



Progress on Off-site Cleanup Efforts in Japan

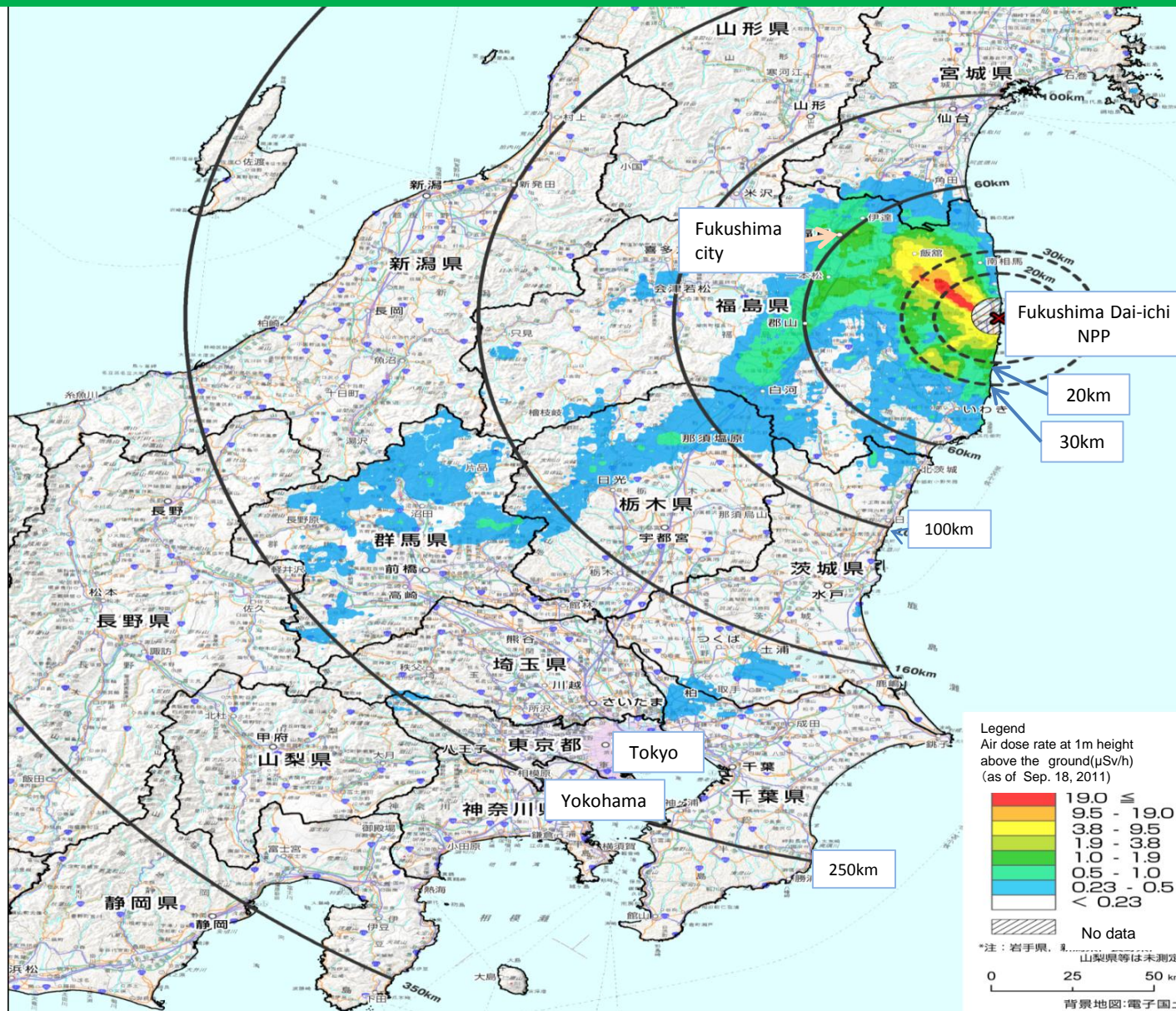
June, 2015

Ministry of the Environment, Japan

Outline

- **Policy Framework**
- Progress in Special Decontamination Area
- Progress in Intensive Contamination Survey Area
- Decontamination Technology
- Overview of New Policies
- Efforts to secure Interim Storage Facility
- Public Communication

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



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

Decontamination is one of the measures for radiation protection* to remove radioactive materials from the inhabitation areas in order to promptly decrease impacts on human health and the environment.

*The national government aims at a long-term goal to reduce additional annual dose to 1 mSv or less by comprehensive measures for radiation risk management including not only decontamination, but also monitoring survey, food safety administration, and health exams .

Aircraft monitoring survey by MEXT/Japan and DOE/US (as of Apr. 29, 2011)

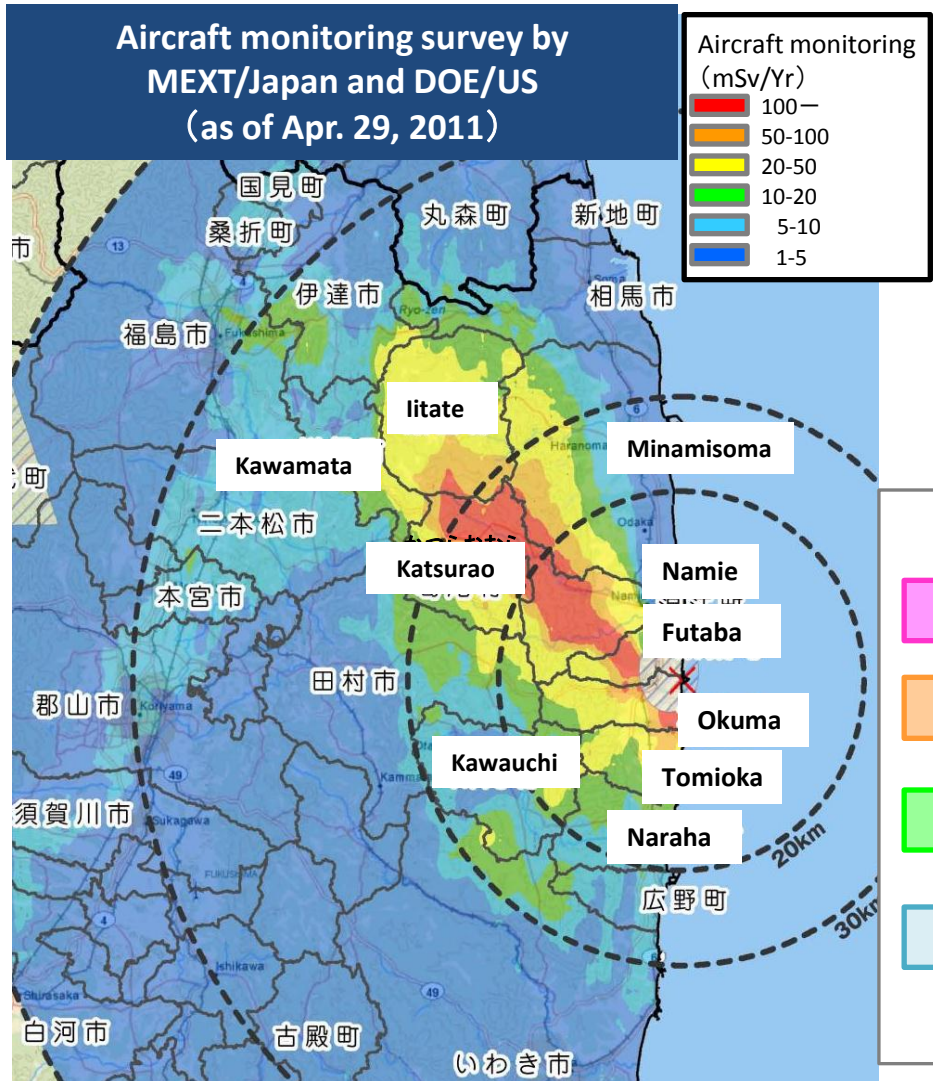
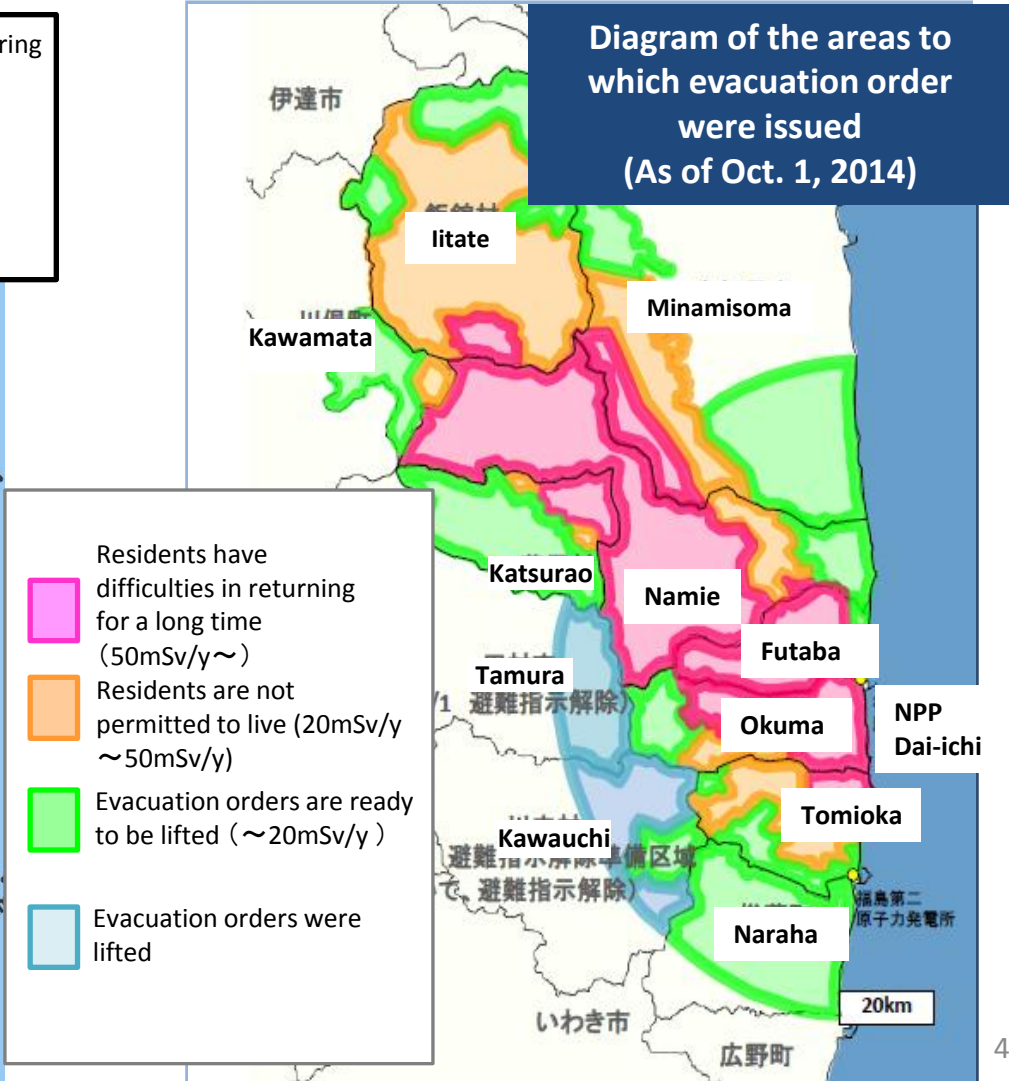


Diagram of the areas to which evacuation order were issued (As of Oct. 1, 2014)



Framework of Decontamination

Legislation for Promoting Decontamination

- ◆ The Act on Special Measures Concerning the Handling of Radioactive Pollution came into force on January 1, 2012.
- ◆ Based on this Act, the following are carried out:
 - Planning and implementation of decontamination work
 - Collection, transfer, temporary storage, and final disposal

Special Decontamination Area (SDA)

- ◆ 11 municipalities in the restricted zone (former) or the planned evacuation zone (<20km from the NPP, or annual cumulative dose is >20mSv)
- ◆ Decontamination is implemented by the national government

(*) Entire areas of Naraha, Tomioka, Okuma, Futaba, Namie, Katsurao, and Iitate.
Some areas of Tamura, Minami Soma, Kawamata, and Kawauchi.

Intensive Contamination Survey Area (ICSA)

- ◆ 104 municipalities in 8 prefectures (*), in which over 0.23 $\mu\text{Sv}/\text{hour}$ of air dose rate (estimated from the long-term target of annual additional exposure dose, 1 mSv/year, under a certain condition) were designated as ICSAs.
- ◆ Decontamination is implemented by each municipality. The national government will finance and provide technical assistance.

(*) Iwate, Miyagi, Fukushima, Ibaraki, Tochigi, Gunma, Saitama, and Chiba

Decontamination based on the “Act on Special Measures”

1) Special Decontamination Area

Designation of SDA by the Minister of the Environment

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

Implementation of decontamination by the national government



2) Intensive Contamination Survey Area

Designation of ICSA by the Minister of the Environment
(Areas where air dose rate is $0.23\mu\text{Sv/h}$ or more)
※ $0.23\mu\text{Sv/h}$ is a criterion for designation of ICSA and not a decontamination target

Survey measurement by the mayors of the municipalities

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

Implementation of decontamination by the municipalities, etc.
(The national government allocates budgets.)

Note: The air dose rate $0.23\mu\text{Sv/h}$ corresponds to a cautiously estimated individual exposure dose of 1mSv/y assuming that people spend
① 8 hours outside ② 16 hours in a wooden house with a low shielding rate in a day

Decontamination and disposal of soil at NPP

Implemented by the nuclear power plant operating company in charge (TEPCO)

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Decontamination Policy for the Special Decontamination Area

Decontamination efforts are determined by the level of air dose rates based on the decontamination implementation plans.

- ◆ **Area where non-background (additional) exposure rate is higher than 50mSv/year (Area Where Residents Have Difficulties in Returning for a Long Time):** Policies are determined by radiation dose outlook based on demonstration model projects, residents' intention of returning, and visions for future industry and reconstruction.
- ◆ **Area where the additional exposure rate is between 20-50mSv/year (Area Where Residents Are Not Permitted to Live):** Decontamination, aiming to reduce exposure dose in residential areas and farmlands to less than 20mSv/year.
- ◆ **Area where additional exposure rate is lower than 20mSv/year (Area Where Evacuation Orders Are Ready to be Lifted):** Decontamination is implemented as well.

