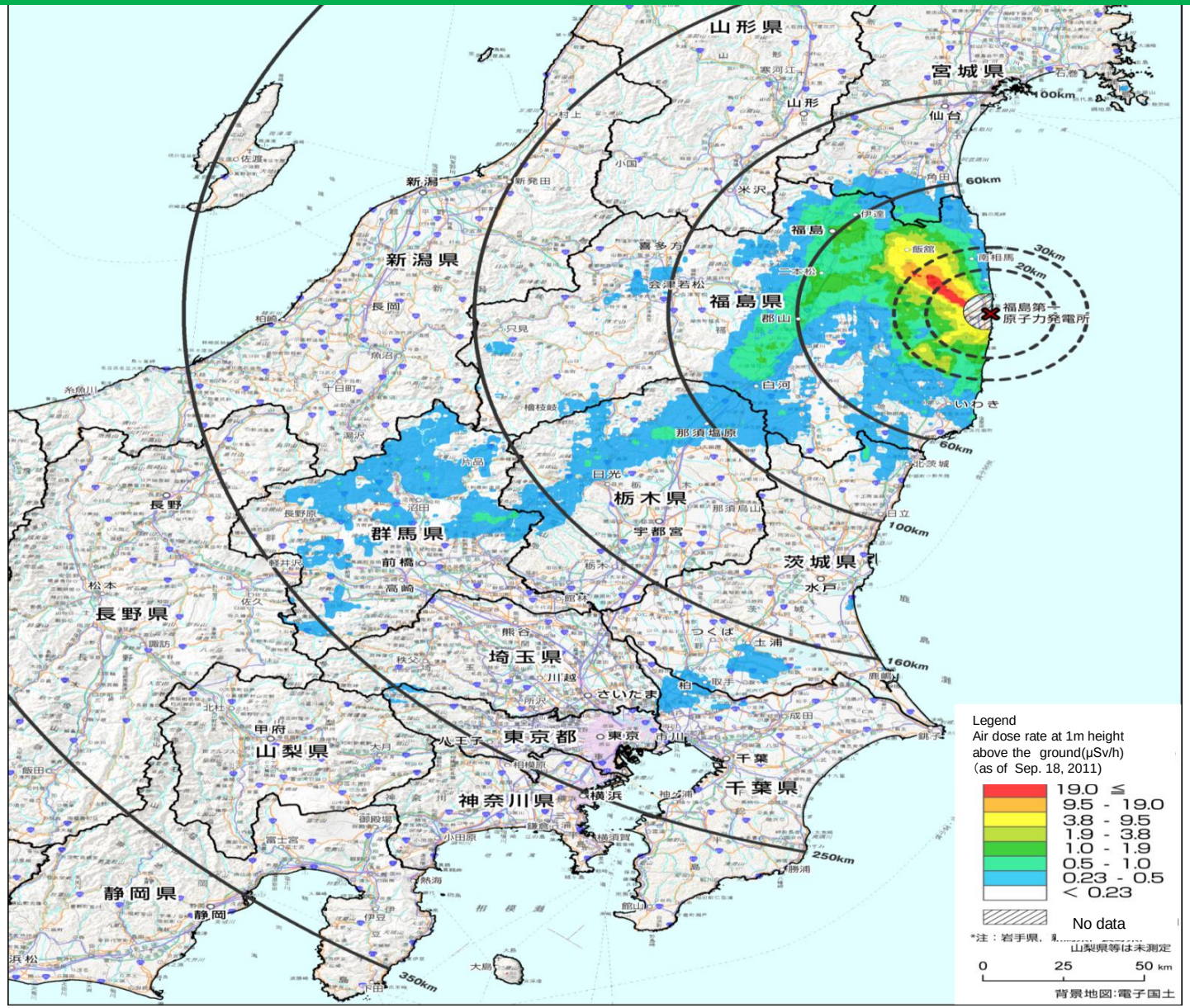
Progress on Off-site Cleanup Efforts in Japan

Masaru MORIYA

Former Head of Fukushima Decontamination Team , Fukushima Office for Environmental Restoration, Ministry of the Environment

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



Progress on Off-site Decontamination of Radioactive Materials

Framework of Decontamination

New 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 followings are carried out:
  - Planning and implementation of decontamination work
  - Collection, transfer, temporary storage, and final disposal

Special Decontamination Area

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

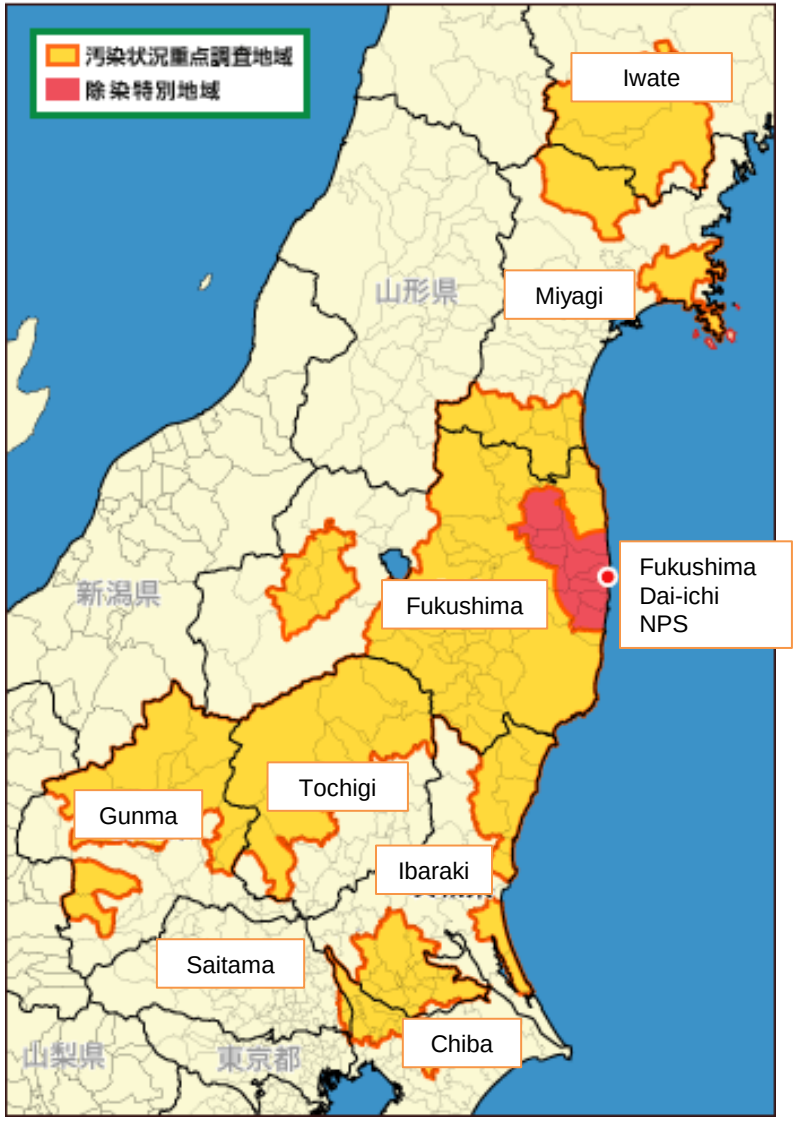
(*) Entire areas of Naraha, Tomioka, Okuma, Futaba, Namie, Katsurao, and Iitate.
Some areas of Tamura, Minami Soma, Kawamata, and Kawachi.

Intensive Contamination Survey Area

- 101 municipalities in 8 prefectures (*), in which over 0.23 μSv/hour of air dose rate (equivalent to over 1 mSv/year) is observed, were designated.
- Decontamination is implemented by each municipality. The national government takes financial and technical measures.

