



Cherry blossom in
Full bloom in Miharu,
Fukushima

Environmental Remediation in Affected Areas in Japan March, 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 Area (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 Area (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

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

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

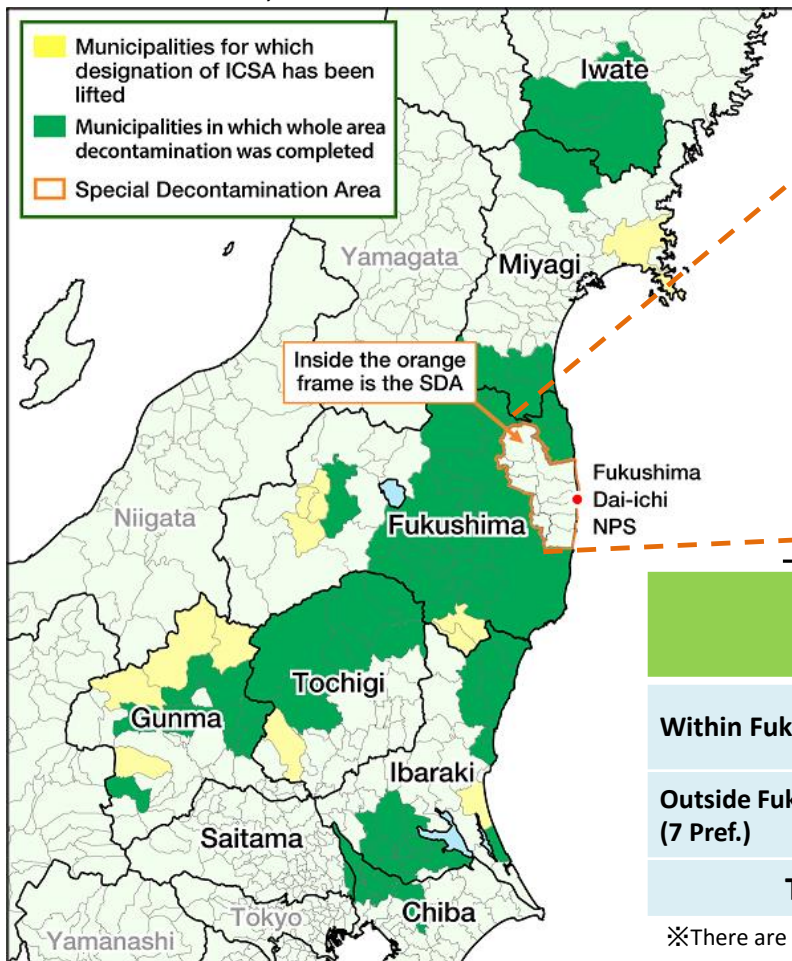
※ Designated as “designated waste” by the Minister of the Environment
※ Contaminated waste above certain level (8,000Bq/kg)

Implemented by the national government

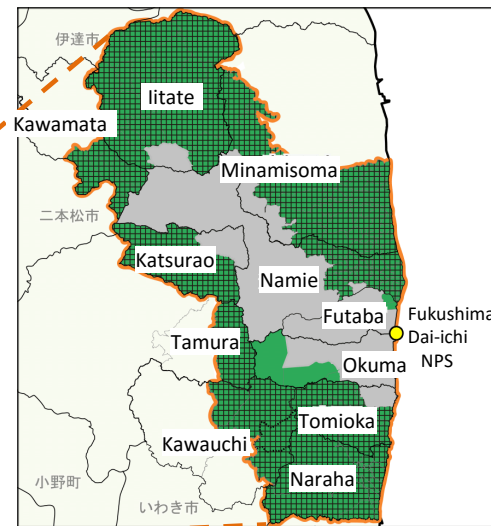
Result of Whole Area Decontamination

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

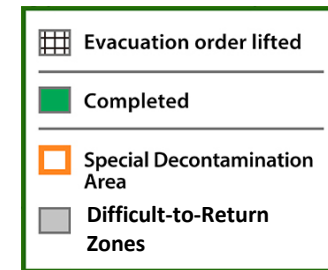
<Intensive Contamination Survey Areas (ICSA)
as of March 15, 2019>



<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

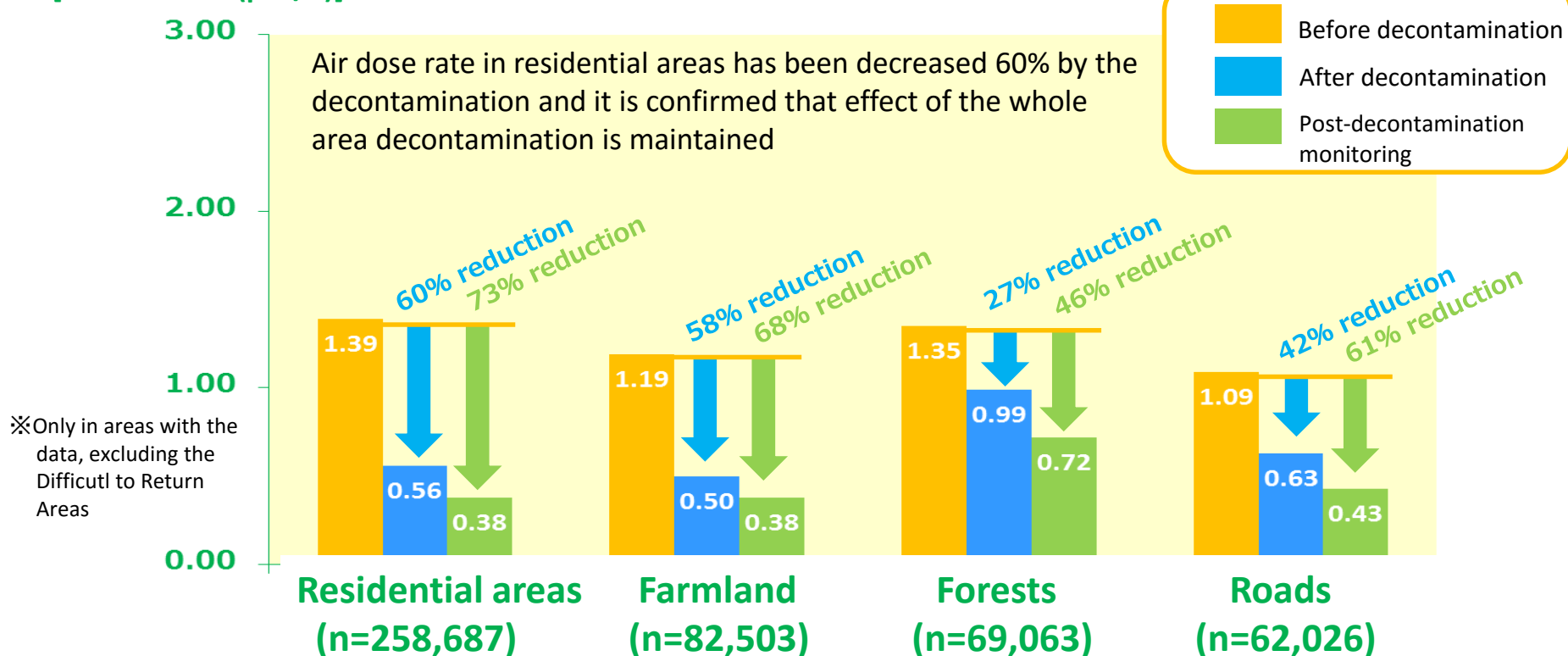
※There are both SDA and ICSA in Minamisoma, Tamura, Kawamata, and Kawauchi

