

Sea Area Monitoring Plan in FY2012

March 30, 2012

Ministry of Education, Culture, Sports, Science and Technology

Fisheries Agency

Ministry of Land, Infrastructure, Transport and Tourism

Japan Coast Guard

Japan Meteorological Agency

Ministry of the Environment

Fukushima prefecture

Tokyo Electric Power Co. Inc.

This document defines how to conduct sea area monitoring under the Comprehensive Monitoring Plan, which was revised at the fourth Monitoring Coordination Meeting (March 15, 2012).

Basic concept of the revision

Under the initiative of MEXT, measurements have so far been carried out steadily in collaboration among related organizations, with regard to the radioactive concentrations in seawater, marine soil, and fishery products in the sea area close to TEPCO's Fukushima Dai-ichi NPP, the coastal area, off-shore area, and outer sea area.

Regarding sea area monitoring in FY2012, measurements of the radioactive concentrations will be carried out under the initiative of MEXT and in collaboration among the Ministry of the Environment, Fisheries Agency, and other related organizations, from the perspective of ascertaining concentration levels mainly for cesium in seawater by enhancing the analysis accuracy, ascertaining the spatial distribution and chronological movement of radioactive materials in marine soil and characteristics of marine soil, and ascertaining the chronological changes in radioactivity concentrations in fishery products with regard to marine organisms, while making proper reviews as necessary. Furthermore, the monitoring content will be enhanced and strengthened by taking into account not only the routes of radioactive materials discharged into the sea from TEPCO's Fukushima Dai-ichi NPP but also those of radioactive materials flowing into the sea from the land area via rivers. When conducting the sea area monitoring, attention will also be paid to the viewpoints of helping the understanding of the movement of radioactive materials from the environment to marine organisms and the bioconcentration process.

Based on these, the policy for revising the sea area monitoring plan in FY2012 onward will be as follows:

- Regarding seawater, frequent monitoring with the aim of checking any new leakage of

radioactive materials from the NPP will be conducted together with monitoring by lowering detection limits according to sea areas for the purpose of scientifically ascertaining long-term effects. TEPCO will be in charge of making adjustments with the regulatory authorities for the former, and with regard to the latter, the period for collecting water samples, measuring points, the depths for sampling, and the frequency will be determined based on the results of simulation on the flow into and diffusion in the sea via rivers, at the same time considering future utilization of monitoring results in simulation, etc.

- Regarding marine soil, measuring points will be determined by taking into consideration river outlets and fishing grounds in order to understand the flow and movement of radioactive materials into the sea via rivers.
- A survey of fishery products will be enhanced in response to the introduction of the new standard value for foodstuffs on April 1, and monitoring will also be conducted in the sea area within 20km from TEPCO's Fukushima Dai-ichi NPP.
- Tokyo Bay, which is the closed sea area where radioactive materials are highly likely to flow in from rivers and be deposited in particular, will be added to the monitoring targets.
- In order to verify analysis results by TEPCO, MEXT will also conduct cross-checking with regard to seawater and marine soil at some of the measuring points.
- Additionally, monitoring of marine organisms and prey organisms, which will function as environmental indices, will be conducted mainly in Fukushima prefecture.

Specifically, monitoring of (a) seawater, (b) marine soil, and (c) marine organisms will be conducted by dividing the targeted sea zone into the following five sea areas (see the Attachment):

- (i) Sea area close to TEPCO's Fukushima Dai-ichi NPP: The area near the NPP requiring close watch
- (ii) Coastal area: The area within about 30km from the coastline of Aomori (only partially), Iwate to Miyagi, Fukushima and Ibaraki prefectures (including river outlets)
- (iii) Off-shore area: The area within about 30 to 90km from the coastline
- (iv) Outer sea area: The area within about 90 to 280km and 280km or farther from the coastline
- (v) Tokyo Bay: The closed sea area where radioactive materials are highly likely to flow in from rivers and be deposited in particular

1. Monitoring of seawater

(1) Outline

The monitoring of seawater will be conducted at the aforementioned five sea areas, while

taking into account the knowledge on the locations of major river outlets from Miyagi to Ibaraki prefectures, and ports and marine fishing grounds in Fukushima prefecture, the sea water density, and ocean currents, as well as the diffusion simulation results, by collecting water samples in collaboration with related local governments. The analysis will be carried out at the same accuracy level as those for the monitoring of environmental radioactivity levels prior to the occurrence of the accident.

Monitoring in the sea area close to TEPCO's Fukushima Dai-ichi NPP will be conducted at a higher frequency from the perspective of checking any leakage of radioactive materials from the NPP.

