



Living together with Environment and Society

- On the Surrounding Environment and Society

Ministry of Economy, Trade and Industry

September 2019

1. Living together with surrounding environment

- (1) Fukushima Daiichi Decommissioning and the society
- (2) Overview of Water Management
 - * 3 Basic Principles for water management
 - Decrease in contaminated water generated
- (3) Environmental Monitoring
- (4) ALPS treated water in tanks
- (5) Handling of ALPS treated water
 - * 5 Options and Long-term storage
 - * ALPS subcommittee and decision-making process

2. Living together with society

- (1) Progress in the decontamination
 - * Effect of the decontamination
- (2) Lift of evacuation orders
 - * Restoration of infrastructures
 - * Reconstruction of area lifted evacuation order
 - * Re-establishment of local businesses
- (3) Stakeholder involvement

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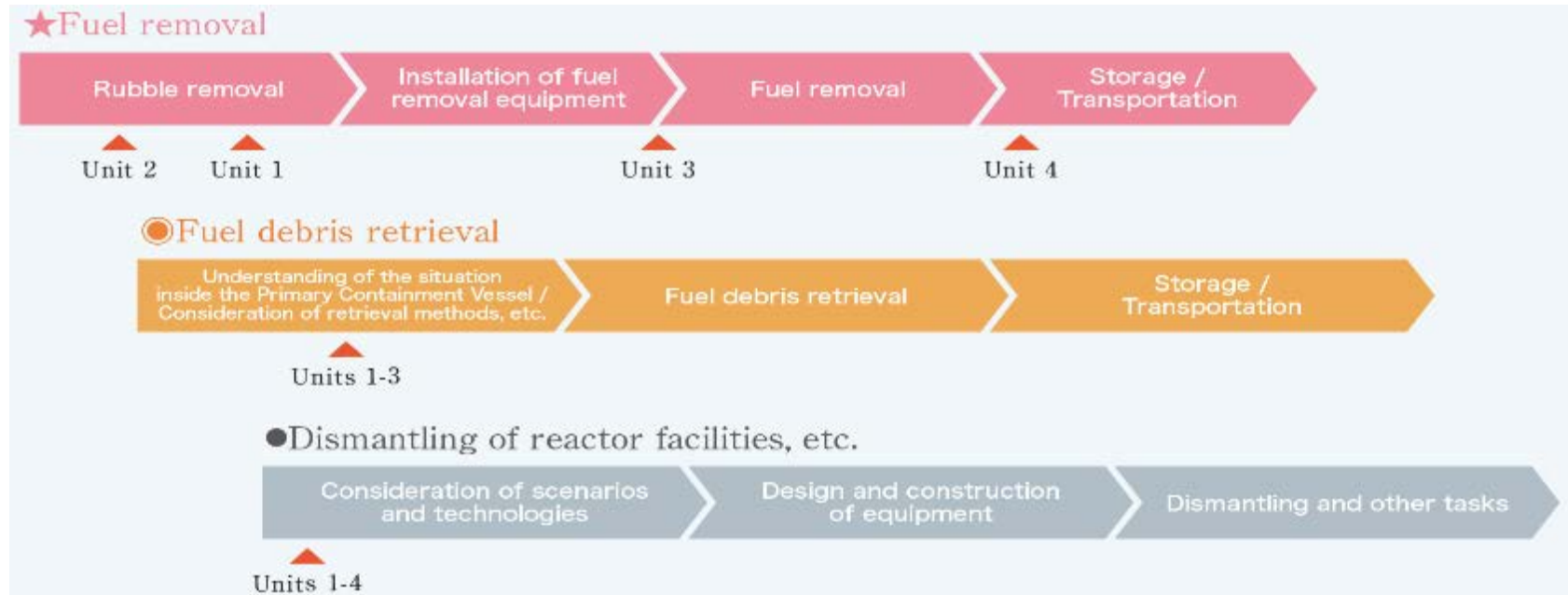
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1. (1) Fukushima Daiichi Decommissioning and the society

- ◇ **Fukushima Daiichi Decommissioning is a continuous risk reduction activity** to protect the people and the environment from the risks associated with radioactive substances
- ◇ **Safe and steady decommissioning is a prerequisite for reconstruction of Fukushima**

Milestones in Mid-and -Long Term Roadmap



1.(2) Overview of water management

*3 Basic Principles for water management

1. **"Isolating"** groundwater from the contamination source

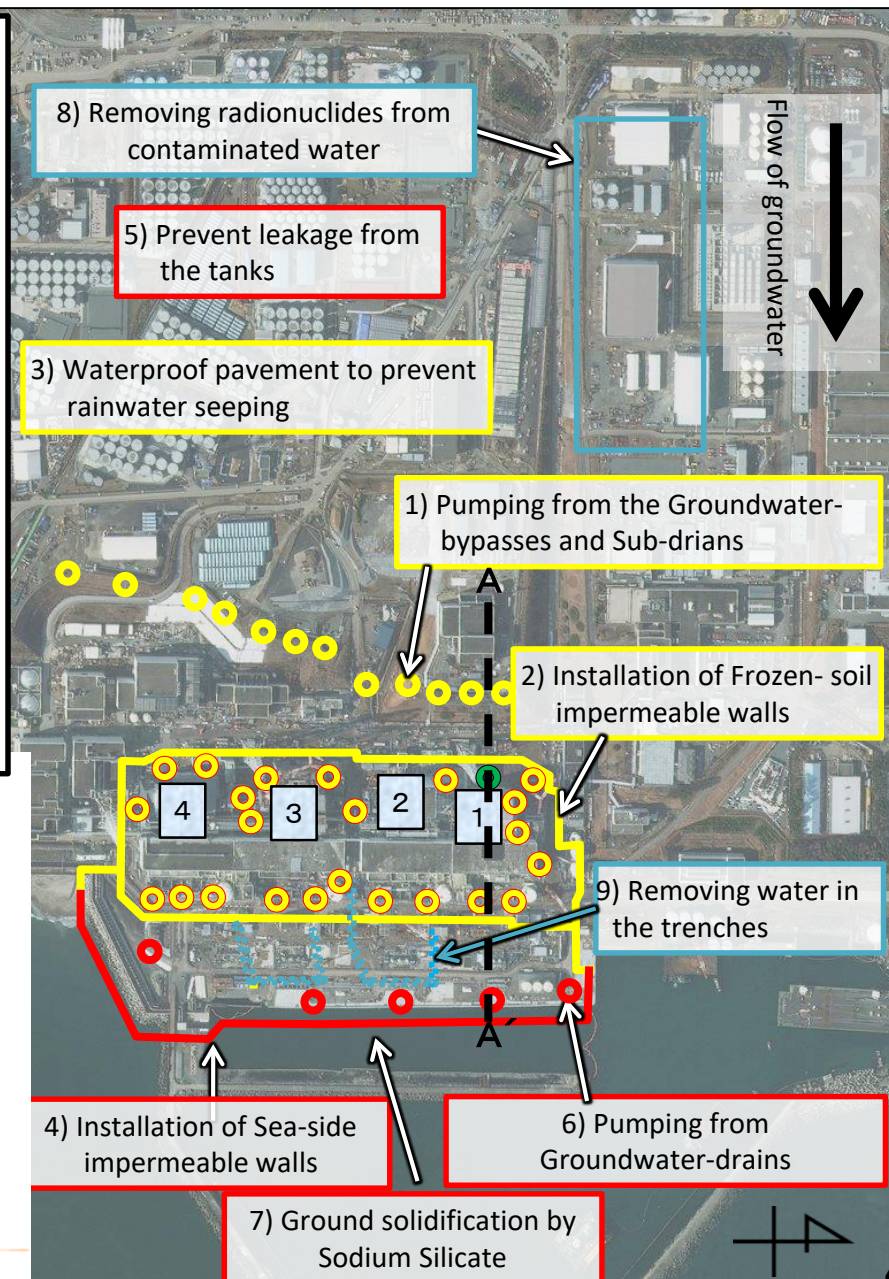
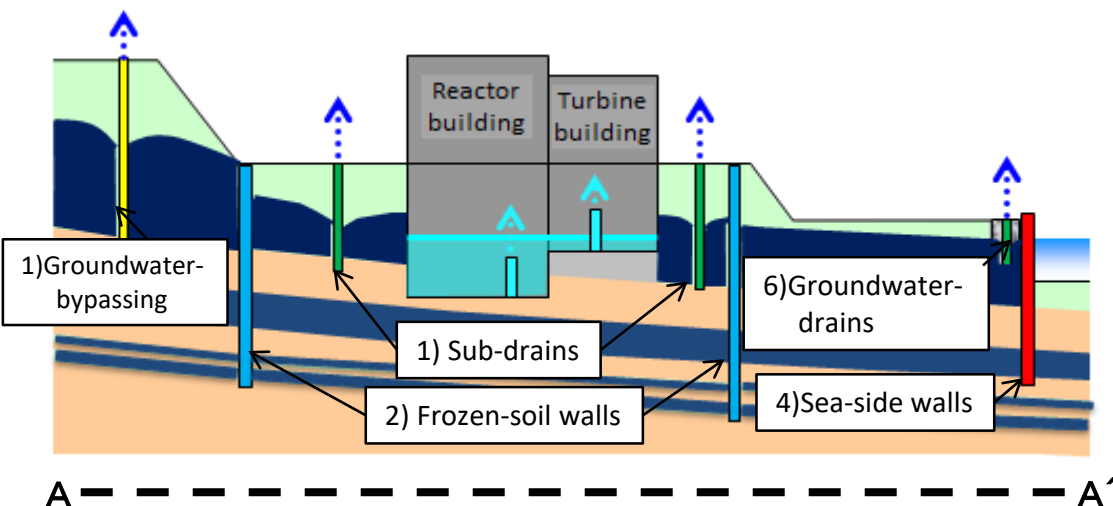
- 1) Pumping from Groundwater-bypasses and sub-drains
- 2) Installation of Frozen-soil impermeable walls
- 3) Waterproof pavement to prevent rainwater seeping; and others

