



Japan's Decontamination Efforts and its Effects

July 5, 2014

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Ministry of the Environment, Japan

Outline

1. Timeline after the accident
2. Decontamination target and its measures based on the Act on Special Measures
3. Status of decontamination implemented by the national government and the municipalities
4. Evaluation of decontamination project
5. Latest topics
 - Follow-up measures after the decontamination
 - Basic concepts of decontamination in forests
 - Measures in the areas where it is expected that residents will face difficulties in returning for a long time
 - Basic concepts to ensure safety and security
 - Background and general outline of Interim Storage Facility
6. Summary

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Timeline after the Accident ①

2011

- Mar. 11: The Great East Japan Earthquake occurred
- Mar. – Apr.: Designation of the evacuation areas according to the Guideline for disaster prevention was designated by Nuclear Safety Commission
“in-house Evacuation Area” (within 20km ~ 30km radius from the NPS)、
“Restricted Area” (within 20 km radius from the NPS)
“Deliberate Evacuation Area” (the areas excluding restricted areas, where the annual cumulative radiation dose was expected to reach 20 mSv after the accident)
“Evacuation Prepared Area in case of emergency” (the areas excluding deliberate evacuation areas, among the areas of in-house evacuation)
- Jul. “Basic Policy on Radiation Protection for Termination of Evacuation and Reconstruction” (Nuclear Safety Commission)
Decontamination model demonstration project started
(Cabinet Office : assignor, JAEA : contractor)
- Aug. “The Act on Special Measures Concerning the Handling of Environment Pollution by Radioactive Materials (The Act on Special Measures)” was enacted
- Nov. “Basic Principle” based on the Act on Special Measures was decided by the Cabinet
- Dec. Designation of “Special Decontamination Area (SDA)” and “Intensive Contamination Survey Area (ICSA)” was announced
“Decontamination Guidelines (1st Edition)” were issued

Timeline after the Accident ②

2012

- Jan. “The Act on Special Measures” was fully enforced.
- Apr. “The Decontamination Implementation Plans for SDA” in Tamura, Naraha, and Kawauchi were announced
- Jul. Decontamination work in SDA started

2013

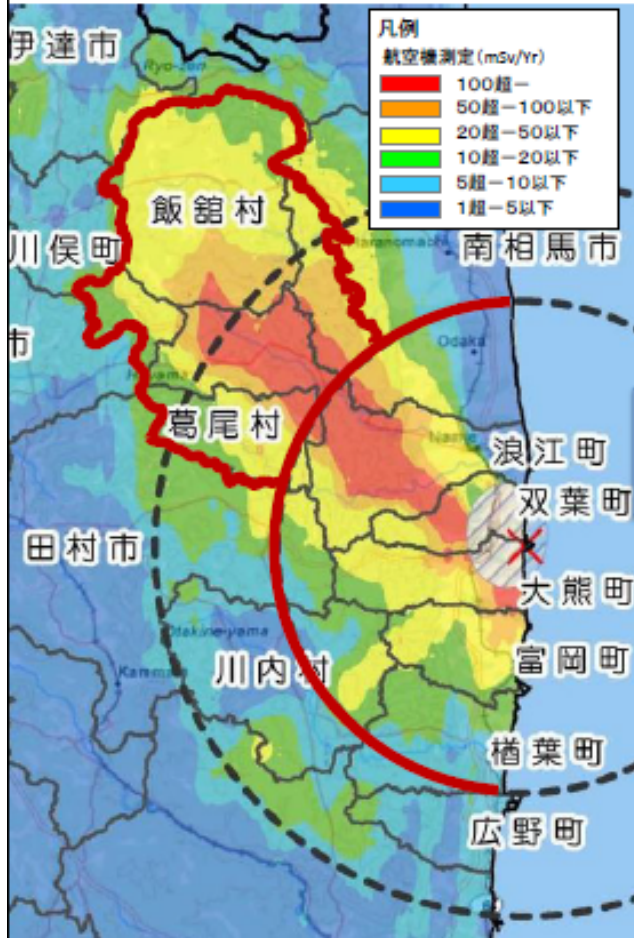
- Jan. “The Decontamination Optimization Program” has been developed in response to inappropriate decontamination work
- May. “Decontamination Guidelines (2nd Edition)” were published
- Jun. Full decontamination work in Miyakoji, Tamura City (SDA) was completed
- Sep. “Overall check of progress of decontamination” was announced
- Oct. International Atomic Energy Agency (IAEA) has sent an “International Mission”
- Dec. Decontamination plans for SDA in some municipalities were revised to respond to current condition of each city, town, and village

2014

- Mar. Full decontamination work in Okuma, Kawauchi, and Naraha (SDA) was completed
- Apr. Evacuation Order in Miyakoji, Tamura City was lifted
- May-Jun. The Ministry held the explanatory meetings for residents(16 times).

Overview Before and After Rearrangement of the Evacuation Order Areas

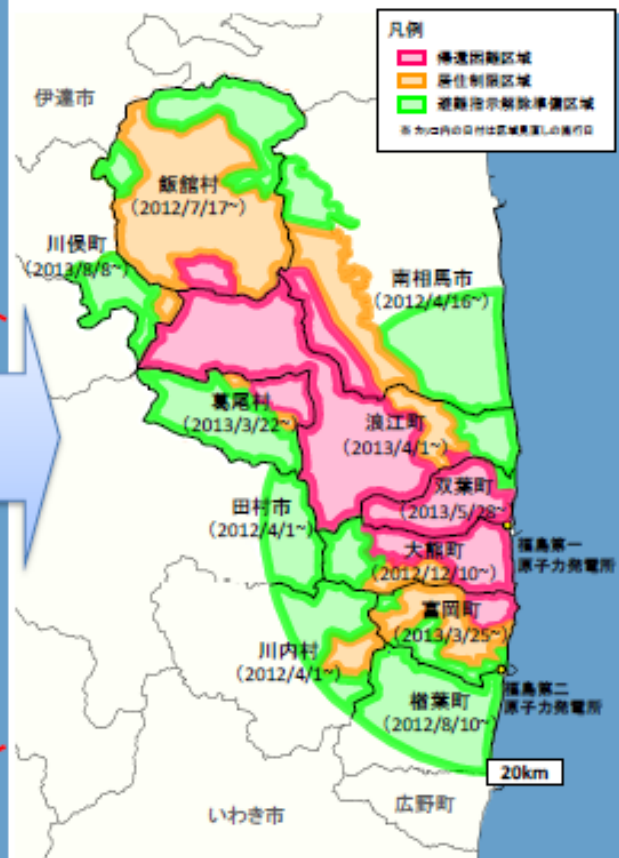
Distribution of cumulative radiation dose estimated from air dose rate
As of April, 2011



Designation of evacuation areas is completed just after the accident
As of April 22, 2011



After rearrangement of the evacuation areas
August 7, 2013-today



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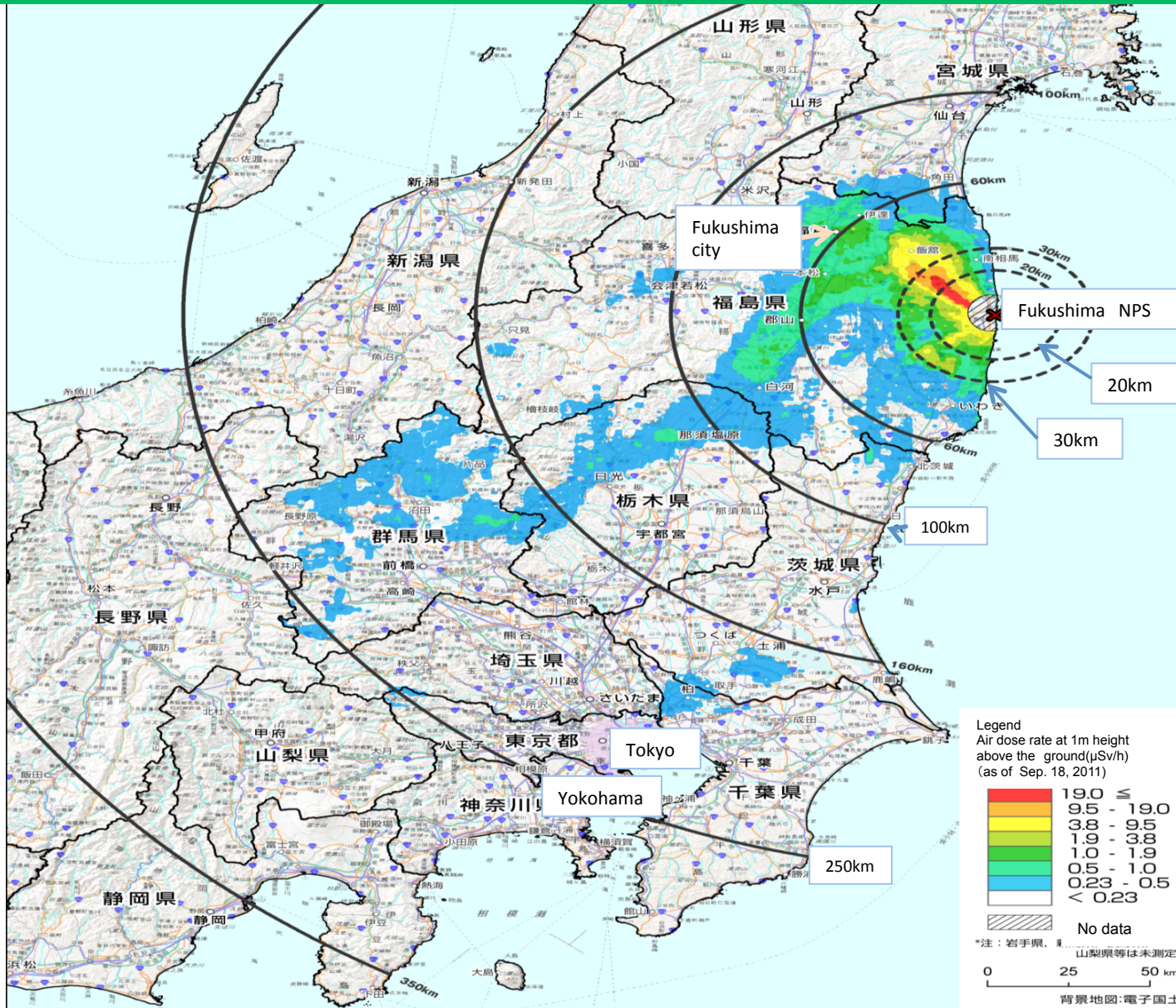
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Radioactive Pollution Caused by the Accident at TEPCO's Fukushima Dai-ichi NPS



Measures such as Decontamination based on the “Act on Special Measures”

1) Special Decontamination Area

Designation of SDA by the Minister of MOE



Development of the decontamination implementation plan in the SDA by the Minister of MOE



Implementation of measures such as decontamination by the national government



2) Intensive Contamination Survey Area

Designation of ICSA by the Minister of MOE



Survey measurement by the mayors of municipalities



Development of the decontamination implementation plan in the ICSA by the mayors of municipalities



Implementation of measures such as decontamination based on the plan by the mayors of municipalities, etc.