- MOE reviewed the progress of decontamination in the SDA and announced on September 10, 2013 that it will revise the previous policy that aimed to complete decontamination and transfer generated materials to temporary storage sites in two years (by the end of March 2014) for all municipalities and will promote decontamination in accordance with reconstruction activities depending on the situation of each municipality.
- MOE announced on December 26, 2013 that it set practical schedules for Minami-Soma, Iitate, Kawamata, Katsurao, Namie and Tomioka in accordance with the situation of each municipality, in consultation with them.

- **Areas with evacuated residents will be the priority decontamination areas.**
- **The decontamination infrastructure work which is important for the evacuees to return home (such as water supply, sewage, and major roads) will be started in advance.**
- **The decontamination projects should be implemented in an accelerated and smooth manner and the project lengths 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.**

Progress in the Special Decontamination Area ①

Decontamination plans have been established in all the 11 municipalities, and progress has been made. Decontamination was completed in Tamura in June, 2013, and in Naraha / Kawauchi / Okuma in March 2014.

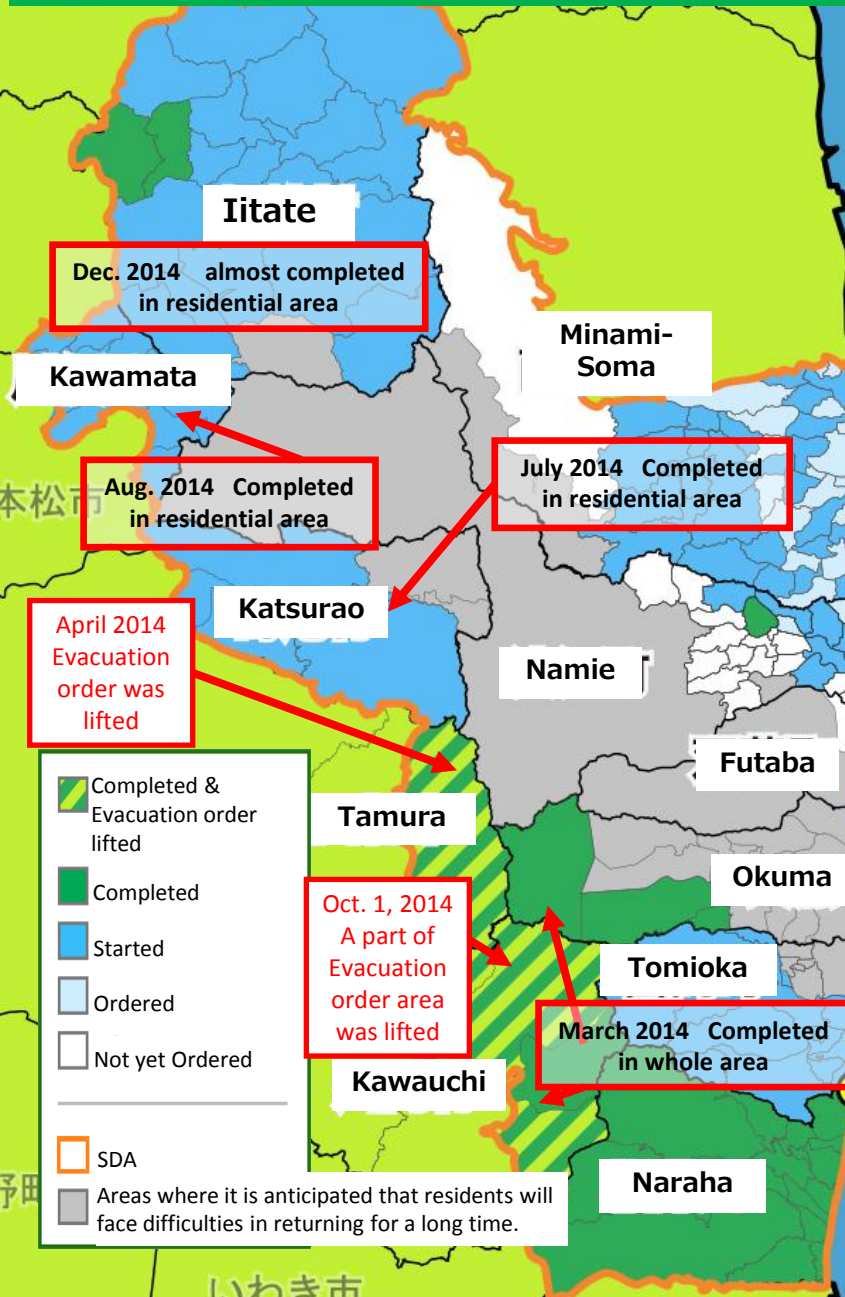
		Population in Decontamination Target Area(person) (approx. Figure)	Decontamination Target Area (ha) (approx. figure)	Rearrangement of the Restricted areas, etc.	Progress of Decontamination Work < as of the end of April 2015 >				Schedule	
					Decontamination Plan	Temporary Storage Site	Consent of landowners, etc.	Decontamination activities	Residential Areas completed	The rest of other areas completed
Whole area decontamination was completed	Tamura	400	500	Apr. 2012	Apr. 2012	Secured	Completed	Completed in June, 2013	FY2013	
	Kawauchi	400	500	Apr. 2012	Apr. 2012	Secured	Completed	Completed in March, 2014	FY2013	
	Naraha	7,700	2,100	Aug. 2012	Apr. 2012	Secured	completed	Completed in March, 2014	FY2013	
	Okuma	400	400	Dec. 2012	Dec. 2012	Secured	Completed	Completed in March, 2014	FY2013	
Decontamination of residential area was completed	Katsurao	1,400	1,700	Mar. 2013	Sep. 2012	Secured	Almost completed	In progress	Summer, 2014 (completed)	Within 2015
	Kawamata	1,200	1,600	Aug. 2012	Aug. 2013	approx. 90% Secured	Almost completed	In progress	Summer, 2014 (completed)	Within 2015
	Iitate	6,000	5,600	Jul. 2012	May 2012	secured	approx. 90%	In progress	Almost completed	Within 2016
Decontamination is under operation & in preparation	Minami-Soma	13,300	6,100	Apr. 2012	Apr. 2012	approx. 90% secured	approx. 80%	In progress	FY2015	FY2016
	Namie	18,800	3,300	Apr. 2013	Nov. 2012	approx. 40% Secured	approx. 80%	In progress	FY2015	FY2016
	Tomioka	11,300	2,800	Mar. 2013	Jun. 2013	secured	Almost completed	In progress	FY2015	FY2016
	Futaba	300	200	May, 2013	Jul. 2014	secured	approx. 70%	Under preparation	FY 2015	

Note 1: Necessary areas for securing Temporary Storage Sites might be reviewed in a future survey

Note 2: In the municipalities where decontamination was completed, such as Tamura, Kawauchi, Naraha, and Okuma, remaining decontamination shall be implemented for the residents who did not originally consent, but have since consented

Progress in the Special Decontamination Area ②

(as of April 2015)



< Completed decontamination >

Tamura	Whole area decontamination was completed in June 2013. Evacuation order was lifted on April 1, 2014
Kawauchi Naraha Okuma	Whole area decontamination was completed in March 2014 ※ As for Kawauchi, a part of the evacuation order was lifted on October 1, 2014
Katsurao	Decontamination of the residential area was completed in July 2014
Kawamata	Decontamination of the residential area was completed in August 2014
Joban Expressway	Decontamination was completed ※ Reopened between Hirono and Joban-Tomioka on Feb. 22, 2014 ※ Opened between Namie and Minami-Soma on Dec. 6, 2014 ※ Opened between Namie and Joban-Tomioka on March 1, 2015

< Schedules of decontamination ahead >

Kawamata Katsurao	Aiming to complete the decontamination of remaining areas within 2015
Iitate	Decontamination of residential area was almost completed at the end of Dec. 2014 aiming at the completion of decontamination of remaining area within 2016
Minami-soma Namie Tomioka	Aiming to complete the decontamination of the residential area within FY 2015 and the completion of decontamination of remaining area within FY 2016
Futaba	Aiming to complete the decontamination within FY 2015

Progress in the Special Decontamination Area ③-1

Progress on decontamination works (executing ratio and ordering ratio) is as follows:

As of the end of Apr., 2015 < Unit: % >	Tamura		Naraha		Kawauchi		Okuma		Iitate	
	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio
Residential area	100	100	100	100	100	100	100	100	97 (96)	100
Farmland	100	100	100	100	100	100	100	100	34	100
Forest	100	100	100	100	100	100	100	100	43 (39)	100
Road	100	100	100	100	100	100	100	100	26	100

Note 1: Executing ratio is calculated as follows: ①Areas in which decontamination work (weeding, removal of sediment, and cleaning, etc.) is completed / ②All areas to be decontaminated

Note 2: Ordering ratio is calculated as follows: ③Areas for which MOE has given decontamination contracts to JVs (Joint Ventures)/ ②All areas to be decontaminated

Note 3: ①, ②, ③ might be modified with further review

Note 4: The number in () was the number in last month. When there is no change, it is not listed

Progress in the Special Decontamination Area ③-2

As of the end of Apr., 2015 < Unit: % >	Kawamata		Katsurao		Minami Soma		Tomioka		Namie		Futaba	
	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio	Executing ratio	Ordering ratio
Residential area	100	100	100	100	11 (8)	99.9	30 (24)	100	13 (11)	48	-	100
Farmland	20 (19)	100	68	100	11 (10)	65	5	100	14	35	-	100
Forest	58	100	99.9	100	41 (38)	79	52 (41)	100	18	43	-	100
Road	4	100	32	100	6	65	70 (65)	100	22 (21)	46	-	100

Note 1: Executing ratio is calculated as follows: ①Areas in which decontamination work (weeding, removal of sediment, and cleaning, etc.) is completed / ②All areas to be decontaminated

Note 2: Ordering ratio is calculated as follows: ③Areas for which MOE has given decontamination contracts to JVs (Joint Ventures) / ②All areas to be decontaminated

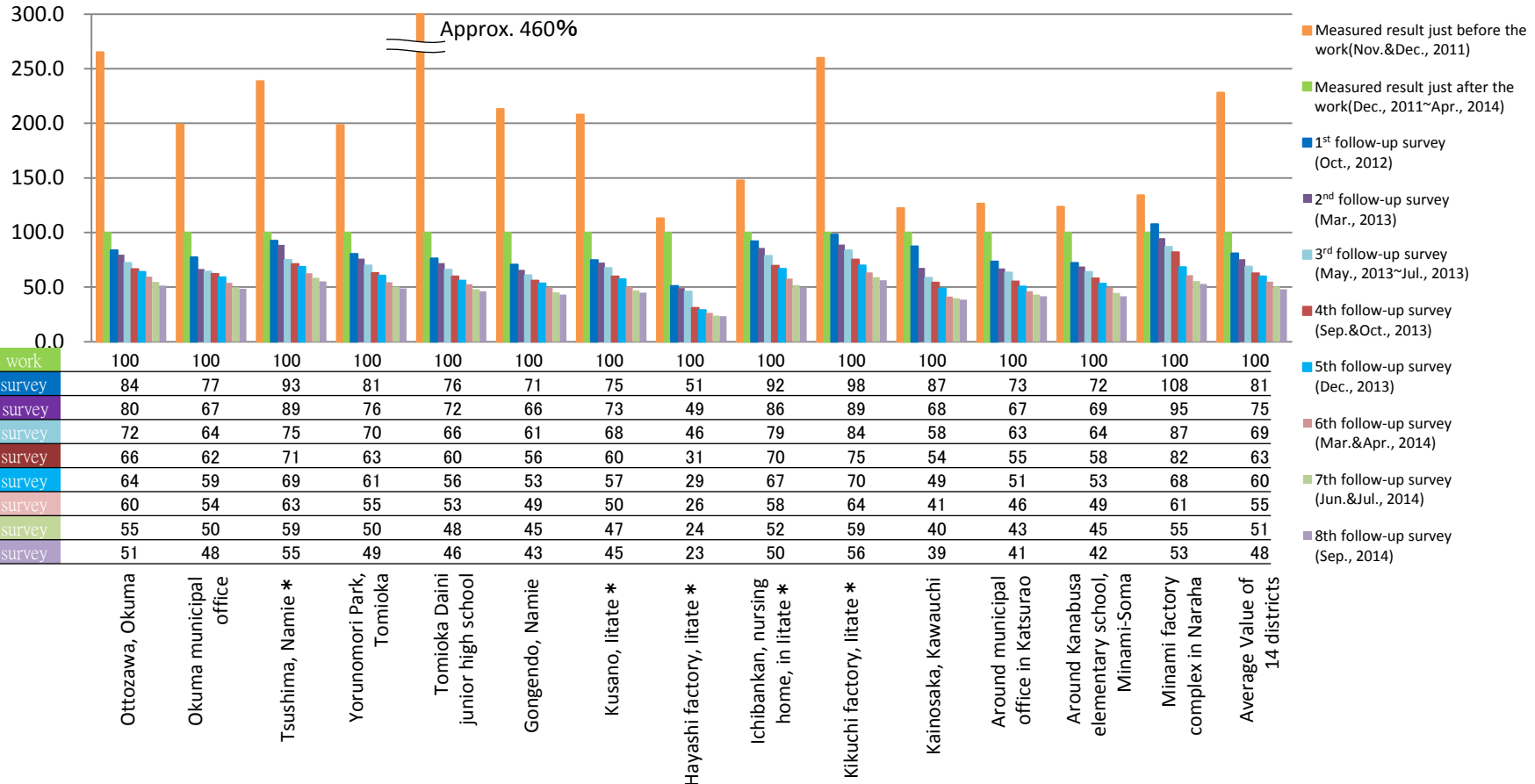
Note 3: ①, ②, ③ might be modified with further review

Note 4: The number in () was the number in last month. When there is no change, it is not listed

The result of Post-Decontamination Monitoring

○ The dose rate is the averaged value measured in each of the sites. The value immediately after decontamination [green column] is normalized to be 100%.

