Off-site Environmental Remediation in Affected Areas in Japan

December, 2019

Ministry of the Environment, Japan

Result and Effect of the Whole Area Decontamination

Interim Storage Facility

Disposal of the Specified Waste

Communication to the Public and International Societies

Decontamination and Waste Treatment based on the “Act on Special Measures”

Measures on decontamination of soil contaminated by radioactive materials

① Special Decontamination Areas (SDA)

Designation of SDA by the Minister of the Environment

↓

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

↓

Decontamination implementation by the National Government

② Intensive Contamination Survey Areas (ICSA)

Designation of the ICSA by the Minister of the Environment
(The areas with more than 0.23μSv/h)
※0.23μSv/h is not the decontamination target, but designation criteria for the ICSA

↓ If the area is more than 0.23 μSv/h, after the monitoring survey by municipality mayors

Development of Decontamination Implementation Plan by the municipality mayors

↓

Implementation of decontamination by municipality mayors based on the plan (the national government allocates the budget)

※Removed soil generated by decontamination work inside NPS, is implemented by the relevant nuclear producer, TEPCO

Management of waste contaminated by radioactive materials

Specified waste

① Waste within the countermeasure area

Designation of contaminated waste management area※ by the Minister of the Environment
※Designated areas which meet requirements to be contaminated by radioactive materials at certain level necessary to manage waste under special management

↓

A management plan for waste within the countermeasure area is formulated by the Minister of the Environment

↓

Implemented by the national government pursuant to the treatment plan for waste

Survey on sewerage sludge, incinerated ash, etc. (obligatory)

↓ Report to the Minister of the Environment

Survey on waste other than that specified in the left box (voluntary basis)

↓ Application

② Designated waste

Designated as “designated waste” by the Minister of the Environment
※ Contaminated waste above certain level (8,000Bq/kg)

↓

Implemented by the national government

Prohibition on unauthorized actions (ex. unauthorized dumping)

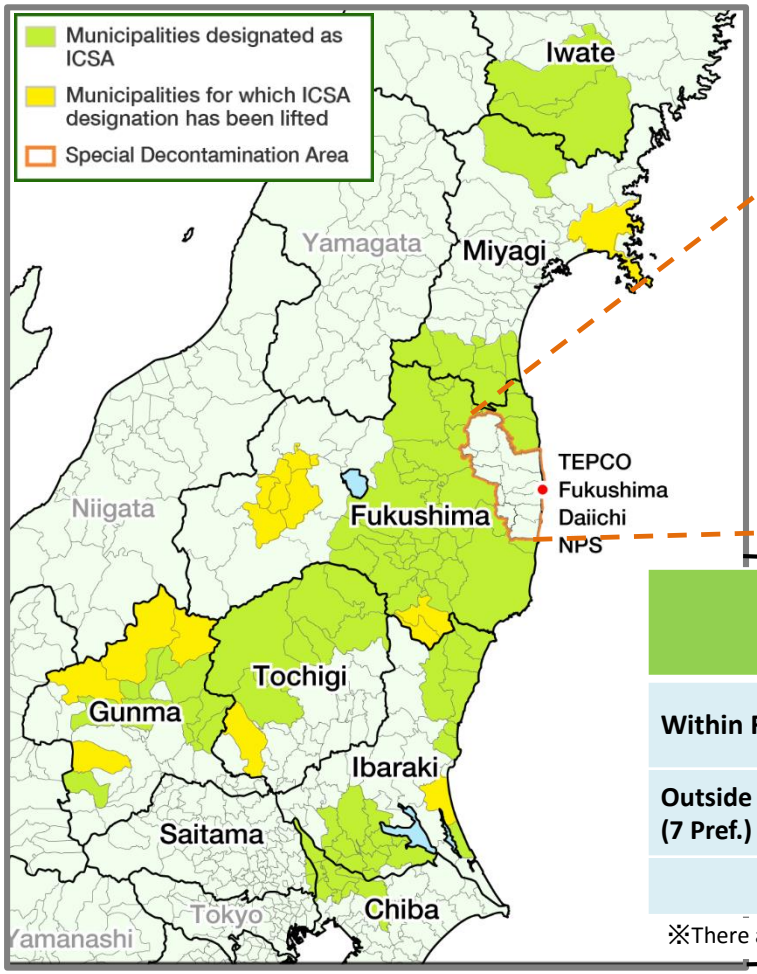
Specified domestic waste and specified industrial waste

- It is stipulated by MOE’s ordinance that the waste applied for waste treatment law, but might be contaminated by radioactive materials diffused from the NPS accident. It is managed based on treatment criteria of the waste treatment law and special treatment criteria on the Act on Special Measures

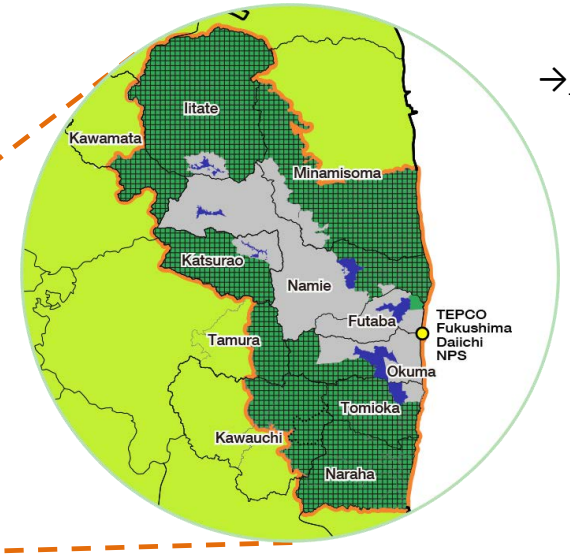
Result of Whole Area Decontamination

Whole area decontamination based on the Act on Special Measures was completed on March 19, 2018, excluding the Difficult-to-Return Zones (DRZ)

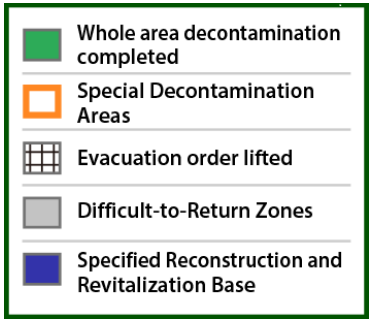
<Intensive Contamination Survey Areas (ICSA)>



<Special Decontamination Areas (SDA)>



→ **Whole area decontamination in the SDA was completed at the end of March 2017**

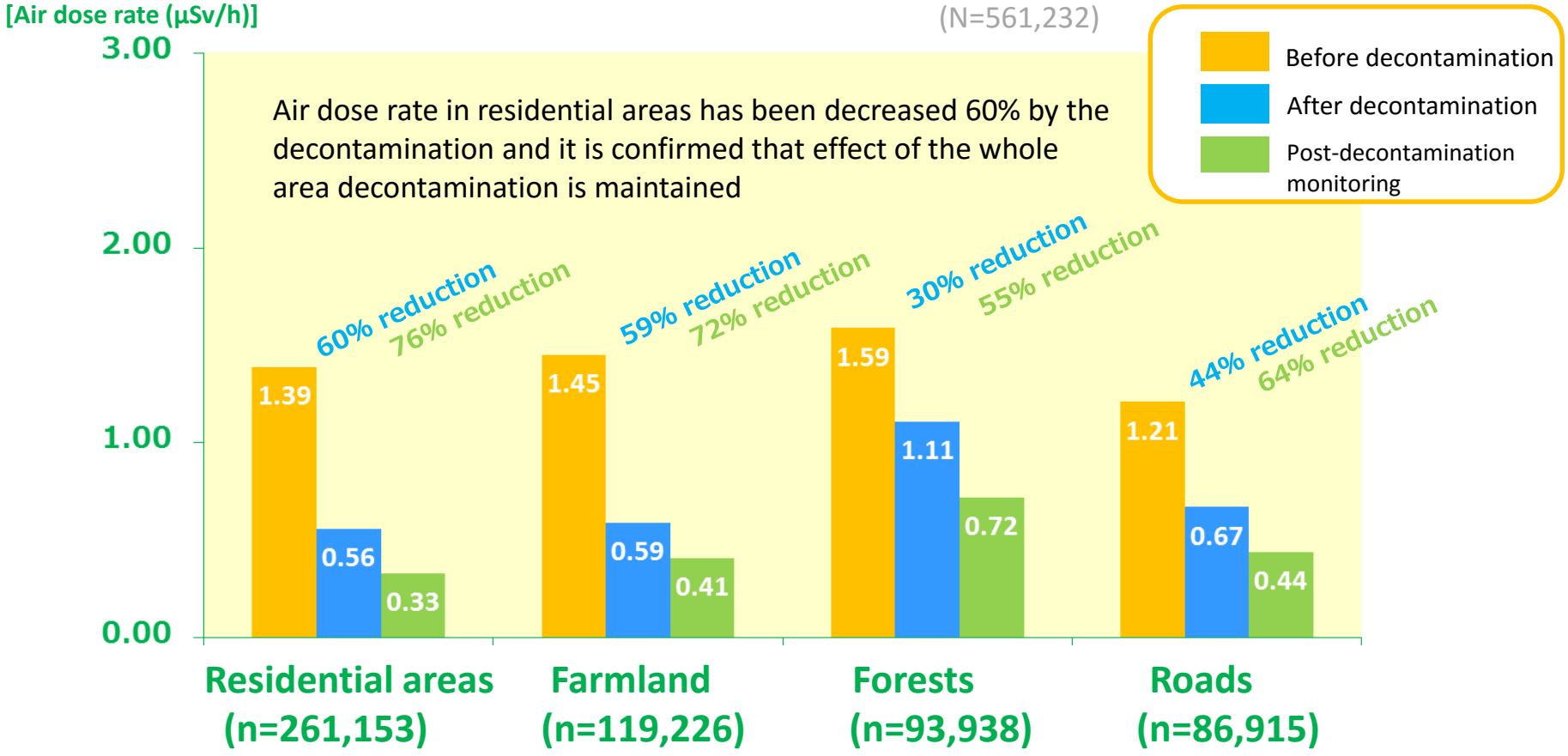


	Municipalities where whole area decontamination was completed		
		SDA（11）	ICSA（93）
Within Fukushima Pref.	43※	11	36
Outside Fukushima Pref. (7 Pref.)	57	—	57
Total	100	Completed in March 2017	Completed in March 2018

