



Environmental Remediation in the Affected Areas in Japan

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Akira Nitta

Director



Ministry of the Environment, Japan

Main Points:

Environmental Remediation in the Affected Areas in Japan

- I. IAEA International Follow-up Mission
- II. Result and Effect of the Whole Area Decontamination
- III. Management of the Removed Soil and Waste
- IV. Communication to the Public and International Societies

I. IAEA International Follow-up Mission

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What is IAEA International Follow-up Mission?

IAEA conducted the investigation on decontamination status in Japan in October 2013 and as a follow-up, it is to give advice for issues and evaluate the progress on environmental remediation activities for off-site decontamination. They sent a mission consisted of 16 IAEA and international experts to Japan from October 14 to 21 in 2013 and investigated.

The mission submitted the overview report on 21st October. The final report was made in the same year and shared with international societies.

Key Points of the Advice from the IAEA International Follow-up Mission

This report provides conclusions for the assessment of specific topics in the remediation program including 8 advice taking into account both international standards and the experience of remediation programs in other countries, which will further help to increase public confidence. The government of Japan will enforce the necessary measures based on these advice.

◆ Radiation Protection of the Public

- Increase efforts to communicate that any level of individual radiation dose in the range of 1 to 20mSv per year is acceptable and in line with the international standards (Advice 2).
- Strengthen efforts to explain to the public that an additional individual dose of 1mSv per year is a long-term goal, and that it cannot be achieved in a short time (Advice 2).

◆ Decontamination activities

- Continue the optimization of the remediation of forest areas around residential areas by concentrating efforts in areas that bring greatest benefit in reducing doses to the public and avoid damage to the ecological functions (Advice 6).

◆ Collection and provision of the information

- Communicating the entire remediation and reconstruction programs and how the various components interact (for example, trade-offs between reducing exposure and increasing waste volumes) (Advice 3).

◆ Review and assessment of the external agencies

- Assess the benefits that could be derived from a more active participation of NRA in the review of remediation activities (Advice 1)



I. IAEA International Follow-up Mission

II. Result and Effect of the Whole Area Decontamination

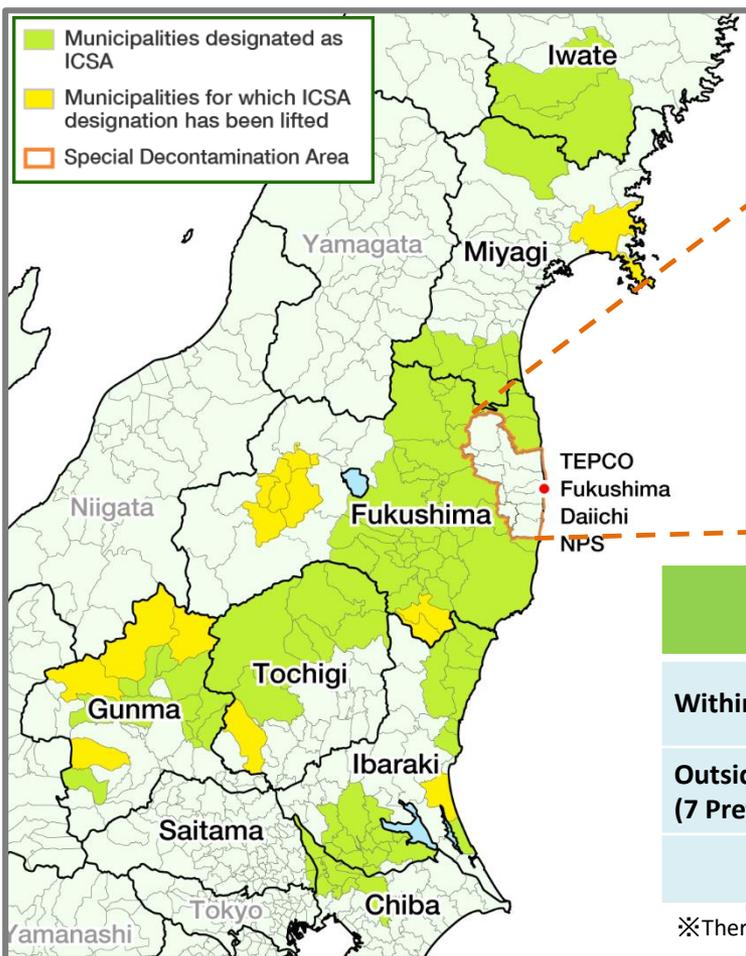
III. Management of the Removed Soil and Waste

IV. Communication to the Public and International Societies

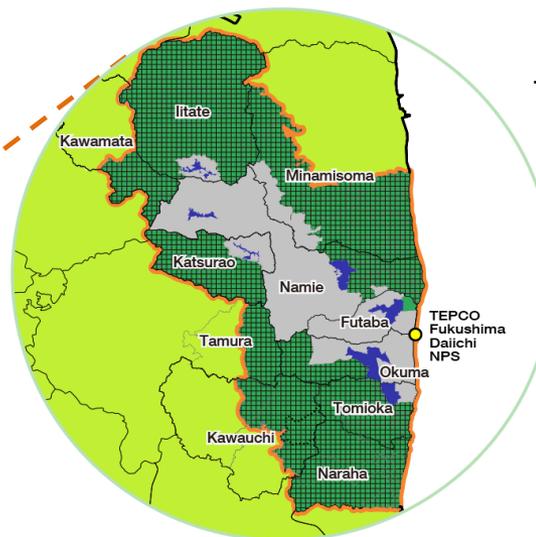
Result of Whole Area Decontamination

Whole area decontamination was completed in 100 municipalities in 8 prefectures 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

Scale of Whole Area Decontamination Project

- ◆ The MOE has budgeted approx. JPY 2.9 trillion (= USD 27 billion) for decontamination until the end of March 2019.
- ◆ 17mil. m³ (among which approx. 16.5mil. m³ were from Fukushima Prefecture) of soil and wastes were removed by the end of March 2018.
- ◆ MOE published "Decontamination Project Report" about experiences, knowledge and lessons learned through the decontamination works in March 2018.