2. **"Preventing leakage"** of contaminated water

- 4) installation of sea-side impermeable walls
- 5) Prevent leakage from tanks (installing welded-joint tanks etc.)
- 6) Pumping from Groundwater-drains
- 7) Ground Solidification by Sodium Silicate; and other measures

3. **"Removing"** the contamination source

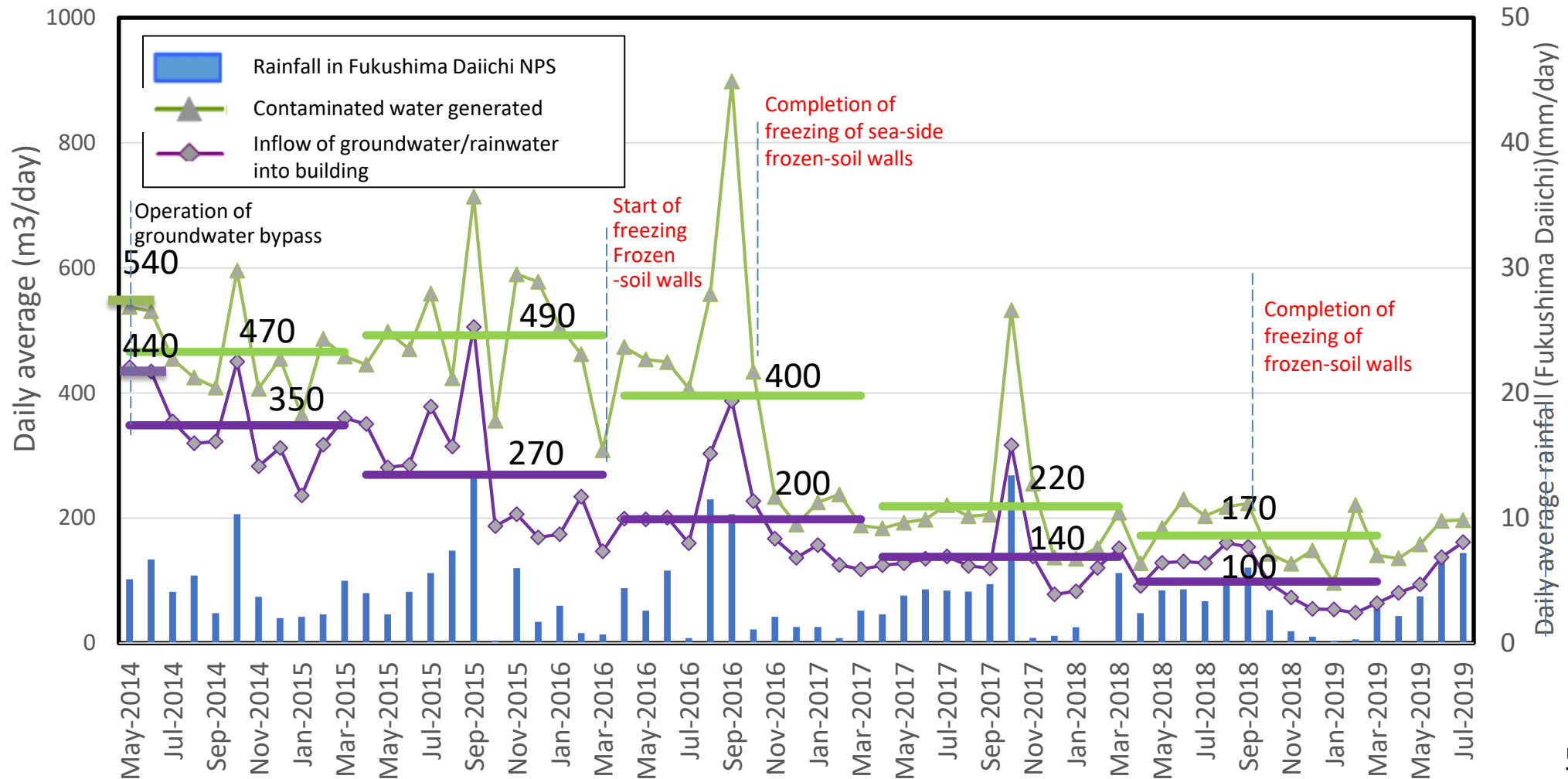
- 8) Removing radionuclides from contaminated water
- 9) Removing water in the trenches; and other measures





1.(2) Overview of water management

*Effect to date: Decrease in contaminated water generation

- ◆ Inflow of groundwater/rainwater into buildings:
440m³/day (2014, May) → 100 m³/day (average FY2018)
- ◆ Contaminated water generated:
540m³/day (2014, May) → 170m³/day (average FY2018)

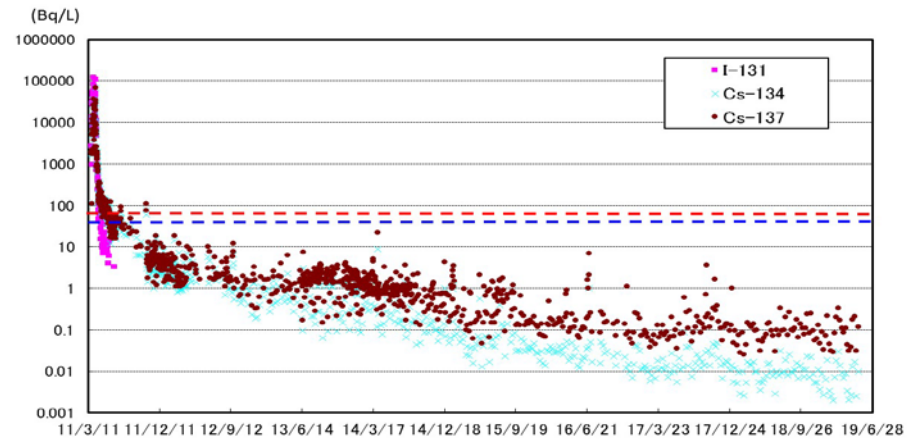


1. (3) Environmental monitoring

Regulatory Limit Specified by Reactor Regulation	
• Cesium 137: 90Bq/L	
• Cesium 134: 60Bq/L	

Bq/l

① North side of units 5 and 6 discharge channel



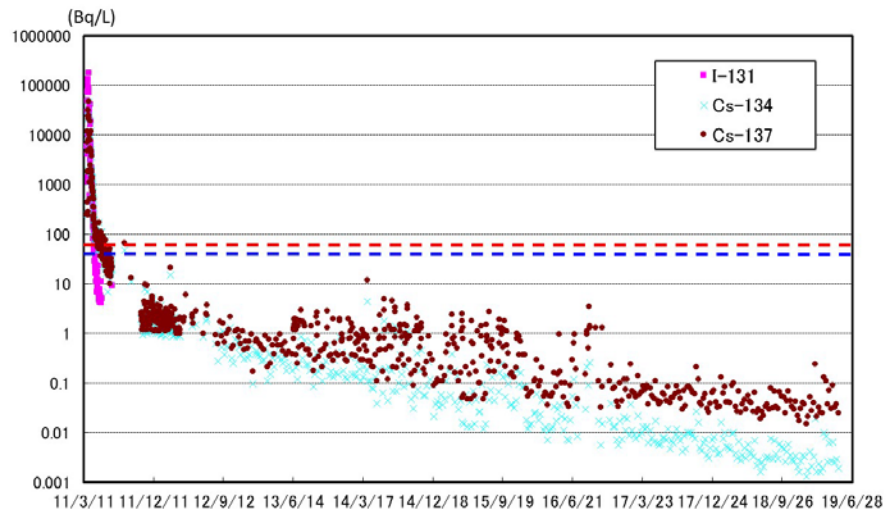
② Real time monitoring

<TEPCO's website>

<http://www.tepco.co.jp/en/nu/fukushima-np/f1/seawater/index-e.html>



③ Near South Discharge Channel

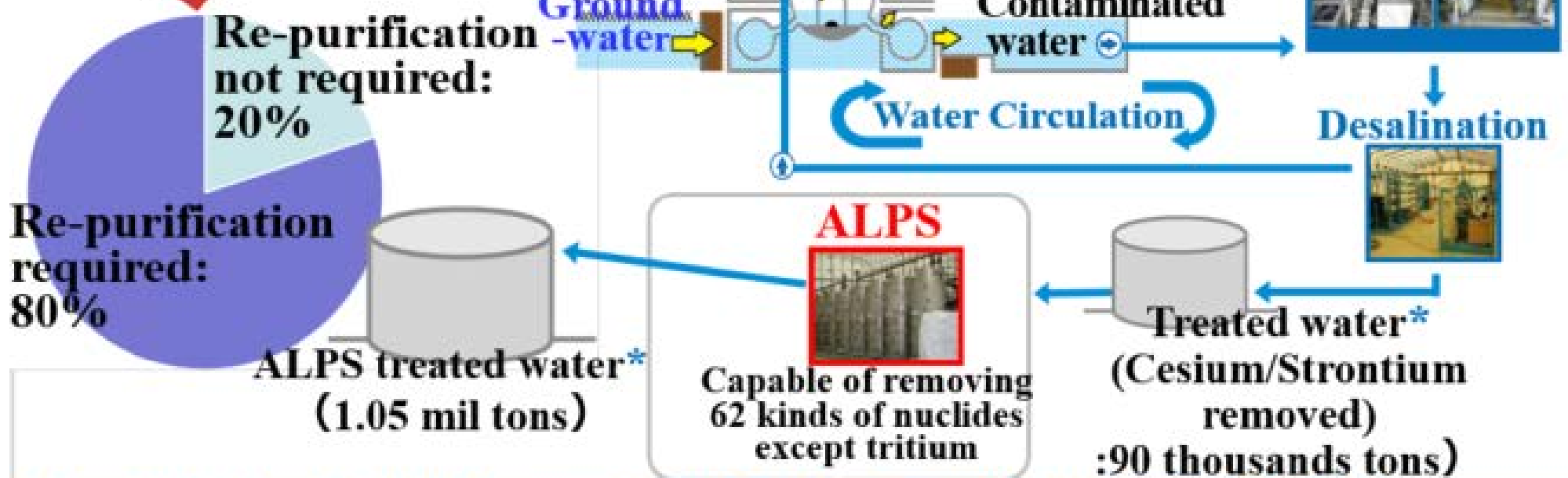


Fukushima Daiichi NPS

1.(4) ALPS treated water in tanks

- The aim of water purification using ALPS is to meet the criteria on the site boundary (less than 1mSv/year).
- If we are to discharge the treated water into the environment, the water should be re-purified in order to meet the criteria for discharging to the environment. (The share of water to be re-purified is 80%)

