



Several Measures to Enhance the Forest Function of Preventing Natural Disasters

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～ Outline of the Presentation～

1 . Features of the National Land of Japan

2 . Former Japanese Forest and
the History of Forest Rehabilitation

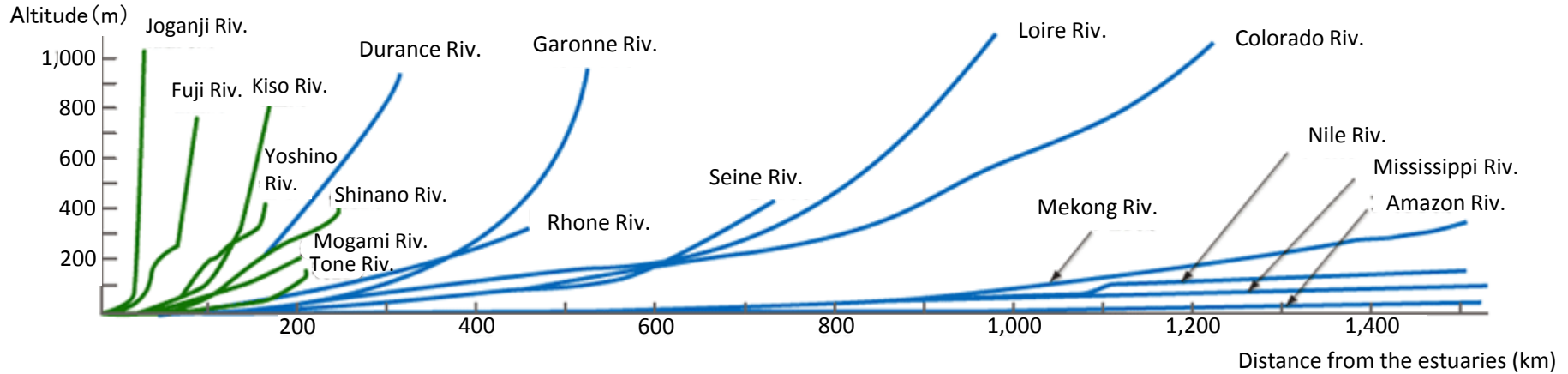
3 . Several Measures to Enhance the Forest Function
of Preventing Natural Disasters

