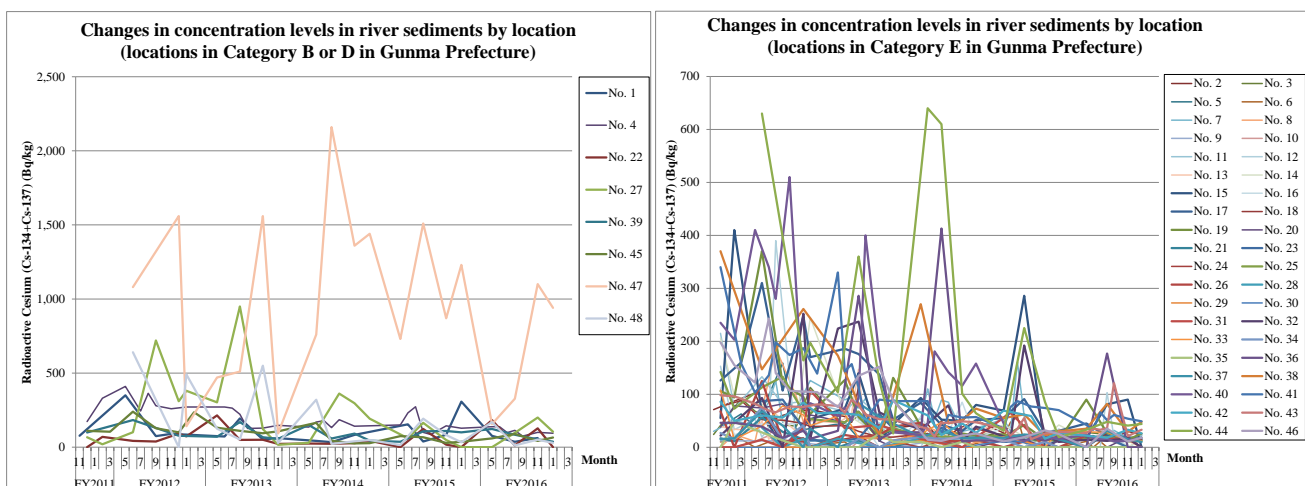
In Gunma Prefecture, surveys were conducted 12 to 37 times from November 2011 to January 2017 at 48 locations (rivers) in public water areas (this analysis excludes the survey results from eight locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized into Category B, seven locations into Category D, and 40 locations into Category E (see Table 4.3-15 and Table 4.3-16).

Concentration levels were generally decreasing at 32 locations, were unchanged at one location and fluctuating at 15 locations.

Table 4.3-15 Categorizations of detected values at respective locations  
(Gunma Prefecture: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	0	(None)
B	Upper 5 to 10 percentile	1	No. 47
C	Upper 10 to 25 percentile	0	(None)
D	Upper 25 to 50 percentile	7	No. 1, No. 4, No. 22, No. 27, No. 39, No. 45, No. 48
E	Lower than upper 25 to 50 percentile (lower 50%)	40	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. 41, No. 42, No. 43, No. 44, 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 4.3-9 Changes in concentration levels over the years at respective locations  
(Gunma Prefecture: river sediments)

Table 4.3-16 Detection of radioactive cesium at respective locations  
(Gunma Prefecture: river sediments) (No.1)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
	Water area	Location	Municipality	FY2011						FY2012															
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Tonegawa River Area	Tonegawa River	Hirose Bridge	Minakami Town				77							350				74		90				
2		Tonegawa River	Tsukiyono Bridge					71		87			102		37	55	54	60		68		71			
3		Akaya River	Kosode Bridge					24			92		68						42		40		113		
4		Sakura River	In Ooaza Yachi	Kawaba Village					173	330			410		244	227	500	279		259		271			
5		Katashina River	Kirinoki Bridge	Katashina Village				38		63		38						159		31					
6			Tonemachitakatoya	Numata City				10		15		0		10	0	15	0		0						
7			Futae Bridge					30		51		39		86	96	154	47		74		126				
8		Agatsuma River	Shinto Bridge	Naganohara Town				0	24			11				187			95		0				
9		Shirasuna River	Shuttatsu Bridge	Nakanojo Town				12										12							
10		Agatsuma River	Downstream of Azuma Bridge	Higashi-Agatsuma Town				0	0			11		22	0	14	14		10		0				
11		Nakuta River	Tonoda Bridge	Takayama Village				215	73					133					85		83				
12		Agatsuma River	Agatsuma Bridge	Shibukawa City				153	33			53	19	37	170	610			0		11				
13		Tonegawa River	Taisho Bridge						39	34			31	49	15	56	69			30		50			
14		Takizawa River	Shintakizawa Bridge	Shibukawa City/Yoshioka Town				206	97			80					50		48		245				
15		Tonegawa River	Gunma-ohashi Bridge	Maebashi City				55	410			64					0		37		53				
16			Fukushima Bridge	Tamamura Town				112	23			44					43		46		39				
17	Karasu River Area	Nagai River	Kamigonda Bridge	Takasaki City				126		160		310				107		247		170					
18		Karasu River	Karasugawa Bridge					77		88		52					51		45		39				
19		Usui River	Nakase Bridge	Annaka City				106	94			370				120		95		63					
20			Hanataka Bridge	Takasaki City				38	78			74				82		40		61					
21		Kabura River	Tadakawa Bridge	Shimonita Town				17	11			56				29		15		17					
22			Kaburagawa Bridge	Takasaki City/Fujioka City				0	69			42				38		91		73					
23		Ogawa River	Kinzan Bridge	Kanra Town								87				90		36		13					
24		Nanmoku River	Ozawa Bridge	Nanmoku Village								68				10		18		0					
25		Someya River	Yakushi Bridge	Shinto Village				142	73			113				133		67		53					
26		Inogawa River	Kamakura Bridge	Takasaki City				68	0			125				12		11		0					
27		Karasu River	Iwakura Bridge	Takasaki City/Tamamura Town				67	19			101				720		310		380					
28		Kanna River	Shinkaname Bridge	Ueno Village								37				0		16		0					
29		Kanna River	Morito Bridge	Kanna Town				0	0			0				0		0		0					
30		Kanna River	Tobukyo Bridge	Fujioka City/Kamikawa Town				0	0			0				0		43		0					
31		Kanna River	Kannagawa Bridge	Kamisato Town				0	0			14				0		36		107					
32		Tonegawa River	Bando-ohashi Bridge	Honjo City				22	46			93				0		252		17					
33	Akagishirakawa River	In Shimohosoi Town	Maebashi City				108	15			40				78		61		41						
34	Momonoki River	Utsuboi Bridge						27	15			75				14		41		0					
35	Arato River	Okuhara Bridge						0	48							13		0		0					
36	Kasukawa River	Hozumi Bridge	Isesaki City				46	46			39				18		31		16						
37	Hirose River	Nakajima Bridge						15	17			68			41		0		35						
38	Hayakawa River	Hayakawa Bridge						370				147						261							
39	Hayakawa River	Maejima Bridge	Ota City				99				183						77								
40	Tonegawa River	Tone-ozeki Weir	Chiyoda Town /Gyoda City				235	203			410		340	280		640	380	72		83					
41	Koguro River	Kayano Bridge	Kiryu City				340		158		103		136	198		228	120	187		139					
42	Watarase River	Takatsudo	Midori City				86	50			60				56		84		64						
43		Intake for Akaiwayosui water channel	Kiryu City					98	96			82		69	66		74	80	76		81				
44	Tatara River	Ejiri Bridge	Oura Town								630						164		197						
45	Kiryu River	Kannon Bridge	Kiryu City				110		104		240				128		100		235						
46		Sakai Bridge	Kiryu City/Ashikaga City					198	155			122		243	140		95	118	105		104				
47	Tsuruuda River	Lake Jonuma	Tatebayashi City								1,080						1,560		141						
48	Yatagawa River	Togoda Bridge	Meiwa Town/Itakura Town								640						0		490						
				Total number of samples	1,142	Detection times	911																		

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-16 Detection of radioactive cesium at respective locations  
(Gunma Prefecture: river sediments) (No.2)

No.	Location			River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)*1																																	
	Water area	Location	Municipality	FY2013												FY2014																					
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3										
1	Tonegawa River System	Tonegawa River	Hirose Bridge	Minakami Town			72		194			52	61					42		34			83														
2		Tonegawa River	Tsukiyono Bridge				70	46	47	115	40		60	36					33	55	25	50	23		38	51											
3		Akaya River	Kosode Bridge				39		60				13	90						16		17			19	24											
4		Sakura River	In Ooaza Yachi	Kawaba Village			282	260	263	222	126		129	147					135	169	179	132	185		141												
5		Katashina River	Kirinoki Bridge	Katashina Village			46		17				17	34					15			13			17												
6			Tonemachitakatoya	Numata City			10	10	0	0	0	0	0	0					42	0	0	0	0		0												
7			Futae Bridge				99	80	95	74	92		39	34					54	110	53	89	85		30	36											
8			Agatsuma River	Shinto Bridge	Naganohara Town			0		0			0	0						38		27			0	10											
9			Shirasuna River	Shuttatsu Bridge	Nakanoyo Town			0		12			0	0						10		0			0	0											
10			Agatsuma River	Downstream of Azuma Bridge	Higashi-Agatsuma Town			0	0	0	12	0	0	0					0	0	0	0	11		0	0											
11			Nakuta River	Tonoda Bridge	Takayama Village			68		93			60	38						19		15			17	21											
12			Agatsuma River	Agatsuma Bridge	Shibukawa City			16	34	95	51	56	46	10					0	26	11	11	0		13	17											
13			Tonegawa River	Taisho Bridge				46	54	65	147	16		15	20					25	20	14	12	15		35	53										
14		Takizawa River	Shintakizawa Bridge	Shibukawa City/Yoshioka Town			65		48			24	39					23			15			24	22												
15		Tonegawa River	Gunma-ohashi Bridge	Maebashi City			73		140			12	43					93			52			50	80												
16		Tonegawa River	Fukushima Bridge	Tamamura Town			64		56			0	0					57			0			85	16												
17		Nagai River	Kamidonda Bridge	Takasaki City			186		176			137	52					84			42			31	51												
18		Karasu River	Karasugawa Bridge					41		30			19	19						26		13			11	35											
19		Usui River	Nakase Bridge	Annaka City			127		57			19	131						17		27			26	22												
20			Hanataka Bridge	Takasaki City			47		68				12	0					0		0			13	0												
21		Kabura River	Tadakawa Bridge	Shimonita Town			0		13			0	0					17			12			0	0												
22			Kaburagawa Bridge	Takasaki City/Fujoka City			214		49				50	22					24			23			27	43											
23		Ogawa River	Kinzan Bridge	Kanra Town			13		16			63	36						13		37			18	18												
24		Tonegawa River System	Nanmoku River	Ozawa Bridge	Nanmoku Village			13		21		0	11					0		13			0	0													
25		Someya River	Yakushi Bridge	Shinto Village			47		67			24	35					23			20			20	17												
26			Inogawa River	Kamakura Bridge	Takasaki City			23		19			23	39					46			10			12	14											
27		Karasu River	Iwakura Bridge	Takasaki City/Tamamura Town			302		950			122	16					29			362			296	192												
28		Kanna River	Shinkaname Bridge	Ueno Village			16					0						17						0													
29		Kanna River	Morito Bridge	Kanna Town			0					0						13						0													
30		Kanna River	Tobukyo Bridge	Fujoka City/Kamikawa Town			0					0						0						0													
31	Kanna River	Kannagawa Bridge	Kamisato Town				36				42						16					0															
32	Tonegawa River	Bando-ohashi Bridge	Honjo City			224		237			66	53					33			79			11	39													
33	Akagishirakawa River	In Shimobosoi Town	Maebashi City			63		17			18	13					25			47			15	10													
34	Momonoki River	Utsuhoi Bridge					0		16			0	13					19			16			17	15												
35	Arato River	Okuhara Bridge	Isesaki City			0		0			26	10					10			0			10	0													
36	Kasukawa River	Hozumi Bridge					31		286			15	29					28			413			11	13												
37	Hirose River	Nakajima Bridge				0		83			57	45					19			32			17	18													
38	Hayakawa River	Hayakawa Bridge				173		82			25	95					270			45			51	73													
39		Maejima Bridge	Ota City			70		169				67	56					150			58			91	44												
40	Tonegawa River	Tone-ozeki Weir	Chiyoda Town /Gyoda City			59	75	50	95	400	172	28					23	45	181			178	105	116	158												
41	Koguro River	Kayano Bridge	Kiryu City			330	143	157	113	48	90	87					102	72	41	26	61		56	57													
42	Watarase River	Takatsudo	Midori City			65			61		36	89					60		23			45	27														
43		Intake for Akaiwayosui water channel	Kiryu City			78	65	90	78	62		53	52					35	35	20	46	46		49	47												
44	Tatara River	Ejiri Bridge	Oura Town			104		360			126	26					640		610			101	64														
45	Kiryu River	Kannon Bridge	Kiryu City			131		110			94	107					164		43			25	27														
46		Sakai Bridge	Kiryu City/Ashikaga City			76		135				152	88					14		12			22	26													
47	Tsuruuda River	Lake Jonuma	Tatebayashi City			470		510			1,560	92					760		2,160			1,360	1,440														
48	Yatagawa River	Togoda Bridge	Meiwa Town/Itakura Town			124		52			550	28					320		22			40	48														

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-16 Detection of radioactive cesium at respective locations  
(Gunma Prefecture: river sediments) (No.3)

No.	Location			FY2015															FY2016															Changes	Average of FY2016 (*2)	No.	Coefficient of variation	Trends(*3)
	Water area	Location	Municipality	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3											
1	Tonegawa River Area	Tonegawa River	Hirose Bridge			154		38				84		307						76		36		62														
2			Tsukiyono Bridge	Minakami Town	27	15	18	18	15				19		22						21	22	12	21	17	30	23											
3		Akaya River	Rosode Bridge		25				11				13		13					28			24		13		13											
4		Sakura River	In Osaza Yachi	Kawaba Village	150	231	273	100	85			144		128						138	138	98	113	74	100	94												
5		Katsushina River	Kimokoi Bridge	Katsushina Village	18				15				14		17					15			25		0	0	0											
6			Tonemachikatoya	Numata City	21	47	58	10	0			0	0	0		0				11	0	11	0	0	0	0	0											
7		Agatsuma River	Futae Bridge	Numata City	53	31	161	59	19			18		24						14	15	14	21	32	17	21												
8			Shinto Bridge	Naganohara Town	0				10				0		20					0			0		0	0	0											
9		Shirasuna River	Shintatsu Bridge	Nakanogo Town	0				0				0		19					0			0		0	0	0											
10		Agatsuma River	Downstream of Azuma Bridge	Higashi-Agatsuma Town	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
11		Nakata River	Tonoda Bridge	Takayama Village	19				17				20		25					15			17		17	22												
12		Agatsuma River	Agatsuma Bridge		0	0	0	0	0	12			0	0	0					0	0	0	103	18	0	13												
13		Tonegawa River	Taisho Bridge	Shibukawa City		12	11	15	14	0			12		16					26	15	27	13	14	12	0												
14		Takizawa River	Shintakizawa Bridge	Shibukawa City/Yoshinaka Town	42								18		42					16			14		0	16												
15		Tonegawa River	Gunma-ohashi Bridge	Miebashi City	69				286				0		14					17			81		90	0												
16		Fukushima Bridge	Tamamura Town	37				11					0		35					0			36		0	0												
17		Karasu River System	Nagai River	Kamigonda Bridge	55				91				28		31					45			21		19	15												
18	Karasuwa Bridge			Takasaki City	22				23				11		0					0			27		16	14												
19	Usui River		Nakase Bridge	Amaka City	20				42				14		13					90			27		14	26												
20			Hamataka Bridge	Takasaki City	13				15				0		12					0			0		19	0												
21	Kubura River		Tadokawa Bridge	Shimonita Town	0				0				0		0					0			0		0	0												
22			Koburagawa Bridge	Takasaki City/Fujisaki City	0				123				17		0					183			12		127	0												
23	Ogawa River		Kinzan Bridge	Kanra Town	10				11				23		13					15			18		0	0												
24	Nanmoku River		Ozawa Bridge	Nanmoku Village	0				0				0		0					0			0		0	0												
25	Someya River		Yakushi Bridge	Shinto Village	23				19				29		21					16			19		11	12												
26	Inogawa River		Kamakura Bridge	Takasaki City	0				11				0		0					22			16		16	0												
27	Karasu River		Iwakura Bridge	Takasaki City/Tamamura Town					60				164		48						96			96		200	104											
28	Kimma River		Shinkaname Bridge	Ueno Village	0								0							0					0													
29	Kimma River		Morito Bridge	Kimma Town	0								0							0					0													
30	Kimma River		Tobukyo Bridge	Fujisaki City/Kamakura Town					14				0							0					0													
31	Kimma River		Kamagawa Bridge	Kamiato Town					65				0							0					0													
32	Tonegawa River		Bando-ohashi Bridge	Honjo City					16				192		23					14			12		17	0												
33	Akagishirakawa River		In Shimozono Town		20				11				0		32					29			28		13	12												
34			Utsuhoi Bridge	Miebashi City	14				0				10		0					0			0		0	0												
35	Arato River		Okuhara Bridge		0				0				0		0					0			0		0	0												
36	Kasukawa River		Hozumi Bridge		12				23				13		20					0			177		0	0												
37	Hirose River		Nakajima Bridge	Ibesaki City	18				24				21		15					0			31		15	10												
38	Hayakawa River		Hayakawa Bridge		55				62				22		30					35			82		29	48												
39		Maejima Bridge	Ota City	36				107				109		100						123			84		52	37												
40	Tonegawa River	Tone-ozeki Weir	Giyoda Town/Gyoda City			16	18	16	11	18		19	16						23	17	15	16	11	12	18													
41	Watarase River Area	Koguro River	Kayano Bridge	36	76	87		97	57		74	70							42	33	66	51	61	54	49													
42			Takatsudo	Midori City	69				59			16	27							22			18		33	26												
43		Watarase River	Intake for Akaiwayosui water channel	Kiryu City	36	22	35	55	15			26	29							27	35	33	36	121	21	33												
44		Futaba River	Ejiri Bridge	Oura Town	31				225				86	19						33			48		41	44												
45		Kiryu River	Kannon Bridge	Kiryu City	74				67				29	36						59			90		42	65												
46			Sakai Bridge	Kiryu City/Ashikaga City	11				19				32	25	0						35			35		11	18											
47		Tsurunda River	Lake Jonuma	Tatebayashi City	730				1,510				870	1,230						156			327		1,100	940												
48		Yatagawa River	Togoda Bridge	Miwa Town/Iwakura Town	14				192				82	33						169			12		51	29												
				*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0".															A B C D E					38	Average													
				*2: Arithmetic Average, calculated by assuming ND=0. Color codes show categories (see the right).																																		
				*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1)(2)															Decreasing					Increasing					Unchanged					Fluctuations				



## 7) Chiba and Saitama Prefectures and Tokyo Metropolis

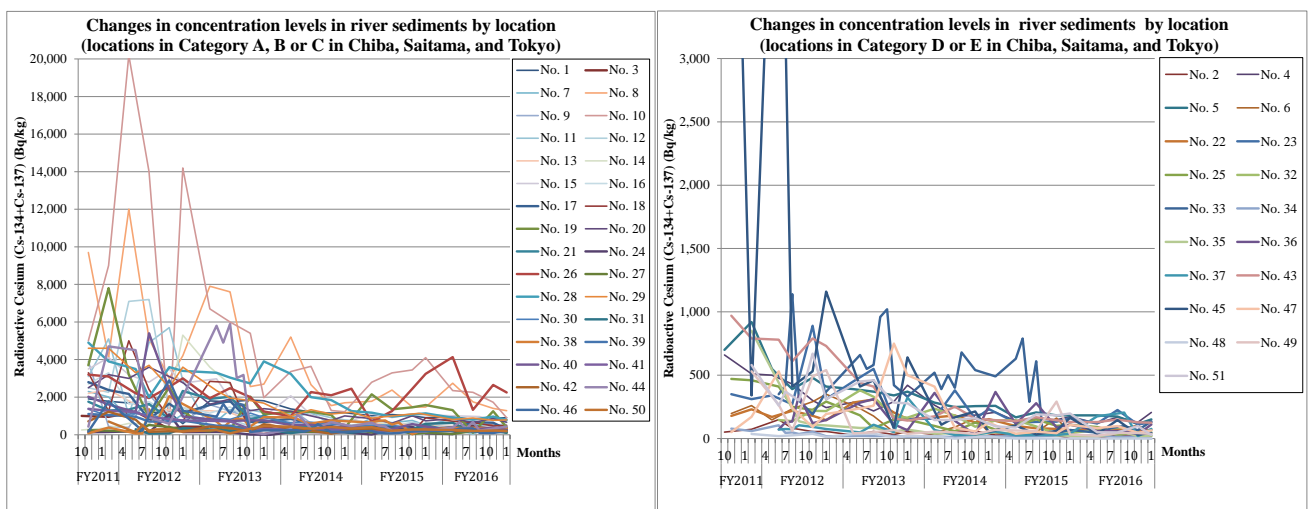
In Chiba and Saitama Prefectures and Tokyo Metropolis, surveys were conducted 20 to 36 times from October 2011 to January 2017 at 51 locations (rivers) in public water areas (47 locations in Chiba Prefecture, two locations in Saitama Prefecture, and two locations in Tokyo Metropolis).

Regarding the concentration levels of detected values, six locations were categorized into Category A, eight locations into Category B, 18 locations into Category C, 13 locations into Category D, and six locations into Category E (see Table 4.3-17 and Table 4.3-18).

Concentration levels were generally decreasing at 41 locations, were unchanged at two locations and fluctuating at eight locations.

Table 4.3-17 Categorizations of detected values at respective locations  
(Chiba and Saitama Prefectures and Tokyo Metropolis: river sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	6	No. 1, No. 8, No. 10, No. 15, No. 26, No. 28
B	Upper 5 to 10 percentile	8	No. 3, No. 7, No. 12, No. 17, No. 18, No. 19, No. 20, No. 29
C	Upper 10 to 25 percentile	18	No. 9, No. 11, No. 13, No. 14, No. 16, No. 21, No. 24, No. 27, No. 30, No. 31, No. 38, No. 39, No. 40, No. 41, No. 42, No. 44, No. 46, No. 50
D	Upper 25 to 50 percentile	13	No. 4, No. 5, No. 6, No. 22, No. 23, No. 32, No. 33, No. 36, No. 37, No. 43, No. 45, No. 47, No. 51
E	Lower than upper 25 to 50 percentile (lower 50%)	6	No. 2, No. 25, No. 34, No. 35, No. 48, No. 49



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 4.3-10 Changes in concentration levels over the years at respective locations  
(Chiba and Saitama Prefectures and Tokyo Metropolis: river sediments)

Table 4.3-18 Detection of radioactive cesium at respective locations  
(Chiba and Saitama Prefectures and Tokyo Metropolis: river sediments) (No.1)

No.	Location				River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
	Prefecture	Water area	Location	Municipality	FY2011									FY2012												
					8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Chiba Prefecture	Tonegawa River System	Shogen River	Fukama-obashi Bridge	Inzai City /Sakae Town				1,910				1,780				1,660	1,190			1,200	590				
2				Shinbei Bridge				50				72				149	81				54	56				
3			Nagato River	Intake at Maeshinden Water Purification Plant	Sakae Town				1,000				950				1,230	850				310	430			
4				Nagato Bridge				660				510			500			430				300	244			
5				Fujimi Bridge				700				920			550			390				480	410			
6			Ryudai River	Ryumatsuno Bridge	Narita City				197				260			147			234			290	350			
7			Nekona River	Shinkawa Floodgate					2,300			2,010			910			1,620			640	1,080				
8		Feeder rivers of Lake Teganuma	Ohori River	Kitakashiwa Bridge	Kashiwa City				9,700			4,100			12,000	5,100			3,000	4,200						
9				Sanno Bridge, under	Kamagaya City				3,900			440			390			2,140			900	710				
10			Otsu River	Kaminuma Bridge	Kashiwa City				5,000			9,000			20,200			14,000			380	14,200				
11				Somemototoshi		Someshinbashi Bridge				3,100			5,100			990			4,900			5,700	2,900			
12			Kanayamaotoshi	Downstream of Karuzawasakai Bridge	Kamagaya City /Shiroi City				2,500			2,260			7,100			7,200			1,300	1,430				
13				Nauchi Bridge	Shiroi City				2,200			2,400			1,800			1,270			1,330	1,210				
14			Kamenari River	Kamenari Bridge	Inzai City				256				360			600			560			1,620	5,300			
15			Feeder rivers of Lake Inbanuma	Igasuuro Channel	Downstream of Igasuuro Channel	Kamagaya City				3,500			4,100			3,200			2,800			3,500	2,750			
16					Futae River	Tomigaya Bridge	Funabashi City /Shiroi City				2,700			3,300			1,640			1,760			1,150	1,460		
17				Kanzaki River	Kanzaki Bridge	Yachiyo City /Inzai City				2,800			2,380			2,170			830			1,650	1,150			
18				Kanno River	Kanno Bridge	Yachiyo City				3,300			1,250			5,000			2,410			880	730			
19				Inba Discharge Channel(Upper reaches)	Yachiyo Bridge					3,700			7,800			3,200			910			2,530	1,280			
20				Teguri River	Mumei Bridge	Sakura City				2,500			3,200			3,000			3,600			3,100	2,780			
21				Moroto River	Moroto Bridge	Inzai City				1,760			1,290			1,340			1,640			850	2,330			
22		Kashima River		Iwatomi Bridge					178			230			170			218			179	144				
23		Takasaki River		Ryuto Bridge	Sakura City				350			310			340			270			890	310				
24		Kashima River		Kashima Bridge					130			149			173			126			1,080	143				
25		Inbasuuro Channel		Tsurumaki Bridge	Inzai City				470			460			410			250			226	291				
26		Edogawa River System		Toneunga Canal	Unga Bridge	Nagareyama City/Noda City				3,200			3,100			2,210			1,950			2,550	3,000			
27					Edogawa River	Nagareyama Bridge	Nagareyama City/Misato City				240			220			166			520			410	275		
28				Sakagawa River	Bentee Bridge	Matsudo City				4,900			3,900			3,500			1,990			3,600	3,400			
29			Shinsaka River	Sakane Bridge					4,600			4,600			3,300			3,700			2,520	3,600				
30			Edogawa River	Shinkatsushika Bridge	Matsudo City/Katsushika City				1,360			1,010			1,120			1,110			740	700				
31					Ichikawa Bridge	Ichikawa City/Edogawa City										290			64			73	350			
32				Vicinity of Keiyo Road	Gyotokukadozekei Weir (upperreaches)	Ichikawa City												145			218	216				
33							Shingyotokubashi Bridge					78			59			104	44		48	35		53	17	
34				Edogawa Floodgate, down 8 km Point to the estuary	Ichikawa City/Edogawa City										850						136	109	103			
35						Imai Bridge											71	128		134	340		121	145		
36				Kyu-Edogawa River	Urayasu Bridge	Urayasu City/Edogawa City				75			380			70	71		1,360	580		2,050	1,640			
37						Mamagawa River	Nemoto Floodgate				1,100			1,050			960			700			700	750		
38			Kokubu River	Suwada Bridge	Ichikawa City				2,020			1,610			1,200			5,400			2,390	970				
39						Haruki River	Before the confluence with Kokubu River				1,380			1,270			1,210			930			840	760		
40		Hasen-okashiwa River	Downstream of Nakazawashinbashi Bridge	Kamagaya City/Ichikawa City				710			1,220			800			153			189	166					
41					Okashiwa River	Sengen Bridge	Ichikawa City				970			790			780			610			790	730		
42		Mamagawa River	Mitomae Bridge					430			4,700			4,500			920			580	2,020					
43		Ebogawa River	Yachiyo Bridge	Funabashi City				6,400			340			6,000			410			530	1,160					
44				Inba Discharge Channel (lower)	Shinhanamigawa Bridge	Chiba City				167			1,770			530	208		1,020	1,730		2,900	1,270			
45							Miyako River	Miyako Bridge				50			171			530			241			91	193	
46		Saitama Prefecture	Arakawa River Middle Reaches	Onari Bridge	Konosu City							35			19			25			37	12				
47				Arakawa River Lower Reaches	Sasame Bridge	Toda City							530			266			61			490	540			
48			Tokyo Metropolis		Sumida River	Kasai Bridge	Koto City /Edogawa City						700			131	520		217	280		300	175			
49				Ryogoku Bridge		Chuo City							580			260	370			300	470	670	310			
					Total number of samples	1,170		Detection times	1,157																	