Effects of Decontamination in SDA

【Air dose rate at the height of 1m from the ground / Transition according to land category】

(n=472,279)

[Air dose rate ($\mu\text{Sv/h}$)]



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 (the first or the second)

[Implementation period] • Monitoring before decontamination

Nov.2011 - Oct. 2016

• Monitoring after decontamination

Dec. 2011 - Dec. 2016

• Post decontamination monitoring

Oct. 2014 - Jun. 2017

Scale of Whole Area Decontamination Project

- ◆ The MOE has budgeted approx. JPY 2.9 trillion (= USD 27 billion) for decontamination until FY2018.
- ◆ 17mil. m³ (among which approx. 16.5mil. m³ 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 m³
※Estimation as of the end of March 2018
- Transported volume of soil from TSS*:
approx. 1,900,000 m³
(ISF: approx. 280,000 m³, Volume Reduction Facility: approx. 1,620,000 m³) ※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 m³ (estimation)
(within Fukushima Pref.: approx. 7,400,000m³, outside Fukushima Pref.:
approx. 500,000m³, both are estimation as of March 2018)
- Transported volume of soil from TSS:
approx. 1,700,000 m³
(ISF: approx.500,000 m³, Volume Reduction Facility:
approx. 1,200,000 m³) ※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*¹ of the transportation to the ISF and achievement in the land restoration*²

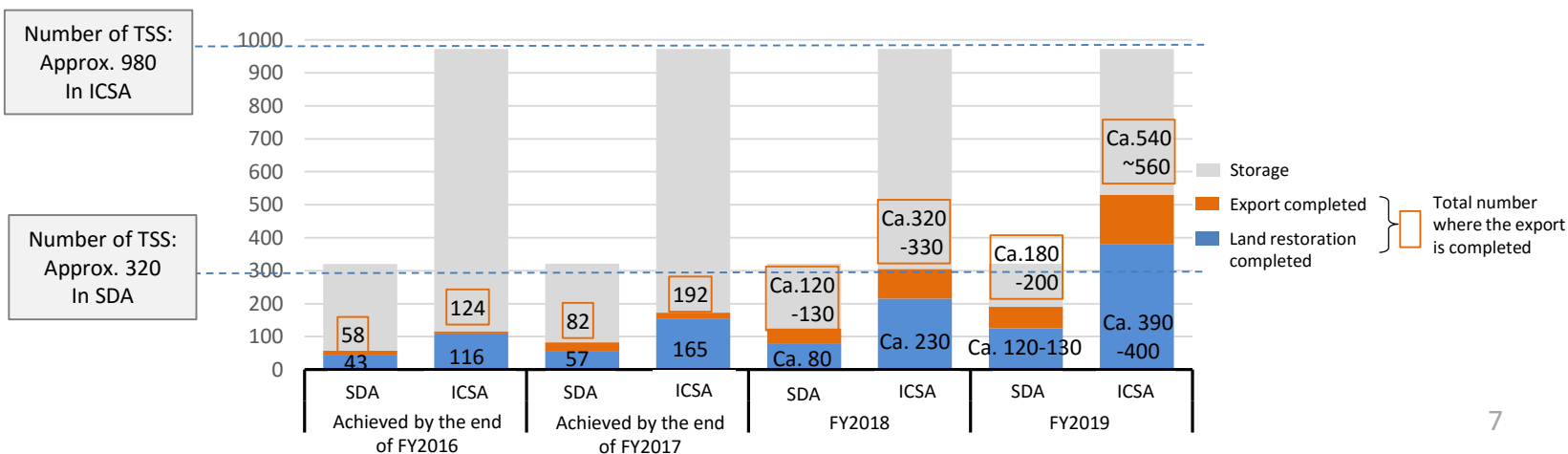
Image of export and land restoration



*1 The accumulative number of TSS as of the end of FY2016

*2 Aiming to transport 1.8 mil. m³ in FY2018, and 4mil. m³ in FY2019

Number of TSS where export and restoration will be completed (Estimation)



Progress in Specified Reconstruction and Revitalization Base (SRRB)

- ◆ By revised “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 allowing the residents to return homes.
- ◆ The dismantling and decontamination works started in 6 municipalities.