If treated water is to be discharged into the environment,



*Capacity of tanks will be increased to 1.37mil tons in 2020, but may not afford to accommodate additional treated water after summer in 2022.

1. (5) Handling of ALPS treated water

* 5 options and Long-term storage

➤ “The Tritiated Water Task Force (2013-2016)”

Technical feasibility (including monitoring to ensure safety), regulatory feasibility period and cost of five handling methods were examined;

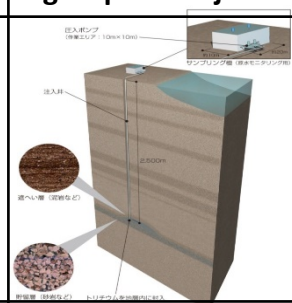
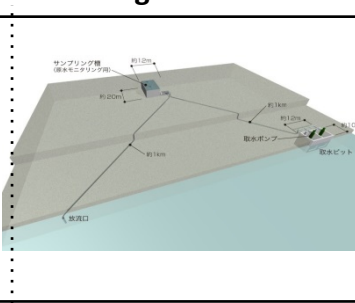
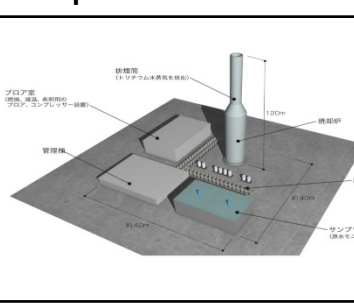
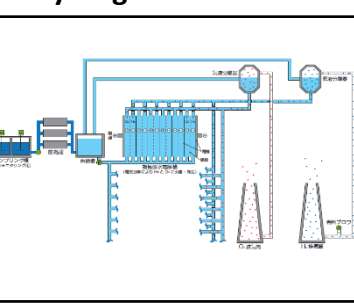
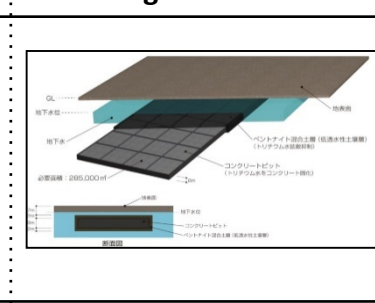
- ✓ All cases were examined on the premise that there is no scientific impact on the human habitant.
- ✓ Verification project showed that the separation technology for tritium cannot yet put into use.

➤ “The Subcommittee on Handling ALPS Treated Water (2016-)”

Five handling methods and long-term storage are examined in a comprehensive manner, including from the perspective of countermeasure for reputational damage and of ensuring scientific safety

➤ All the measures, throughout their implementation, are subject to the approval of Nuclear Regulatory Authority in accordance with the Reactor Regulation Act.

Table Results of assessment of Tritiated water task force

Method of disposal	(1) Example of geosphere injection	(2) Example of discharge to the sea	(3) Example of vapor release	(4) Example of hydrogen release	(5) Example of underground burial
Image					
Technical feasibility	<ul style="list-style-type: none"> - If proper stratum is not found, commencement of handling will be delayed. - There is no monitoring method established 	<p>Examples)</p> <ul style="list-style-type: none"> - Existing Nuclear facilities' liquid radioactive waste discharge to the sea 	<p>Example) TMI-2</p> <ul style="list-style-type: none"> - water volume: 8,700 m³ - Tritium volume: 24 tri. Bq. - Tritium conc.: 2.8mil. Bq/L - Total period: 2.8 years 	<p>To handle the ALPS treated water, R&D for pre-treatment and scale expansion might be needed.</p>	<p>examples)</p> <ul style="list-style-type: none"> - Concrete pit disposal site - Shut-off disposal site
Regulatory feasibility	It is necessary to formulate new regulations and standards related to disposal concentration	Feasible	Feasible	Feasible	New standards might be needed.

1. (5) Handling of ALPS treated water

* ALPS subcommittee

- “The Subcommittee on Handling ALPS Treated Water (2016-)
 - Under “the Inter-Ministerial Council for Contaminated Water and Decommissioning Issues”
- After receiving report of the subcommittee and having stakeholder discussion, GOJ will decide basic policy for the handling ALPS treated water.

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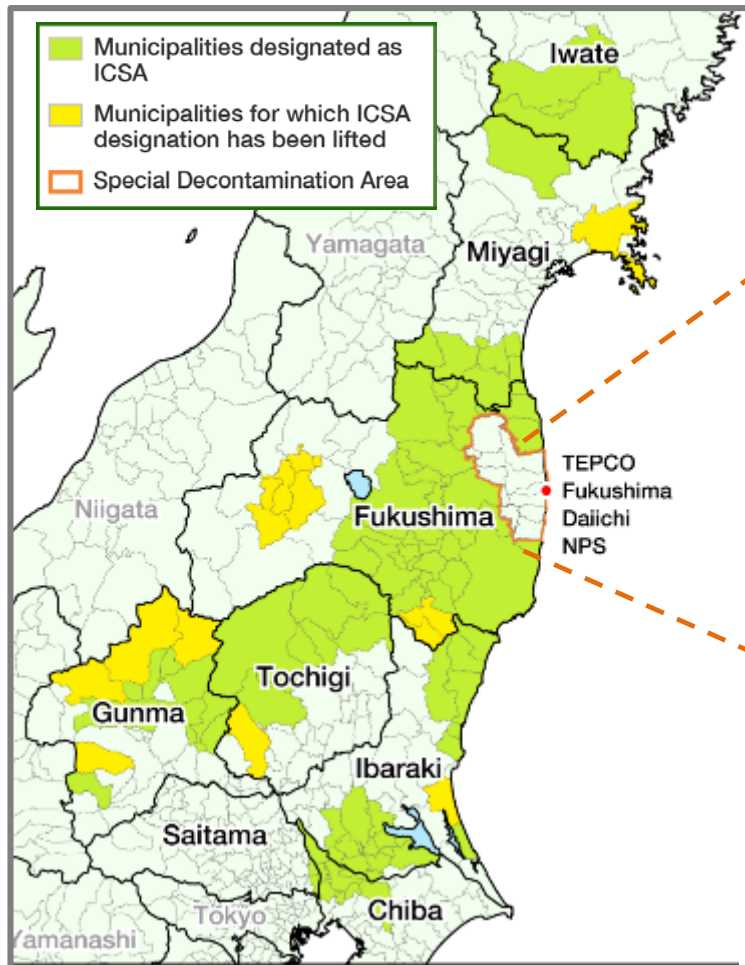
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- (3) Stakeholder involvement