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-18 Detection of radioactive cesium at respective locations  
(Chiba and Saitama Prefectures and Tokyo Metropolis: river sediments) (No.2)

No.	Location				River sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)																							
	Prefecture	Water area	Location	Municipality	FY2013									FY2014														
					4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Chiba Prefecture	Tonogawa River System	Fukama-obashi Bridge	Inzai City/Sakae Town	1,800			1,750			1,840	1,810			1,210													
2			Shogen River	Shinbei Bridge	Inzai City/Sakae Town	26			56			31	55			31										27		
3			Nagato River	Intake at Maeshinden Water Purification Plant	Sakae Town	420			210			320	420			171										178		
4				Nagato Bridge		285			217			291	420			263											207	
5				Fujimi Bridge		390			370			340	370			283											258	
6				Ryudai River	Ryumatsumo Bridge	Narita City			236	177			49	45			46											
7			Nekona River	Shinkawa Floodgate	Narita City				720			1,330			910													
8	Chiba Prefecture	Feeder rivers of Lake Teganuma	Obori River	Kikakashiwa Bridge	Kashiwa City	7,900			7,600			2,560	2,690			5,200												
9			Otsu River	Sanno Bridge, under	Kamagaya City	1,600			1,250			930	820			1,120												
10				Kaminuma Bridge	Kashiwa City	6,700			6,000			5,400	1,970			3,360												
11			Someirotoshi	Someishinbashi Bridge	Kashiwa City	305			430			1,310	1,190			1,100												
12			Kanayamaotoshi	Downstream of Karuzawasaki Bridge	Kamagaya City /Shiroi City	920			820			460	460			440												
13				Nachi Bridge	Shiroi City	1,280			1,170			750	710			129												
14			Kamenari River	Kamenari Bridge	Inzai City				3,600			2,680	162	222			265											
15			Igusasuino Channel	Downstream of Igusasuino Channel	Kamagaya City				2,980			1,890	800	970			2,070											
16			Futae River	Tomigaya Bridge	Funabashi City /Shiroi City				1,150			1,480	760	760					730									
17			Kanzaki River	Kanzaki Bridge	Yachiyo City /Inzai City				1,590			1,790	680	670			850											
18			Kanno River	Kanno Bridge	Yachiyo City				2,840			2,780	126	58			265											
19			Inba Discharge Channel(Upper reaches)	Yachiyo Bridge	Yachiyo City				202			231	2,030	1,080			1,220											
20			Toguri River	Munsei Bridge	Sakura City				1,620			1,900	1,280	1,390			1,250											
21			Moroto River	Moroto Bridge	Inzai City				1,910			2,020	810	1,010			540											
22	Kashima River	Iwatomi Bridge	Sakura City				284			307	205	154			167													
23	Takasaki River	Ryuto Bridge	Sakura City				450			550	143		154		157													
24	Kashima River	Kashima Bridge	Sakura City							149	127	12			132													
25	Inbassuro Channel	Tsurumaki Bridge	Inzai City							182	81				99													
26	Chiba Prefecture	Edogawa River System	Toneunga Canal	Unga Bridge	Nagareyama City/Noda City	1,940			2,480			2,000	1,240			980												
27			Edogawa River	Nagareyama Bridge	Nagareyama City/Misato City	191			450			348	282			216												
28			Sakagawa River	Benten Bridge	Matsudo City				3,300			3,040	2,730	3,900			3,240											
29			Shinsaka River	Sakane Bridge	Matsudo City				2,350			1,950	1,820	1,680			990											
30			Edogawa River	Shinkasushika Bridge	Matsudo City/Katsushika City				890			820	1,150	920			630											
31				Ichikawa Bridge	Ichikawa City/Edogawa City				258			206		250	287			92										
32				Vicinity of Keiyo Road	Ichikawa City				380			330		175	164			235										
33				Gyotokudozoki Weir (upperreaches)	Ichikawa City				660	550	580	960	1,020	420	330			520	390	500	400	680			540		490	
34			Shingyotokubashi Bridge	Ichikawa City				20			19		20	12			16							11		15		
35			Kyu-Edogawa River	Edogawa Floodgate, down	Ichikawa City/Edogawa City				83			84		56	70			38							42		31	
36				8 km Point to the estuary	Ichikawa City/Edogawa City				283			310		112	65			360							139		30	
37				Imai Bridge	Ichikawa City				48			108		50	323			67							27		31	
38			Mamagawa River	Urayasu Bridge	Urayasu City/Edogawa City				700	380	700	850	810	440	940			920	840	680	590	650			760		700	
39				Nemoto Floodgate	Ichikawa City				480			480		222	295			279							335		260	
40			Kokubu River	Suwada Bridge	Ichikawa City				790			730		770	770			520							530		406	
41			Haruki River	Before the confluence with Kokubu River	Ichikawa City				730			710		304	309			306							321		286	
42			Hasen-okashiwa River	Downstream of Nakazawashinbashi Bridge	Kamagaya City/Ichikawa City				440			350		178	560			323							215		56	
43			Okashiwa River	Sengen Bridge	Ichikawa City				440			410		158	141			175							251		156	
44			Mamagawa River	Mitome Bridge	Ichikawa City				5,800	4,900	5,900	3,010	3,180	138	34			295	1,060	730	314	411			670		460	
45			Ehigawa River	Yachiyo Bridge	Funabashi City				410			460		80	640				108						167		213	
46			Inba Discharge Channel (lower)	Shinhanmigawa Bridge	Chiba City				960	1,640	1,130	1,680	1,590	146	232			329	154	174	284	570			131		160	
47			Saitama Prefecture	Arakawa River System	Miyako River	Miyako Bridge	Chiba City				238		259		750	500			410							85		56
48					Arakawa River Middle Reaches	Onari Bridge	Komosu City				34			38		10	19			17						0		10
49					Arakawa River Lower Reaches	Sasame Bridge	Toda City				41			49		67	36			53							48	
50			Tokyo Metropolis	Sumida River	Kasai Bridge	Koto City /Edogawa City				248			75		316	450			430							317		410
51					Ryogoku Bridge	Chuo City				450			460		283	278			145								147	

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0".



(2)-2 Lakes

1) Miyagi Prefecture

In Miyagi Prefecture, surveys were conducted 11 to 21 times from October 2011 to December 2016 for lake sediment samples collected at 21 locations.

Regarding the concentration levels of detected values, one location was categorized into Category C, three locations were categorized into Category D and 17 locations were categorized into Category E (see Table 4.3-19 and Table 4.3-20).

Concentration levels were generally decreasing at 12 locations, unchanged at three locations, and fluctuating at six locations.

Table 4.3-19 Categorizations of detected values at respective locations  
(Miyagi Prefecture: lake sediments)

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

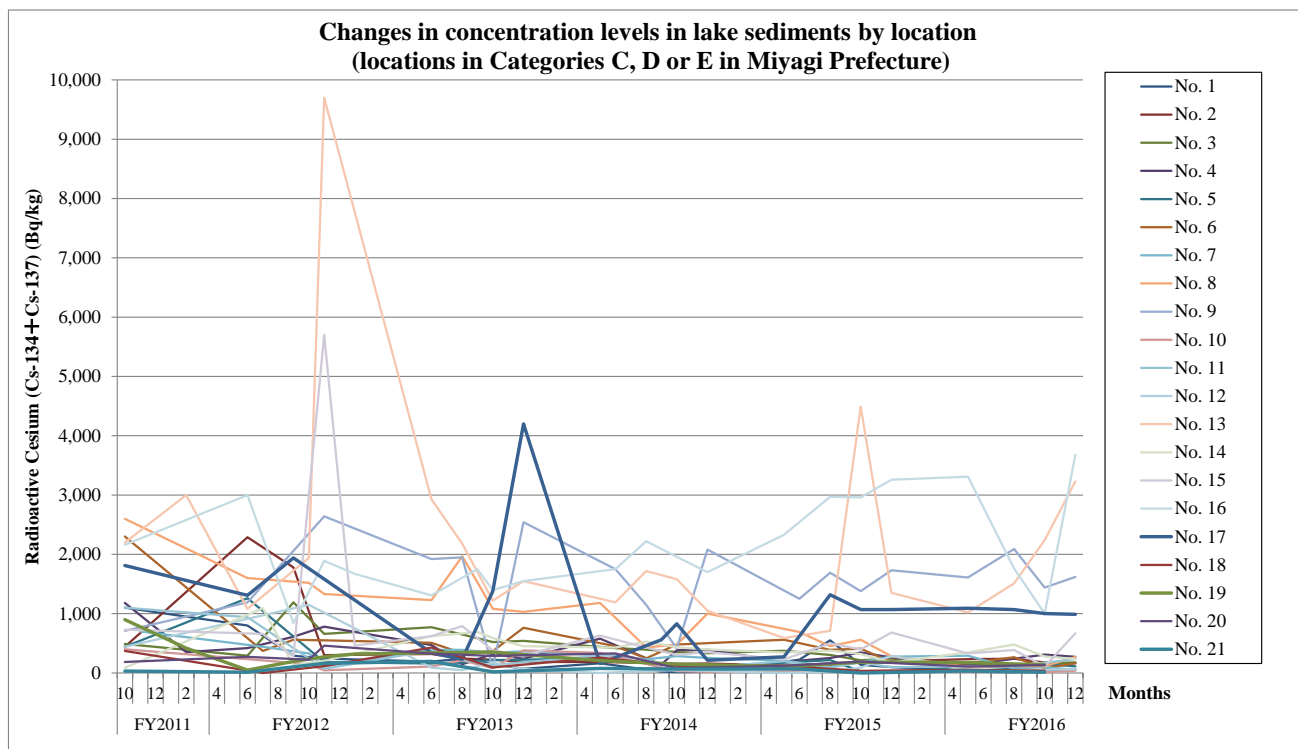


Figure 4.3-11 Changes in concentration levels over the years at respective locations  
(Miyagi Prefecture: lake sediments)

Table 4.3-20 Detection of radioactive cesium at respective locations  
(Miyagi Prefecture: lake sediments) (No.1)

Location				Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)*(#1)																			
No.	Water area	Location	Municipality	FY2011									FY2012										
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Kitakami River System	Kurikoma Dam	Dam site	Kurihara City			1,100								800		290		242				
2		Hanayama Dam	Dam site				440							2,290		1,780		300					
3		Narugo Dam	Dam site		Osaki City			490								290		1,190		660			
4		Lake Naganuma	Dam site					1,180			350					420		610		780			
5		Shukunosawatameike Pond	Pond exit			Kurihara City			440							1,260				183			
6	Naruse River System	Futatsuishi Dam	Dam site	Kami Town			2,300								370		560		550				
7		Urushizawa Dam	Dam site					700							440			330	115				
8		Minamikawa Dam	Dam site		Taiwa Town			2,600							1,600			1,520	1,330				
9	Sunaoshi River System	Sonoseki Dam	Dam site	Rifu Town			710							1,190			2,640						
10	Nanakita River System	Nanakita Dam	Dam site	Sendai City			400							232		148	44						
11	Marutazawatameike Pond	Pond exit					1,100							940			69						
12	Natori River System	Okura Dam	Dam site					440									1,150						
13	Lake Amanuma	Lake exit					2,200			3,000				1,080		1,940	9,700						
14	Natori River System	Kamafusa Dam	Dam site	Kawasaki Town			85								1,090	126	204						
15	Abukuma River System	Kawarago Dam	Dam site	Shiroishi City			730								660	280	5,700	460					
16		Shichikashuku Dam	Dam site	Shichikashuku Town			2,160							3,000		840	1,890	1,670					
17	Lake Bagyunuma	Lake exit		Shiroishi City			1,810							1,310		1,940							
18	Abukuma River System	Murata Dam	Dam site	Murata Town			370								0		115						
19	Kitakami River System	Lake Izunuma	Lake exit	Tome City			900			420				48		195	270	320					
20	Natori River System	Tarumizu Dam	Dam site	Natori City			185							270		222	460						
21	Naruse River System	Miyatoko Dam	Dam site	Taiwa Town			31							12			163						
				Total number of samples	385	Detection times				381													
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																							

Location				Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)*(#1)																			
No.	Water area	Location	Municipality	FY2013									FY2014										
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
1	Kitakami River System	Kurikoma Dam	Dam site	Kurihara City			193		241		154		69				164		23	14	18		
2		Hanayama Dam	Dam site				320		243		225		184				185		168	153	161		
3		Narugo Dam	Dam site		Osaki City			770		650		520		540				420		394	350	331	
4		Lake Naganuma	Dam site					470		146		318		238				580		141	384	392	
5		Shukunosawatameike Pond	Pond exit			Kurihara City			161		176		216		225			246		164	19	76	
6	Naruse River System	Futatsuishi Dam	Dam site	Kami Town			510		331		369		760				450		245	480			
7		Urushizawa Dam	Dam site				390		390		343		364				286		231	284	252		
8		Minamikawa Dam	Dam site		Taiwa Town			1,230		1,970		1,080		1,030			1,180		432	476	1,000		
9	Sunaoshi River System	Sonoseki Dam	Dam site	Rifu Town			1,920		1,950		88		2,540			1,750		1,150	415	2,080			
10	Nanakita River System	Nanakita Dam	Dam site	Sendai City			107		213		80		380			340			91	33	20		
11	Marutazawatameike Pond	Pond exit					380		222		129		181				313		165	109	94		
12	Natori River System	Okura Dam	Dam site					88		47		175		68			0		41	46	35		
13	Lake Amanuma	Lake exit					2,930		2,180		1,220		1,550			1,190		1,720	1,580	1,050			
14	Natori River System	Kamafusa Dam	Dam site	Kawasaki Town			620			690	590		450			430		530	431	395			
15	Abukuma River System	Kawarago Dam	Dam site	Shiroishi City			620		790		380		297			630		430	306	352			
16		Shichikashuku Dam	Dam site	Shichikashuku Town			1,310			1,750	1,400		1,550			1,750		2,220	1,960	1,700			
17	Lake Bagyunuma	Lake exit		Shiroishi City			340		231		1,380		4,200			160		560	830	215			
18	Abukuma River System	Murata Dam	Dam site	Murata Town			430			92					259			121					
19	Kitakami River System	Lake Izunuma	Lake exit	Tome City			340			350					208			149					
20	Natori River System	Tarumizu Dam	Dam site	Natori City			326			288						329		79					
21	Naruse River System	Miyatoko Dam	Dam site	Taiwa Town			195			18						75		66					
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																							

Table 4.3-20 Detection of radioactive cesium at respective locations  
(Miyagi Prefecture: lake sediments) (No.2)

No.	Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																								Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)					
	Water area	Location	Municipality	FY2015												FY2016																Changes				
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3									
1	Kurikoma Dam	Dam site	Kurihara City			224		550		137		100						23		13		43		60												
2		Dam site			124		123		204		196							234		241		175		165												
3	Kirakami River System	Narugo Dam	Osaki City					304		214		244						149		147		154		179												
4		Dam site			185		252		346		263							133		241		310		270												
5	Shukunosawataike Pond	Pond exit	Kurihara City					218		24		10						118		80		146		112												
6	Naruse River System	Futatsushii Dam	Kami Town					390		410		182						164		266		81		163												
7		Dam site			209		105		188		276							290		74		99		51												
8	Minamikawa Dam	Dam site	Taiwa Town			690		451		560		282						103		116		114		268												
9	Sumaoshi River System	Sonoseki Dam	Dam site	Rifu Town			1,250		1,690		1,380		1,730					1,610		2,090		1,440		1,620												
10	Nanakita River System	Nanakita Dam	Dam site	Sendai City			18		70		32		37					26		23		12		38												
11	Manatazawataike Pond	Pond exit				199		90		179		94						110		113		171		236												
12	Natori River System	Okura Dam	Dam site	Sendai City			0		20		89		288					57		32		54		65												
13	Lake Amamura	Lake exit				590		710		4,490		1,350						1,020		1,510		2,240		3,230												
14	Natori River System	Kamafusa Dam	Dam site	Kawasaki Town			345		377		319		180					344		479		279		235												
15	Abukuma River System	Kawarago Dam	Dam site	Shiroishi City			231		500		396		680					329		386		109		670												
16		Dam site	Shichikashuku Town		2,330		2,970		2,960		3,260							3,310		1,760		1,000		3,680												
17	Lake Bagyunuma	Lake exit	Shiroishi City			270		1,320		1,070		1,070						1,090		1,070		1,000		990												
18	Abukuma River System	Murata Dam	Dam site	Murata Town			121				36							55				39														
19	Kirakami River System	Lake Irumuma	Lake exit	Tome City			108				181							174				136														
20	Natori River System	Tarunizu Dam	Dam site	Natori City			121				190							108				135														
21	Naruse River System	Miyatoko Dam	Dam site	Taiwa Town			67				0							35				12														
				*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																								A	B	C	D	E	460	Average		
				*2: Arithmetic Average, calculated by assuming ND=0. Color codes show categories (see the right).																																
				*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2)																								↘ Decreasing ↗ Increasing ~ Unchanged ⚡ Fluctuations								

2) Fukushima Prefecture

(i) Hamadori

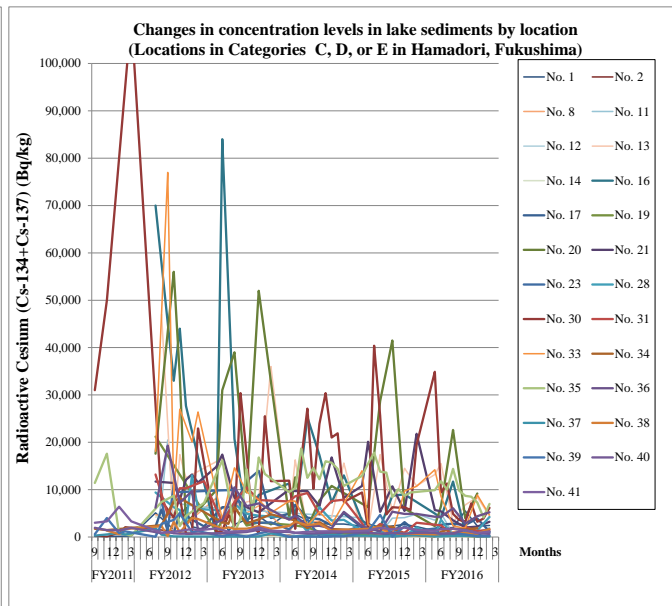
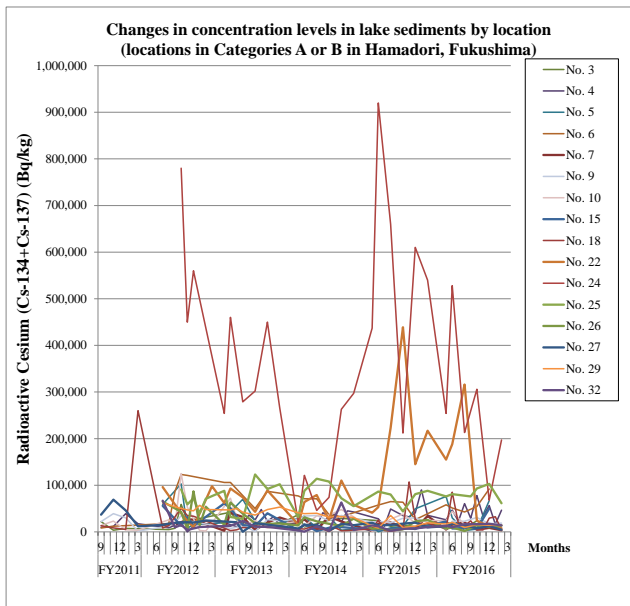
In Hamadori, Fukushima Prefecture, surveys were conducted 19 to 54 times from September 2011 to February 2017 for lake sediment samples collected at 41 locations.

Regarding the concentration levels of detected values, eight locations were categorized into Category A, eight locations into Category B, 11 locations into Category C, nine locations into Category D, and five locations into Category E (see Table 4.3-21 and Table 4.3-22).

Concentration levels were generally decreasing at 21 locations, were unchanged at four locations, were fluctuating at 15 locations, and were generally increasing at one location.

Table 4.3-21 Categorizations of detected values at respective locations  
(Hamadori, Fukushima Prefecture: lake sediments)

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



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 4.3-12 Changes in concentration levels over the years at respective locations  
(Hamadori, Fukushima Prefecture: lake sediments)



Table 4.3-22 Detection of radioactive cesium at respective locations  
(Hamadori, Fukushima Prefecture: lake sediments) (No.1)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																						
No.	Water area	Location	FY2011							FY2012															
			8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
1	Soso (farm pond)	Takei		140		129		154		209				5,100			1,580	4,400	6,300	2,180			1,560		
2		Uchizawa		250		45		830	2,140																
3	Matsugabo Dam (Lake Utagawa)			22,000		3,600		7,500							4,900	7,800	59,000	23,400							
4	Mano Dam			9,900		11,500		39,000		17,400					8,800	14,400	19,000	42	1,270	21,800		9,400	38,000		
5	Soso (farm pond)	Ainosawa												59,000			103,000	8,100	15,500						
6	Ganbe Dam Reservoir			8,200		12,200									18,000	87,000	123,000	121,000							
7	Soso (farm pond)	Fugane Dam												12,000			20,500	26,600	26,500						
8		Sasatoge												4,700			4,000	2,900	2,760						
9	Takanokura Dam Reservoir			22,000		39,000		30,000		1,560					12,400	19,100	35,000	23,600							
10	Yokokawa Dam Reservoir			13,800		23,000		4,500		3,500					25,900	14,200	125,000	53,000		2,900	2,020				
11	Soso (farm pond)	Tarayachi													420	7,600	20,500	7,200					6,400		
12		Takeshiyachi															1,180	1,340	1,240	790					
13		Ryugasaku														47,000	1,080	17,400	12,500						
14	Soso (farm pond)	Uwatashi													4,200		5,100	690	820						
15		Koakuto													56,000		13,000	32,000	13,000						
16		Yosouchi													70,000		33,000	44,000	27,700						
17		Myobusaku No. 2													2,240	5,800	1,180	830	5,100						2,250
18	Ogaki Dam			13,100		8,400		5,100		260,000					8,200	13,600	51,000	35,000	30,000	37,000					
19	Soso (farm pond)	Uenokawa													21,200										
20		Heigoiri													17,600		56,000	34,000	2,790						
21		Mekurasawa No. 2													11,700		11,400	7,900	12,100	13,200	11,500				
22		Joroku													96,000		40,000	23,800	10,000						98,000
23	Furumichigawa Power Plant Dam														7,600	1,580	11,000	9,500							
24	Soso (farm pond)	Sawari No. 1															780,000	450,000	560,000						
25		Suzunai No. 4															91,000	59,000	72,000	40,000	71,000				
26		Nishihaguro													65,000		43,000	5,200	87,000	13,900	54,000				
27	Sakashita Dam			37,000		69,000		46,000		11,800				15,100	17,600	20,600	20,700	20,100	21,900	24,600					
28	Soso (farm pond)	Atamamori 2													9,400		6,300	5,700	2,790	13,000	5,900				
29		Yonomori													62,000		54,000	47,000	45,000	57,000	48,000				
30	Takikawa Dam			31,000		50,000		80,000		110,000				28,000	7,600	4,100	8,600	760	630	690	850	45,000			
31	Soso (farm pond)	Takinosawa													13,200	4,700	10,300	10,300						11,800	
32		Kamisigeoka No. 1													67,000	9,500	14,800	4,200		10,400					
33		Shimoshigeoka													18,100	77,000	8,400	27,000		20,100	26,400				
34	Komachi Dam			1,730		1,460									2,480	7,500	8,200								
35	Kido Dam			11,400		17,600		810		290					7,400	8,700	2,290	4,700	4,200					7,200	
36	Soso (farm pond)	Otsutsumi													6,200	19,300	13,200	7,200		9,700	1,450				
37	Iwaki (farm pond)	Shinike		310		540		830	510					1,780	500		132								
38	Kodama Dam Reservoir (Lake Kodama)					1,360		600	1,710						2,280	213	3,200	960		4,000	3,800				
39	Iwaki (farm pond)	Kanoritsutsumishita		600		4,000		820	1,200					48	2,800	3,600	5,000			990	1,240				
40	Takashiba Dam Reservoir (Lake Takashiba)			1,940		1,430		1,410		1,920					800	1,070	790	690		700	710				
41	Shitoki Dam Reservoir			3,000		3,300		6,400		3,300					930	980	1,120	1,310		1,690	1,400				
			total number of samples	1,275	Detection times	1,274																			

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-22 Detection of radioactive cesium at respective locations  
(Hamadori, Fukushima Prefecture: lake sediments) (No.2)