- (2) Targeted sea areas, frequency, measuring points, depths for sampling, radionuclides to be analyzed, and detection limits

The major analysis target will continue to be radioactive cesium, but considering that the concentration levels are becoming close to those prior to the occurrence of the accident at many measuring points, monitoring will be renewed by narrowing down measuring points and lowering detection limits so that radioactive materials can be detected even at the level prior to the accident.

At about 250 points in total now under consideration (at present, there are about 220 measuring points in total), water samples are to be collected once a day to once every three to four months, or once every six months at some measuring points. Further efforts will be made to increase measuring points with the cooperation of related ministries and agencies, organizations and voluntary ships.

- (i) Sea area close to TEPCO's Fukushima Dai-ichi NPP: Once a day (Surface layer: for checking)

- From the perspective of checking any leakage of radioactive materials, sampling and analysis will be conducted by relatively higher detection limits at a higher frequency (TEPCO will make adjustments with the regulatory authorities).
- Nuclide analysis will be conducted with regard to Cs-134, Cs-137, and I-131, once a day, by setting the detection limit at 1Bq/L. Furthermore, about once a month, analysis will also be conducted with regard to Sr-89, Sr-90, H-3, Pu-238, Pu-239 + Pu-240, gross α -emitting nuclides, gross β -emitting nuclides, Mn-54, Co-60, and Ce-144, by setting detection limits at 1-20Bq/L in accordance with types of radionuclides.

- (ii) Coastal area

(River outlets, etc.) About once every one to four months

- Regarding all major rivers from Miyagi to Fukushima and Ibaraki prefectures, water samples will be collected at points about 1km off the coast on the extended line of the center of river outlets, both from the upper layer and the bottom layer, and then the analysis will be conducted.
- Basically, monitoring will be conducted about once every two months at the outlets of the Abukuma River and rivers in Fukushima prefecture, and about once every three to four months at other river outlets. In the rainy season, however, monitoring will be conducted more frequently, about once a month, at points where radioactive materials are highly likely to flow into the sea from rivers.
- Nuclide analysis will be conducted with regard to Cs-134 and Cs-137, by setting the detection limit at 1Bq/L for the time being.

(Other coastal area): Once every two weeks to four months

- Regarding measuring points where consideration needs to be given to major ports, fishing ports, and shore/shallow water fishing grounds, analysis will be conducted once or twice a month with regard to I-131, Cs-134, and Cs-137 in water samples collected in the surface layer and those collected at some measuring points at a depth of 2 to 20m, by setting the detection limit at 1Bq/L.
- Regarding measuring points where consideration needs to be given to the influences of coastal currents and the Black Current, fishing grounds, and requests from local governments and fishery unions, as well as the necessity to obtain data continuously, water samples will be collected from the surface layer and the bottom layer (about 2 to 3m from the marine bottom), and from the middle layer (between the surface layer and the bottom layer) as well at some points, and then the analysis will be conducted. The frequency will be about once a month, and the detection limit will be set at 0.001Bq/L for the analysis of Cs-134 and Cs-137 (for water samples collected at some measuring points, analysis will also be conducted with regard to I-131, Sr-89, Sr-90, H-3, Pu-238, Pu-239 + Pu-240, gross α -emitting nuclides, and gross β -emitting nuclides).
- Regarding measuring points from Aomori to Fukushima prefectures, where consideration needs to be given to the checking of harmful materials on the coast of the devastated areas, analysis will be conducted about once every four months with regard to Cs-134 and Cs-137 in water samples collected from the surface layer, by setting the detection limit at 0.001Bq/L.
- When conducting monitoring at these measuring points, attention will also be paid so that the results will contribute to the future research on the movement and the bioconcentration process of radioactive materials from seawater or marine soil to prey organisms and fishery products.
- With regard to seawater collected at some of the measuring points, MEXT and TEPCO will conduct cross-checking.