Measures on decontamination of Soil and disposal of removed soil generated from the work

Implemented by related nuclear power plant operational company (TEPCO)

Basic Principle of Decontamination ①

Basic Target

Decontamination measures shall be promptly implemented to reduce the effects on human health and/or living environment.

Basic Items regarding Decontamination Measures

- Decontamination plans are required to be formulated preferentially from the viewpoint of human health. Among others, living environment of children should be prioritized
- Aiming at stepwise and rapid reduction in areas where additional exposure dose rate is expected to be more than 20mSv/year.
As for areas with particularly high air dose rate, it is required to be implemented in a long-term action.
- Aiming at following measures in areas where additional exposure dose rate is expected to be less than 20mSv/year.
 - ① Aiming at reducing additional exposure dose rate less than 1mSv/year as a long-term goal.
 - ② To reduce additional annual radiation dose of the public by around 50 % including physical attenuation of radioactive materials by the end of Aug. 2013 from the level at the end of Aug. 2011
 - ③ To reduce estimated annual additional dose of the children by around 60 % including physical attenuation compared to Aug. 2011

Basic Principle of Decontamination②

Vertical Axis: Annual Dose

[mSv/yr]

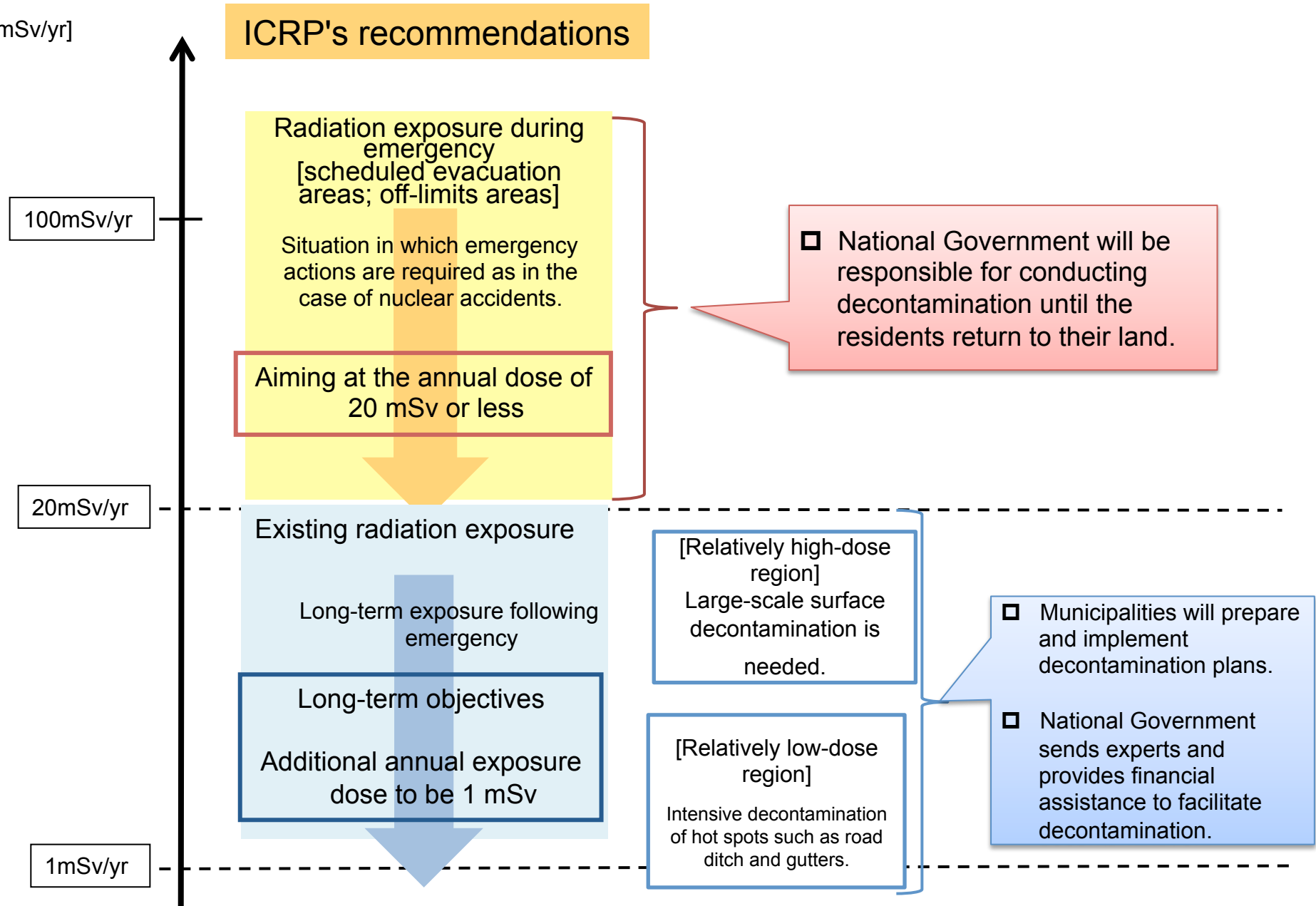
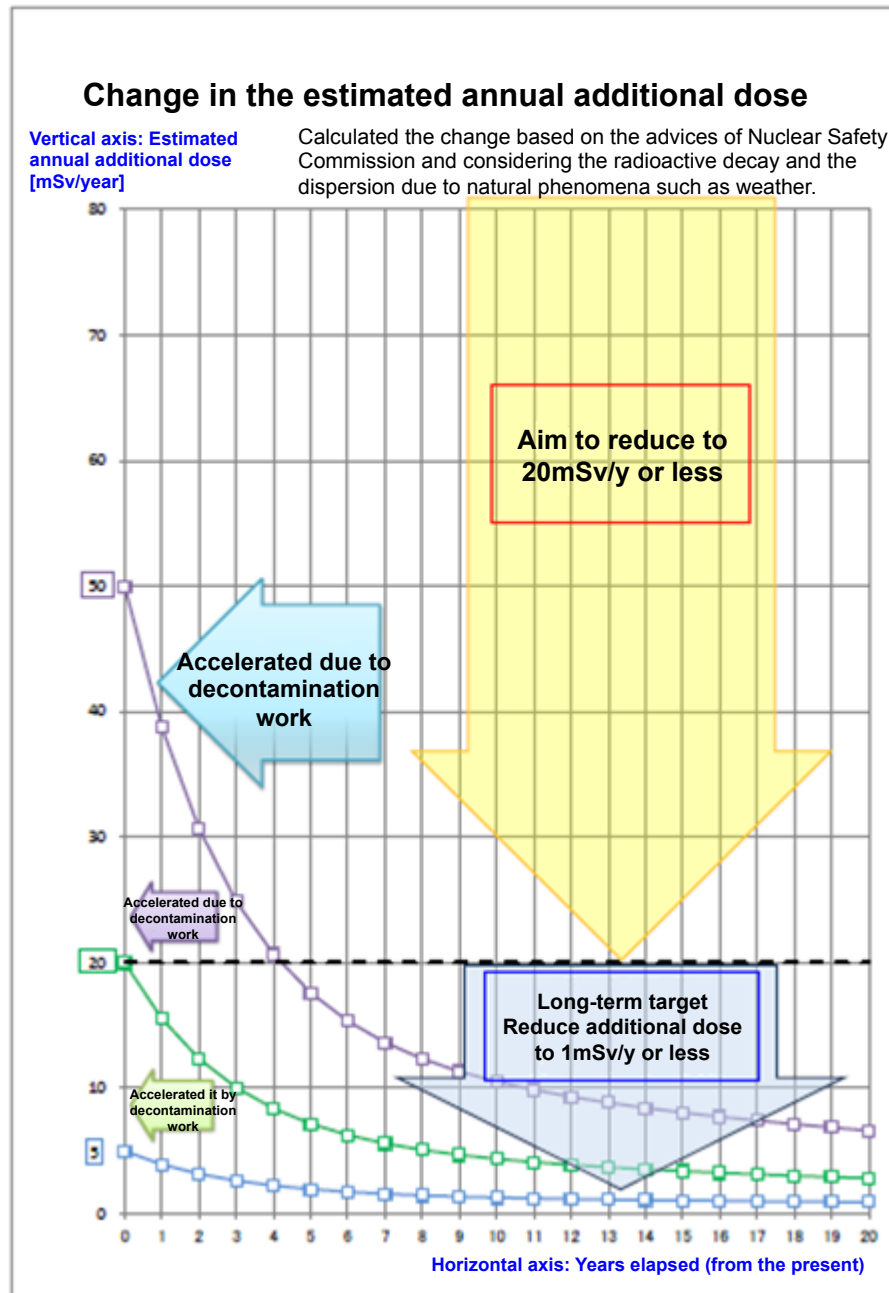


Illustration of image of lowering radiation dosage



- Considering the release rate of cesium-134 and cesium-137, the intensity of each dose, radioactive decay (Half-life), and the dispersion by natural phenomena such as infiltration/diffusion, etc., radiation will be halved in about 3 years after release, and reduced to about 20% in 10 years.
- However, after that, the rate of reduction will decrease due to the effect of remaining cesium-137 with longer half-life (30 years).
- It is possible to reduce dose faster by removing the cesium through the decontamination work.