No.	Location		Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																							
	Water area	Location	FY2013											FY2014												
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Soso (farm pond)	Takei			4,300		1,280	2,650	3,700	4,400		2,580			5,200	4,800		3,530		2,830	2,740		2,730			
2		Uchizawa			350		370	530		340		277		254		390	222		307		213	282		239		
3		Matsugabo Dam (Lake Utagawa)			42,000		26,200	20,900		10,800		15,400		16,800		36,900	10,400		17,200		25,100	28,800				
4		Mano Dam			19,800		5,000	17,500	17,200	36,000	25,500	48,000	22,600	32,800	13,900		20,400	27,200	17,600	12,400	41,000	31,700	38,300	21,100	45,000	42,700
5		Ainosawa			19,400	43,000			70,000		22,700		14,200			28,700	33,900		7,200		33,000		3,530			
6		Ganbe Dam Reservoir			106,000	106,000			78,000		50,000		87,000			77,000	71,000		71,000		36,800		32,800			
7		Fugane Dam			2,540	41,000			32,000		4,100		19,900		30,900		17,800	26,900		3,610		33,000		22,400	14,100	
8		Sawatoge			8,200	1,030			7,500		5,100		6,600				1,090	2,960		3,090		3,390		980		
9		Takanokura Dam Reservoir				7,300		9,800		13,200		960		26,800		23,400		27,200	33,900		35,100		24,200		35,200	
10		Yokokawa Dam Reservoir				72,000		29,300		12,500		24,300		12,300			22,900	11,900		34,700		35,700		48,000	32,200	
11		Tarayachi																								
12		Takeshiyachi			550	1,180		600		410		520		600		1,240	294		293		1,080		265		225	
13		Ryugasaku			26,600	6,600		6,600		7,400		8,000		36,000		3,670	16,300		1,590		2,410		4,140		15,600	
14		Uwatahoro			380	1,060		780		311		140				165	193		190		226		660			
15		Koakuto			61,000	51,000		14,600		12,500		40,000				3,260	16,300		1,530		8,900		10,300			
16		Yosouchi			520	84,000		20,700		3,030		8,900				11,300	4,000		25,300		17,300		7,300		13,000	
17		Myobusaku No. 2				10,800	1,750		6,400		11,800		14,000		4,000		4,900	6,800		4,080		3,760		2,460	5,000	
18		Ogaki Dam			8,100	2,800		4,500	9,300	8,300	13,100	11,000	9,300	10,000			6,000	10,100	6,800	6,100	740	8,900	2,440	3,090		
19		Uenokawa			1,100	3,600		6,400		2,420		3,050				2,580	2,450		2,030		1,070		810		710	
20		Heigoiri			9,900	31,000		39,000		9,400		52,000				4,200	12,600		1,910		7,700		10,800			
21		Mekurasawa No. 2			14,800	17,400		8,300		6,300		5,200				10,000	9,700		9,700		6,500		16,800		8,300	
22		Joroku			62,000	93,000		74,000		43,000		89,000				16,000	64,000		79,000		25,600		110,000		58,000	
23		Furumichigawa Power Plant Dam			9,800			9,900	10,000		3,200		2,980		3,100		1,620	2,830		3,750		87		161		
24		Sawairi No. 1			254,000	460,000		279,000		302,000		450,000		266,000		20,500	121,000		46,000		74,000		263,000		297,000	
25		Suzunai No. 4			88,000	32,000		27,700		123,000		92,000		102,000		31,600	88,000		114,000		108,000		72,000		55,000	
26		Nishihaguro			15,100	63,000		39,000		18,500		17,100		18,200		13,800	31,000		22,600		17,200		12,900		28,300	
27		Sakashita Dam				17,700	25,000	20,700	350	18,800		15,300				7,200	14,800		14,700		2,600		17,100		14,300	
28		Atamamori 2			5,700	3,900		7,000		4,900		4,500				4,100	4,200		1,160		6,300		3,470		3,620	
29		Yonomori				47,000		50,000	42,000		36,000		48,000		53,000		41,000	39,000		39,900		31,600		32,800	30,900	
30		Kawauchi Village			990	1,320		4,700	2,320	30,400	17,300	2,130	930	25,500	11,800		11,900	1,740	16,300	27,100	10,200	23,900	30,400	21,000	21,900	7,400
31		Takinosawa				4,100	2,060		7,400		10,500		7,800			7,500	8,600		9,300		4,800		7,600		7,900	
32		Kamisigeoka No. 1			16,000	9,800		23,400		11,000		10,600				2,940	590		11,800		2,370		63,000		3,890	
33		Shimoshigeoka			4,900	2,660		14,600		9,500		7,900		5,100		7,600	7,600		2,410		5,300		2,600		7,100	
34		Komachi Dam				3,100		2,790	6,300		2,860		3,700		4,800			3,320	3,650		1,880		3,100		1,690	
35		Kido Dam			16,200	14,800	4,200	820	3,900	14,300	5,400	16,800	13,300			9,500	10,300	18,700	12,500	14,600	12,200	16,000	15,700	14,400	10,800	
36		Otsutsumi			5,700	1,470		10,500		6,500		7,100				3,650	4,500		2,390		2,370		1,840		5,300	
37		Shinike			89		78	112		68		111		750		18	141		380		610				304	
38		Kodama Dam Reservoir (Lake Kodama)				1,740		2,020	1,730		1,770		2,300		1,740		2,340	3,190		2,520		2,790		1,290	1,480	
39		Kanoritsutsumishita				170		500	510		82		730		1,310		32	92		53		80		150	140	
40		Takashiba Dam Reservoir (Lake Takashiba)			790			870	880		1,050		1,530		1,140		1,050	860		720		780		950	990	
41		Shitoki Dam Reservoir			1,820			1,120	1,200		1,270		2,000		1,340		1,230	900		1,110		1,200		1,220	1,130	

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."



(ii) Nakadori

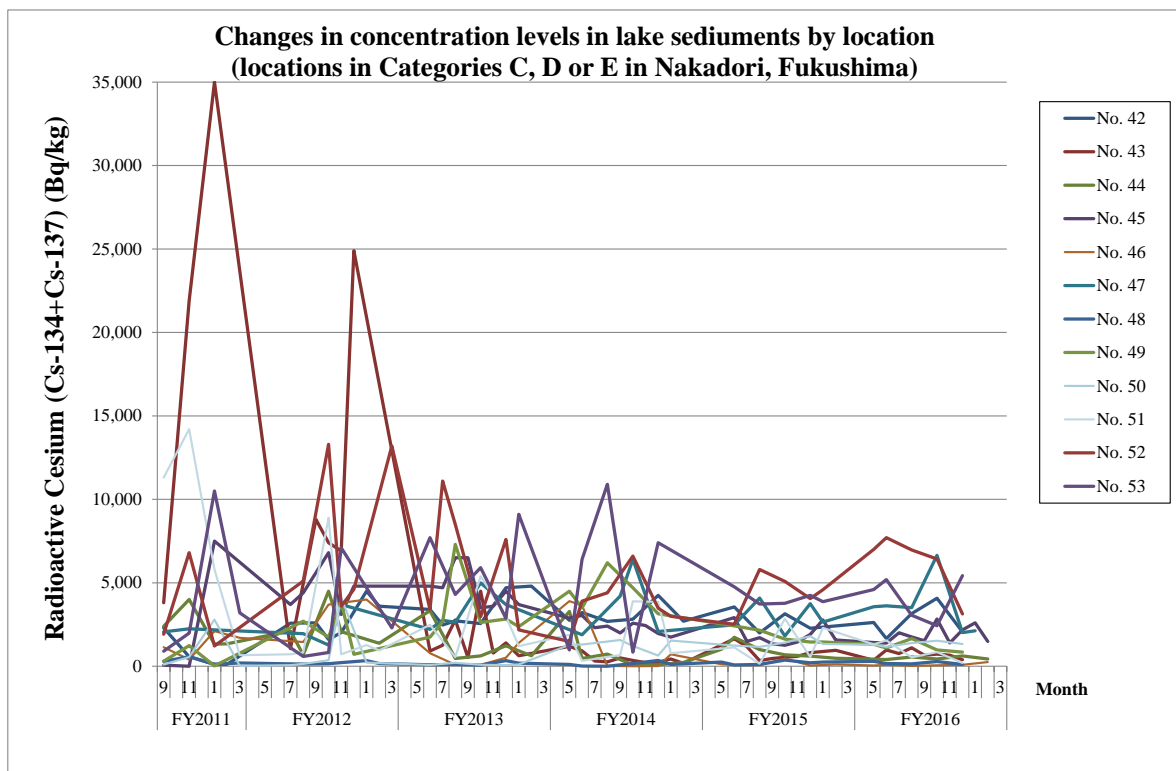
In Nakadori, Fukushima Prefecture, surveys were conducted 27 to 46 times from September 2011 to February 2017 for lake sediment samples collected at 12 locations.

Regarding the concentration levels of detected values, four locations were categorized into Category C, five locations into Category D, and three locations into Category E (see Table 4.3-23 and Table 4.3-24).

Concentration levels were generally decreasing at five locations, were unchanged at two locations, and fluctuating at five locations.

Table 4.3-23 Categorizations of detected values at respective locations  
(Nakadori, Fukushima Prefecture: lake sediments)

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



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

Figure 4.3-13 Changes in concentration levels over the years at respective locations  
(Nakadori, Fukushima Prefecture: lake sediments)

Table 4.3-24 Detection of radioactive cesium at respective locations  
(Nakadori, Fukushima Prefecture: lake sediments) (No.1)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
No.	Water area	Location	FY2011									FY2012												
			8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
42	Surikamigawa Dam Reservoir	Fukushima City		2,300		570			104	116						2,580	2,600	1,600	2,020			4,500	3,600	
43	Lake Handanuma (farm pond)	Kori Town		3,800		21,900			35,000						1,050		8,800	7,400	6,900	24,900				
44	Oike Pond (farm pond)	Motomiya City		2,400		4,000			1,320	1,340					2,110	680		4,500	2,070	1,840			1,380	
45	Miharu Dam	Miharu Town		69		0			7,500						3,700	4,400		6,800	3,100	4,800				
46	Hounokusa (farm pond)	Koriyama City		1,140		400			2,100		1,700					1,450		3,700				4,000		
47	Lake Hatori	Tenei Village		2,060		2,240										1,950		1,270	3,700					
48	Hirodaira (farm pond)	Sukagawa City		290		570			119		191				139	133		148	217			340	163	
49	Sengosawa Dam Reservoir	Ishikawa Town		300		1,240			17						2,700		1,740	3,800	720					
50	Watarike Pond (farm pond)	Yabuki Town		102		550			2,800		17				63	144		360	4,100			222		
51	Izumikawa (farm pond)	Shirakawa City		11,300		14,200			5,800		660				720	820		8,900	710			1,270	940	
52	Hokkawa Dam	Nishigo Village		1,920		6,800			1,210							5,100		13,300	3,600	4,600				13,200
53	Lake Nanko	Shirakawa City		900		1,980			10,500		3,200					580		820	7,100					2,300
			total number of samples	402	Detection times	399																		

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																							
No.	Water area	Location	FY2013												FY2014											
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
42	Surikamigawa Dam Reservoir	Fukushima City			3,400	2,470	2,720	2,560	4,700	4,800			2,750	3,220		2,690	2,820	4,250	2,700							
43	Lake Handanuma (farm pond)	Kori Town		930	890	1,260	2,770	520	4,500	790	1,400	630		1,190	920	317	257	500	346	216	233	437	176			
44	Oike Pond (farm pond)	Motomiya City		960	5,700		470	620	1,220	630			3,280	470		730	71	85	226							
45	Miharu Dam	Miharu Town		4,800	4,600	4,800	6,500	6,500	3,500	3,600	4,500	3,700		2,880	3,040	2,310	2,410	1,990	2,580	2,440	1,960	1,740				
46	Hounokusa (farm pond)	Koriyama City		1,460	92		83	88	510	1,400			3,900	3,640		18	0	13	710							
47	Lake Hatori	Tenei Village		2,210	2,750	2,630	5,000	3,700						2,340	1,440		4,200	6,400	2,080							
48	Hirodaira (farm pond)	Sukagawa City		88	75		106	69	340	179			104	16		0	159	351	107							
49	Sengosawa Dam Reservoir	Ishikawa Town		1,740	2,670	7,300	2,620	2,830	2,370				4,500	3,500		6,200	4,700	3,140								
50	Watarike Pond (farm pond)	Yabuki Town		75	99		202	88	68	107			1,280	1,300		1,570	1,210	640	1,540							
51	Izumikawa (farm pond)	Shirakawa City		3,200	1,770		540	5,400	3,000	1,200			1,880	326		670	3,890	3,860	780							
52	Hokkawa Dam	Nishigo Village		3,400	11,100	8,500	2,970	7,600	2,180				1,480	3,900		4,400	6,600	3,480	2,990							
53	Lake Nanko	Shirakawa City		8,600	6,800		4,300	5,900	2,870	9,100			970	6,400		10,900	840	7,400								
			*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																							

Table 4.3-24 Detection of radioactive cesium at respective locations  
(Nakadori, Fukushima Prefecture: lake sediments) (No.2)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)1																							Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)	
No.	Water area	Location	FY2015											FY2016																	
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3					
42	Surikamigawa Dam Reservoir	Fukushima City			4,020	3,090		1,990		3,140		2,280				2,620	1,660		3,150		4,070		2,060					2,712	42	0.43	
43	Lake Handanuma (farm pond)	Kori Town			2,780	520	1,170	335	464	529	600	810		950		356	970	760	1,110	663	728	656	395					705	43	2.18	
44	Oke Pond (farm pond)	Motomiya City		1,020		1,730		1,000		680		610		479		420	403		548		433		613		430			475	44	1.00	
45	Miharu Dam	Miharu Town			2,070	3,770	1,480	1,710	1,340	1,260	1,450	1,910	2,770	1,570		1,420	1,390	2,000	1,750	1,530	2,830	1,400	2,180	2,600	1,480			1,858	45	0.60	
46	Hounokusa (farm pond)	Koriyama City		123		81		68		454		44		107		40	92		23		51		83		246			89	46	1.43	
47	Lake Hatori	Tenei Village			1,900	3,070		4,080		1,810		3,750	2,640			3,570	3,620		3,510		6,640		2,020	2,120				3,580	47	0.45	
48	Hirodaira (farm pond)	Sakagawa City		244		75		113		368		201	245			296	162		143		280		110					198	48	0.64	
49	Sengosawa Dam Reservoir	Ishikawa Town			1,200	3,640		2,160		1,620		1,450	1,450			1,310	1,090		1,660		970		850					1,176	49	0.71	
50	Watarike Pond (farm pond)	Yabuki Town			1,200	1,260		1,160		1,420		1,800	1,330			1,290	1,160		1,390		1,530		1,330					1,340	50	0.91	
51	Izumikawa (farm pond)	Shirakawa City			870	1,390		153		2,850		552	2,300			1,310	1,550		527		850		190					885	51	1.28	
52	Hokkawa Dam	Nishigo Village			2,570	2,450		5,800		5,080		4,050	4,580			7,000	7,700		6,970		6,420		3,130					6,244	52	0.59	
53	Lake Nanko	Shirakawa City			6,200	3,320		3,730		3,770		4,250	3,870			4,590	5,190		3,060		2,430		5,430					4,140	53	0.63	
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."															A B C D E					1,950	Average										
*2: Arithmetic Average; calculated by assuming ND=0. Color codes show categories (see the right).																															
*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2																							Decreasing    Increasing    Unchanged    Fluctuations								

(iii) Aizu

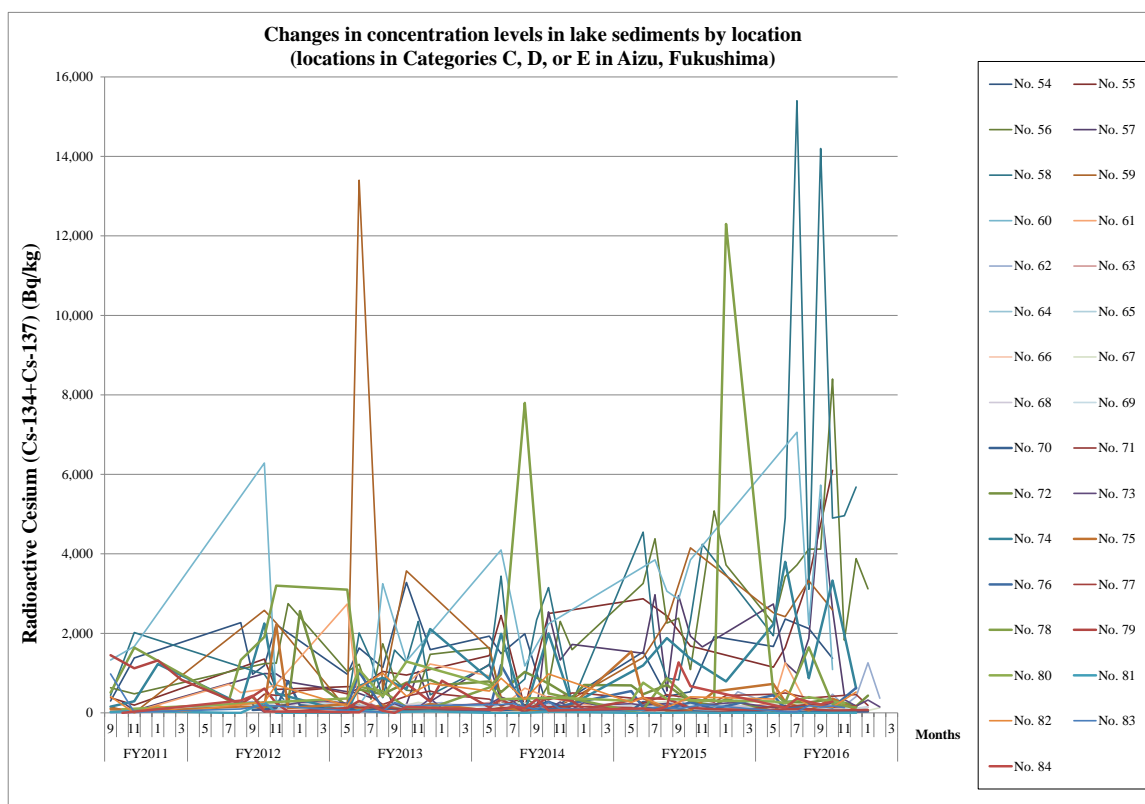
In Aizu, Fukushima Prefecture, surveys were conducted 18 to 50 times from September 2011 to February 2017 for lake sediment samples collected at 31 locations.

Regarding the concentration levels of detected values, seven locations were categorized into Category C, two locations were categorized into Category D and 22 locations were categorized into Category E (see Table 4.3-25 and Table 4.3-26).

Concentration levels were generally decreasing at eight locations, unchanged at four locations, fluctuating at 13 locations, and increasing at six locations.

Table 4.3-25 Categorizations of detected values at respective locations  
(Aizu, Fukushima Prefecture: lake sediments)

Category	Percentile (percentile in all detected values)	Number of locations	Locations
A	Upper 5 percentile	0	(None)
B	Upper 5 to 10 percentile	0	(None)
C	Upper 10 to 25 percentile	7	No. 55, No. 56, No. 57, No. 58, No. 59, No. 60, No. 74
D	Upper 25 to 50 percentile	2	No. 54, No. 78
E	Upper 50 to 100 percentile (lower 50%)	22	No. 61, No. 62, 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 4.3-14 Changes in concentration levels over the years at respective locations  
(Aizu, Fukushima Prefecture: lake sediments)

Table 4.3-26 Detection of radioactive cesium at respective locations  
(Aizu, Fukushima Prefecture: lake sediments) (No.1)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																							
No.	Water area	Location	FY2011						FY2012																	
			8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
54	Nicchu Dam	Kitakata City		298		1,380										2,270	970		1,190	2,220						
55	Lake Sohara	Kitashiobara Village		380		196													530	2,180	590					
56	Lake Hibara			630		480													1,420	1,060	1,250	2,750				
57	Lake Onogawa					270	57													1,870	111	980	780			
58	Lake Akimoto	Inawashiro Town		440		2,020													1,760	177	540	219				
59	Lake Bishamonnuma	Kitashiobara Village		150		0													1,260	3,900	2,260					
60	Lake Oguninuma				1,330		1,670													2,370	10,200	310				
61	Aizu(farm pond)	Lake Onuma	Nishiizu Town		61		28									720	510			600		720				
62	Lake Inawashiro	Center	Aizuwakamatsu City		0		0			44									286	133	76	33	126	122		
63		Takahashi River Estuary	Inawashiro Town																	86	154	270	166	128	284	
64		Oguro River Estuary																		200	76	179	114	127	245	
65		Tenjinhama Beach																			111	110	99	132	135	
66		Hishinuma River Estuary	Koriyama City																	83	108	39	96	89	68	
67		Intake of Asakasosui																			126	118	115	251	108	116
68		Hamajihama Beach																			235	203	240	169	242	221
69		Funatsu Port																			223	213	186	370	182	223
70		Offshore of Funatsu River Estuary	Aizuwakamatsu City																	74	86	118	800	186	116	
71		Seishogahama Beach																			220	470	440	460	560	610
72	Haragawa River Estuary	Inawashiro Town																	390	151	168	215	2,560	610		
73	Koishigahama Floodgate																			206	22	161	209	263	306	
74	Higashiyama Dam Reservoir	Aizuwakamatsu City		157		290			1,230										220		2,250	490				
75	Lake Numazawa	Center	Kaneyama Town		100		59			63									160		138	2,210	120			
76		Midpoint between the center of the lake and off the estuary																								
77		Offshore of Maenosawa River Estuary																								
78	Aizu (farm pond)	Aizumisato Town		510		1,640										310	1,330			1,910	3,200					
79	Okawa Dam Reservoir	Aizuwakamatsu City		1,450		1,120			1,320										218		610	242	35	44	69	
80	Tagokura Reservoir	Tadami Town				90													229							
81	Minamiaizu (farm pond)		Fukui		22		47										0	0			270	0				
82	Tajima Dam Reservoir (Lake Funehana)	Minamiaizu Town		410		0			177										207		270	700				
83	Okutadami Reservoir	Tadami Town		980		18													97		190					
84	Lake Ozenuma	Hinoemata Village				0													310	430	34					
				total number of samples	911		Detection times	887																		

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."



Table 4.3-26 Detection of radioactive cesium at respective locations  
(Aizu, Fukushima Prefecture: lake sediments) (No.2)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																											
No.	Water area	Location	FY2013												FY2014															
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
54	Nicchu Dam	Kitakata City		970	1,630		1,140			3,280			1,590					1,930	1,490	1,990			43							
55	Lake Sohara			660	650		1,040			950								1,440	2,450	130			2,500							
56	Lake Hibara	Kitashiohara Village		1,040	1,220	342	1,740	850		570	540	1,470						1,640	287	196	373	192	710	2,300	1,590					
57	Lake Onogawa				530	490	380	870	86		210	1,040	282						1,220	309	168	97	62	2,540	1,330	1,720				
58	Lake Akimoto	Inawashiro Town		214	2,010	1,340	380	1,580		1,270	2,300	450						1,200	3,440	590	850	2,340	3,150	1,710	257					
59	Lake Bishamonnuma	Kitashiohara Village		82	13,400		570			3,570								1,620	400		140		11							
60	Lake Oguninuma				198	620	3,250				1,300								4,100	2,670	1,180		2,240							
61	Aizu (farm pond)	Lake Onuma	Nishiaizu Town	2,740	59		480			740			1,230					930	129		620		385							
62	Lake Inawashiro	Center	Aizuwakamatsu City	190	178	229	86	103		215	99	237	256	199				149	29	114	63	319	97	119	194	67	193			
63		Takahashi River Estuary	Inawashiro Town	171	300		130			147		153	139					261	291		142		233		195	98				
64		Oguro River Estuary		110	84		163			130		114	126						90	99		95		96		110	88			
65		Tenjinhama Beach		208	122		80			157		105	83						198	99		106		201		47	148			
66		Hishinuma River Estuary		85	50		57			82		60	15						39	47		49		25		47	23			
67		Intake of Asakasosui	Koriyama City	236	249	172	123	241		194	263	216	222	152				182	91	255	247	201	160	170	248	440	103			
68		Hamajhama Beach		194	162		151			205		228							189	189		151		206		213	161			
69		Funatsu Port		186	141		187			107		138	160						192	382		101		141		224	109			
70		Offshore of Funatsu River Estuary		88	97		107			92		70							87	74		91		278		73	79			
71	Seishogahama Beach	480		620		211			420		550	470						344	174		387		331		500	490				
72	Haragawa River Estuary	Aizuwakamatsu City	176	590		470			760		830	700					790	520		1,030		740		379	700					
73	Koishigahama Floodgate	Inawashiro Town	241	133	144	134	228		111	133	361	114	195				226	389	303	30	363	109	274	89	257	200				
74	Higashiyama Dam Reservoir	Aizuwakamatsu City	24	680		880			600			2,110					850	1,990		18		2,000		214						
75	Center	Kaneyama Town	219	90		191			62			221					57	127		58		70		197						
76	Midpoint between the center of the lake and off the estuary		146	1,030		118			77			103						37	1,200		129		74		237					
77	Offshore of Maenosawa River Estuary		144	139		134			79			54						98	118		163		148		163					
78	Aizu (farm pond)	Azumisato Town	3,100	660		540			142			117					640	970		7,800		490								
79	Okawa Dam Reservoir	Aizuwakamatsu City	120	297		49			740		286	810					139	344		14		400		298	90					
80	Tagokura Reservoir		360	1,090		410			1,290								700	343		360				378						
81	Minamiaizu (farm pond)	Fukui		0	70		12		28		39						0	0		0		30								
82	Tajima Dam Reservoir (Lake Funehana)	Minamiaizu Town	175	630		1,000			420		740						550	870		333		980								
83	Okutadami Reservoir	Tadami Town		38	24	34	259		160	180							209	236	148	86		277	103							
84	Lake Ozenuma	Hinoemata Village			13	202	51	0	242	57							70	160	117	550	122	59								

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-26 Detection of radioactive cesium at respective locations  
(Aizu, Fukushima Prefecture: lake sediments) (No.3)

No.	Location		Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)																								Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)			
	Water area	Location	FY2015												FY2016																			
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3								
54	Nicchu Dam	Kitahata City			180	2,890		413		530		1,920				1,670	2,360		2,120			1,370												
55	Lake Sohara	Kitashiobara Village			2,450	3,290	2,440		1,680						1,150	1,640		3,390			6,100													
56	Lake Hbara				1,970	4,540	4,380	2,260	2,380	1,090	3,070	5,080	3,720			2,250	3,430	3,720	4,120	4,120	8,400	1,830	3,880	3,120										
57	Lake Onogawa				1,530	1,470	2,970	550	2,950	1,930	1,660					2,740	1,260	990	1,870	5,370	2,600	437												
58	Lake Akimoto	Inawashiro Town			3,190	5,900	1,720	870	830	2,330	4,240				1,940	4,910	15,400	3,110	14,200	4,900	4,960	5,680												
59	Lake Bichanomama	Kitashiobara Village			452	2,330	2,310		4,150						2,520	2,420		3,320			2,590													
60	Lake Ogumima					3,850	3,060		2,860	3,850							7,060	2,210	5,730			1,090												
61	Aizu (farm pond)	Lake Onuma	Nishizu Town	0	17		172		351		0				263	1,260		114		115		148												
62		Center	Aizuwakamatsu City	81	159	214	212	372	87	102	156	198	530		199	285	313	267	183	468	177	409	1,260	369										
63		Takahashi River Estuary	Inawashiro Town	97	99		86		155		93	141			163	136		100		150		99	133											
64		Oguro River Estuary		75	85		75		89		78	65			76	78		72		73		76	61											
65		Teijuhama Beach		83	71		62		95		39	92			63	73		115		93		53	80											
66		Hichinuma River Estuary		28	27		28		25		30	45			22	12		27		27		29	35											
67		Intake of Asakasouji		162	211	262	278	156	225	272	211	178	359			238	187	219	227	193	189	138	119	59	129									
68	Lake Inawashiro	Hamajima Beach		175	138		152		149		156	176			177	158		167		177		123	148											
69		Funatsu Port		Koriyama City	174	146		244		202		221	123			138	177		127		156		105	146										
70		Offshore of Funatsu River Estuary	54		273		166		42		22	13			68	22		25		57		31	34											
71		Seishogahama Beach	370		241		455		374		272	438			469	500		373		418		463	188											
72		Haragawa River Estuary	690		469		700		279		188	348			45	276		262		344		167	434											
73		Keishigahama Floodgate	Inawashiro Town	229	193	211	235	190	121	205	219	246	256		131	189	112	198	189	242	334	170	324	148										
74	Higashiyama Dam Reservoir	Aizuwakamatsu City			520	1,870	1,880	1,360				790			2,230	3,800		870		3,330		619												
75		Center			1,540	372		45		60	537				730	279		57		358		74												
76	Lake Numazawa	Midpoint between the center of the lake and off the estuary	Kaneyama Town	550	130		101		265		100				443	94		207		135		627												
77		Offshore of Maenosawa River Estuary		131	53		72		26		15				161	149		216		141		179												
78	Aizu (farm pond)		Aizumizato Town	41	79		870		308		327	12,300			517	259		1,650		218		137												
79	Okawa Dam Reservoir		Aizuwakamatsu City			526	218	350		124	89				75	95		95		54		70	68											
80	Tagokura Reservoir			303	760		351			310					289	247		395				241												
81	Minamizuru (farm pond)	Fukui	Tadami Town	0	0		0		10		0				0	0		0		0		0												
82	Tajima Dam Reservoir (Lake Funehana)		Minamizuru Town	260	384		134		404						347	576		179		146		524												
83	Okutadami Reservoir		Tadami Town		71	140	131	109	154	203					31	25	184	146	172	133														
84	Lake Ozemuma		Hinoemata Village			112	70	160	1,160	1,380	670				130	361	276	75	345	284														
			*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																								A	B	C	D	E	1,021	Average	
			*2: Arithmetic Average; calculated by assuming ND=0. Color codes show categories (see the right).																								→ Decreasing    ↗ Increasing    ~ Unchanged    ~ Fluctuations							
			*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2)																															

### 3) Ibaraki Prefecture

In Ibaraki Prefecture, surveys were conducted 13 to 22 times from September 2011 to February 2017 for lake sediment samples collected at 19 locations.