- (iii) Off-shore area: About once every three months (in the surface layer, at a depth of 100m from the surface (in the case of measuring points with a depth of over 100m), and in the bottom layer (about 10m from the marine bottom))
- Consideration will be given to coastal currents and the Black Current, fishing grounds, and the necessity to obtain data continuously.
 - Analysis will be conducted with regard to Cs-134 and Cs-137, by setting the detection limit at 0.001Bq/L. Additionally, analysis will also be conducted with regard to Sr-90 for some measuring points selected by considering fishing grounds and points where the concentration levels of radioactive cesium were relatively high in past surveys.
- (iv) Outer sea area: Once every six months (in the surface layer and at depths of 100m, 200m, 300m, and 500m from the surface); At the wider outer sea area, water samples will be collected only from the surface layer (or from multiple layers at some points) as needed.
- The period for collecting water samples, measuring points, the depths for sampling, and the frequency will be determined based on diffusion simulation results, at the same time taking into consideration future utilization of monitoring results in simulation, the Black Current, and the necessity to obtain data continuously.
 - Analysis will be conducted with regard to Cs-134 and Cs-137, by setting the detection limit at 0.001Bq/L.
- (v) Tokyo Bay: Five times a week to once every two weeks (in the surface layer: around ports and the center of the bay-mouth); Basically about once every three to four months, and during the rainy season, about once a month (in the surface layer and the bottom layer: river outlets); About once every two months (in the surface layer: the center of the bay)
- Considering rivers flowing in and sea currents, etc., sampling and analysis will be conducted for water at river outlets, major ports, the center of the bay, and around the center of the bay-mouth, with the cooperation of related local governments, etc.
 - Analysis will be conducted with regard to Cs-134 and Cs-137 (and Sr-90, Co-60, and Ce-144 for water samples collected at some measuring points), by setting the detection limit at around 1Bq/L (or 0.001Bq/L for some of the analysis) for the time being with regard to samples collected at river outlets, and at 2 to 10Bq/L (or 0.001Bq/L for some of the analysis) for the time being with regard to samples collected at major ports and around the center of the bay-mouth. The detection limit will be set at 0.001Bq/L with regard to samples collected at the center of the bay.

In the event of any new leakage of radioactive materials from TEPCO's Fukushima Dai-ichi NPP, TEPCO and related ministries and agencies will collaborate with each other as necessary

to promptly collect water samples at measuring points separately determined in advance and conduct nuclide analysis appropriate for the leaked materials.

2. Monitoring of marine soil

(1) Outline

The monitoring of marine soil will be conducted in sea areas excluding the outer sea area ((i) to (iii) and (v) above), while taking into account similar matters as in the case of the monitoring of seawater, and the radioactive concentrations in marine soil will be measured in collaboration with related local governments. In addition, information concerning the characteristics of marine soil will be collected.

In particular, in sea areas (ii) and (iii), attention will be paid to the flow of radioactive materials from rivers, and their spatial distribution and chronological movement, and in sea area (v), monitoring will be conducted by closely collaborating with related organizations, while paying attention to the flow of radioactive materials from rivers.

(2) Targeted sea areas, frequency, measuring points, radionuclides to be analyzed, and detection limits

It is scheduled to collect marine soil samples at about 170 points in total (at present, there are about 90 measuring points in total), once a month to once every three to four months (or once every six months at some measuring points). Analysis will be conducted mainly with regard to radioactive cesium.

(i) Sea area close to TEPCO's Fukushima Dai-ichi NPP: About once a month

- Analysis will be conducted about once a month with regard to I-131, Cs-134, and Cs-137, by setting the detection limit at 10Bq/kg-dry soil. Additionally, analysis will also be conducted with regard to Sr-90, Pu-238, and Pu-239+240 as the concentration levels of radioactive cesium were relatively high in past surveys.

(ii) Coastal area

(River outlets, etc.) About once every one to four months

- Regarding all major rivers from Miyagi to Fukushima and Ibaraki prefectures, marine soil samples will be collected at points about 1km off the coast on the extended line of the center of river outlets, and then the analysis will be conducted.
- Basically, monitoring will be conducted about once every three to four months at river outlets, but in the rainy season, monitoring will be conducted more frequently, about

once a month, at points where radioactive materials are highly likely to flow into the sea from rivers.

- Analysis will be conducted with regard to Cs-134 and Cs-137, by setting the detection limit at 1Bq/kg-dry soil for the time being.

(Other coastal area): Once every one to six months

- Regarding measuring points where consideration needs to be given to coastal fishing grounds, analysis will be conducted about once every one to six months with regard to I-131, Cs-134, and Cs-137, by setting the detection limit at 10Bq/kg-dry soil.
- Regarding measuring points where consideration needs to be given to the influences of coastal currents and the Black Current, fishing grounds, and requests from local governments and fishery unions, as well as the necessity to obtain data continuously, analysis will be conducted about once every one to two months with regard to Cs-134 and Cs-137, by setting the detection limit at 10Bq/kg-dry soil (for marine soil samples collected at some measuring points, analysis will also be conducted with regard to Sr-89, Sr-90, Pu-238, Pu-239 + Pu-240, Am-241, Cm-242, Cm-243+244, U-234, U-235, and U-238).
- Regarding measuring points from Aomori to Fukushima prefectures, where consideration needs to be given to the checking of harmful materials on the coast of the devastated areas, analysis will be conducted about once every four months with regard to Cs-134 and Cs-137, by setting the detection limit at 10Bq/kg-dry soil.
- At these measuring points, a survey will be carried out in collaboration with local governments so as to ascertain the movement of some parts of marine soil showing higher radioactivity concentrations that is assumed to move from the coastal area to the off-shore area. When carrying out the survey, attention will be paid so that the results will contribute to the future research on the movement of radioactive materials from seawater or marine soil to prey organisms and fishery products, and the bioconcentration process.
- With regard to marine soil collected at some of the measuring points, MEXT and TEPCO will conduct cross-checking.