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 the end of March 2019
- Volume of the removed soil:
approx. 9,100,000 m³
※Estimation as of the end of March 2018

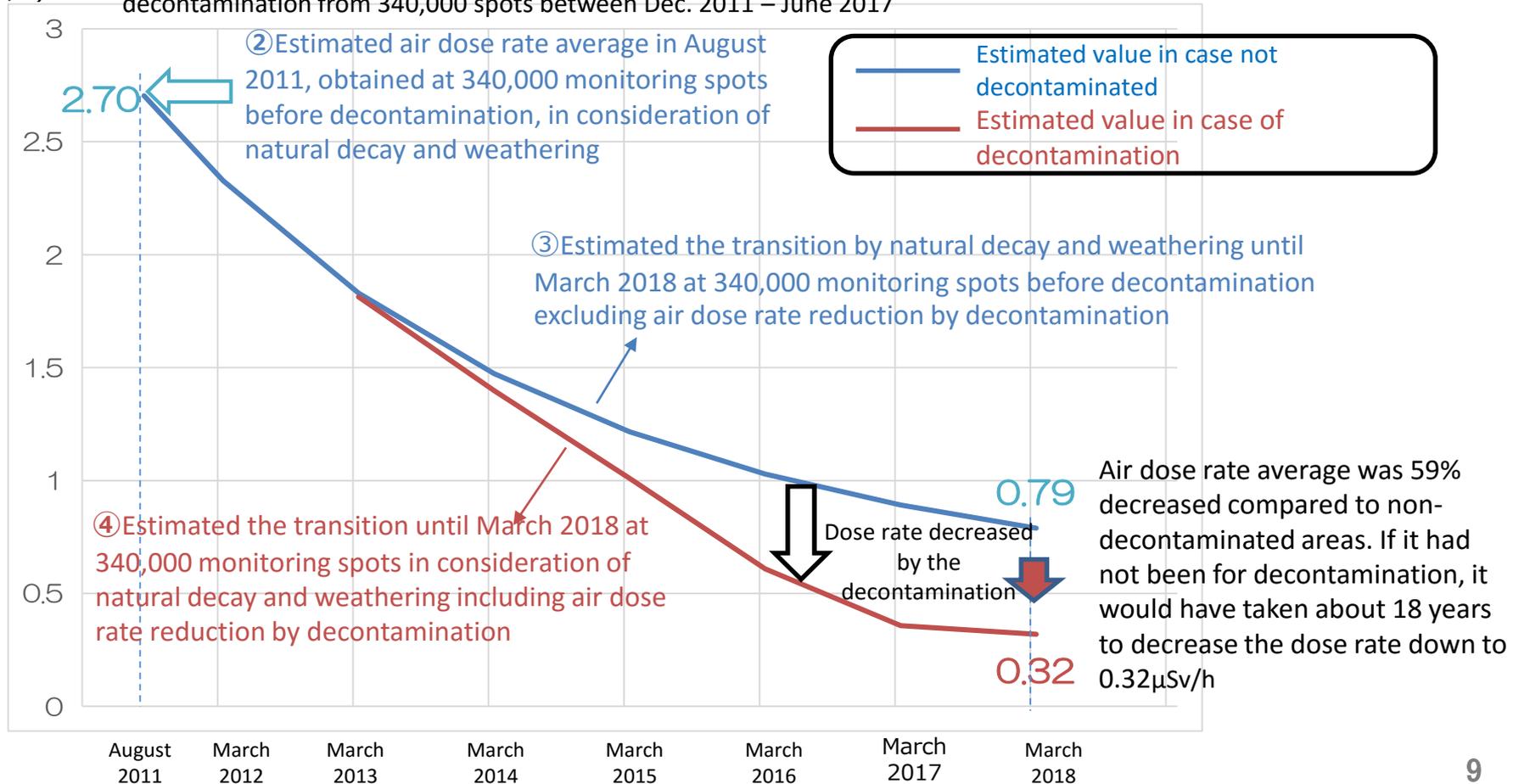
Decontamination in ICSEA

- 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 the end of March 2019)
- Volume of the removed soil:
approx. 7,900,000 m³ (estimation)
(within Fukushima Pref.: approx. 7,400,000 m³, outside Fukushima Pref.:
approx. 500,000 m³, both are estimations as of March 2018)

Transition of Air Dose Rate Average in the SDA (Residential Areas and Farmland)

- Air dose rate reduction was achieved by decontamination 18 years earlier comparing to the case without any decontamination works
- Decontamination is reconstruction foundation for the affected areas. It is contributed to recovery such as lifting evacuation order by earlier reduction of air dose rate