Regarding the concentration levels of detected values, one location was categorized into Category C, five locations into Category D, and 13 locations into Category E (see Table 4.3-27 and Table 4.3-28).

Concentration levels were generally decreasing at nine locations, unchanged at six locations, and fluctuating at four locations.

Table 4.3-27 Categorizations of detected values at respective locations  
(Ibaraki Prefecture: lake sediments)

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

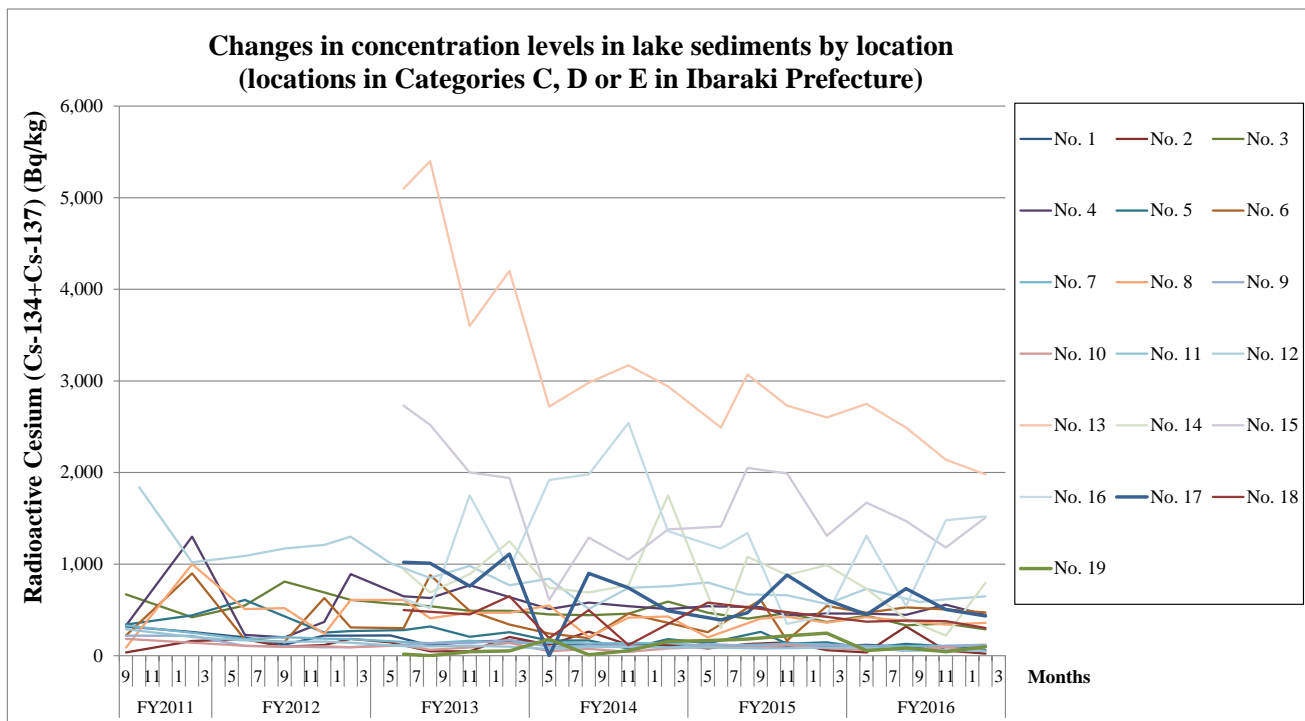


Figure 4.3-15 Changes in concentration levels over the years at respective locations  
(Ibaraki Prefecture: lake sediments)

Table 4.3-28 Detection of radioactive cesium at respective locations  
(Ibaraki Prefecture: lake sediments) (No.1)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																								
No.	Water area		Location	FY2011												FY2012											
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
1	Hinuma	Hiroura	Ibaraki Town		320						260				200			122			219	219					
2		Miyamae			37						162				179			98			118	184					
3		Oyazawa			670						420				550			810			690	610					
4	Lake Kasumigaura	Offshore of Tamatsukuri	Namegata City		330					1,300				228			201			370	890						
5		Offshore of Kakeuma	Ami Town		340					440				610			430			252	270						
6		Center	Miho Village		221					900				178			151			630	310						
7		Offshore of Aso	Inashiki City		330					250				183			202			186	183						
8	Lake Kitaura	Offshore of Kamaya	Namegata City		90					1,000				510			520			239	610						
9		Jingu Bridge	Itako City		220					217				106			103			93	95						
10	Hitachitone River	Lake Sotonasakaura			184					143				110			97			102	93						
11		Ikisu	Kamisuru City		290					205				168			152			154	142						
12	Lake Ushikunuma	Center of Lake Ushikunuma	Ryugasaki City			1,840				1,020				1,090			1,170			1,210	1,300						
13	Mizunuma Dam	Center	Kitaibaraki City																								
14	Koyama Dam		Takahagi City																								
15	Hananuki Dam																										
16	Jyuou Dam		Hitachi City																								
17	Ryuji Dam		Hitachiota City																								
18	Fujigawa Dam		Shirosato Town																								
19	Iida Dam		Kasama City																								
				total number of samples	373	Detection times	371																				

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-28 Detection of radioactive cesium at respective locations  
(Ibaraki Prefecture: lake sediments) (No.2)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																						
No.	Water area	Location	FY2013									FY2014													
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	Hinuma	Hiroura		221			114			155			165			136			111			136			94
2		Miyamae		146			49			49			204			119			264			120			119
3		Oyazawa		570			540			490			490			450			442			460			590
4	Lake Kasumigaura	Offshore of Tamatsukuri			650		630			770			640			510			580			540			510
5		Offshore of Kakeuma			280		320			208			257			165			168			78			182
6		Center			300		880			490			340			242			192			460			360
7		Offshore of Aso			150		139			164			138			143			134			139			138
8	Lake Kitaura	Offshore of Kamaya			610		410			470			470			550			203			416			429
9		Jingu Bridge			121		136			139			172			99			107			115			86
10	Hitachitone River	Lake Sotonasakaura			113		66			91			141			49			76			42			79
11		Ikisu			104		102			108			98			74			97			95			91
12	Lake Ushikunuma	Center of Lake Ushikunuma		1,010			850			980			770			840			510			740			760
13	Mizunuma Dam	Center	Kitaibaraki City		5,100		5,400			3,600			4,200			2,720			2,980			3,170			2,940
14	Koyama Dam		Takahagi City		940		690			890			1,250			740			690			770			1,750
15	Hananuki Dam			2,730		2,520			2,000			1,940			610			1,290			1,050			1,380	
16	Jyuou Dam		Hitachi City		620		520			1,750			950			1,920			1,980			2,540			1,360
17	Ryuji Dam		Hitachiota City		1,020		1,010			760			1,110			0			900			740			490
18	Fujigawa Dam		Shirosato Town		500		480			450			650			193			498			117			346
19	Iida Dam		Kasama City		18		0			45			53			180			11			55			156

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-28 Detection of radioactive cesium at respective locations  
(Ibaraki Prefecture: lake sediments) (No.3)

No.	Location		Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																							Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)												
	Water area	Location	FY2015											FY2016																												
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2						3											
1	Hinuma	Hiroura	101				99					95					99						120				97					96				94		102	1	0.43		
2		Miyamae	80				128						146				61							36				319					56			23		109	2	0.62		
3		Oyazawa	470				405						465					367							439				332					351			288		353	3	0.25	
4	Lake Kasumigaura	Offshore of Tamatsukuri	540						530			439					461							460				446					557			444		477	4	0.42		
5		Offshore of Kakeuma	137						261			132					147							83				130					103			62		95	5	0.59		
6		Center	Miho Village	257						610			165					543							470				528					506			471		494	6	0.51	
7	Lake Kitaura	Offshore of Aso	108						121			133					124							107				105					108			106		107	7	0.35		
8		Offshore of Kamaya	Namegata City	200						405			427					361							421				378					340			359		375	8	0.43	
9		Jingu Bridge	Itako City	128						102			118					117							100				53					107			122		96	9	0.32	
10	Hitachitone River	Lake Sotonasakaura	94						89			115					81							64				67					93			51		69	10	0.36		
11		Ikiu	Kamisu City	91						80			82					91							86				53					64			51		64	11	0.49	
12	Lake Ushikunuma	Center of Lake Ushikunuma	800						670								565							730				586					616			650		646	12	0.35		
13	Mizunuma Dam	Center	Kitabaraki City			2,490		3,070				2,730				2,600							2,750				2,490					2,140			1,980		2,340	13	0.31			
14	Koyama Dam		Takahagi City			302		1,080				880					990							730				400					220			797		537	14	0.45		
15	Hananuki Dam					1,410		2,050				1,990					1,310							1,670				1,470					1,180			1,510		1,458	15	0.34		
16	Jyuu Dam		Hitachi City			1,170		1,340				346					445							1,310				543					1,480			1,520		1,213	16	0.51		
17	Ryuji Dam		Hitachiotu City			391		469				880					610								449				732					505			435		530	17	0.44	
18	Fujigawa Dam		Shirosato Town	580																					372				385					378			302		359	18	0.36	
19	Iida Dam		Kasama City	165						182				218				246							56				83					45			98		71	19	0.78	
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																							A	B	C	D	E	499	Average													
*2: Arithmetic Average; calculated by assuming ND=0; Color codes show categories (see the right).																																										
*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2)																																										

#### 4) Tochigi Prefecture

In Tochigi Prefecture, surveys were conducted 18 to 22 times from October 2011 to December 2016 for lake sediment samples collected at eight locations.

Regarding the concentration levels of detected values, three locations were categorized into Category D, and five locations into Category E (see Table 4.3-29 and Table 4.3-30).

Concentration levels were generally decreasing at two locations, fluctuating at four locations, and increasing at two locations.

Table 4.3-29 Categorizations of detected values at respective locations  
(Tochigi Prefecture: lake sediments)

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

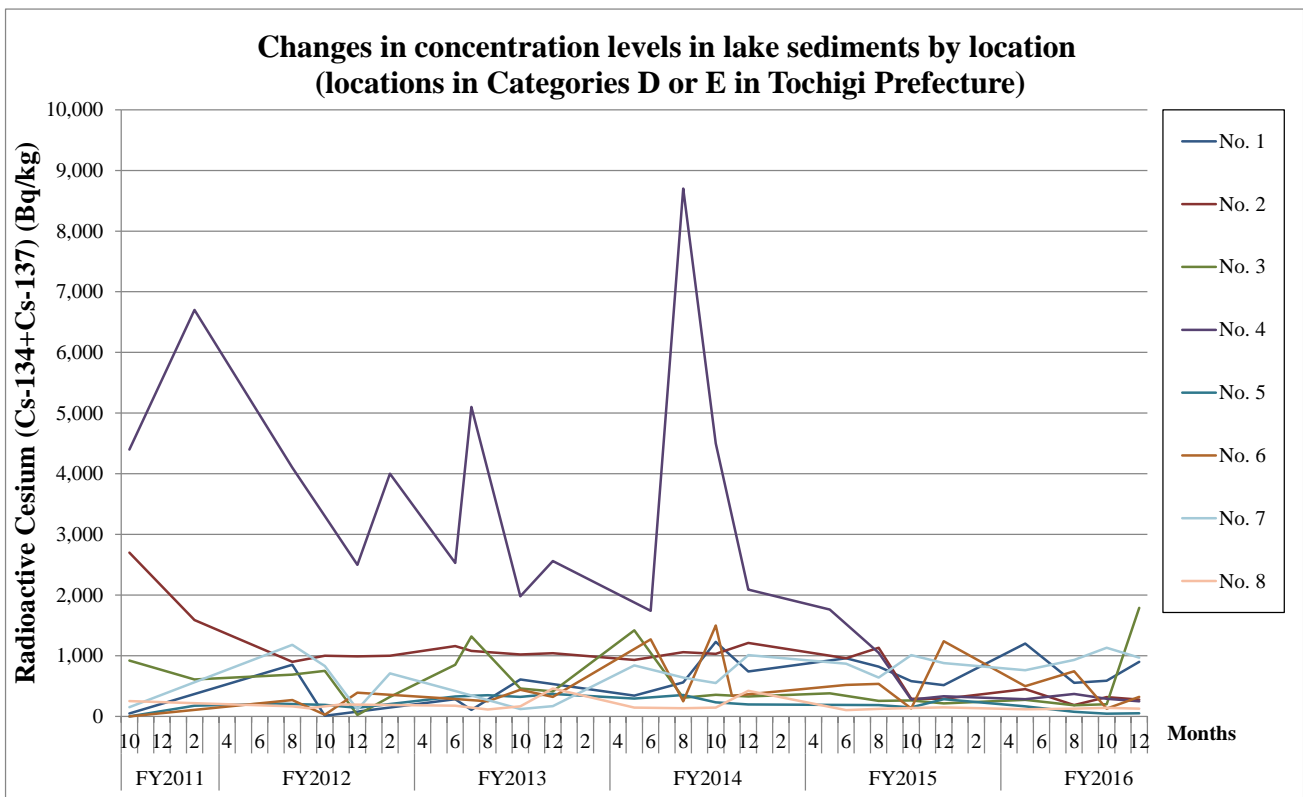


Figure 4.3-16 Changes in concentration levels over the years at respective locations  
(Tochigi Prefecture: lake sediments)

Table 4.3-30 Detection of radioactive cesium at respective locations  
(Tochigi Prefecture: lake sediments)

Location				Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																									
No.	Water area	Location	Municipality	FY2011					FY2012																				
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3						
1	Nakagawa River System	Miyama Dam Reservoir	Center	Nasushiobara City			48										850	11											
2		Shiobara Dam Reservoir	Center				2,700				1,590							900	1,000	990	1,000								
3	Kinugawa River System	Kawaji Dam Reservoir	Center	Nikko City			920			610						690	750	25	320										
4		Ikari Dam Reservoir	Center				4,400			6,700						4,100	3,300	2,500	4,000										
5		Kawamata Dam Reservoir	Center				0			176					212		190	140											
6		Lake Yuno	Center				0									270	28	390											
7		Lake Chuzenji	Center				153									1,180	830	115	710										
8	Watarase River System	Watarase Reservoir	Center	Tochigi City			251								165	134	197												
					total number of samples	166	Detection times	164																					

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location				Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																								
No.	Water area	Location	Municipality	FY2013									FY2014															
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Nakagawa River System	Miyama Dam Reservoir	Center	Nasushiobara City			284	106			610						343	560	1,230	740								
2		Shiobara Dam Reservoir	Center				1,160	1,080			1,020	1,040					930	1,060	1,030	1,210								
3	Kinugawa River System	Kawaji Dam Reservoir	Center	Nikko City			850	1,320			460	410				1,420	307	355	330									
4		Ikari Dam Reservoir	Center				2,530	5,100			1,980	2,560					1,740	8,700	4,500	2,090								
5		Kawamata Dam Reservoir	Center				330	350			321	370					293	354	232	196								
6		Lake Yuno	Center				286	248			440	320					1,270	250	1,500	339								
7		Lake Chuzenji	Center				420	270			122	168					840	640	550	1,010								
8	Watarase River System	Watarase Reservoir	Center	Tochigi City			177	113		164	460				146	134	144	421										

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location				Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)															Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)							
No.	Water area	Location	Municipality	FY2015					FY2016																					
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
1	Nakagawa River System	Miyama Dam Reservoir	Center	Nasushiobara City			960	820		580	514					1,200		554	589	900										
2		Shiobara Dam Reservoir	Center				960	1,130		290	290						450		185	317	276									
3	Kinugawa River System	Kawaji Dam Reservoir	Center	Nikko City			382		257	261	215					274		183	199	1,790										
4		Ikari Dam Reservoir	Center				1,760		1,050		275	333					283		369	290	250									
5		Kawamata Dam Reservoir	Center				191		185		147	285					165		77	44	52									
6		Lake Yuno	Center					520		535		132	1,240					497		743	126	320								
7		Lake Chuzenji	Center					870		640		1,010	880					760		930	1,130	970								
8	Watarase River System	Watarase Reservoir	Center	Tochigi City			103		123	137	148					118		128	143	129										
											A	B	C	D	E	451	Average													

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

\*2: Arithmetic Average; calculated by assuming ND=0. Color codes show categories (see the right).

\*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2)

↘ Decreasing ↗ Increasing ↔ Unchanged 📊 Fluctuations



### 5) Gunma Prefecture

In Gunma Prefecture, surveys were conducted 16 to 22 times from November 2011 to December 2016 for lake sediment samples collected at 24 locations.

Regarding the concentration levels of detected values, 13 locations were categorized into Category D and 11 locations were categorized into Category E (see Table 4.3-31 and Table 4.3-32).

Concentration levels were generally decreasing at 10 locations, unchanged at six locations, fluctuating at seven locations, and increasing at one location.

Table 4.3-31 Categorizations of detected values at respective locations  
(Gunma Prefecture: lake sediments)

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

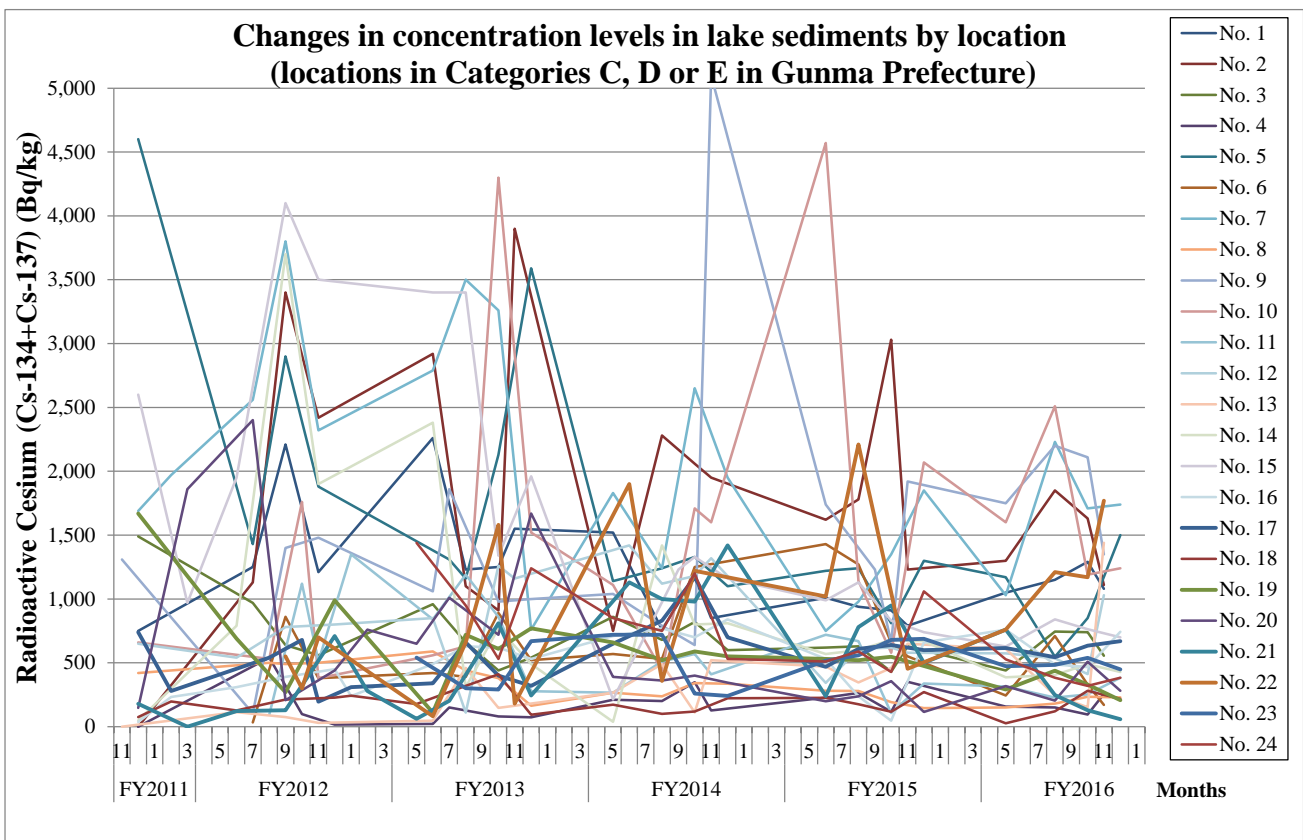


Figure 4.3-17 Changes in concentration levels over the years at respective locations  
(Gunma Prefecture: lake sediments)

Table 4.3-32 Detection of radioactive cesium at respective locations  
(Gunma Prefecture: lake sediments) (No.1)

Location				Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																		
No.	Water area	Location	Municipality	FY2011									FY2012									
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	Tonegawa River	Lake Okutone (Yagisawa Dam)	Center	Minakami Town					750							1,250	2,210	1,210				
2		Lake Naramata (Naramata Dam)	Center						0							1,130	3,400	2,420				
3		Lake Dogen (Sudagai Dam)	Center						1,490							970	640	560				
4		Lake Marunuma (Marunuma Dam)	Center	Katashina Village					0							540	98	16				
5		Lake Fujiwara (Fujiwara Dam)	Center	Minakami Town					4,600							1,430	2,900	1,880				
6		Lake Tanbara (Tanbara Dam)	Center	Numata City												33	860	380				
7		Lake Akaya (Aimata Dam)	Center	Minakami Town					1,690	1,970						2,560	3,800	2,320				
8		Lake Sonohara (Sonohara Dam)	Center	Numata City					420								500	490	500			
9		Lake Akagionuma	Center	Maebashi City				1,310								104	1,400	1,480				
10	Agatsuma River Area	Lake Okushima (Shimagawa Dam)	Center	Nakanajo Town					660							530	1,760	380				
11		Lake Shimako (Nakanajo Dam)	Center													94	1,120	510	1,350			
12		Lake Tashiro (Kazawa Dam)	Center	Tsumagoi Village					650							540	780	800				
13	Karasu River	Lake Haruna	Center	Takasaki City/Higashi-Agatsuma Town				0							114	76	30					
14		Lake Kirizumi (Kirizumi Dam)	Center	Annaka City					49						790	3,700	1,900					
15		Lake Utsui (Sakamoto Dam)	Center						2,600		970				1,950	4,100	3,500					
16		Lake Arafune (Dodairagawa Dam)	Center	Shimonita Town					37	233					310	390	450	239				
17		Lake Oshio (Oshio Dam)	Center	Tomioka City					740	280						540	680	196	310			
18		Lake Kanna (Shimokubo Dam)	Center	Fujioka City/Kamikawa Town					75	197						128	213	228	242			
19		Lake Hebikami (Shiozawa Dam)	Center	Kanna Town					1,670							690	270	990				
20	Watarase River Area	Lake Kusaki (Kusaki Dam)	Center	Midori City					147		1,860				2,400	207	440	760				
21		Lake Umeda (Kiriyugawa Dam)	Center	Kiryu City					179		0				123	129	710	280				
22	Nakatsu River	Lake Nozori (Nozori Dam)	Center	Nakanajo Town												550	300	700				
23	Watarase River Area	Lake Jonuma	Center	Tatebayashi City																		
24		Lake Tataranuma	Center																			
				total number of sample	479	Detection times	475															

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Table 4.3-32 Detection of radioactive cesium at respective locations  
(Gunma Prefecture: lake sediments) (No.2)

No.	Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
	Water area	Location	Municipality	FY2013									FY2014												
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1
1	Tonegawa River	Lake Okutone (Yagisawa Dam)	Center	Minakami Town			2,260	1,230	1,250	1,550							1,520		760	1,170	850				
2		Lake Naramata (Naramata Dam)	Center				2,920	1,100	910	3,900							750		2,280	2,060	1,950				
3		Lake Dogen (Sudagai Dam)	Center				960	660	440	540							860		680	820	600				
4		Lake Marunuma (Marunuma Dam)	Center	Katashina Village			21	151		81	74					211		201	349	127					
5		Lake Fujiwara (Fujiwara Dam)	Center	Minakami Town				1,310	1,160	2,130	3,590					1,140			1,240	1,330	1,100				
6		Lake Tanbara (Tanbara Dam)	Center	Numata City			420	390	890	520						570		530	1,250						
7		Lake Akaya (Aimata Dam)	Center	Minakami Town			2,790	3,500	3,260	760						1,830		1,240	2,650	1,950					
8		Lake Sonohara (Sonohara Dam)	Center	Numata City			590	440	380	164						266		237	342	336					
9		Lake Akagionuma	Center	Maebashi City			1,060	1,860		980	1,000					1,040		790	640	5,100					
10	Agatsuma River Area	Lake Okushima (Shimogawa Dam)	Center	Nakanojo Town			560	630	4,300	1,520						1,110		438	1,710	1,600					
11		Lake Shimako (Nakanojo Dam)	Center				840	1,190	860	278						266		510	570	410					
12		Lake Tashiro (Kazawa Dam)	Center	Tsumagoi Village			850	110	1,260	1,160							1,420	1,120	1,180	1,320					
13	Karasu River	Lake Haruna	Center	Takasaki City/Hgashi-Agatsuma Town			47	460	148							266		490	112	520					
14		Lake Kirizumi (Kirizumi Dam)	Center	Annaka City			2,380	310	770	490						38		1,420	800	810					
15		Lake Usui (Sakamoto Dam)	Center				3,400	3,400	1,340	1,960							215		1,230	1,330	1,160				
16		Lake Arafune (Dodairagawa Dam)	Center	Shimonita Town			490	630	620	530						710		770	700	840					
17		Lake Oshio (Oshio Dam)	Center	Tomioaka City			340	660	400	320						650		830	1,170	700					
18	Lake Kanna (Shimokubo Dam)	Center	Fujioaka City/Kamikawa Town			178		320	410	93					173		100	119	222						
19	Lake Hebikami (Shozawa Dam)	Center	Kanna Town				111	720	610	770					660		520	590	550						
20	Watarase River Area	Lake Kusaki (Kusaki Dam)	Center	Midori City			650	1,010		720	1,670					390		361	400	345					
21		Lake Umeda (Kiryugawa Dam)	Center	Kiryu City			62	203		810	245						1,130	1,000	980	1,420					
22	Nakatsu River	Lake Nozori (Nozori Dam)	Center	Nakanojo Town			82	660	1,580	181							1,900	358	1,220						
23	Watarase River Area	Lake Jonuma	Center	Tatebayashi City			540		301	291	670					720		720	260	241					
24		Lake Tataranuma	Center				1,440		950	530	1,240						850		750	1,200	530				



6) Chiba Prefecture

In Chiba Prefecture, surveys were conducted 22 times from November 2011 to February 2017 for lake sediment samples collected at eight locations.