(iii) Off-shore area: About once every three months

- Sampling and analysis will be conducted while giving consideration to the influences of coastal currents and the Black Current, fishing grounds, and the necessity to obtain data continuously.
- Analysis will be conducted about once every three months with regard to Cs-134 and Cs-137, by setting the detection limit at 1Bq/kg-dry soil. Additionally, analysis will be conducted with regard to Sr-90 by selecting some measuring points as fixed points while considering fishing grounds and points where the concentration levels of radioactive

cesium were relatively high in past surveys. Furthermore, similarly considering the concentration levels of radioactive cesium and the influences of diffusion from TEPCO's Fukushima Dai-ichi NPP, analysis will also be conducted with regard to Pu-238, Pu-239+240, Am-241, Cm-242, and Cm-243+244 at some measuring points.

(iv) Outer sea area: Sampling will not be conducted.

(v) Tokyo Bay: Basically about once every three to four months, and during the rainy season, about once a month (river outlets), about once every two months (the center of the bay), and once every three months (the port of Yokosuka)

- Considering rivers that flow into Tokyo Bay and sea currents, etc., marine soil samples will be collected at river outlets, the center of the bay, and the port of Yokosuka, with the cooperation of related local governments, and then analysis will be conducted.
- Analysis will be conducted with regard to Cs-134 and Cs-137 (and Sr-90, Co-60, and Ce-144 for marine soil samples collected at some measuring points), by setting the detection limit at 1Bq/kg-dry soil.

3. Monitoring of marine organisms

(1) Outline

As the monitoring of marine organisms, the radioactive concentrations in fishery products will be measured steadily, while considering fishery operations mainly in the coastal area of the Pacific Ocean and past monitoring results, and the monitoring will also be conducted with regard to marine organisms that will function as environmental indices, mainly close to Fukushima prefecture. Furthermore, in Tokyo Bay as well, local governments and fishery unions will cooperate with each other to collect fishery products and conduct analysis.

Prey organisms will also be monitored in the course of research concerning the movement of radioactive materials to fishery products and the bioconcentration process.

(2) Targeted sea areas and frequency

- A fishery product survey will be conducted once a week, in principle, with regard to species living or migrating in the sea areas (i) to (v), in accordance with fishery operations. In the area within 20km from TEPCO's Fukushima Da-ichi NPP within the sea areas (i) and (ii), monitoring will be conducted about once a month, for the time being, at ten points in total using a gill net and trawl net.
- In the sea area (ii), the monitoring of marine organisms that will function as

environmental indices will be conducted about once every four months at river outlets, etc. mainly close to Fukushima prefecture.

(3) Targeted species

- Mainly in the sea area of East Japan, samples of littoral fishes (seaperch, flounder, flatfish, etc.) and migratory fishes (bonito, saury pikes, mackerel, salmon, etc.) will be collected by purchasing landed fishery products or through sampling by survey vessel, and radioactive materials contained in these samples will be surveyed.
- Also regarding Tokyo Bay, samples of littoral fishes (seaperch, flounder, etc.), shellfish (clams, etc.), and seaweed will be collected by such means as purchasing fishery products caught in the bay, and radioactive materials contained in these samples will be surveyed.
- In the sea area (ii), samples of marine organisms, including fish, shellfish, and prey organisms, that will function as environmental indices will be collected and radioactive materials contained in these samples will be surveyed.

(4) Radionuclides to be analyzed, and detection limits

- With regard to fishery products, which are foodstuffs, analysis will be conducted in line with the notification *Shokuanhatsu* 0315 No. 4 issued by the Head of the Department of Food Safety, Pharmaceutical Food Safety Bureau, Ministry of Health, Labour and Welfare (targeted radionuclides: Cs-134 and Cs-137; detection limit: 20Bq/kg-wet or lower).
- Regarding environmental indices and marine organisms for research, analysis will be conducted basically with regard to Cs-134 and Cs-137, and additionally with regard to Sr-90 and Sr-89 as needed.