Comparison of average figure on air dose rate
(assuming the figure after the work as 100)



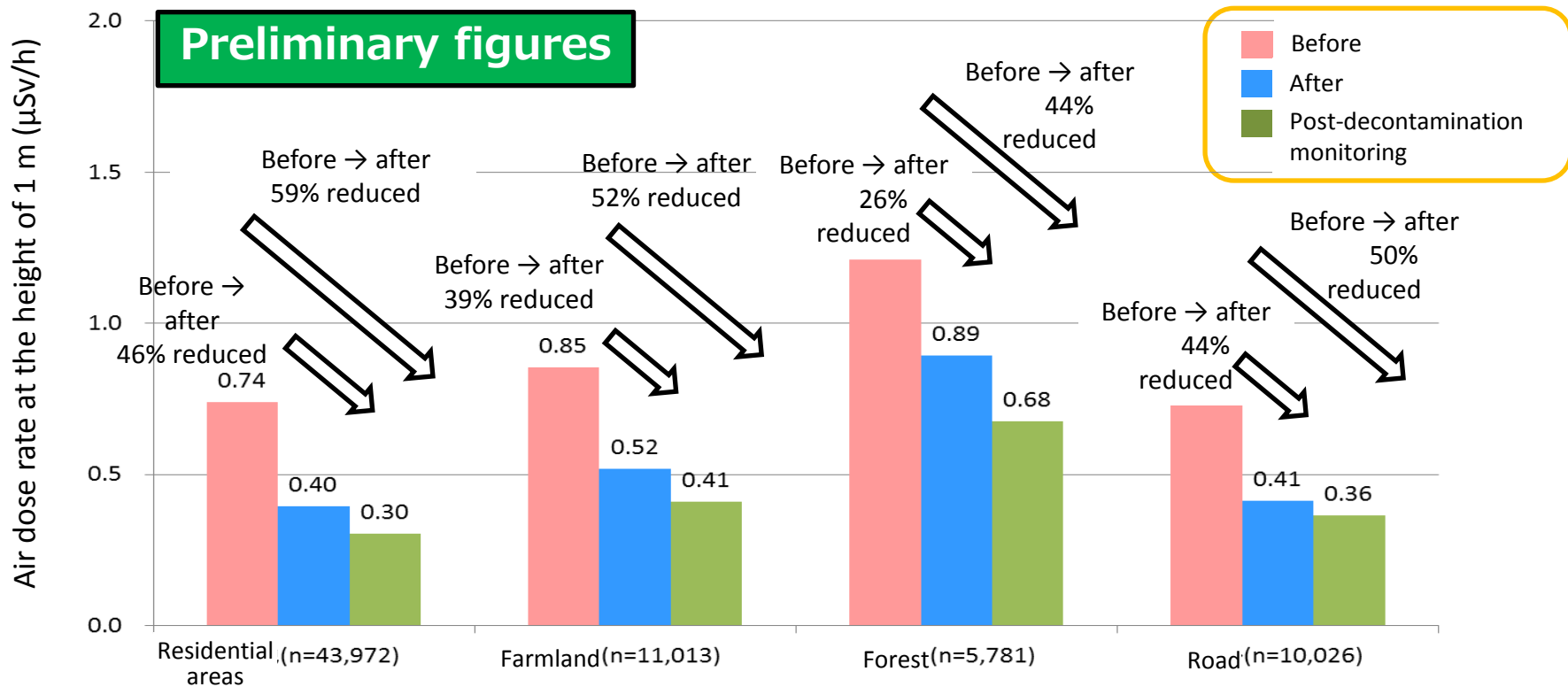
* : Measurement result just after the decontamination work in Tsushima, Namie and Iitate, might be possibly low because of accumulated snow

Note 1: Measurement figure might be changed by environmental condition, e.g. climate condition, such as rainfall, snowfall,

Note 2: 2 years and 6 months passed between the post-decontamination measurement and the 8th follow-up survey. The air dose rate was reduced by 40% during that time as a result of physical attenuation

Effects of Decontamination Work in Naraha

- ◆ Decontamination work decreased radiation dose by approx. 46% in the residential area
- ◆ Post-decontamination monitoring confirmed that effects of the whole-area decontamination are beneficial and that radiation dose is continuously decreasing



Periods of measurement:

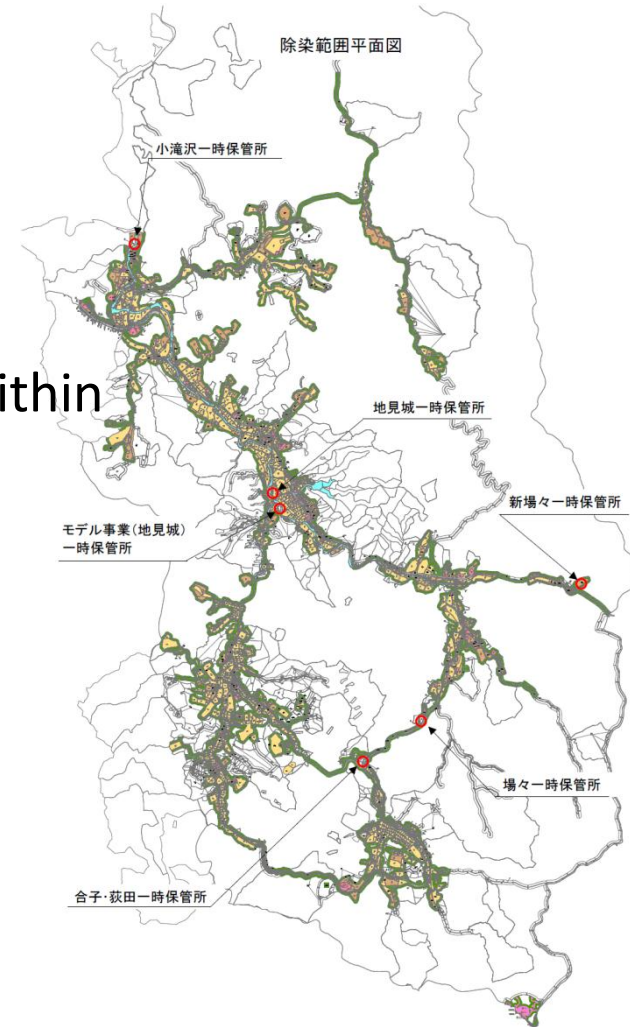
Before decontamination: June 2012-March 2014, After decontamination: June 2012-May 2014, Post-decontamination monitoring: July 2014-Nov. 2014

- ◆ It is the policy to entirely conduct the whole-area decontamination the first time. However, if post-decontamination monitoring finds hot spots where decontamination effects are not maintained and high radiation affects air dose rates of the surrounding environment, follow-up decontamination may be conducted in each situation, taking into account rationality and feasibility.

Overview of the Decontamination Project in Tamura City

Decontamination work based on the Decontamination Implementation Plan has been finished in Tamura City.

- Work Period: July 5, 2012 ~ June 28, 2013
- Number of Workers: Max. 1,300/day
(A total of 120,000/ man-hour days)
- Decontamination target area :
residential area and a part of forests (area within
20m from the edge) in Furumichi, Miyakoji
district
- Volumes of work
 - Buildings 228,249m²(121 family units)
 - Roads 95.6km
 - Farmland 1,274,021m²
 - Forests 1,921,546m²



Lift of Evacuation Order in Tamura City

April 2012

Designated as areas to which evacuation orders are ready to be lifted after the Rearrangement of Evacuation Order Areas
Formulation of a decontamination implementation plan

July 2012-

Full-scale decontamination work based on the plan was started

June 2013-

Decontamination work was completed

Aug.-Nov. 2013-

Post-decontamination monitoring

October 2013

Explanatory meeting to local residents

<Reported the result of post-decontamination 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

The evacuation order was lifted

Decontamination follow-up

1. Consultation counter for decontamination

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

2. Continuous Post-decontamination monitoring

3. Removal of contaminated soil depending on the situation



Before & After the Decontamination Work in Tamura City



Decontamination Activities in Tamura City



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 covering with clean soil

Effect on Decontamination Work in Tamura City ①

(Air Dose Rate 1 m above surface)

Average Figures: $0.34\mu\text{Sv/h}$

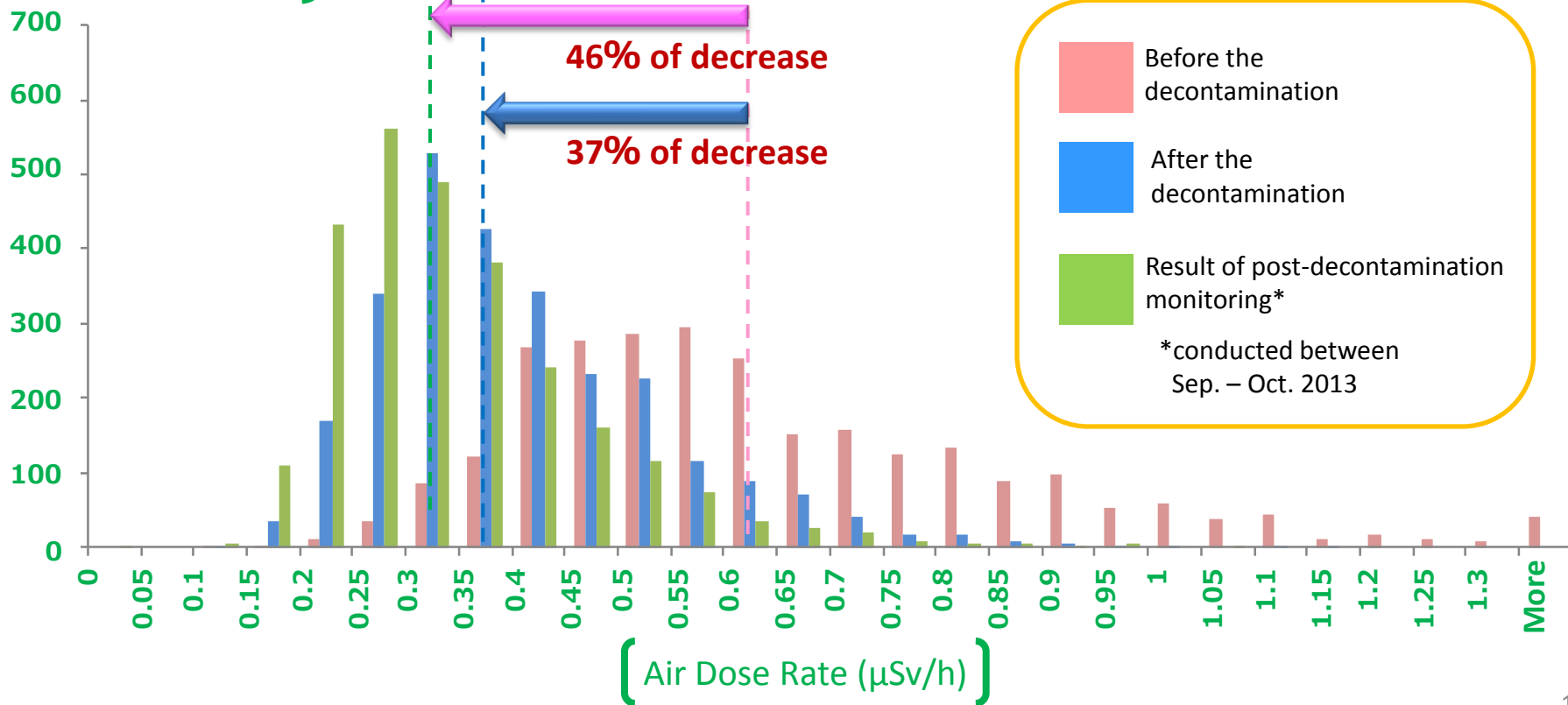
Average Figures after the Decontamination: $0.40\mu\text{Sv/h}$

Average Figures before the Decontamination: $0.63\mu\text{Sv/h}$

(Number of Measurement Points)

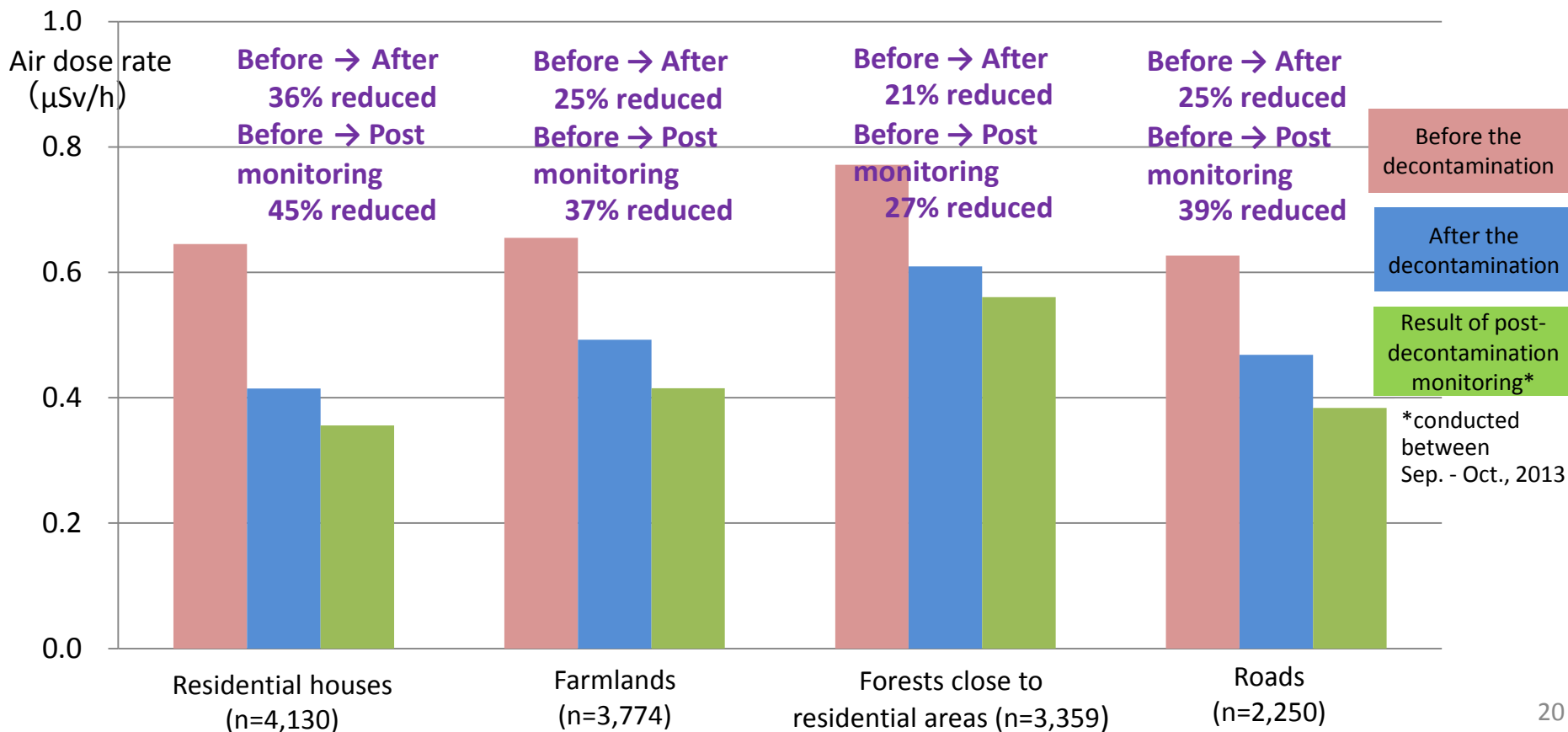
46% of decrease

37% of decrease



Effects on Decontamination Work in Tamura City ②

- ◆ Decontamination work has reduced air dose rates by approx. 36% for residential houses.
- ◆ The data from the post-decontamination monitoring confirm that the effects of whole-area decontamination have remained and show that air dose rates have been continuously decreasing.