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

Special Decontamination Area and Intensive Contamination Survey Area



・・Special Decontamination Area

・・Intensive Contamination Survey Area

Guidelines to Help Understand Regulations under the Act

- **Waste-related guidelines:** storage, maintenance and management standards and disposal standards
- **Decontamination-related guidelines:** methods for the investigation and measurement of the status of pollution, decontamination and other measures, collection, transfer and storage of the removed soil
- **Guidelines for decontamination workers:** exposure dose management methods, preventive measures against internal exposure, safety and health management systems

Progress
in Special Decontamination Area

Decontamination Policy for Special Decontamination Area

Policy in FY2012 and 2013

Decontamination should be implemented taking into account the level of air dose rate.

- **Areas less than 20mSv/year**: Aiming for reducing additional exposure dose less than 1mSv/year as long-term goal.
- **Areas with 20 - 50mSv/year**: Aiming for reducing exposure dose in residential and farmland area less than 20mSv/year by the end of FY 2013.
- **Areas more than 50mSv/year**: Demonstration projects will be implemented. Lessons learned will be reflected into future decontamination policy.

Policy in FY 2014 & Beyond

- Aiming for reducing additional exposure dose less than 1mSv/year as a long-term goal
- Check and evaluate two-year decontamination results, consider proper actions, and revise implementation plans as needed.

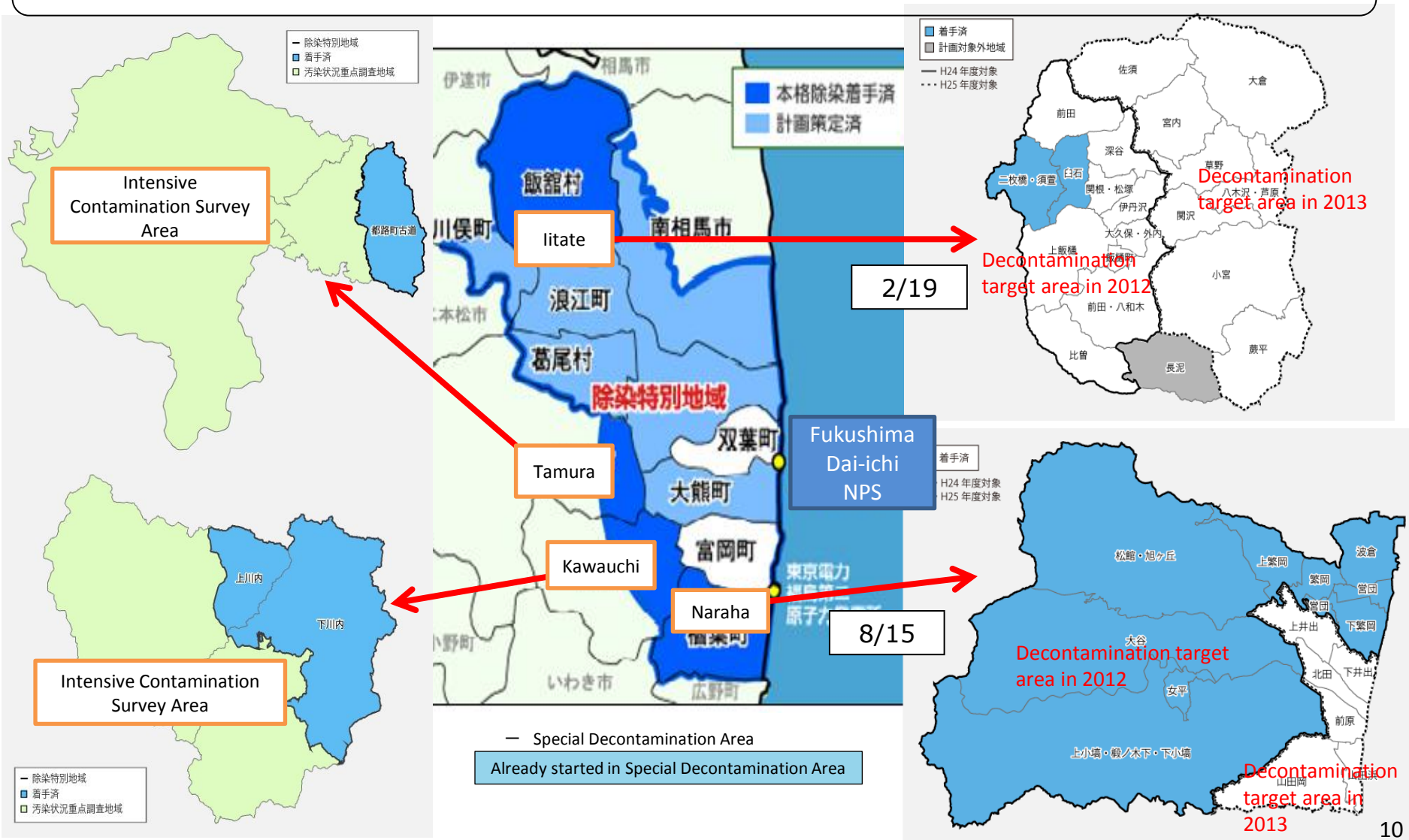
Progress of Work in the Special Decontamination Area

Progress Status		Preliminary Decontamination (base, etc.)	Full Scale Decontamination Work(surface decontamination)			
			Decontamination Plan	Temporary Storage Site	Decontamination Work	
					2012	2013
on full -scale decontamination work/on plan	Tamura city	✓	✓(Apr. 13)	✓(secured)	✓	—
	Naraha town	✓	✓(Apr. 13)	✓(secured)	✓	✓
	Kawauchi village	✓	✓(Apr. 13)	✓(secured)	✓	✓
	Iitate village	✓	✓(May. 24)	✓(partially secured)	✓	under local coordination process
	Kawamata town	✓	✓(Aug. 10)	✓(partially secured)	✓Preparation work completed	✓
	Katsurao village	✓	✓(Sep. 28)	✓(partially secured)	✓Preparation work completed	✓
	Okuma town	✓	✓(Dec. 28)	under local coordination process		on public announcement
Already planned/ prepared to order	Minami-Soma city	✓	✓(Apr. 18)	under local coordination process		
	Namie town	✓	✓(Nov. 21)	under local coordination process		
Plans not yet formulated	Tomioka town	✓	under local coordination process	under local coordination process		
	Futaba town					

*Decontamination work in a municipality is to be implemented based on the premises of formulation of the decontamination implementation plan, consent of house and land owners and securing of temporary storage sites.

Progress of Decontamination in Special Decontamination Area (1)

○Full scaled decontamination work started in 4 municipalities in FY2012



Progress of Decontamination in Special Decontamination Area (2)（as of Mar. 31, 2013)

○Progress of decontamination work implemented in FY2012 is shown below:
○Decontamination work in Tamura city has almost completed.

	Tamura city	Naraha town	Kawauchi village	Iitate village
Residensial area	99%	38%	100%	1%
Farm land	100%	34%	-※ ※Plan for implementation in FY2013	0%
Forest	85%	56%	34%	4%
Road	99%	0%※ ※Plan for implementation in the final process	53%	0%※ ※Plan for implementation in the final process
	Already implemented in FY2012	Plan for implementation in FY2012 and 2013	Plan for implementation in FY2012 and 2013	Plan for implementation in FY2012 and 2013

Note：As for Implementation rate, denominator is a dimension of decontamination target area of relevant municipalities, numerator is calculated by a dimension of completed area of sequential decontamination work (weeding, sediment removal, and washing, etc.)
・Figures of decontamination target area and completed decontamination area might be refined and changed in the future.
・In FY 2012, full decontamination has not started in other seven municipalities.