4. Entities for conducting sea area monitoring

(1) Entities to conduct monitoring

Monitoring will be conducted in collaboration among the Ministry of Education, Culture, Sports, Science and Technology; Fisheries Agency; Ministry of Land, Infrastructure, Transport and Tourism; Japan Coast Guard; Ministry of the Environment; Meteorological Research Institute of Japan Meteorological Agency; Fukushima prefecture; Tokyo Electric Power Co. Inc.; other related local governments; and fishery unions, etc.

(2) Entities to conduct analysis

Fukushima prefecture, Tokyo Electric Power Co. Inc., and other analytical organizations (to be decided through public bidding)

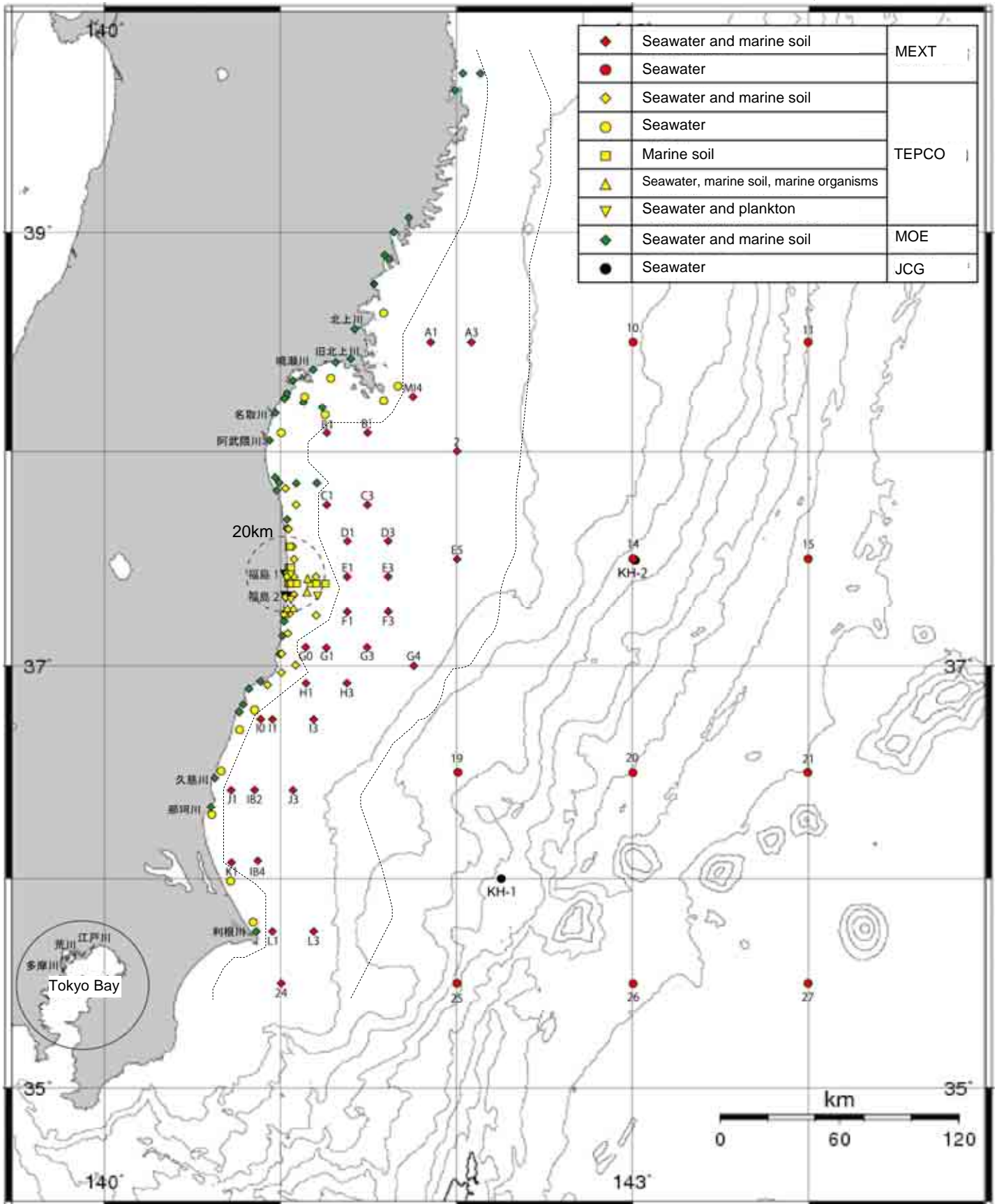
(Reference)

In FY2011, analysis was conducted by the Japan Atomic Energy Agency, Fisheries Research Agency, Fukushima branch of the Environmental Radioactivity Monitoring Center of Fukushima, Fukushima Agricultural Technology Center, Japan Chemical Analysis Center, Kyushu Environmental Evaluation Association, Tokyo Electric Power Co. Inc., General Environmental TECHNOS Co., Ltd., IDEA Consultants, Inc., etc.