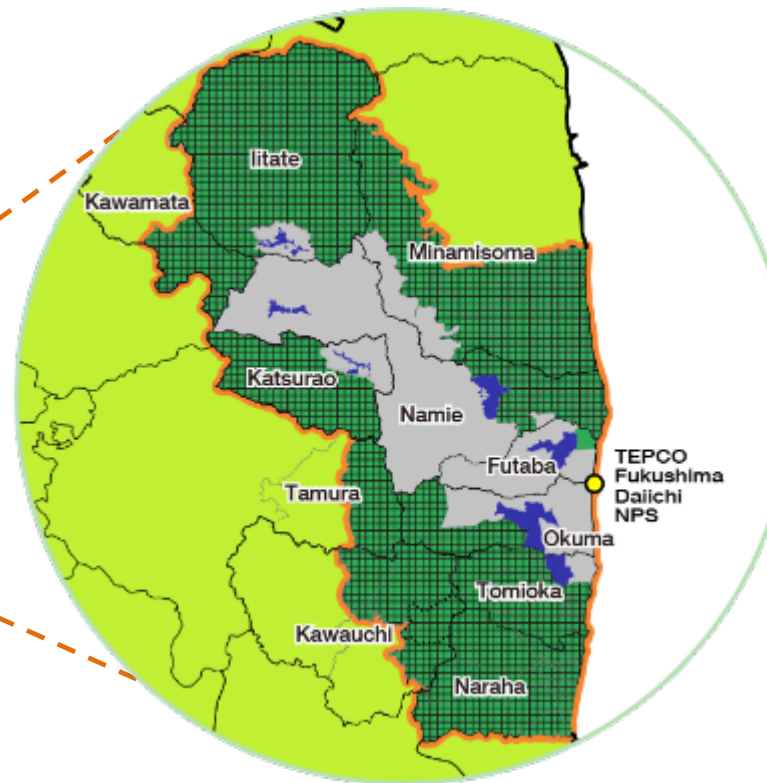
2. (1) Progress in the decontamination

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)>

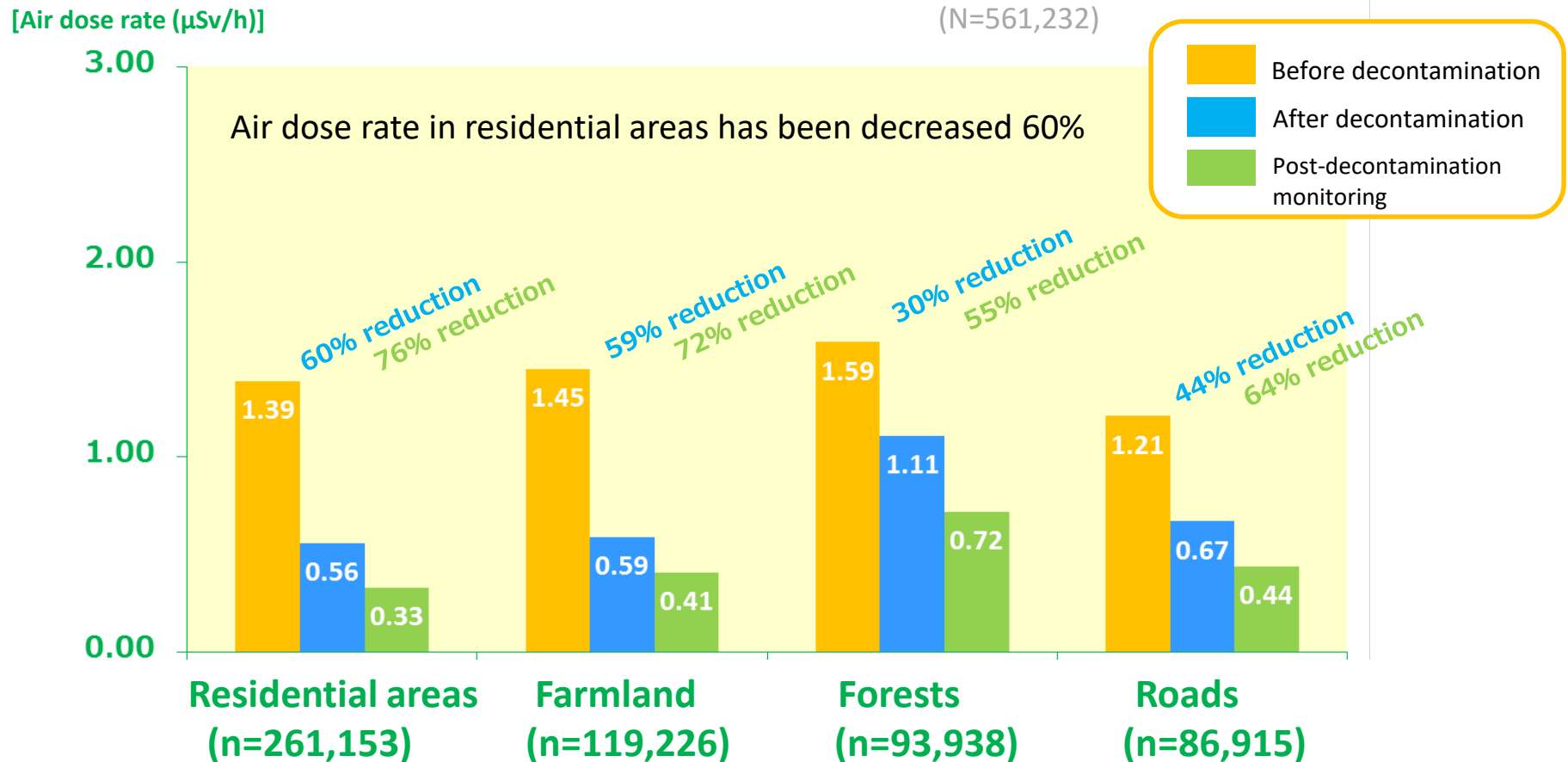


→ Whole area decontamination in the SDA was completed at the end of March 2017

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

2. (1) Progress in the decontamination - Effects of Decontamination

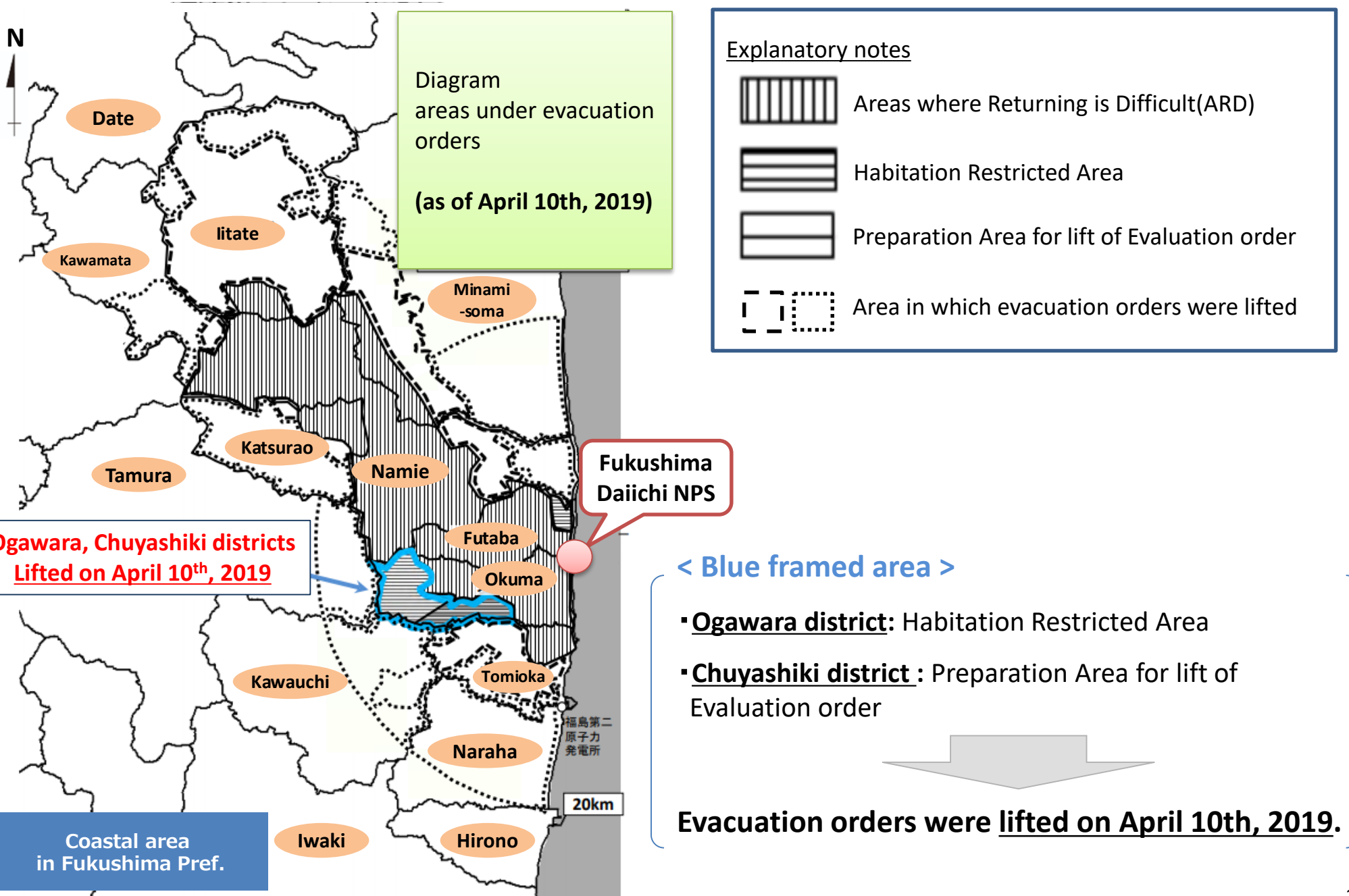
<Air dose rate measured at the height of 1m from the ground / Transition according to land category>