Restricted Areas and Areas to Which Evacuation Orders Have Been Issued (as of Mar. 26, 2013)

Ahead of the decontamination in the Special Decontamination Area, Decontamination Plans are to be elaborated taking into account the progress of rearrangement of the Restricted Areas and Deliberate Evacuation Area.

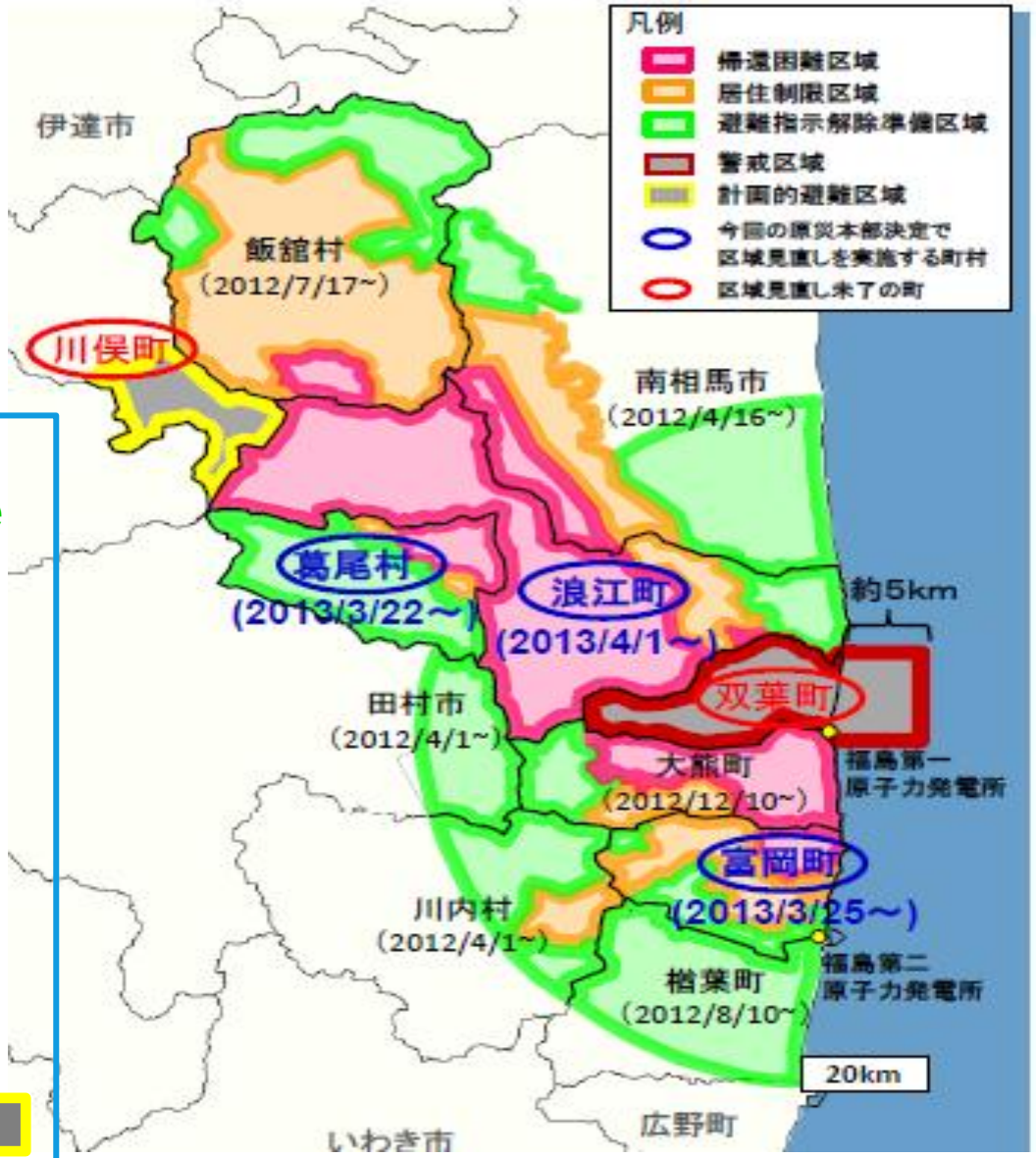
Area 1: <20mSv/yr
Evacuation orders are ready to be lifted:

Area 2: 20 – 50 mSv/yr
Areas in which residents are not permitted to live:

Area3: >50 mSv/yr
Residents will face difficulties in returning for a long time:

Restricted Area:

Deliberate Evacuation Area:



Decontamination Work in Tamura City

Removal of branches and fallen leaves in a Shrine

Weeding and removal of leaves in a grave site

Decontamination Work in Kawauchi Village

Forests (within 20m from living areas): removal of fallen leaves and topsoil

House garden: removal of topsoil

ground : Removal of deposited materials

House wall: wiping

Effectiveness of Decontamination Methods

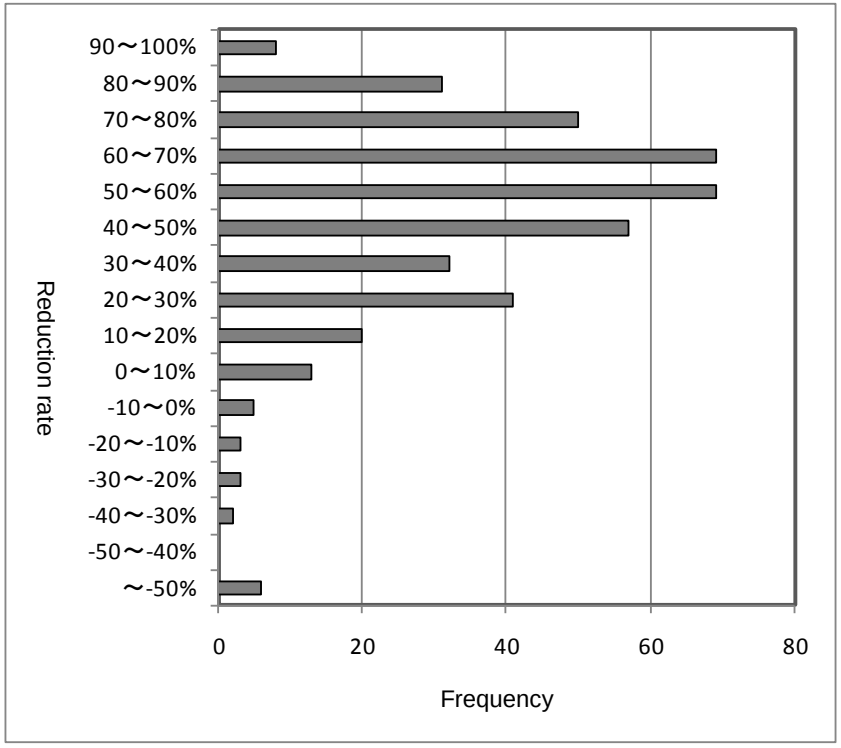
Information was collected and sorted on decontamination effectiveness of early decontamination project(mainly in 2012), e.g. model project, and preliminary decontamination work implemented in Fukushima by the national government and relevant municipalities.

The results shows that surface concentration of contamination(cpm) were reduced by **50-70%** by washing, **30-70%** by high-pressure washing, and **70-90%** by scraping on surface of asphalt-paved roads. As for playground, **80-90%** reduction was achieved by top soil removal.