Examples

Before
decontamination

Decontamination work

After decontamination

Tomioka



Okuma



Before dismantling

Dismantling work

After dismantling

Futaba



Result and Effect of the Whole Area
Decontamination

Interim Storage Facility

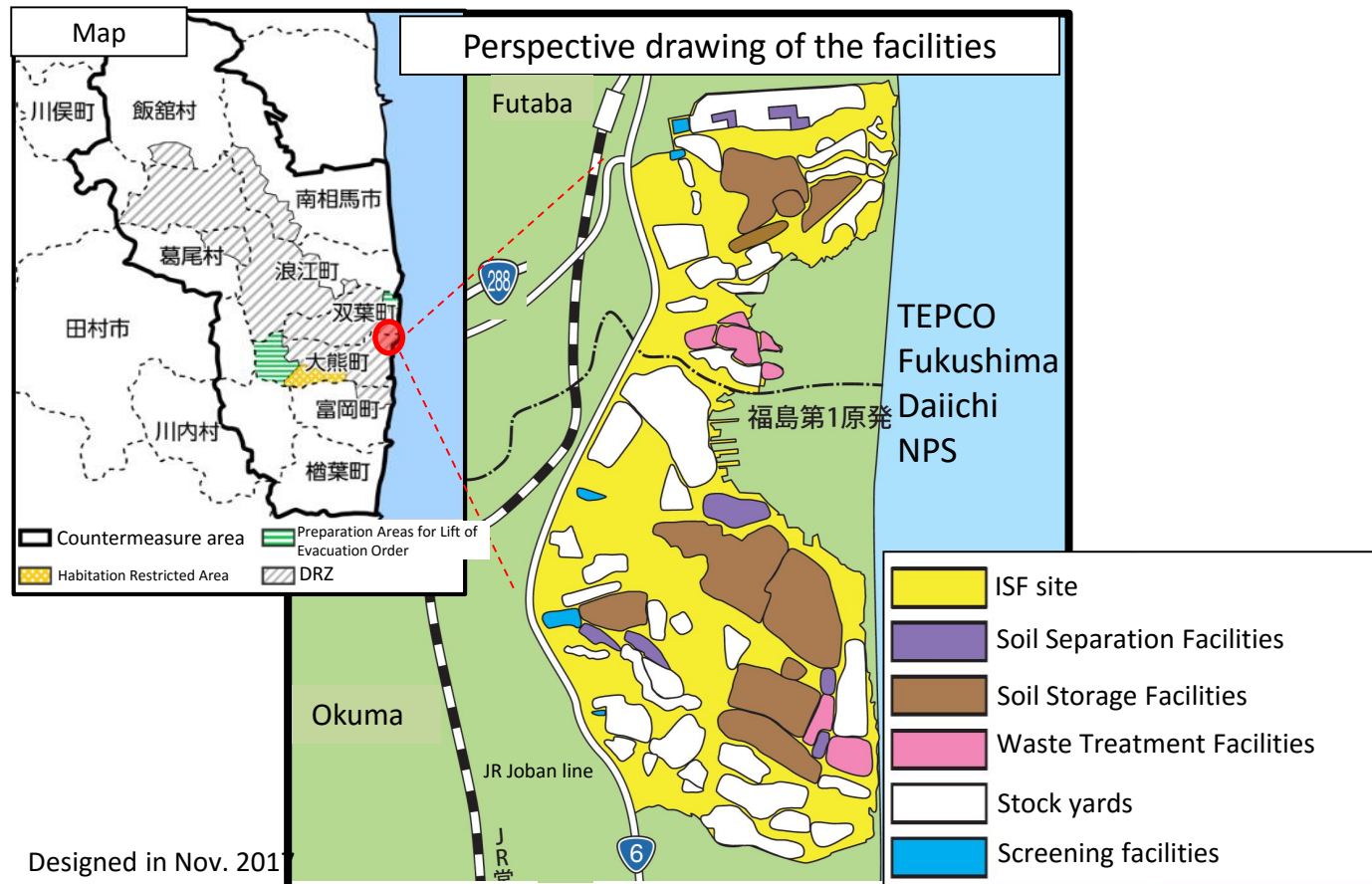
Disposal of the Specified Waste

Communication to the Public and
International Societies

Interim Storage Facility (ISF)

What is the Interim Storage Facility?

- 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 activities, and specified wastes ($> 100,000 \text{ Bq/kg}$) are stored.
- The total volume is currently estimated at around 14 mil. m^3 , with the further review reflecting the actual circumstances.



Process of the ISF Project

Land acquisition

Construction of facilities

Transportation of soil and waste

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

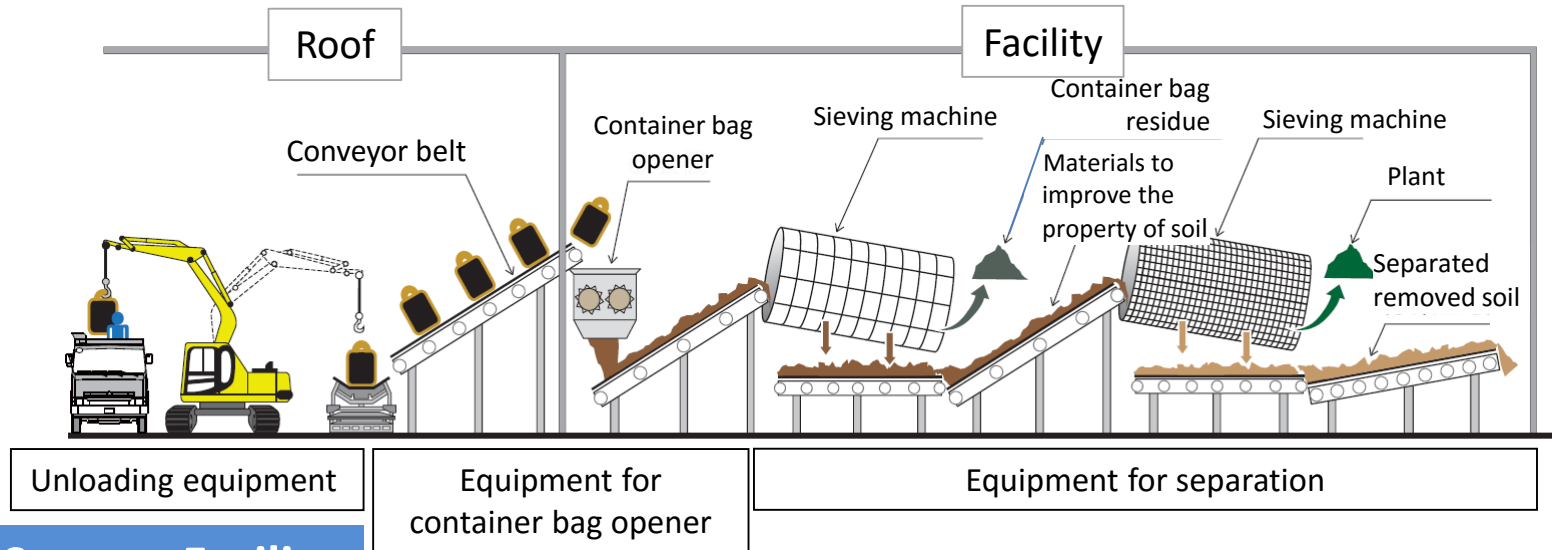
As of the end of
February 2019

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. 1,950 pers. ※1 82.6%
Private land Ca.1,270ha (Ca.79%)	<div><div>Contracted</div><div><div>Private land out of contracted land Ca. 1,067ha</div><div>Public land out of contracted land Ca. 39ha</div></div></div>	<div><div>Ca. 1,105ha (69.1%)</div><div><Reference> Ca. 1,396ha (87.3%)</div></div>	<div><div>1,683 pers. ※2 71.3%</div><div>The ratio to 1,950 pers. landowners with contact information: 86.3%</div></div>
National/ Municipality land Ca.330ha (Ca. 21%)	Other public land	Ca. 291ha (18.2%)	※1 Including National/Municipality institutions ※2 Private landowner: 1,662 pers. Public land: 2pers.

