

Fukushima Remediation - Soil Transportation & Storage

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**035 Panel: Fukushima Daiichi NPP-Focus on
Offsite Cleanup and International Collaboration
WM Symposia 2017, Phoenix, Arizona**

1 Demanding constraints in procurement

Workers in cleanup projects in Special Decontamination Area ^{*(1)} was about to count 20,000.



^{*(1)} Special Decontamination Area in 3 categories (with changes in designation and demarcation):

- 1) Evacuation zone
- 2) Deliberate evacuation zone
- 3) Evacuation prepared zone

1 Cleanup works carried out

● Structures

1

2

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STEP 1: Wipe out roof and gutter (horizontal), wall



STEP 2: High-pressure wash on roof gutter (vertical)



STEP 3: Care on ground – remove sediments, weed, shallow-cut, cover



1 Cleanup works carried out

● Structures

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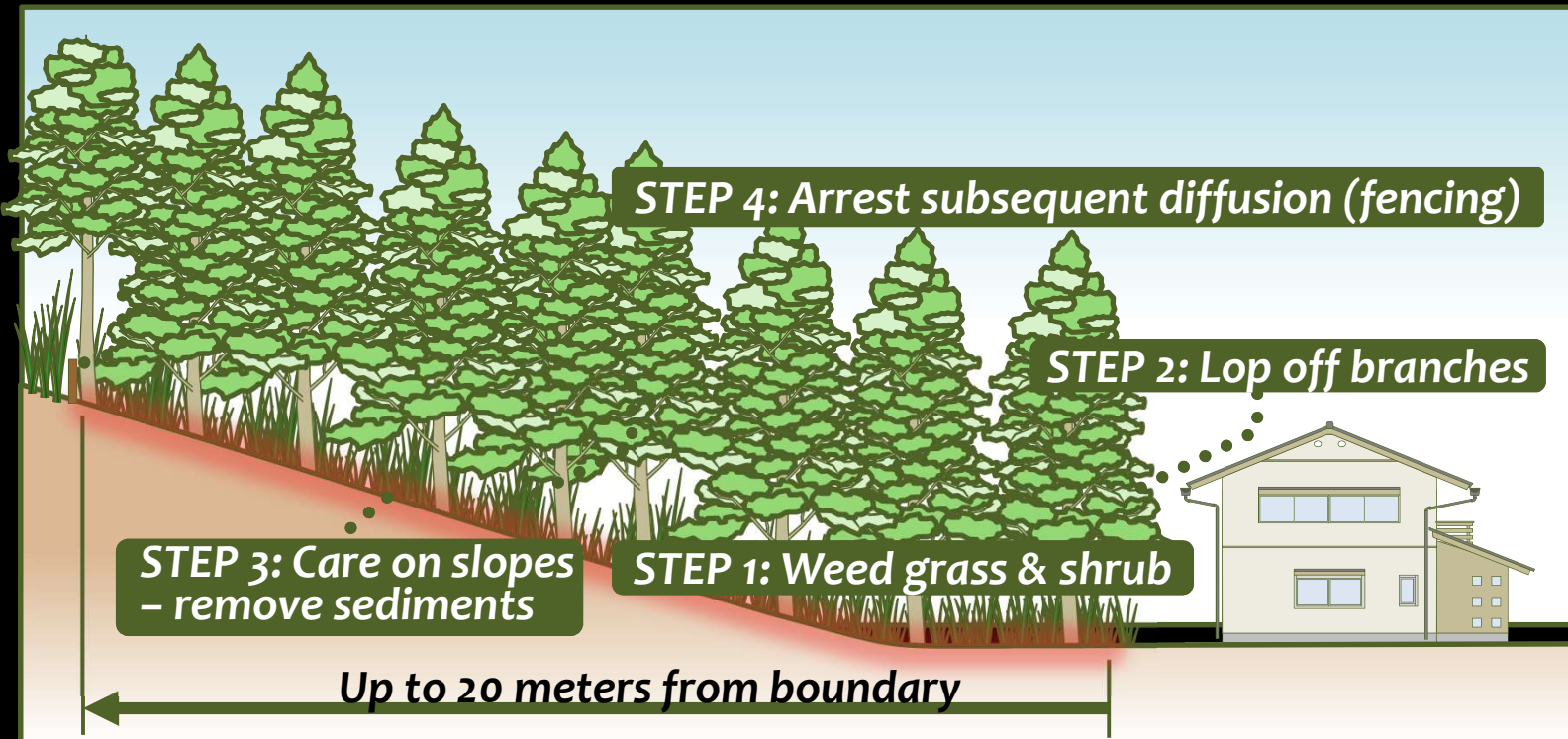


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1 Cleanup works carried out

● Woods



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1 Cleanup works carried out

● Woods

1



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1 Cleanup works carried out

● Roads

1



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1 Cleanup works carried out

● Fields

1



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1 Mechanism to assure the Works

1) Provision

- legislation
- Standards and guidelines
- Contracts - Conditions/Specifications
- Procurement

2) Pilot projects

- Procure prior to full-scale contracts

1 Mechanism to assure the Works

3) Full-scale contracts - Bidding stage

- Two envelops (technical + commercial) evaluated, and technical first
- Additional scores for new and better technologies
- Technical development and method statement are of crucial importance