4 . International Cooperation of Japan

1. Features of the National Land of Japan

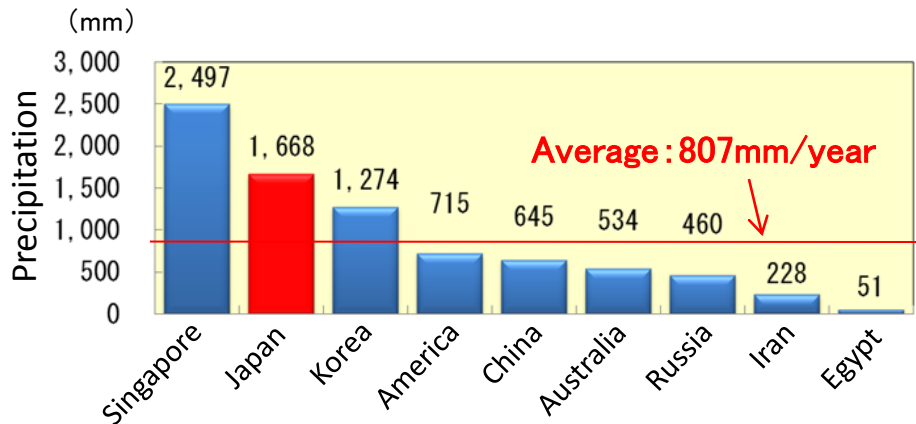
A Disaster-prone Country

■ Steep topology



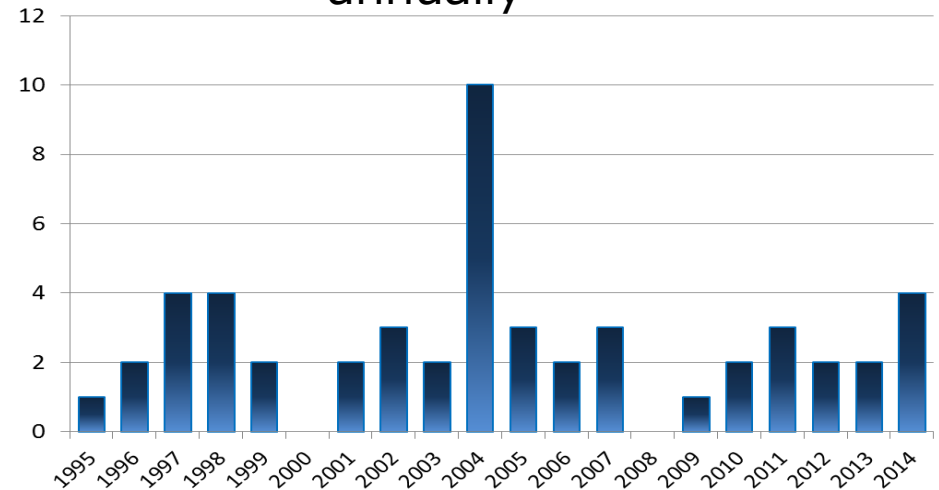
Source: Website of MLIT KANTO

■ Massive precipitation



Source: Based on data from Japanese Resource 2014(MLIT)

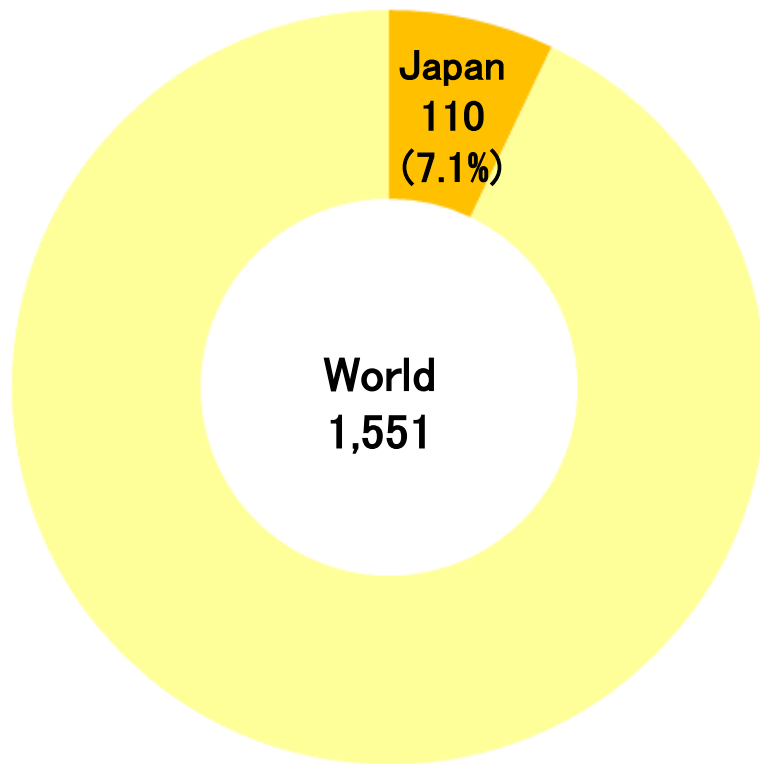
■ Two to three typhoons strike annually



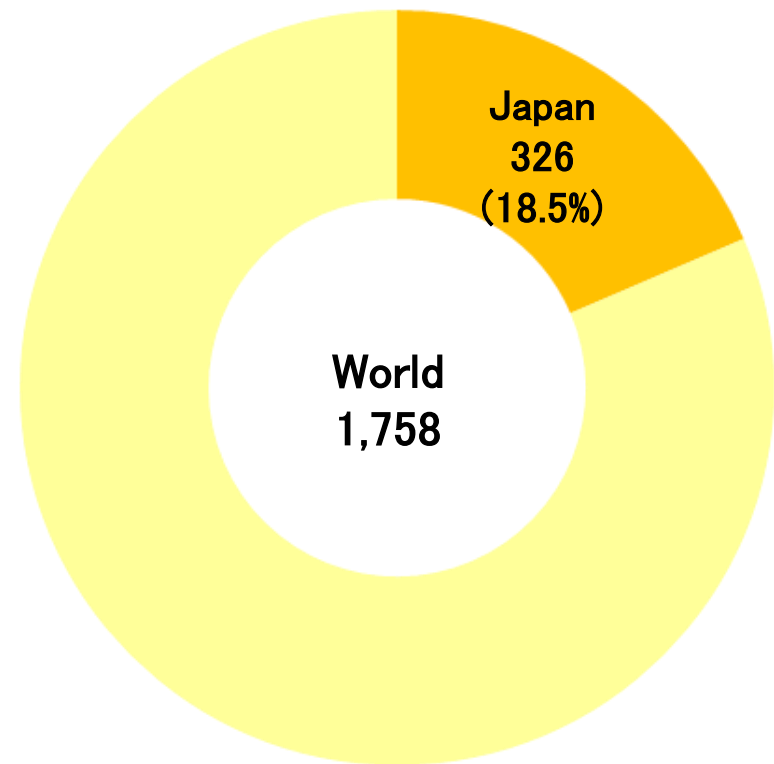
Source: Website of the Japan Meteorological Agency

A Disaster-prone Country (cont.)