Results of decontamination on Joban Expressway

After the synergistic work of decontamination by MOE and restoration by East Nippon Expressway Company Limited, the air dose rates have been decreased and fallen much below the targets in the "Decontamination Policy".

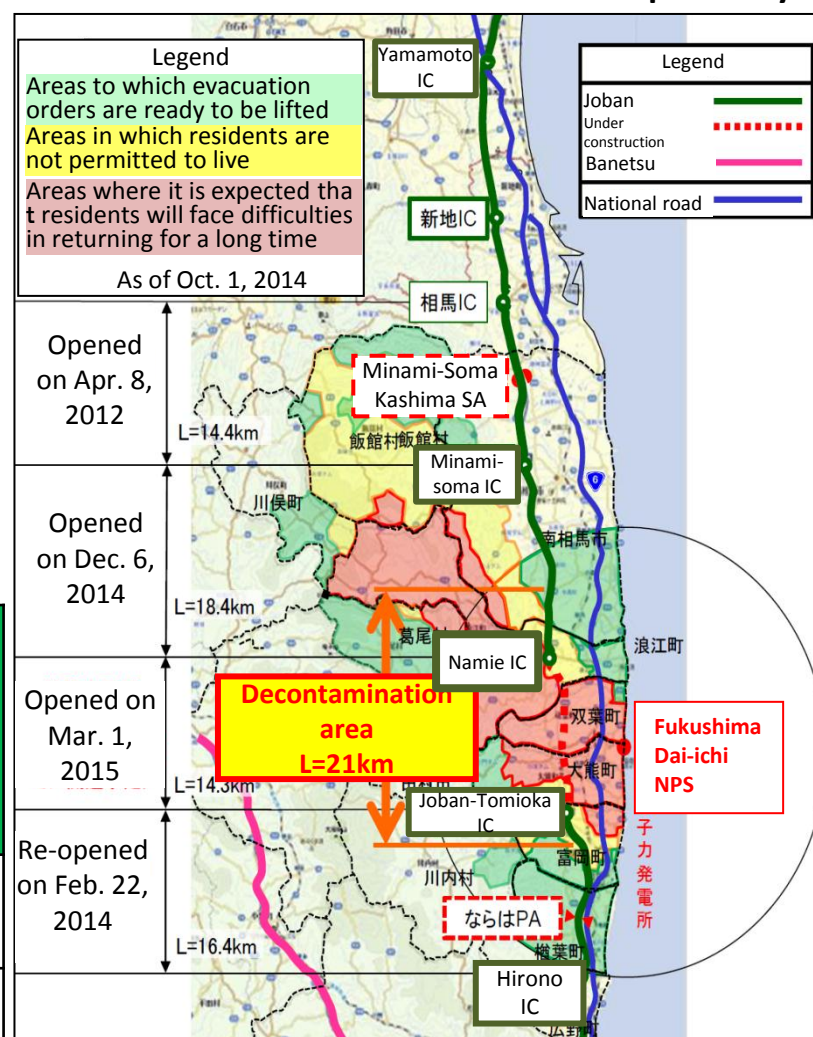
● Outline of decontamination

Period	December 2012 ~ June 2013
Decontamination area	Areas where air dose rates exceeded $3.8 \mu\text{Sv/h}$ (equivalent to 20 mSv/year) on the roads
Main Decontamination method	<p>Side slope : Weeding (removing vegetation)</p> <p>Road surface : High pressure water jet washing</p> <p>Future site : Weeding, Soil mixture, Surface compaction</p> <p>Bridge (handrail, safety fence) : Wiping out ※Top soil removal of road surface was omitted for the not-yet-opened areas of the main line.</p>

● Result of decontamination



Section (as of June 2012)	Target ($\mu\text{Sv/h}$)	Average air dose rate at the height of one meter ($\mu\text{Sv/h}$)			Decreasing rate for Oct. 2014 to pre-decontamination
		Before	After	Oct. 2014	
① $3.8 \mu\text{Sv/h} <$ $\sim \leq 9.5 \mu\text{Sv/h}$	≤ 3.8	4.3	2.8	0.9	79%
② $> 9.5 \mu\text{Sv/h}$	≤ 9.5	15.7	9.9	2.3	85%

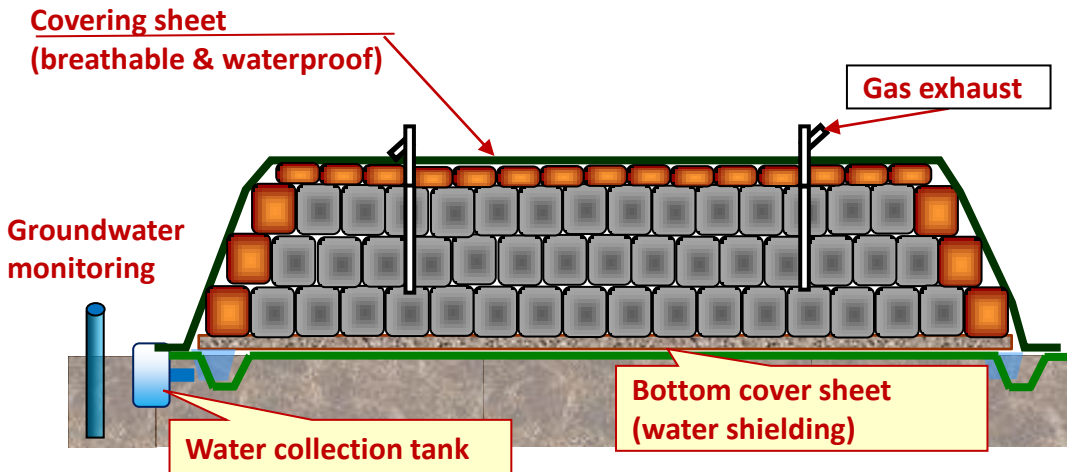
● Zones of decontamination on Joban Expressway



Temporary Storage Sites <TSS>

◆ Basic structure of TSS / Routine management & checkup (A case in Special Decontamination Area)

-  Container with removed soil, etc.
-  Shield-effect sandbag with non-contaminated soil



< Checkup points >

Routine checkup: once a week	<ul style="list-style-type: none"> • Visual check • Air dose rate monitoring
once a month	<ul style="list-style-type: none"> • Groundwater monitoring
If necessary	<ul style="list-style-type: none"> • Leachate monitoring in water collection tank and after confirming the safety, will be discharged
Emergency checkup in case of abnormal climate or earthquake	<ul style="list-style-type: none"> • Visual check • Air dose rate monitoring

◆ Number of TSS and the volume of removed soil, etc. in the storage

Location of Decontamination	Number of TSS	Number of Sites (storage on-site)	Volume of removed soil, etc.
SDA (as of the end of Feb. 2015)	208	—	2,977,579 bags
ICSA (as of the end of Dec. 2014)	775	86,608	3,452,243 m³

※The value in ICSA is only from Fukushima prefecture

Outline

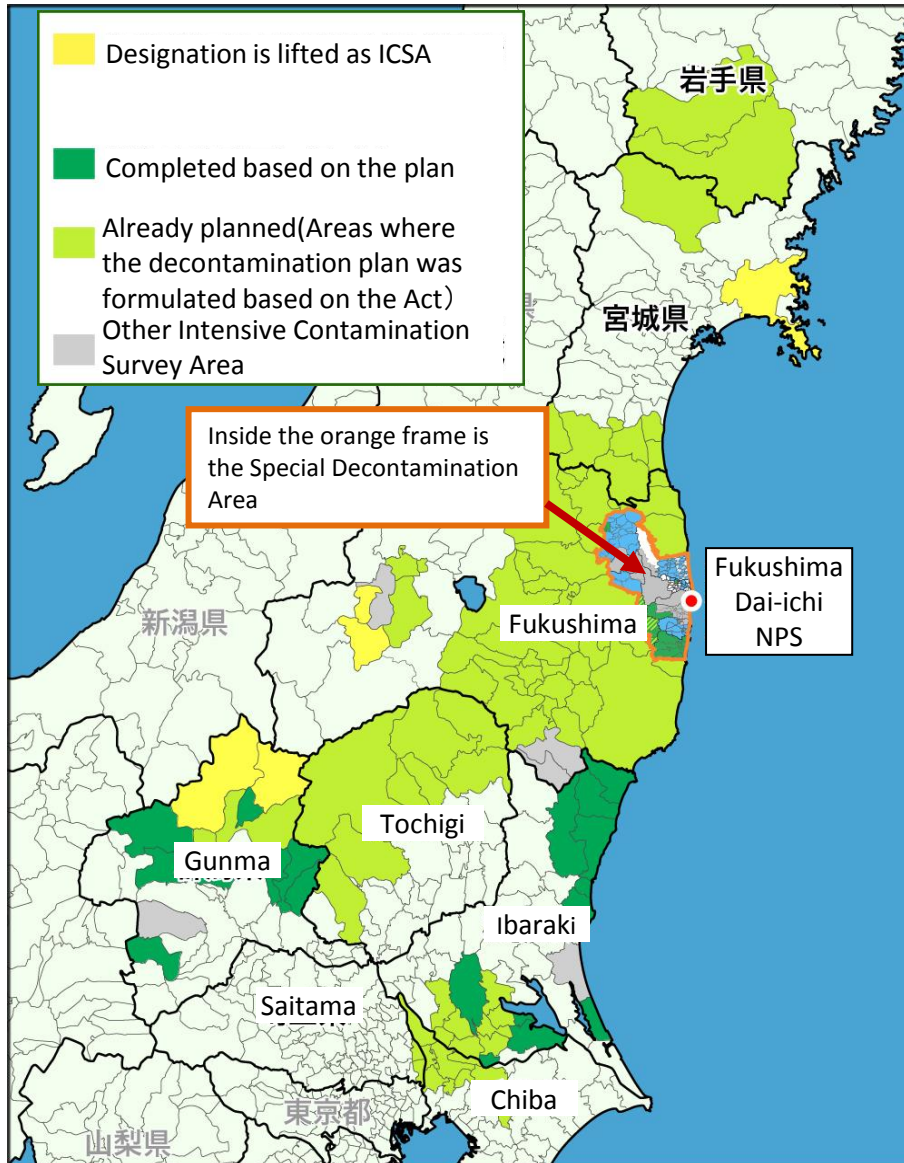
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Progress in Intensive Contamination Survey Area ①

As of April 2015

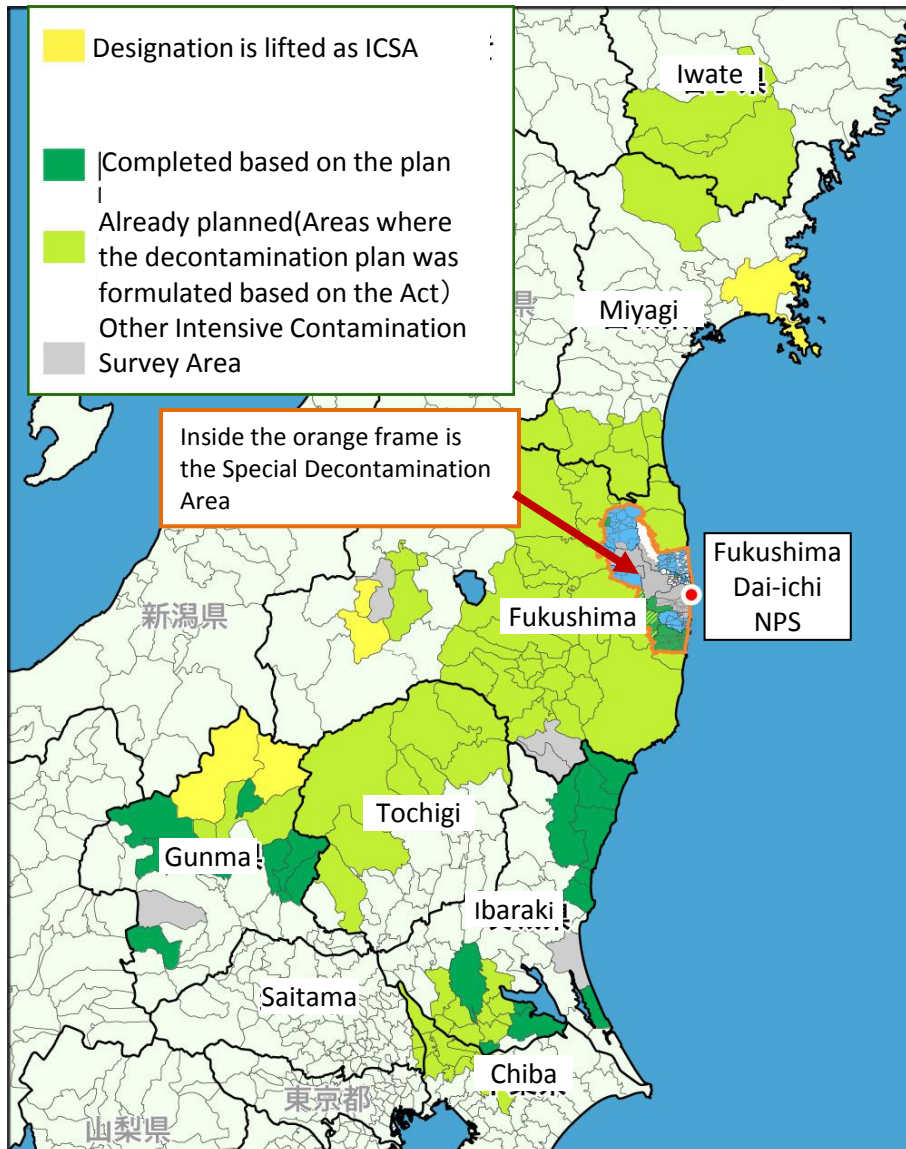
< In Fukushima prefecture >

- ◇ Number of municipalities designated as the Intensive Contamination Survey Area:
41 (at the start) → 39 (at present)
The designation was lifted in two municipalities because of the radiation dose decrease, etc.
- ◇ Municipalities that formulated decontamination implementation plans:
36 municipalities (all that had intended to do)
- ◇ Municipalities in process of implementing decontamination based on the plans:
36 municipalities
- ◇ The progress of decontamination (as of the end of March 2015):
Public facilities: approx. 90%
Residential houses: approx. 60%
Roads: approx. 50%
- ◇ Most of the decontamination plans are set between FY2015- FY2016.