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Review of Progress of Decontamination

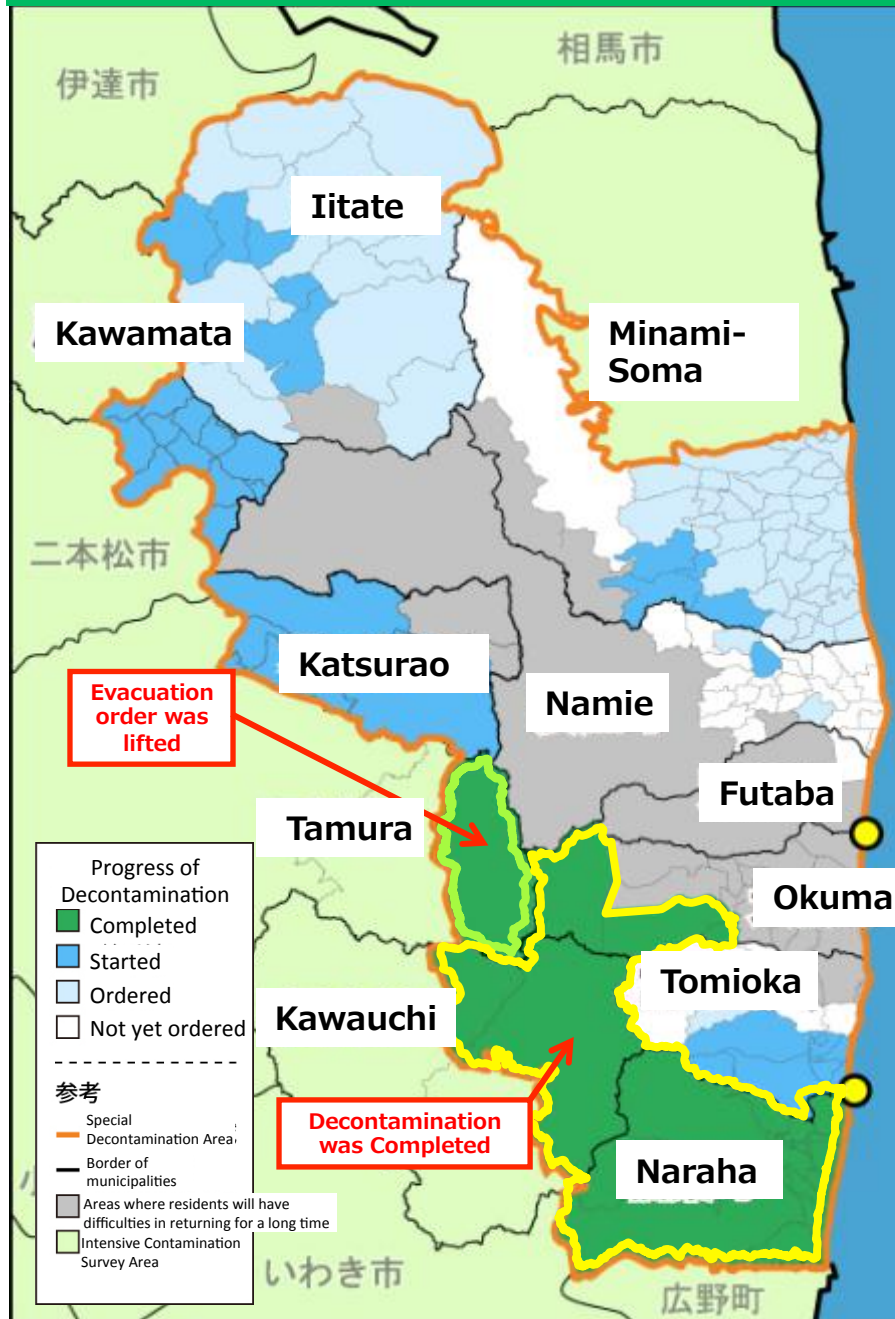
(September 10, 2013)

1. Review of progress of decontamination on Special Decontamination Area and Intensive Contamination Survey Area was carried out.
2. The previous target that aims to complete decontamination and transfer removed materials to a temporary storage sites in two years (by the end of March 2014) for all areas is changed to a target that promotes decontamination according to the condition of each city, town or village in concert with the restoration activities.
3. In the new target, a measure is taken to make the decontamination accelerated and smooth and the decontamination procedures are reviewed in a flexible manner according to the embodiment and progress of the restoration.
4. For Tamura city, the decontamination based on the decontamination plan is finished. For Naraha town, Kawauchi village, and Okuma town, the decontamination will finish by the end of 2013 as scheduled in the current decontamination plan. For Minami-Soma city, Iitate village, Kawamata town, Katsura village, Namie town, and Tomioka town, the current decontamination plan will be changed by the end of the year in consultation with their local governments. For Futaba town, consultation with the local government will continue to determine the direction of the restoration and a decontamination plan.

Revision of Decontamination Plan for the Special Decontamination Areas (December 26, 2013)

- In the review in September, it was decided to change the current decontamination plan for Minami-Soma city, Iitate village, Kawamata town, Katsura village, Namie town, and Tomioka town by the year end. A realistic schedule will be established in consultation with the local governments and communities in accordance with their conditions.
- Residential areas and their surroundings will be decontaminated on a priority basis for the evacuees to return home.
- For the recovery of the infrastructure such as water supply, sewage, and major roads, are decontaminated in advance along with the restoration activities after the consultation with associated agencies and local governments.
- The decontamination projects should be made in an accelerated and smooth manner and the project terms should be shortened as much as possible. The work process should be fully controlled and the progress status should be made open to the public.
- Following this guideline, the decontamination plans for the six municipalities were changed.
- ✂ For the difficult returning area, decontamination will be discussed by taking account of the results of the model projects, the restoration plan, and the dose level. Based on this discussion, consultation for Futaba town will be continued to establish a decontamination plan.

Progress in the Special Decontamination Area ①



Municipalities in which the decontamination work has been completed according to the plan

Tamura	Completed in June, 2013 Evacuation order was lifted on Apr. 1, 2014
Kawauchi	Completed in Mar., 2014
Naraha	Completed in Mar., 2014
Okuma	Completed in Mar., 2014
Joban Expressway	Completed (Reopened between Hirono and Joban-Tomioka)

Other Municipalities

Katsurao & Kawamata	Decontamination in residential houses is aimed to be completed in the Summer of 2014
Iitate	Decontamination in residential houses is aimed to be completed within 2014

- ◆ The plan was already reviewed at the end of 2013
- ◆ Decontamination will be accelerated with full force and will be implemented based on the reviewed plan for evacuees to return home

Progress in the Special Decontamination Area ②

Decontamination Plan has been established in 10 municipalities out of 11 target municipalities and the progress has been made. Decontamination works in Tamura, Naraha, Kawauchi and Okuma have been completed at the end of March, 2014

	Population in Decontamination Target Area(person) (approx. Figure)	Decontamination Target Area (ha) (approx. figure)	Rearrangement of the Restricted areas, etc.	Progress of the Decontamination Work < as of the end of Mar., 2014 >				Schedule	
				Decontamination Plan	Temporary Storage Site	Consent of landowners, etc.	Decontamination activities	Residential Areas completed	The rest of other areas completed
Tamura	400	500	Apr. 2012	Apr. 2012	Secured	Completed	Completed in June. 2013	Already completed in FY2013	
Naraha	7,700	2,100	Aug. 2012	Apr. 2012	Secured	completed	Completed in March, 2014	Already completed in FY2013	
Kawauchi	400	500	Apr. 2012	Apr. 2012	Secured	Completed	Completed in March, 2014	Already completed in FY2013	
Okuma	400	400	Nov. 2012	Dec. 2012	Secured	Completed	Completed in March, 2014	Already completed in FY2013	
Minami-Soma	13,300	6,100	Apr. 2012	Apr. 2012	approx. 60% secured	approx. 30%	In progress	FY2015	FY2016
Iitate	6,000	5,600	Oct. 2012	May 2012	approx. 50% secured	approx. 80%	In progress	Within 2014	Within 2016
Kawamata	1,200	1,600	Aug. 2013	Aug. 2012	approx. 80% secured	Almost completed	In progress	Summer, 2014	Within 2015
Katsurao	1,400	1,700	Mar. 2013	Sep. 2012	approx. 30% secured	Almost completed	In progress	Summer, 2014	Within 2015
Namie	18,800	3,300	Apr. 2013	Nov. 2012	approx. 20% secured	approx. 40%	In progress	FY2015	FY2016
Tomioka	11,300	2,800	Mar. 2013	Jun. 2013	approx. 40% secured	approx. 20%	In progress	FY2015	FY2016
Futaba	300	200	May, 2013	Under coordination	Under coordination	Under coordination	Under coordination (plans not formulated)	Still under coordination to formulate a plan	

Note 1: In Namie and Futaba, where residents will have difficulties in returning for a long time, model projects for the areas, are in progress

Note 2: Necessary areas for securing Temporary Storage Sites might be reviewed in future survey

Note 3: The plan was already reviewed at the end of 2013

Progress in Intensive Contamination Survey Area

As of Mar. 2014



- ◇ Decontamination work as planned in public facilities including living environment of children is coming to an end with more than 80%
- ◇ Also the decontamination work in residential areas, farmland/meadows and roads, more than 60% have been ordered
- ◇ Steady progress has been made and there are municipalities who have already completed the planned work