※There are both SDA and ICSA in Minamisoma, Tamura, Kawamata, and Kawauchi

Effects of Decontamination in SDA

<Air dose rate measured at the height of 1m from the ground / Transition according to land category>



NOTE: The chart shows the air dose rate average in each category (aggregated data of measuring points).
Residential areas include schools, parks, cemeteries, and large-sized facilities, farmland includes orchard, and forests include slopes, grassland and lawn.
Post-decontamination monitoring was implemented after 6 months to a year after the decontamination work. The latest result of post decontamination monitoring in municipalities were summarized

[Implementation period] ・Monitoring before decontamination Nov.2011 - Nov. 2016
・Monitoring after decontamination Dec. 2011 - Dec. 2017
・Post decontamination monitoring Oct. 2014 - Aug. 2018

Scale of Whole Area Decontamination Project

◆The MOE has budgeted approx. JPY 2.9 trillion (= USD 27 billion) for decontamination until FY2018.
◆17mil. ㎥ (among which approx. 16.5mil. ㎥ were from Fukushima Prefecture) of contaminated soil and wastes were removed until the end of FY2017.
◆MOE published "Decontamination Project Report" to leave a record behind of the experiences, knowledge and lessons learned through decontamination works.

Decontamination in SDA

- Total number of labor:
  approx. 13,700,000 workers
  ※as of the end of March 2018
- Budget: approx. JPY 1.5 trillion
  ※ MOE's budget until FY2018
- Volume of the generated soil:
  approx. 9,100,000 ㎥
  ※Estimation as of the end of March 2018
- Transported volume of soil from TSS*:
  approx. 1,900,000 ㎥
  (ISF: approx. 280,000 ㎥, Volume Reduction Facility: approx. 1,620,000 ㎥) ※Estimation as of the end of 2018

※Considered 1US$ =JPY107

Decontamination in ICSA

- Total number of labor:
  approx. over 18,400,000 workers
  ※ estimated from interviews with relevant municipalities as of the end of March 2018
- Budget: approx. JPY 1.4 trillion
  (within Fukushima Pref. : approx. JPY 1.4 trillion,
  outside Fukushima Pref. : approx. JPY 40 billion
  ※MOE's budget until FY2018
- Volume of the generated soil:
  approx. 7,900,000 ㎥ (estimation)
  (within Fukushima Pref.: approx. 7,400,000㎥, outside Fukushima Pref.: approx. 500,000㎥, both are estimation as of March 2018)
- Transported volume of soil from TSS:
  approx. 1,700,000 ㎥
  (ISF: approx.500,000 ㎥, Volume Reduction Facility: approx. 1,200,000 ㎥) ※Estimation as of the end of March 2018

Prospects on Export of Removed Soil and Restoration of Land in Temporary Storage Sites (TSS) <Estimation>

By early 2020, max. 60% of the removed soil from approx. 1,300 TSS* 1 will be transported to the ISF, and up to 40% of land restoration will be completed, according to estimation based on prospect* of the transportation to the ISF and continuously aim to proceed transportation and land restoration at an early stage

*FY2018: Approx. 1.8 mil. ㎥
FY2019: Approx. 4 mil. ㎥ are planned

Image of transportation and land restoration

Transportation to the ISF / Land restoration

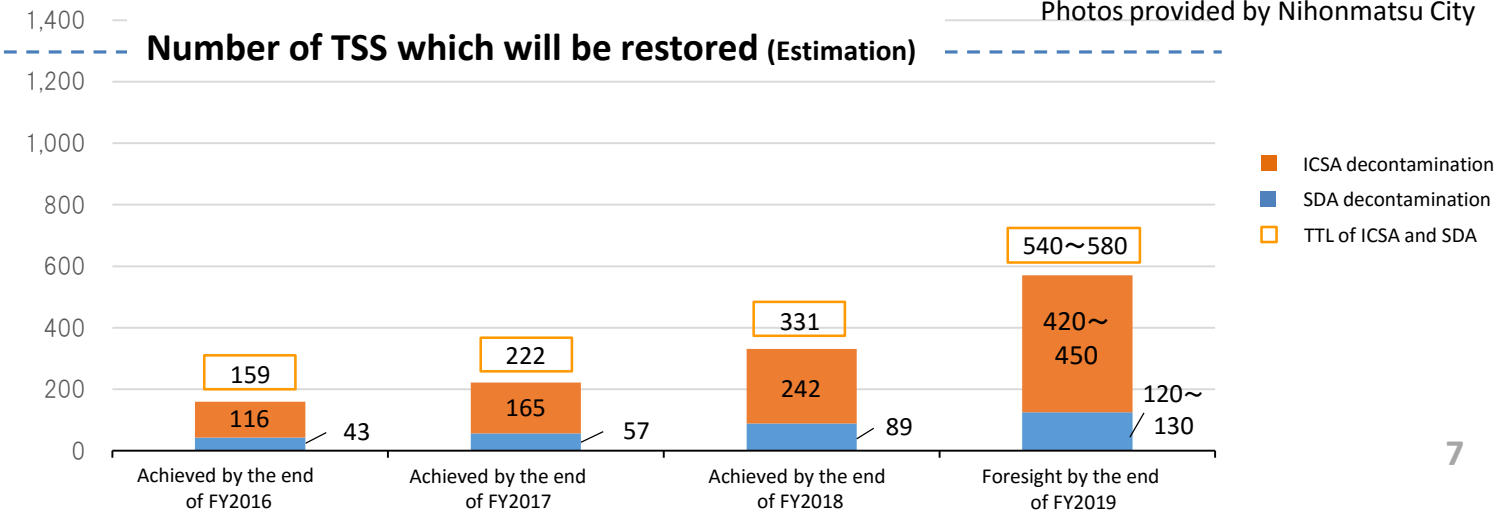
Storage situation

After land restoration

Restart farming by the land owner

Photos provided by Nihonmatsu City

Number of TSS 1,328



Progress in Specified Reconstruction and Revitalization Base (SRRB)

- By the revision of “Act on Special Measures for the Reconstruction and Revitalization of Fukushima” in 2017, 6 municipalities could make plans to construct “Special Reconstruction and Revitalization Base (SRRB)”, aiming at lifting evacuation orders and enabling the residents to return homes.
- The dismantling and decontamination works started in 6 municipalities.

Examples

	Before decontamination		Decontamination work		After decontamination
Tomioka					
Okuma					
Futaba					