Progress in Intensive Contamination Survey Area ②

As of April 2015



< Outside Fukushima prefecture >

- ◇ Number of municipalities designated as the Intensive Contamination Survey Area: 63 (at the start) → 60 (at present)
The designation was lifted in three municipalities because of the radiation dose decrease, etc.
- ◇ Municipalities that formulated decontamination implementation plans: 58 municipalities (all that had intended to do)
- ◇ 19 out of 58 municipalities have completed their plans (and continued monitoring of air dose rates).
- ◇ 29 out of 58 municipalities have almost completed plans.
- ◇ The progress of decontamination (as of the end of March 2015)
Schools & nurseries: almost completed
Residential houses: approx. 90%
Roads: approx. 90%

Progress in Intensive Contamination Survey Area ③

Decontamination implementation plans were formulated in 94 municipalities, and progress has been made (in Fukushima: as of the end of March 2015, other prefectures: as of the end of March 2015)

	Number of municipalities	Municipalities designated as Intensive Contamination Survey Area			
		Already formulated the plans			No plan at present
		Completed	Almost completed	decontamination work in progress	
Fukushima	39			36	3
Iwate	3		2	1	
Miyagi	8		4	4	
Ibaraki	20	12	7		1
Tochigi	8		4	4	
Gunma	10	7	1	1	1
Saitama	2		2		
Chiba	9		9		
Total	99	19	29	46	5

Progress in Intensive Contamination Survey Area ④

Within Fukushima prefecture (As of the end of March 2015)	Ordering Ratio (Number of ordering/Number of planning)	Executing Ratio (Number of actual achievement/Number of planning)
Public facilities, etc.	mostly ordered	approx. 90%
Residential houses	mostly ordered	approx. 60%
Roads	approx. 80%	approx. 50%
Farmlands & meadows	mostly ordered	approx. 80%
Forests(in living areas)	approx. 80%	approx. 60%

Note: The table is based on the investigation result conducted by Fukushima prefecture.

The number of planning is the total number until the end of FY2014, which might be increased in future depending on each municipality's status.

Outside Fukushima pref. (As of the end of March 2015)	Ordering Ratio (Number of Ordering/number of planning)	Executing Ratio (Number of actual achievement/number of planning)
Schools and nurseries	ordered	almost completed
Park, Sports facilities	mostly ordered	almost completed
Residential houses	mostly ordered	approx. 90%
Other facilities	approx. 80%	approx. 70%
Roads	approx. 90%	approx. 90%
Farmlands & meadows	ordered	completed
Forests(in living areas)	mostly ordered	almost completed

Note: The number of planning areas have been continuously revised

Acceleration of Decontamination and Reconstruction ①

- Interim report of the strategies of the national government and the 4 cities -

Background

- The 4 cities (Fukushima, Koriyama, Soma, Date) requested the national government to accelerate the decontamination and reconstruction and to provide accurate information to lessen public misinterpretation of decontamination targets.
- The national government and the 4 cities developed together an interim report as their common view of the strategies.

What the national government could not correctly convey

The long term target of radiation protection is the additional exposure dose of 1 mSv/yr.

Decontamination is only one of the radiation protection methods. 1 mSv/yr is not a limit of exposure or a boundary between safety and danger. The government uses the value of air dose rate 0.23 $\mu\text{Sv/h}$ as a criterion to specify the Intensive Contamination Survey Area but does not set it as a goal to be achieved only by decontamination activities. 0.23 $\mu\text{Sv/h}$ is a numerical value conservatively estimated based on a hypothetical life pattern.

$$\begin{array}{l} \text{Estimated conservatively} \\ \text{Depending on patterns of living} \end{array}$$
$$\begin{array}{l} 1000\mu\text{Sv/year} \\ (\text{マイクロシーベルト}) \\ \parallel \\ 1\text{ mSv/year} \\ (\text{ミリシーベルト}) \end{array} = \left[\begin{array}{l} \text{Estimated conservatively} \\ 0.19 \\ \mu\text{Sv/h} \end{array} \times \left\{ \underbrace{(8 \times 1)}_{\text{hours shielding outdoors}} + \underbrace{(16 \times 0.4)}_{\text{hours shielding indoors}} \right\} \right] \times 365 \text{ days}$$
$$+ \begin{array}{l} 0.04 \\ \parallel \\ 0.23 \end{array} \begin{array}{l} \text{Background radiation} \\ \mu\text{Sv/h} \\ \text{Criterion to specify ICSA} \\ \mu\text{Sv/h} \end{array}$$

Acceleration of Decontamination and Reconstruction ②

- Interim report of the strategies of the national government and the 4 cities -

New findings

(1) Air dose rate

Decontamination and radioactive decay over the past three years have led to decrease air dose rates.

(2) Individual exposure dose

The level of annual individual additional exposure is about 1 mSv for many residents. Individual additional exposure is approx. 1 mSv/yr for the residents living in the area where the air dose rate is about 0.3-0.6 $\mu\text{Sv/h}$. Actual exposure dose tends to be lower than that is estimated from the air dose rate.

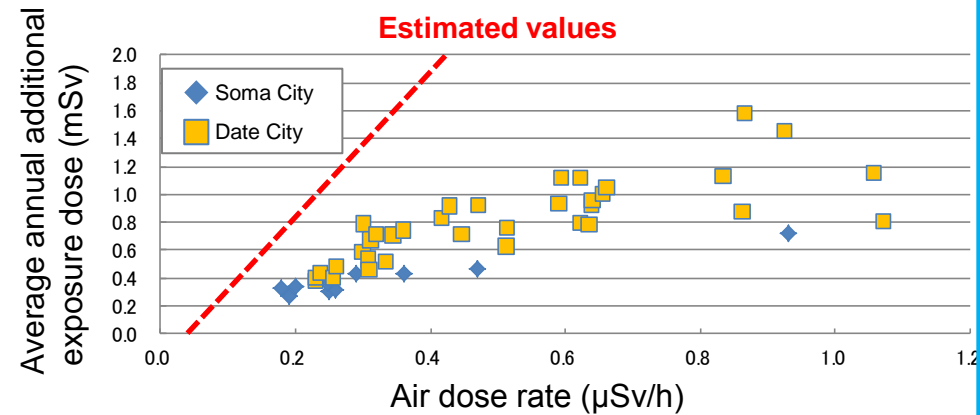
(Based on the estimation, annual additional exposure of 1 mSv is converted to air dose rate of 0.23 $\mu\text{Sv/h}$.)

(3) Change of contamination situation

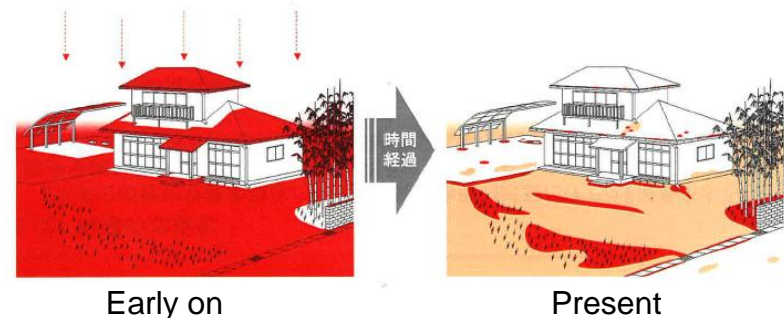
Contamination tends to be topically concentrated under rain gutters etc. in a garden due to weathering and human activities, and was widespread early on in the incident.

Correlation between the Average Air Dose Rate and the Average Annual Additional Exposure Dose

- Soma City (elementary school pupils) and Date City (0 to 15 years old) -



Change of contamination situation



Acceleration of Decontamination and Reconstruction ③

- Interim report of the strategies of the national government and the 4 cities -

Direction of the future strategies

(1) Promote radiation protection of the public, focusing on individual exposure dose

- Enhance activities for radiation protection, focusing on individual exposure dose in areas where decontamination was done as planned.
- Promote monitoring of individual doses by providing residents with personal dosimeters.

(2) Enhance risk communication

- Convey clearly and deliberately the government policy on decontamination, scientific knowledge about radiation, and new findings on effects of decontamination and relationships between air dose rate and individual exposure dose.
- Improve officials' knowledge about decontamination and the health impacts of radiation.
- Secure and cultivate human resources who can convey knowledge and ideas of the government and experts.

(3) Conduct decontamination effectively, depending on the nature of contamination

- Determine whether to conduct decontamination and select appropriate measures, depending on the radiation level.
- Improve effectiveness and efficiency of decontamination activities.

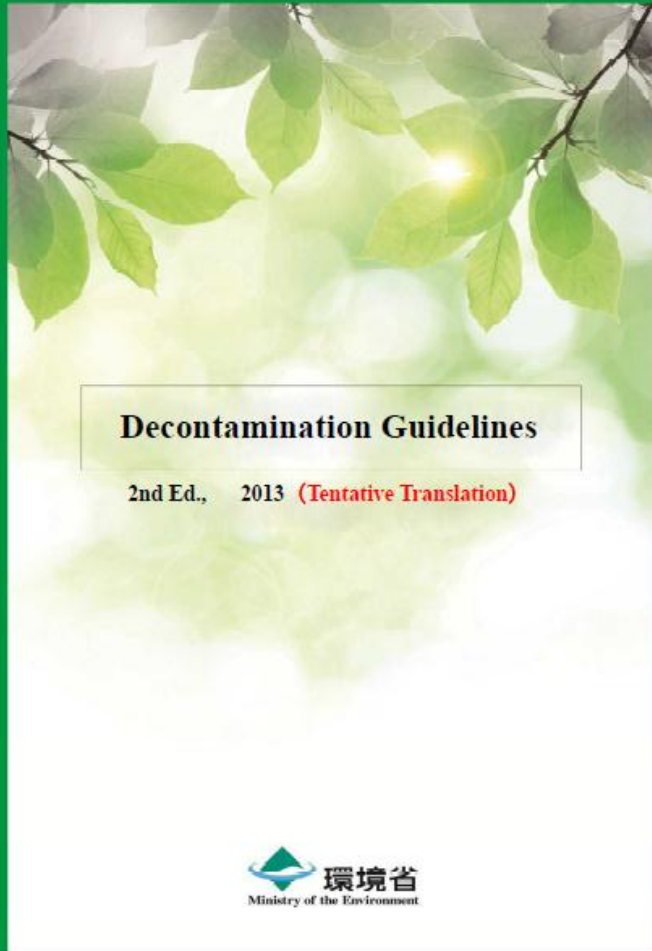
(4) Enhance comprehensive policies to secure radiation protection and address anxieties of the public

- By effectively combining policies of (1)-(3), address people's concern and instill a sense of security.

Outline

- Policy Framework
- Progress in Special Decontamination Area
- Progress in Intensive Contamination Survey Area
- **Decontamination Technology**
- Overview of New Policies
- Efforts to secure Interim Storage Facility
- Public Communication

Formulation of the Decontamination Guidelines



- Technical guidelines for carrying out decontamination
- Developed to complement the Ordinance of the Ministry of the Environment
- Used as reference when contracting decontamination projects

Contents

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

URL:

http://josen.env.go.jp/en/framework/pdf/decontamination_guidelines_2nd.pdf

Techniques Used for Decontamination ①

- Houses, buildings
 - Removing deposits from the roof, deck, and gutters
 - Wiping off roofs and walls, high-pressure washing etc.
- Gardens and standing trees
 - Mowing, removing fallen leaves, topsoil stripping etc.
- Roads
 - Removing deposits in ditches, high-pressure washing etc.

Decontaminating paved surfaces
(by a collective type high-pressure water cleaner)



Decontaminating roofing tiles (by wiping)



Decontaminating gardens (by removing soils etc.)



Techniques Used for Decontamination ②

- **Schoolyards, gardens and parks**
Stripping soils and topsoil etc.
- **Farmlands**
Reverse tillage, stripping topsoil etc.
- **Forests and woods**
Removing fallen leaves and lower twigs, pruning etc.