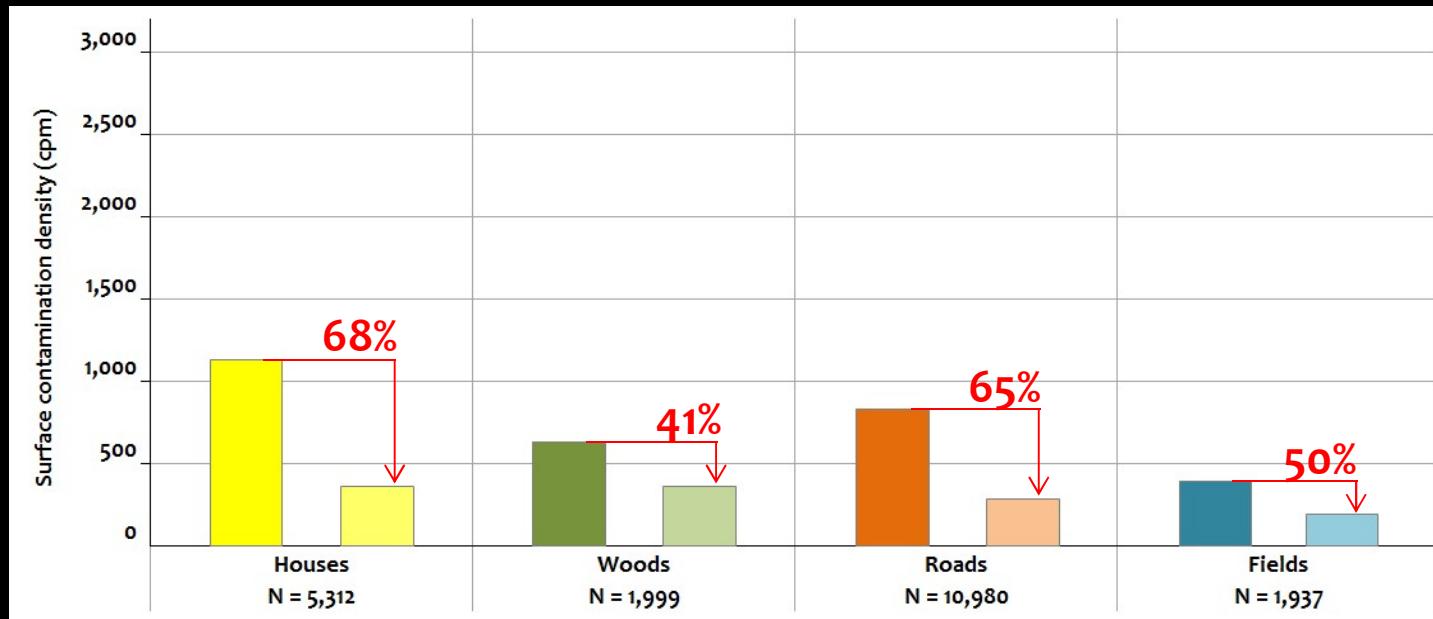
1 Mechanism to assure the Works

4) Full-scale contracts - Execution stage

- Trials/feedbacks on activities at the initial phase of contract to agree on fine-tuning from the Guidelines – fit for local conditions via change orders
- Residual hot-spots to be taken care of

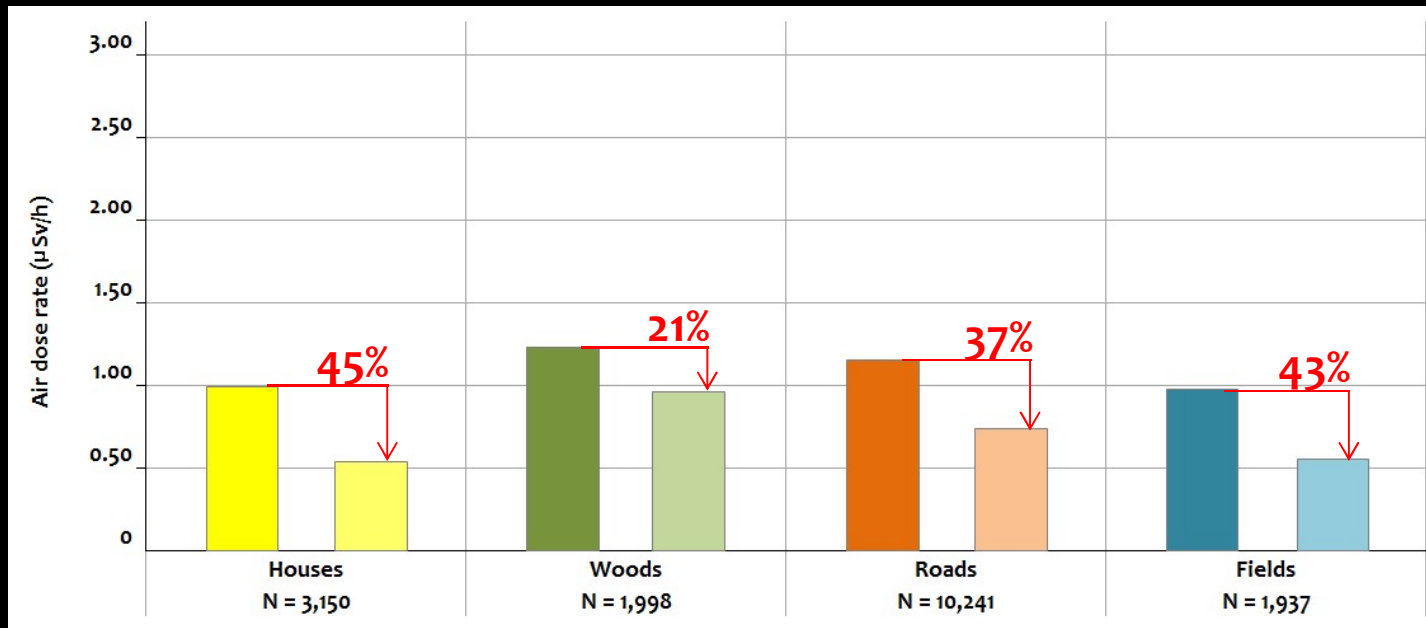
2 The Works output

- Surface contamination density before/after cleanup (OBAYASHI's case)



2 The Works output

- Air dose rate (1m) before/after cleanup (OBAYASHI's case)



2 The Works output

1

Concern 1: Degree of Decontamination

2

VS.