NOTE: 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

2.(2) Lift of evacuation orders

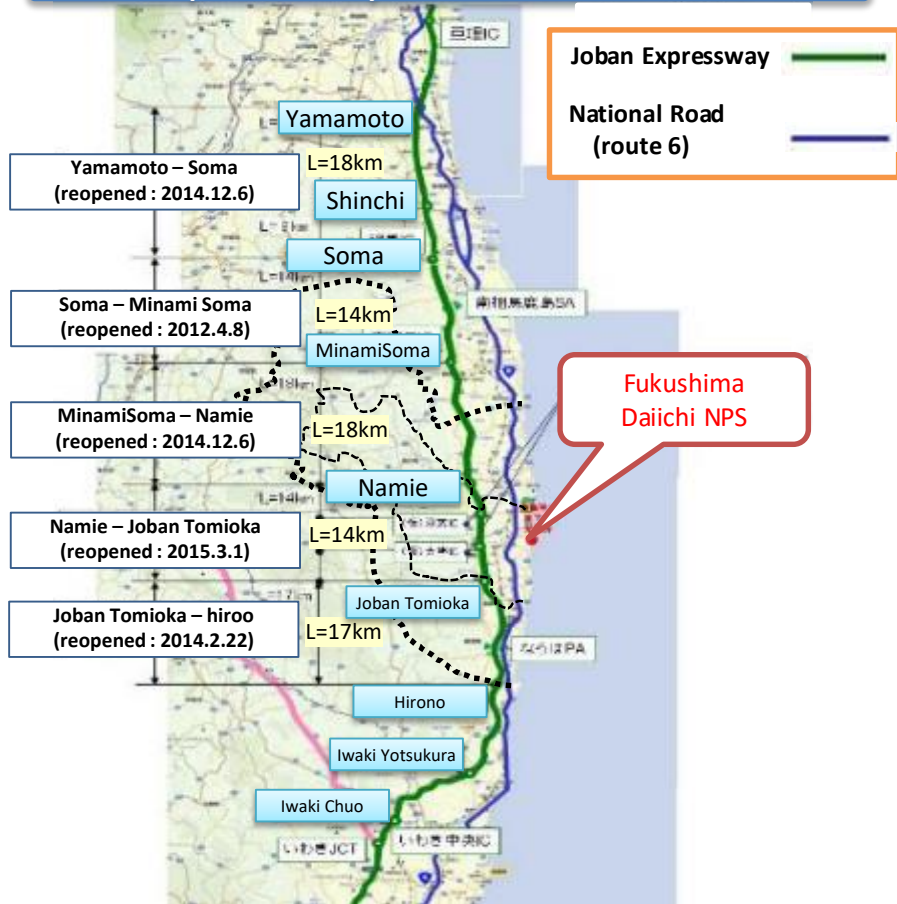


2. (2) Lift of evacuation order - Restoration of infrastructure

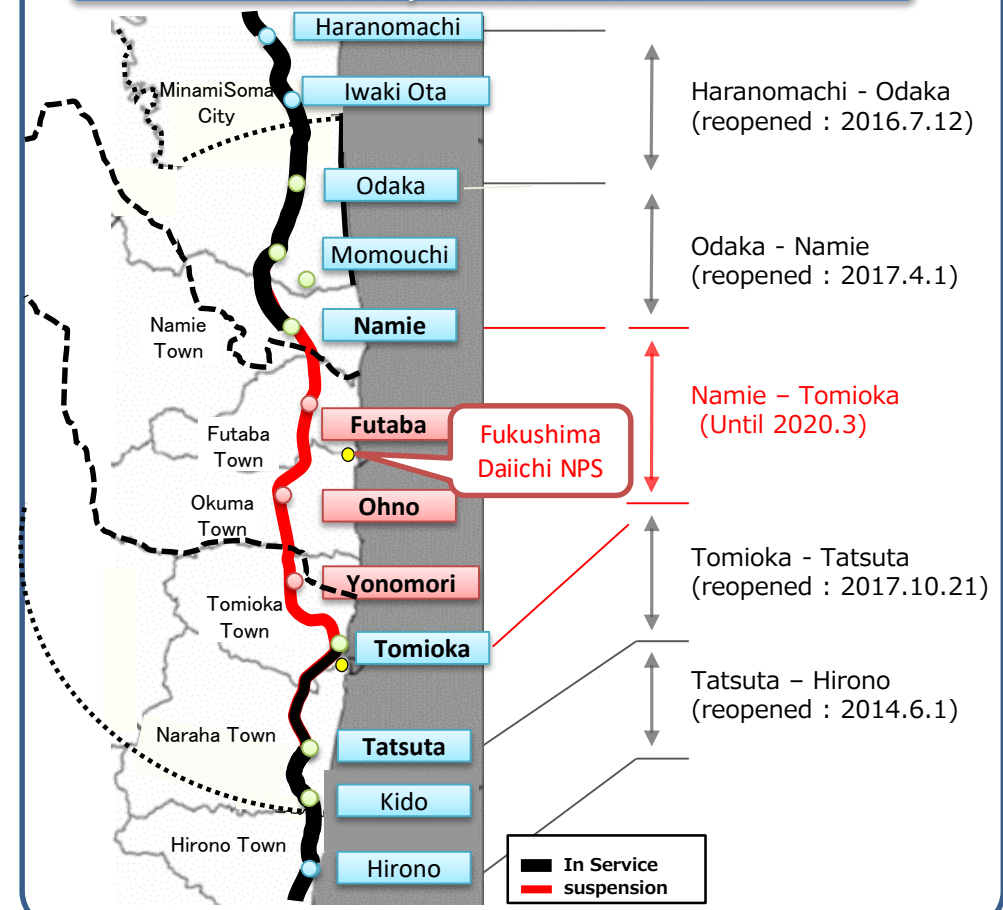
- Restoration of infrastructures, such as road and rail way, are making steady progress.

 areas under evacuation orders
 Former areas under evacuation orders

Express Way and National Road



Railway : JR Joban line



2. (2) Lift of evacuation orders - Reconstruction of area lifted evacuation order

School



Kusano Elementary · Iitoi Elementary ·
Usuishi Elementary · Iitate Junior High
School in Iitate
New open 2018.4



ODAKA Industrial Technology and
Commerce High School in Odaka
New open 2017.4

Medical service

Futaba Medical Center
in Tomioka
New Open 2018.4



A clinic in Katsurao
Reopened 2016.7 and 2018.11

Shopping mall

AEON Namie
2019.7 New open



Sports facility

J-Village (Reopened 2018.7 and 2019.4) in Naraha
(Soccer National training center)



Public facilities

Okuma town hall in Okuma
Reopened 2019.5



2. (2) Lift of evacuation orders - Re-establishment of local businesses

Consult by experts



Acquiring human resources



Acquiring new markets and customers



Resume operations



2. (3) Stakeholder involvement

Fukushima Advisory Board on Decommissioning and Contaminated Water Management

Purpose

- To respond quickly to local governments and local needs, it reinforces both providing information and maintaining communication with local stakeholders.
- To ask the local people about how to proceed with decommissioning and how to provide information and publication.
- To consider future decommissioning measures, etc. with the local stakeholders

Members

Chair : State Minister of Economy, Trade and Industry

Members :

- Deputy Governor of Fukushima Prefecture, Mayor of 13 local municipalities
- Chamber of commerce, Japan Agricultural Cooperative Fukushima Chuou-kai, Fukushima Prefectural Federation of Fisheries Co-operative Associations, NPO
- TEPCO, Nuclear Regulation Authority, METI, Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment

Thank you for your support for Fukushima!



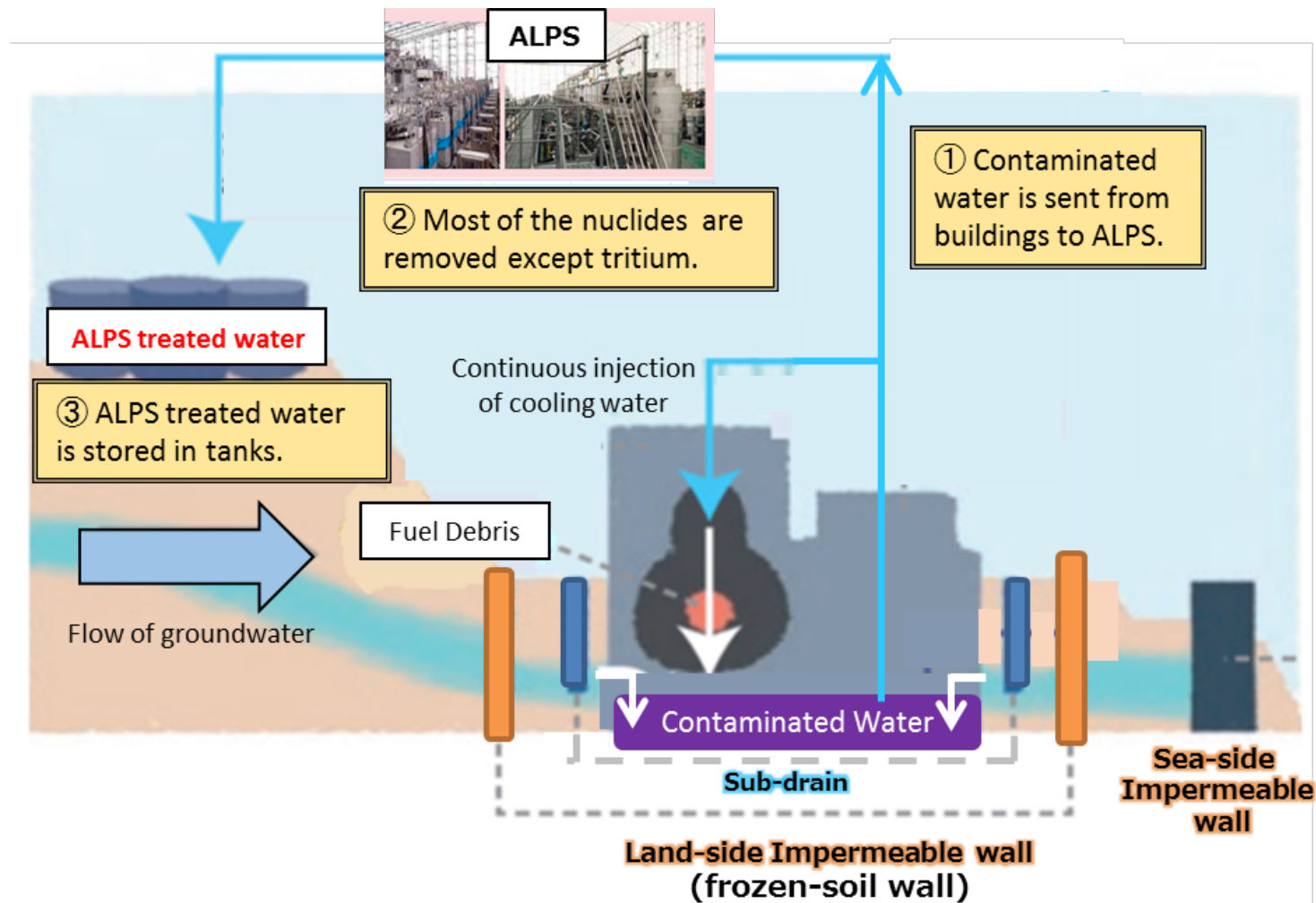
More info from here ↓

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.htm>

References:

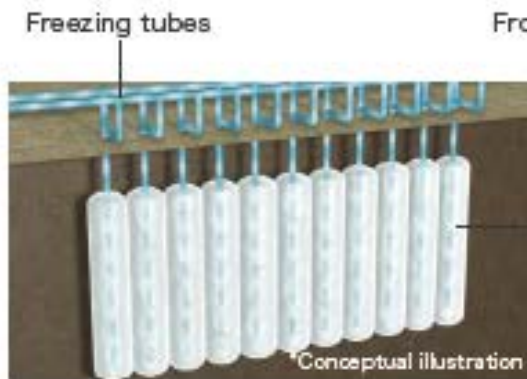
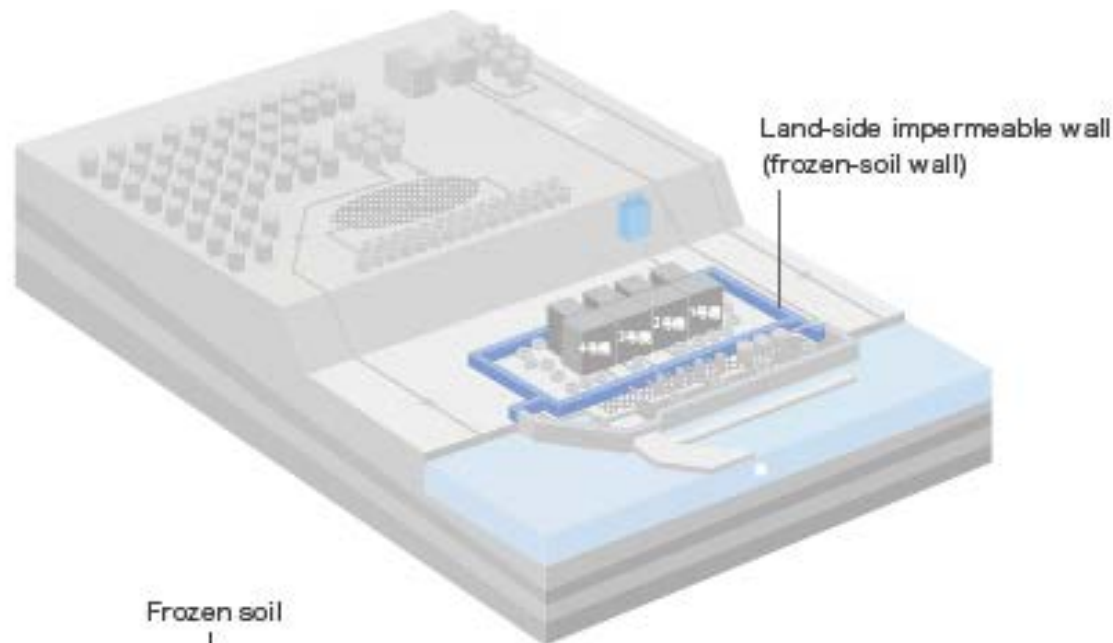
(Ref.1) Overview of Water Management - Multilayered Countermeasures -

- ◇ Contaminated water is generated by groundwater and rainwater which are flowing inside the unit 1 to Unit 4 buildings of the NPS.



(Ref.2) Frozen -soil wall

- ◇ Frozen-soil wall suppressed the generation of contaminated water by inflow of ground water.
- ◇ The amount of contaminated water had been reduced from 490 m³/day to 170 m³ /day, with other countermeasures such as sub-drain system.



Frozen-soil wall in the ground

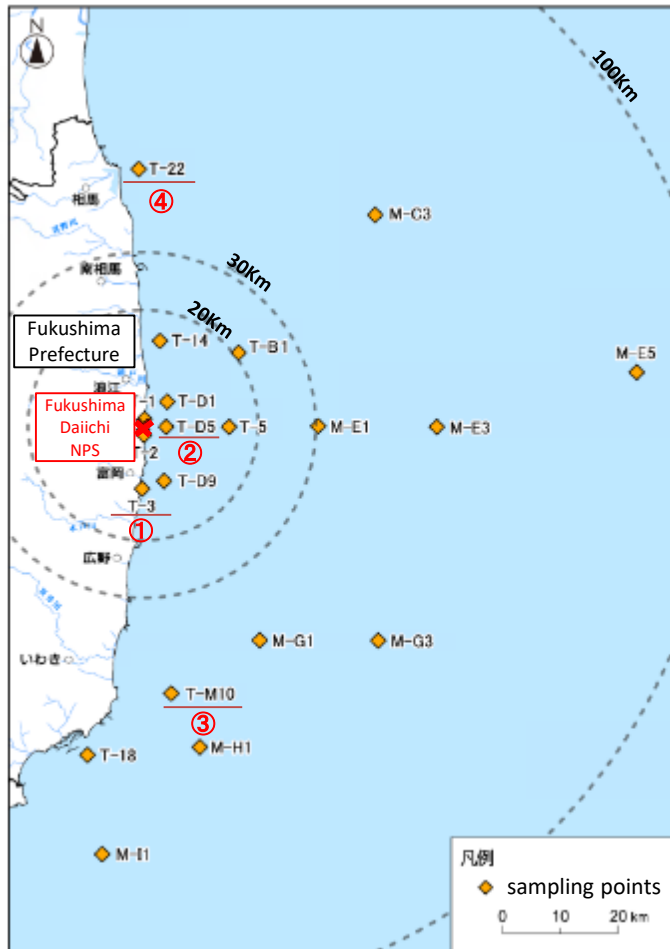


Actual situation of freezing
(thermometer reading is -10.6°C)

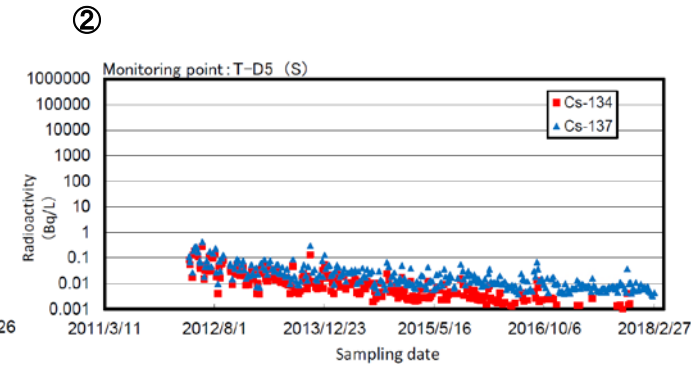
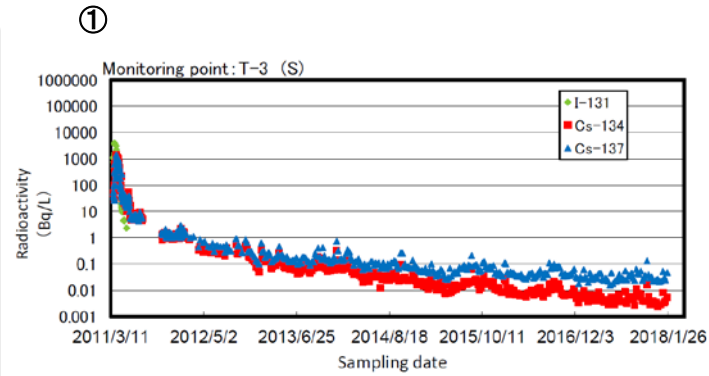


Freezing tubes

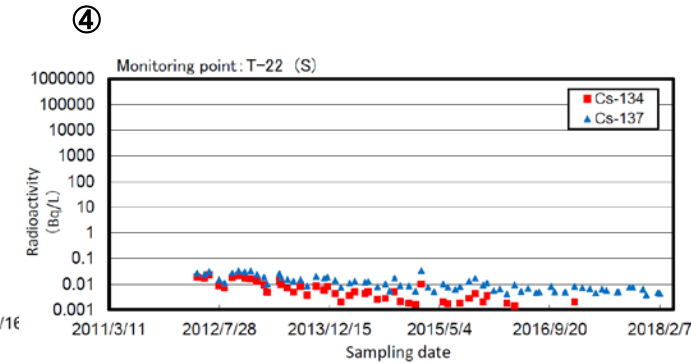
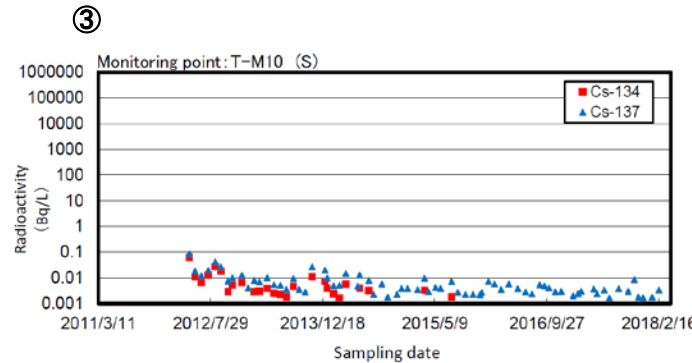
Seawater sampling points