Regarding the concentration levels of detected values, one location was categorized into Category C, one location into Category D, and six locations into Category E (see Table 4.3-33 and Table 4.3-34).

Concentration levels were generally decreasing at seven locations and were unchanged at one location.

Table 4.3-33 Categorizations of detected values at respective locations  
(Chiba Prefecture: lake sediments)

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

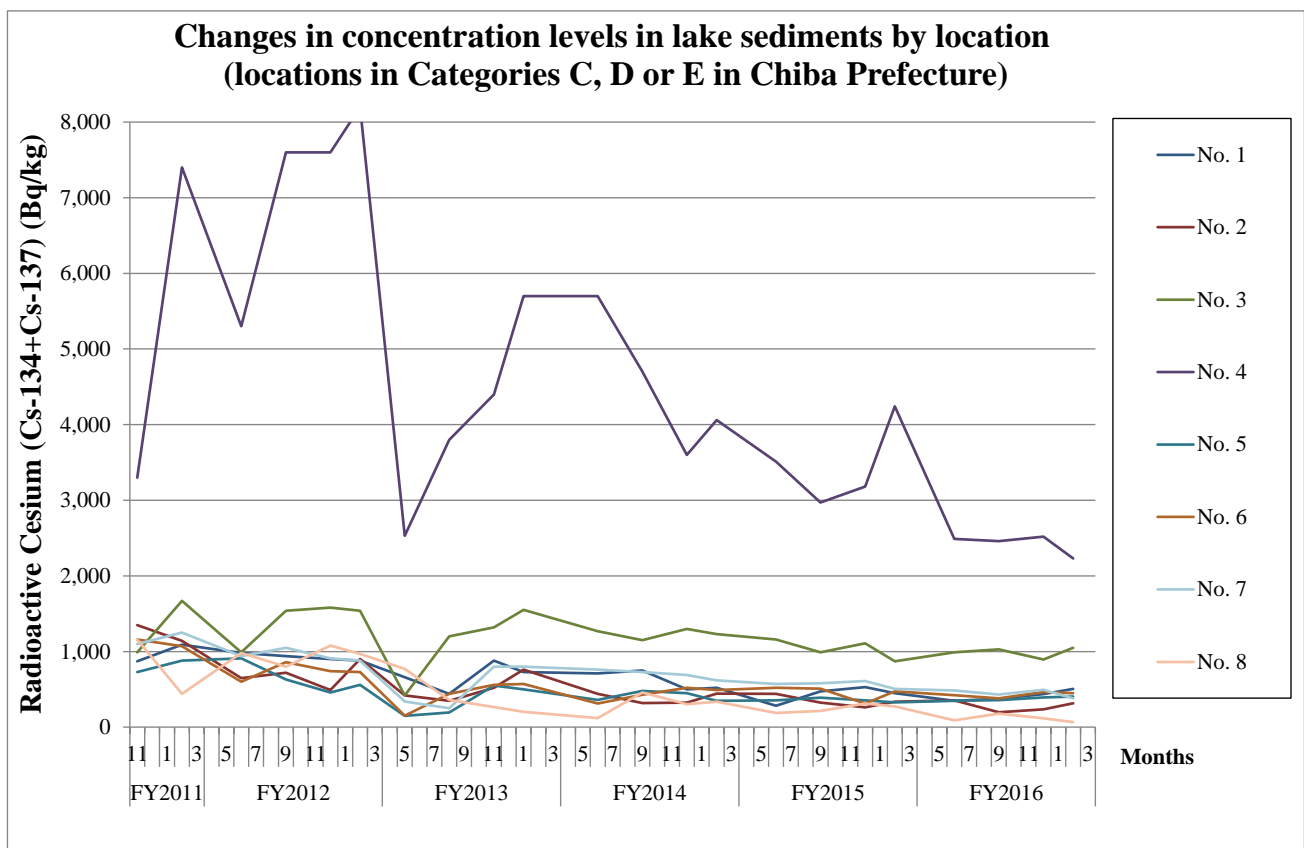


Figure 4.3-18 Changes in concentration levels over the years at respective locations  
(Chiba Prefecture: lake sediments)

Table 4.3-34 Detection of radioactive cesium at respective locations (Chiba Prefecture: lake sediments)

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																				
No.	Location	Municipality	FY2011									FY2012											
			8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Fusashita	Inzai City				870									980			940			900	880	
2	Shimoteganuma Chuo					1,350									650			720			490	900	
3	Teganuma Chuo	Abiko City/Kashiwa City				990									990			1,540			1,580	1,540	
4	Nedoshita					3,300									5,300			7,600			7,600	8,200	
5	Kita-Inbanuma Chuo	Inzai City/Narita City				730									880			910			630	460	560
6	Ipponmatsushita	Inzai City				1,160									1,070			600			860	740	730
7	Lower area of Josuido water intake	Sakura City				1,100									1,250			940			1,050	910	880
8	Asobashi Bridge	Yachiyo City				1,160									440			980			800	1,080	970
			total number of samples	176	Detection times	176																	

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																													
No.	Location	Municipality	FY2013									FY2014																				
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3						
1	Fusashita	Inzai City		660				440							880			730							710			750			500	520
2	Shimoteganuma Chuo				420				349							520			760							440			320			325
3	Teganuma Chuo	Abiko City/Kashiwa City			420			1,200							1,320			1,550							1,270			1,150			1,300	1,230
4	Nedoshita				2,530				3,800							4,400			5,700							5,700			4,700			3,600
5	Kita-Inbanuma Chuo	Inzai City/Narita City			151			195							550			500							360			480			450	350
6	Ipponmatsushita	Inzai City			152			440							560			570							313			430			520	490
7	Lower area of Josuido water intake	Sakura City			340			251							800			800							760			730			690	620
8	Asobashi Bridge	Yachiyo City			770			360							266			202							121			460			304	338

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location			Lake Sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																		Average of FY2015 (*2)	No.	coefficient of variation	Trends (*3)									
No.	Location	Municipality	FY2015									FY2016													Changes								
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1		2	3						
1	Fusashita	Inzai City			283			474							530			451							350			375			438	505	
2	Shimoteganuma Chuo				441			324								264			338							354			197			235	315
3	Teganuma Chuo	Abiko City/Kashiwa City			1,160			990								1,110			870							990			1,030			894	1,050
4	Nedoshita				3,510			2,970								3,180			4,240							2,490			2,460			2,520	2,230
5	Kita-Inbanuma Chuo	Inzai City/Narita City			355			391							354			328								348			357			392	405
6	Ipponmatsushita	Inzai City			520			509							313			473								424			380			465	451
7	Lower area of Josuido water intake	Sakura City			570			580							610			505								486			433			495	382
8	Asobashi Bridge	Yachiyo City			187			216							312			273								90			179			117	66
																					A	B	C	D	E	774	Average						

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

\*2: Arithmetic Average, calculated by assuming ND=0; Color codes show categories (see the right).

\*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2) Decreasing Increasing Unchanged Fluctuations

(2)-3 Coastal areas

1) Iwate Prefecture

In Iwate Prefecture, surveys were conducted 11 times from January 2012 to November 2016 for coastal area sediment samples collected at two locations.

Regarding the concentration levels of detected values, both locations were categorized into Category E (see Table 4.3-35 and Table 4.3-36).

Concentration levels were unchanged at one location and fluctuating at the other location.

Table 4.3-35 Categorizations of detected values at respective locations  
(Iwate Prefecture: coastal area sediments)

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

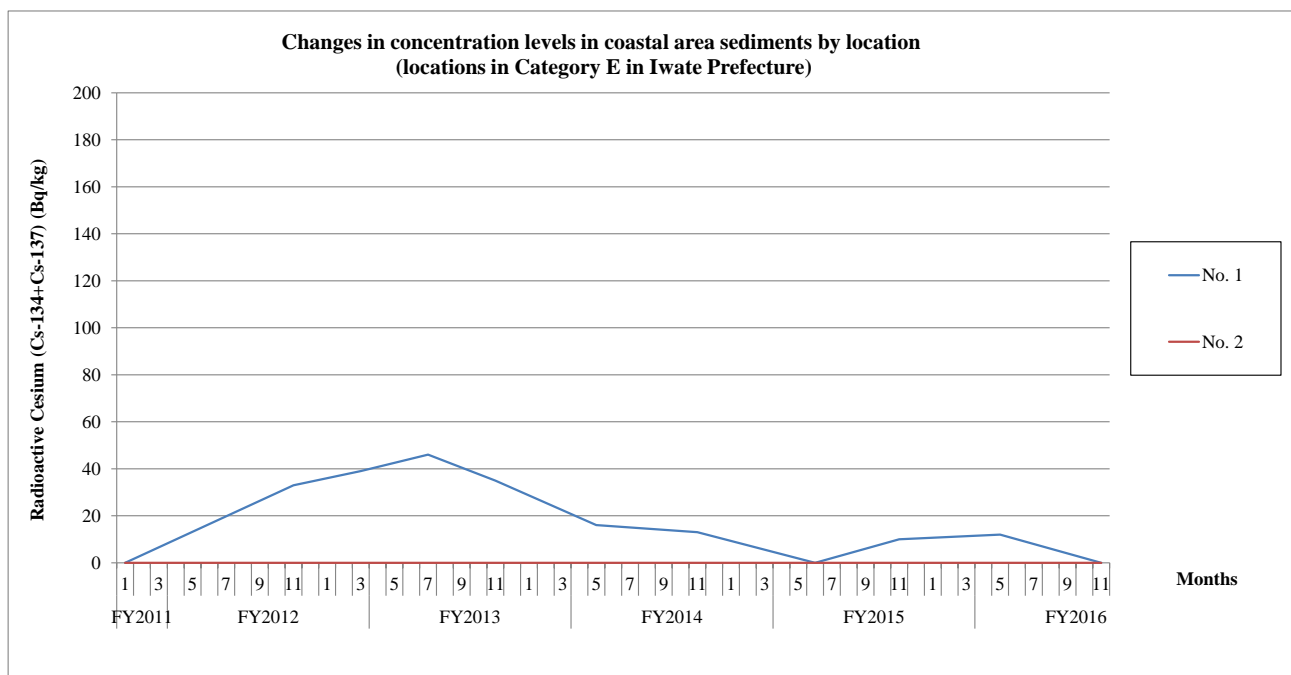


Figure 4.3-19 Changes in concentration levels over the years at respective locations  
(Iwate Prefecture: coastal area sediments)

Table 4.3-36 Detection of radioactive cesium at respective locations  
(Iwate Prefecture: coastal area sediments)

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																				
No.	Location	FY2011										FY2012										
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Ofunato Bay (A)						0										33				39	
2	Hirota Bay						0										0			0		
		total number of samples	22		Detection times	8																
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																						

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																						
No.	Location	FY2013										FY2014												
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	Ofunato Bay (A)				46					35					16					13				
2	Hirota Bay				0					0					0					0				
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																								

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																				Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)				
No.	Location	FY2015										FY2016																		
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3					
1	Ofunato Bay (A)			0						10					12					0										
2	Hirota Bay			0						0					0					0										
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																							A	B	C	D	E	3.0	Average	
*2: Arithmetic Average; calculated by assuming ND=0; Color codes show categories (see the right).																														
*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2																							↘	↗	↔	〰	〰			



## 2) Miyagi Prefecture

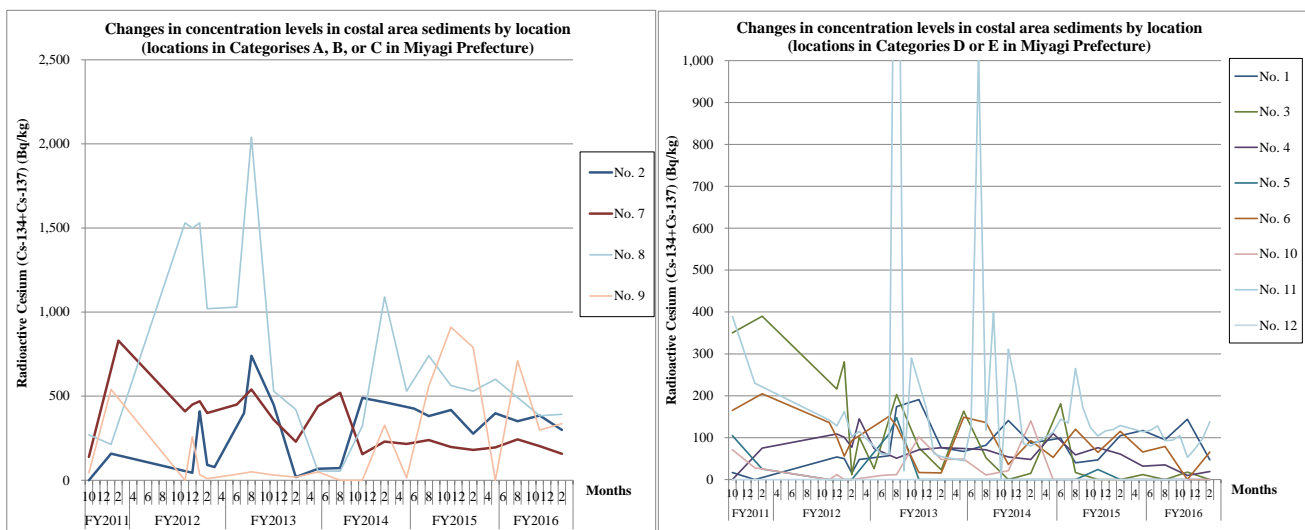
In Miyagi Prefecture, surveys were conducted 11 to 47 times from October 2011 to February 2017 for coastal area sediment samples collected at 12 locations (this analysis excludes the survey results from 28 locations where the survey was conducted only in 2011).

Regarding the concentration levels of detected values, one location was categorized into Category A, one location into Category B, two locations into Category C, three locations into Category D, and five locations into Category E (see Table 4.3-37 and Table 4.3-38).

Concentration levels were generally decreasing at three locations, unchanged at one location, fluctuating at seven locations, and increasing at one location.

Table 4.3-37 Categorizations of detected values at respective locations  
(Miyagi Prefecture: coastal area sediments)

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



Note: 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 4.3-20 Changes in concentration levels over the years at respective locations  
(Miyagi Prefecture: coastal area sediments)

Table 4.3-38 Detection of radioactive cesium at respective locations  
(Miyagi Prefecture: coastal area sediments)

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																							
No.	Location	FY2011												FY2012											
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
1	Kesennuma Bay (B) Offshore of Hachigasaki			17				0										54	50	16	48				
2	Kesennuma Bay (C) Offshore of Oshimakita			0			158											44	410	91	78				
3	All other neighboring sea areas Oppa Bay (Jyusanhama Beach)			350				390										216	281	12	101				
4	Neighboring sea area of Ishinomaki (C) Lake Mangokuura, M-6 (center)			0				75										109	101	77	145				
5	Neighboring sea area of Ishinomaki (B-3) Offshore of Kitakami River Estuary			105				25									0	0	0	0					
6	Neighboring sea area of Ishinomaki (C) Offshore of Naruse			165				205									136	101	56	93					
7	Matsushima Bay (B) Nishihama Beach			139				830									410	450	470	400					
8	Neighboring sea area of Sendai Port(A) Naiko Inner Port, 4-Nai			270			213										1,530	1,500	1,530	1,020					
9	Neighboring sea area of Sendai Port (B) Gamo-3			44			540										0	258	33	10					
10	All other neighboring sea areas Ido-5			71			28										0	12	0	0					
11	Offshore of Abukuma River Estuary			390			230										142	128	193	131					
12	Offshore of Tsuyagawa River Estuary			0													0			0					
		total number of samples						278						Detection times						225					

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																							
No.	Location	FY2013												FY2014											
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Kesennuma Bay (B) Offshore of Hachigasaki				57	174				191				76			67		82		141			87	
2	Kesennuma Bay (C) Offshore of Oshimakita				400	740				450			19			68		72		490			464		
3	All other neighboring sea areas Oppa Bay (Jyusanhama Beach)		26			203				76			23			163		52		0			15		
4	Neighboring sea area of Ishinomaki (C) Lake Mangokuura, M-6 (center)		74			51			71				76			74		71		54			48		
5	Neighboring sea area of Ishinomaki (B-3) Offshore of Kitakami River Estuary				109	148				0			0			0		0		0			0		
6	Neighboring sea area of Ishinomaki (C) Offshore of Naruse				151	128				17			16			149		136		36			93		
7	Matsushima Bay (B) Nishihama Beach			450		540				360			229			440		520		155			230		
8	Neighboring sea area of Sendai Port(A) Naiko Inner Port, 4-Nai			1,030		2,040				530			420			55		54		322			1,090		
9	Neighboring sea area of Sendai Port (B) Gamo-3			35		50				31			19			49		0		0			327		
10	All other neighboring sea areas Ido-5			10		12				102			48			49		11		21			140		
11	Offshore of Abukuma River Estuary			61	13	108	2,030	21	290			170	62	55			45	126	1,020	118	400	0	311		
12	Offshore of Tsuyagawa River Estuary			0						0						0				0			0		

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																								Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)					
No.	Location	FY2015												FY2016																					
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3										
1	Kesennuma Bay (B) Offshore of Hachigasaki			99		40				47				105			117		95		144			47											
2	Kesennuma Bay (C) Offshore of Oshimakita			426		382				418				277			398		351		385			299											
3	All other neighboring sea areas Oppa Bay (Jyusanhama Beach)			181		17				0				0			12		0		18			0											
4	Neighboring sea area of Ishinomaki (C) Lake Mangokuura, M-6 (center)			110		59				76				61			32		35		10			19											
5	Neighboring sea area of Ishinomaki (B-3) Offshore of Kitakami River Estuary			0		0				24				0			0		0		0			0											
6	Neighboring sea area of Ishinomaki (C) Offshore of Naruse			53		120				65				115			66		79		0			66											
7	Matsushima Bay (B) Nishihama Beach			216		239				198				180			195		243		203			157											
8	Neighboring sea area of Sendai Port(A) Naiko Inner Port, 4-Nai			530		740				563				530			601		492		383			392											
9	Neighboring sea area of Sendai Port (B) Gamo-3			15		560				910				790			0		710		298			337											
10	All other neighboring sea areas Ido-5			0		0				0				0			0		0		0			0											
11	Offshore of Abukuma River Estuary			113	144	135	265	171	124	104	116	119	129			114	117	128	93	94	105	53	73												
12	Offshore of Tsuyagawa River Estuary			0						0						0					0			0											
		A						B						C						D						E						137	Average		

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."  
 \*2: Arithmetic Average; calculated by assuming ND=0; Color codes show categories (see the right).  
 \*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2

### 3) Fukushima Prefecture

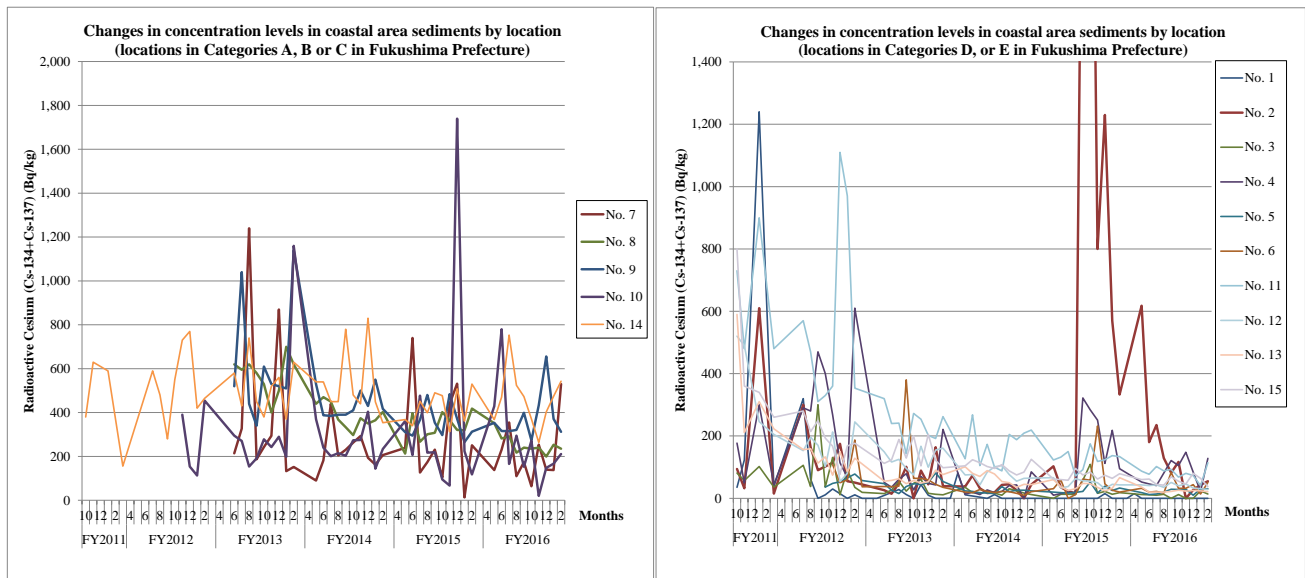
In Fukushima Prefecture, surveys were conducted 40 to 53 times from October 2011 to February 2017 for coastal area sediment samples collected at 15 locations (this analysis excludes the survey results from eight locations where the survey was conducted only once in 2011).

Regarding the concentration levels of detected values, one location was categorized into Category A, one location into Category B, three locations into Category C, five locations into Category D, and five locations into Category E (see Table 4.3-39 and Table 4.3-40).

Concentration levels were generally decreasing at 10 locations, unchanged at one location, and fluctuating at four locations.