3

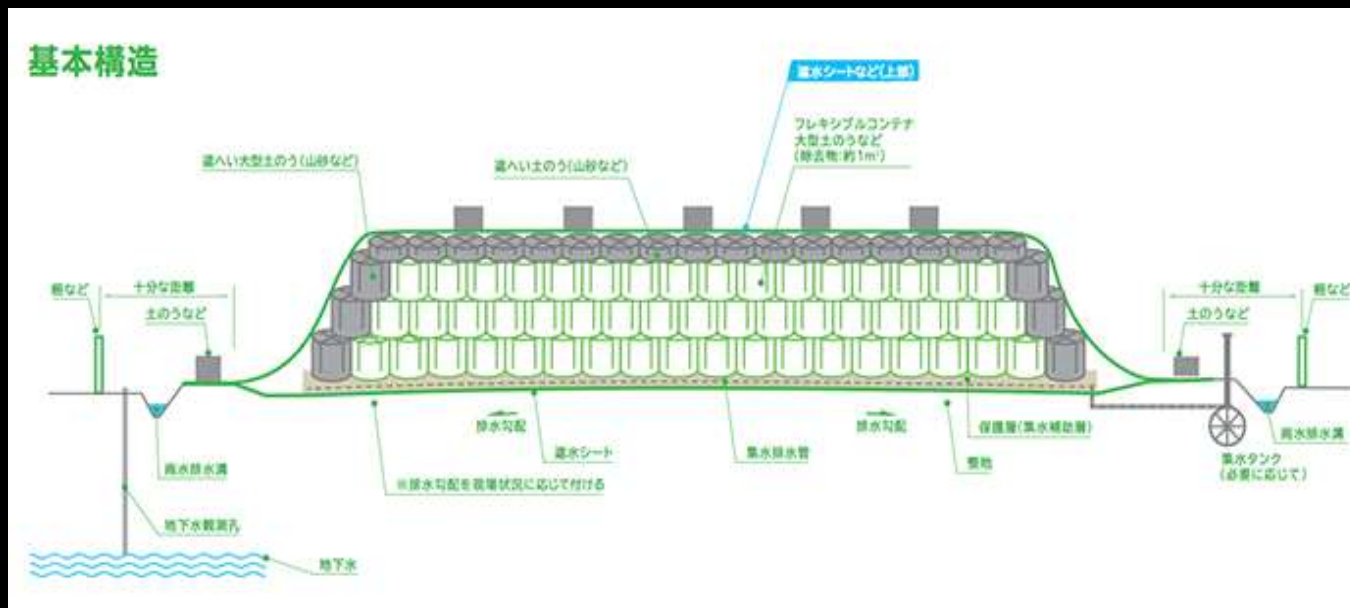
Concern 2: Urgency of Separation

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2 Temporary separation from the Public

- Typical section of storages to temporarily arrest contamination



Source: MOE

2 Temporary separation from the Public

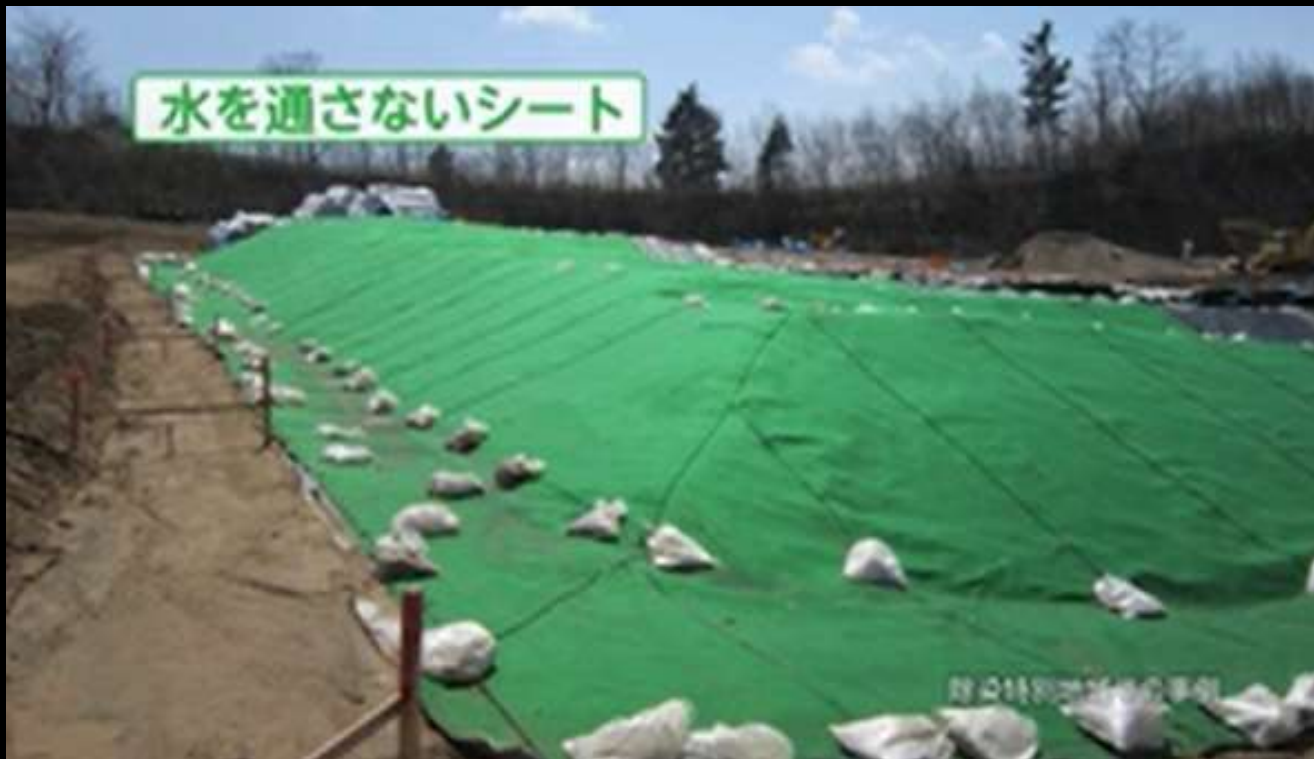
- Numerous containers generated and stored