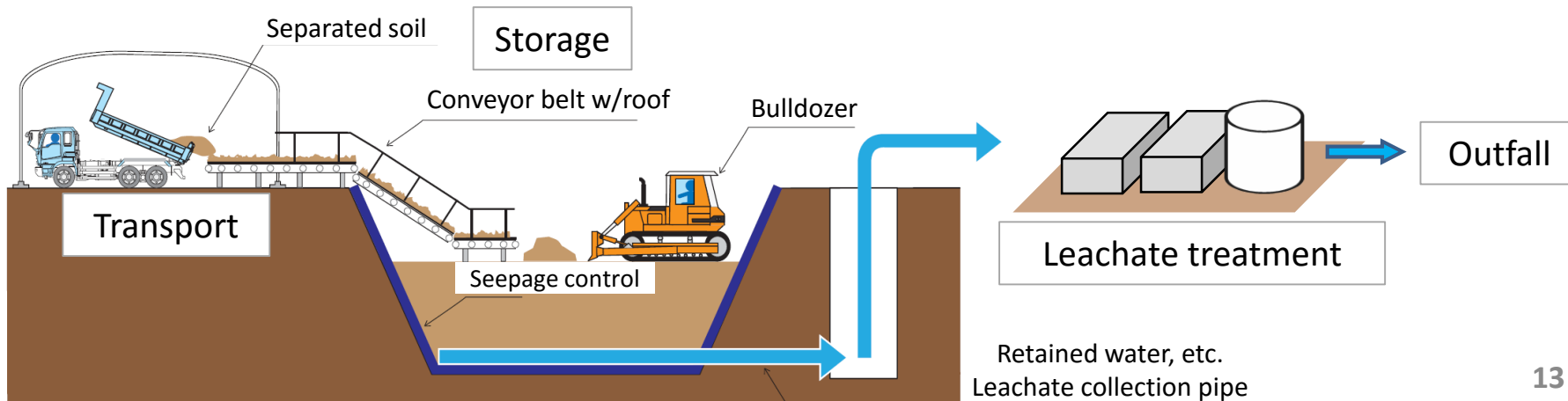
Soil Separation / Storage Facility

- ◆ Soil storage facility started the operation in October 2017 in Okuma and in December 2017 in Futaba

Soil Separation Facility



Soil Storage Facility

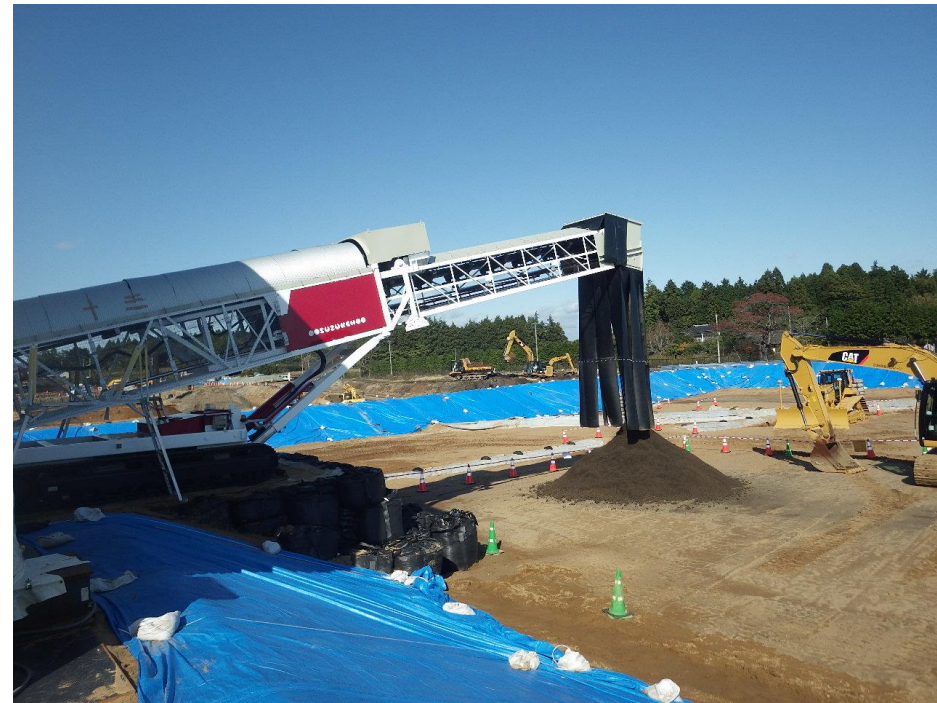


Operational Status of the ISF

- ◆ 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

- ◆ By December 27, 2018, accumulative total of 2,000,000m³ of removed soil was transported
- ◆ In FY2018, about 1,800,000m³ will be transported
- ◆ Safe and secure transportation will be sequentially conducted managing whole numbers of transport objects, managing traffic of trucks, and implementing environmental monitoring, and etc.

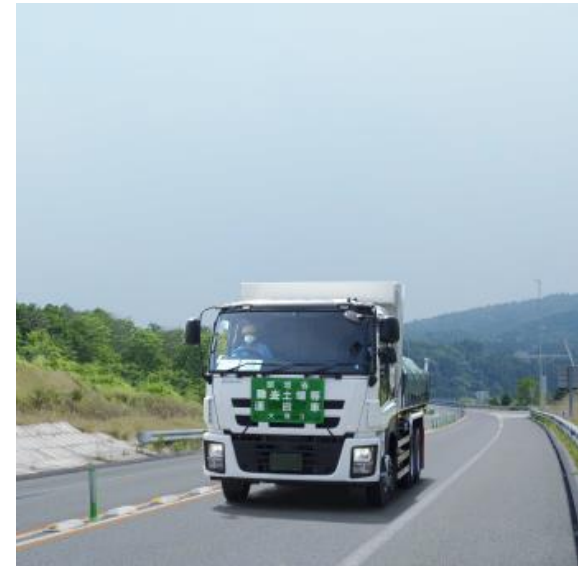
<Actual achievement> As of March 12, 2019

◆ Stored volume: 1,726,201 m³ in FY2018
(2,511,576 m³ in TTL)

* Calculated on the assumption that the volume of a large bag is 1 m³

◆ Total number of trucks used: 253,543 in FY2018
(379,219 in TTL)