Decontaminating a schoolyard



Photo provided by: JAEA

Decontaminating a grass plot



Photo provided by: Japanese Society of Turf grass Science


Decontaminating a forest (by removing fallen leaves)



Photo provided by: JAEA

Summary on Decontamination Effect

Effect of decontamination work 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: Released in "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 March 2012 to October 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)

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- Efforts to secure Interim Storage Facility
- Public Communication

Overview of New Policies ①

< Follow-up Decontamination >

Decontamination based on the Act on Special Measures

Decontamination based on the plans

Follow-up of decontamination

1. Confirming retained effects / Follow-up decontamination

Post-decontamination monitoring in detail

Confirming retained effects of decontamination

Follow-up decontamination

Measurement after the decontamination

2. Continuous monitoring

※ Designed according to radiation doses

3. Finely tuned service to communities

- ◇ Verifying sites
- ◇ Monitoring
- ◇ Risk communication
- ◇ Actions on site

Select 1-3 as needed

Other measures※
<Examples>

※ MOE cooperates with relevant ministries and municipalities

Health management and risk communication

- ◇ Measurement and management of individual doses
- ◇ Health activity and advice

Other measures for radiation protection

- ◇ Monitoring
- ◇ Daily maintenance and cleaning of houses and gardens
- ◇ Advice on daily activities

Overview of New Policies ②

< Concepts on Forested Areas >

MOE and the Forestry Agency will continue to cooperate in research and development and will examine 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 diffusion of radioactive materials from forest to the populated area and to prevent discharges from landslides and to ensure safety and security for the local residents 【C】

- Trial measures to prevent landslides caused by underground decay
- Understanding the current status of radioactive material diffusion from the forest

Around residential area【A】

Remove organic residuals to prevent sediment runoff 【A】

Widen the decontamination area beyond the 20m-barrier, if a relatively high air dose rate is detected around houses 【A】

Overview of New Policies ③

< Concepts on Rivers and Lakes >

- Contaminated sediments in rivers and lakes generally do not impact the air dose rate of the surrounding environment due to the radiation shielding by water. (More than 99% of radiation is shielded at the depth of 1 m). Thus, decontamination will be implemented as necessary only in case that shielding is not effective due to drying up of water, air dose rate is relatively high by the accumulation of radioactive cesium, and there is high-human activity.
- Considering the fact that there are many cases that people voluntarily refrain from recreational activities at rivers and lakes, and that they have anxiety for drinking water, risk communication will be implemented to stakeholders to foster an appropriate public perception of risk.

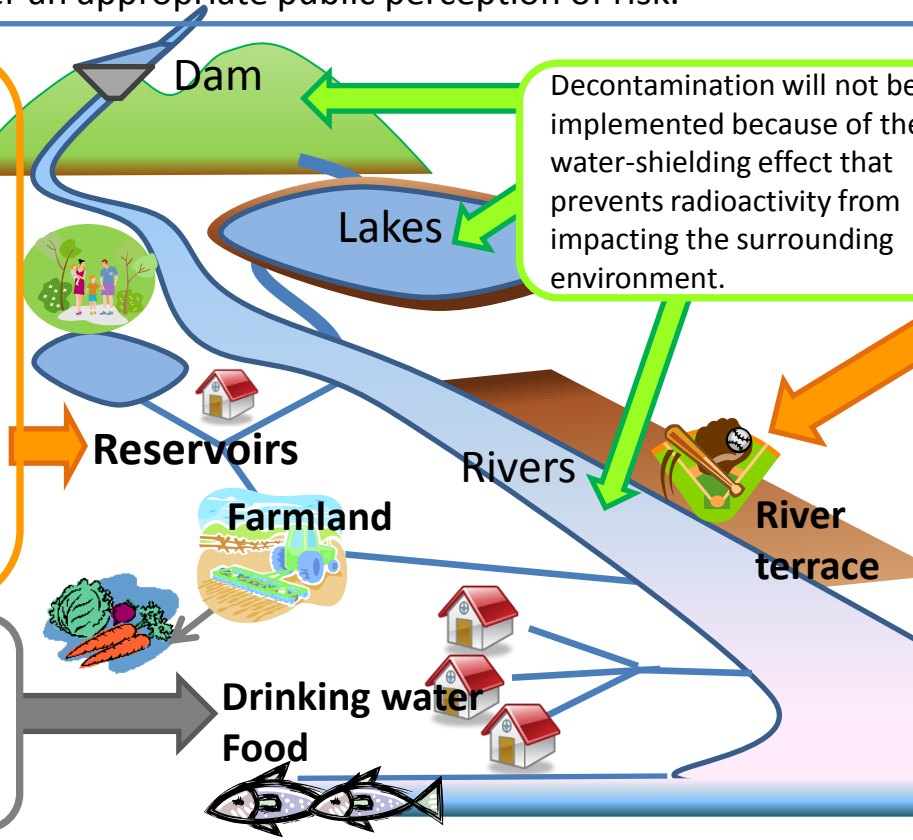
Decontamination will be implemented only in reservoirs located at residential areas and parks, and only when water is dried up for a certain period of time and the surrounding air dose rate is significantly increased.
*Measures for the restart of farming and agricultural reconstruction will be implemented by MAFF.

Decontamination will not be implemented because of the water-shielding effect that prevents radioactivity from impacting the surrounding environment.

At public facilities such as parks and playgrounds using a part of river beds, where there are many public activities, decontamination will be implemented as a part of the living area as necessary, comparing the air dose rate to that of the surrounding living areas.

Continuous monitoring and research & development from the long term perspective will be conducted to comprehend the environmental behavior of radioactive cesium throughout the entire river basin.

Continuous measures such as food inspection and water inspection at the water treatment plants will be taken.



Ref.) Related Responses towards Evacuees Returning Home

“The Policy for accelerating Fukushima’s reconstruction from the nuclear disaster”
(Cabinet Decision, 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. With these measures, we continue to pursue the long-term goal (additional individual dose of 1mSv per year or below) for the returned evacuees.

URL; http://www.kantei.go.jp/foreign/96_abe/actions/201312/20gensiryoku_e.html

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

One of the practical measures for evacuees to return their home is to focus on the individual dose. For the evacuees to return home, measures that contribute to measure, manage the individual dose, and to reduce radiation exposure of residents are suggested. Also, to establish a system of supporting the evacuees who choose to return home in a comprehensive manner, the necessity of allocating counseling staff and developing a system of supporting them was suggested.

URL; http://www.nsr.go.jp/english/library/data/special-report_20140204.pdf

Outline

- Policy Framework
- Progress in Special Decontamination Area
- Progress in Intensive Contamination Survey Area
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- **Efforts to secure Interim Storage Facility**
- Public Communication

What is an Interim Storage Facility (ISF)?

- In Fukushima prefecture, large quantities of contaminated soil and waste have been generated from decontamination activities.
- Currently, it is difficult to clarify methods of final disposal of such soil and waste.
- Until final disposal becomes available, it is necessary to establish an Interim Storage Facility (ISF) in order to safely manage and store soil and waste.

The following materials generated in Fukushima prefecture will be stored in the ISF.

1. Soil and waste (such as fallen leaves and branches) generated from decontamination activities, which have been stored at the Temporary Storage Sites.



2. Incineration ash with radioactive concentration more than 100,000 Bq/kg.
* In principle, combustible materials will be incinerated, and incinerated ash will be stored.

Note) MOE's policy is that materials such as incinerated ash with radioactive concentration less than 100,000 Bq/kg will be finally disposed of at a privately managed disposal site (named Fukushima Eco Tec Clean Center) in Tomioka .

Process regarding the Interim Storage Facility ①

Time	Contents
Oct. 2011	<p>MOE announced the Basic Principles of the roadmap of the Interim Storage Facility (ISF).</p> <p>✖Main Contents</p> <ul style="list-style-type: none"> • The National Government will secure, maintain and manage the ISF • The National Government will make utmost efforts to start operating of the ISF in about 3 years after start of full-scale collection of soil to the temporary storages sites • Only soil and waste generated in Fukushima prefecture will be stored in the ISF • The above materials will be finally treated outside Fukushima prefecture within 30 years after launch of interim storage
March 2012	<p>MOE explained the Fukushima prefecture and the 8 towns that the ISF may be located separately in 3 towns (Futaba, Okuma and Naraha).</p>
Nov. 2012	<p><u>The Governor of Fukushima announced the acceptance of the investigation proposed by MOE, subject to in-depth explanation to the local communities.</u></p>
April 2013-	<p>MOE started the field survey including boring survey, obtaining the consent from the Local communities.</p>
June- Sep. 2013	<p><u>The study groups on safety measures and environmental protection were held.</u></p>
Dec. 2013	<p><u>MOE requested that Fukushima prefecture and the 3 towns (Futaba, Okuma and Naraha) accept the establishment of the ISF (and also requested Tomioka and Naraha at the same time to utilize the EcoTech Clean Center).</u></p>

Process regarding the Interim Storage Facility ②

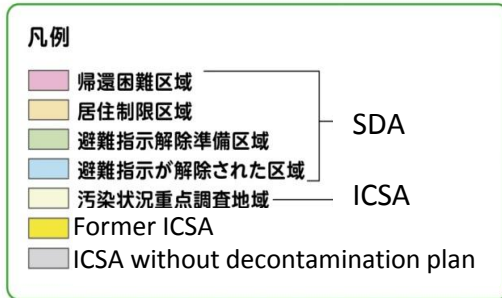
Dec. 2013 - Sep. 2014	<u>MOE reviewed transportation of removed soil, etc. in a study group.</u>
Sep. 1, 2014	<u>The Governor accepted the construction of the ISF, and both mayors of Okuma and Futaba conveyed that they took the Governor's acceptance seriously and agreed that the government would explain to the landowners. The Prime Minister Abe met the Governor of Fukushima and the both mayors and the Governor told the Prime Minister about the acceptance as well.</u>
The end of Sep. - Oct. 2014	MOE held <u>explanatory meetings for landowners</u> (12 times in total: 9 times in Fukushima and 3 times outside Fukushima).
Oct. - Nov. 2014	In Oct., the amendment bill for the Japan Environmental Safety Corporation (JESCO) Law in order to legislate the final disposal of contaminated soil and waste outside Fukushima prefecture was approved by the Cabinet and submitted to the Diet. <u>The amendment of JESCO Law was enacted in Nov. and implemented in December.</u>
Nov. - Dec. 2014	<u>MOE finalized the Basic Transportation Plan and proposed a transportation implementation plan in a transportation liaison and coordination meeting with relevant ministries and organizations.</u>
The end of Nov. - Jan. 2015	<u>Announcement of construction work for stockyard. The contracts were concluded in January.</u>
Dec. - Jan. 2015	<u>Both Okuma and Futaba accepted the construction of the ISF.</u>

Process regarding the Interim Storage Facility ③

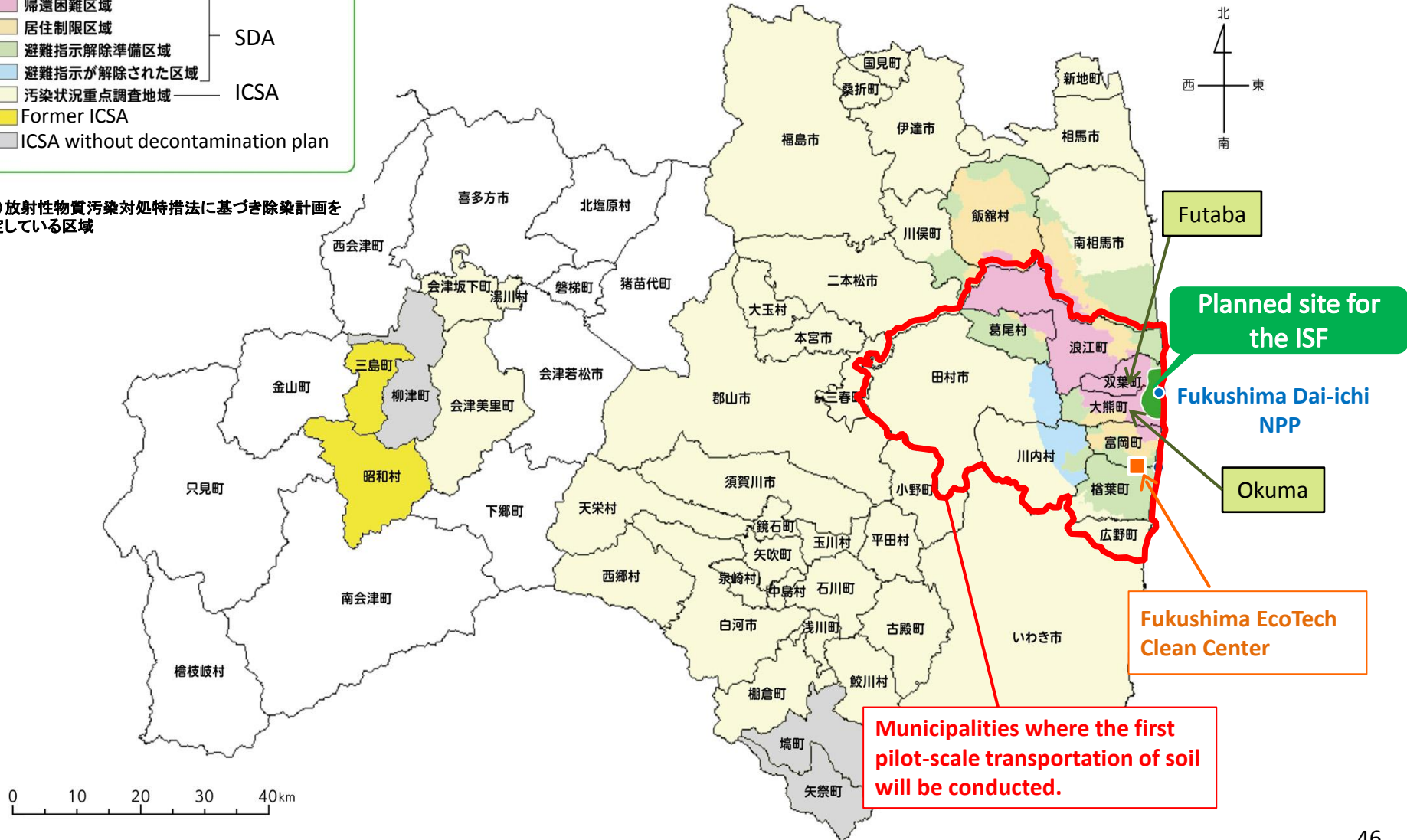
Jan. 16, 2015	<u>MOE confirmed the commencing time of transportation of removed soil to the ISF, announcing if things go according to the plan, it will start the construction of stock yards at the beginning of Feb. and will make every efforts to start the transportation of soil through the pilot-scale transportation Before Mar. 11, 2015, if the 5 conditions requested from Fukushima prefecture be fulfilled.</u>
Jan. 2015	<u>On the basis of transportation liaison and coordination meeting held on 26th, MOE finalized the transportation implementation plan.</u>
Feb. 3, 2015	<u>The construction of stock yards started.</u>
Feb. 8, 2015	<u>The Minister of the Environment and the Minister for Reconstruction explained to the Governor of Fukushima the progress related to 5 conditions which should be confirmed before the transportation of soil and waste to the ISF.</u>
Feb. 25 & 27, 2015	<u>On 25th, the Minister of the Environment and the Minister for Reconstruction had a meeting with the Governor of Fukushima. The governor and both mayors of Okuma and Futaba conveyed the acceptance. The mayors requested the commencement to be after Mar. 12, also to pay respect to the residents' visit to their graves during the season. Based on these requests, the Minister of the Environment announced that the transportation of soil and waste will start from Mar. 13 and will be stopped as well as construction work of a stock yard from Mar. 18 to 24.</u>
March - May 2015	<u>Soil and waste from Fukushima prefecture are being consolidated from temporary storage sites and transported to stockyards. In Okuma on Mar. 13, in Futaba on March 25, in Tamura on April 10 and in Tomioka on May 26.</u>
April 13, 2015	<u>The First Environmental Safety Committee on the ISF was held.</u>