■ Number of active volcanos



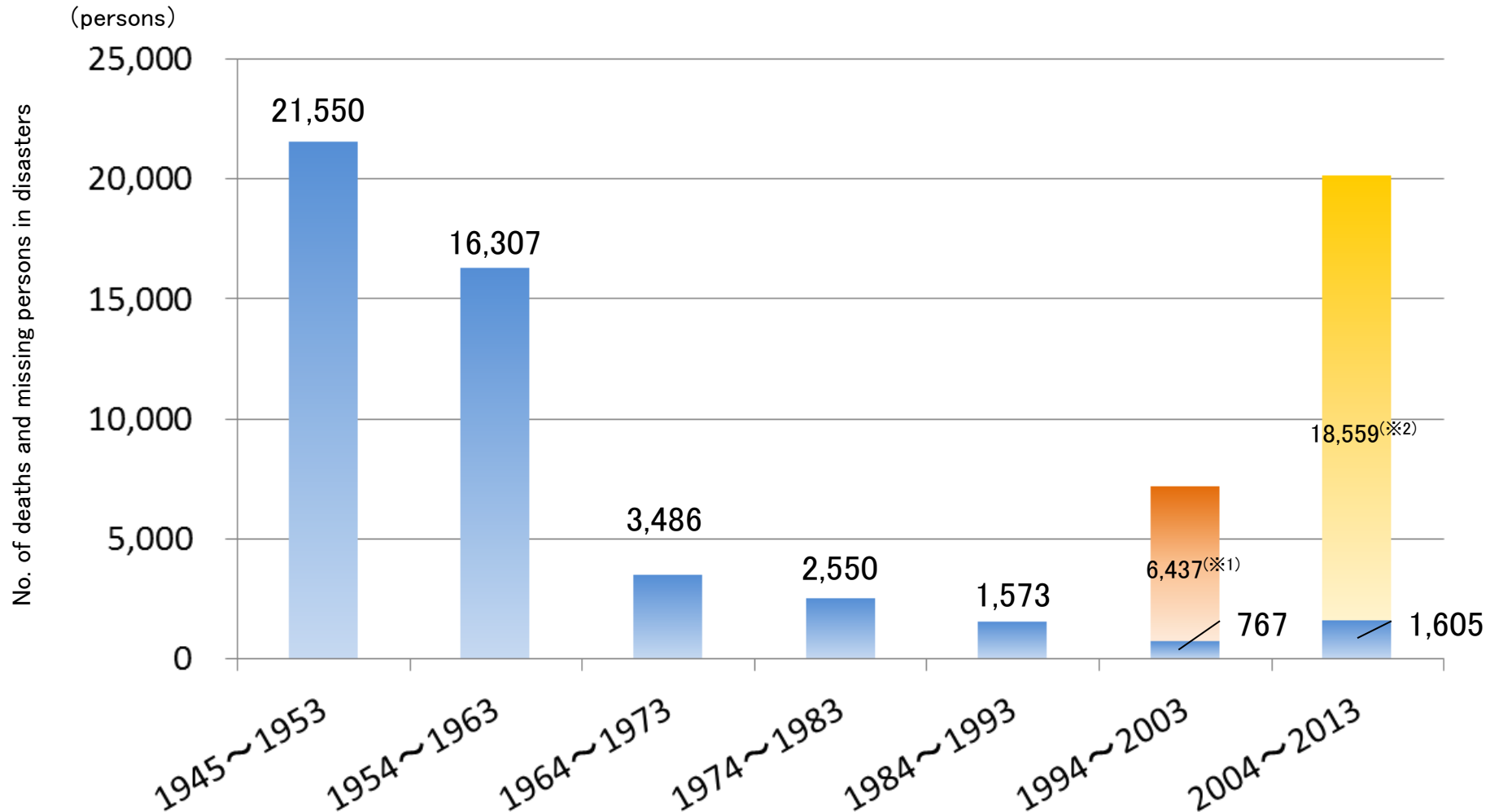
■ Number of earthquakes (magnitude of 6.0 or greater)



Source: White Paper on Disaster Management in FY2014

A Disaster-prone Country (cont.)