* 6 m³ (6 bags) of removed soil is loaded on each truck

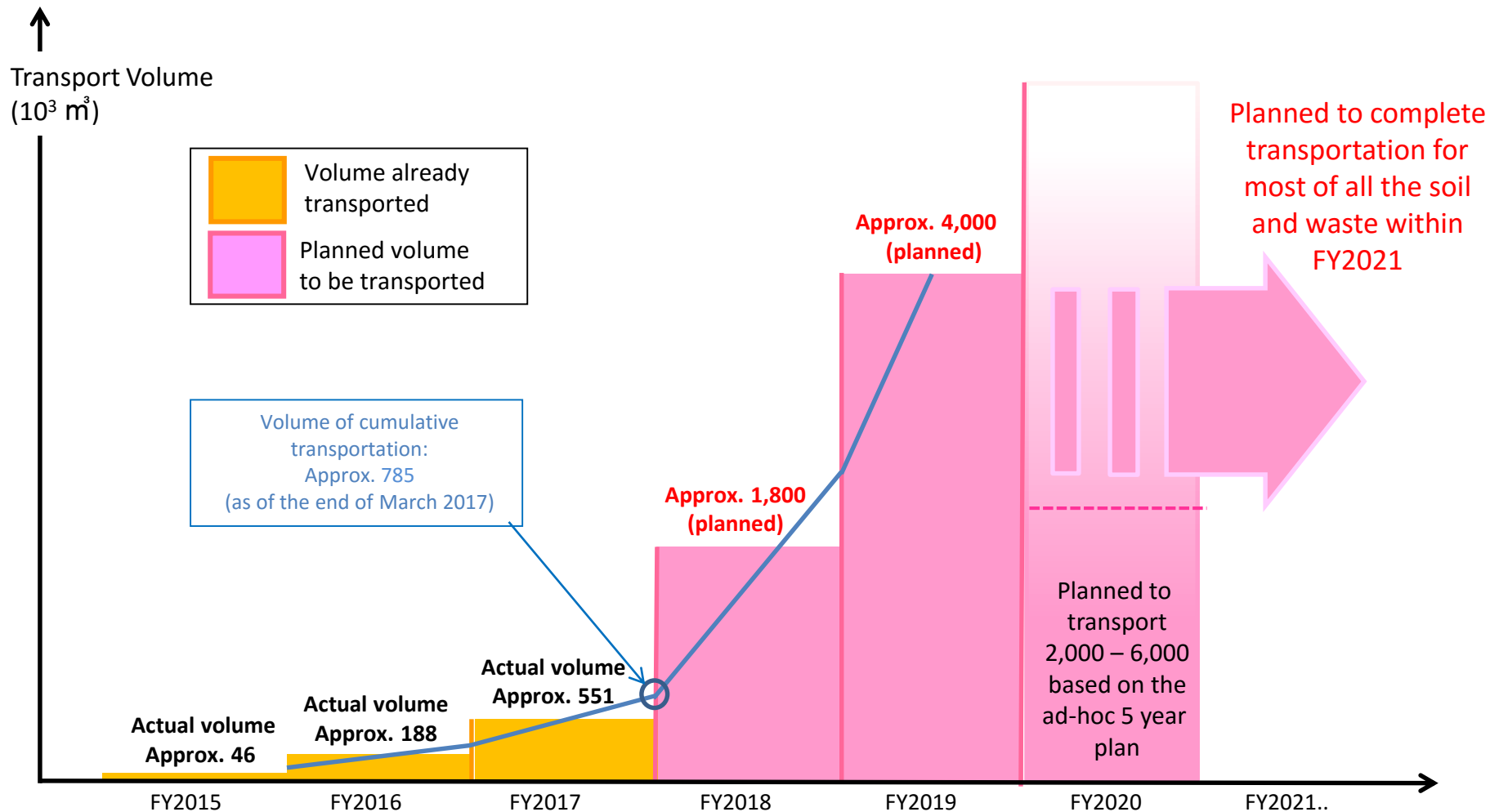


A truck transporting removed soil

Prospect for Ad-hoc Policy on Interim Storage Facility

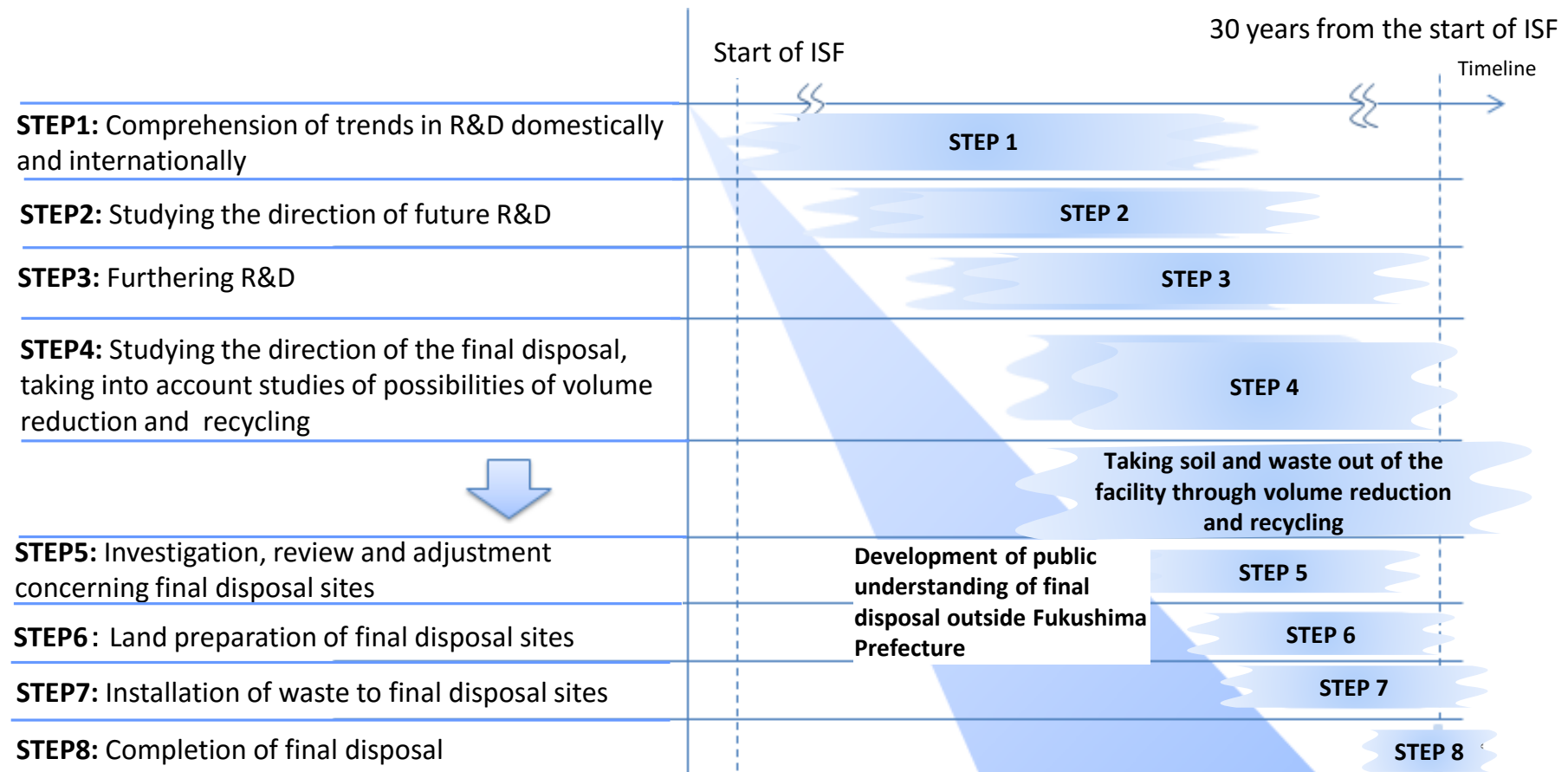
<Including achievement>

- ◆ Transport volume is expected to be largely increased in future and traffic measures are conducting accordingly
- ◆ Proceed the transportation of the removed soil from TSS and aim to reduce a number of TSS close to the residential areas by the year 2020