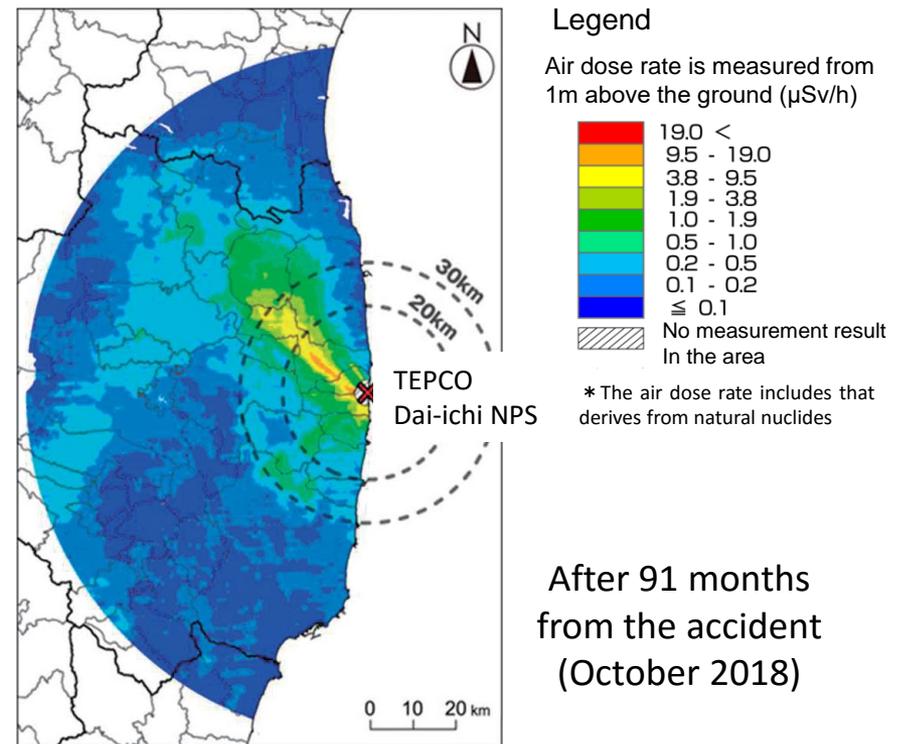
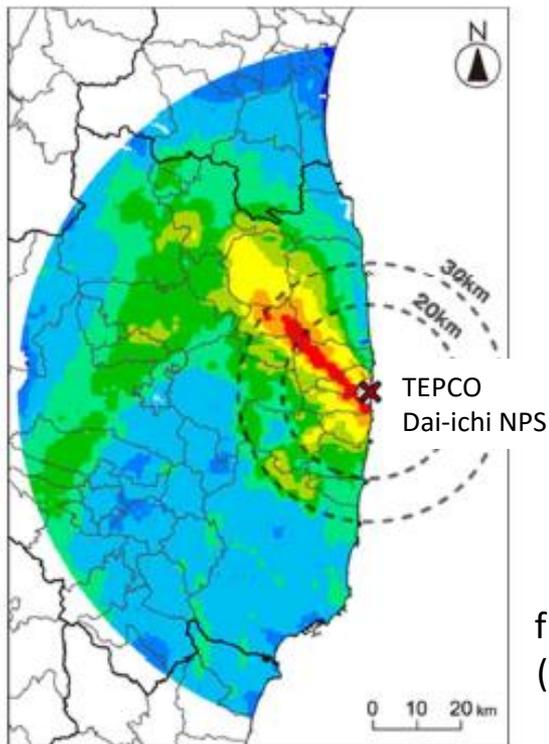
① Monitoring result before the decontamination between Nov. 2011 - July 2016 and monitoring result estimated after the decontamination from 340,000 spots between Dec. 2011 – June 2017



Transition of the Air Dose Rate

Compared air dose rate of 7 months after the accident (as of November 5, 2011) with that of 91 months after the accident (as of October 16, 2018), the latter decreased by 74%. It was confirmed that the decrease was faster than natural attenuation as an overall tendency

Distribution map showing transition of the air dose rate within 80km radius



“Result of airborne monitoring in and around Fukushima Prefecture (NSR / as of March 8, 2019)

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



Integrated Measures towards restoration of Fukushima Forestry

- ◆ In March 2016, Reconstruction Agency, Ministry of Agriculture, Forestry and Fisheries and MOE cooperated to summarize “Integrated Measures towards Restoration of Fukushima Forestry” at “Relevant ministries’ project team for restoration of Fukushima forestry” (ministerial level)
- ◆ Already selected 14 districts as a model areas and have been conducting model projects to comprehensively proceed *satoyama* restoration

I. Measures towards restoration of forestry

1. Measures to secure safety in living environment

- Forest decontamination neighboring residential houses, construction of fences to prevent soil runoff, if necessary

2. Measures towards restoration of *Satoyama* around residential houses

- Decontamination where people have daily access in the forest
- Measures to reconstruct forestry in broad leaf forest
- Comprehensive promotion to proceed *satoyama* restoration selecting model area

※Selection status for the model areas

Sep. 6, 2016: Kawamata, Hirono, Kawauchi, Katsurao

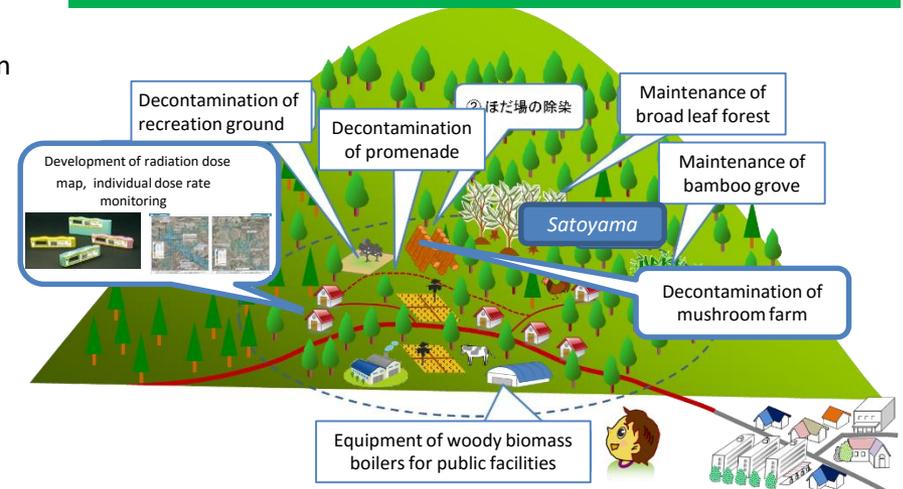
Dec. 22, 2016: Soma, Nihonmatsu, Date, Tomioka, Namie, Iitate

March 2, 2018: Tamura, Minamisoma, Naraha, Okuma

3. Measures towards restoration of forest deep in mountains

- To promote demonstration project to forestry restoration and forest development and to implement radiation protection if needed
- To establish a guidebook on radiation safety and security measures easy to understand for the workers