Table 4.3-39 Categorizations of detected values at respective locations  
(Fukushima Prefecture: coastal area sediments)

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



Note: 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 4.3-21 Changes in concentration levels over the years at respective locations  
(Fukushima Prefecture: coastal area sediments)

Table 4.3-40 Detection of radioactive cesium at respective locations  
(Fukushima Prefecture: coastal area sediments) (No.1)

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)																					
No.	Location	FY2011									FY2012												
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Neighboring sea area of Soso	Approx. 2,000 m offshore of Tsurushihama Fishing Port			35	123		1,240		38				320	62	0	11	30	0	11	0	0	
2	Matsukawaura sea area	Around center of Fishing Right Area-1 in Matsukawaura sea area			94	32		610		15				300	164	90		105	123	175	55	53	48
3	Neighboring sea area of Soso	Approx. 2,000 m offshore of Manogawa River			81	57		102		36				106	38	300	36	131	11	91		35	19
4	Neighboring sea area of Haramachi City	Approx. 1,000 m offshore of Niida River			177	49		300		44				290	280	470	400	268	114	67		610	
5		Approx. 1,000 m offshore of Ota River															36	48	53			78	57
6		Approx. 1,000 m offshore of Odaka River																88	127	50	59	187	37
7		Approx. 2,000 m offshore of Ukedo River																					
8	Neighboring sea area of Soso District	Approx. 1,000 m offshore of Kumagawa River																					
9		Approx. 1,000 m offshore of Tomioka River																					
10	Neighboring sea area of Naraha Town	Approx. 1,000 m offshore of Kidogawa River															400	380	154	113	380	530	
11		Approx. 1,000 m offshore of Asami River Estuary			730	480		900		480				570	470	310	330	360	1,110	970	277	430	
12		Approx. 1,000 m offshore of Ohisa River Estuary			520	490		246		205				153	196	170	102	213	54	80	290	200	
13	Neighboring sea area of Iwaki City	Approx. 1,500 m offshore of Natsui River			590	211		310		223				156	159	113	133	74	150	86	125	132	
14	Onahama Port	Approx. 400 m north of Nishihouhatei No. 2			380	630		590		156				590	480	280	550	730	770	420	470	460	
15	Joban coastal sea area	Approx. 1,000 m offshore of Binda River			800	360		340		260				280	214	249	193	167	77	168	169	184	
			total number of samples		733		Detection times		689														
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																							

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*)																								
No.	Location	FY2013									FY2014															
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Neighboring sea area of Soso	Approx. 2,000 m offshore of Tsurushihama Fishing Port			28	12	0	44	10	0	0	0	81	11			0	12	0	0	0	0	0	0		
2	Matsukawaura sea area	Around center of Fishing Right Area-1 in Matsukawaura sea area			26	18	11	48	101	0	89	45	164	39			38	73	32	17	19	43	45	26	0	44
3	Neighboring sea area of Soso	Approx. 2,000 m offshore of Manogawa River			15	36	17	55	23	48	61	16	13	11			35	18	17	20	17	10	31	24	17	12
4	Neighboring sea area of Haramachi City	Approx. 1,000 m offshore of Niida River			51	33	38	61	79	27	70	48	43	221			13	20	12	27	18	22	41	43	0	85
5		Approx. 1,000 m offshore of Ota River			47	14	38	15	38	47	44	51	81	54			24	22	18	17	15	38	21	26	26	24
6		Approx. 1,000 m offshore of Odaka River			38	31	44	39	380	64	64	59	45	35			20	18	28	22	18	22	21	16	10	21
7	Neighboring sea area of Soso District	Approx. 2,000 m offshore of Ukedo River			214	420	234	1,240	187	243	294	870	133	152			90	182	440	205	230	263	293	194	163	206
8		Approx. 1,000 m offshore of Kumagawa River			620	570	620	620	580	530	400	500	700	620			440	470	450	368	333	297	374	350	365	403
9		Approx. 1,000 m offshore of Tomioka River			520	480	1,600	440	340	610	530	520	510	1,140			530	388	385	390	390	410	500	430	550	417
10	Neighboring sea area of Naraha Town	Approx. 1,000 m offshore of Kidogawa River			295	290	251	154	191	278	243	290	198	1,160			370	240	201	215	203	274	275	404	144	234
11		Approx. 1,000 m offshore of Asami River Estuary			320	290	190	241	143	272	254	202	192	262			127	268	105	173	100	88	205	188	209	219
12		Approx. 1,000 m offshore of Ohisa River Estuary			149	131	102	125	96	75	167	100	155	161			75	76	43	84	101	105	76	55	64	65
13	Neighboring sea area of Iwaki City	Approx. 1,500 m offshore of Natsui River			55	60	55	63	47	57	49	53	90	76			101	80	70	89	78	54	50	35	45	44
14	Onahama Port	Approx. 400 m north of Nishihouhatei No. 2			580	460	400	740	450	380	520	560	370	630			540	540	450	450	780	480	440	830	449	354
15	Joban coastal sea area	Approx. 1,000 m offshore of Binda River			112	139	108	189	129	200	104	205	122	98			104	124	114	102	96	108	88	75	84	125
*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																										

Table 4.3-40 Detection of radioactive cesium at respective locations  
(Fukushima Prefecture: coastal area sediments) (No.2)

No.	Location	Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																													Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)																																			
		FY2015														FY2016																																																						
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8						9	10	11	12																															
1	Neighboring sea area of Soso	Approx. 2,000 m offshore of Tsurushihama Fishing Port																											0	0	0	0	0	15	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	→	0	1	4.42	→		
2	Matsukawaura sea area	Around center of Fishing Right Area-1 in Matsukawaura sea area																											103	35	23	16	2,460	2,950	800	1,230	570	333			618	180	235	129	82	117	0	27	43	55															↕	149	2	2.27	↕	
3	Neighboring sea area of Soso	Approx. 2,000 m offshore of Manogawa River																											0	13	13	12	58	109	16	22	13	18			12	11	10	13	0	12	0	0	24	14															→	10	3	1.33	→	
4	Neighboring sea area of Haramachi City	Approx. 1,000 m offshore of Niida River																											10	15	20	17	322	284	251	112	218	95			52	46	41	81	121	105	148	84	22	128																→	83	4	1.10	→
5		Approx. 1,000 m offshore of Ota River																											20	18	17	19	22	52	17	39	25	33			18	12	14	20	29	28	29	10	30	31																→	22	5	0.53	→
6		Approx. 1,000 m offshore of Odaka River																											31	59	0	12	62	58	232	46	26	20			32	20	22	17	83	32	32	44	14	51															↕	35	6	1.23	↕	
7	Neighboring sea area of Soso District	Approx. 2,000 m offshore of Ukedo River																											239	740	127	174	231	104	440	532	13	251			138	231	355	110	174	64	254	140	138	530															↕	213	7	0.83	↕	
8		Approx. 1,000 m offshore of Kamagawa River																											213	397	267	301	308	402	365	321	319	418			351	282	292	217	240	235	240	199	253	235															→	254	8	0.35	→	
9		Approx. 1,000 m offshore of Tomioka River																											311	295	367	480	354	297	484	372	265	313			353	316	315	321	399	273	433	656	371	312																→	375	9	0.52	→
10	Neighboring sea area of Naraha Town	Approx. 1,000 m offshore of Kadogawa River																											361	206	477	217	219	95	67	1,740	224	118			429	780	166	295	153	272	20	148	167	211															↕	264	10	0.92	↕	
11	Approx. 1,000 m offshore of Asami River Estuary																											123	132	150	72	92	175	118	124	137	134			87	77	102	88	93	68	80	73	41	114																→	82	11	0.91	→	
12	Approx. 1,000 m offshore of Ohisa River Estuary																											66	33	38	63	56	55	50	31	45	43			43	41	43	35	51	40	46	33	31	28																→	39	12	0.92	→	
13	Neighboring sea area of Iwaki City	Approx. 1,500 m offshore of Natsui River																											60	57	25	31	48	47	35	24	32	66			36	20	20	20	22	26	23	25	24	21															→	24	13	1.12	→	
14	Onahama Port	Approx. 400 m north of Nishibouhatei No. 2																											368	340	452	399	490	477	312	508	361	530			368	470	753	524	473	371	264	403	474	543														↕	464	14	0.28	↕		
15	Joban coastal sea area	Approx. 1,000 m offshore of Binda River																											62	60	58	96	75	84	62	74	64	79			60	62	45	42	69	55	46	80	64	38															→	56	15	0.88	→	
		*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																																																														138	Average					
		*2: Arithmetic Average; calculated by assuming ND=0; Color codes show categories (see the right).																																																																				
		*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2)																																																																				

#### 4) Ibaraki Prefecture

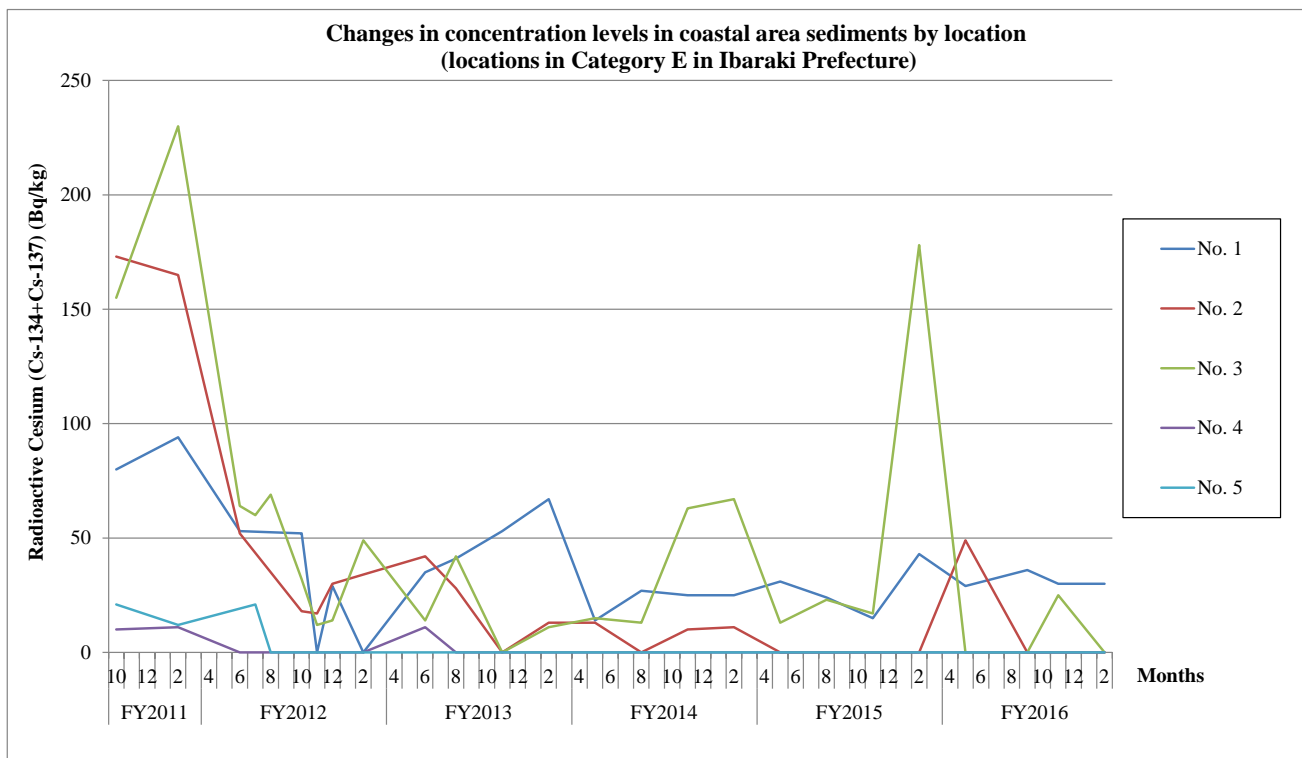
In Ibaraki Prefecture, surveys were conducted 23 to 25 times from October 2011 to February 2017 for coastal area sediment samples collected at five locations.

Regarding the concentration levels of detected values, all five locations were categorized into Category E (see Table 4.3-41 and Table 4.3-42).

Concentration levels were generally decreasing at three locations and fluctuating at two locations.

Table 4.3-41 Categorizations of detected values at respective locations  
(Ibaraki Prefecture: coastal area sediments)

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



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

Figure 4.3-22 Changes in concentration levels over the years at respective locations  
(Ibaraki Prefecture: coastal area sediments)

Table 4.3-42 Detection of radioactive cesium at respective locations  
(Ibaraki Prefecture: coastal area sediments)

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																					
No.	Location	FY2011					FY2012																
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Offshore of Satone River Estuary						94						53						52	0	29		0
2	Offshore of Okita River Estuary				173					165				52					18	17	30		34
3	Offshore of Momiya River/Kujigawa River Estuaries				155					230				64	60	69		32	12	14		49	
4	Neighboring water body of Ken-o Offshore of Nakagawa River				10					11				0	0	0		0	0	0		0	
5	Offshore of Tonegawa River Estuary				21					12					17	25	0		0	0		0	
		total number of samples			121	Detection times		63															

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																							
No.	Location	FY2013					FY2014																		
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Offshore of Satone River Estuary				35	41				53				67				14				25		25	
2	Offshore of Okita River Estuary				42	28				0				13			13				0		10		11
3	Offshore of Momiya River/Kujigawa River Estuaries				14	42				0				11			15				13		63		67
4	Neighboring water body of Ken-o Offshore of Nakagawa River				11	0				0				0			0				0		0		0
5	Offshore of Tonegawa River Estuary				0	0				0				0			0				0		0		0

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)															Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)								
No.	Location	FY2015					FY2016																						
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
1	Offshore of Satone River Estuary				31	24				15				43				29				30		30	Fluctuations	31	1	0.63	↕
2	Offshore of Okita River Estuary				0	0				0				0			49				0		0	Decreasing	12	2	1.66	↘	
3	Offshore of Momiya River/Kujigawa River Estuaries				13	23				17				178				0			0		25	Fluctuations	6.3	3	1.26	↕	
4	Neighboring water body of Ken-o Offshore of Nakagawa River				0	0				0				0				0			0		0	Decreasing	0	4	2.77	↘	
5	Offshore of Tonegawa River Estuary				0	0				0				0				0			0		0	Decreasing	0	5	2.43	↘	
																		10	Average										

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

\*2: Arithmetic Average; calculated by assuming ND=0; Color codes show categories (see the right).  
A B C D E

\*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2  
 ↘ Decreasing    ↗ Increasing    ~ Unchanged    〰 Fluctuations

### 5) Chiba Prefecture and Tokyo Metropolis

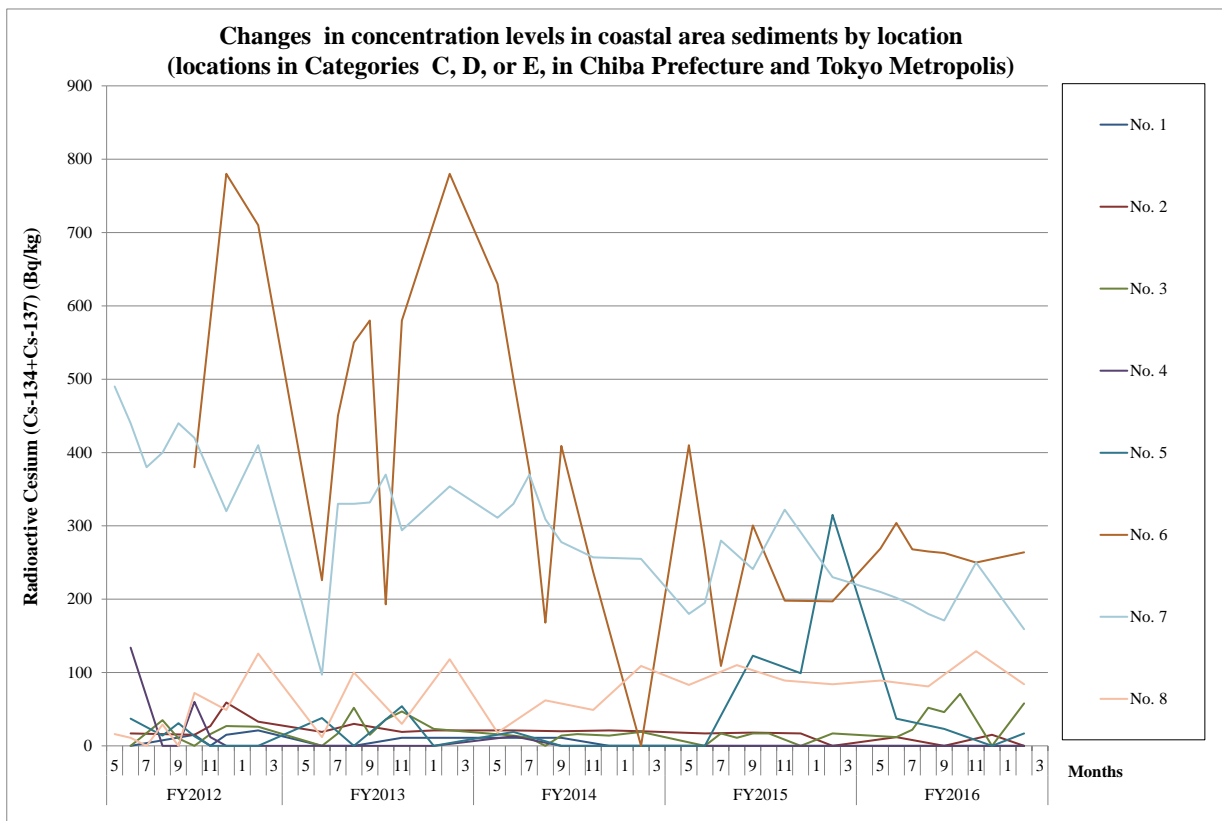
In Chiba Prefecture and Tokyo Metropolis, surveys were conducted 21 to 36 times from May 2012 to February 2017 for coastal area sediment samples collected at eight locations in total.

Regarding the concentration levels of detected values, one location was categorized into Category C, three locations were categorized into Category D and four locations were categorized into Category E (see Table 4.3-43 and Table 4.3-44).

Concentration levels were generally decreasing at five locations and fluctuating at three locations.

**Table 4.3-43 Categorizations of detected values at respective locations  
(Chiba Prefecture and Tokyo Metropolis: coastal area sediments)**

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



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

**Figure 4.3-23 Changes in concentration levels over the years at respective locations  
(Chiba Prefecture and Tokyo Metropolis: coastal area sediments)**



Table 4.3-44 Detection of radioactive cesium at respective locations  
(Chiba Prefecture and Tokyo Metropolis: coastal area sediments)

No.	Prefecture	Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																									
				FY2011									FY2012																
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3						
1	Chiba Prefecture	Tokyo Bay 7	Offshore of Yorogawa River Estuary																	0			15	0	15		21		
2		Tokyo Bay 5	Offshore of Miyako River Estuary																		17			15	27	59		33	
3		Coastal sea area of Makuhari	Offshore of Inbanuma Discharge Channel																		0	35	10	0	16	27		26	
4		Approx. 1 km offshore of Ehigawa River Estuary	Coastal area of Keiyo Port (Ehigawa River Estuary)																		134	0	0	60	12	0		0	
5		Approx. 1 km offshore of Edogawa River Estuary																				37	14	31	13	0	0		0
6	Tokyo Metropolis	Approx. 1 km offshore of Kyu-Edogawa River Estuary	Offshore of Kyu-Edogawa River Estuary																						380		780	710	
7		St-8	Offshore of Arakawa River/Kyu-Edogawa River Estuaries																		490	440	380	400	440	420		320	410
8		Southwestern area of Toyosu Wharf	Offshore of Sumida River Estuary																			16	11	0	29	0	72		49
				total number of samples	214	Detection times		158																					

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

No.	Prefecture	Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																								
				FY2013									FY2014															
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Chiba Prefecture	Tokyo Bay 7	Offshore of Yorogawa River Estuary			0		0				11		11							11			11			0	0
2		Tokyo Bay 5	Offshore of Miyako River Estuary			19		30				19		21							21			20			21	20
3		Coastal sea area of Makuhari	Offshore of Inbanuma Discharge Channel			0	17	52	15	36	47										14	11	0	14	16		14	19
4		Approx. 1 km offshore of Ehigawa River Estuary	Coastal area of Keiyo Port (Ehigawa River Estuary)			0	0		0		0											13		0			0	0
5		Approx. 1 km offshore of Edogawa River Estuary				38	0					54										19			0			0
6	Tokyo Metropolis	Approx. 1 km offshore of Kyu-Edogawa River Estuary	Offshore of Kyu-Edogawa River Estuary			226	450	550	580	193	580			780							630	500	375	168	409		237	0
7		St-8	Offshore of Arakawa River/Kyu-Edogawa River Estuaries			97	330	330	332	370	294			354							311	330	370	309	278		257	255
8		Southwestern area of Toyosu Wharf	Offshore of Sumida River Estuary			12		100			30			118							18		62			49		109
				*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																								

\*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."

No.	Prefecture	Location		Coastal area sediments/Radioactive Cesium (Cs-134+Cs-137)/Concentration(Bq/kg)(*1)																		Changes	Average of FY2016 (*2)	No.	coefficient of variation	Trends (*3)				
				FY2015									FY2016																	
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9						10	11	12	1
1	Chiba Prefecture	Tokyo Bay 7	Offshore of Yorogawa River Estuary			0		0				0		0						0		0		0		0		0		
2		Tokyo Bay 5	Offshore of Miyako River Estuary			17				18			17		0						12			0		15		0		
3		Coastal sea area of Makuhari	Offshore of Inbanuma Discharge Channel			0	17	11	17	17		0	17								12	22	52	46	71		0	58		
4		Approx. 1 km offshore of Ehigawa River Estuary	Coastal area of Keiyo Port (Ehigawa River Estuary)						0		0		0								0		0		0		0		0	
5		Approx. 1 km offshore of Edogawa River Estuary				0			123			99		315								37			23			0	17	
6	Tokyo Metropolis	Approx. 1 km offshore of Kyu-Edogawa River Estuary	Offshore of Kyu-Edogawa River Estuary	410	267	109		266	335		198			197						269	304	268	265	263		250		264		
7		St-8	Offshore of Arakawa River/Kyu-Edogawa River Estuaries	180	195	280		248	234		322			230						210	202	192	180	171		250		159		
8		Southwestern area of Toyosu Wharf	Offshore of Sumida River Estuary	83				110			89			84						89			81			129		84		
				*1: Blank cells are locations where samples were not collected. The result "Not detectable" is indicated as "0."																		A	B	C	D	E	78	Average		

\*2: Arithmetic Average; calculated by assuming ND=0; Color codes show categories (see the right).

\*3: Results of the analysis of trends at respective locations using the method explained on 4.3(1) 2) → Decreasing → Increasing ~ Unchanged ~ Fluctuations

### (3) Conclusion

The concentration levels of detected values for sediment samples from public water areas (rivers, lakes, and coastal areas) from FY2011 to FY2016 and their changes shown so far are summarized as follows (see Figure 4.3-24 and Table 4.3-45).

#### 1) Concentration levels of detected values

##### • Rivers

Out of all surveyed locations (396 locations), the number categorized into Categories A and B, which fall under the upper 10%, was the largest in Hamadori in Fukushima Prefecture (18 locations). Other such locations were also found in Nakadori and Aizu in Fukushima Prefecture, Ibaraki Prefecture, Gunma Prefecture and Chiba Prefecture.

##### • Lakes

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

##### • Coastal areas

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

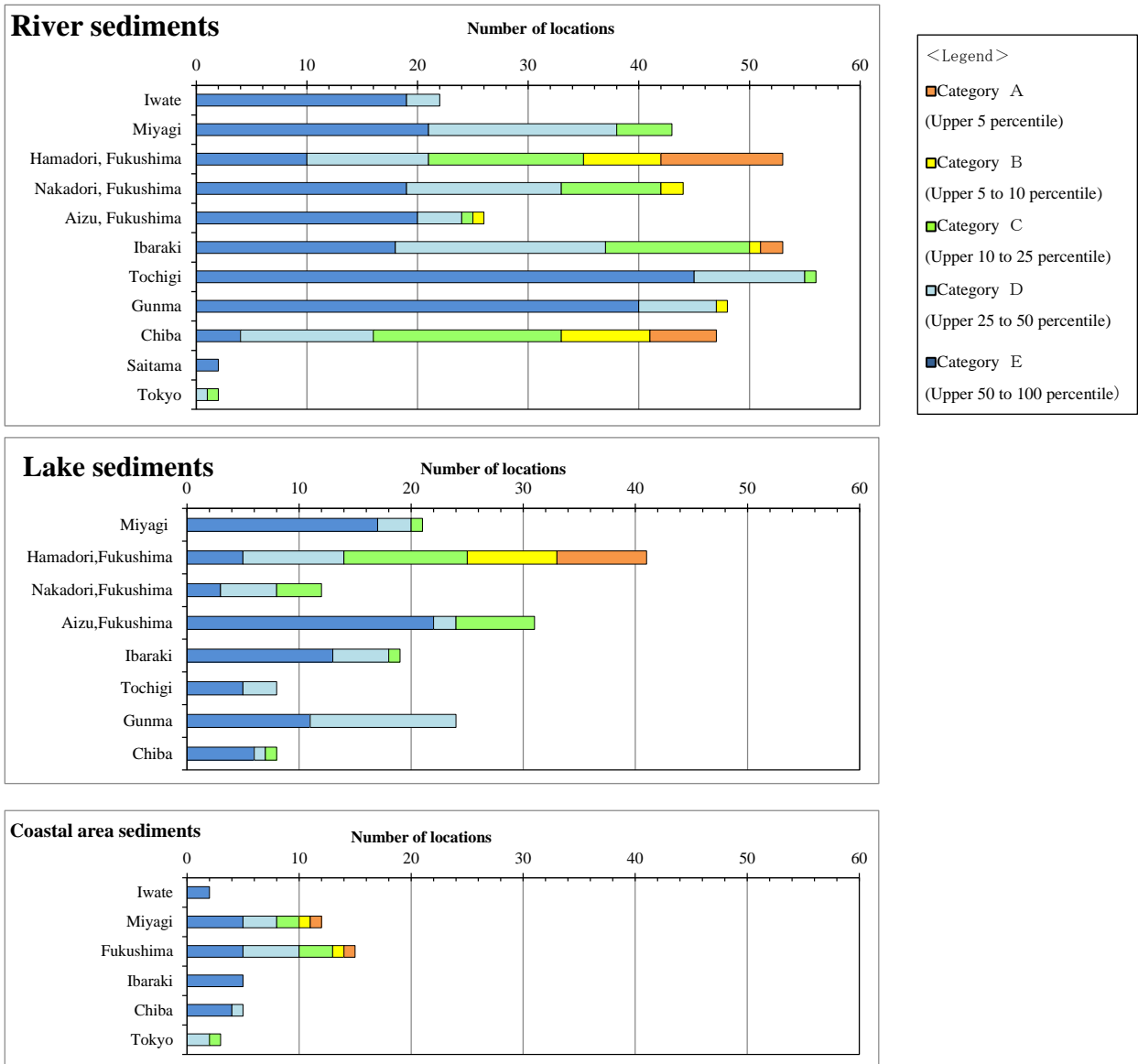


Figure 4.3-24 Categorizations by concentration levels of detected values for sediment samples  
 (upper: rivers; middle: lakes; lower: coastal areas)  
 (\* Figure 4.3-24 shows the aforementioned Table 3.1-1 graphically.)

## 2) Changes in detected values

### • Rivers

A decreasing trend was observed at most locations.

### • Lakes

Detected values were generally decreasing or unchanged at most locations but some locations showed fluctuations.

### • Coastal areas

A decreasing trend was observed at most locations but some locations showing fluctuations.

Table 4.3-45 Changes in detected values for sediment samples from public water areas (rivers, lakes, and coastal areas)

#### <Rivers>

Trends	Number of locations												Total	
	Iwate	Miyagi	Fukushima			Ibaraki	Tochigi	Gunma	Chiba	Saitama	Tokyo	Total		
			Hamadori	Nakadori	Aizu							Number of locations	Percentage	
Decreasing	19	35	49	42	20	46	40	32	38	2	1	324	81.8	
Unchanged	0	0	1	0	0	2	0	1	1	0	1	6	1.5	
Fluctuations	3	8	3	2	6	5	16	15	8	0	0	66	16.7	
Increasing	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
Total	22	43	53	44	26	53	56	48	47	2	2	396	100.0	

#### <Lakes>

Trends	Number of locations										Total	
	Miyagi	Fukushima			Ibaraki	Tochigi	Gunma	Chiba	Total			
		Hamadori	Nakadori	Aizu					Number of locations	Percentage		
Decreasing	12	21	5	8	9	2	10	7	74	45.1		
Unchanged	3	4	2	4	6	0	6	1	26	15.9		
Fluctuations	6	15	5	13	4	4	7	0	54	32.9		
Increasing	0	1	0	6	0	2	1	0	10	6.1		
Total	21	41	12	31	19	8	24	8	164	100.0		

#### <Coastal areas>

Trends	Number of locations							Total	
	Iwate	Miyagi	Fukushima	Ibaraki	Chiba	Tokyo	Total		
							Number of locations	Percentage	
Decreasing	0	3	10	3	3	2	21	50.0	
Unchanged	1	1	1	0	0	0	3	7.1	
Fluctuations	1	7	4	2	2	1	17	40.5	
Increasing	0	1	0	0	0	0	1	2.4	
Total	2	12	15	5	5	3	42	100.0	

### 3) Summary by prefecture

Concentration levels of detected values and their changes are summarized by prefecture as follows (see Figures 4.3-25 to 4.3-27).

#### (i) Iwate Prefecture

- For rivers, all the 22 surveyed locations were categorized into either Category D or E. A decreasing trend was observed at most locations.
- For coastal areas, the two surveyed locations were categorized into Category E. An unchanged trend was observed at most locations except for some locations that showed fluctuations.

#### (ii) Miyagi Prefecture

- For rivers, of the 43 surveyed locations, some locations in the lower reaches were categorized into Category C, but over 80% of the surveyed locations were categorized into Category D or E. A decreasing trend was observed at most locations.
- For lakes, of the 21 surveyed locations, most locations were categorized into Category D or E, while one location was categorized into Category C. Concentration levels were generally decreasing or unchanged except for some locations that showed fluctuations.
- For coastal areas, approximately 70% of the 12 surveyed locations were categorized into Category D or E, rest of them were categorized into Category A, B or C. There was a location categorized into Category A in the Sendai Port. Although concentration levels were fluctuating at some locations, most other locations showed decreasing or unchanged trends.