Source: MOE

2 Temporary separation from the Public

- Temporary storage site counts > 2,000



Source: MOE

OBYASHI 

2 Temporary separation from the Public

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**Arrested 1 m³ container
bags expected to count
> 20 million**

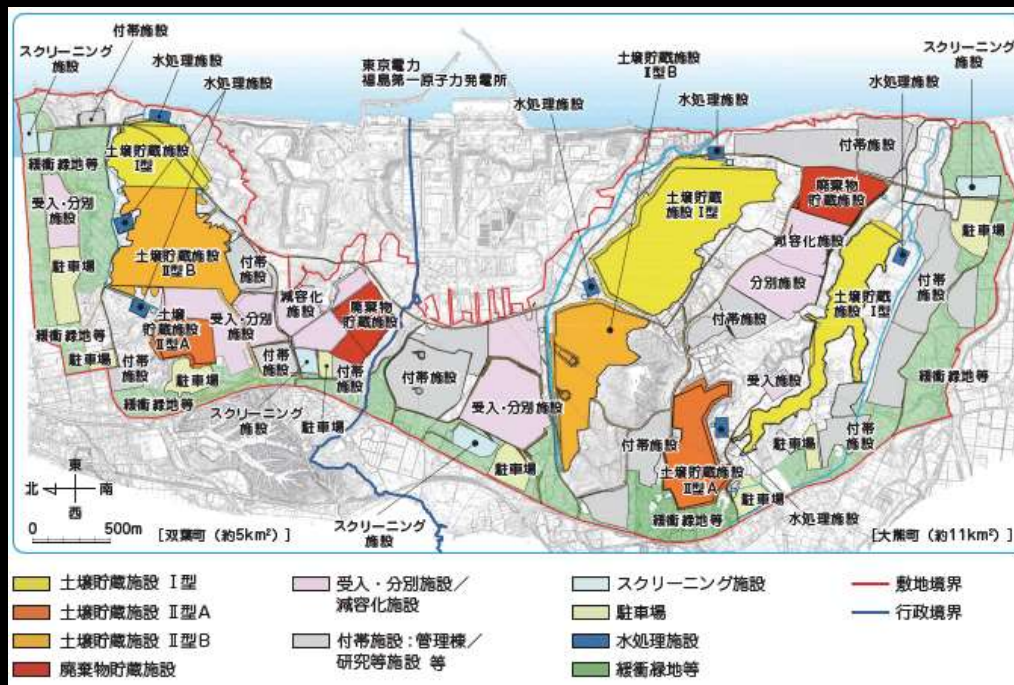
2 The Works get into the new phase



Source of Map: MOE

2 The Works get into the new phase

- 30-year interim storage profile



Source: MOE

to function:

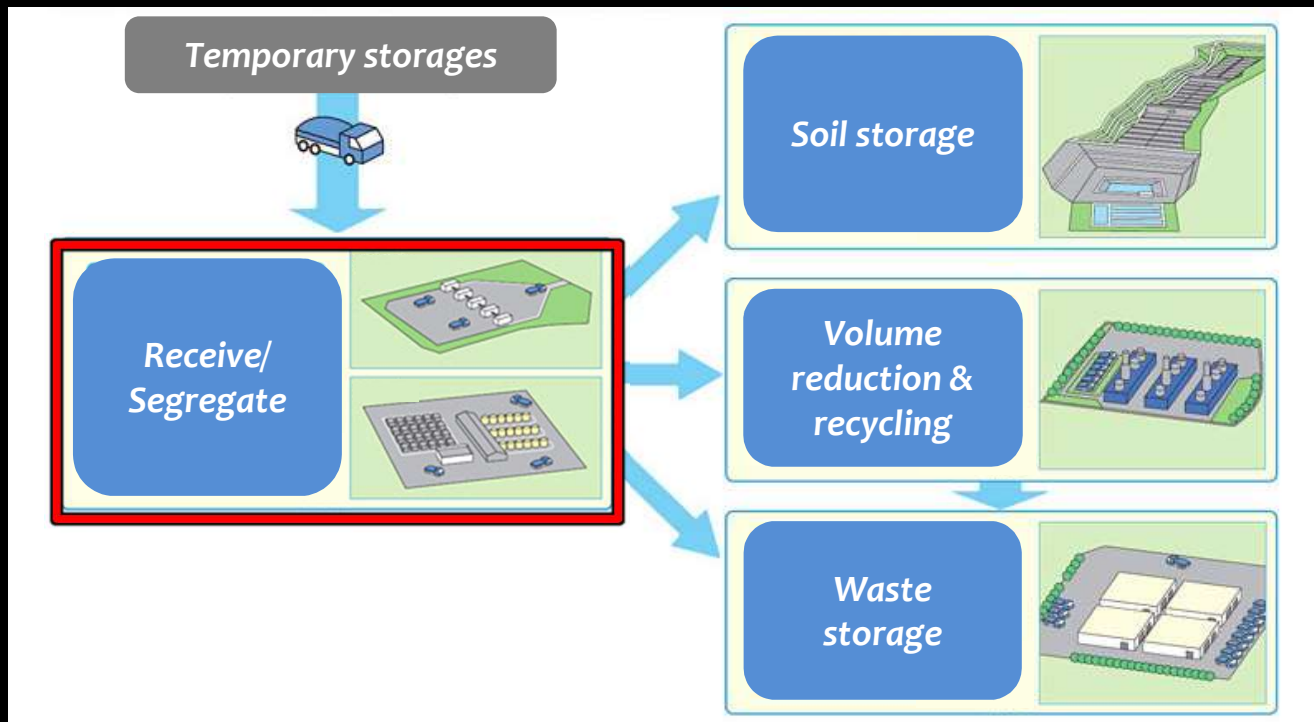
➤ Receive & segregate

➤ Store Type I & II

upon degree of contamination

2 Transportation & interim storage

- What will be done at Interim Storage?