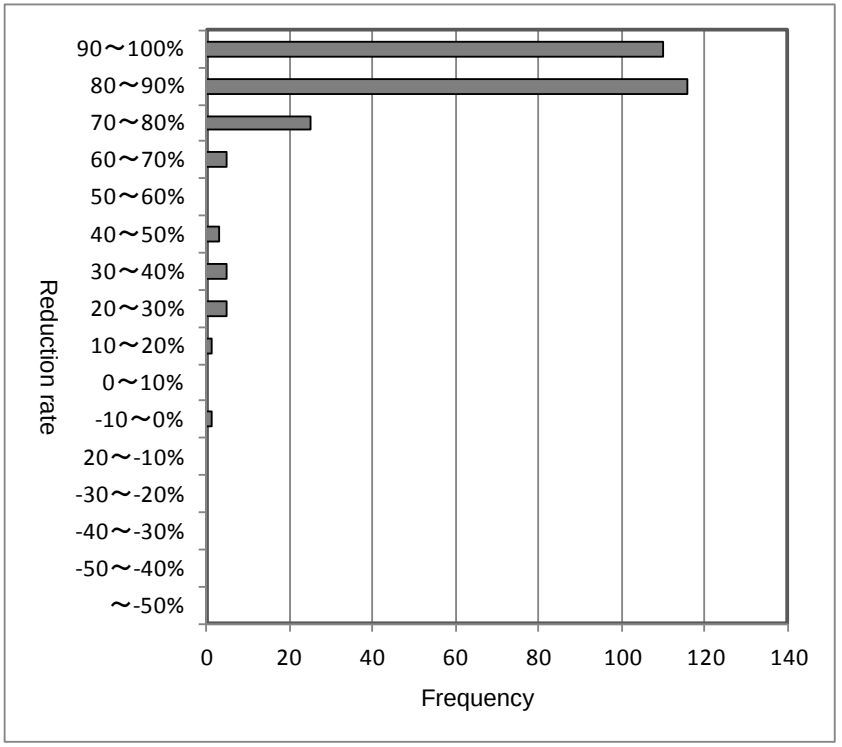
※ As the objective of this analysis is to collect information on effectiveness of each decontamination work, the data is expressed as reduction rates of surface concentration of contamination on each decontamination method.

※ This analysis is tentative, as the scope of the analysis is the decontamination work carried out at early stages, where decontamination methods were not established yet and recent improvements were not reflected.

Example 1: Decontamination work on asphalt-paved roads



Example 2: Decontamination Work on Playground



Reference：Announcement on “Effectiveness of decontamination work which is implemented by the national government and relevant municipalities in decontamination project”（Jan. 18, 2013）

Decontamination Model Work in the Joban Expressway

■Objective

To test and evaluate various decontamination methods taking into account different road paving conditions and air dose rates.

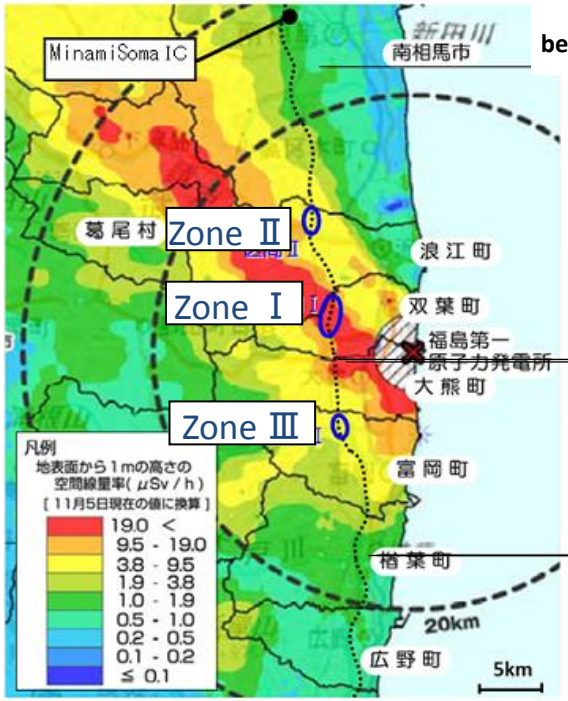
■Outline

Period: March -July, 2012

Results:

In Zone I (most highly contaminated zone), it is confirmed that air dose rate could be reduced to less than 9.5 μSv/h, or equiv. to 50 mSv/y.

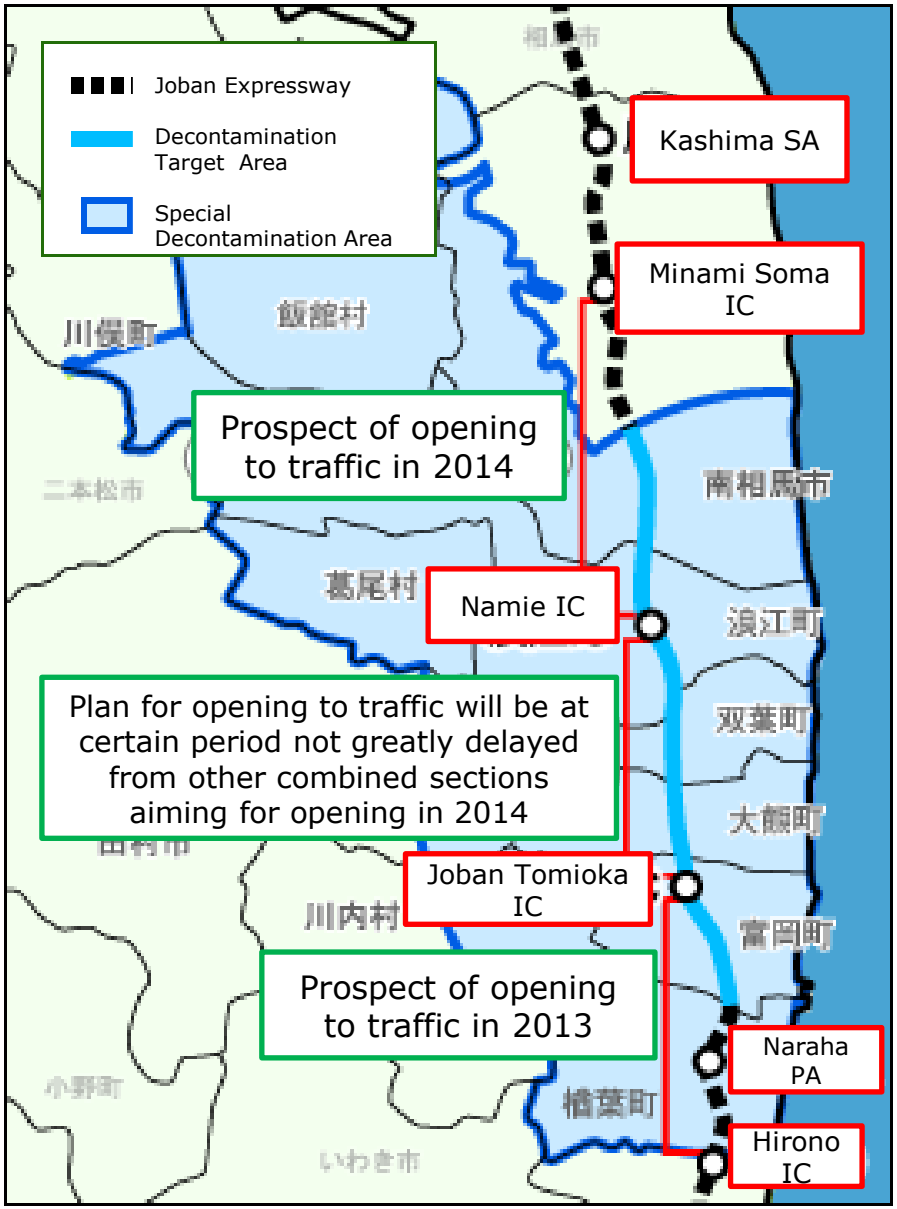
In zone II and III, it is confirmed that air dose rate could be reduced to approximate 3.8μSv/h , or equiv. to 20 mSv/y.