Planned Site for the Interim Storage Facility

Fukushima Prefecture

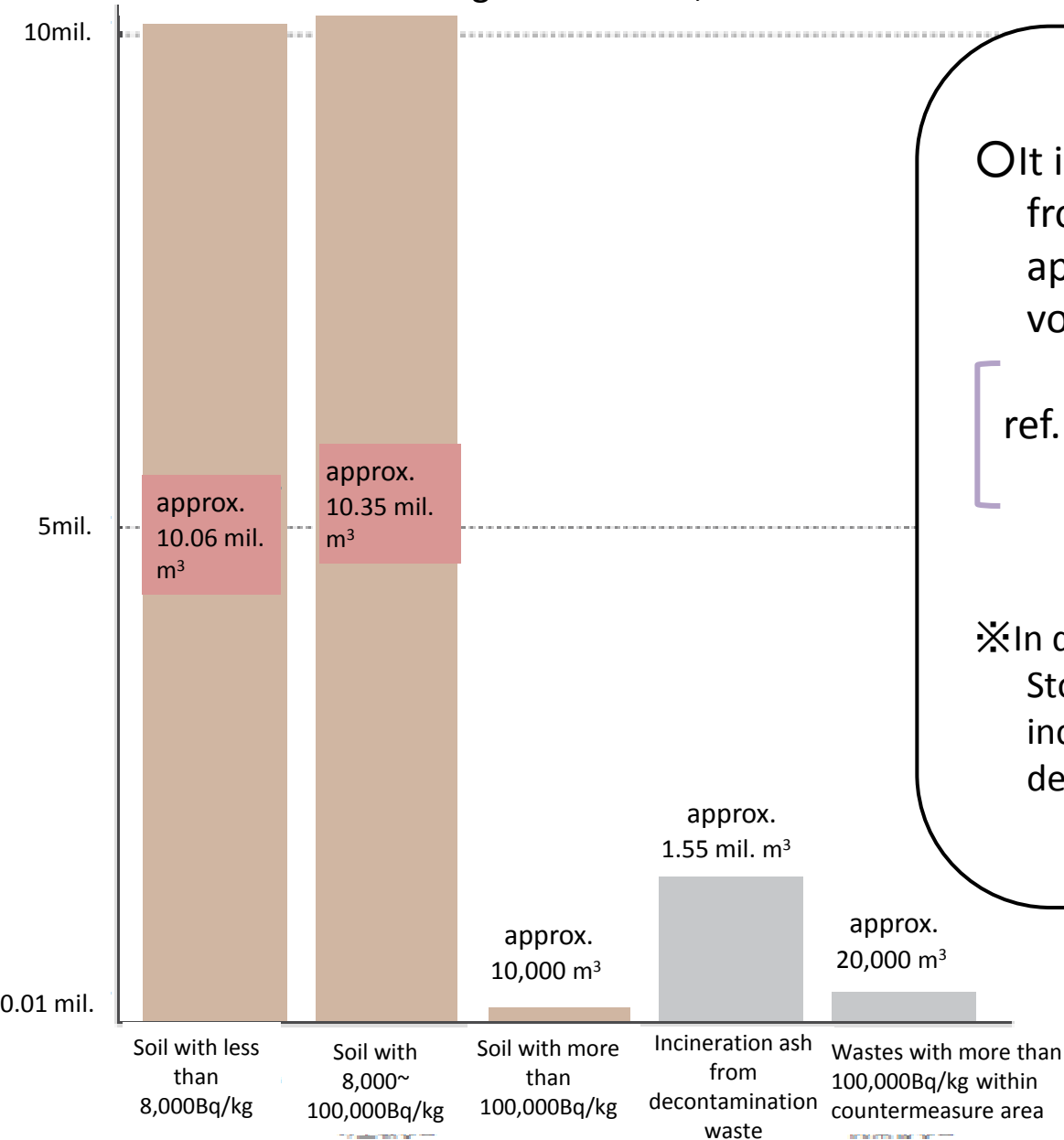


(※)放射性物質汚染対処特措法に基づき除染計画を策定している区域



Estimated Volume in the Interim Storage Facility

(m³) Estimated volume of generated soil, etc. from decontamination work (in case of 22 million m³)



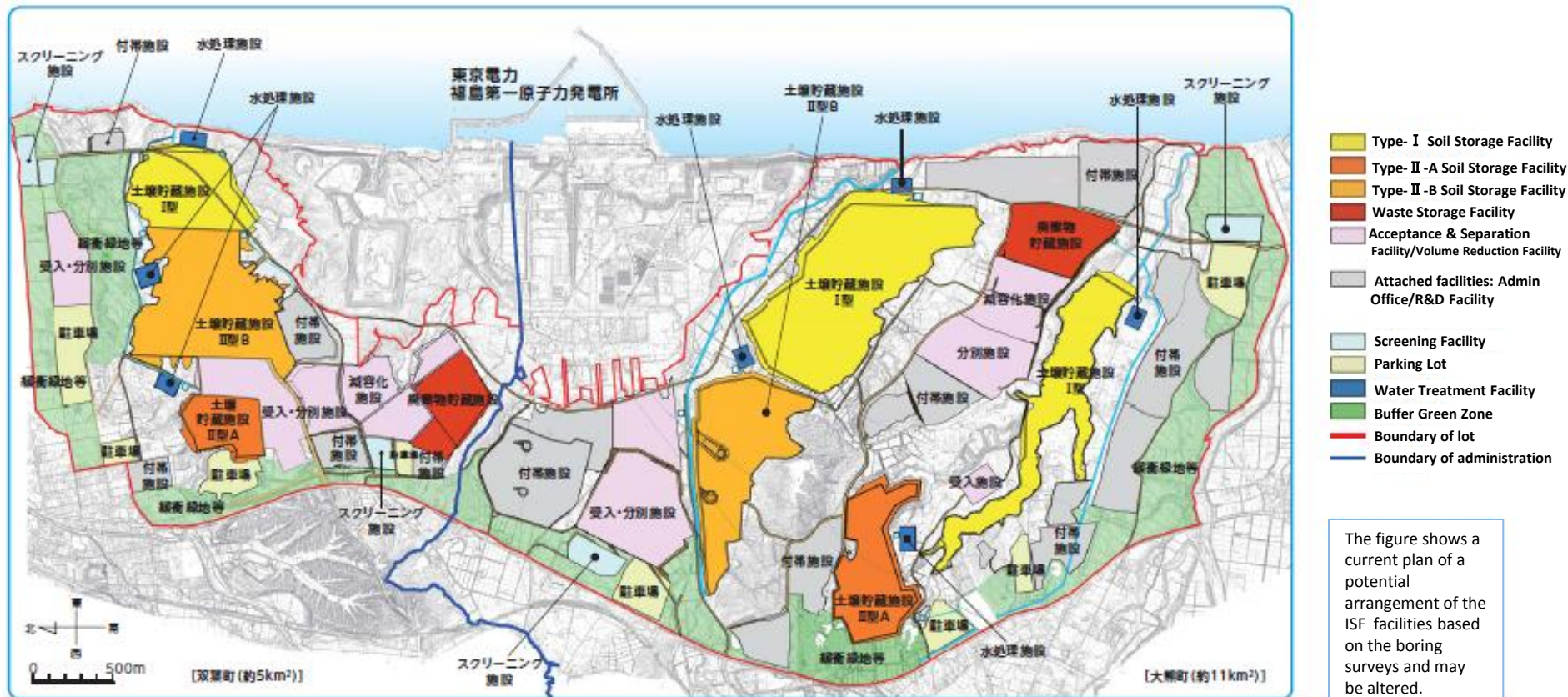
○ It is estimated that generated soil from decontamination will be approx. 16 ~ 22 mil. m³ after the volume reduction (incineration)

[ref. : approximately 13~18 times as much as the volume of Tokyo Dome (1.24 mil. m³)]

✂ In discussing the plan for the Interim Storage Facility, the volume of soil may increase due to additional decontamination activities.

Layout Drawing of Interim Storage Facilities (draft)

- Interim Storage Facility will consist of facilities with various functions.
- Those facilities will be developed based on the status of the consent of landowners and the generation of removed contaminated soil, etc.



Interim Storage Facility Facilities and Process

○ The Interim Storage Facility will consist of several facilities with various functions.

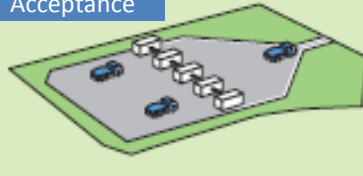
Temporary Storage Sites, etc.



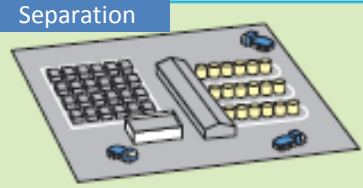
Acceptance & Separation Facility

To separate the soil and waste transported by measuring the weight and radiation dose.

Acceptance



Separation



Image

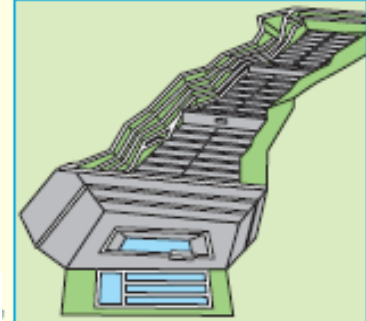
Other Facilities

- Screening
- Water treatment
- Stockyard
- Admin. Office
- R&D

Soil Storage Facility

To store soils after separation by radioactive cesium concentrations and other features

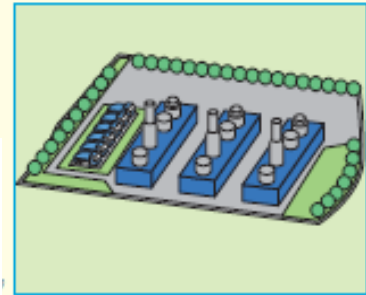
Image



Volume Reduction Facility

To reduce the volume of stockpile by incinerating the combustibles (branches and plants, etc.)

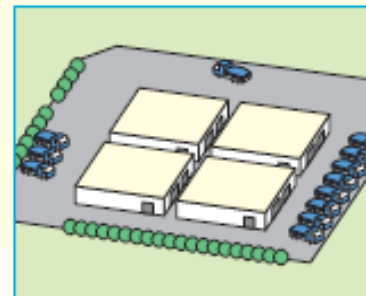
Image



Waste Storage Facility

To store waste (incineration ash, etc.) measuring more than 100,000 Bq/kg

Image

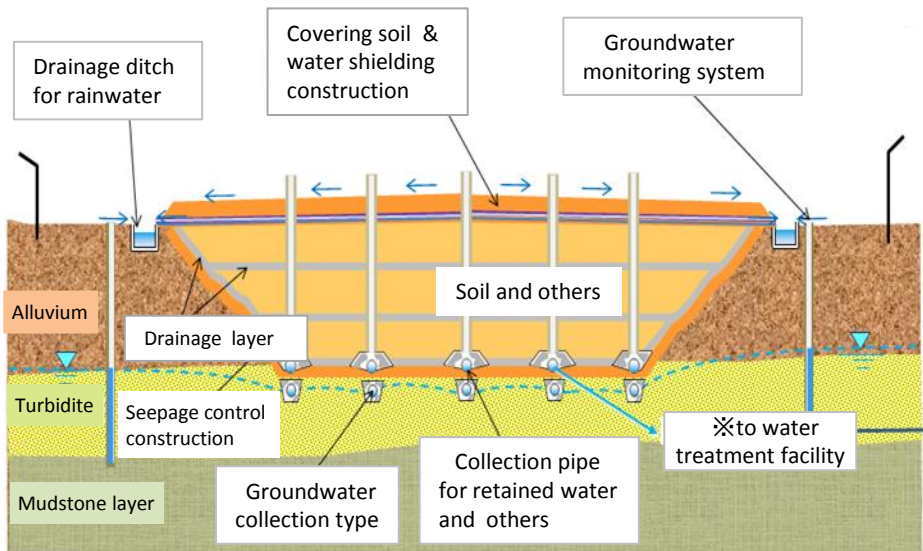


Structure of Interim Storage Facility

< Schematic view of Soil Storage Facility >

Applicable geography and geology:
table

Radioactive cesium concentration:
more than 8,000 Bq/kg

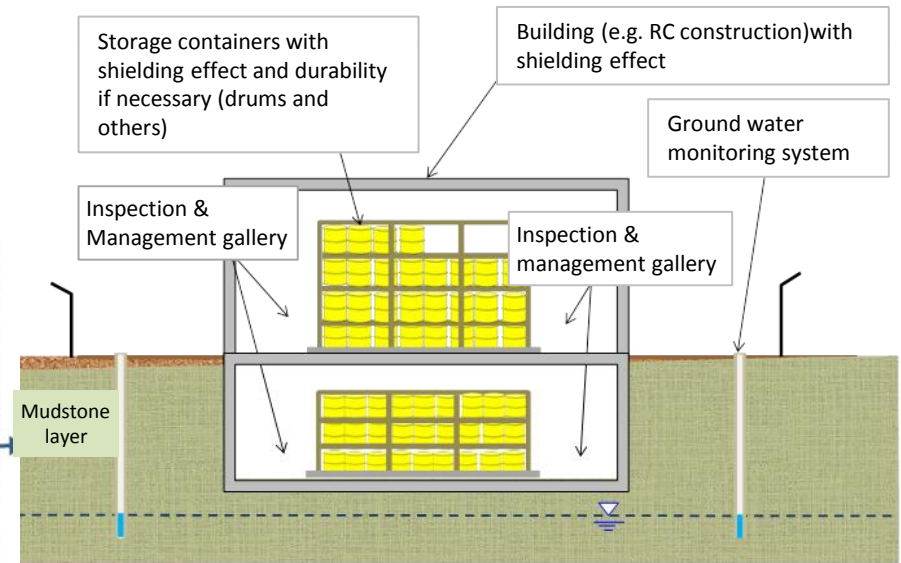


Soil storage facility
<Type II B>

< Schematic view of waste storage Facility >

Applicable geography and geology:
Hill, table

Radioactive cesium concentration:
more than 100,000 Bq/kg



※Some details may change while considering geography and geology

Overview of Stock Yard Construction in the ISF

【Objective】

Stock Yards are facilitated in order to store removed soil, etc. temporarily within the planned site of the facility until commencement of the full-scale construction according to the specific layout of the ISF