#### (iii) Hamadori, Fukushima Prefecture

- For rivers, approximately 60% of the 53 surveyed locations were categorized into Category A, B or C. Many locations categorized into Category A or B were found near to or northwest of Fukushima Daiichi NPS, while locations categorized into Category C were seen in the northern and southern parts of the district. A decreasing trend was observed at most locations.
- For lakes, approximately 70% of the 41 surveyed locations were categorized into Category A, B or C. Many locations categorized into Category A or B were found northwest of Fukushima Daiichi NPS. A decreasing or unchanged trend was observed generally except for some locations that showed fluctuations.
- For coastal areas, approximately 70% of the 15 surveyed locations were categorized into Category D or E, and the rest were categorized into Category A, B, or C. One location categorized into Category A was seen in Onahama port. A decreasing trend was generally observed except for some locations that showed fluctuations.

#### (iv) Nakadori, Fukushima Prefecture

- For rivers, more than 70% of the 44 surveyed locations were categorized into Category D or E, and the rest were categorized into Category B or C. The locations categorized into Category B or C were found between the center and the northern part of the Abukuma River system. A decreasing trend was observed at most locations.
- For lakes, eight of the 12 surveyed locations were categorized into Category D or E, and the remaining four locations were categorized into Category C. The locations categorized into Category C were seen in the

upper and lower reaches of the Abukuma River basin. A decreasing or unchanged trend was generally observed except for some locations that showed fluctuations.

(v) Aizu, Fukushima Prefecture

- For rivers, one of the 26 surveyed locations was categorized into Category B, one location was categorized into C, and all the remaining locations were categorized into Category D or E. A decreasing trend was observed at most locations.
- For lakes, seven of the 31 surveyed locations were categorized into Category C, and approximately 80% of the locations were categorized into Category D or E. Although concentration levels were fluctuating at some locations, decreasing or unchanged trends were observed at rest of the locations.

(vi) Ibaraki Prefecture

- For rivers, approximately 70% of the 53 surveyed locations were categorized into Category D or E, and the rest were categorized into Category A, B, or C. The locations categorized into Category A or B were found in rivers flowing into Lake Kasumigaura. A decreasing trend was observed at most locations.
- For lakes, out of the 19 surveyed locations, one in the northern part of the prefecture was categorized into Category C, and the remaining locations were categorized into Category D or E. A decreasing or unchanged trend was observed at most locations.
- For coastal areas, all the five surveyed locations were categorized into Category E. A decreasing trend was generally observed at most locations except for some locations that showed fluctuations.

(vii) Tochigi Prefecture

- For rivers, one of the 56 surveyed locations was categorized into Category C, and the remaining locations were categorized into Category D or E. A decreasing trend was generally observed except for some locations that showed fluctuations.
- For lakes, all eight locations were categorized into Category D or E. Concentration levels were fluctuating at many of the locations, and rest of the locations showed a variety of trends.

(viii) Gunma Prefecture

- For rivers, of the 48 surveyed locations, some locations in the lower reaches of the Watarase River basin were categorized into Category B, and all the remaining locations were categorized into Category D or E. A decreasing trend was generally observed except for some locations that showed fluctuations.
- For lakes, all the 24 surveyed locations were categorized into Category D or E. Although concentration levels were fluctuating at some locations, decreasing or unchanged trends were generally observed.

(ix) Chiba and Saitama Prefectures and Tokyo Metropolis

- For rivers, over 60% of the 51 surveyed locations were categorized into Category A, B, or C. The locations categorized into 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. A decreasing trend was observed at most locations.
- For lakes, one of the eight surveyed locations, in Lake Teganuma, was categorized into Category C, and all the remaining locations were categorized into Category D or E. A decreasing trend was observed at most locations.

- For coastal areas, one of the eight surveyed locations, the mouth of the Kyuedogawa River, was categorized into Category C, and all remaining locations were categorized into Category D or E. A decreasing trend was observed at most locations except for some locations that showed fluctuations.

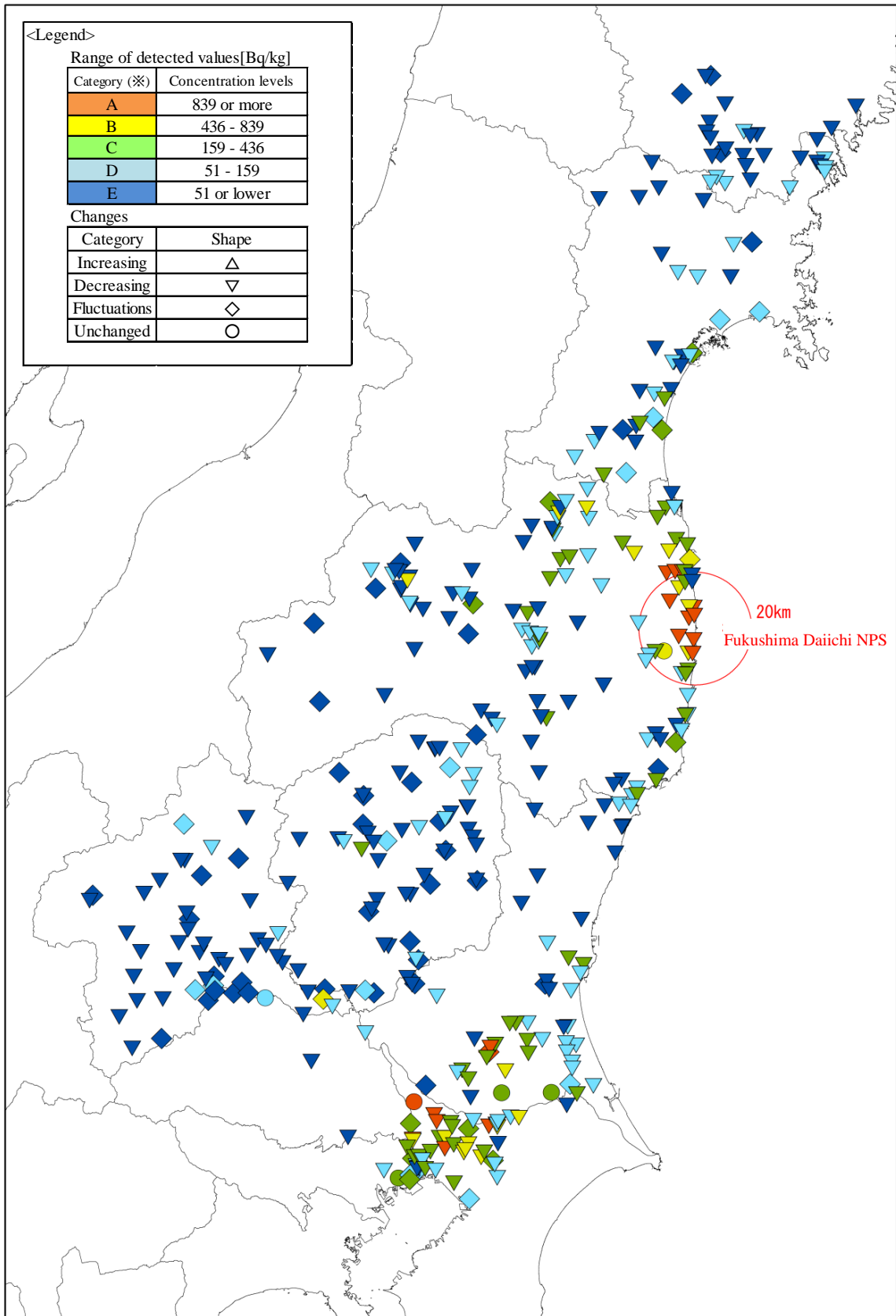


Figure 4.3-25 Categorization of and changes in concentration levels for river sediment samples from public water areas

(\*) 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.



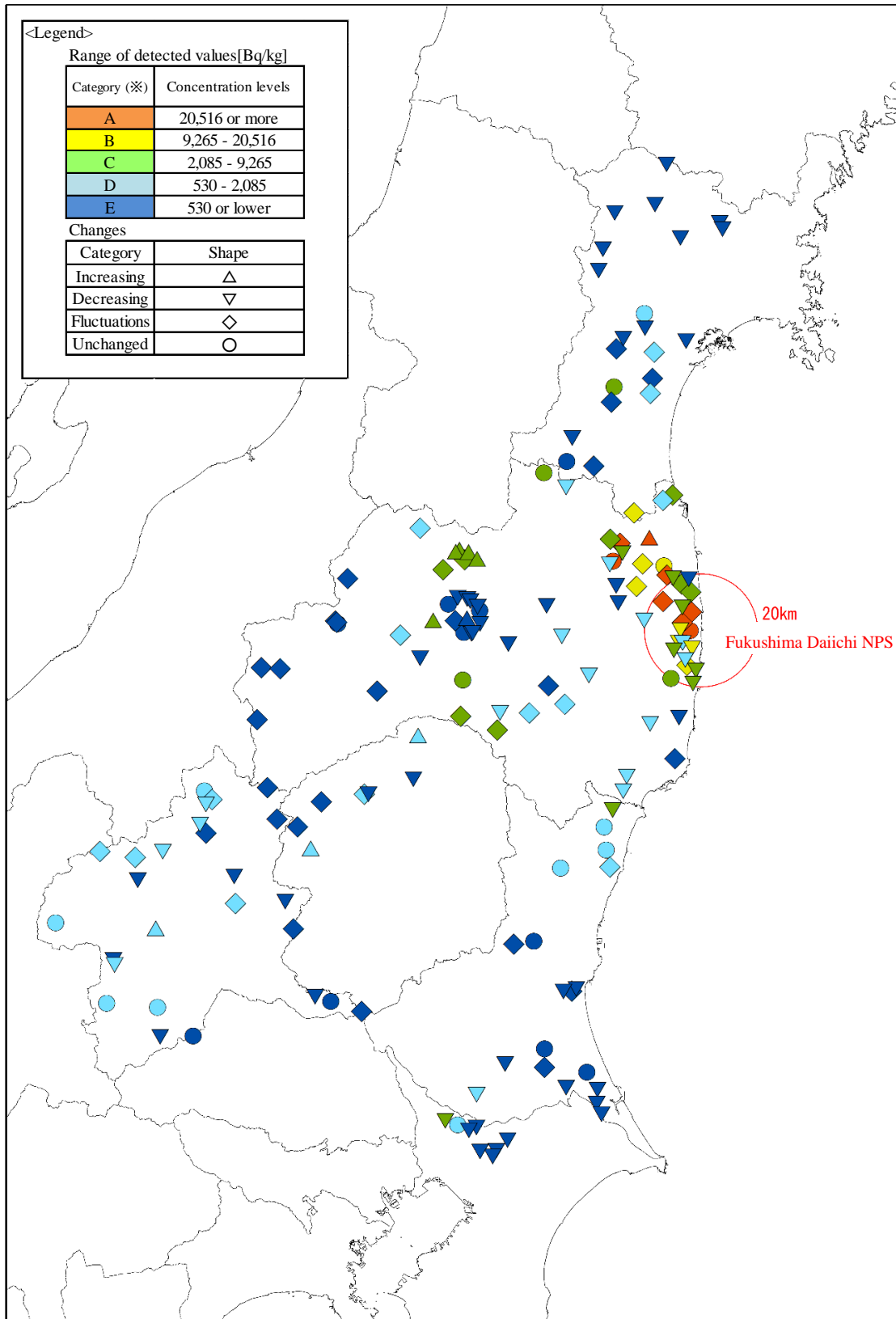


Figure 4.3-26 Categorization of and changes in concentration levels for lake sediment samples from public water areas

(\*) 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.

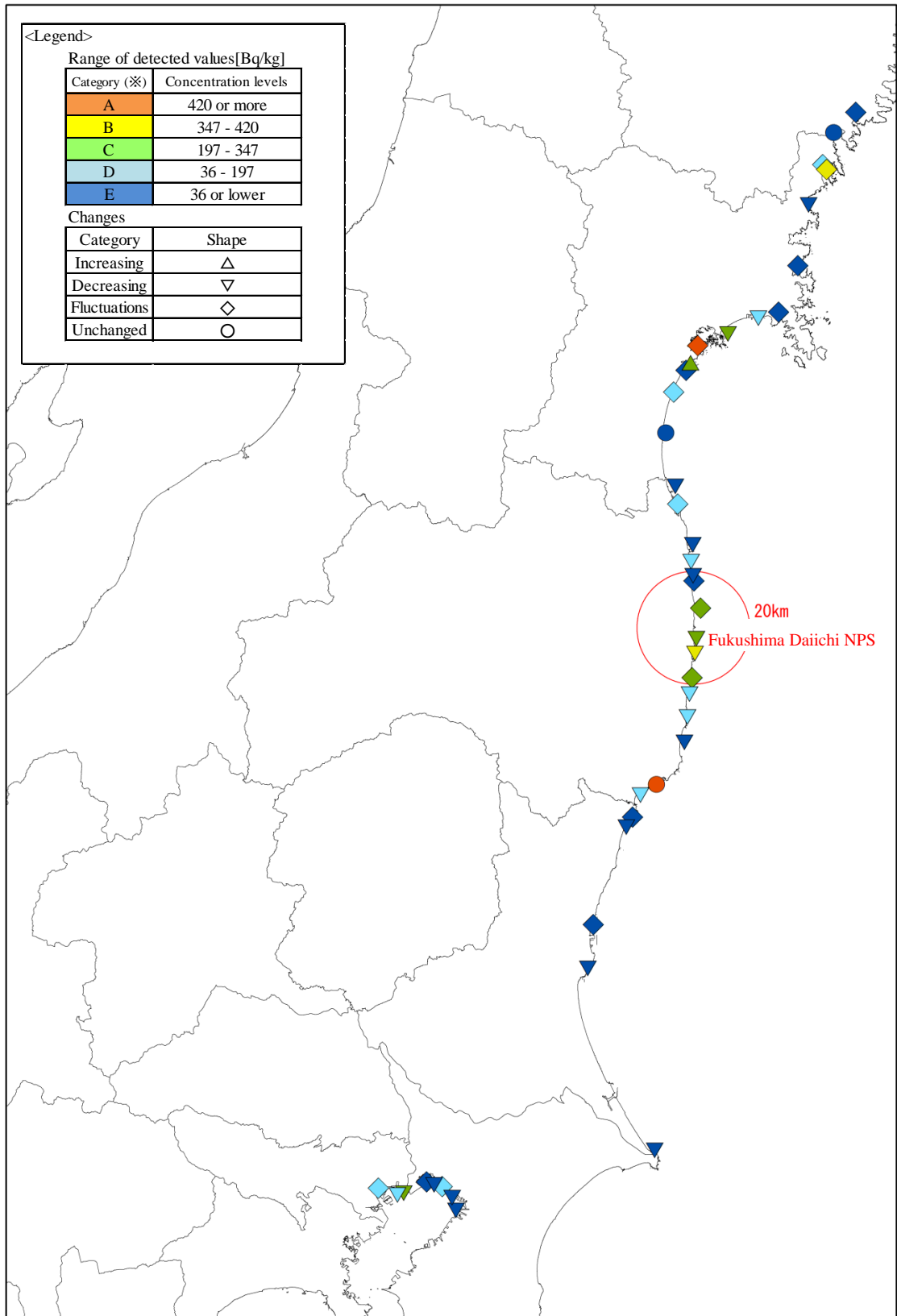


Figure 4.3-27 Categorization of and changes in concentration levels for coastal area sediment samples from public water areas

(\*) 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.

## 5 Results (Radionuclides Other than Radioactive Cesium)

### 5.1 Radioactive strontium (Sr-90 and Sr-89)

#### (1) Public water areas

##### 1) Outline

In principle, radioactive strontium was measured at locations where the radioactive cesium concentration in the sediments was high. Sediment samples from public water areas (rivers, lakes, and coastal areas) were surveyed for Sr-90 from FY2011 to FY2016, and those from public water areas (rivers and lakes) for Sr-89 in FY2011, respectively. The status of the survey and the summary of the survey results are as shown in Table 5.1-1 (detection limits: approx. 1 Bq/kg for Sr-90, and approx. 2 Bq/kg for Sr-89).

In addition, in FY2016, Sr-90 was surveyed (detection limit: approx. 1Bq/L for Sr-90 in water) for 45 water samples collected on the same day at the same locations (two locations in Miyagi, 32 locations in Fukushima, two locations in Ibaraki and eight locations in Gunma) where Sr-90 was detected at 1.0 Bq / kg or more in public water areas (lakes).

The detection status by medium for Sr-90 is as shown in 2) and 3).

Although a single 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.

#### 2) Detection of Sr-90 in sediment samples

##### (i) River sediments

Sr-90 was detected in 12 out of 23 river sediments samples surveyed in FY2016 (detection rate: 52.2%). Detected values were less than 1 Bq/kg (see Table 5.1-1).

Sr-90 has been continuously detected since FY2011 at some locations in 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 5.1-1).

##### (ii) Lake sediments

In FY2016, 66 lake sediments samples were surveyed for Sr-90; Sr-90 was detected in 65 samples (detection rate: 98.5%) (see Table 5.1-1). Sr-90 has been continuously detected until FY2016 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 FY2016 was from not detectable to 100 Bq/kg(see Figure 5.1-1).

##### (iii) Coastal area sediments

In FY2016, 32 coastal area sediment samples were surveyed; Sr-90 was detected in two samples collected in Fukushima Prefecture (detection rate: 6.3%) (see Table 5.1-1). Measured values ranged from not detectable to 0.38 Bq/kg, which were lower values than those obtained from rivers and lakes.

#### 3) Detection of Sr-90 in water

Surveys on 45 water samples, which were collected on the same day from the same public water area (lakes)

sediments where Sr-90 was detected at 1.0 Bq/kg or more, were conducted. Sr-90 was not detectable at any surveyed locations even in measurements at the lower limit value (0.032 to 0.047 Bq/L) which was even lower than 1 Bq/L.

Table 5.1-1 Detection of Sr-90 and Sr-89 in sediment samples from public water areas (rivers, lakes, and coastal areas)

○ Sr-90

Property	Prefecture	FY2011				FY2012				FY2013				FY2014			
		Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)
Rivers	Miyagi	2	2	100.0	0.40 - 1.10	7	1	14.3	ND - 1.2	5	3	60.0	ND - 0.56	4	3	75.0	ND - 0.52
	Fukushima	7	7	100.0	1.2 - 4.1	25	15	60.0	ND - 12	16	10	62.5	ND - 2.9	14	9	64.3	ND - 1.5
	Ibaraki	1	1	100.0	1.6 - 1.6	4	1	25.0	ND - 1.8	6	4	66.7	ND - 1.8	6	2	33.3	ND - 0.89
	Tochigi	1	1	100.0	1.3 - 1.3	2	0	0.0	ND	2	1	50.0	ND - 0.23	2	1	50.0	ND - 0.53
	Gunma	1	1	100.0	0.70 - 0.70	2	0	0.0	ND	2	1	50.0	ND - 0.44	1	0	0.0	ND
	Chiba	1	1	100.0	1.1 - 1.1	4	0	0.0	ND	4	2	50.0	ND - 0.49	4	1	25.0	ND - 0.40
	Total	13	13	100.0	0.40 - 4.1	44	17	38.6	ND - 12	35	21	60.0	ND - 2.9	31	16	51.6	ND - 1.5
Lakes	Miyagi	1	1	100.0	1.6 - 1.6	3	2	66.7	ND - 2.1	5	5	100.0	0.30 - 2.2	6	5	83.3	ND - 0.96
	Fukushima	3	3	100.0	3.3 - 6.8	41	41	100.0	2.1 - 93	40	40	100.0	0.70 - 55	39	39	100.0	0.70 - 50
	Ibaraki	2	2	100.0	0.70 - 3.3	6	1	16.7	ND - 7.0	6	5	83.3	ND - 5.2	6	6	100.0	0.57 - 3.0
	Tochigi	1	1	100.0	1.3 - 1.3	2	1	50.0	ND - 1.6	2	2	100.0	0.74 - 0.93	2	2	100.0	1.0 - 1.1
	Gunma	1	1	100.0	2.0 - 2.0	2	2	100.0	1.9 - 2.2	2	1	50.0	ND - 1.7	2	2	100.0	1.5 - 1.7
	Chiba	1	1	100.0	1.4 - 1.4	4	1	25.0	ND - 4.4	2	1	50.0	ND - 1.8	4	3	75.0	ND - 2.5
	Total	9	9	100.0	0.70 - 6.8	58	48	82.8	ND - 93	57	54	94.7	ND - 55	59	57	96.6	ND - 50
Coastal areas	Miyagi	0	0	-	-	2	0	0.0	ND	4	0	0.0	ND	2	0	0.0	ND
	Fukushima	0	0	-	-	21	0	0.0	ND	30	1	3.3	ND - 0.33	30	2	6.7	ND - 0.58
	Tokyo	0	0	-	-	2	0	0.0	ND	0	0	-	-	0	0	-	-
	Total	0	0	-	-	25	0	0.0	ND	34	1	2.9	ND - 0.33	32	2	6.3	ND - 0.58

○ Sr-89

Prefecture	River		Lake	
	Number of samples	Detection times	Number of samples	Detection times
Miyagi	2	0	1	0
Fukushima	7	0	3	0
Ibaraki	1	0	2	0
Tochigi	1	0	1	0
Gunma	1	0	1	0
Chiba	1	0	1	0
Total	13	0	9	0

Property	Prefecture	FY2015				FY2016				Total			
		Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/kg)
Rivers	Miyagi	2	0	0.0	ND	2	1	50.0	ND - 0.43	22	10	45.5	ND - 1.2
	Fukushima	10	5	50.0	ND - 1.9	10	4	40.0	ND - 0.68	82	50	61.0	ND - 12
	Ibaraki	4	2	50.0	ND - 0.92	4	3	75.0	ND - 0.69	25	13	52.0	ND - 1.8
	Tochigi	1	0	0.0	ND	0	0	-	-	8	3	37.5	ND - 1.3
	Gunma	0	0	-	-	0	0	-	-	6	2	33.3	ND - 0.70
	Chiba	5	2	40.0	ND - 0.35	7	4	57.1	ND - 0.53	25	10	40.0	ND - 1.1
	Total	22	9	40.9	ND - 1.9	23	12	52.2	ND - 0.69	168	88	52.4	ND - 12
Lakes	Miyagi	8	7	87.5	ND - 1.4	8	7	87.5	ND - 1.3	31	27	87.1	ND - 2.2
	Fukushima	40	39	97.5	ND - 150	35	35	100.0	0.63 - 100	198	197	99.5	ND - 150
	Ibaraki	6	6	100.0	0.34 - 2.6	6	6	100.0	0.33 - 2.5	32	26	81.3	ND - 7.0
	Tochigi	2	2	100.0	0.47 - 2.2	2	2	100.0	0.92 - 2.0	11	10	90.9	ND - 2.2
	Gunma	8	8	100.0	0.67 - 2.4	11	11	100.0	0.71 - 2.6	26	25	96.2	ND - 2.6
	Chiba	4	4	100.0	0.56 - 0.61	4	4	100.0	0.43 - 0.75	19	14	73.7	ND - 4.4
	Total	68	66	97.1	ND - 150	66	65	98.5	ND - 100	317	299	94.3	ND - 150
Coastal areas	Miyagi	2	0	0.0	ND	2	0	0.0	ND	12	0	0.0	ND
	Fukushima	30	3	10.0	ND - 0.78	30	2	6.7	ND - 0.38	141	8	5.7	ND - 0.78
	Tokyo	0	0	-	-	0	0	-	-	2	0	0.0	ND
	Total	32	3	9.4	ND - 0.78	32	2	6.3	ND - 0.38	155	8	5.2	ND - 0.78

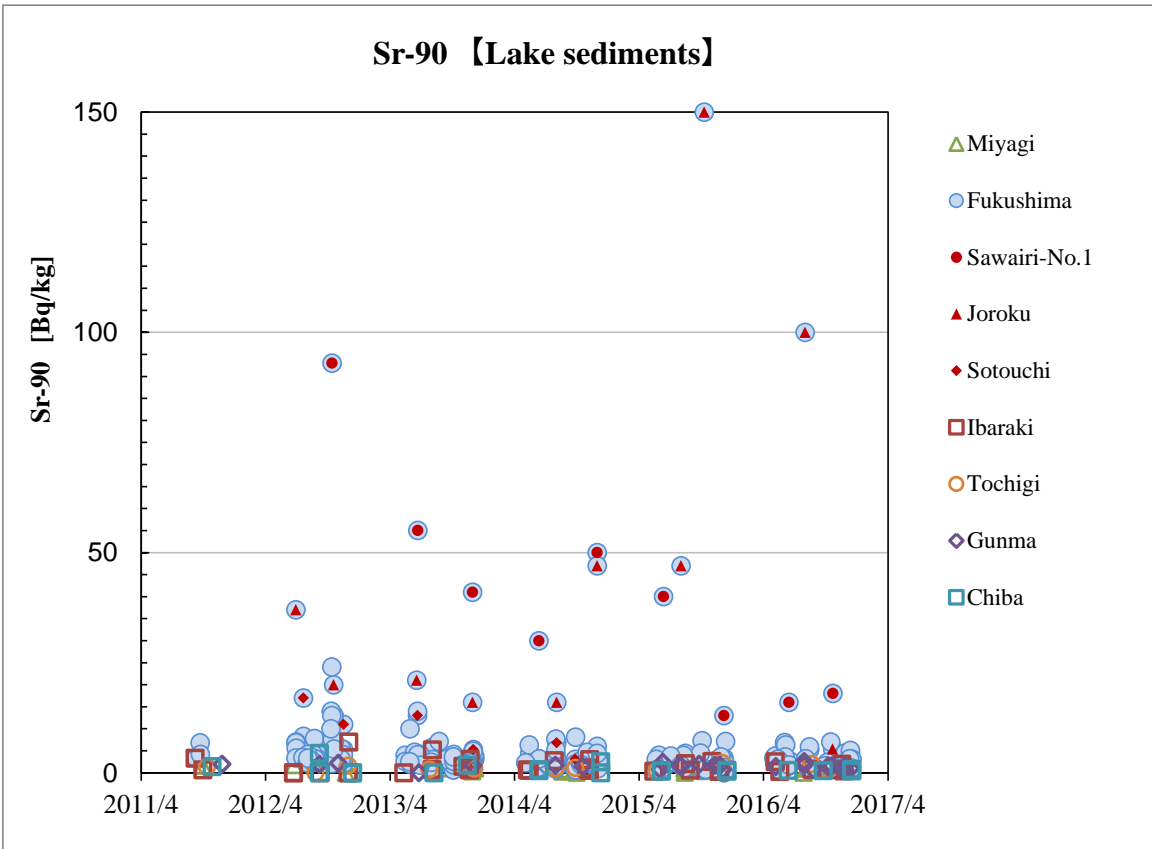
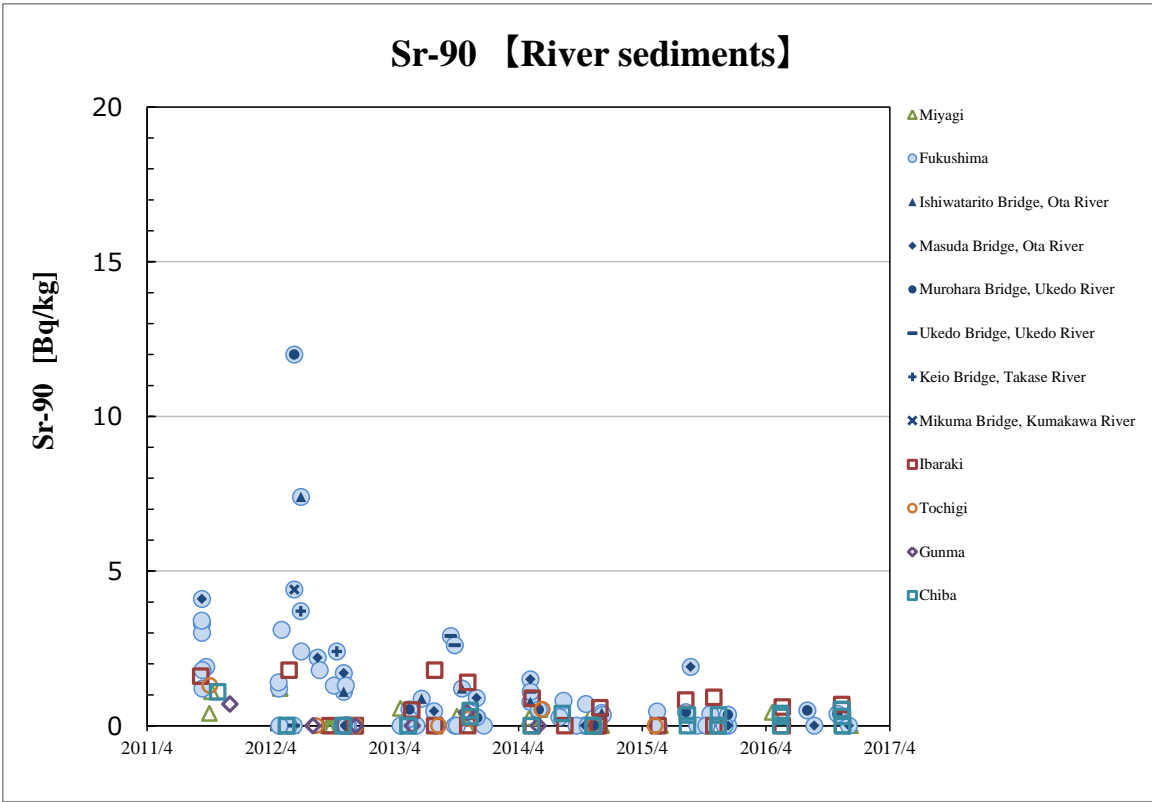


Figure 5.1-1 Detection of Sr-90 in sediment samples from public water areas  
(upper: rivers; lower: lakes)

(2) Groundwater

Surveys for Sr-89 and Sr-90 were conducted on approximately 240 groundwater samples collected in Fukushima Prefecture between January 2012 and February 2017.