	Before dismantling		Dismantling work		After dismantling

Result and Effect of the Whole Area Decontamination

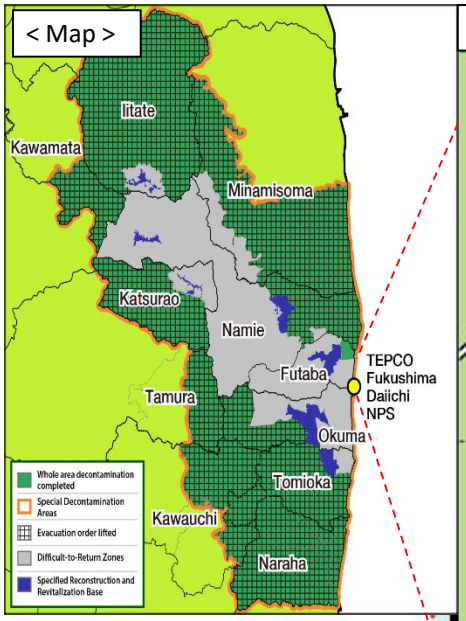
Interim Storage Facility

Disposal of the Specified Waste

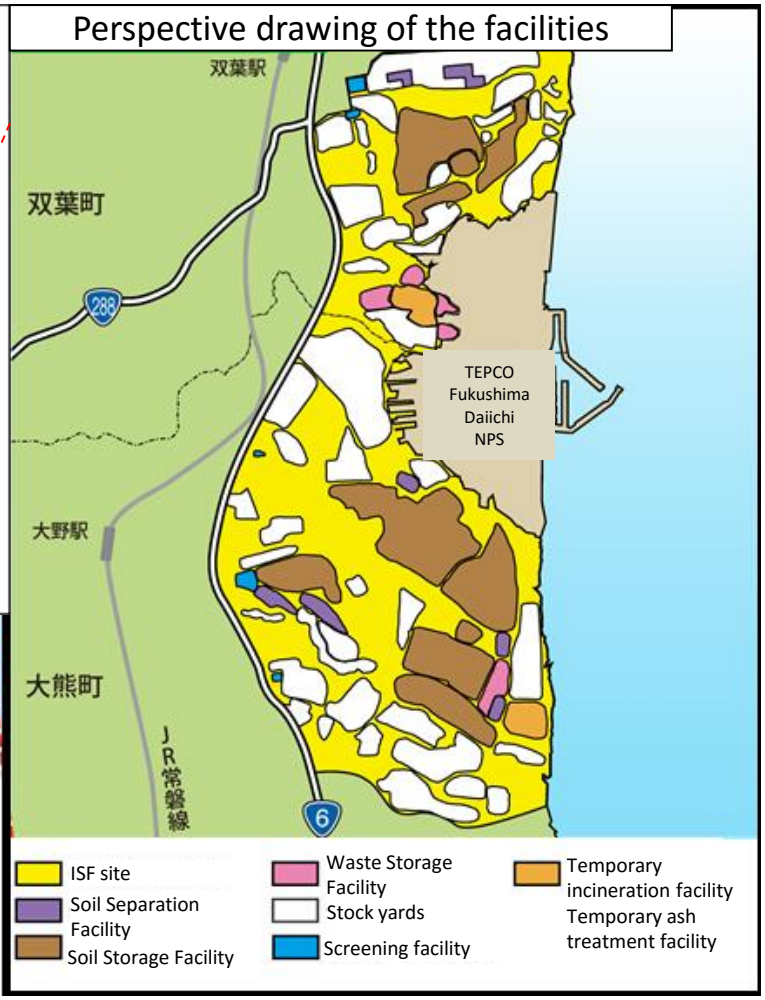
Communication to the Public and International Societies

Interim Storage Facility (ISF)

- In Fukushima Prefecture, large quantities of removed soil and waste have been generated from decontamination works.
- The Interim Storage Facility is necessary to safely and intensively manage and store the soil and waste until the final disposal.
- Removed soil and waste derived of decontamination works, and specified wastes (> 100,000 Bq/kg) are stored.
- The total volume is currently estimated at around 14 mil. ㎥, with the further review reflecting the actual circumstances.



※ This drawing is as of December 2018 and might be modified according to land acquisition and facility construction status.



【Process of the ISF Project】

Land acquisition

Construction of facilities
For soil separation and soil storage facility

Transportation of soil and waste from TSS to ISF

Processing and storage of soil and waste

Current Status of Interim Storage Facility

Photo of the ISF taken by drone

Source : http://www.jesconet.co.jp/interim_infocenter/index.html

Progress of Land Acquisition of the ISF

As of the end of November 2019

Whole Area Ca. 1,600ha	Item		Ratio to the whole area		Ratio and the number of people registered to whole registration record (2,360 pers.※1)
	Landowners with contact information		Ca. 1,560ha ※1 97.5%		Ca. 1,960 pers. ※1 83.1%
Private land Ca. 1,270ha (Ca. 79%)	Contracted	Private land out of contracted land Ca. 1,086ha	Ca. 1,126ha (70.4%)	<Reference> Ca. 1,416ha (88.5%)	1,727 pers. ※2 73.2% (The ratio to 1,960 pers. landowners with contact information: 87.7%)
National/ Municipality land Ca. 330ha (Ca. 21%)		Public land out of contracted land Ca. 40ha			
	Other public land		Ca. 290ha (18.1%)		

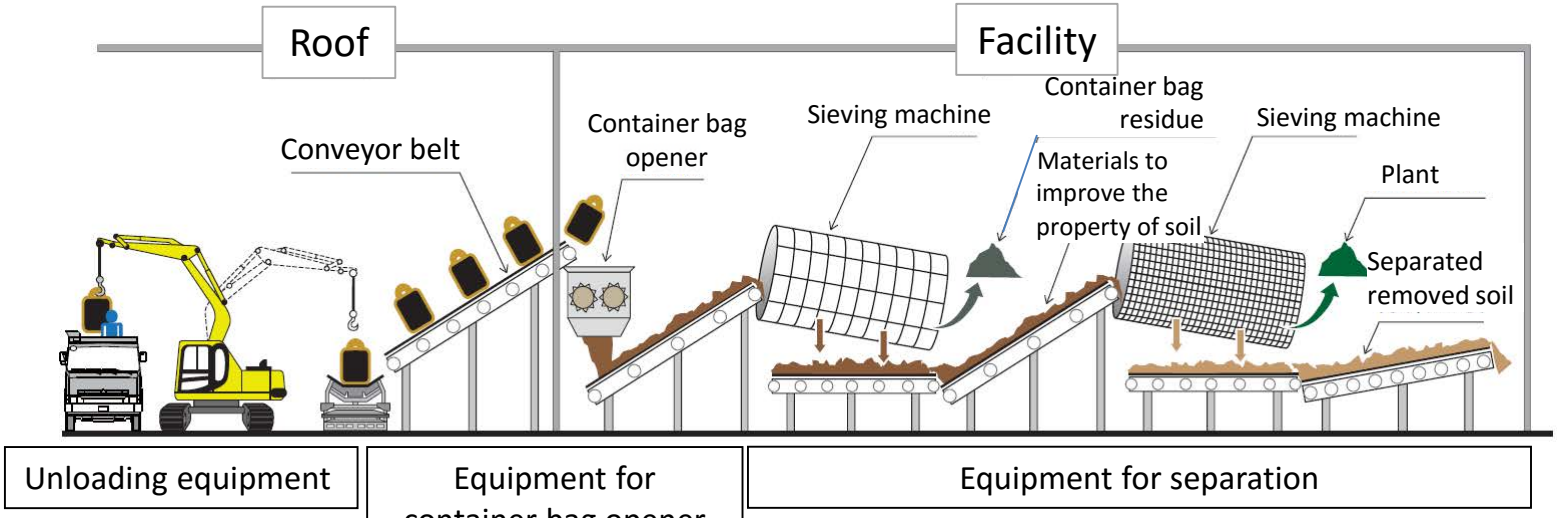
※1 Including National/Municipality institutions

※2 Private landowner: 1,717 pers.
Public land: 2pers.

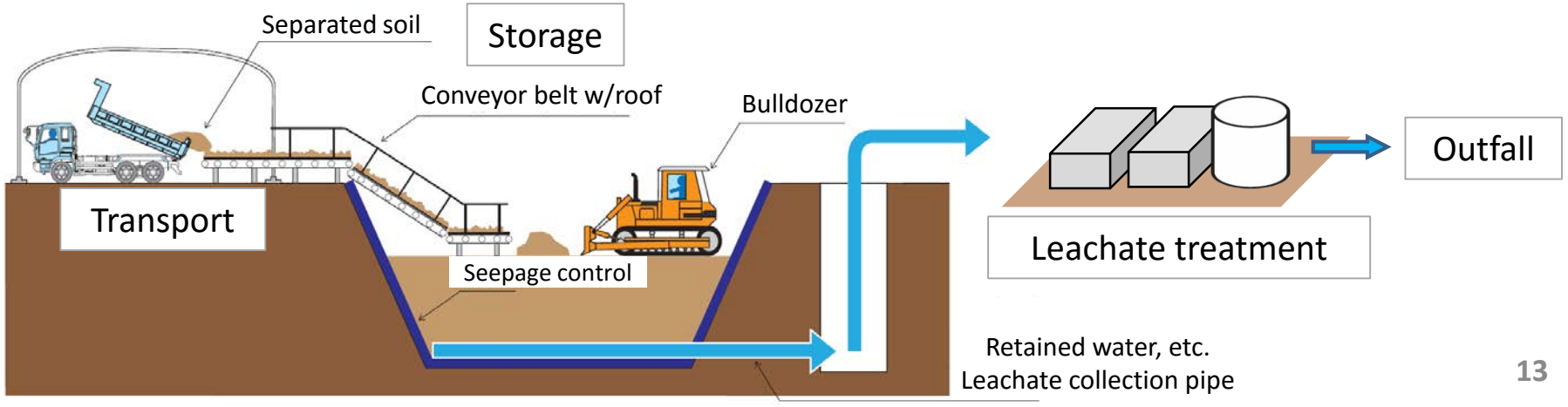
Soil Separation / Storage Facility

◆ Soil Storage Facility started the operation in October 2017 in Okuma and in December 2017 in Futaba