Decontamination Zone	Air dose rate	Situation before the accident	Road shape	Air dose rate at the center of expressway (μSv/h)			
				Before	→	After	Decreasing rate
Zone I	More than 9.5μSv/h (equivalent to more than 50mSv/y)	Under Construction	Cutting interval	43.1	→	8.3	▲81%
			Landfill interval	11.6	→	4.2	▲64%
			Bridge interval	10.3	→	5.9	▲43%
Zone II	3.8～9.5μSv/h (Annually equivalent to 20～50mSv)		Cutting interval	5.8	→	2.3	▲60%
			Landfill interval	5.4	→	2.5	▲54%
Zone III		Opened	Cutting interval	5.1	→	4.1	▲20%

Progress of Decontamination Work in Joban Expressway

Decontamination work is in progress to be completed by the end of June, 2013.



■ Future Schedule

○On the premise of temporary storage being secured, decontamination work will be started within this year which will be planned to complete until the end of June, 2013.

○Parallel to decontamination work, reconstruction and maintenance project will be started based on premise that adjustment with related agencies will be set aiming for in-service time as follows:

- Between Hirono IC～Joban Tomioka IC(17km)：within FY2013
- Between Namie IC ～Minami Soma IC(18km)：within FY2014
- Between Joban Tomioka～Namie(14km)： Plan for opening to traffic will be at certain period not greatly delayed from other combined sections, aiming for opening in 2014

Securing Appropriate Decontamination Work

Securing Proper Decontamination Work

Press reports of Inproper Decontamination work (Asahi-Shinbun on Jan. 4, 2013, etc.)

*** Highly regrettable to receive these reports**
*** Fact investigation and strict measures based on the result**

Establishing Taskforce for Securing Appropriate Decontamination Work in the Ministry（Instructed by Minister Ishihara）

Head : Senior Vice-Minister Inoue　　Deputy Head: Parliamentary Secretary Akino, etc.

Investigation for fact confirmation

- Instruction to the Contractors for investigation by Senior Vice-Minister Inoue (Jan. 8)
- Site visit by Senior Vice-Minister Inoue and Parliamentary Secretary Akino (Jan. 9)
- Hearing from the Contractors and instruction to submit reports by the Fukushima Office for Environmental Restoration (Jan.7)
- On-site investigation for specified sites
- Interviewing workers/ reporters who could be reached

Launch of Appropriate Decontamination Promotion Program on Jan. 18, 2013

<Investigation Result & Response to Individual Cases>

28 cases reported >> Summarized into 19 cases as some of the 28 cases considered identical

- **2 cases: Ministry instructed the contractors, who acknowledged the reported facts, to take corrective actions**
  - ✓Naraha Town : Treatment of wastewater from high-pressure cleaning for a house balcony was inappropriate
  - ✓Iitate Village : Treatment of wastewater from high-pressure cleaning for a post office was inappropriate
- **1 case: Ministry found the case in its site inspection and instructed the Contractor to take appropriate actions**
  - ✓ Tamura City : Edged plants and trees were left by the river side after the work

●other 2cases: Ministry gave the contractor a guidance to take appropriate actions

※Ministry also conducted an investigation of its response to the reported cases (questionnaire survey for staff in charge, checking the number of calls to the decontamination call center, etc)

The Key Elements of the Appropriate Decontamination Promotion Program

Countermeasures to prevent inappropriate decontamination work

Actions

Thorough responsibility of contractors

- Establishment of a system for responsible execution of work
- Imposing strict measures (suspension of bidding qualification by the entire government)
- reinforcement of no-notice inspection etc.

Establishment of broader management framework

- Collaboration w/ municipalities on check & info. exchange
- Information provision to the local residents about decontamination implementation (time & place)
- Effective monitoring by a third-party etc.

Reinforcement of MOE's administration system

- Drastic reinforcement of a supervisory system (Increase field supervisors)
- Establishment of a special hotline for inappropriate decontamination reports
- System for uniform management of such reports etc.

Problems

Inadequate system of operation & management

- Necessity of improving an implementation system & awareness raising of contractors
- Necessity of deterrence against inappropriate work
- Gap between order intention & field management

Lack of viewpoints of locals and third-parties

- Anxiety of local residents on decontamination effects
- Necessity of the improvement of a monitoring system: more specialty/ objectivity/ transparency

Insufficient response system of MOE

- Necessity of a proper management system to secure effectiveness of decontamination work in various and broad areas
- Incomplete reception and transaction of inappropriate decontamination reports

Promotion of reliability/ Acceleration of decontamination work

Progress in Intensive Contamination Survey Areas

Decontamination Progress in Intensive Contamination Survey Area (1)

101 municipalities designated as Intensive Contamination Survey Area shall implement monitoring survey and formulate a decontamination implementation plan which stipulates areas, methods and contractors for decontamination work.

○As of the end of March 2013, decontamination implementation plans have been formulated in 94 municipalities.

○As decontamination is to covers large areas including public facilities, residential houses, roads, farmland and forest, municipalities shall prioritize the object, in consideration with the protection of public health as a top priority at decontamination work.

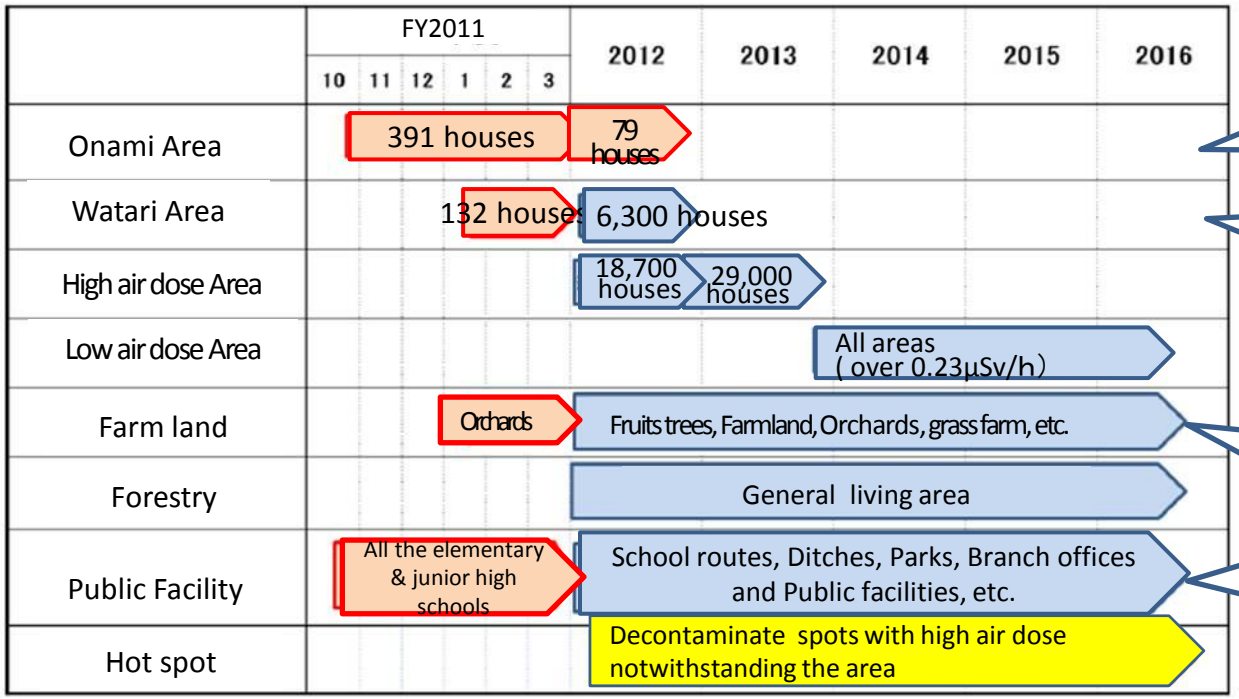
⇒Decontamination work is implemented based on a decontamination implementation plan stipulated by each municipality.