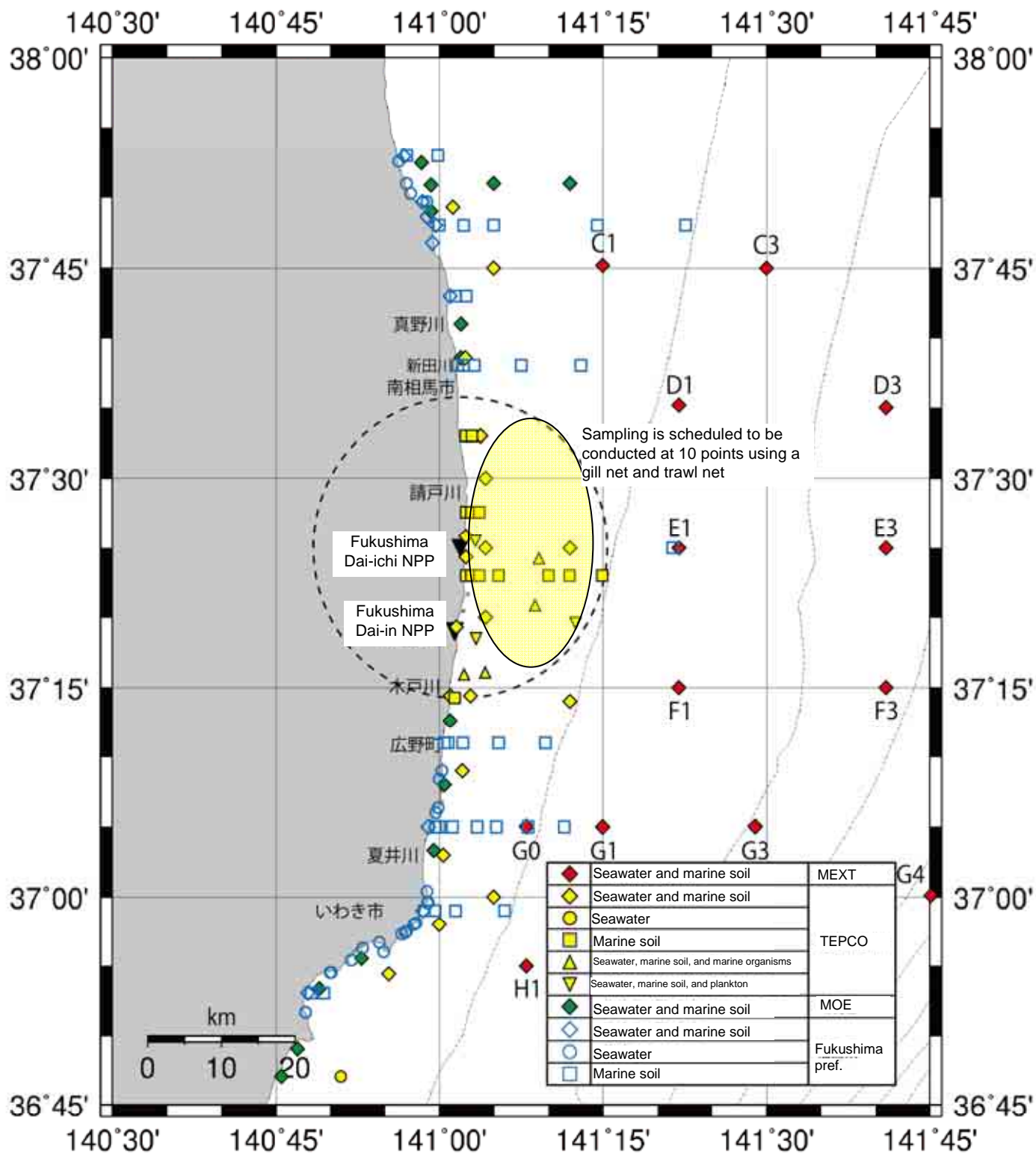
While conducting the sea area monitoring, measuring points, frequency, targeted radionuclides, and the detection limits, etc. will be flexibly reviewed as necessary, based on the measurement results.