Source: MOE

2 Transportation crucial to the Works



Source of Map: MOE

3 Pilot Transport for transportation & interim storage

- To validate in transportation part:
 - 1) Traceability of:
 - a) Container bags with respective ID from temporarily stored areas/spots to interim storage
 - b) Conventional transport
 - 2) Certainty of integrated data accumulation
 - 3) Health & safety for public and workers

3 Crucial transportation to the Works

- EX: Reclamation of West Japan Int'l Airport



Volume of
rock & soil =
10 times of
Fukushima
Soil

3 Crucial transportation to the Works

- EX: Reclamation of West Japan Int'l Airport



Limited origins to
single destination

3 Crucial transportation to the Works

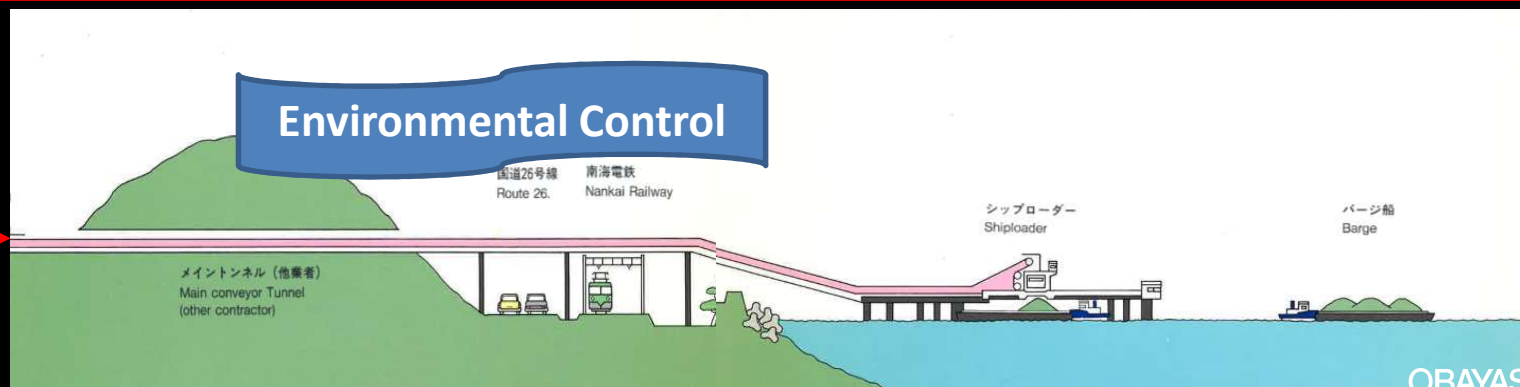
- EX: Reclamation of West Japan Int'l Airport



Independent
& fixed belts
installed
fitting-for-
purpose

3 Crucial transportation to the Works

- Fit-for-purpose fixed belts to the shoreline



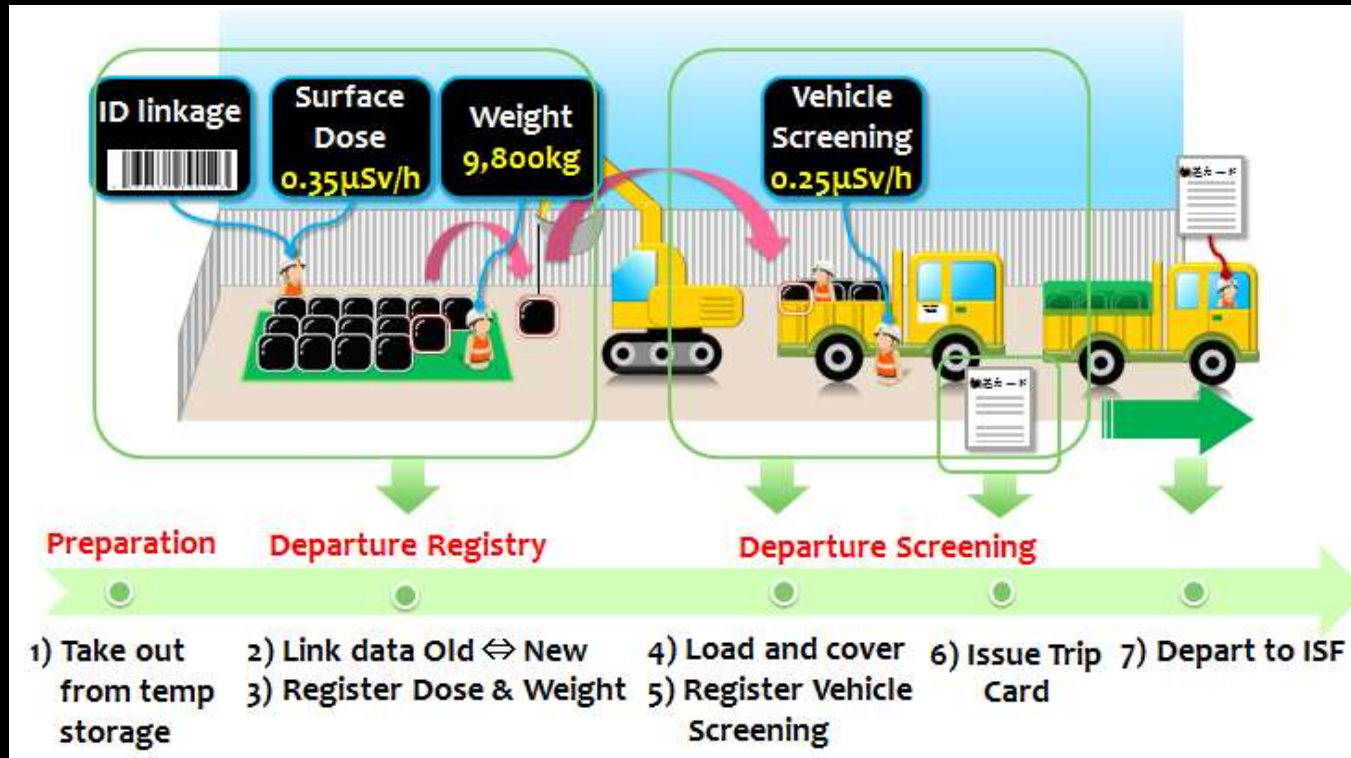
3 Crucial transportation to the Works

VS.