- Number of municipalities designated as Intensive Contamination Survey Area:
104 (at first) → 100 (at present)
 If the conditions would not be fulfilled, the designation of Intensive Contamination Survey Area can be lifted
 The designation was lifted in 4 municipalities up to now because of radiation dose decrease, etc.
- Decontamination implementation plans formulated (for all municipalities which have the intention):
94 municipalities
- Publicly announced the completion of decontamination work based on the plan (monitoring survey will be continued):
7 municipalities
- In process of implementing decontamination work based on the plan:
87 municipalities
 Completion of the plan is set between FY2015~FY2016 (34 municipalities) in Fukushima prefecture and most of other municipalities, between FY2012~FY2013 (45 municipalities)
- According to the plans, most municipalities in Fukushima are setting their ending periods at the end of FY2015 and FY2016, while many municipalities in other prefectures are setting them at the end of FY2012 and FY2013

Decontamination Guidelines



- Technical guidelines for carrying out decontamination
- Developed to complement the Ordinance of the Ministry of the Environment

Contents

1. Guidelines on the methods of investigating and measuring the status of environmental pollution in intensive survey areas
2. Guidelines pertaining to measures on decontamination and the like
3. Guidelines pertaining to the collection and transportation of the removed soil
4. Guidelines pertaining to the storage of the removed soil

- December, 2011 1st Edition issued
- May, 2013 2nd Edition issued with knowledge and new technology obtained afterwards
- December, 2013 Addenda (Forest Management)

Decontamination Activities



Wiping off rooftop and walls



Wiping off a gutter



High pressure water cleaning of a drain pipe



High pressure water cleaning of paved road

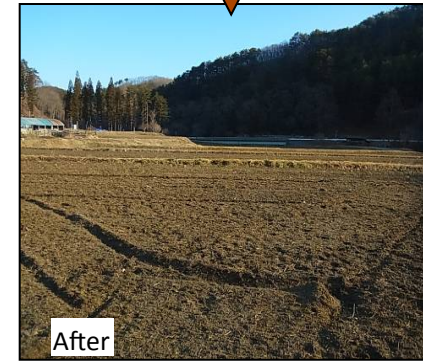


Mowing and removal of sludge



Removal of crushed stones and topsoil, and cover with clean soil

Before & After the Decontamination Work



Storage of Removed Soil, etc. in Fukushima

【Special Decontamination Area】

Current status of storage	Mar. 31, 2014	Dec. 31, 2013	Increase/Decrease
Temporary storage site	60	67	-7

Note: Including temporary storage on-site

【Municipalities】

Current status of storage	Mar. 31, 2014	Dec. 31, 2013	Increase/Decrease
Temporary storage site based on a decontamination implementation plan	664	636	+28
Storage on-site	53,057	47,433	+5,545
Other temporary storage site	104	95	+9
TOTAL	53,825	48,164	+5,661

Note: Ref. from Fukushima prefectural government. Investigation target is 52 out of 59 municipalities in Fukushima pref. which excludes 7 towns and villages(which whole area is designated as Special Decontamination Area)



Completed in Temporary storage site in the Sanitary Center, Iwaki



Installing in Nagano temporary storage site in Minami-Soma



Temporary storage on-site in Koriyama

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Assessment ① Evaluation regarding the Goal of Basic Principle

Assessment was performed in relation to the targets aimed at the end of August, 2013 in the basic principles based on the Act on Special Measures by utilizing the data collected in contamination survey area. It was confirmed that the targets had been achieved.

	Additional annual dose for general public	Additional annual dose for children
Targets set in the Basic Principles on the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials (adopted by the Cabinet in November 2011)	Achieve approx. <u>50% reduction</u> (including physical attenuation) by the end of August 2013 compared with the rate in the end of August 2011 .	Achieve approx. <u>60% reduction</u> (including physical attenuation) by the end of August 2013 compared with the rate in the end of August 2011.
Results of Provisional assessment*	Approx. 64% reduction	Approx. 65% reduction

* 1. The air dose rate in each category of facility at the end of August 2011 had been estimated from the air dose rate before decontamination and the air dose rate in each category of facility after decontamination was estimated at the end of August 2013. The reduction rate of the air dose rate in decontaminated facilities were assessed as a total of the reduction rate in decontamination work and that due to physical attenuation of the radioactive substances.

Although the basic principles aimed at reduction of additional dose, it cannot be directly measured. Therefore, reduction of additional dose was assessed on the assumption that it is proportional to a decrease in the air dose rate.

*2. Average air dose rate was used for the assessment under the presumption that additional individual dose, which cannot be directly measured, is proportional to the average air dose rate.

○ Reduction rate of additional dose from the end of August 2011 to the end of August 2013

$$R1 = 1 - \frac{\Sigma (\text{Average additional dose at the end of assessment in each category of facility (August 31, 2013)} \times \text{Coefficients})}{\Sigma (\text{Average additional dose at the beginning of assessment in each category of facility (August 31, 2011)} \times \text{Coefficients})}$$

● Reduction rate due to physical and natural attenuation: About 40%

● Reduction rate by decontamination over 2 years: R1 - 40(%)

< Calculation of additional dose rate taking into patterns of living of general public into consideration >

The additional dose at each type of facility was multiplied by coefficients that take patterns of living into consideration, and the annual additional dose was calculated from the total of the calculation.

Assessment② Summary on Decontamination Effect

Effect of decontamination works by national and local governments (Major results)

Air dose rate ^{*1,2} (Measured at 1m height)	Before decontamination: 0.36-0.93 μSv/h ↓ After decontamination: 0.25-0.57 μSv/h		
Reduction rate (average) of air dose rate ^{*2,3}	<1μSv/h before decontamination	1-3.8μSv/h before decontamination	> 3.8μSv/h before decontamination
	32%	43%	51%
Example of reduction rate of surface concentration of contamination ^{*4}	Asphalt-paved roads: 50-70% by washing, 30-70% by high-pressure washing Playground(Soil): 80-90% by stripping off surface-dirt		

*1: Range from 25 to 75 percentile values of the air dose rate.

*2: Data measured at 50cm height in children's living environment are not included.

*3: Average reduction rate of the air dose rate for different dose levels before decontamination.

(Reduction rate (%)= (1-air dose rate after decontamination / air dose rate before decontamination) x100.)

*4: Already in press release of "Announcement on 'Effectiveness of decontamination work which is implemented by the national government and relevant municipalities in decontamination project' (Jan. 18, 2013)"

<Original Data>

○Projects: Mostly, decontamination projects after FY2012

(Projects by national government: 10 municipalities;
Projects by municipalities: 90 municipalities in 8 prefectures)

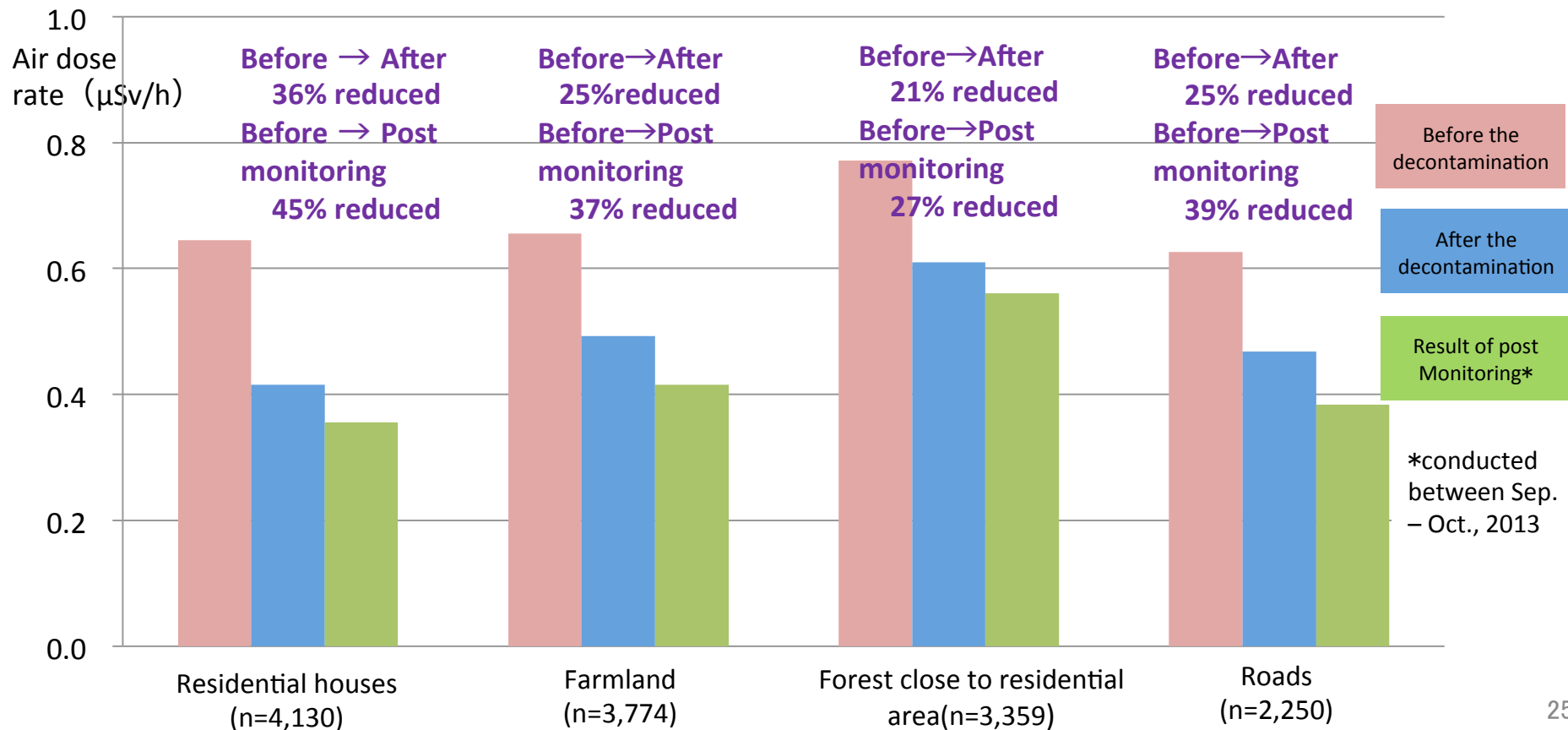
○Data measurement term : Roughly from Mar. 2012 to Oct. 2013