Soil Separation Facility



Soil Storage Facility



Operational Status of the ISF

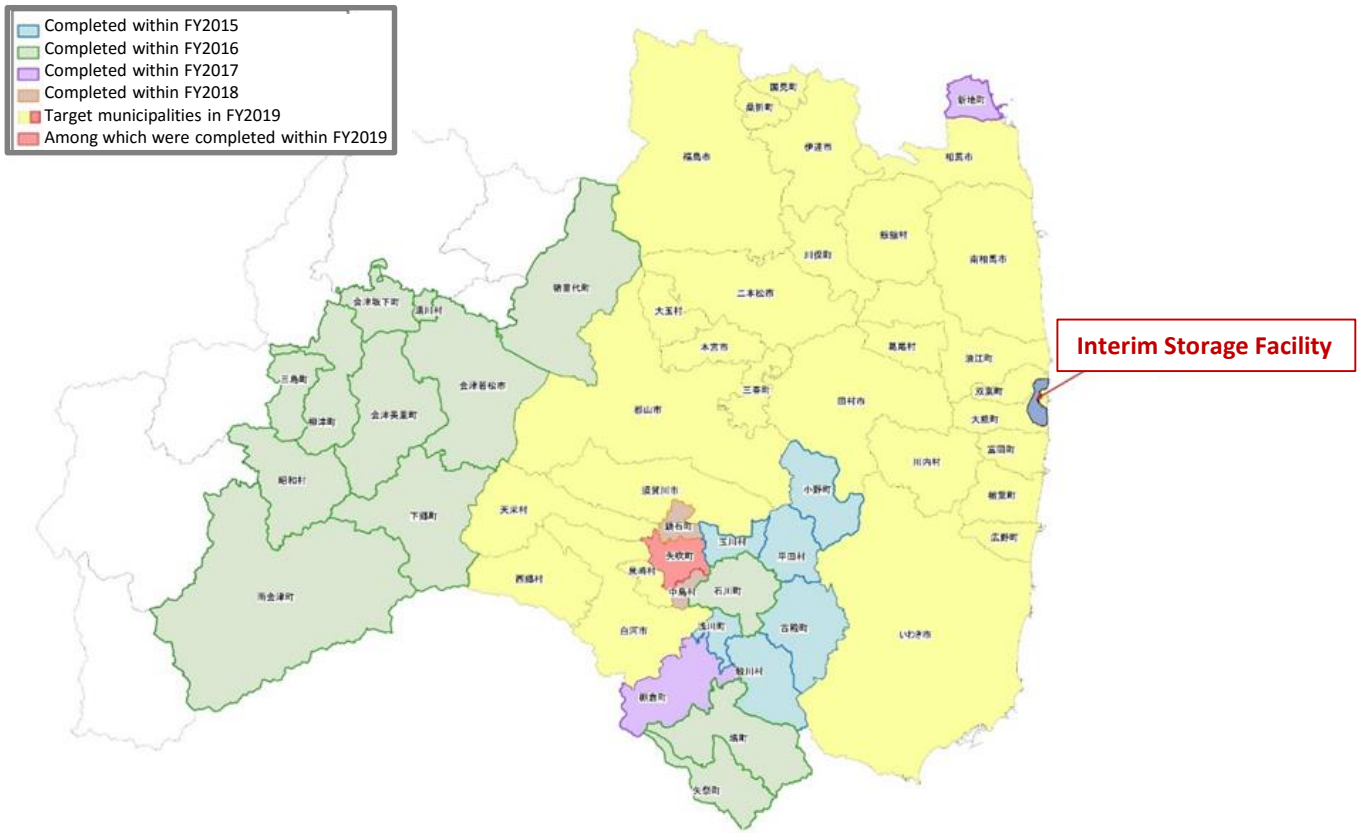
- Construction of the facility started in November 2016
- The operation of Soil Separation Facilities started in June 2017 in Futaba, and in August 2017 in Okuma
- The storage of the removed soil started in October 2017 in Okuma and in December 2017 in Futaba after the completion of the Soil Storage Facilities

Soil Separation Facility (in Futaba)

Soil Storage Facility (in Okuma)

Transportation to the ISF

- Transportation of the removed soil from TSS to the ISF has been implemented mostly using 10-ton dump trucks.
- Cumulative total of approx. 5.2mil. ㎥ has been transported so far, which makes 37.2% of the whole transport target object (14mil. ㎥ as of the end of October 2019), was delivered to the ISF (as of December 12, 2019) .
- Safe and secure transportation has been sequentially conducted.



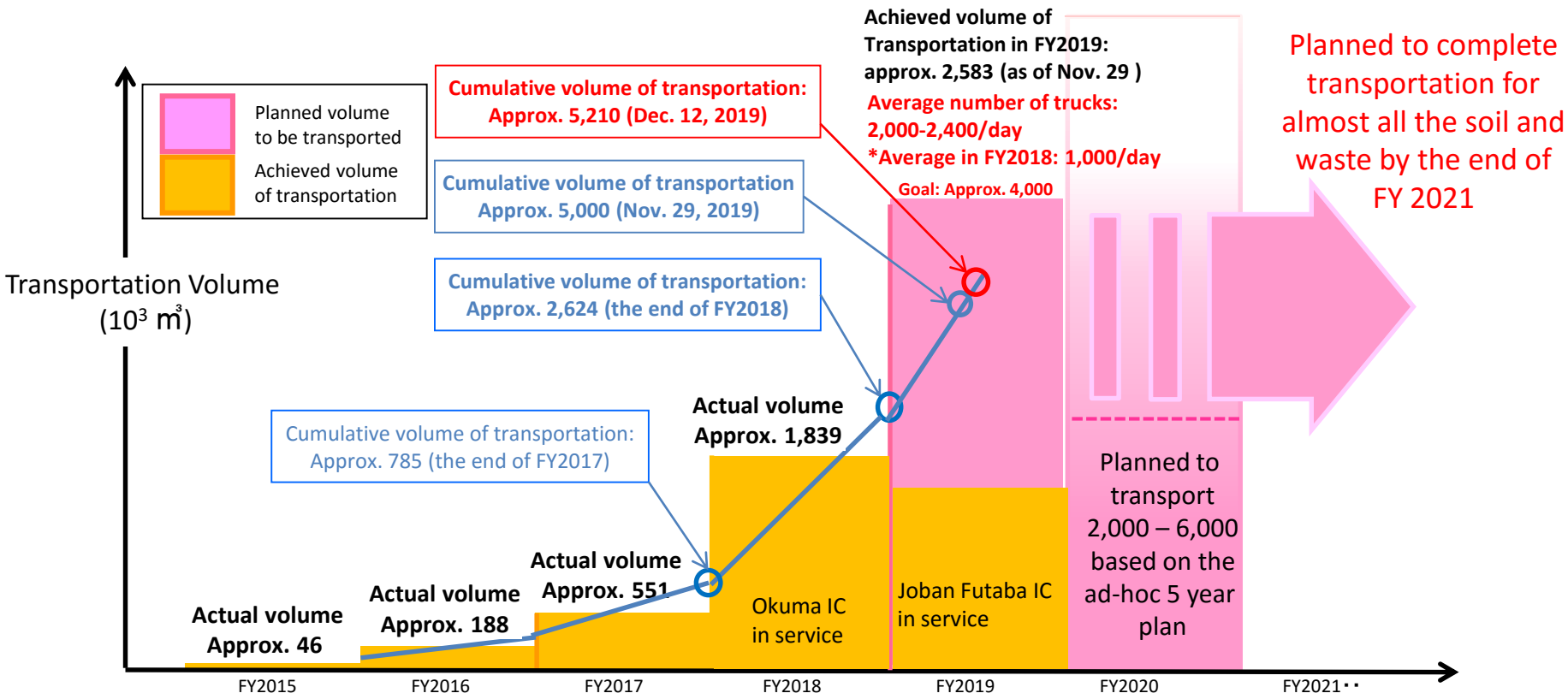
A truck transporting removed soil

A truck leaving from the ISF gate

Ad-hoc Policy on Transportation to the Interim Storage Facility

◆ Towards the transportation of all the targeted objects (14 mil. ㎥ *) to the ISF, the transportation volume will be sequentially increasing in the light of land acquisition and facility construction. *As of October 2019

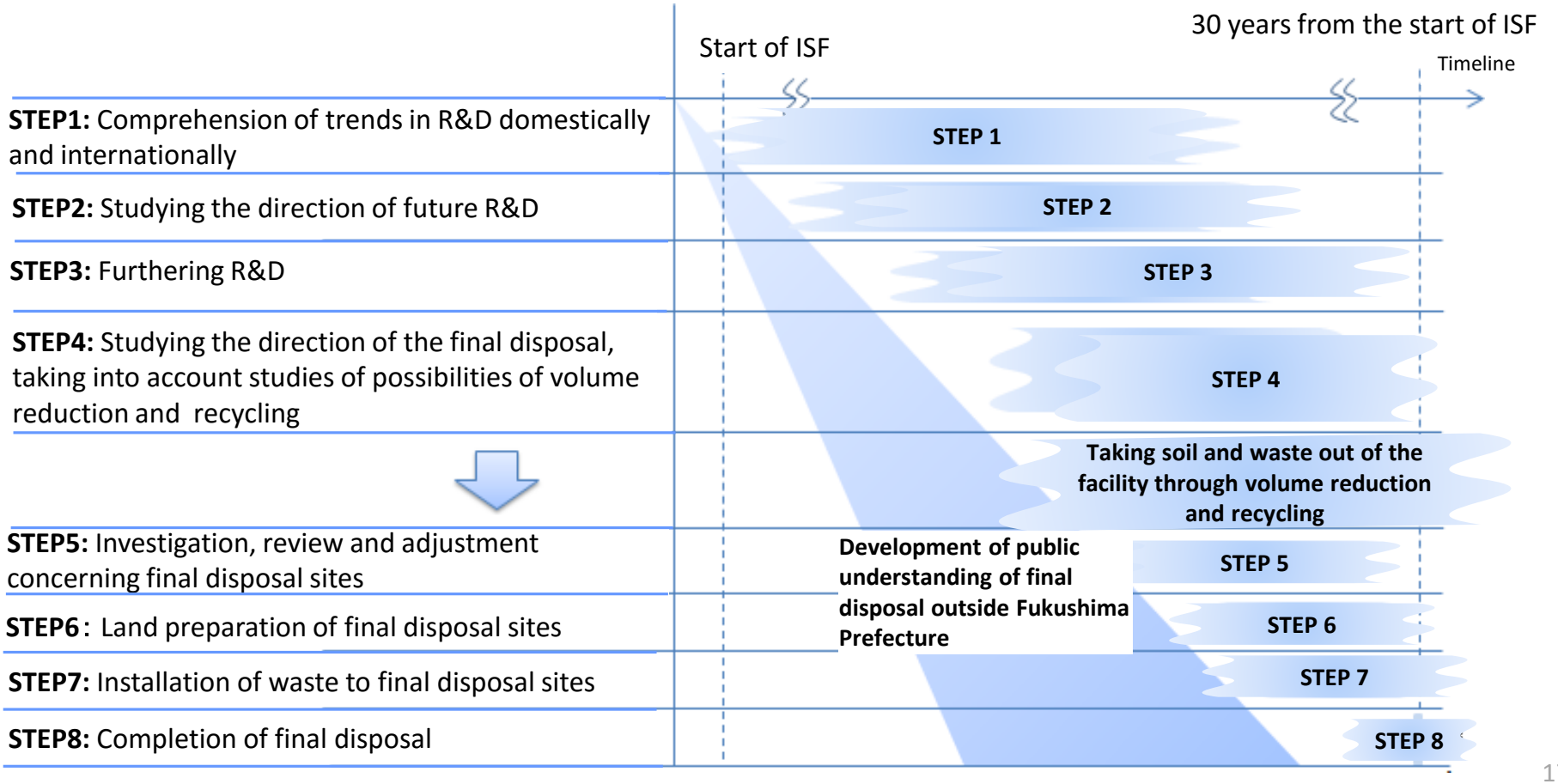
- In FY 2019, approx. 4 mil. ㎥ will be transported. MOE will aim to reduce a number of TSS close to the residential areas within early 2020.
- By the end of FY 2021, MOE aims to complete the transportation of most of the removed soil and waste (except in DRZ) which are temporarily stored in Fukushima Prefecture.