**Conventional transport on
existing public road network
at Case Fukushima Soil**

3 Crucial transportation to the Works

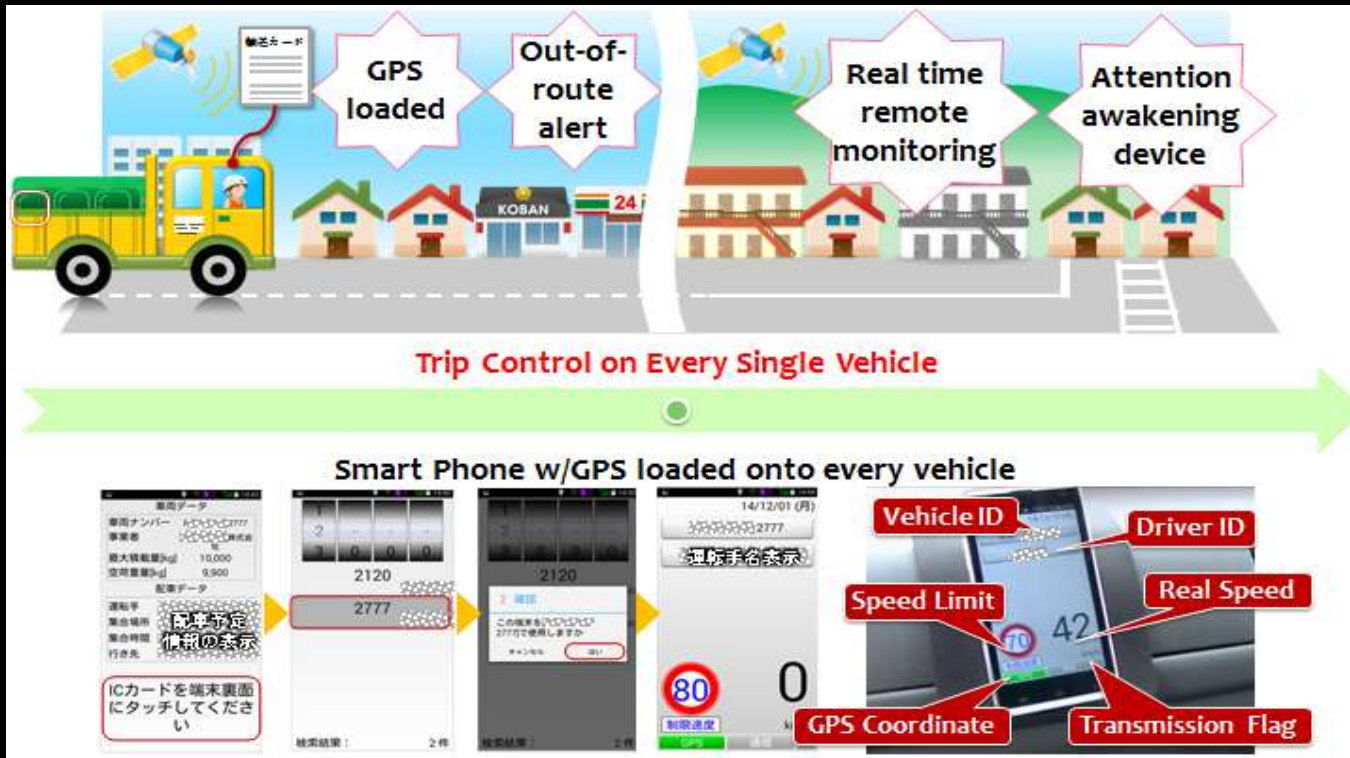
● Case Fukushima Soil



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3 Crucial transportation to the Works