○Measured item: Air dose rate (measured at 1m and 50cm heights; Unit: μSv/h)

○Number of data: About 250,000 (A pair of data collected before and after decontamination is counted as one item of data)

Assessment③ Result on Decontamination Work in Tamura (in the Special Decontamination Area)

- ◆ Decontamination work decreased radiation dose:
e.g. approx. 36% in residential area
- ◆ It is confirmed that the effect on decontamination work in whole area has been maintained, and post monitoring survey shows that radiation dose has been continuously decreasing



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Lift of Evacuation Order in Tamura and Thereafter

April 2011

Designated as areas to which evacuation orders are ready to be lifted after rearrangement of evacuation order area
Formulated a decontamination implementation plan

July 2012-

Started full-scale decontamination work based on the plan

June 2013-

Completed the decontamination work

Aug.-Nov. 2013-

Post-monitoring

October 2013

Explanatory meeting to local residents
<Reported the result of post-monitoring of residential houses>

February 2014-

Explanatory meeting to local residents
<Set up an inquiry counter and carried out measurement upon residents' requests>

April 2014

Lifted the evacuation order

Decontamination follow-up

1. Inquiry counter for decontamination

<Started to measure air dose rate and to check the extent of contamination upon residents' requests>

2. Continuous Post monitoring

3. Removal of contaminated soil depending on the situation



Overview of Follow-Up after the Decontamination

Measures based on the Act on Special Measures

Decontamination based on the plan

Decontamination follow-up

1. Maintain & check the effect /follow

Detailed post-monitoring

Maintain & check the effect

Decontamination follow-up

Measurement after the decontamination

Select 1-3 as needed

2. Continuous monitoring

※Designed upon the amount of radiation dose

3. Specific response for the residents

Response to the reports of the local residents

- ◇ confirmation at spot
- ◇ Monitoring
- ◇ risk communication
- ◇ response at spot

Other countermeasures※

※Cooperation with the relevant ministries and municipalities

<Examples>

Health management and risk communication

- ◇ Management on individual dose
- ◇ Activity and advice on health

Other radiation protections

- ◇ Monitoring
- ◇ Daily care and cleaning of houses and gardens
- ◇ Advices on daily life activities

Future Concepts on Forested Areas

MOE and Forestry Agency will continue to cooperate with research and development and will examine the newly discovered knowledge when needed

Forestry Agency

Measures to manage proper forestry [C]

- model project for forestry revitalization
- Research & development of technology to prevent the diffusion of radioactive materials

Forestry run in deep forest

※Division of forest area

- Area A: Around residential area
- Area B: Where people have daily access
- Area C: Forest in whole

Area where people have daily access [B]

Ministry of the Environment

Sharing knowledge

Tackle the task cooperating with relevant agencies and municipalities

Clearly identify the decontamination in mushroom farm [B]

Measures on diffusion of radioactive materials from forest to living environment and to prevent landslide not to discharge the materials to ensure safety and security for the local residents [C]

- Trial measures to prevent landslide where understory decays
- Understanding the current status of radioactive materials diffusion from the forest

Around residential area [A]

Implement the additional removal of organic residuals and measures to prevent sediment runoff [A]

Make an exceptional measure possible to widen the area of decontamination to over 20m in case relatively high air dose rate is monitored around the house supposing such a house located in a valley, etc. [A]

Future actions for the Areas Where it is Expected that Residents will Face the Difficulties in Returning for a Long Time

(Cabinet Decision on December 20, 2013)

Nuclear Emergency Response Headquarters announced as follows:

“ The Policy accelerating Fukushima’s reconstruction from the nuclear disaster”

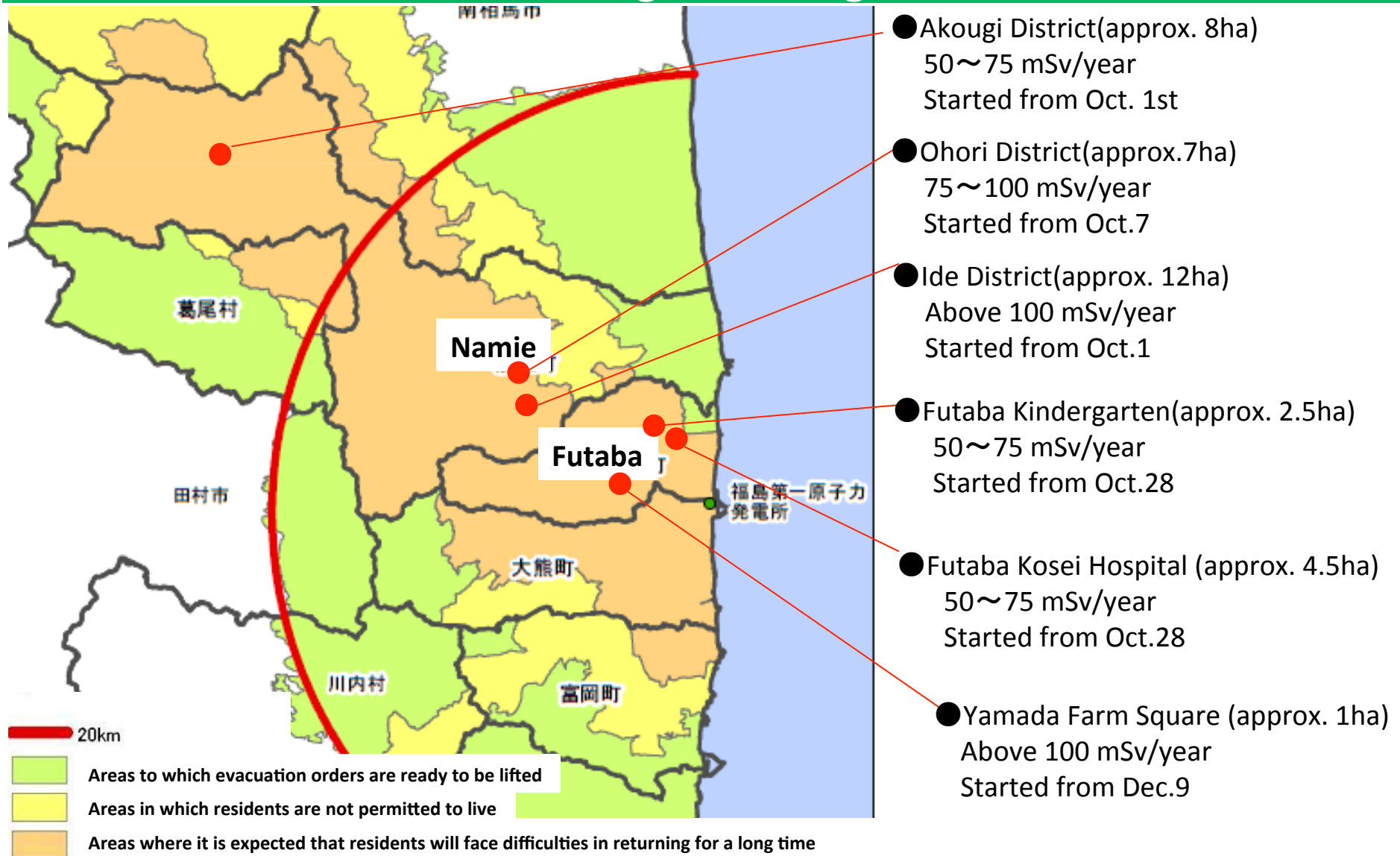
2. Improve the measures to start a new life

<3>Future actions for the areas where it is expected that residents will face the difficulties in returning for a long time

Regional development including decontamination will be reviewed along with the local municipalities taking into account the future radiation dose after the result of decontamination model project, evacuees’ intention whether to return, and future image of industry and reconstruction.

(tentative translation)

The Areas of Decontamination Demonstration Project in the Area where it is Expected that Residents will Face Difficulties in Returning for a Long Time



※The value of radiation dose is due to measurement data at the time of selecting candidate sites

Reduction Rate of Each Dose Rates Bands

<Decontamination Model Demonstration Project>

	Dose Rate Bands before the decontamination [$\mu\text{Sv/h}$]	Number of measurement points	Average value of dose rate			Reduction rate at each point		
			Before the decontamination [$\mu\text{Sv/h}$]	After the decontamination [$\mu\text{Sv/h}$]	Reduction rate	25% percentile	Median value	75% percentile
Residential areas	3.8~9.5	975	7.65	3.36	56.1%	44.9%	59.1%	68.8%
	9.5~14.3	423	11.37	4.32	62.0%	51.7%	66.4%	75.7%
	above 14.3	717	19.07	8.24	56.8%	46.1%	59.7%	70.4%
Farmland	3.8~9.5	476	8.11	3.52	56.6%	44.2%	58.5%	68.8%
	9.5~14.3	299	12.01	4.23	64.8%	56.4%	67.3%	77.6%
	above 14.3	754	19.06	5.99	68.6%	58.7%	73.4%	81.3%
Roads	3.8~9.5	226	6.69	2.91	56.5%	49.4%	58.0%	65.4%
	9.5~14.3	89	12.13	4.71	61.2%	54.2%	62.5%	69.0%
	above 14.3	167	19.56	7.12	63.6%	54.5%	64.5%	71.8%
Forests	3.8~9.5	41	8.40	6.85	18.5%	9.7%	12.6%	24.3%
	9.5~14.3	77	10.95	8.64	21.1%	13.1%	18.8%	26.1%
	above 14.3	78	18.82	14.05	25.3%	11.4%	20.4%	35.8%
Residential areas Farmland Roads	3.8~9.5	1677	7.65	3.35	56.3%	45.1%	58.6%	68.3%
	9.5~14.3	811	11.69	4.33	62.9%	53.6%	66.1%	76.1%
	above 14.3	1638	19.12	7.09	62.9%	52.1%	66.1%	77.2%

Ref: Press release from Decontamination Team, MOE on June 10, 2014

- ◇ Measured height: 1m above the ground
- ◇ Excluding measurement points within 10m from non-decontaminated area to eliminate the effects of non-decontaminated area
- ◇ Weeding & Top soil removal(5cm) were implemented in farmlands of Ide-district, (Ploughing & additional-soil were not)
- ◇ "Forests" includes measurement points of non-living district (10m from the forest adjacent)
- ◇ "percentile" is an arrange data in ascending order, when values lower than a value x occupy p% of all data, the value x is called percentile.
Suppose there are 100 values of data, 25 percentile corresponds to the 25th value from the lowest, 50 percentile is the 50th, and 75 percentile is the 75th value.