An outline of these survey results is as shown in Table 5.1-2. Detected values of Sr-89 and Sr-90 were all below the detection limit (1 Bq/L).

Table 5.1-2 Detection of Sr-89 and Sr-90 in groundwater samples (all collected in Fukushima Prefecture)

Fiscal Year	Sr-90				Sr-89			
	Number of samples	Detection times	Detection rate (%)	Range of measured values (Bq/L) (*1)	Number of samples	Detection times	Detection rate (%)	Range of measured values (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
Total	289	0	0.0	ND	289	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 0.0002Bq/L in FY2011, and 1Bq/L thereafter, and similarly, the detection limit of Sr-89 was 0.001 Bq/L in FY2011, and 1 Bq/L thereafter.

In the 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.

## 5.2 Other $\gamma$ -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 FY2016 to obtain activity concentrations of accident-derived radionuclides (Ag-110m, Te-129m, Nb-95, Sb-125 and Ce-144, etc.<sup>10</sup>) and major naturally occurring radionuclides such as K-40. The summary of the results is as shown in Table 5.2-1 and Table 5.2-2.

Among the detected radionuclides, no artificial radionuclides were detected in water samples, 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 the other species are all either uranium series or thorium series radionuclides, which are widely distributed in nature including the Earth's crust.

Table 5.2-1 Detection of other radionuclides (Water)

Fiscal year	Number of samples	Major detected artificial radionuclide		Major detected naturally occurring radionuclide	
		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%
FY2015	3,916	-	-	Pb-214	9%
				Pb-212	7%
				K-40	7%
FY2016	3,890	-	-	Pb-214	17%
				Pb-212	10%
				K-40	8%

<sup>10</sup> 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 sediments).



Table 5.2-2 Detection of other radionuclides (Sediments)

Fiscal year	Number of samples	Major detected artificial radionuclide		Major detected naturally occurring radionuclide	
		Nuclide	Detection rate and detected values	Nuclide	Detection rate
FY2011	1,559	Ag-110m	4 samples (0.26%) 46 - 170 Bq/kg	K-40	79%
				Pb-212	41%
				Pb-214	16%
				Tl-208	14%
FY2012	2,885	Ag-110m	26 samples (0.90%) 7.9 - 350 Bq/kg	Ac-228	41%
				Bi-214	43%
		Sb-125	3 samples (0.10%) 140 - 420 Bq/kg	K-40	97%
				Pb-212	75%
FY2013	3,062	-	-	Pb-214	44%
				Tl-208	39%
				Ac-228	25%
				Bi-214	25%
				K-40	91%
FY2014	3,035	-	-	Pb-212	49%
				Pb-214	23%
				Tl-208	23%
				Ac-228	24%
				Bi-214	24%
FY2015	3,158	-	-	K-40	91%
				Pb-212	48%
				Pb-214	24%
				Tl-208	24%
				Ac-228	32%
FY2016	3,088	-	-	Bi-214	60%
				K-40	88%
				Pb-212	63%
				Pb-214	67%
				Tl-208	37%
FY2016	3,088	-	-	Ac-228	35%
				Bi-214	66%
				K-40	92%
				Pb-212	64%
				Pb-214	75%
				Tl-208	40%

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

## Part 3: Other Radioactive Material Monitoring Conducted Nationwide (FY2016)

### 1 Outline of the Monitoring

#### 1.1 Covered monitoring

As other radioactive material monitoring activity conducted nationwide, the results of the Monitoring of Environmental Radioactivity Levels in FY2016, which was conducted in FY2016 by the Nuclear Regulation Authority for the purpose of clarifying the existence or nonexistence of the influence of nuclear facilities, etc. nationwide, are compiled here.

Monitoring locations are as shown in Table 1.1-1 and Figure 1.1-1. See the relevant website for more details. (<http://www.env.go.jp/air/rmcm/result/nsr.html>)

#### 1.2 Compilation methods

Measurement data are available on the website of Environmental Radioactivity and Radiation in Japan.<sup>11</sup>

Data for this report were collected from this website under the following search criteria.

- (i) Period: April 2016 to March 2017 (Published on Feb 14, 2018)
- (ii) Coverage: Nationwide
- (iii) Targets: All radionuclides
- (iv) Targeted samples: Inland water (river water, lake water, freshwater), seawater, sediments (river sediments, sea sediments)

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<sup>11</sup> Environmental Radioactivity and Radiation in Japan "Environmental Radiation Database" <http://search.kankyo-hoshano.go.jp/servlet/search.top>. (Japanese only, accessed Feb 14, 2018)

Table 1.1-1 Locations for the Monitoring of Environmental Radioactivity Levels (30 in total)

No.	Prefecture	Property	Sampling locations	Water	Sediments
1	Hokkaido	Lake	Oyafuru, Ishikari City (Lake Barato)	○	-
2		Coastal area	Yoichi Town, Yoichi County (Yoichi Bay)	○	○
3	Aomori	Coastal area	Fukaura Town, Nishitsugaru County (off Kasose)	○	○
4		Coastal area	Hiranai Town, Higashitsugaru County (Mutsu Bay)	○	○
5	Iwate	Coastal area	Hirono Town, Kunohe County (off Taneichi)	○	○
6	Akita	River	Asahikawa, Akita City	○	-
7	Fukushima	Coastal area	Soma City (off Haragama Beach)	○	○
8		River	Zainiwasaka, Fukushima City	○	-
9	Ibaraki	Lake	Kasumigaura	○	-
10		Coastal area	Tokai Village, Naka County (off the NPS)	○	○
11	Chiba	Coastal area	Tokyo Bay (off Sodegaura City)	○	○
12	Kanagawa	Coastal area	Yokosuka City (Odawa Bay)	○	○
13	Niigata	Lake	Shichikuyama, Chuo Ward, Niigata City	○	-
14		Coastal area	off Niigata Port	○	○
15	Fukui	Lake	Inogaikae Pond, Tsuruga City	○	-
16	Nagano	Lake	Lake Suwa	○	-
17	Aichi	Coastal area	Tokoname City (off Kosugaya)	○	○
18	Mie	River	Seki Town, Kameyama City (Suzuka River)	○	-
19	Kyoto	Freshwater	Tenno, Ogura Town, Uji City	○	-
20	Osaka	Coastal area	Osaka City (Entrance to Osaka Port)	○	○
21	Tottori	River	Katamo (Katamo River System)	○	○
22		River	Kawakami (Kawakami River System)	○	○
23		River	Hotani (Iwakura River System)	○	○
24		River	Bessho (except for Katamo River System)	○	○
25		River	Kannokura (Oshika River System)	○	○
26	Hiroshima	River	Kawate Town, Shobara City (Saijo River)	○	-
27	Yamaguchi	Coastal area	Ajisu, Yamaguchi City (Yamaguchi Bay)	○	○
28	Fukuoka	Coastal area	Higashiminato Town, Moji Ward, Kitakyushu City (off Chichisaki)	○	○
29	Kagoshima	Coastal area	Minamisatsuma City (off the mouth of Manose River)	○	○
30	Okinawa	Coastal area	Katsuren White Beach, Uruma City	○	○

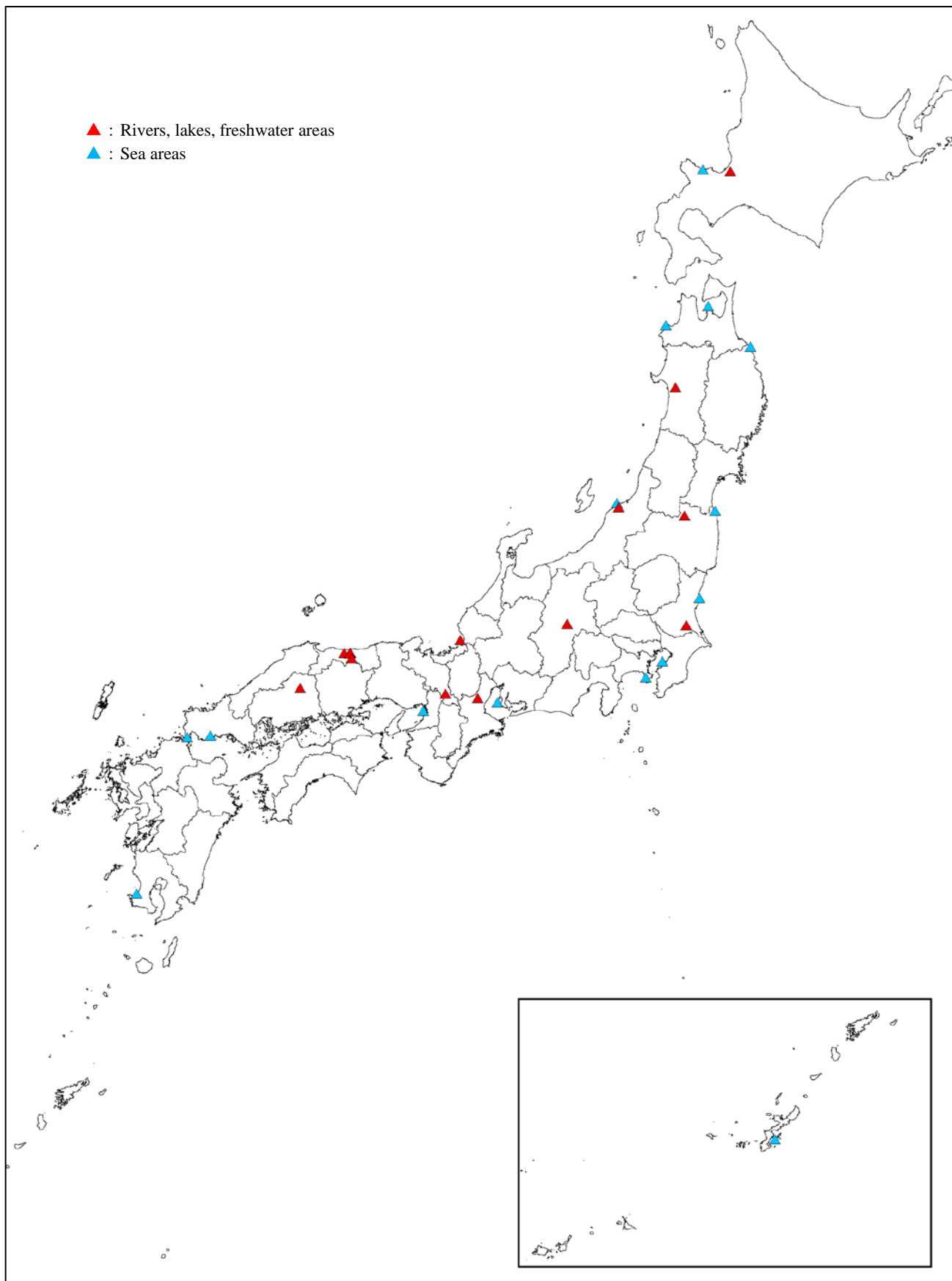


Figure 1.1-1 Locations for the Monitoring of Environmental Radioactivity Levels

## 2 Results

### 2.1 Water

#### (1) Inland water<sup>12</sup>

In the Monitoring of Levels in FY2016, inland water samples were reported for 9 radionuclides (Be-7, K-40, U-234, U-235, U-238, Cs-134, Cs-137, I-131 and Sr-90), as shown in Table 2.1-1.

A comparison with the results of the Monitoring of Levels for the last twenty years (excluding data from March 11, 2011, to March 10, 2013) revealed that although detected values for Be-7, which is a naturally occurring radionuclide, exceeded the range of past measurement values, all these radionuclides were considered to be within the past measurement trends since its maximum value in other environment monitoring is 0.18Bq/L<sup>13</sup> (see Figure 2.1-1).

Table 2.1-1 Detection of radionuclides in the Monitoring of Levels [inland water]

Nuclides		Number of reported data	Detection times	Range of measured values (Bq/L)	The range of past measurement records (Bq/L) (*1)
Naturally Occurring radionuclides	Be-7	7	4	ND - 0.034	ND - 0.021
	K-40	10	10	0.016 - 0.18	0.0067 - 0.30
	U-234	10	10	0.0015 - 0.0073	0.00042 - 0.015
	U-235	10	0	ND	ND - 0.00054
	U-238	10	10	0.00071 - 0.0055	ND - 0.013
Artificial radionuclides	Cs-134	9	1	ND - 0.0035	ND - 0.028
	Cs-137	9	4	ND - 0.019	ND - 0.055
	I-131	7	0	ND	ND - 0.013
	Sr-90	3	3	0.0013 - 0.0024	ND - 0.0050

(\*1) Results of the Monitoring of Levels from FY1996 to FY2015 (excluding data from March 11, 2011 to March 10, 2013)

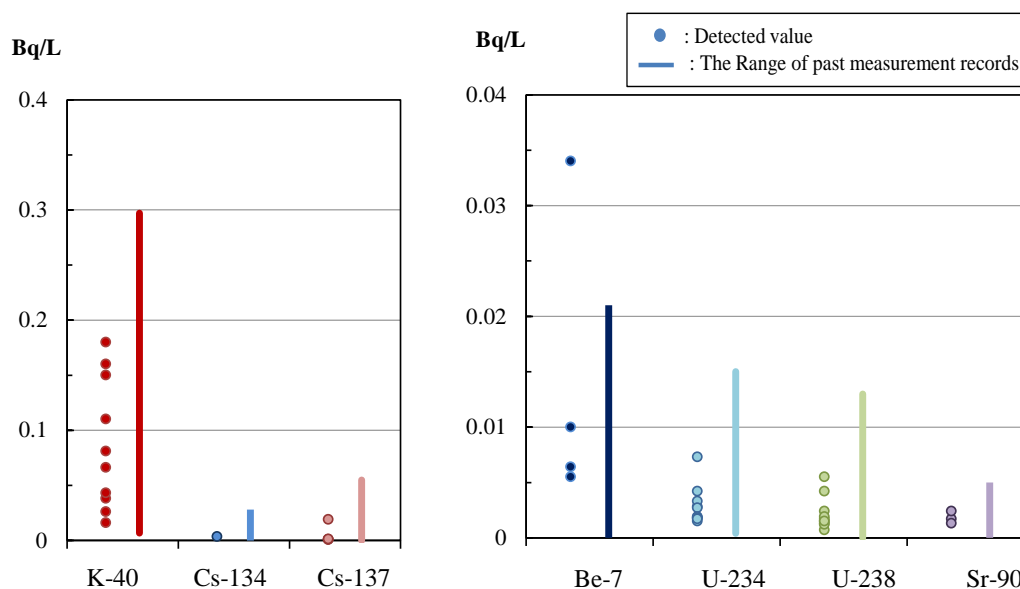


Figure 2.1-1 Detection of radionuclides in the Monitoring of Levels [inland water]

<sup>12</sup> This report only covers data for river water, lake water, and freshwater in the Monitoring of Levels.

<sup>13</sup> Environmental Radioactivity and Radiation in Japan "Environmental Radiation Database" <http://search.kankyo-hoshano.go.jp/servlet/search.top>. (Japanese only, accessed Feb 14, 2018)

(2) Seawater

In the Monitoring of Levels in FY2016, 6 radionuclides (Be-7, K-40, Cs-134, Cs-137, I-131 and Sr-90) were reported from seawater samples, as shown in Table 2.1-2.

A comparison with the results of the Monitoring of Levels for the last twenty years (excluding data from March 11, 2011, to March 10, 2013) revealed that detected values for K-40 and Cs-137 exceeded the range of the past measurement trends (see Figure 2.1-2). K-40 is a naturally occurring radionuclide and is derived from potassium in seawater. The detected value for Cs-137 is the same level as the detection limit collected at the same location in recent years.

Table 2.1-2 Detection of radionuclides in the Monitoring of Levels [seawater]

Nuclides		Number of reported data	Detection times	Range of measured values (Bq/L)	Range of past measurement records (Bq/L) (*1)
Naturally occurring radionuclides	Be-7	2	0	ND	ND
	K-40	16	16	0.18 - 15	0.078 - 14
Artificial radionuclides	Cs-134	16	0	ND	ND
	Cs-137	16	2	ND - 0.064	ND - 0.0034
	I-131	13	0	ND	ND
	Sr-90	15	15	0.00064 - 0.0011	ND - 0.0025

(\*1) Results of the Monitoring of Levels from FY1996 to FY2015 (excluding data from March 11, 2011 to March 10, 2013)

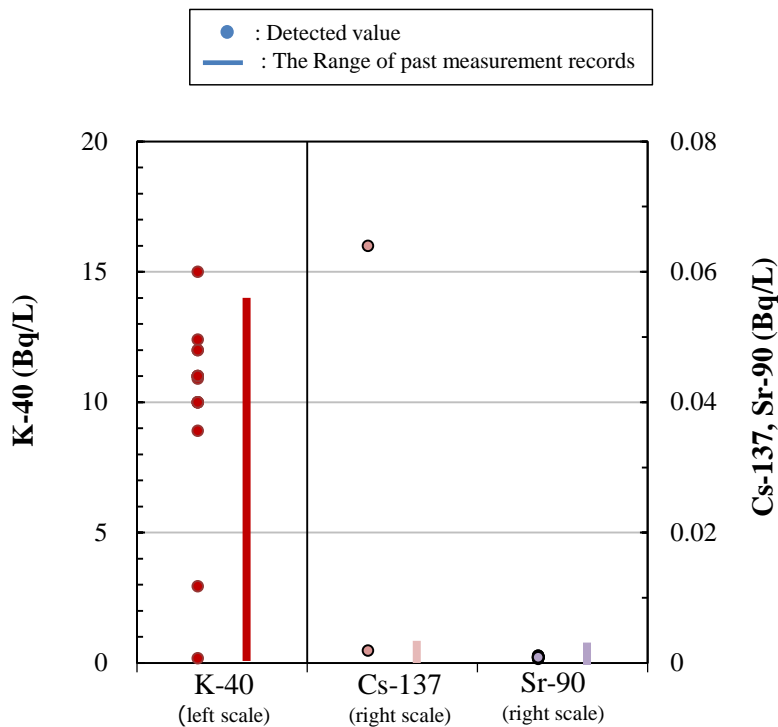


Figure 2.1-2 Detection of radionuclides in the Monitoring of Levels [seawater]

## 2.2 Sediments

### (1) Inland water sediments (river sediments)

In the Monitoring of Levels in FY2016, 3 radionuclides (U-234, U-235 and U-238) were reported from inland water sediment samples (river sediments) as shown in Table 2.2-1.

A comparison with the results of the Monitoring of Levels for the last twenty years (excluding data from March 11, 2011, to March 10, 2013) revealed that detected values for all 3 detected radionuclides were within the past measurement trends (see Figure 2.2-1).

Table 2.2-1 Detection of radionuclides in the Monitoring of Levels  
[Inland water sediments (river sediments)]

Nuclides		Number of reported data	Detection times	Range of measured values (Bq/L)	Range of past measurement records (Bq/L) (*1)
Naturally occurring radionuclides	U-234	5	5	12 - 27	6.5 - 76
	U-235	5	5	0.47 - 1.1	0.20 - 3.4
	U-238	5	5	11 - 28	6.6 - 94

(\*1) Results of the Monitoring of Environmental Radioactivity Levels from FY1996 to FY2015 (excluding data from March 11, 2011 to March 10, 2013 and results reported in mg/kg units)

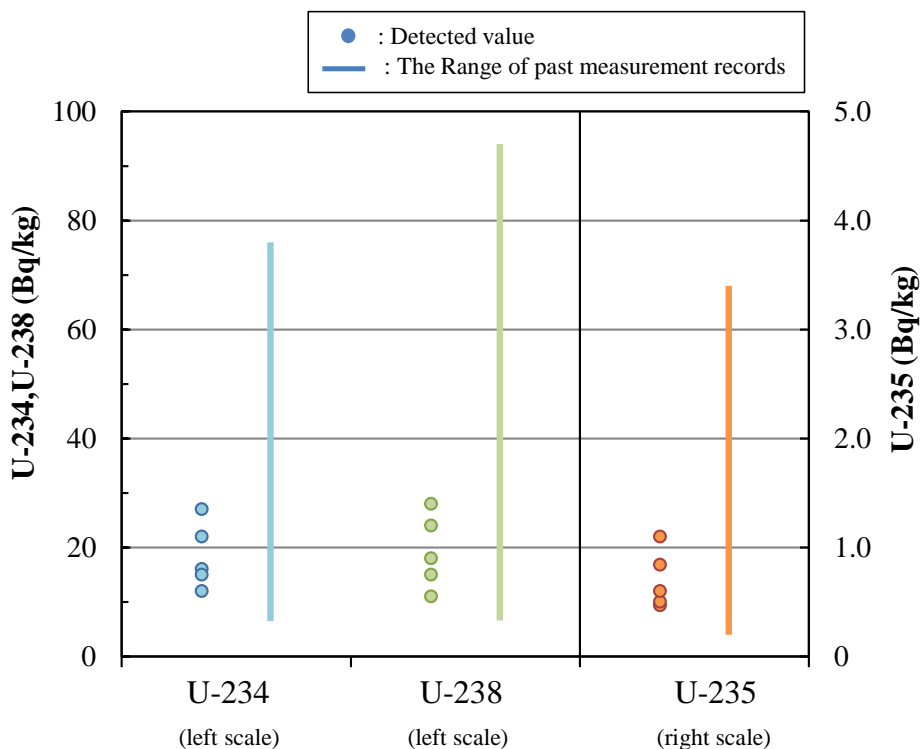


Figure 2.2-1 Detection of radionuclides in the Monitoring of Levels [Inland water sediments (river sediments)]

(2) Sea sediments

In the Monitoring of Levels in FY2016, 6 radionuclides (Be-7, K-40, Cs-134, Cs-137, I-131, and Sr-90) were reported from seawater sediment samples as shown in Table 2.2-2.

A comparison with the results of the Monitoring of Levels for the last twenty years (excluding data from March 11, 2011, to March 10, 2013) revealed that detected values for all these radionuclides were within the past measurement trends (see Figure 2.2-2).

Table 2.2-2 Detection of radionuclides in the Monitoring of Levels [Sea sediments]

Nuclides		Number of reported data	Detection times	Range of measured values (Bq/L)	Range of past measurement records (Bq/L) (*1)
Naturally occurring radionuclides	Be-7	4	0	ND	ND - 13
	K-40	15	15	86 - 690	33 - 750
Artificial radionuclides	Cs-134	15	3	ND - 1.9	ND - 35
	Cs-137	15	9	ND - 11	ND - 76
	I-131	8	0	ND	ND
	Sr-90	8	0	ND	ND - 0.41

(\*1) Results of the Monitoring of Environmental Radioactivity Levels from FY1996 to FY2015 (excluding data from March 11, 2011 to March 10, 2013)

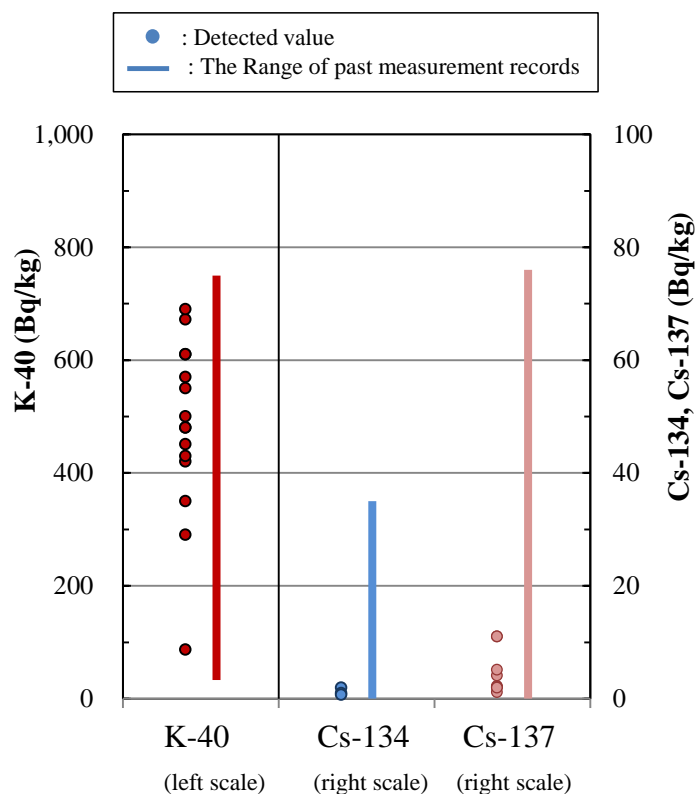


Figure 2.2-2 Detection of radionuclides in the Monitoring of Levels [Sea sediments]