~20Km from Fukushima Daiichi NPS



30~100Km from Fukushima Daiichi NPS

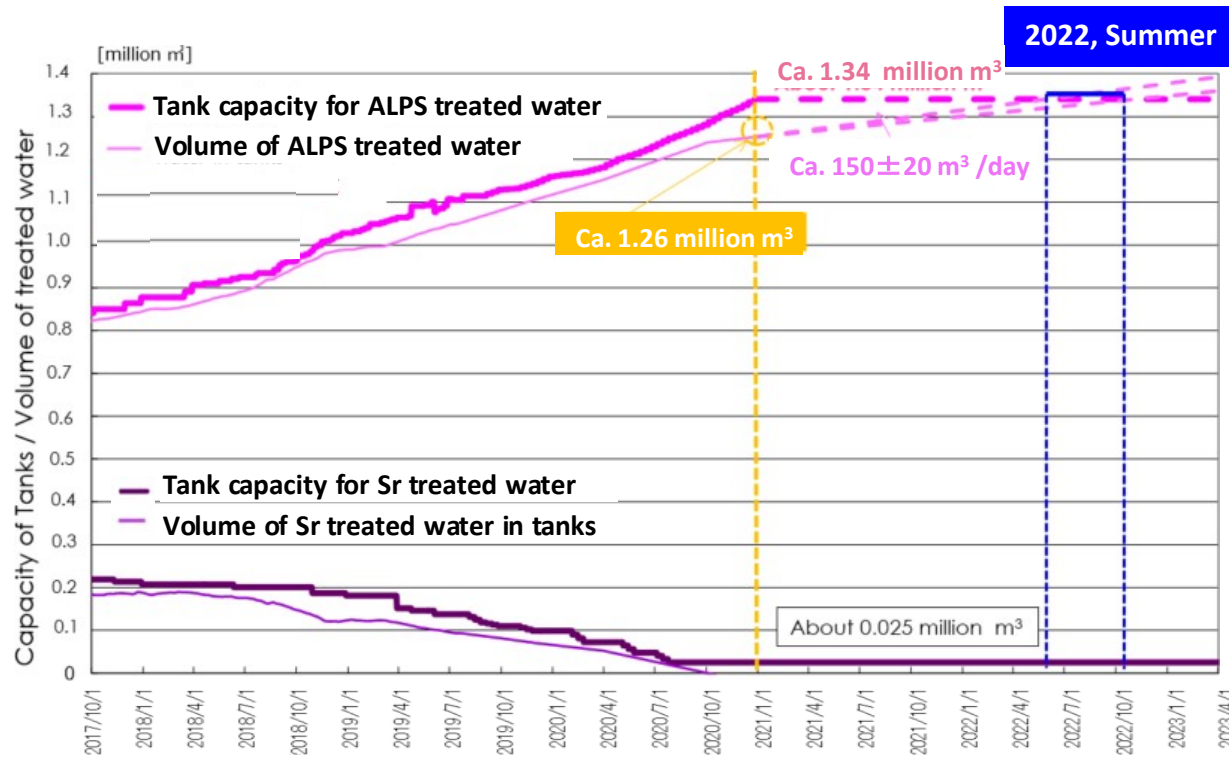


(Source : NRA website)

<https://radioactivity.nsr.go.jp/en/contents/8000/7742/24/engan.pdf>

(Ref.4) Discussion at ALPS subcommittee (9 August, 2019)

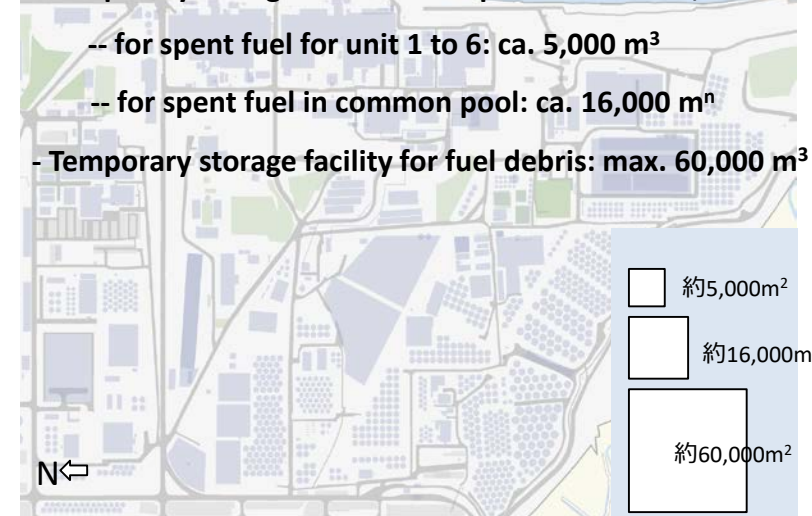
- Report from TEPCO at subcommittee (9 August, 2019)
 - Tank construction capacity: 1.37 million m³ by the end of 2020
 - * **Time to reach its full capacity (forecast): around summer of 2022**
 - **TEPCO will further examine its plan, considering limitation of site use as well as the tanks and other facilities which will be needed for decommissioning** .
- The subcommittee will continuously discuss on the handling of ALPS treated water including continuation of storage.



[Examples of facilities which will be needed for decommissioning work]

- 1) Tanks to store ALPS treated water
- 2) Temporary storage facilities for spent fuel and fuel debris

- Temporary storage facilities for spent fuel: ca. 21,000 m³
 - for spent fuel for unit 1 to 6: ca. 5,000 m³
 - for spent fuel in common pool: ca. 16,000 m³
- Temporary storage facility for fuel debris: max. 60,000 m³



【Source】

TEPCO handout material, The 13th Subcommittee on Handling ALPS Treated Water

(Ref.5) Current attributes of ALPS treated water

◇ Two regulatory Standards:

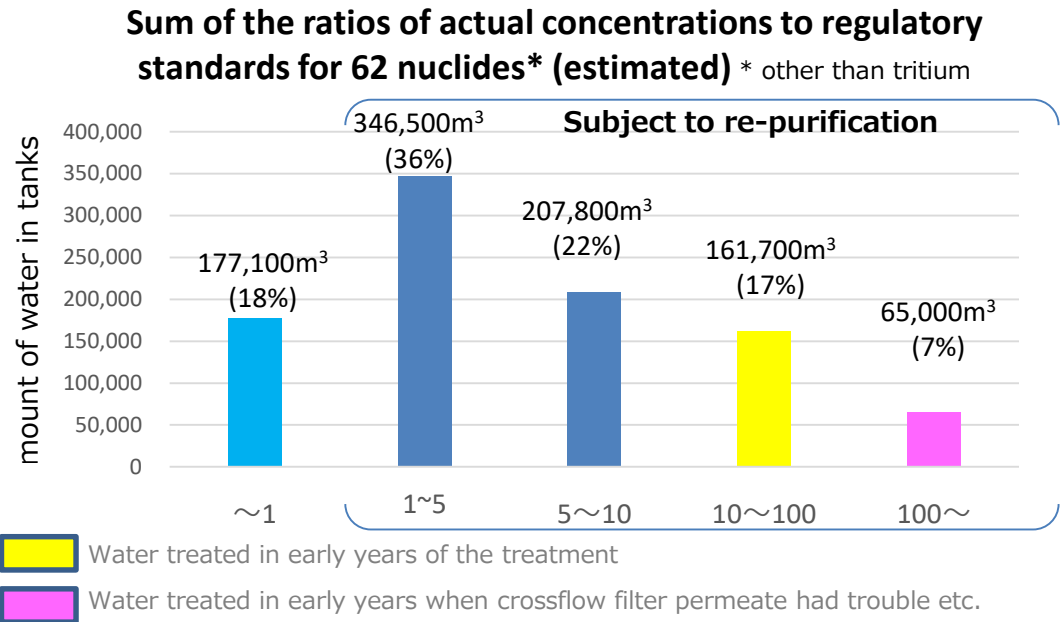
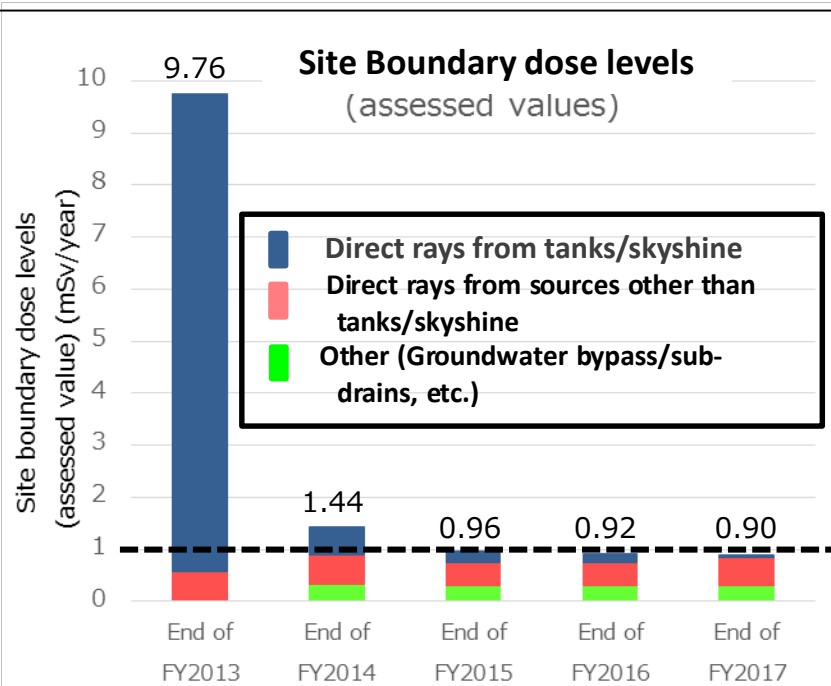
- 1) **Applicable to storage**: to keep site boundary dose levels less than 1mSv/year Current operational goal of ALPS
- 2) **Applicable to release to the environment**: to keep radionuclides concentrations of treated water less than the regulatory limit.

◇ There are various concentration of ALPS treated water in the tanks, because:

- Concentration of ALPS treated water depends on the attributes of water to be treated and operation management of ALPS such as frequency of absorbent exchange; and
- Especially in early years, before improvement of ALPS performance, concentrations of ALPS treated water is relatively higher.