Estimation of Future Reduction on Air Dose Rate

◇ In terms of air dose rate measured above 1m from the ground as of Nov. 19 2013, the reduction rate is estimated as follows

◇ to estimate the reduction of air dose rate in living areas after the work of decontamination and to estimate it in areas without the work of decontamination on November 19, 2015

Unit: $\mu\text{Sv/h}$ air dose rate measured above 1m from the ground

As of Nov. 19, 2013 Last day of Aircraft monitoring	Estimation As of Mar. 11, 2015(before decontamination)	Reduction Rate in case of performing decontamination	Estimation				
			As of Mar. 11 2015	As of Mar. 11 2017	As of Mar. 11 2019	As of Mar. 11 2021	
19.0	14.0	No decontamination	14.0	10.4	8.3	7.1	
		Decon tami nation	Reduction rate(low)	6.5	4.8 ~ 5.0	3.9 ~ 4.1	3.3 ~ 3.6
			Reduction rate(middle)	4.7	3.5 ~ 3.6	3.0 ~ 3.2	2.4 ~ 2.6
			Reduction rate(high)	3.3	2.5 ~ 2.6	2.0 ~ 2.1	1.7 ~ 1.9
9.5	7.0	No decontamination	7.0	5.2	4.2	3.6	
		Decon tami nation	Reduction rate(low)	3.9	2.9 ~ 3.0	2.4 ~ 2.6	2.0 ~ 2.1
			Reduction rate(middle)	2.9	2.2 ~ 2.2	1.9 ~ 2.0	1.5 ~ 1.6
			Reduction rate(high)	2.2	1.7 ~ 1.7	1.4 ~ 1.5	1.1 ~ 1.2
3.8	2.8	No decontamination	2.8	2.1	1.7	1.5	
		Decon tami nation	Reduction rate(low)	1.9	1.4 ~ 1.5	1.2 ~ 1.2	1.0 ~ 1.1
			Reduction rate(middle)	1.5	1.1 ~ 1.2	0.9 ~ 1.0	0.8 ~ 0.9
			Reduction rate(high)	1.2	0.9 ~ 0.9	0.7 ~ 0.7	0.6 ~ 0.7

Estimation of Annual Exposure dose calculated from Air Dose Rate

Estimate calculation has been made as follows, according to current status taking into consideration the connection (conversion factor) between air dose rate measured by a survey meter and measured value by individual dosimeter based on the estimation (1) indicated on previous slide, various pattern of life and activities, and shielding effect of radiation depends on the quality of house materials

Ref: Press release from Team in Charge of Assisting the Lives of Disaster Victims, on June 23 2014

空間線量率 ($\mu\text{Sv/h}$)			年間被ばく線量 (mSv/年)							
H25.11.19時点	生活圏において仮に除染を実施した場合の低減率 ^{*1}	H33. 3.11時点	区域設定等で利用 ^{*2} (屋外8.0h/屋内16.0h)	屋外6.5h/屋内17.5h (農林業者の目安を想定 ^{*3})		屋外1.3h/屋内22.7h (事務員・教職員の目安を想定 ^{*3})		屋外1.0h/屋内23.0h (高齢者の目安を想定 ^{*3})		
			屋内低減効果: 0.4(木造)	屋内低減効果: 0.4(木造)	屋内低減効果: 0.2(ブロック)	屋内低減効果: 0.4(木造)	屋内低減効果: 0.2(ブロック)	屋内低減効果: 0.4(木造)	屋内低減効果: 0.2(ブロック)	
19.0	除染なし	7.1	37	24	18	18	10	18	10	
	除染あり	低減率 54%(低)	3.3 ~ 3.6	17 ~ 19	11 ~ 12	8 ~ 9	8 ~ 9	5 ~ 5	8 ~ 9	4 ~ 5
		低減率 66%(中)	2.4 ~ 2.6	13 ~ 14	8 ~ 9	6 ~ 6	6 ~ 7	3 ~ 4	6 ~ 7	3 ~ 3
		低減率 76%(高)	1.7 ~ 1.9	9 ~ 10	6 ~ 6	4 ~ 4	4 ~ 5	2 ~ 2	4 ~ 5	2 ~ 2
9.5	除染なし	3.6	19	12	9	9	5	9	5	
	除染あり	低減率 45%(低)	2.0 ~ 2.1	10 ~ 11	6 ~ 7	5 ~ 5	5 ~ 5	3 ~ 3	5 ~ 5	3 ~ 3
		低減率 59%(中)	1.5 ~ 1.6	8 ~ 9	5 ~ 5	3 ~ 4	4 ~ 4	2 ~ 2	4 ~ 4	2 ~ 2
		低減率 68%(高)	1.1 ~ 1.2	6 ~ 7	4 ~ 4	3 ~ 3	3 ~ 3	1 ~ 2	3 ~ 3	1 ~ 2
3.8	除染なし	1.5	8	5	3	4	2	3	2	
	除染あり	低減率 32%(低)	1.0 ~ 1.1	5 ~ 6	3 ~ 3	2 ~ 2	2 ~ 3	1 ~ 1	2 ~ 2	1 ~ 1
		低減率 46%(中)	0.8 ~ 0.9	4 ~ 5	2 ~ 3	2 ~ 2	2 ~ 2	1 ~ 1	2 ~ 2	1 ~ 1
		低減率 59%(高)	0.6 ~ 0.7	3 ~ 4	2 ~ 2	1 ~ 1	1 ~ 2	1 ~ 1	1 ~ 1	1 ~ 1



Practical measures to ensure safety and security

● “Practical Measures for Evacuees to Return Their Homes” (Nuclear Regulation Authority on November 20, 2013)

- Nuclear Regulation Authority (NRA) of Japan formulated practical measures of radiation protection for the evacuees, who will return their homes, from scientific and technological points of view. In this report they focus on the individual dose as follows.
- It has been acknowledged that the data of individual dose vary depending on individual daily life, and individual dose data collected by municipalities have a tendency to be lower than the exposure doses estimated from the air dose rates.
- it is necessary to implement measures to reduce individual exposure dose and health care depending on the individual dose data.

● “For Accelerating the Reconstruction of Fukushima From the Nuclear Disaster” (Cabinet Decision on December 20, 2013)

- Integrated and multi-tiered protective actions are taken by the related ministries in collaboration with each other. The ministries conduct, or continue to examine, measures of measuring and managing individual doses, reducing radiation exposure in various manners, and establishing a consultation system.
- Decontamination work in cooperation with the move toward the reconstruction and further efforts after completing the decontamination work as planned at present
- After evacuees return home, focus on their individual doses.

(tentative translation)

(Reference) IAEA International Follow-up Mission on Remediation

● What is IAEA Follow-up Mission ?

Oct. 2011, IAEA carried out the investigation on the decontamination status in Japan.

As follow-up process, in order to make assessment on the remediation activity and to give advices to the issues, IAEA dispatched the delegation comprising of IAEA members and expert in various countries, in all 16 staffs, to Japan Oct. 2013 and performed the survey.

From the viewpoint of helping the improvement in credibility of local residents, advices on 8 items are described in final report based on international standard and the experience of the activity of remediation in other countries.

○ Japanese institutions are encouraged to increase efforts to communicate that (point 2)

- in remediation situations, any level of individual radiation dose in the range of 1 to 20 mSv per year is acceptable and in line with the international standards and with the recommendations
- an additional individual dose of 1 mSv per year is a long-term goal, and that it cannot be achieved in a short time, e.g. solely by decontamination work