Image of *satoyama* restoration model project



II. Measures on investigation research for the future

- Radiation monitoring in the woods, investigation research for radiation dose decrease and radiological dynamic state, and efforts to continue restoration of forest and forestry

III. Information transmission and communication

- Latest information transmission by web-site, PR magazines on the government’s measures for restoration of forest and forestry
- To continue the efforts to secure safety of Fukushima people and communicate including experts’ dispatch

I. IAEA International Follow-up Mission

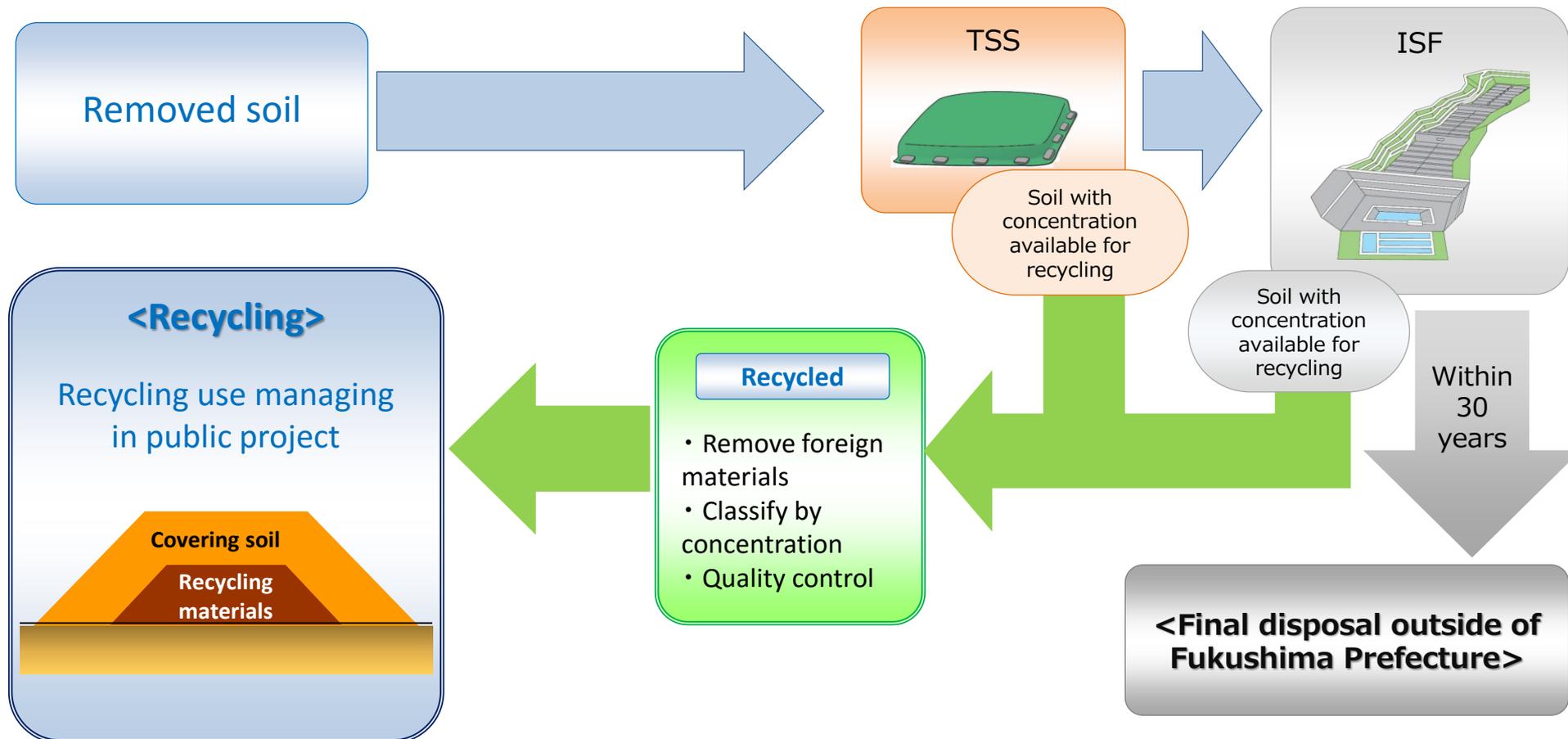
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Societies

Removed Soil Generated in Fukushima Prefecture

- The national government will take necessary measures to complete the final disposal of removed soil stored in the Interim Storage Facility, at the outside of Fukushima Prefecture within 30 years from the start of ISF
- The national government as a whole has been promoting measures for volume reduction and recycling of the removed soil to decrease the volume for final disposal outside the Prefecture



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. m³
 FY2019: Approx. 4 mil. m³ are planned