■ Number of Deaths and Missing Persons in Disasters



※1 : Figure 6,437 stands for the number from the Great Hanshin-Awaji Earthquake in 1994.

※2 : Figure 18,559 stands for the number from the Great East Japan Earthquake in 2011.

Source: Based on the data from White Paper on Disaster Management in FY2012 and FY2014

2. Former Japanese Forest and the History of Forest Rehabilitation

Former Japanese Forest Situation

- Demand for wood increased due to modernization works after Meiji Restoration in 1868.
- Great amounts of wood were cut down as important domestic resource during and following World War II.



Okutama Town, TOKYO in 1920s

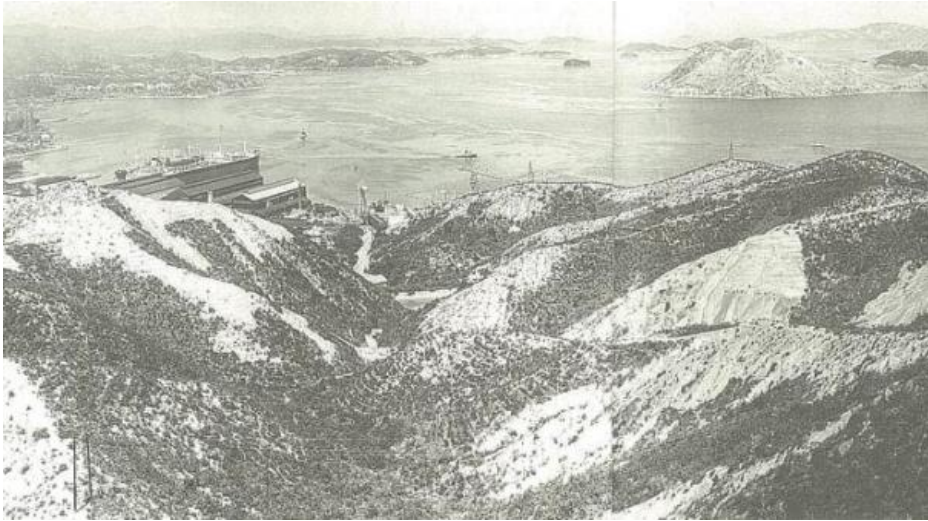


Ashiya City, HYOGO in 1930s

Source: National Land Afforestation Promotion Organization, The Commemorative Photographs of 60th Tree-Planting Ceremony

Restoration of over harvested forests

- Influence of forest devastation brought about repeated water and mountain disasters such as Typhoon Catherine, which caused unprecedented flood in 1947.
- Forest improvement projects and erosion control projects have been promoted since mid 1950s.



Tamano City, OKAYAMA in 1950s
Forest was devastated by excessive
cutting.