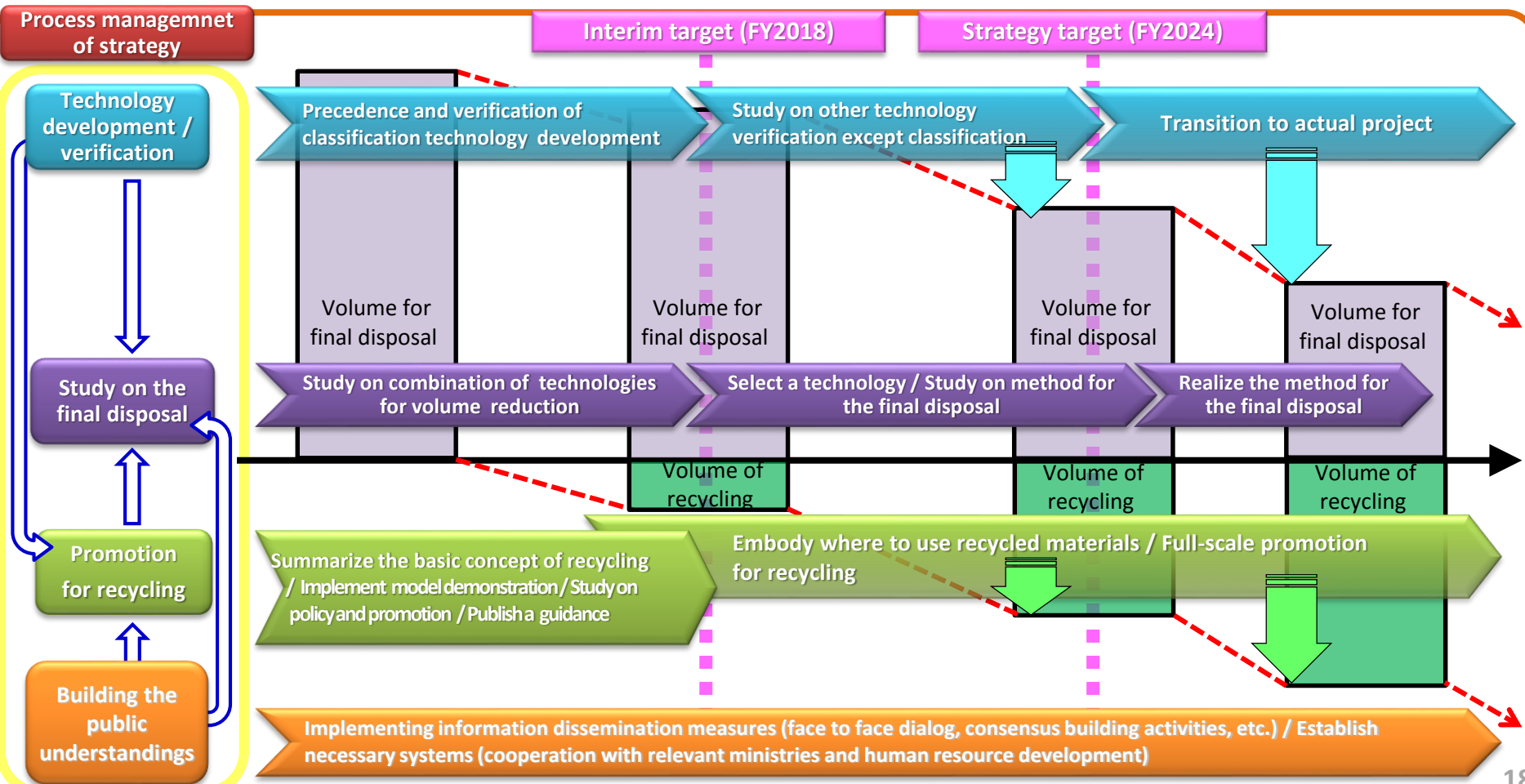
8 Steps towards the Final Disposal outside Fukushima Prefecture within 30 years from the Start of the ISF

- 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】

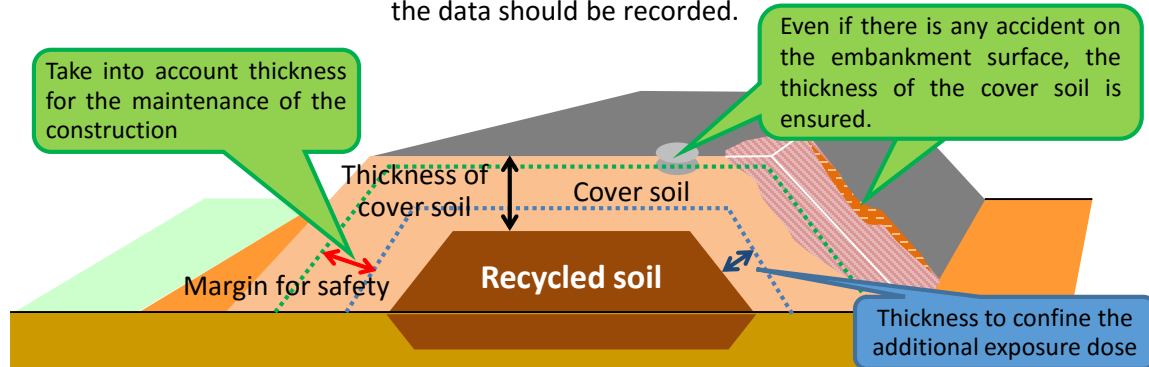
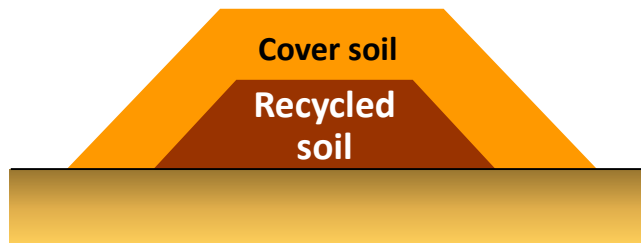
The removed soil should be used mainly for public projects with a responsible management system for the controlled materials (with a radioactivity level below 8,000Bq/kg in principle and set according to purpose) after necessary treatment, e.g. removal of debris, classification treatment. The use will 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.