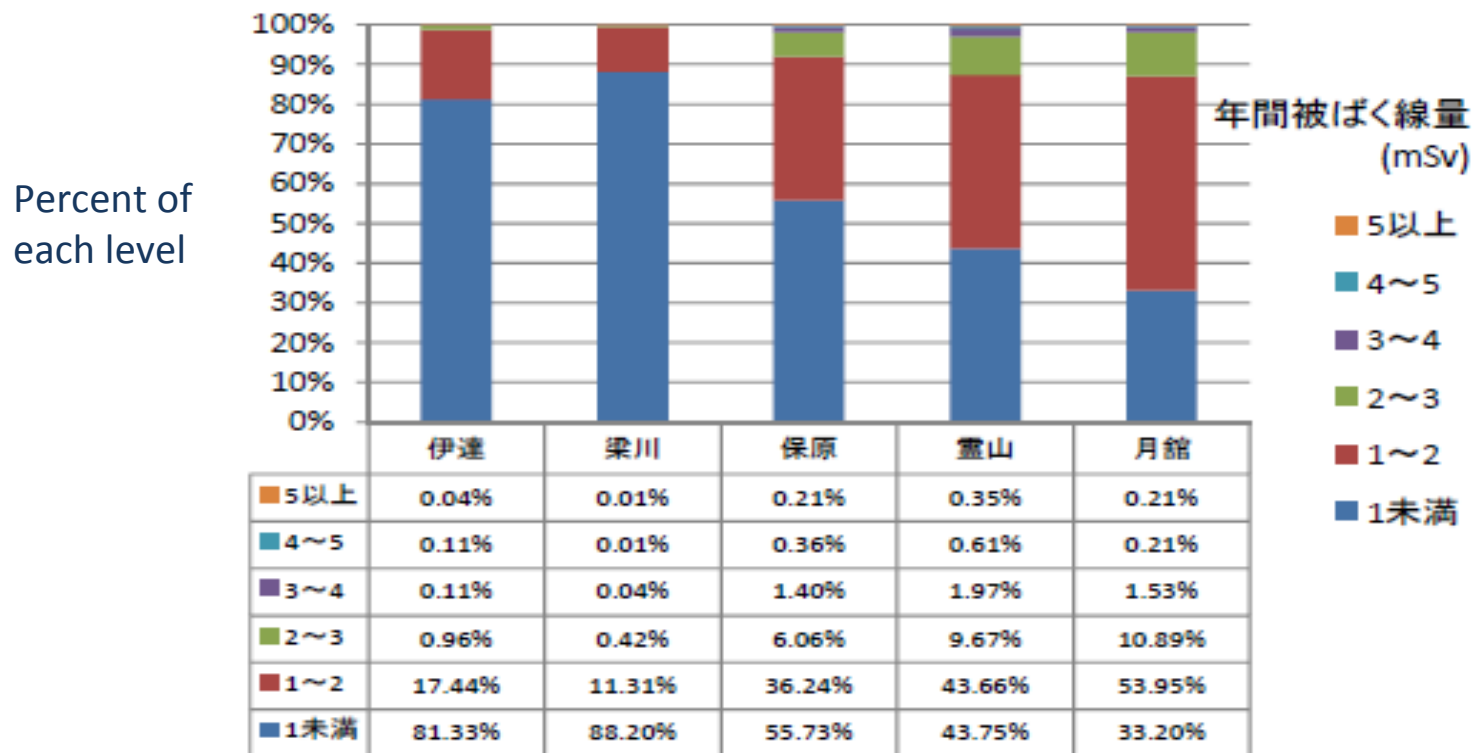
○ There needs to be a continued movement towards the use of the individual doses, as measured with personal dosimeters, to support remediation decisions (point 4).

Relation between Individual Dose Rate and Air Dose Rate (example of Date city) ①

In Date city, personal dosimeters were delivered to all citizens and the result of measurement of annual exposure dose rate was announced. Variations in exposure dose rate are observed in the same area and by age. It is considered to be the difference of life pattern, etc.

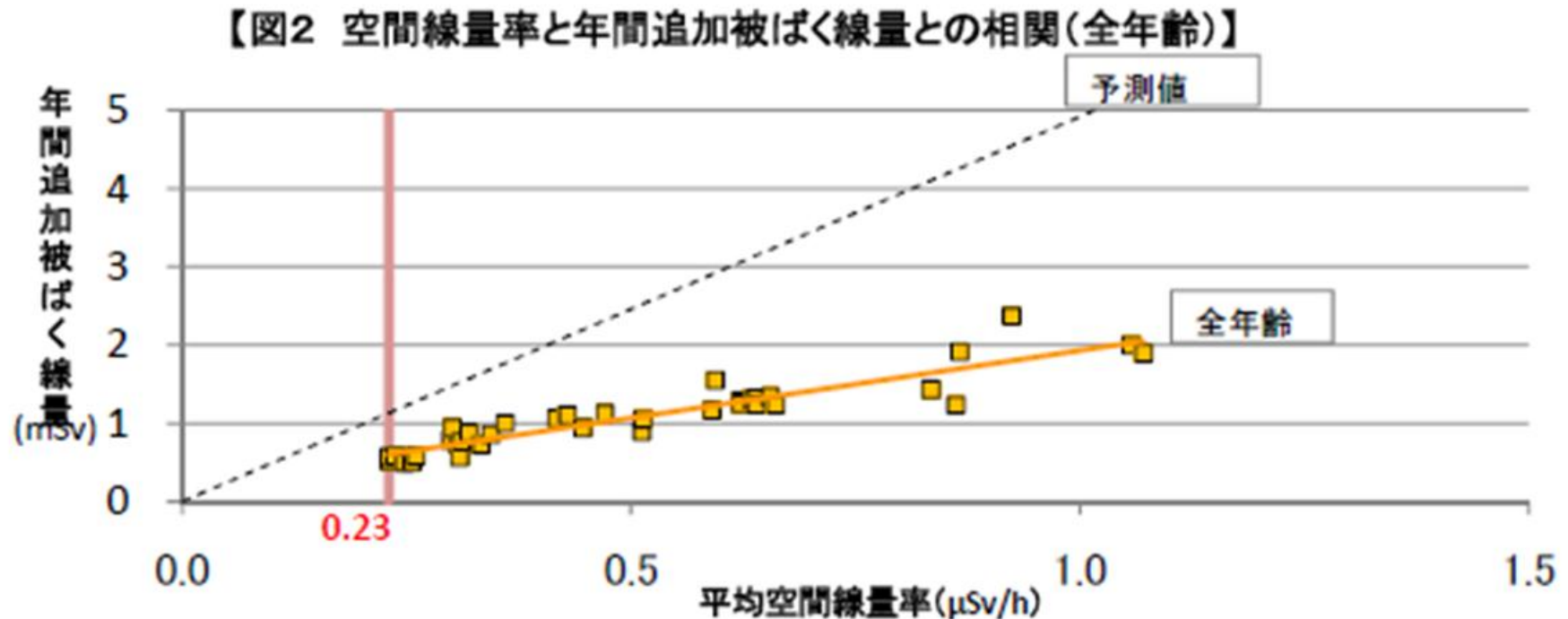
Annual exposure dose rate of each area (range)

地域毎での年間被ばく線量の分布から、1mSv未満の割合が最も多いのは梁川地域で88.2%でした。最も少ないのは月館地域で33.2%でした。



Relation between Personal Dose Rate and Air Dose Rate (example of Date city) ②

According to Date city's Investigation, there are cases that average exposure dose rate of citizens is less than 1mSv per year even though average air dose rate in residential area is over 0.23 μ Sv/h.



出典:平成25年11月 伊達市「外部被ばく線量年間実測値の分析結果について」より

What is an ISF(Interim Storage Facility)?

- A Large quantities of Soils and Waste which contain radioactive-materials has been generated by decontamination work in Fukushima prefecture.
- It is difficult to clarify the methods of final disposal at the current stage.
- Until the final disposal, it is necessary to establish ISF(Interim Storage Facility) in order to manage and store them safely and intensively.

Following materials generated in Fukushima prefecture will be stored in ISF.

1. Soils and wastes (fallen leaves, branches) generated by decontamination work which has been stored at Temporary Storage Sites.



2. Incinerated ash with radioactive concentration in excess of 100,000 Bq/kg.
✕ In principle, combustible materials will be incinerated and stored as ash.

Note) Policy, such as incinerated ash with radioactive concentration of 100,000 Bq /kg or less, will be finally disposed at private managed disposal site in Tomioka (Fukushima Eco Tec)

Efforts to secure Interim Storage Facility①

Oct., 2011 Ministry of the Environment announced the Basic Principles for Interim Storage Facility (the roadmap), and explained to the heads of relevant municipalities

✂Main Contents of the roadmap

- The National Government shall secure, maintain and manage ISF
- The National Government shall make efforts to start the operation of for Interim Storage Facility within about 3 years(by January, 2015)
- Materials to be stored are limited to soil and waste generated in Fukushima prefecture

Dec., 2011 The Ministry requested Fukushima Prefecture and 8 towns in Futaba County to examine location sites within Futaba county

Mar., 2012 The Ministry explained the Fukushima Prefecture and 8 towns that ISF may be located separately in 3 towns (Futaba, Okuma and Naraha)

Aug., 2012 The Ministry proposed the investigation for ISF to Fukushima Prefecture and 8 towns

Nov., 2012 The Governor of Fukushima Prefecture announced the acceptance of the investigation proposed by the Ministry

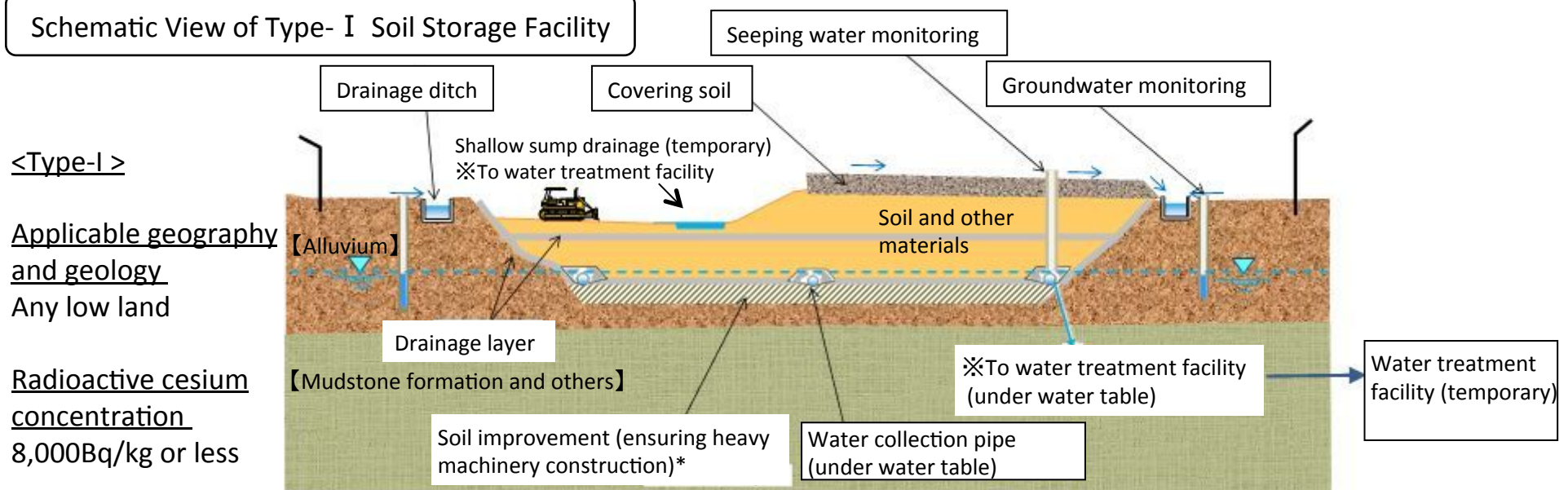
Efforts to secure Interim Storage Facility ②