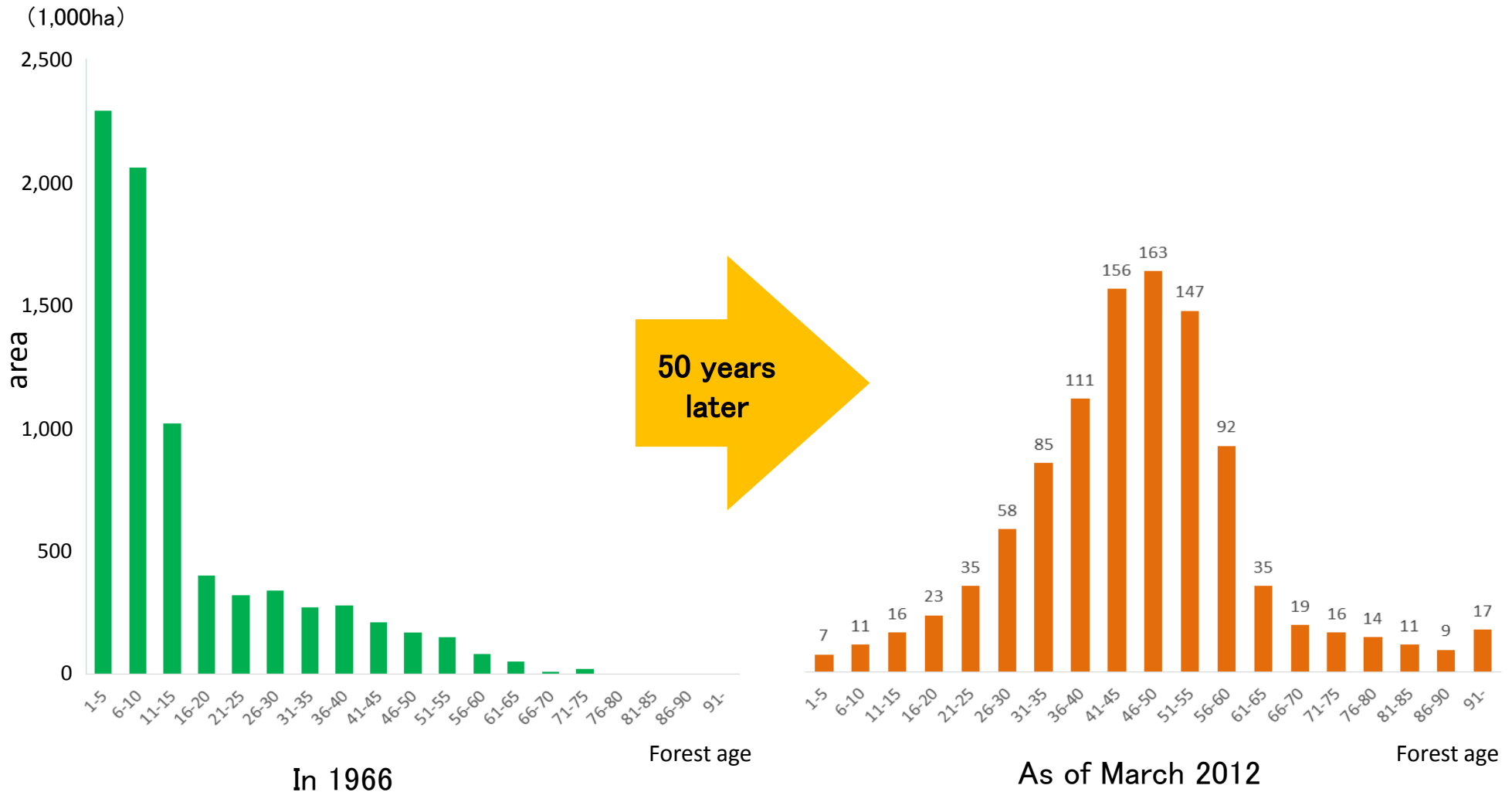
Tamano City, OKAYAMA Current
Rich forest was recovered.



Under the work (Stair Slope Work)
(around 1953)

Restoration of over harvested forests (cont.)

■ Composition of forest age class of planted forest in Japan



Source: Forestry Agency, Forest Resource Status(2012, 1968)

Restoration of Coastal Protection Forests

- During and following World War II, devastated coastal forests caused huge damage toward houses and farms.
- Rehabilitation projects for coastal forests had been intensively promoted since early 1950s.



Devastated Syonai Coast, YAMAGATA (in 1953)

Current Syonai Coast, YAMAGATA



A house buried in sand
(in 1950)