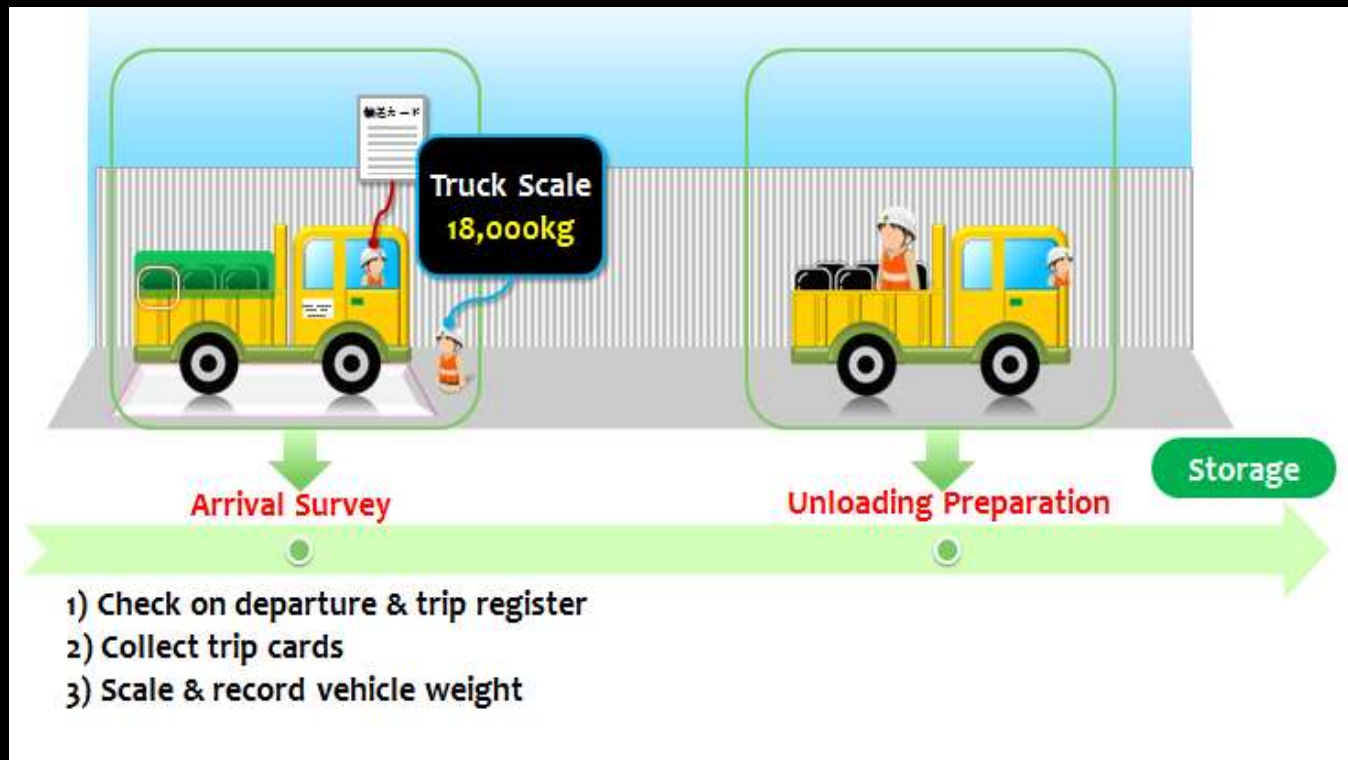
● Case Fukushima Soil



2/5

3 Crucial transportation to the Works

● Case Fukushima Soil



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3 Crucial transportation to the Works

- Case Fukushima Soil



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3 Crucial transportation to the Works

- Case Fukushima Soil



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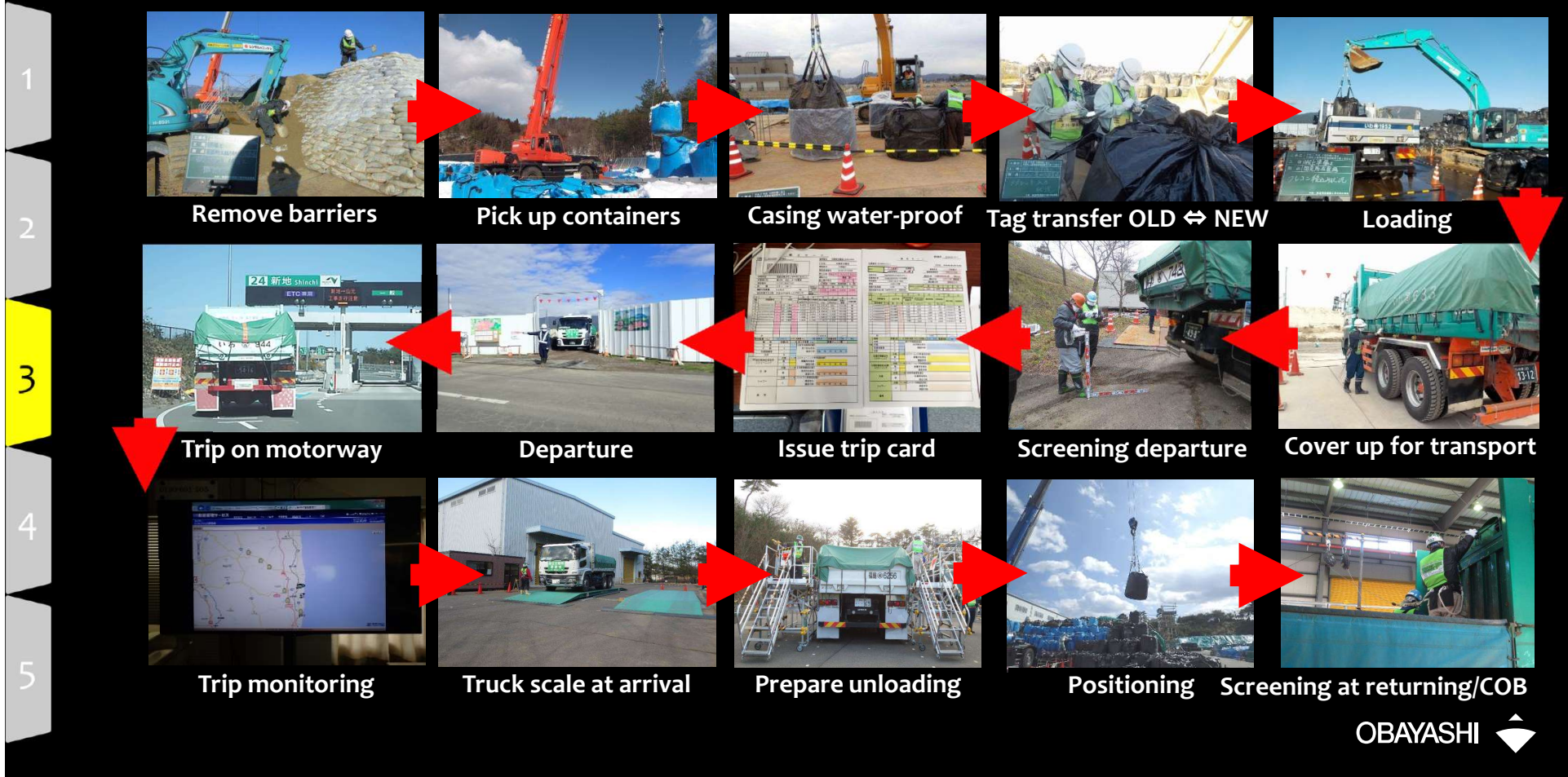
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3 Crucial transportation to the Works