Outline of the Sea Area Monitoring off Miyagi, Fukushima, and Ibaraki Prefectures FY2012

March 30, 2012



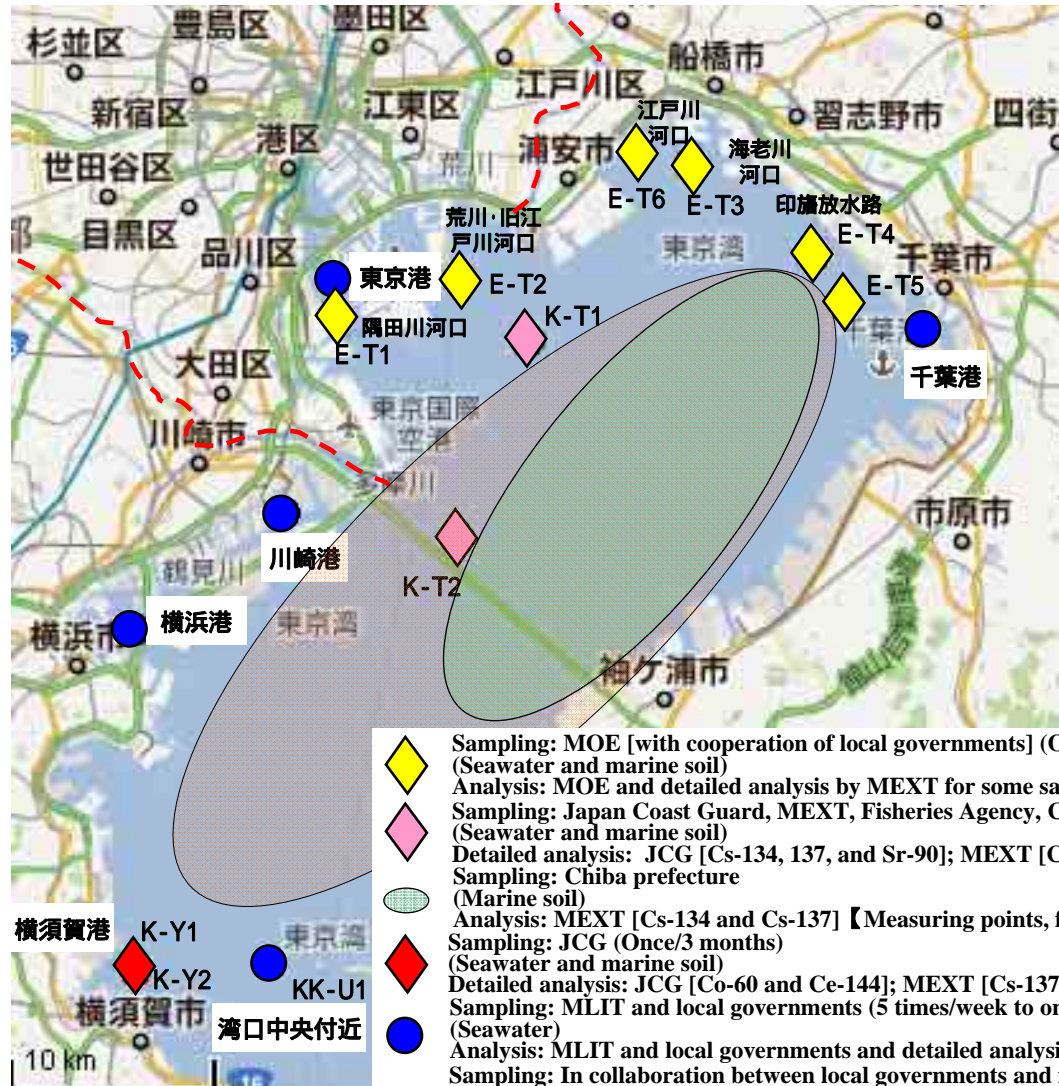
Sea Area Monitoring at the Coast of Fukushima Prefecture (FY2012)