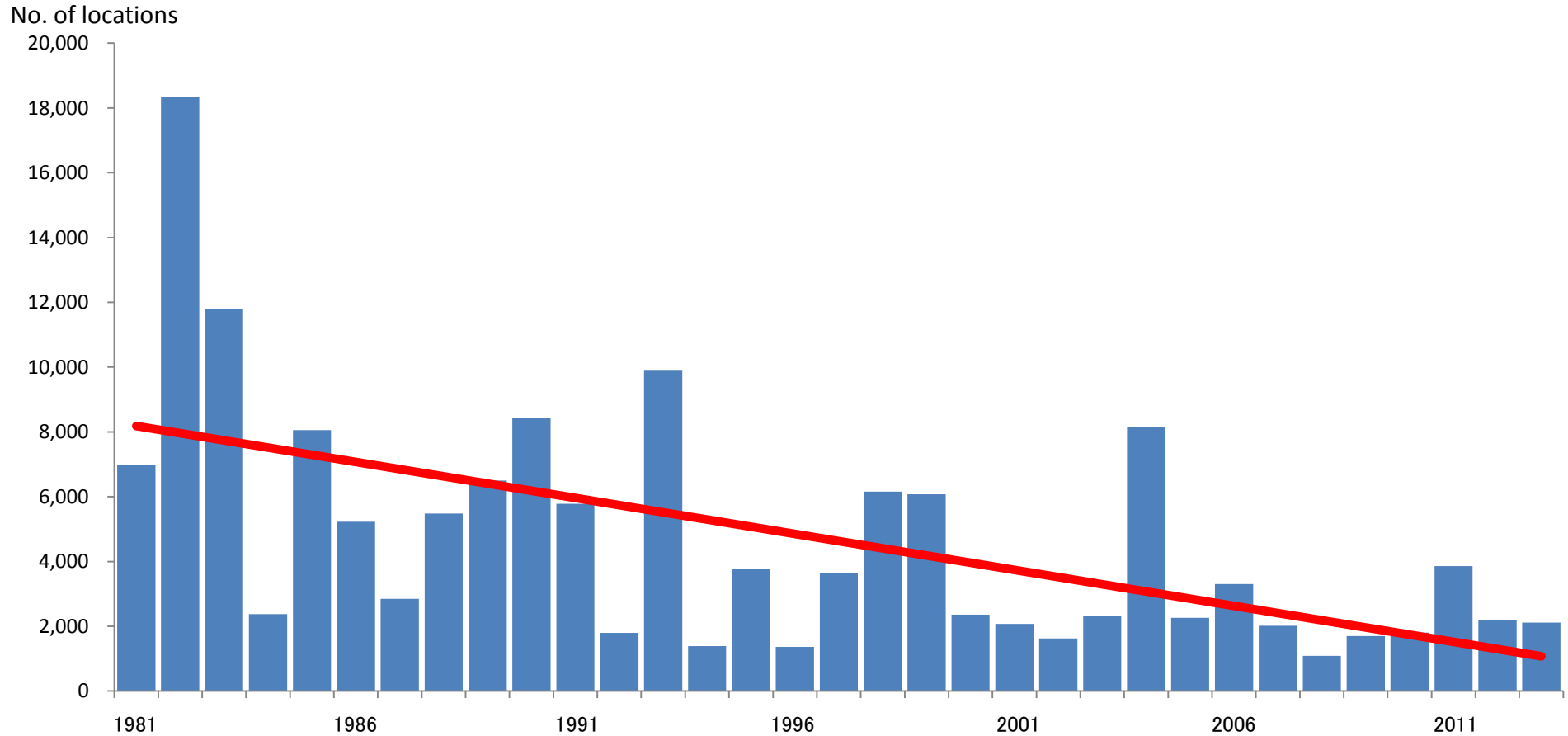


Planting work (in 1960)

Decreasing trend of mountain disasters

- Occurrence of mountain disasters shows decreasing trend although there are several singular values.

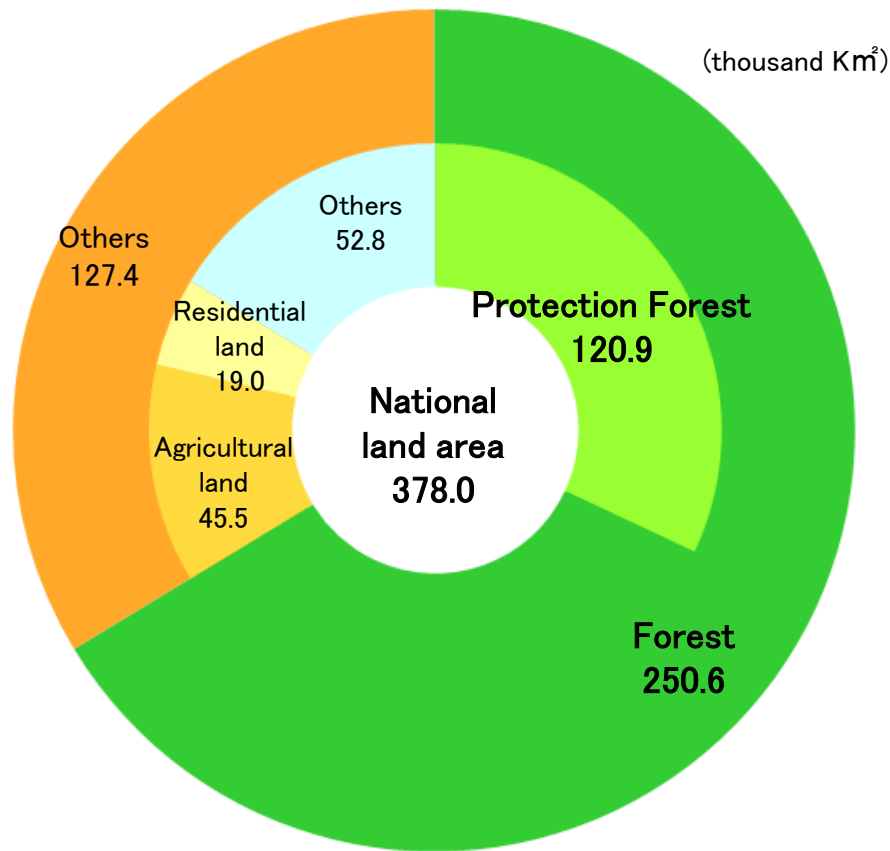
■ Occurrence of mountain disasters



"Protection Forests" are requested to demonstrate public welfare

Forests that are particularly requested to demonstrate public welfare such as land conservation and headwaters conservation are designated as "Protection Forests" and are appropriately protected by means of logging restrictions and other measures.