Image of transportation and land restoration

Transportation to the ISF / Land restoration



Storage situation



After land restoration



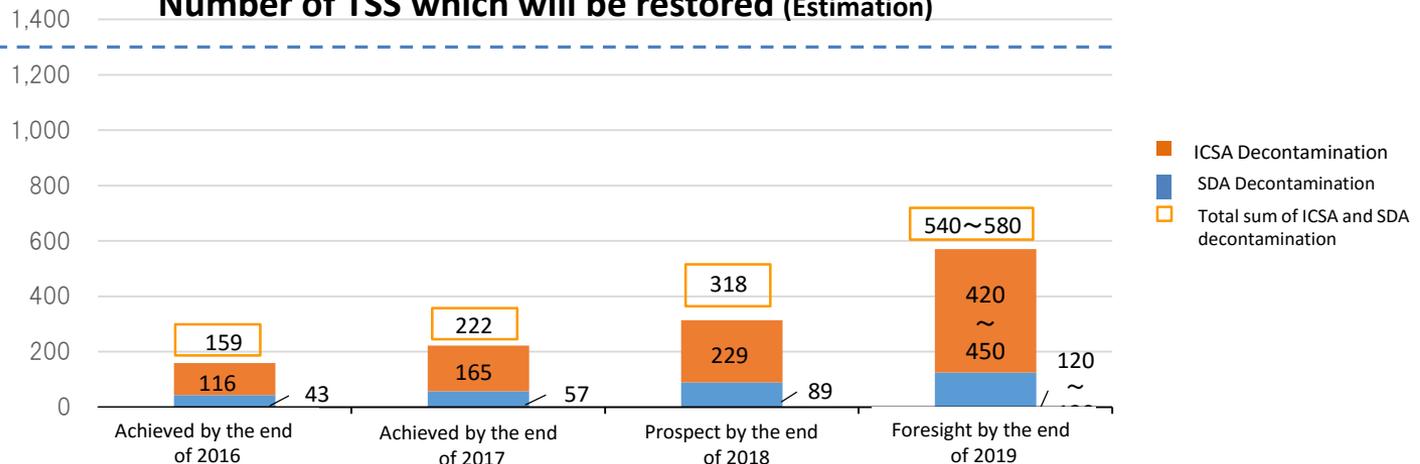
Restart farming by the land owner



Photos provided by Nihonmatsu City

Number of TSS which will be restored (Estimation)

Total number of TSS: about 1300



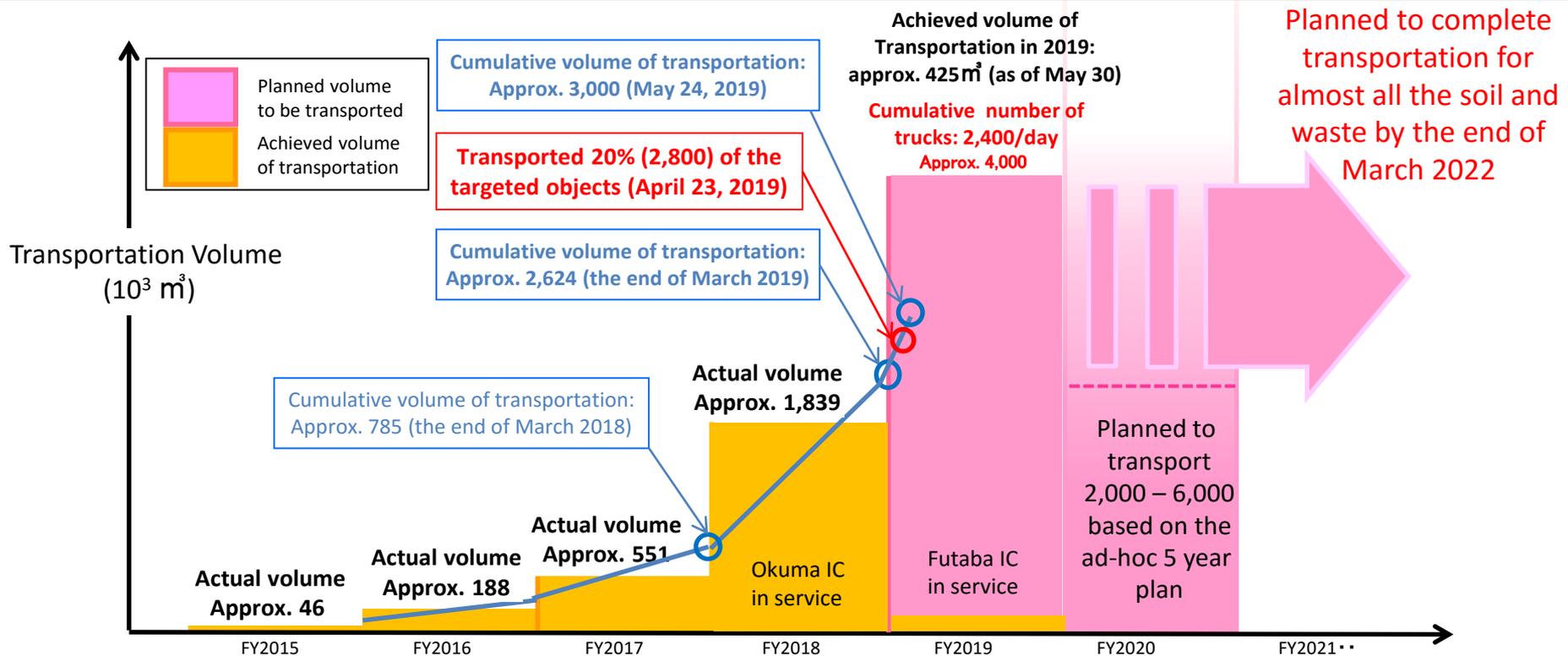
Ad-hoc Policy on Transportation to the Interim Storage Facility

◆ Towards the transportation of all the targeted objects (14 mil. m^3 *) to the ISF, the transportation volume has been sequentially increasing in the light of land acquisition and facility construction.

*As of January 2019

< Announcement of “Policy on Interim Storage Facility Project in FY2019” on December 6, 2018 >