◆Okuma IC has been used for the transportation in the wake of its opening on March 31, 2019 (700/day)

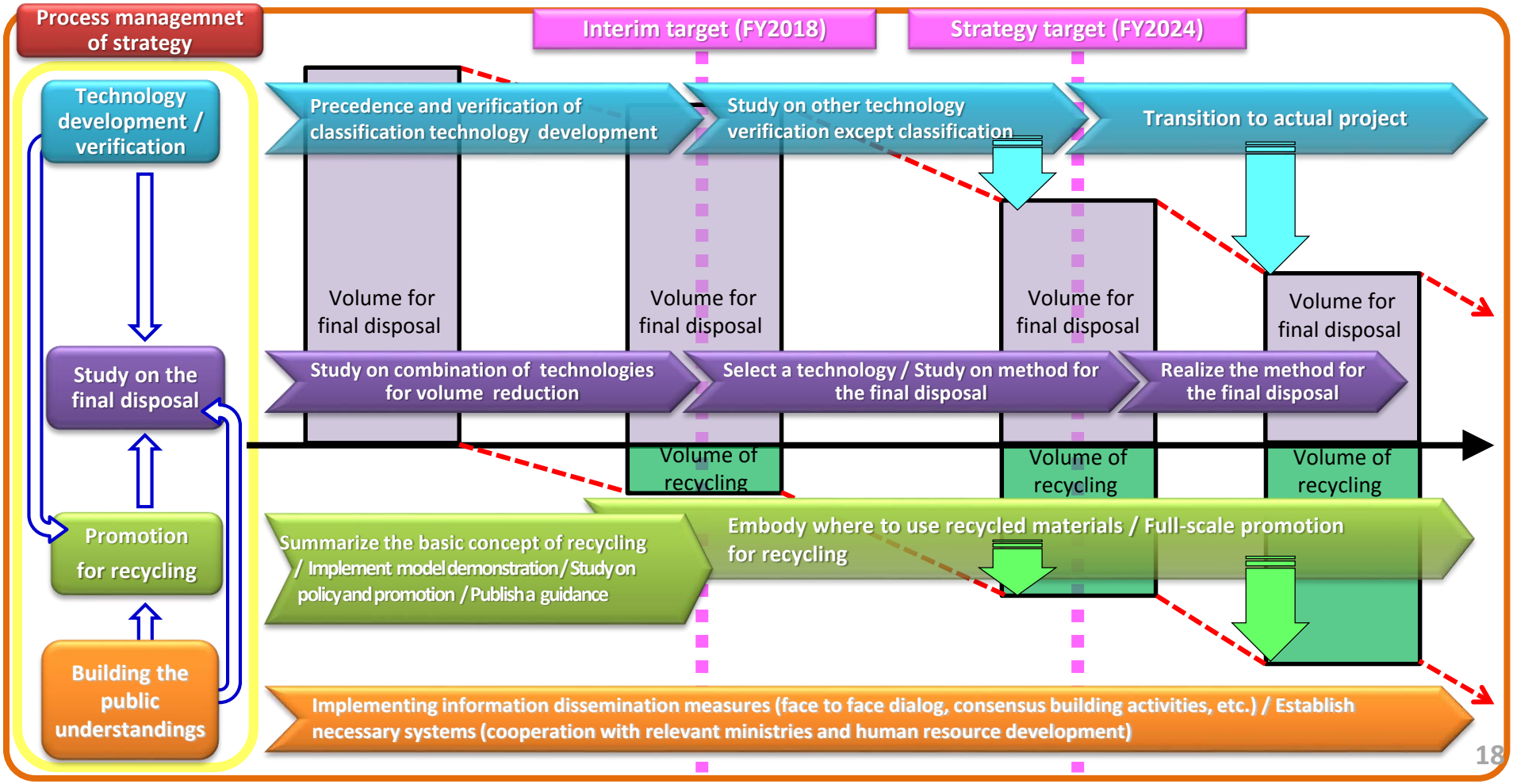
8 Steps towards the Final Disposal outside Fukushima Prefecture within 30 years from the Start of the ISF

- MOE conducts R&D to examine how the final disposal to be implemented taking into account the effect of radioactive decay and the potential of volume reduction and recycling
- MOE shares the information with the public to build the consensus for recycling of lower contaminated soil and the final disposal outside Fukushima Prefecture



Technology Development Strategy for Volume Reduction & Recycling of the Removed Soil

- Towards the final disposal of the removed soil outside Fukushima Pref., MOE will promote recycling of the soil after volume reduction technology as much as possible, which consequently would lead to reduce the volume of soil for the final disposal
- After clarifying the objectives and priority of technology development and volume reduction & recycling, basic technology development is planned to be completed within 10 years, then move onto a phase of treatment
- On the premise of securing safety, MOE will try to realize the recycling in the possible field, building public understandings for the safety
- Based on technology development and prospect of recycling in the future, MOE would propose some options for structure and necessary dimension of the final disposal

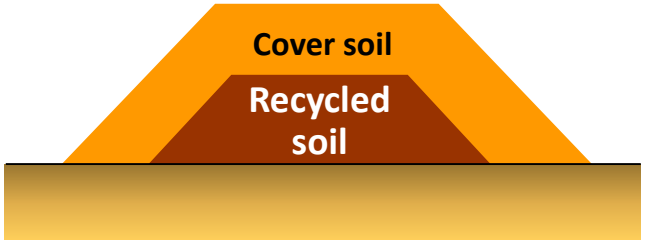


Concepts on Safe Use of the Removed Soil after Recycling (June 2016)

【Basic Concept】
The removed soil should be used mainly for public projects with a responsible management system for the controlled materials (with a radioactivity level below 8,000Bq/kg in principle and set according to purpose) after necessary treatment, e.g. removal of debris, classification treatment. The use will be limited, such as the basic structure material of an embankment which is not assumed to change shape artificially, and be managed appropriately.

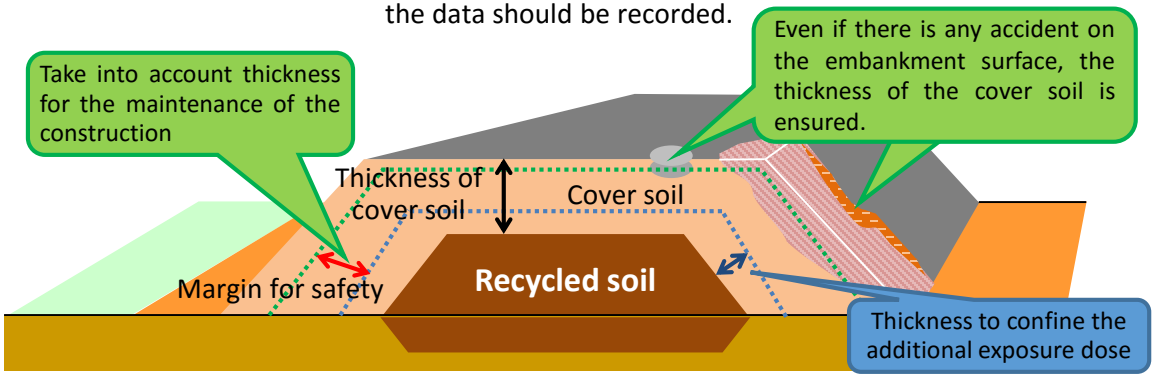
Limited use

- The use will be limited to the material which is not assumed to change shape artificially for a long time period, e.g. basic structure material of banking for coastal levees or seaside protection forests, embankment materials for roads, cover soil for waste disposal sites, landfill materials and basic structure for farms of flowers and energy crops.



Appropriate management

- The projects will be mainly public projects with a responsible management system.
- The radioactive cesium concentration in the removed soil should be limited in order to confine the additional exposure dose. The additional exposure dose should be below 1mSv/y during the construction and below 0.01mSv/y at the time of service.
- Covering soil should be installed, scatter and leakage should be prevented, ground form change should be observed, and the data should be recorded.