◇ **In case of releasing ALPS treated water to the environment, the water needs to satisfy standard 2).**

- TEPCO announced to re-purify ALPS treated water, to meet standard 2) for radionuclides other than tritium.

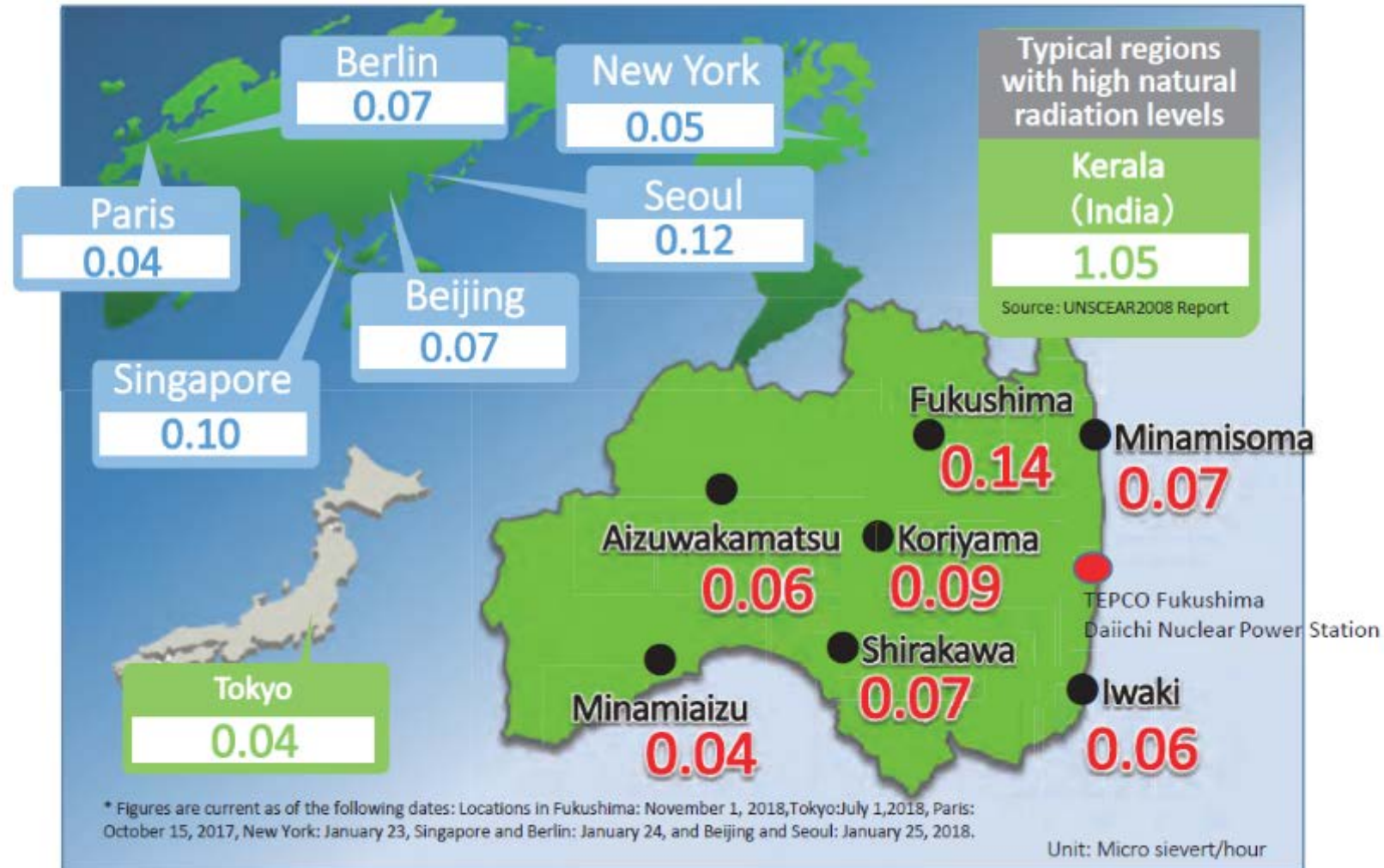


*These drawings are quoted from "Treated water portal site (TEPCO HP)"

(Ref.6) Air dose rate in major cities

Current State of Air Dose Rates within Fukushima

○ The air dose rate of major cities in Fukushima Prefecture is about the same level as other major cities overseas.



Source: Created by the Reconstruction Agency based on Fukushima Prefecture "Steps for Revitalization in Fukushima (24th)",

(Ref.7) Summary of the 4th IAEA Review (1)

- Team and scope of the review mission -

1. Review period

November 5-13, 2018



2. Review team composition:

Team leader: Mr. Christophe XERRI, Director, Division Nuclear Fuel Cycle and Waste Technology (NEFW), IAEA

13 experts: 9 from IAEA and 4 others from Indonesia, Russia, U.K., U.S.

3. Agenda of the peer review

- ✓ Current situation of Fukushima Daiichi
- ✓ Follow-up of the previous IAEA review
- ✓ Specific issues
 - Management of contaminated water
 - Removal of spent fuel and retrieval of fuel debris
 - Management of radioactive waste
 - Institutional and organizational issues



[Ref.]

1st mission : April 15-22, 2013
2nd mission : November 25 – December 4, 2013
3rd mission : February 9-17, 2015

4. Main findings

- IAEA team said Japan has made significant progress since the accident in March 2011, advancing from an emergency situation towards a stable situation now.
- The team acknowledged a number of accomplishments since the 2015 mission, including:
 - The repair of subdrains and construction of the frozen soil wall around reactor Units 1-4, which have reduced groundwater ingress into the reactor buildings.
 - Improved site working conditions including a reduced need for full protective gear, and real-time radiation monitoring easily accessed by the workforce.
 - Progress towards the removal of spent fuel from Units 1-3 as well as remote investigations of fuel debris by robots.
- The team said the Government of Japan, in engaging all stakeholders, should urgently decide on a disposition path for ALPS treated water. The treated water is accumulating in tanks on site and is expected to reach the currently planned tank capacity within three to four years.

* Totally 17 acknowledgements and 21 advisory points are provided in the preliminary summary report.



5. Management of ALPS Treated Water Stored in Tanks

As stated in the previous Review missions, the IAEA Review Team is of the opinion that the present plan to store the ALPS treated water containing tritium and other radionuclides in above ground tanks, with the current capacity of 970,000 m³, can only be a temporary measure while a more sustainable solution is needed.

Currently, the Government of Japan is considering five solutions including the possible resumption of controlled discharges to the sea, which are routinely used by operating nuclear power plants and fuel cycle facilities in Japan and worldwide, and for which a large amount of information is readily available.

Acknowledgement

The IAEA Review Team acknowledges the work done by METI to identify possible technologies to remove tritium and assess possible disposition paths. The IAEA Review Team also acknowledges ongoing dialogue with all stakeholders, and especially with the local communities. The IAEA Review Team also takes note of the statements issued by the Nuclear Regulation Authority (NRA) on the management of ALPS treated water.

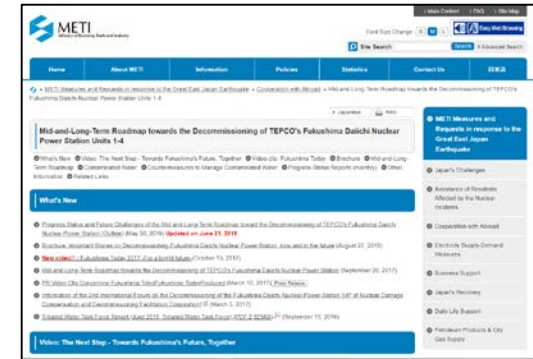
Advisory Point

The IAEA Review Team holds that a decision on the disposition path for the stored ALPS treated water containing tritium and other radionuclides, after further treatment as needed, must be taken urgently, engaging all stakeholders, to ensure the sustainability of the decommissioning activities and of the safe and effective implementation of other risk reduction measures.



◆ Decommissioning and Contaminated Water Management at TEPCO's Fukushima Daiichi NPS

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html>



◆ Film, Fukushima Today 2018 - Efforts to Decommission and Reconstruction

<https://www.youtube.com/watch?v=TZV2HRKNvao>



FukushimaToday Search



◆ Treated Water Portal Site

<http://www.tepco.co.jp/en/decommission/progress/watertreatment/index-e.html>



◆ Observation Data, Fukushima Daiichi NPS

https://www7.tepco.co.jp/responsibility/decommissioning/1f_newsroom/data/index-e.html





◆ Fukushima Daiichi Status Updates

<https://www.iaea.org/newscenter/focus/fukushima/status-update>



◆ IAEA Review mission reports (Press release)

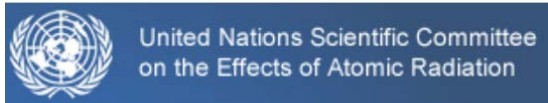
IAEA Team Completes Fourth Review of Japan's Plants to Decommission Fukushima Daiichi (November 13, 2018)

<https://www.iaea.org/newscenter/pressreleases/iaea-team-completes-fourth-review-of-japans-plans-to-decommission-fukushima-daiichi>



IAEA Issues Final Report on Fourth Review of Fukushima Decommissioning (January 31, 2019)

<https://www.iaea.org/newscenter/pressreleases/iaea-issues-final-report-on-fourth-review-of-fukushima-decommissioning>



◆ UNSCEAR 2016 REPORT Annex C - Biological effects of selected internal emitters-Tritium

https://www.unscear.org/docs/publications/2016/UNSCEAR_2016_Report-CORR.pdf