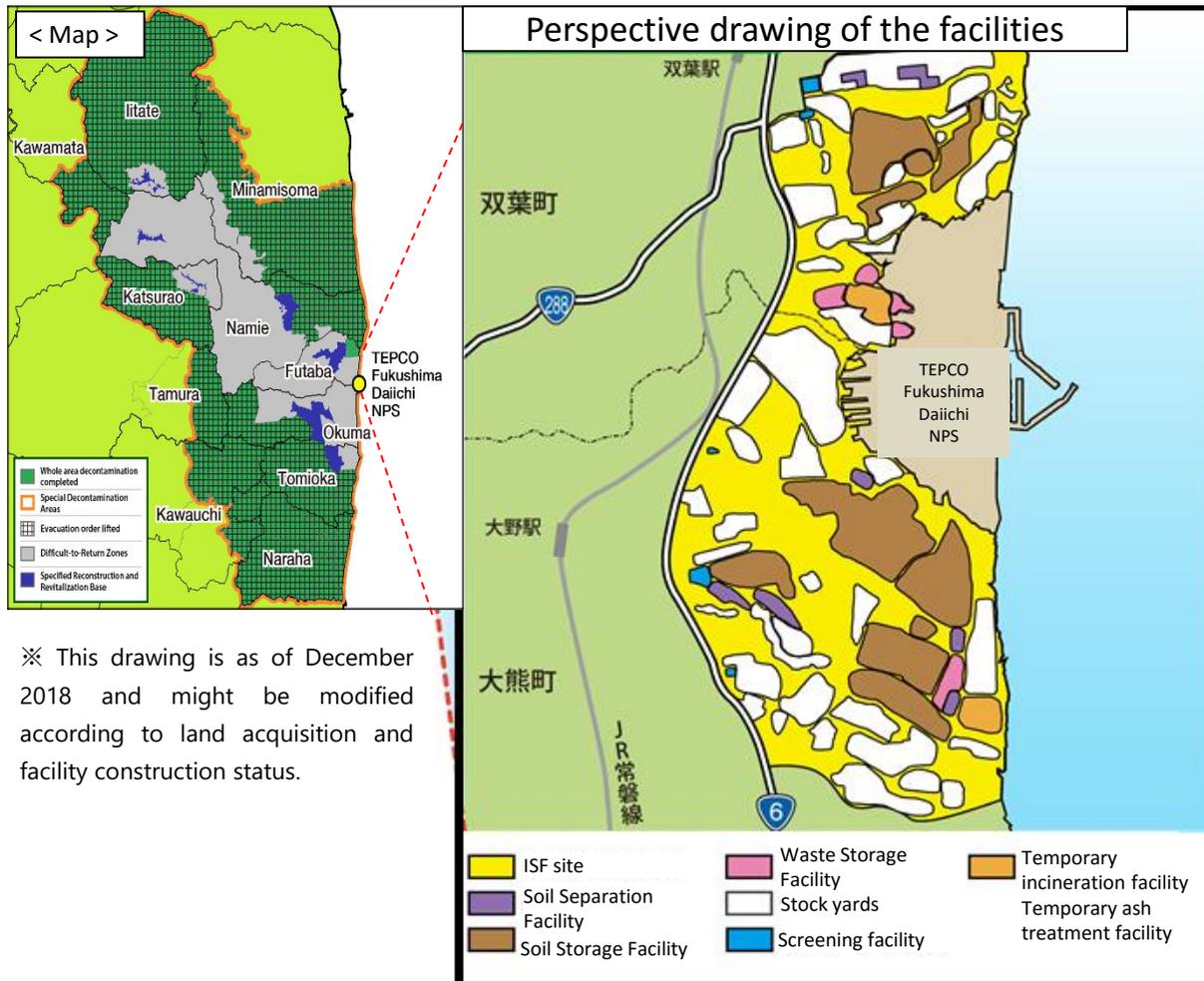
- During FY 2019, approx. 4 mil. m^3 will be transported, aiming to eliminate TSS close to the residential areas
- By the end of March 2022, MOE aims to complete transportation of almost all the removed soil and waste (except DRZ) which have been temporarily stored within Fukushima Prefecture.



◆ Okuma IC has been used for the transportation in the wake of its opening on March 31, 2019

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. m³, with the further review reflecting the actual circumstances.



【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



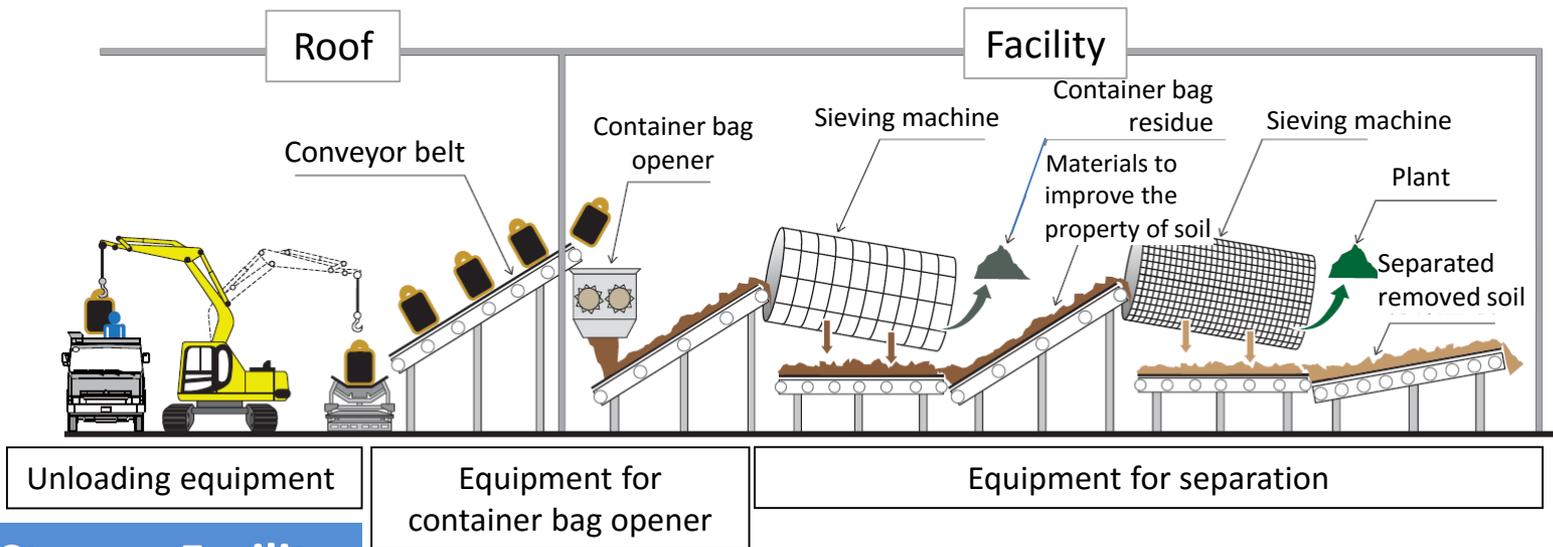
ISF Construction Information Center

MOE has established the ISF Construction Information Center along Route 6. The information about progress of ISF and radiation monitoring are available. At the front, you can enjoy donated “TSS wall paint” by high school students in Date City.