The thickness of cover soil should be designed to ensure the necessary thickness to confine the additional exposure dose, even when the general maintenance for the construction is conducted.

How to proceed recycling

As the environmental improvement towards the practical recycling of the removed soil, demonstration projects and model projects based on the above concepts should be implemented keeping the safety against radiation, studying specific verification of the management method and building stakeholders' and public understanding.

Demonstration Project for Recycling in Minamisoma City

Demonstration project is currently being implemented in Minamisoma City, studying specifically on handling radiation during the procedure of recycling and ensuring the quality of the recycled soil as construction material in order to promote safe recycling and reuse of the removed soil in a step by step manner.

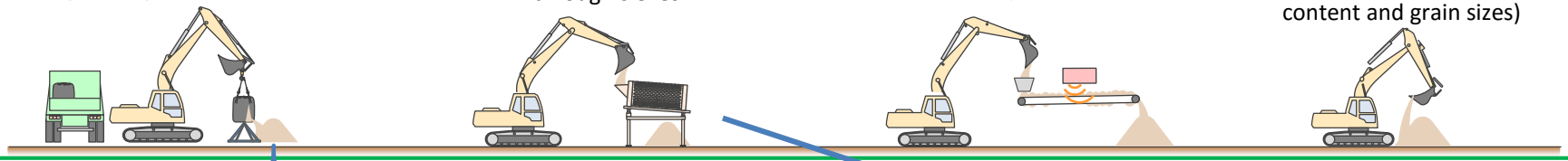
1. Preliminary treatment / quality control process (April 2017-)

1. Open sandbags and remove large stones and debris
   Open large sandbags and remove large foreign materials

2. Further eliminate smaller debris
   Eliminate small foreign materials through sieves

3. Classify soil by concentration
   Measure radiation and classify soil

4. Control quality
   Control quality of soil to be used for an embankment (such as water content and grain sizes)



vegetation

stones

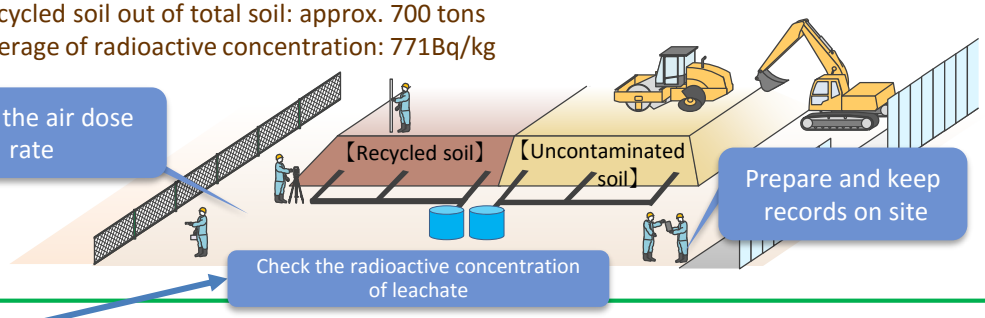
pebbles

2. Test embankment process (May 2017-)

5. Construct test embankment / Monitoring

- Construct a test embankment (covered with uncontaminated soil by 50cm)
- Continue to measure the air dose rate and other indicators

- Total amount of soil in embankment: approx. 4,000 tons
- Recycled soil out of total soil: approx. 700 tons
- Average of radioactive concentration: 771Bq/kg



Air dose rate was not much changed before and after opening of sandbags of the removed soil

Since the test embankment was constructed, radioactive materials have not been detected in the leachate

【Result of council of advisers】
◆ Confirmed safety in this method for recycling demonstration
◆ To accumulate data continuously conducting demonstration project

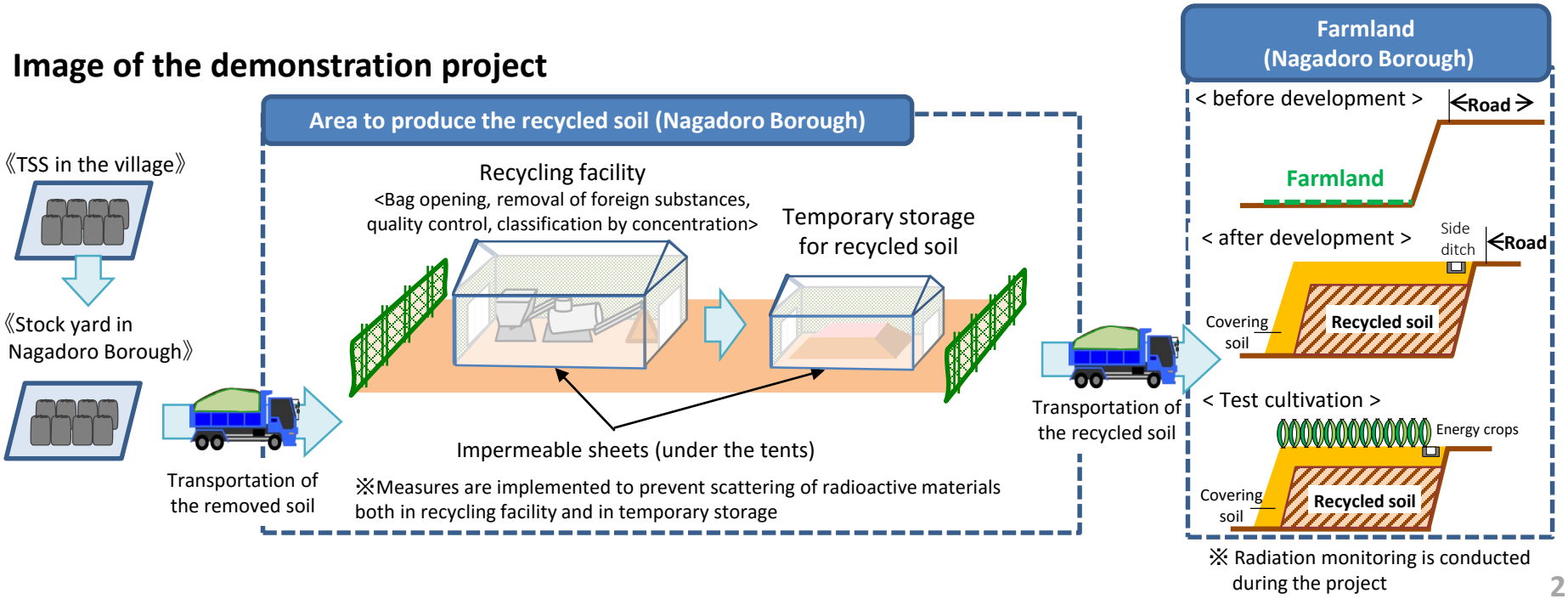
Demonstration Project for Recycling in Iitate Village

Another demonstration project is planned in Iitate Village. In response to the request from Iitate Village, the removed soil stored at TSS in Iitate Village will be recycled, and experimented in cultivation of flowers and energy crops in Nagadoro Borough of the village.

Contents of the demonstration project

1) Transport the removed soil from TSS in Iitate Village to the stock yard in Nagadoro Borough
2) Produce the recycled soil by separating foreign materials from the removed soil, classifying upon the radioactive concentration, and controlling the quality after construction of the recycling facility
3) At the demonstration project site, develop the basement of the farmland with the recycled soil covering the surface with uncontaminated soil
4) Conduct test cultivation at the farmland in the demonstration project site