Decontamination Progress in Intensive Contamination Survey Area (2)

94 out of 101 municipalities finalized their decontamination implementation plans under the Act (as of Apr. 1, 2013)

Example of Fukushima City

- Planning term : 5 years until Sep. 2016 (2 years as an intensive term)
- Priority: Houses in high air dose areas, public facilities, especially for children



＜Progress as of Apr. 1,2013＞

Completed in 470 houses（100%）

completed in approx. 4,000 houses

Completed in 5,276 ha of farmland, etc.（ca.93%）

Completed in 206 schools and nurseries（100%）

: Decontamination completed

Reference: Fukushima Furusato Decontamination Implementation Plan

Decontamination Progress in Intensive Contamination Survey Area (3)

Decontamination is in progress in accordance with each municipality's decontamination implementation plan. Especially in places where children are likely to be exposed and in public facilities, it seems to be getting close to the end. However, decontamination work in other places needs to be implemented for another few years.

In Fukushima pref. (As of the end of Jan.,2013)	**Ordering Ratio**	**Implementation Ratio**
Public facility, etc.	More than 90%	approx. 75%
Residence	approx. 80%	approx. 60%
Road	approx. 75%	approx. 60%
Farmland & meadow	approx. 80%	approx. 60%
Forest(living area)	Nearly 20%	Less than 10%
Outside Fukushima pref. (As of the end of Dec., 2012)	**Ordering Ratio**	**Implementation Ratio**
School, nursery school	Almost ordered	More than 80%
Park, sports facility	approx. 80%	approx. 60%
Residence	approx. 40%	approx. 20%
Public facility, etc.	approx. 70%	approx. 70%
Road	approx. 60%	approx. 60%
Farmland & meadow	approx. 70%	approx. 30%
Forest(living area)	Partially ordered	Partially implemented

Note: The ratio calculated against the numbers of target buildings/ land areas where the decontamination work was planned in FY2012.

The number in each plan is still in adjustment and uncertain, and still likely to be increased in the future.

※Please refer to the Information Site on Decontamination for individual municipality status. http://josen.env.go.jp/zone/index.html

Dissemination of Information regarding Decontamination Progress on the Website

In case of Fukushima City:

Information Site on Decontamination
URL: http://josen.env.go.jp/en/

Efforts to secure Interim Storage Facility

Efforts to secure Interim Storage Facility

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

Main Contents

- The National Government shall secure, maintain and manage the facility
- The National Government shall make utmost efforts **to start the operation of facility within about 3 years(by January, 2015)**
- Target materials for storage is limited to soil and waste generated in Fukushima prefecture

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

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

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

Nov., 2012 The Governor of the Fukushima Pref. announced the acceptance of the investigation proposed by the Ministry at the consultation meeting with the mayors of Futaba County's towns and villages

Mar., 2013 The Ministry selected contractors, who will implement the investigations

Apr., 2013 On-site exploratory investigation has started in Naraha

Outlook for Selection of Proposed Site for Interim Storage Facility

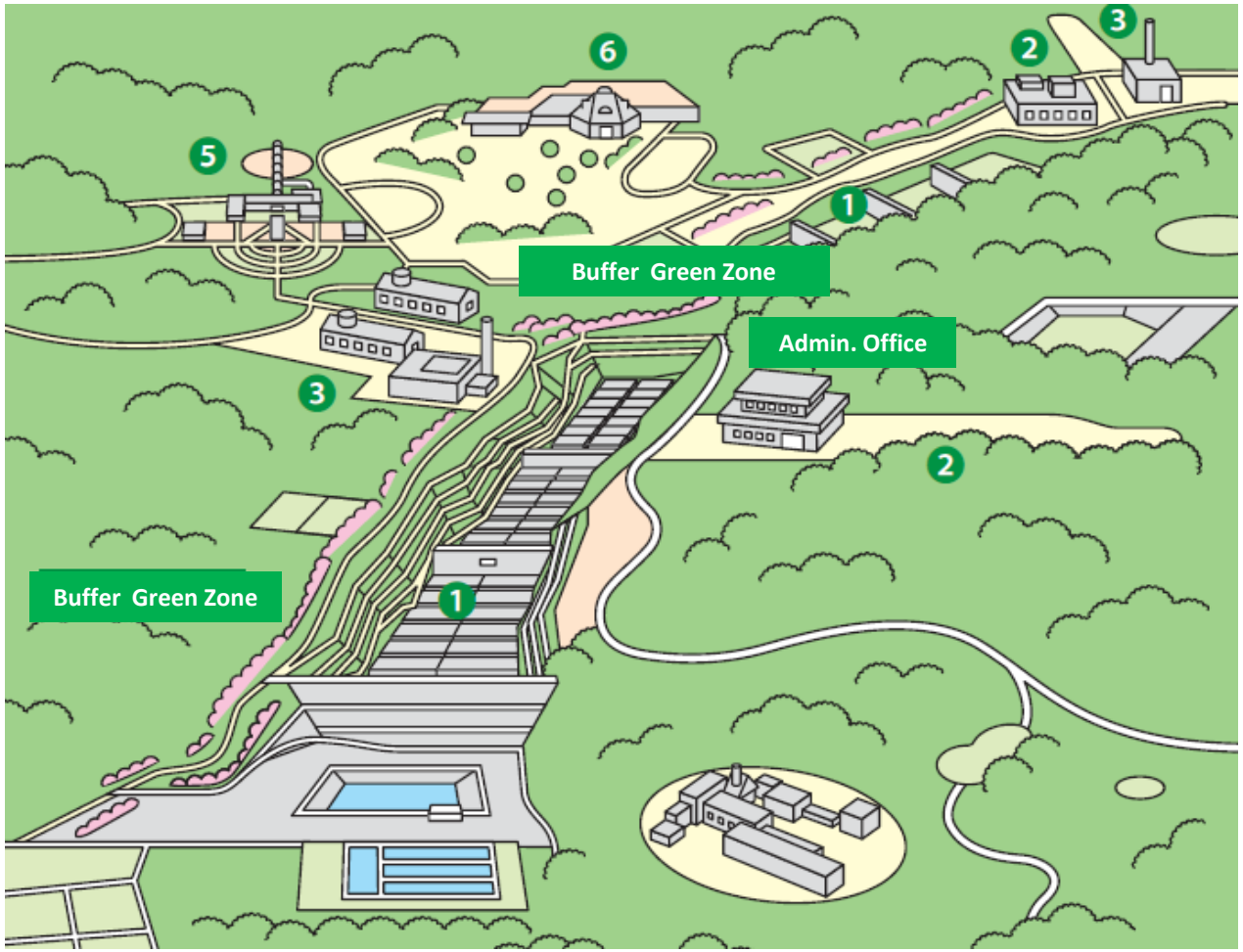
①Sufficient area for expected waste inventories
②Easy access from the area of mass generation of soils and wastes.
③Easy access to major arterial roads
④Avoid active fault and soft ground
⑤Minimize of change in geological formation such as surface water diversion

Following three sites which will fulfill the conditions above, are proposed as candidate sites of facility to Fukushima prefecture and 8 municipalities of Futaba county, as an outlook of the government.