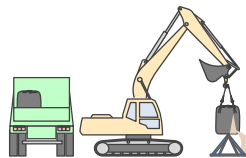
Demonstration Project for Recycling in Minamisoma City

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

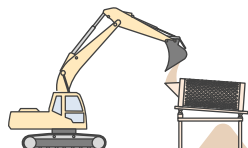
Open large sandbags and remove large foreign materials



vegetation

2. Further eliminate smaller debris

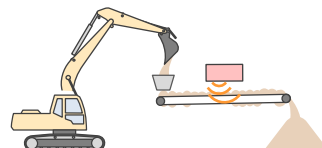
Eliminate small foreign materials through sieves



stones

3. Classify soil by concentration

Measure radiation and classify soil



pebbles

4. Control quality

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



2. Test embankment process (May 2017-)

5. Construct test embankment / Monitoring

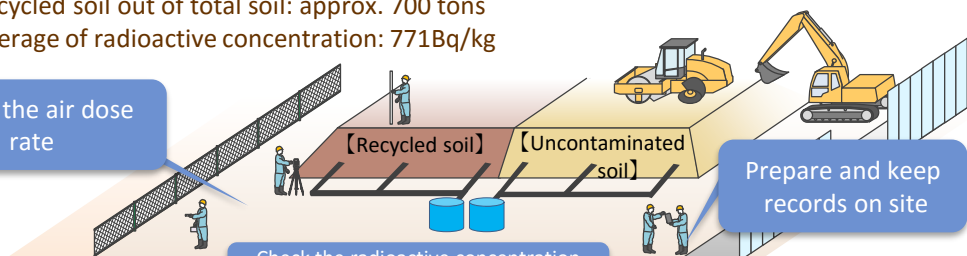
- Construct a test embankment (covered with uncontaminated soil by 50cm)
- Continue to measure the air dose rate and other indicators

Check the air dose rate

- 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

Check the radioactive concentration of leachate

Prepare and keep records on site



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

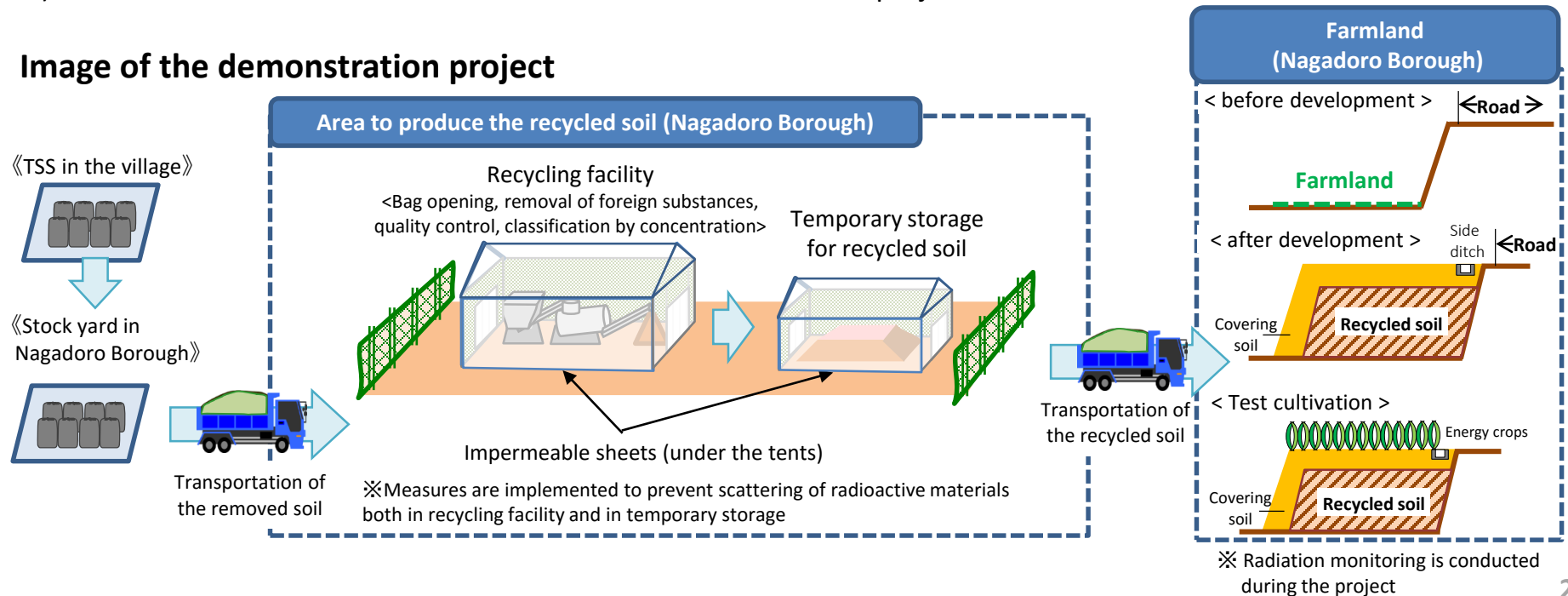
Demonstration Project for Recycling in Iitate Village

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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Communication to the Public and
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Progress on Disposal of waste in the Countermeasure Areas (Fukushima Prefecture)

As of February 4, 2019

- ◆ Transportation of disaster waste to the TSS has completed 2.15mil. tons as of the end of December 2018 (of which 390,000 tons were incinerated, 1,350,000 tons were recycled and 21,600 tons were reclaimed.)
- ◆ Transported disaster waste has been recycling as large as possible

< Status of disaster waste by category >

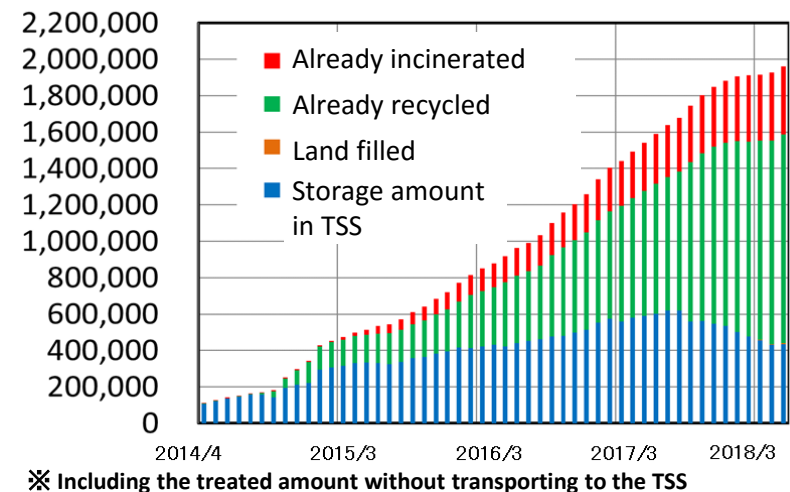
(1) Disaster waste disposal generated by Tsunami

- ◆ All the debris excluding that from Difficult-to-Return Zones (DRZ) has completed to remove and transport to the TSS as of March 2016
- (2) Dismantling and removal of collapsed houses
 - ◆ It is under operation to take application for dismantling and investigation, then conduct dismantling and removal
 - ◆ Application for dismantling and removal of which 15,400 cases were registered, already announced dismantling work, 14,300cases, among which 11,700cases were removed

(3) Treatment of household waste

- ◆ Pick-up service at garbage stations or door-to-door visit
- ◆ Door-to-door retrieval is conducted after adjusting the schedule of the owner

Transported amount of disaster waste already transported to the TSS in the countermeasure area <ton>



Dismantling of a collapsed house



TIF in Okuma

Implementation Situation of Waste Disposal across Municipalities

- To promote 'Waste disposal across municipalities': city/town/village hosting TIFs accept waste from other cities.
- Currently, Namie Town decided to accept boars' disposal caught at DRZ in Futaba County.
- Nihonmatsu City will start 'Waste disposal across municipalities' at the TIFs in FY2018.