Image of the demonstration project



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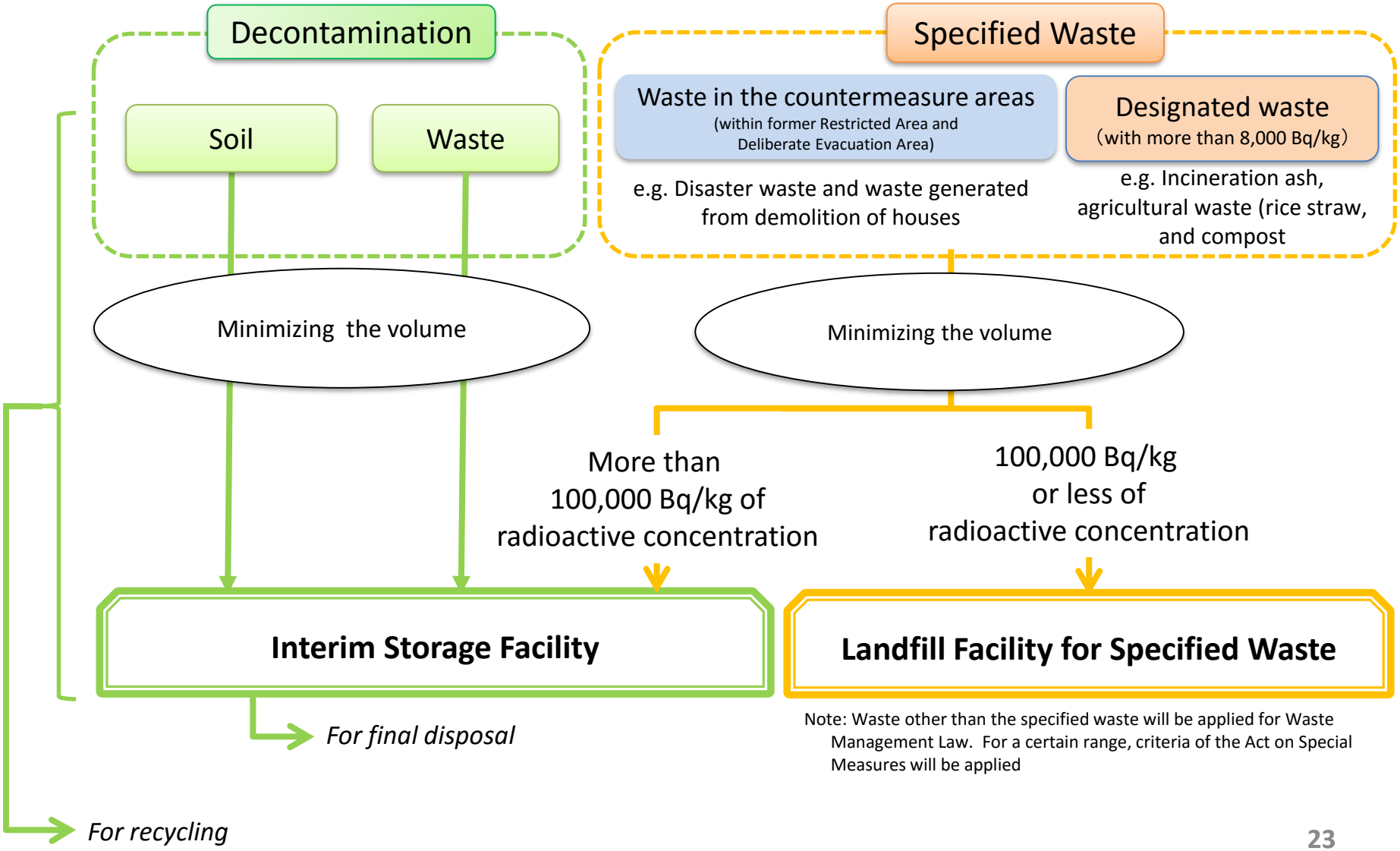
Flowchart of the Specified Waste and Removed Soil Treatment Generated within Fukushima Prefecture

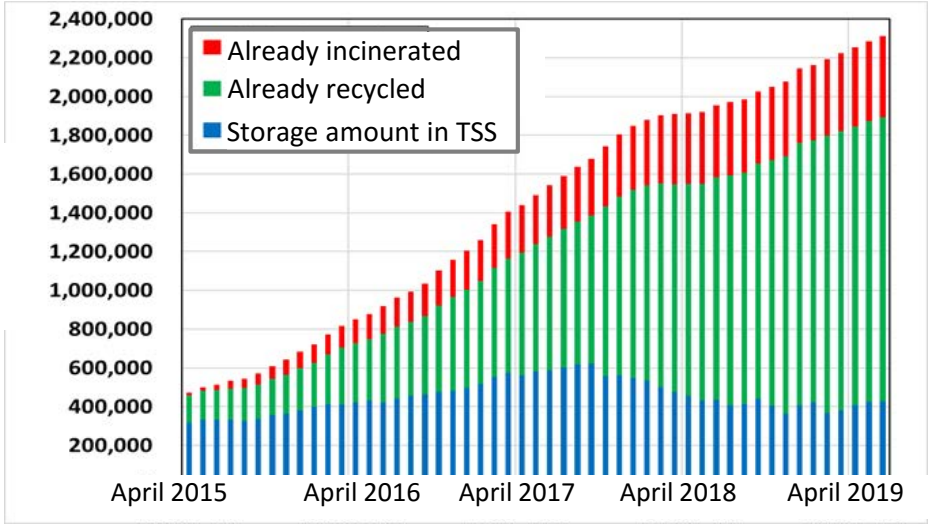


Note: Waste other than the specified waste will be applied for Waste Management Law. For a certain range, criteria of the Act on Special Measures will be applied

Progress on Waste Disposal in the Countermeasure Areas
(Fukushima Prefecture)

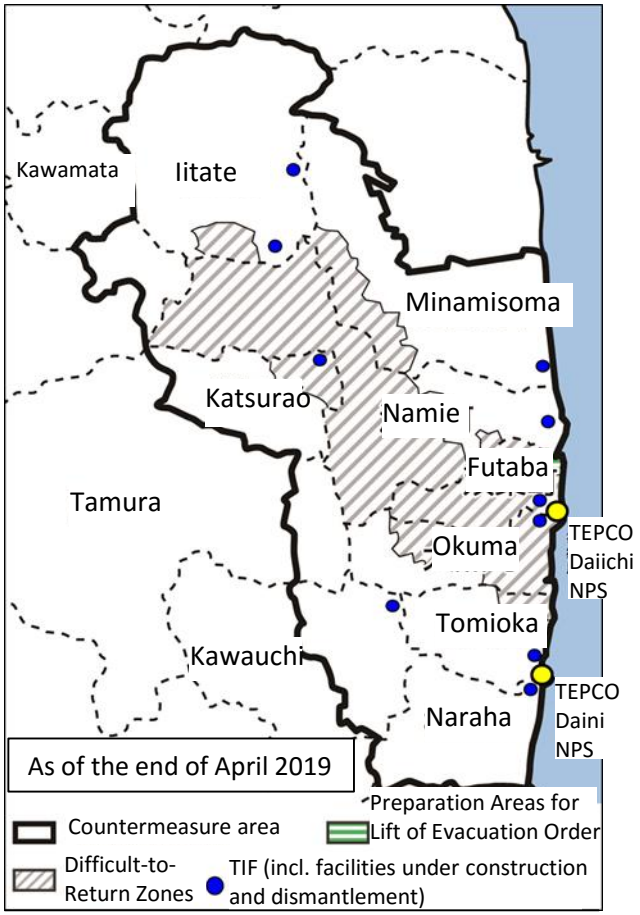
◆Approx. 2.45 mil. tons of disaster waste has completed the transportation to the TSS
*As of the end of October 2019
440,000 tons of them were incinerated, while 1.53mil. tons of them were recycled.
MOE has already landfilled 90,000 tons of the disaster wastes.
◆The transported disaster waste has been recycling as large as possible.

Amount of the disaster waste already transported to the TSS (t)



Dismantling of a damaged house


Temporary incineration facility at Okuma



Implementation Situation of Waste Disposal across Municipalities

➢ To promote waste disposal across municipalities: city/town/village hosting Temporary Incineration Facilities accept waste from other cities.

Date City (130t/day) <Completed>

- Waste generated by decontamination from Date area (Date City, Kunimi Town, Kori Town, Kawamata Town)

Nihonmatsu City (120t/day)

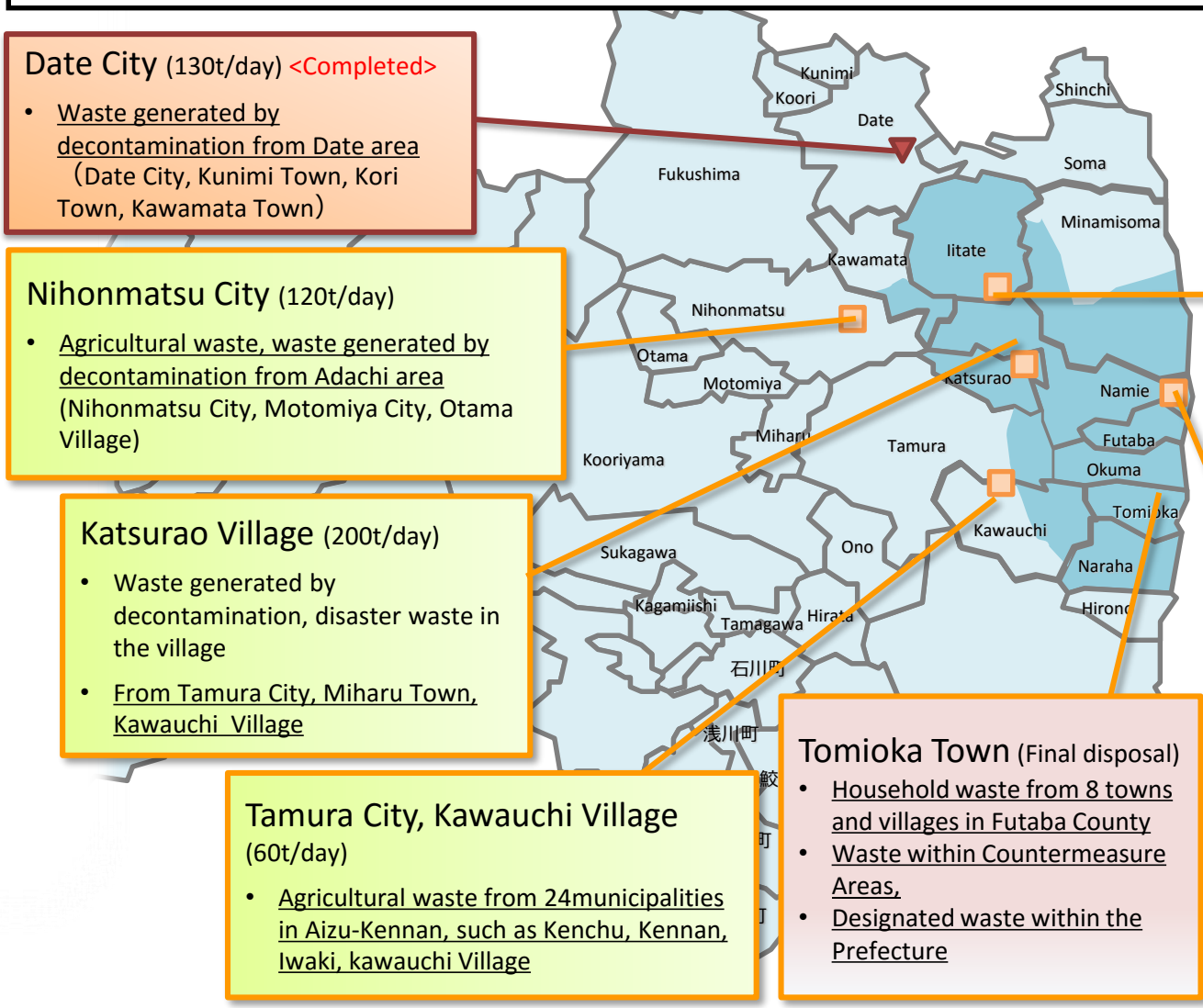
- Agricultural waste, waste generated by decontamination from Adachi area (Nihonmatsu City, Motomiya City, Otama Village)