Breakdown of national land area and forest area ■ Types of Protection Forest



Source: Basted on data in Japan Statistical Yearbook 2015 (Ministry of Internal Affairs and Communications) and Forest and Forestry Statistics Catalogue 2014 (Forestry Agency)



Protection Forest for headwaters conservation



Protection Forest for landslide prevention



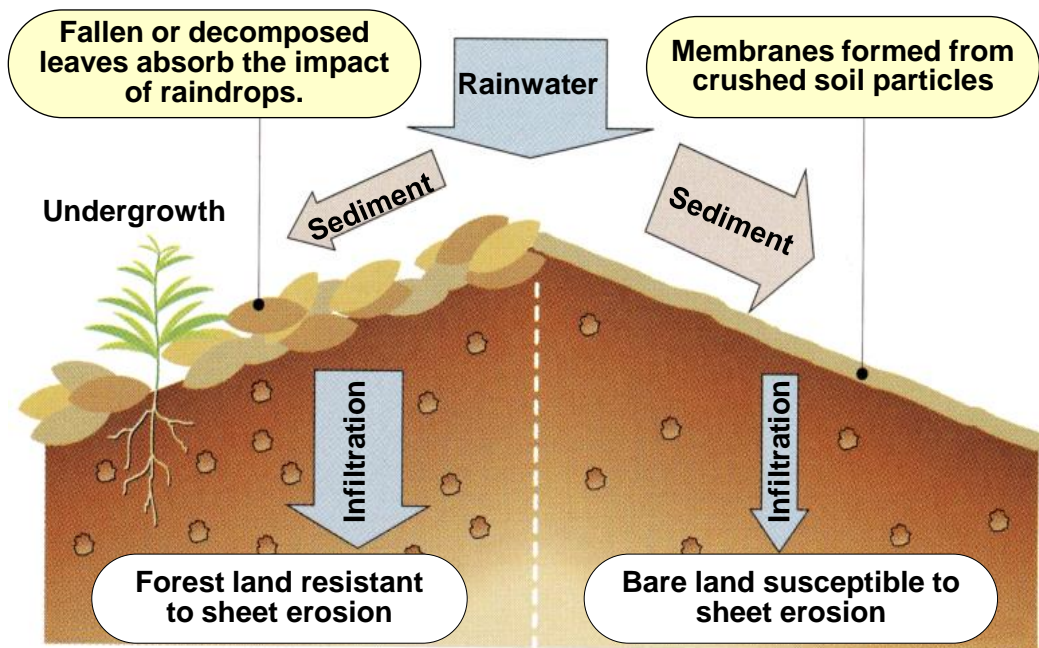
Protection Forest For tide damage prevention

Mechanism of forest functions for protection of sediment disasters and soil protection

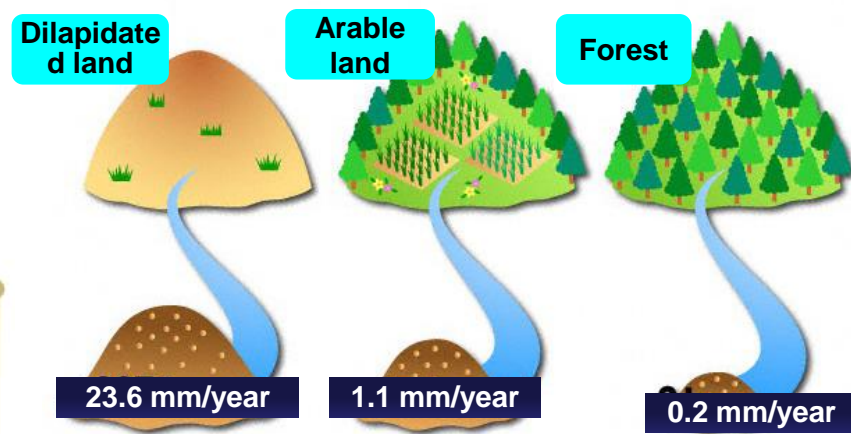
Function to prevent sheet erosion

Forest land prevents sheet erosion and sediment discharge

Comparison with the condition above ground



(cf.) Comparison of average annual erosion depths



Note: These values are the average of those measured values of erosion that are for slopes of 13° or over.