①North side of Fukushima Dai-ichi NPS of Futaba town
②South side of Fukushima Dai-ichi NPS of Okuma town
③South side of Fukushima Dai-ni NPS of Naraha town

Interim Storage Facility: Bird's-Eye View

Interim Storage Facility will be consisted of facilities with various functions



①Storage Facility

②Emplacement & Segregation Facility

③Volume Reduction Facility

④24hour monitoring Equipment(placed in several points, not specifically indicated)

⑤R & D Facility

⑥Public information Center

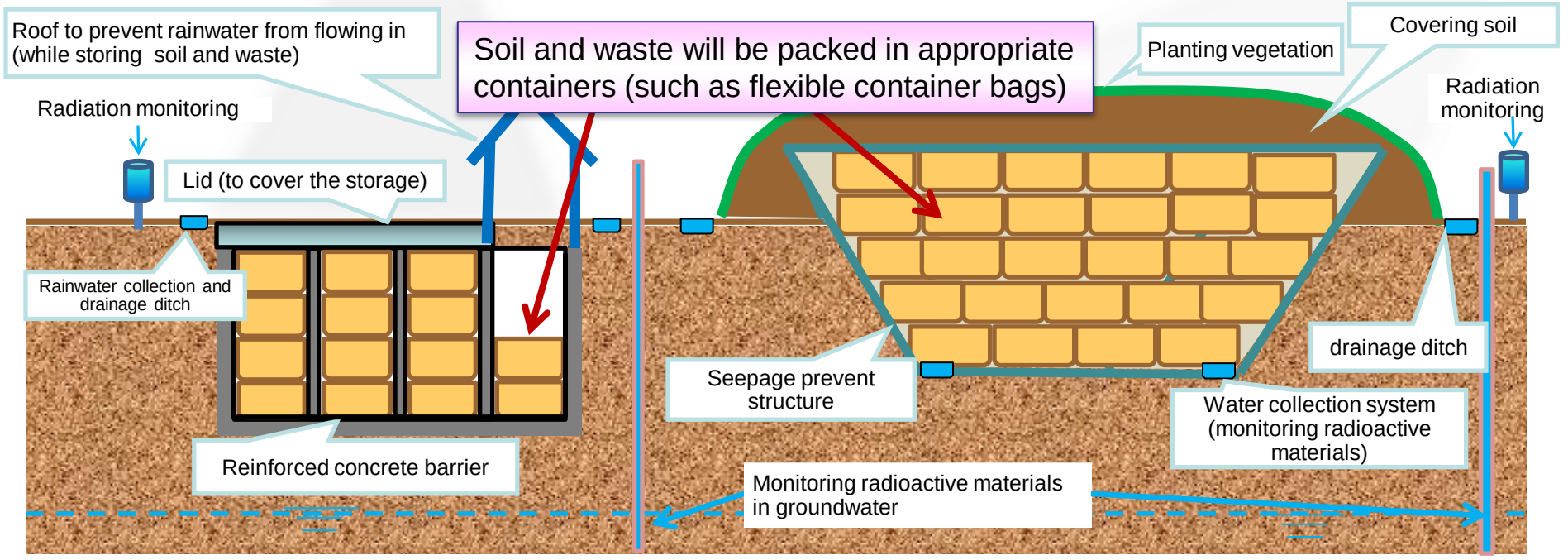
Scale of the whole facility（estimation）
Total storage volume ranges between 15-28 million ㎥, which is 12-23 times big as a baseball stadium(approx. 1.24million ㎥)

Storage Facility Image in ISF

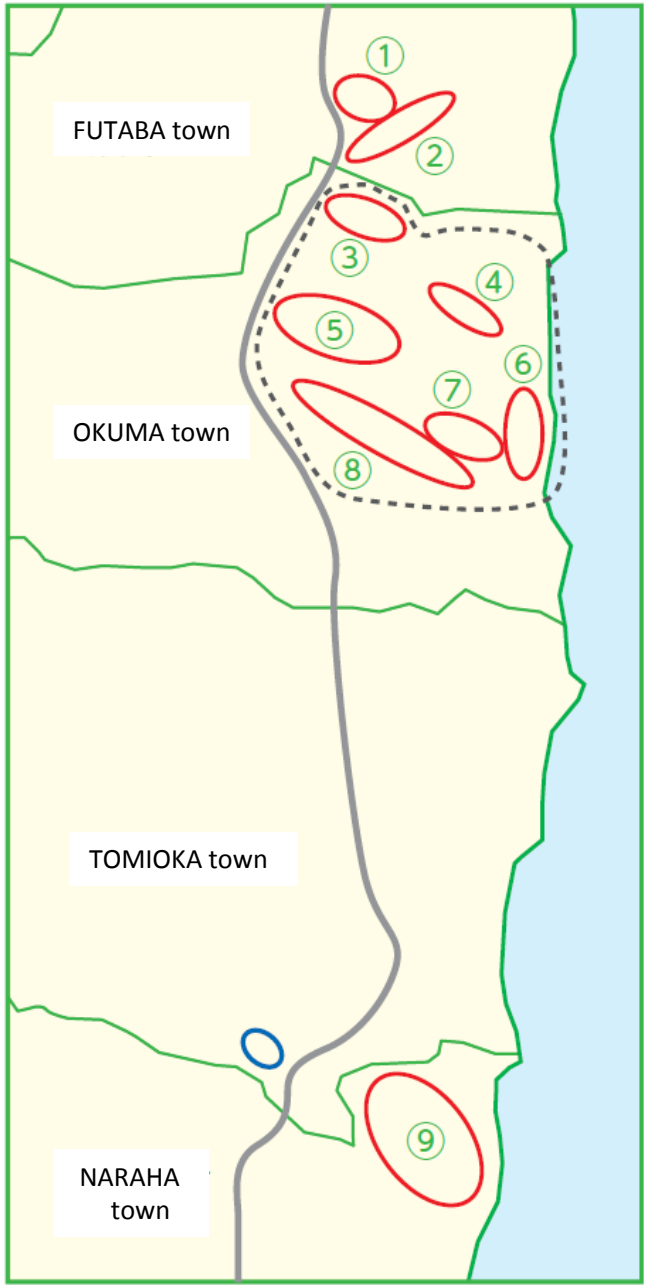
- Several types of Storage Facilities may be installed according to the characteristics of stored soil and waste.
  - ✓・Level of contamination
  - ✓・Leachate traits under various environmental scenario.

Example of facilities for radioactive waste which can generate leachate

Example of facilities for radioactive waste which does not generate leachate



Outlook for Selecting Potential Survey Sites for ISF



Potential survey sites were selected in 3towns(Futaba, Okuma and Naraha), in consideration with existing data and following conditions:

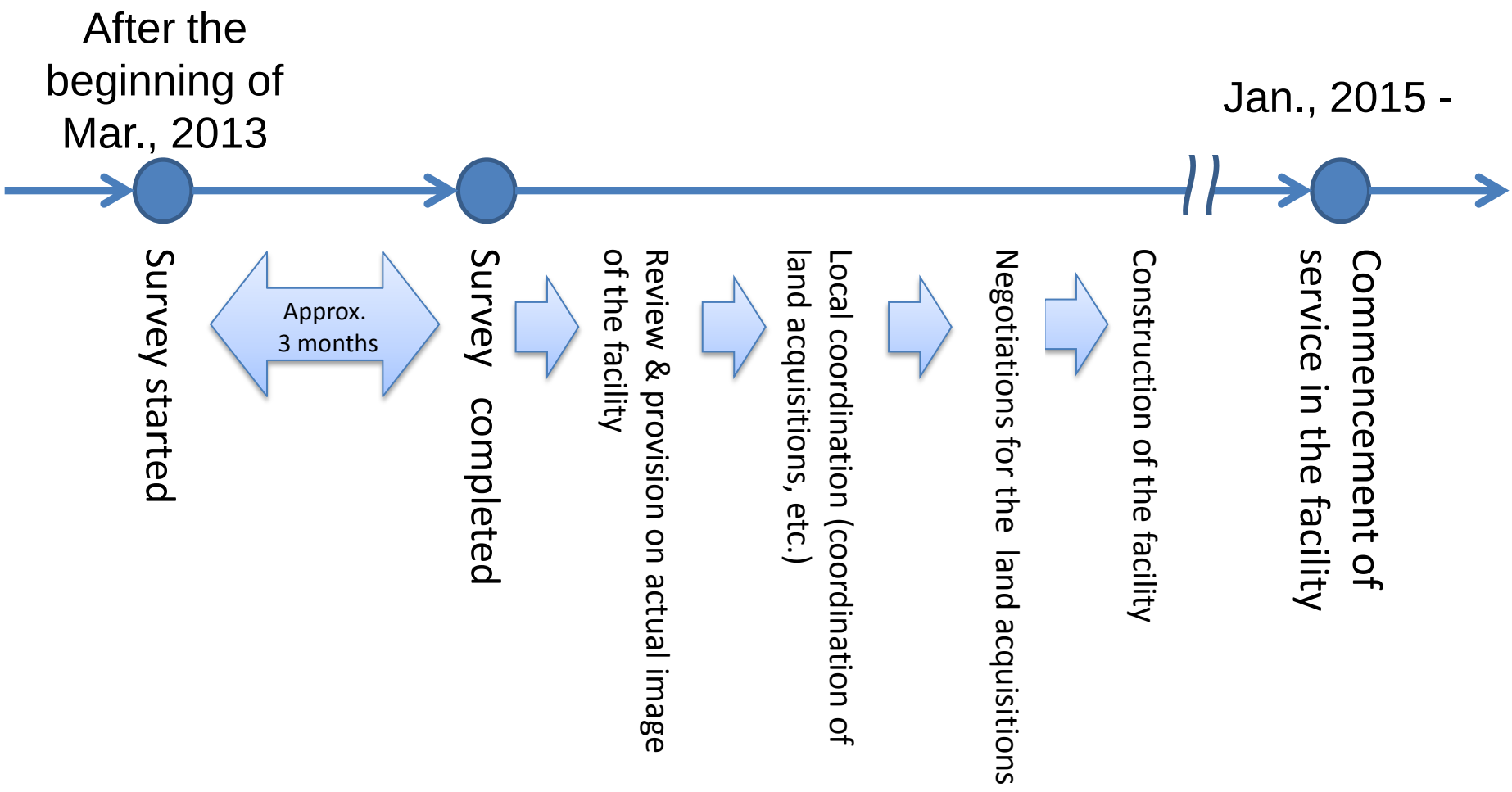
- ○Effective utilization of existing geological formation, e.g. plateaus and hills
- ○Utilization of existing facility
- ○Utilization of sites contributed to disaster prevention

Potential survey sites

Existing controlled landfill site

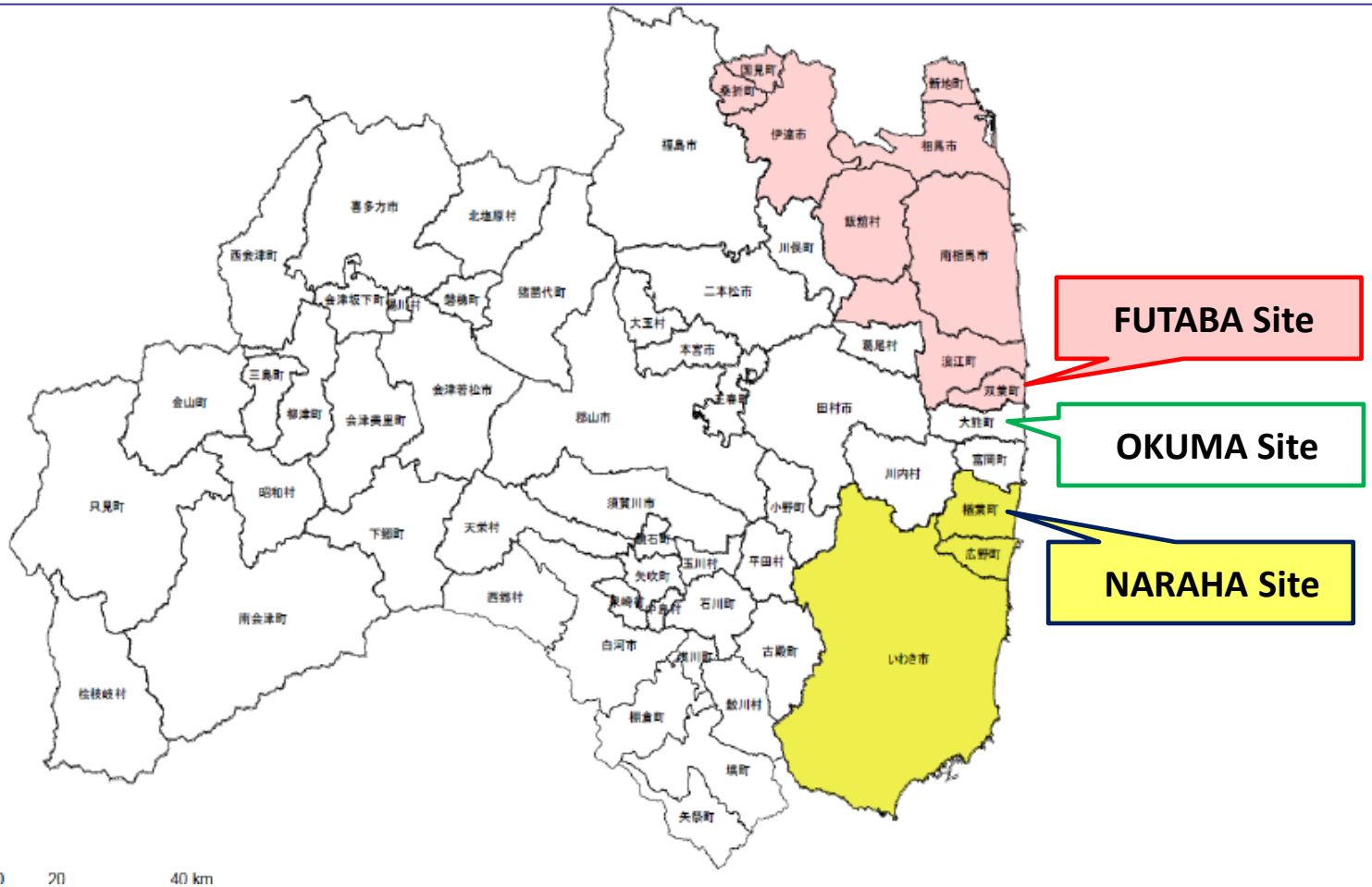
※The marked areas on the map indicate only rough outline of potential survey sites envisaged at this moment.

Future Plan


After the beginning of Mar., 2013
Jan., 2015 -
Survey started
Approx. 3 months
Survey completed
Review & provision on actual image of the facility
Local coordination (coordination of land acquisitions, etc.)
Negotiations for the land acquisitions
Construction of the facility
Commencement of service in the facility

Transportation Plan

- Municipalities in Fukushima pref. are categorized into 3 areas according to
  - ISF locations (FUTABA, OKUMA and NARAHA)



Major Challenges in Decontamination Work

- Speeding-up of decontamination work for living environment
  - Human resources
  - Temporary storage space
  - Interim Storage Facility (ISF)
- Decontamination and rehabilitation of agricultural land
- Decontamination of forest beyond the areas adjacent to houses

Major Challenges in Decontamination Work

- Decontamination and monitoring technology development and their application
- Communication of information and knowledge on radiation risk
- Research on the behavior and environmental fate of cesium, including the development of transport models
- Collaboration of decontamination work and infrastructure recovery