【Scale】

<First step> approx. 30,000m² in each of Okuma and Futaba town

<Second step> assumed approx. 20,000m² in Okuma, and 30,000m² in Futaba

※including loading spaces, and administration offices as well as stock yard

【Volume of Storage】

<First step> approx. 10,000m³ in each of Okuma and Futaba town

<Second step> approx. 10,000m³ in each of Okuma and Futaba

【Construction period】

<First step> January 9, 2015 to the end of June 2015

<Second step> Planned from late May 2015 until the end of March 2016

【Main contents of the operation】

- ① **Measure to reduce radiation dose (decontamination)** → Prior to establishing a stock yard, conduct appropriate decontamination activities at the stock yard site and in the vicinity
- ② **Road repair** → To implement repair work on the roads within the planned site of the ISF
- ③ **Facilitation on-site** → To establish a screening facility as well as to develop the site after decontamination
- ④ **Repair soil stock yards** → To establish facilities in compliance with temporary storage sites
- ⑤ **Transportation of removed soil** → Removed soil is delivered from Temporary storage sites to stock yards and installed

Commencement of the Transportation to the ISF

- ▶ On March 13, 2015, the transportation to the ISF started in Okuma (delivered from Minami-Daira TSS to the stock yard in Okuma town and installed)
- ▶ The transportation was halted during the season of visiting ancestors' graves (March 18-24)
- ▶ The transportation started in Futaba on March 25 (delivered from Shinzan TSS to the stock yard in Futaba town)
- ▶ Also in Tamura, transportation started on April 10



Transportation operations from Minami-Daira TSS in Okuma town



Installation operations to the stock yard in Okuma town

Transportation to the ISF (Pilot Transportation)

- Pilot transportation is implemented for about a year in order to confirm safe and secure transport towards full-scale transportation of a large quantity of removed soil
- From the start of pilot transportation, MOE conducts management of whole targeted materials, traffic management (transportation vehicles) and monitoring survey to implement safely and steadily
- By pilot transportation, approx. 1,000 m³ of removed soil will be transported from each relevant municipality

◆ Formulation of traffic operation plan

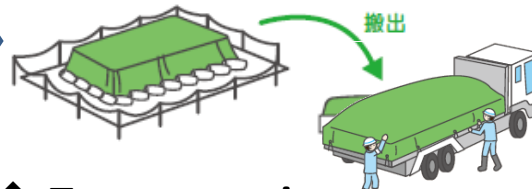
After necessary adjustment with municipalities, MOE developed the specific transportation plan and also educates and trains drivers, etc.

◆ Route setting

Transport route is set beforehand.
Actively using express highways.

◆ Loading

Extra care is taken for the surrounding environment by loading and securing the packaging so it does not scatter or leak



◆ Transportation

During the delivery, transport objects and location will be monitored

◆ Response to accidents

A system shall be established in case of an accident, to be thoroughly prepared and for proper response

◆ Monitoring survey

Monitoring result will be publicly announced if there is any effect on the living environment or increase of air dose rate due to transportation

⇒ MOE is preparing for full-scale transportation through pilot transportation demonstration projects

Amendment Bill, necessary for ISF facilitation, etc.

(Overview of Amendment Bill for JESCO Law)

- The government will take full responsibility to maintain and manage the ISF, which is an indispensable facility for decontamination and reconstruction in Fukushima
- The government will set the necessary rules for utilizing JESCO (invested 100% by the government) as a specialized institution, of which the government has the strong guidance and supervision authority

Name of the company and law

1. The name of the company shall be changed to JESCO (Japan Environmental Storage & Safety Corporation)
2. The name of the law shall be changed to the JESCO (Japan Environmental Storage & Safety Corporation) Law

Government's Responsibility

1. The government will build interim storage facilities, and ensure safety
2. The government will take necessary measures to gain understanding and cooperation from residents living in the vicinity of the interim storage facilities, and other stakeholders
3. The government will take necessary measures to complete final disposal outside of the Fukushima prefecture within 30 years from the start of transfer to the interim storage facilities

Scope of Business Operations

The company shall operate the ISF on consignment from the government, Fukushima prefecture and relevant municipalities, etc., and others specified by Ministry order <※ will be implementing the disposal of PCB wastes continuously>

Government's stocks, investment and taxation exceptions

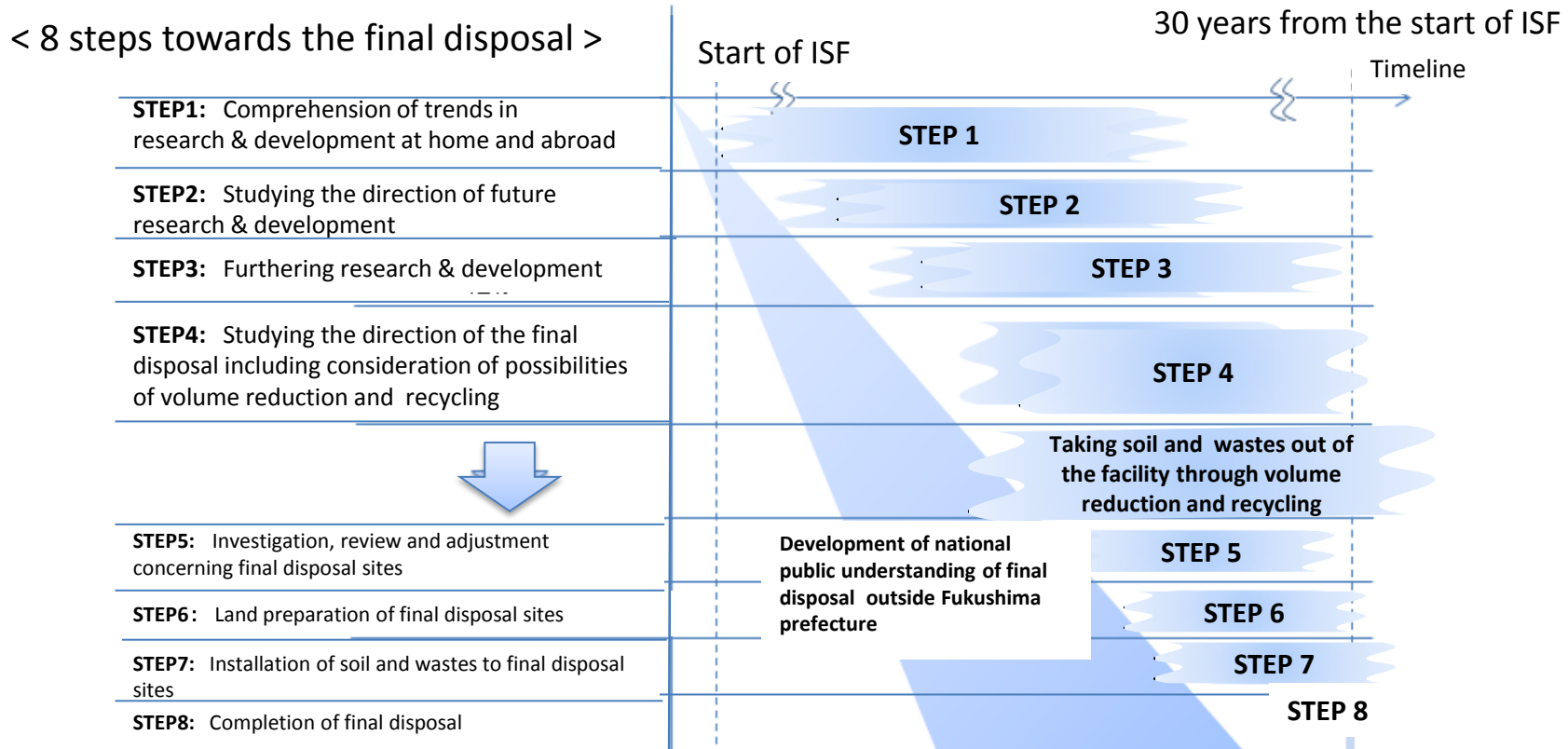
1. The government shall own the total number of outstanding stocks (the original law defined more than half of stocks owned by the government . However the government owns all stocks)
2. Additional investment by the government
3. Exclusion from taxation of registration license tax concerning the registration of increased capital stock with additional investment

※ Legally required measures, such as sectionalized accounting, may be implemented

※ This law is implemented on the day specified by the government ordinance within two months from the date of promulgation (Dec. 24, 2014) with some exceptions

Final Disposal outside Fukushima pref. within 30years from the Commencement of Interim Storage Facility

- Final disposal will be processed outside Fukushima prefecture in accordance with 8 steps
- Collecting information widely and considering physical attenuation of radiation in the process, MOE will undertake:
 - ①research and develop technology
 - ②a direction to study the final disposal taking into account the possibility of volume reduction and recycling
- MOE will develop national public understanding through dissemination of information concerning reuse of low radioactive materials and the final disposal outside Fukushima prefecture



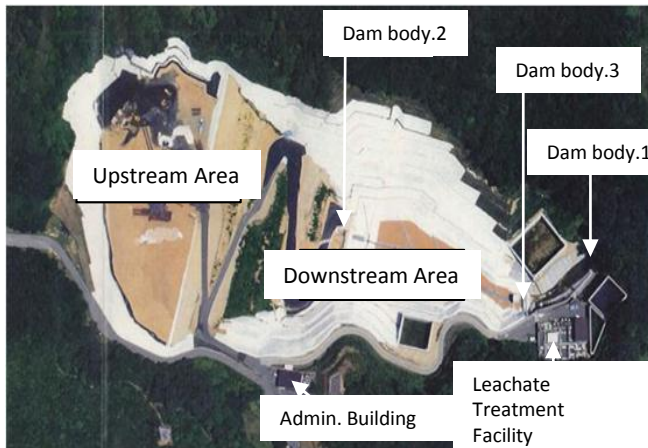
Ref.) Landfill Disposal Plan at Fukushima EcoTech Clean Center (Draft)

1. Introduction

- Need to resolve the problem of waste contaminated with radioactive materials ASAP for Futaba area and Fukushima prefecture.
- Need to secure final disposal site and to start landfill disposal immediately for the contaminated waste with 100,000Bq/kg or less which is possible to be disposed by utilizing existing controlled disposal facilities.

2. Overview of Fukushima EcoTech

- Site location : Tomioka
- *Carry-In entrance located in Naraha
- Disposal site area : approx. 9.4ha
- Landfill capacity : approx. 960,000m³
- Remaining capacity : approx. 740,000m³



Fukushima EcoTech Clean Center (Shooting; July 2010)

3. Disposal plan

(1) Landfill object

- Household garbage from 8 towns and villages in Futaba county after evacuees' returning (for 10yrs) : approx. 30,000 t <approx. 27,000 m³>
- Waste in measurement areas : approx. 490,000 t <approx. 445,000 m³>
- Designated waste in Fukushima prefecture : approx. 200,000t <approx. 182,000m³>

(2) Project period

- Household garbage of 8 towns and villages in Futaba county : approx. 10yrs
- Designated waste and waste in countermeasure areas, etc.: goal is approx. 6yrs (Amount: 420 bags/day)

(3) Waste disposal method

- The waste which has a relatively large amount of elution of radioactive cesium will be solidified in cement.
- Multiple measures will be implemented to prevent leakage of radioactive materials. Such as, protection of the new landfill areas shall be covered by sheets (Restraint of rainwater infiltration), Development of impermeable soil layer (Restraint of rainwater infiltration), Development of intermediate soil layer (Adsorption of radioactive materials).

(4) Safety assessment of landfill disposal

- The maximum additional exposure dose during landfill work (0.056mSv/y) is significantly below the reference level (1mSv/y) in the safety assessment of radiation exposure at the site boundary, etc.

4. Maintenance/Monitoring

(1) Inspection of the facility and Monitoring air dose rate

- Periodical inspection of seepage control layer and leachate treatment facilities, and monitoring air dose rate and radioactive concentration in groundwater.

(2) Responsibility, Supervision and Monitoring of MOE

- MOE will implement landfill disposal as the operating body based on the Act on Special Measures.
- MOE will station full-time staff responsible for the site to ensure appropriate landfill disposal and management of the facility.
- MOE will implement the environmental monitoring and announce the results.
- The government assumes responsibility for accidental damages.

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- **Public Communication**

Public Communication

WEB

- Comprehensive and instantaneous information



Pamphlets and other materials

- Easy-to-understand and detailed information
- Distributed at meetings, workshops, city offices, banks, convenience stores, etc.
- Available on the Web



Newspaper ads and TV programs

- Media is the largest information source for people in FP



Decontamination Information Plaza

- Information hub of decontamination run by MOE and FP (located near the Fukushima Station)
- Providing people inside and outside of FP and municipalities with comprehensive and latest information of decontamination and radiation



Interactive exhibition, demonstration, and workshops



Dispatch of experts to municipalities, communities, schools, etc.