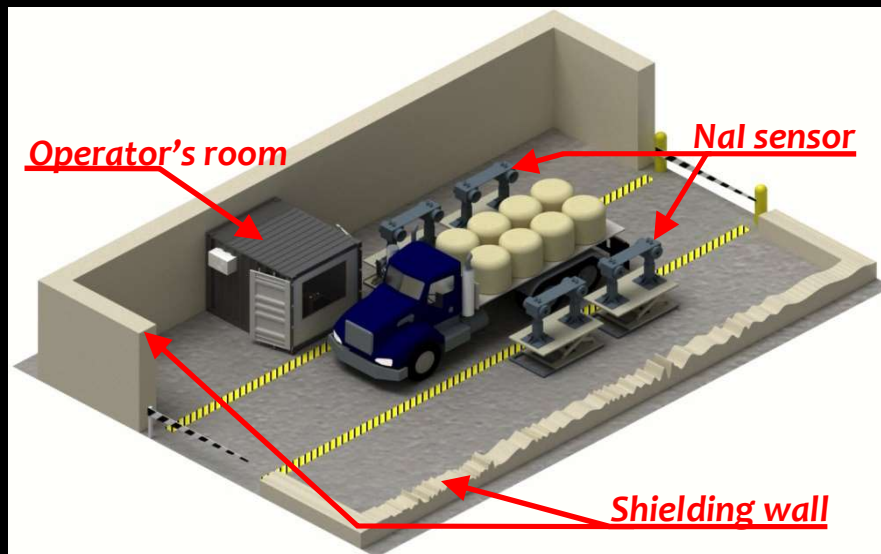
3 Crucial transportation to the Works

● Comparison: Transportation

		West Japan Int'l Airport	Fukushima Interim storage
Origin & Destination		Limited origins to single destination	Numerous origins to single destination
Soil Delivery		Independent & fixed belts fir-for-purpose	Dependent on existing public road network
State of Soil		Raw & continuous on belts	Every 1 m ³ contained in hard-duty container bag
Financial Viability	Unit Price per ton-km	Economical	Ordinal
	Return on End Operation	Constant annual revenue	NIL at the moment
Site Management	Quality Control	Different but even on respective criteria	
	Environmental Control	Noise, vibration & dust	Radiation supercedes
	Safety Control	Ordinal construction	Traffic + radiation

4 R & D for Interim Storage

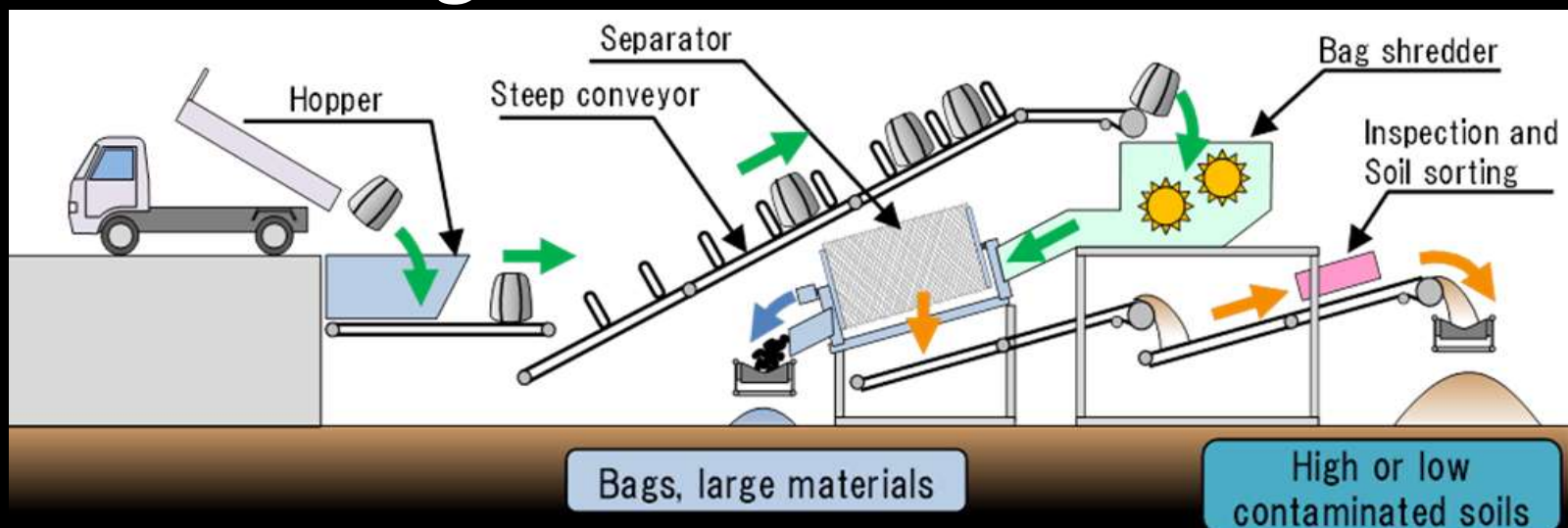
- Gate Sorting: Co-developing multiple-bag survey system minimizes the time to survey contamination and of workers' exposure



- **Simultaneous** measurement on **multiple** container bags
- Adaptability on various sizes and heights of truck bed
- **Optimization of positioning time** at the storage

4 R & D for Interim Storage

- Core Sorting: Co-developing fast & accurate sorting system segregates soil in accordance with the degree of contamination



4 R & D for Interim Storage

- Volume Reduction & Recycling
 - Minimize stored soil volume: burden to next generation
 - Minimize via compilation of latest first-class sorting & recycling technology
 - Currently working on segregation
 - Combusting & washing technologies to follow to be verified

5 Cleanup is extensive project management

- Local: Contractors stay on technically competitive edge and exhibit expertise in networking at emergency for quick delivery
- International: Every cross-cutting approach helps and shapes good with respective partner's long-term experience
- Everything for staying with local stakeholders' demand and satisfaction