Apr., 2013	Field survey started in Naraha and Okuma
May., 2013	Boring survey started in Okuma
Jul., 2013	Boring survey started in Naraha
Jun.-Sep., 2013	Studied by a study Group on environmental protection and safety measures for ISF
Oct., 2013	Field survey and boring survey started in Futaba
Dec., 2013	<u>The Ministry requested the Fukushima prefecture and 3 towns (Futaba, Okuma and Naraha) for the establishment of ISF</u>
Dec., 2013-	A study group on transportation was established
Feb., 2014	The Governor of Fukushima prefecture requested the Ministry to review the plan to consolidate ISF in Okuma and Futaba
Mar., 2014	The Ministry responded to consolidate ISF in 2 towns
May-Jun., 2014	The Ministry held the explanatory meetings for residents (16 times).

Concept of Structure of Storage Facility

	Type-I Soil Storage Facility	Type-II Soil Storage Facility	Waste Storage Facility
Main substances for storage (Radioactive cesium concentration)	Soil and other materials that do not risk polluting public water area and groundwater with radioactive cesium (8,000Bq/kg or less)	Soil and other materials exceeding the condition shown in left column (More than 8,000Bq/kg)	Waste
Measures to prevent water seeping into ground water	—	Seepage control and other infrastructure (Seepage control sheet and other infrastructure or low-permeability soil layer)	Package

Schematic View of Type- I Soil Storage Facility



*Basement: In the case of alluvium, soil improvement (approximately up to 1m depth) will be performed. In the case of mudstone formation, no action will be needed.

Concept of Structure of Storage Facility

Schematic View of Type- II Soil Storage Facility

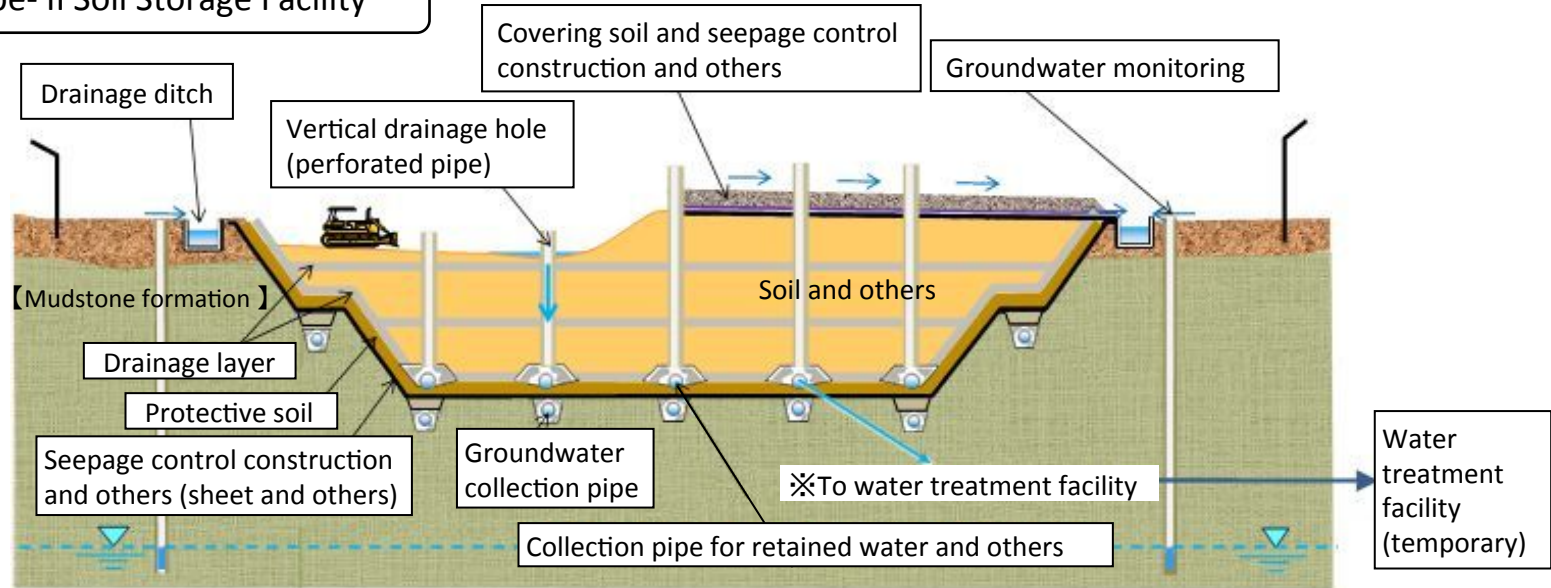
<Type – II >

Leakage control
Seepage control sheet patterns

Applicable geography and geology

Hill , Tableland

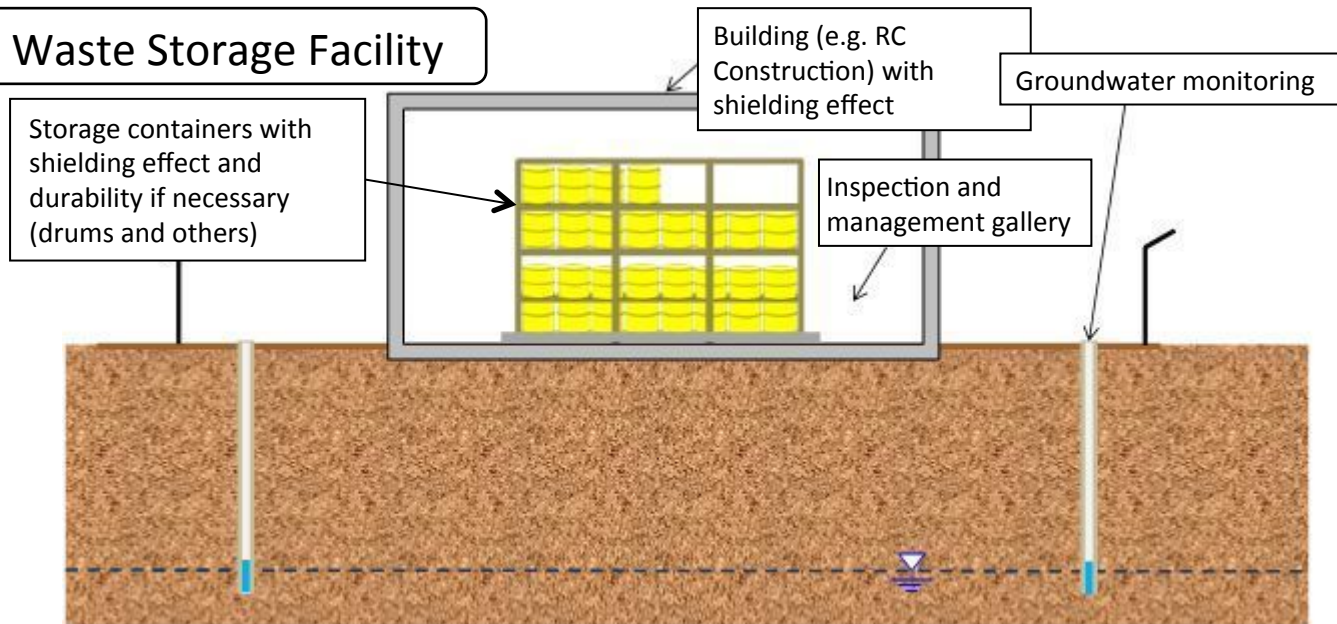
Radioactive cesium concentration
more than 8,000Bq/kg



Schematic View of Waste Storage Facility

Applicable geography and geology
Hill, Tableland

Radioactive cesium concentration
More than 100,000Bq/kg



Outline

1. Timeline after the accident
2. Decontamination target and its measures based on the Act on Special Measures
3. Status of decontamination implemented by the national government and the municipalities
4. Evaluation of decontamination project
5. Latest topics
 - Follow-up measures after the decontamination
 - Basic concepts of decontamination in forests
 - Measures in the areas where it is expected that residents will face difficulties in returning for a long time
 - Basic concepts to ensure safety and security
 - Background and general outline of Interim Storage Facility

6. Summary

SUMMARY①

1.

Decontamination works by municipalities have been started right after the accident at Fukushima Daiichi Nuclear Power Plant.

Since the Act on Special Measures was enforced, Japanese Government and municipalities have promoted the decontamination works systematically.

Although there are many unprecedented difficulties, progress has been made steadily with local resident's understanding and cooperation.

2.

There are issues such as the handling of the soil and waste generated by decontamination work.

With aiming at proper management of temporary storage facility and volume reduction of incineration of combustible materials, we will make our best efforts to install Interim Storage Facility.

3.

We shall try the acceleration of decontamination work based on the implementation plan and we shall implement the decontamination work in cooperation with the movement of local residents' returning and reconstruction.

In that case, it is important to consider the reduction of individual dose rate and enhancement of risk communication.

SUMMARY②

4.

It is important to enrich the middle and long-term knowledge through the radioactive monitoring and the research of radio-caesium behavior at Fukushima Environment Creation Center(open in 2017).

5.

We shall make use of the advice continuously from international organizations including IAEA, and we shall send the message and contribute to international society by the accumulation and systematization of our technological / societal knowledge obtained from our experience.