Katsurao Village (200t/day)

- Waste generated by decontamination, disaster waste in the village
- From Tamura City, Miharu Town, Kawauchi Village

Tamura City, Kawauchi Village (60t/day)

- Agricultural waste from 24municipalities in Aizu-Kennan, such as Kenchu, Kennan, Iwaki, kawauchi Village



Iitate Village (240t/day) <Completed>

- Waste generated by decontamination, disaster waste in the Village
- Sewage sludge, agricultural waste from outside the village (Fukushima City, Date City, Kunimi Town, Kawamata Town, Minamisoma City)

Namie Town (300t/day)

- Waste generated by decontamination, disaster waste in the Town
- Waste generated by decontamination, disaster waste in Tomioka Town
- Disaster waste from Futaba Town
- Buried livestock in Futaba Town, boars caught in the DRZ (July 2019-)

Tomioka Town (Final disposal)

- Household waste from 8 towns and villages in Futaba County
- Waste within Countermeasure Areas,
- Designated waste within the Prefecture

Countermeasure area

TIFs managed by the government

TIF managed by municipalities in Date district

Disposal Project utilizing Existing Controlled Landfill Site

◆ As for Landfill disposal project for specified waste, the transportation to the site started on Nov. 17, 2017
◆ 86,820 container bags of waste mostly from Tomioka and Naraha Towns were transported (as of the end of July 2019)
◆ Monitoring survey result before and after transportation shows no significant increase of air dose rate

※Specified waste: Waste within Countermeasure areas or designated waste

Outline of the facility

◆ To use existing controlled landfill site (formerly Fukushima Eco Tech Clean Center)
◆ To locate it in Tomioka (access from Naraha)
◆ The facility has been nationalized after local coordination
◆ Positioning as the final disposal site

Landfill object/Transport period

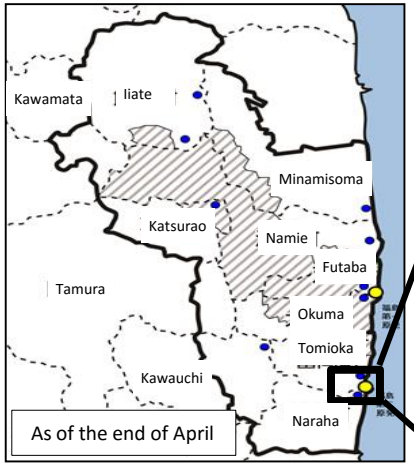
◆ Waste within the countermeasure areas (with radioactivity concentration of 100,000Bq/kg or less): 6years
◆ Designated waste within Fukushima Pref. (100,000Bq/kg or less) : 6years
◆General waste in 8municipalities in Futaba County: 10years
◆Waste with more than 100,000Bq/kg will be transported to the ISF

Outline of the history

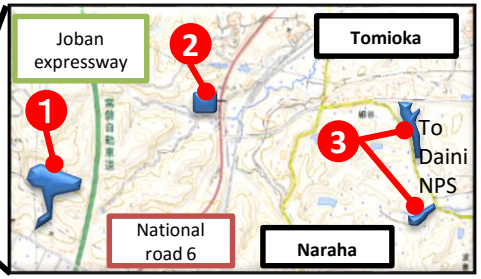
◆ 14.12.2013 The government requested Fukushima Pref, Tomioka and Naraha Towns to accept the project
◆ 04.12.2015 Fukushima Pref., Tomioka and Naraha conveyed the message to accept the project
◆ 18.04.2016 Nationalized the controlled landfill site
◆ 27.06.2016 Fukushima Pref. and both Towns sighed the safety agreement
◆ 13.11.2017 The government announced Fukushima Pref. and both Towns to start the transportation
◆ 17.11.2017 Started transportation
◆ 24.08.2018 Established Reprun Fukushima, the information center of the specified waste
◆ 20.03.2019 Solidification treatment facility for the specified waste has started operation

Related facilities

1. **Landfill facility for specified waste**
2. **Specified waste information facility, Reprun**
3. **Solidification treatment facility for specified waste**



TIFs (incl. those under construction and those removed)
Contaminated Waste within Countermeasure area
Preparation area for lift of evacuation order
Difficult-to-Return Zone



Result and Effect of the Whole Area Decontamination

Interim Storage Facility

Disposal of the Specified Waste

Communication to the Public and International Societies

Transmission of Information on Environmental Regeneration

- "Decontamination Information Plaza" ("Environmental Regeneration Plaza" at present) was established to provide information of decontamination projects, Interim Storage Facility and activities of environmental regeneration in January 2012.
- "Reprun Fukushima" started in August 2018 to introduce landfill disposal project of specified waste in Tomioka Town.
- ISF Information Center opened in January 2019 in Okuma Town to transmit progress of Interim Storage Facility and the safety efforts.

Environmental Regeneration Plaza

"Environmental Regeneration Plaza" is the base to transmit information of radiation, ISF, and environmental regeneration which provides seminars and dispatches experts to town meetings and schools with the cooperation of Fukushima Prefecture

"Reprun Fukushima", information center for landfill disposal of specified waste

* Informs the progress of disposal and the updated information about monitoring results with the concept of 'moving, touching and playing'.

Exhibition room

ISF Information Center

* Informs the progress of Interim Storage Facility construction and the efforts of regeneration and reconstruction in Fukushima showing video picture taken by a drone.

Video picture of ISF

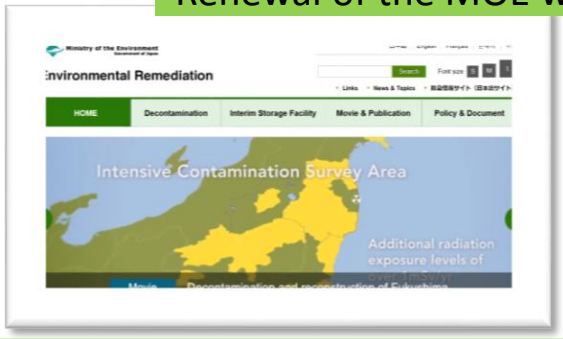
Current PR Activities by MOE

Ministry of the Environment (MOE) released an English booklet in August 2017. English web-site, "Environmental Remediation" was also renewed and two TV shows are available on MOE's web site.

English booklet

A comic style booklet, "Nasubi no Gimon", was released in August 2017, explaining radiation measures for food, etc.

Renewal of the MOE web-site



MOE renewed the web-site, adding more updated information http://josen.env.go.jp/en/

TV programs

"Fukushima Diaries" by Discovery Channel: In this 30-minitues show, three famous bloggers from overseas visited different destinations in Fukushima Prefecture with their own interests. They showed the viewers what is really going on in Fukushima http://josen.env.go.jp/en/movie_publication/cooperation_index.html

Channel Japan/CNBC ASIA: CNBC broadcasted 15-minitues program 4times in a row. Each program showed you the key persons in Fukushima how hard they work to fight against misconceptions and to revitalize Fukushima. Each content is as follows;

#1 The story of Mr. McMichael, who tries to help widely communicate correct information on Fukushima to international communities

#2 The story of two young people who are eager to revitalize their hometown, Fukushima

#3 The story of small factories that tackle on the development of robots for decommission.

#4 The story of Dr. Hayano, who teaches what is radiation from academic point of views.

Cooperation with International Societies

Oct. 26-27, 2017
The 6th Annual Japan-UK Nuclear Dialogue (@London)

Nov. 6-10, 2017
The 4th IAEA-MOE Experts Meeting on Environment Remediation of Off-Site areas after the Fukushima Dai-ichi Nuclear Power Station Accident (@Tokyo)

Nov. 21, 2017
The 7th Meeting of the Japan-France Nuclear Cooperation Committee (@Tokyo)

Nov. 27, 2017
The 5th Meeting of Japan-Ukraine Joint Committee for the cooperation to advance aftermath response to accidents at nuclear power stations (@Kiev)

Aug. 8, 2018
The 5th Meeting of US-Japan Bilateral Commission on Civil Nuclear Cooperation (@Tokyo)

Oct. 25, 2018
The 7th Annual Japan-UK Nuclear Dialogue (@Tokyo)

Nov. 21, 2018
The 8th Meeting of the Japan-France Nuclear Cooperation Committee (@Paris)

Oct. 2, 2019
The 9th Meeting of the Japan-France Nuclear Cooperation Committee (@Tokyo)

Nov. 27, 2019
The 8th Annual Japan-UK Nuclear Dialogue (@London)