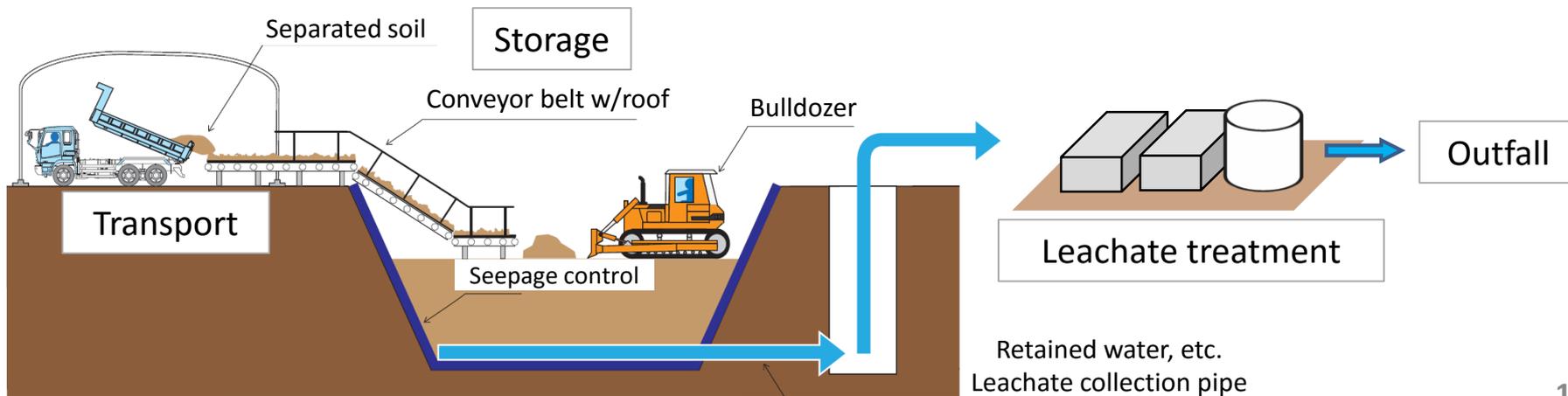
Reception / Separation / Soil Storage Facility

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

Reception / Separation Facility



Soil Storage Facility



Operational Status of the ISF in Okuma

- ◆ Construction of the facility started in November 2016.
- ◆ The operation of Reception/Separation facilities started in August 2017.
- ◆ **The storage of the removed soil started in October 2017** after the completion of the soil storage facilities.