Date city (130t/day)

Waste generated by decontamination from Date area (Date city, Kunimi town, Kori town, Kawamata town)

Nihonmatsu city (120t/day)【planned】

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 24 municipalities, such as Kenchu, Kennan, Iwaki, Kawauchi village, Aizu Kennan

Iitate village (Warabidaira district) (240t/day)

Waste generated by decontamination, disaster waste in the village
Sewage sludge, agricultural waste from outside 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, Buried livestock in Futaba town, boars caught in the DRZ (July 2019-)

Tomioka Town

(Final disposal)
Household waste of 8 towns and villages in Futaba County, waste within Countermeasure Areas, designated waste within the prefecture

- Countermeasure area
- TIFs managed by the government
- TIF by municipalities in Date district

Disposal Project utilizing Existing Controlled Landfill Site

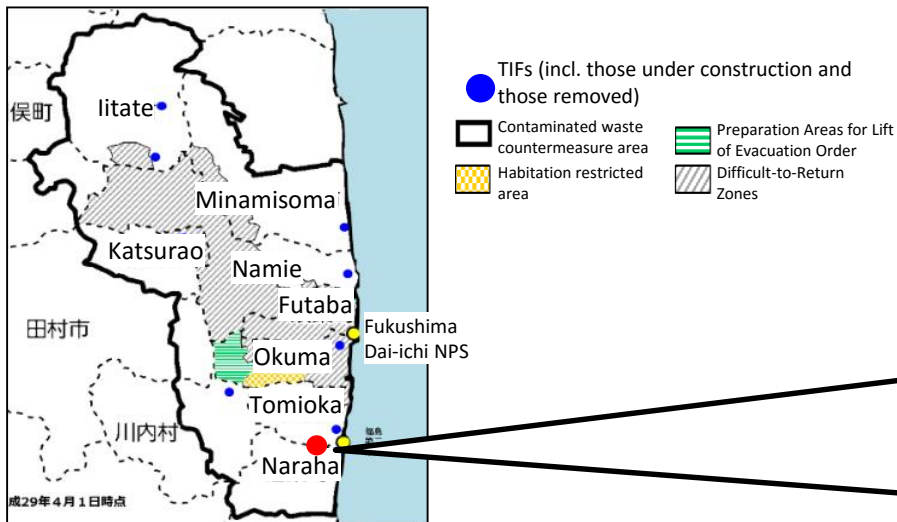
- ◆ As for Landfill disposal project for specified waste, the transportation to the site started on Nov. 17, 2017
- ◆ 53,212 container bags of waste mostly from Tomioka and Naraha Towns were transported (as of the end of Dec. 2018)
- ◆ Monitoring survey result before and after transportation shows no significant increase of air dose rate

Outline of the facility

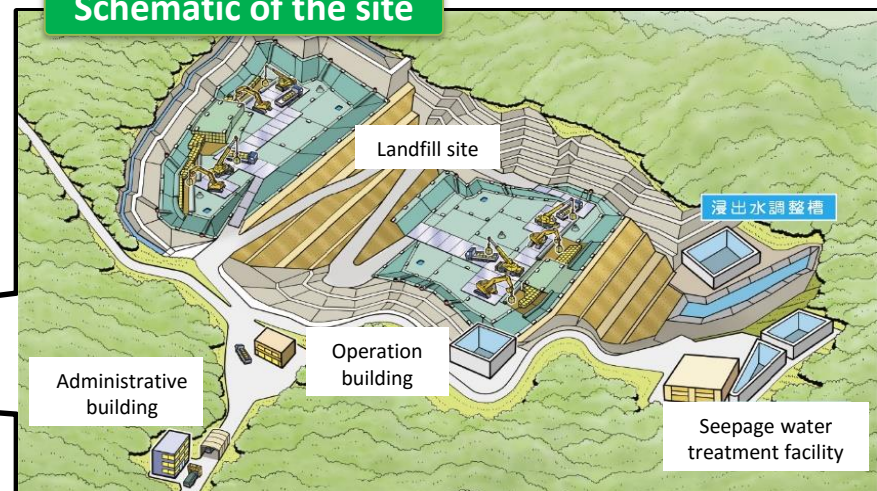
- ◆ To use **existing controlled landfill site** (formerly Fukushima Eco Tech Clean Center)
- ◆ To locate it in **Tomioka** (access from **Naraha**)
- ◆ The facility has been **nationalized** after local coordination
- ◆ Positioning as **the final disposal site**

Target object for landfill / Transport period

- ◆ **Waste within the countermeasure areas** (less than 100,000Bq/kg of radioactive concentration) [about 440,000m³] – about 6 years
- ◆ **Designated waste** (less than 100,000Bq/kg of radioactive concentration) [about 180,000m³] – about 6 years
- ◆ **General waste from houses** – about 10 years in 8 municipalities in Futaba
- ◆ Waste with more than 100,000Bq/kg of radioactive concentration will be delivered to the ISF



Schematic of the site



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**Communication to the Public and
International Societies**

Information Exchange with Local Communities

MOE has been making efforts to share the information with local communities;

- ◆ “Environmental Regeneration Plaza” provides seminars and dispatches experts to town meetings and schools with the cooperation of Fukushima Prefecture
- ◆ “Reprun” helps you to understand specified waste landfill project.
- ◆ “Interim Storage Facility(ISF) Information Center” provides you the progress of ISF and radiation monitoring data.

Fukushima Regeneration Plaza
at Fukushima City



Reprun at
Tomioka Town

ISF Information Center
at Okuma Town



Current PR Activities by MOEJ

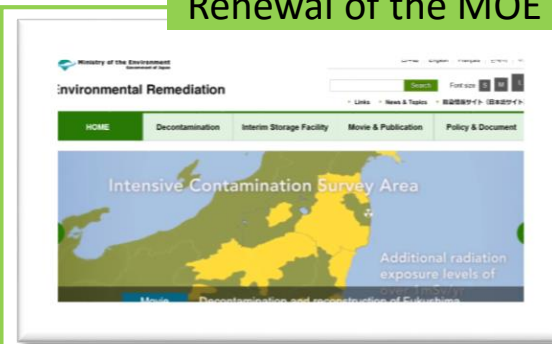
Ministry of the Environment, Japan (MOEJ) released an English booklet in August 2017. English web-site, “Environmental Remediation” was also renewed and two TV shows are now available on MOE’s web site.

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 Pref. 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

Dec. 5, 2016

The 4th Meeting of Japan-Ukraine Joint Committee for the cooperation to advance aftermath response to accidents at nuclear power stations (@Tokyo)

Apr. 17-21, 2017

The 3rd IAEA-MOE Experts Meeting on Environment Remediation of Off-Site areas after the Fukushima Dai-ichi Nuclear Power Station Accident (@Tokyo)

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)