Monitoring of Radioactive Materials in Tokyo Bay

- FY2012 -

March 30, 2012



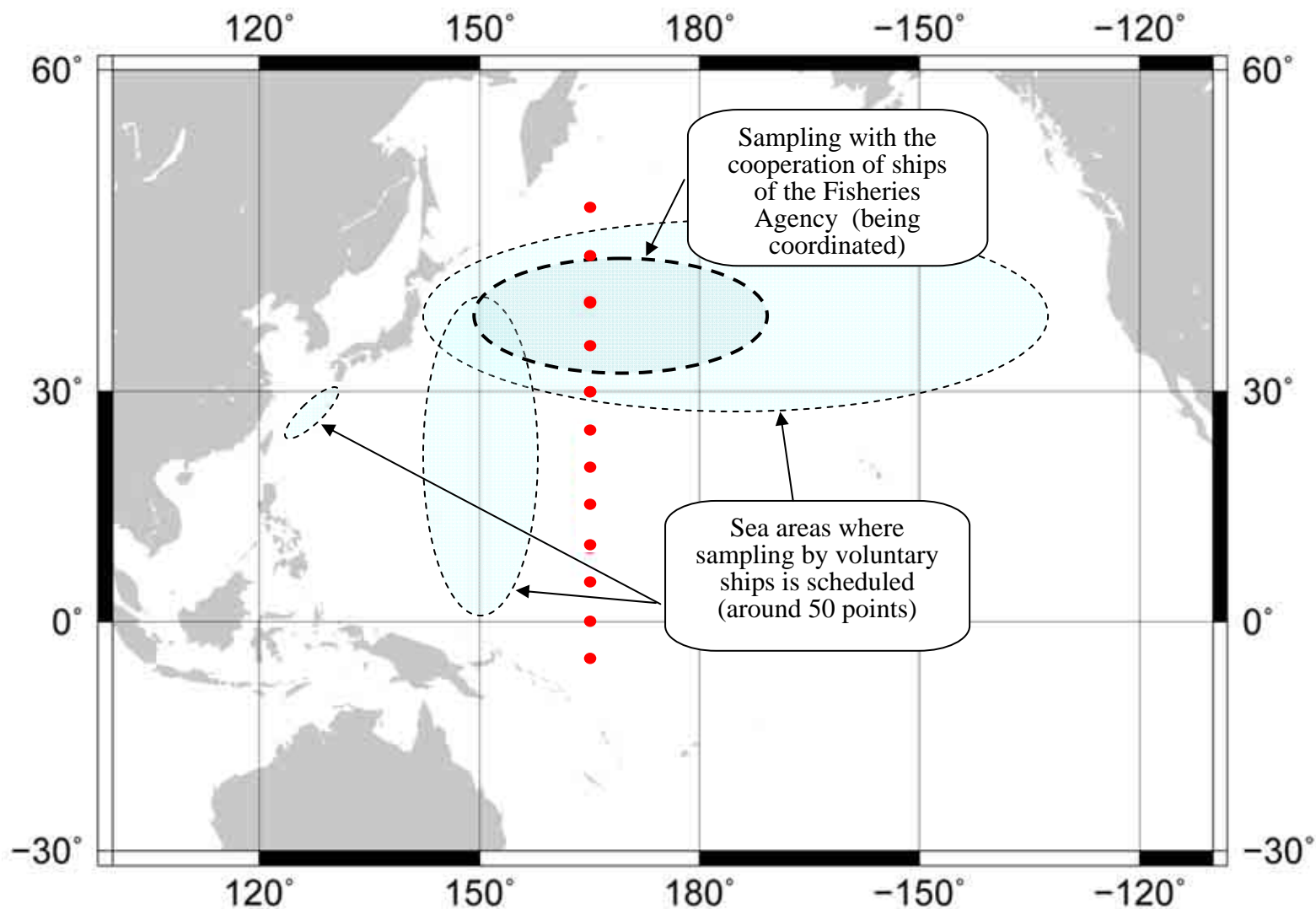
- ◆ Sampling: MOE [with cooperation of local governments] (Once/3-4months; Rainy season: Partially once/month) (Seawater and marine soil)
 Analysis: MOE and detailed analysis by MEXT for some samples [Cs-134 and Cs-137] **【Being coordinated】**
 - ◆ Sampling: Japan Coast Guard, MEXT, Fisheries Agency, Chiba prefecture, etc. (Seawater and marine soil)
 Detailed analysis: JCG [Cs-134, 137, and Sr-90]; MEXT [Cs-134 and Cs-137]
 Sampling: Chiba prefecture (Marine soil)
 Analysis: MEXT [Cs-134 and Cs-137] **【Measuring points, frequency now being coordinated】** **【Being coordinated】**
 - ◆ Sampling: JCG (Once/3 months) (Seawater and marine soil)
 Detailed analysis: JCG [Co-60 and Ce-144]; MEXT [Cs-137, etc.]
 Sampling: MLIT and local governments (5 times/week to once/2 weeks) (Seawater)
 Analysis: MLIT and local governments and detailed analysis by MEXT for some samples [Cs-134 and Cs-137]
 - Sampling: In collaboration between local governments and fishery unions, etc. (Once/week in principle) (Fishery products*)
 Analysis: In collaboration between local governments, fishery unions, etc., and the Fishery Agency [Cs-134 and Cs-137]
- (At least once/2 months)

* Targeting Tokyo Bay as a whole, samples of fish, shellfish, and other fishery products living in the bay will be collected. Sampling points, frequency, and time will be determined through making adjustments between sampling organizations and local governments.

Outer Sea Area: Wide-area Monitoring

- FY2012 -

March 30, 2012



: Water samples will be collected by the Japan Meteorological Agency's observation ship from eight water layers down to a depth of 1,000m.

Furthermore, adjustments are now being made among related organizations to seek means to conduct additional monitoring.