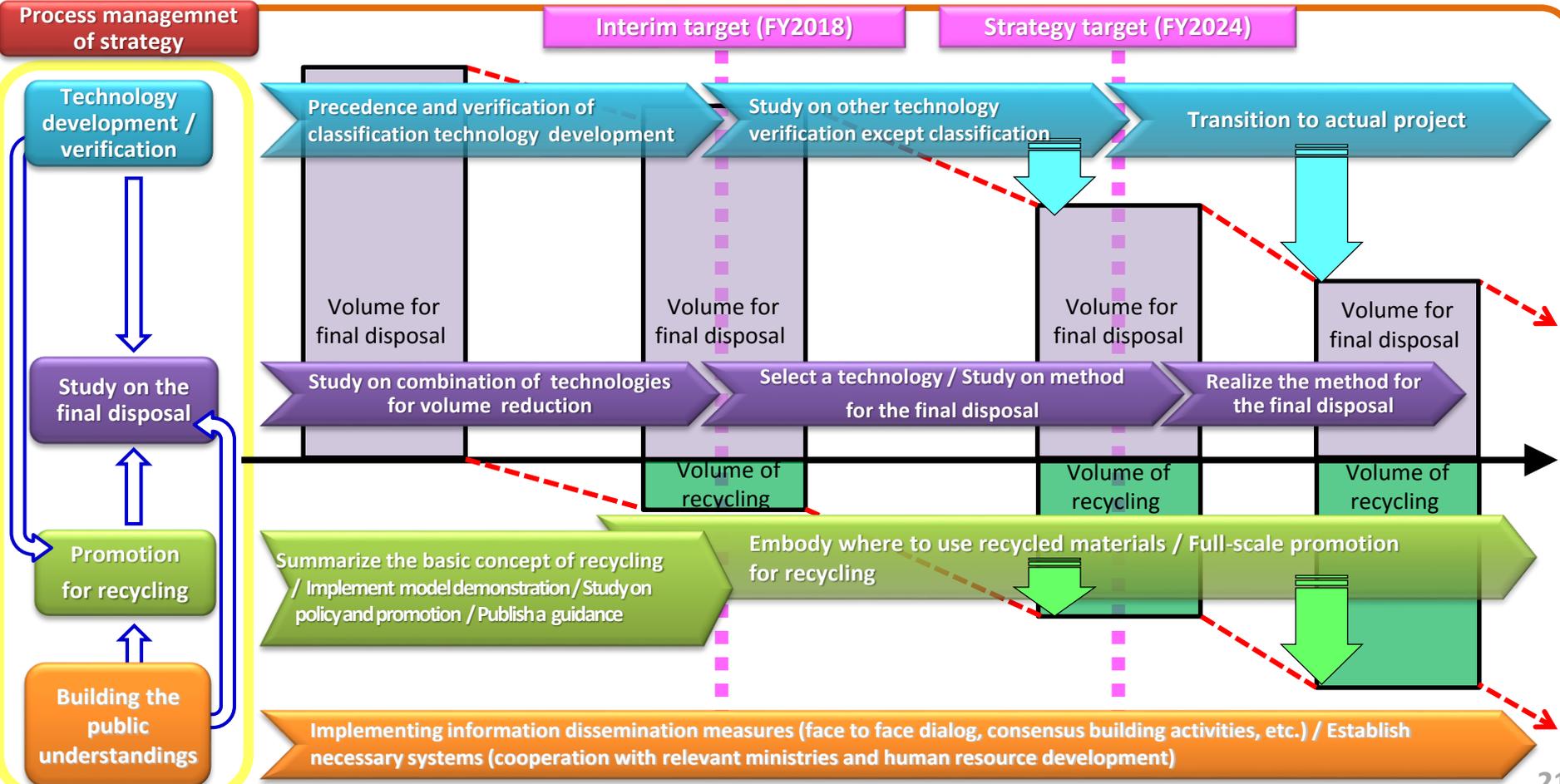
Reception/Separation Facility



Soil Storage Facility

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 for Recycling (June 2016)

【Basic Concept】

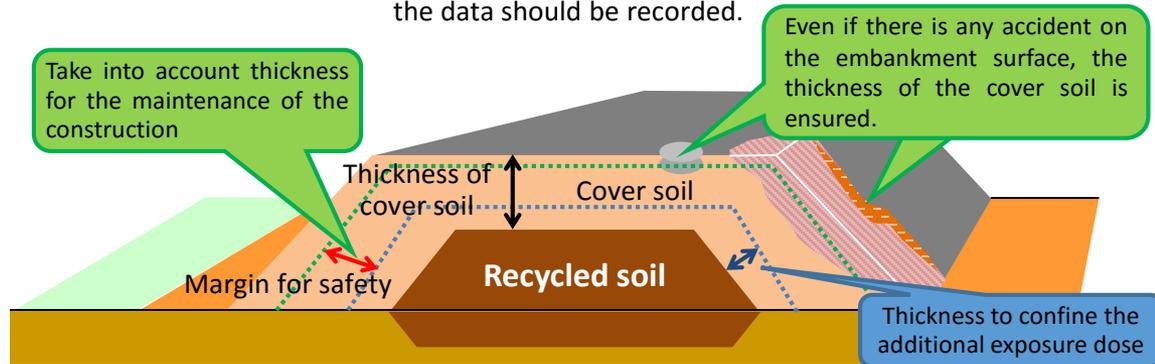
The removed soil can be used for public projects and others with a responsible management system after necessary treatment, e.g. removal of debris, classification treatment. The use will be limited, such as the basic structure material of an embankment which is not assumed to change shape artificially, and be managed appropriately. The recycled soil should be used under the management and this is different from the concept of “clearance”.

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 public projects and others 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.

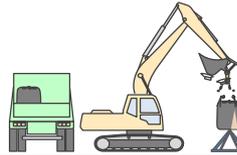
Demonstration Project for Recycling in Minamisoma City

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

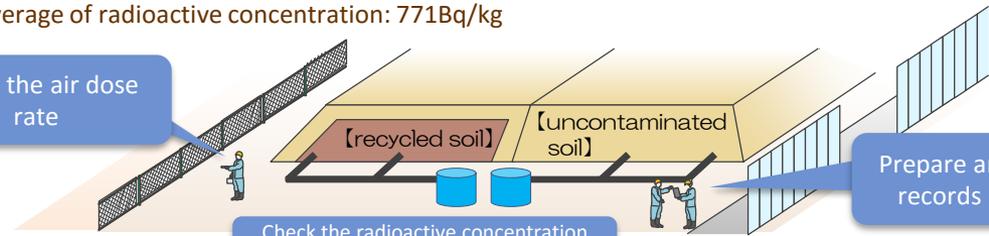
- Construct a test embankment (covered with uncontaminated soil by 50cm)
- Continue to measure the air dose rate and other indicators

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

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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” was newly established to help people understand specified waste landfill project.
- ◆ “ISF Construction Information Center” provides you the progress of ISF and radiation monitoring data.

Reprun at
Tomioka Town



ISF Construction
Information Center at
Okuma Town



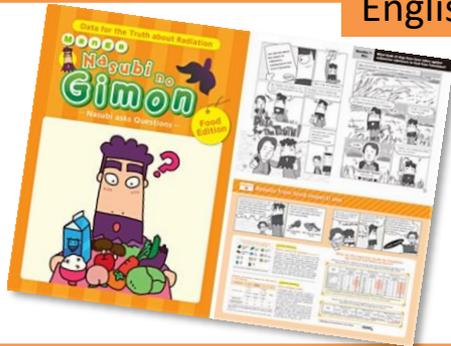
Fukushima Regeneration Plaza
at Fukushima City



Current PR Activities by MOE

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

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-minutues 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-minutues 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

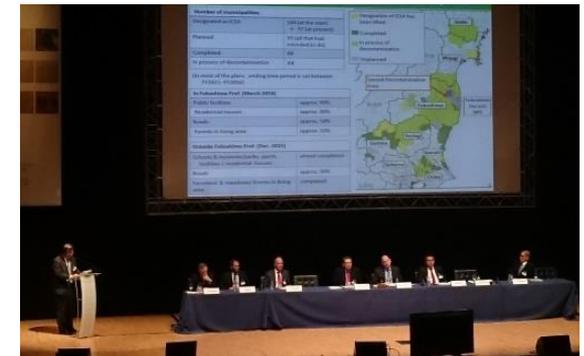
The 5th Meeting of US-Japan Bilateral Commission on Civil Nuclear Cooperation (@Tokyo)

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)



Updated information is available on the web-site below:

<http://josen.env.go.jp/en/>