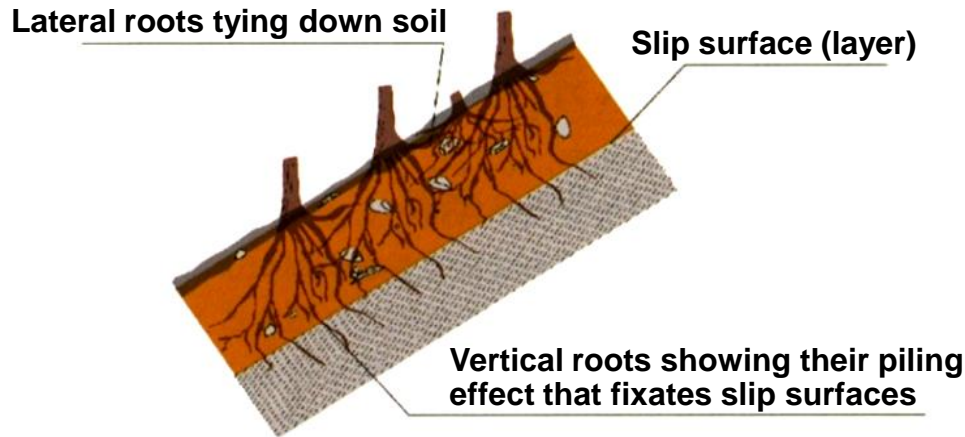


Mechanism of forest functions for protection of sediment disasters and soil protection (cont.)

Function to prevent shallow landslide

Roots grip shallow soil and prevent shallow landslide

Effects of lateral roots and vertical roots

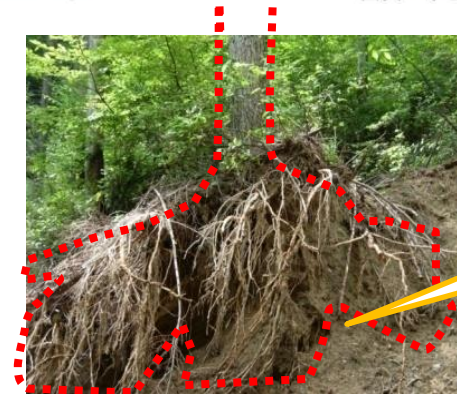
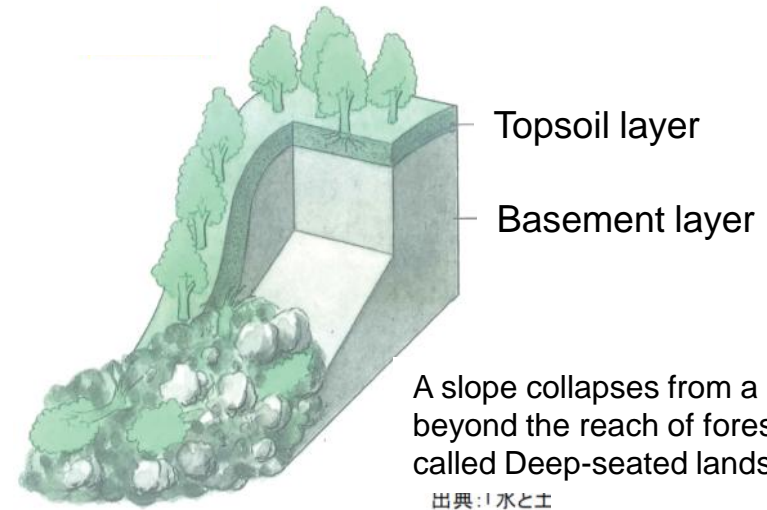


Schematic illustration of the uplift resistance of roots (revised from Kitahara, 2006)



Forest not thinned on a timely basis

(cf.) Deep-seated landslide



Appropriately thinned forest

Thinning thickens roots, which activates root swelling.

Improvement of forest preventive functions by thinning

Before thinning



After thinning



Thick floor vegetation



- Thick floor vegetation prevents sheet erosion.
- Growth of trees and roots prevents shallow landslide.

Development of safety national land with Erosion Control Projects

■ Hillside Work

○ Facilities intended to stabilize the mountain slopes, including landslide protection work and vegetation work are laid out appropriately to match the characteristics of each failure so as to promote sure restoration of forests.

◇ Restoration and regeneration of forest by hillside work (Shinoyama City, HYOGO)



collapse(1996)



Immediately after the work (1998)



Around 10 years after the work

■ Stream Work

○ Construction of erosion control dams and other facilities prevents erosion of banks and beds of mountain streams and stabilizes the foot slopes thereby to ensure the growth basis of forests.

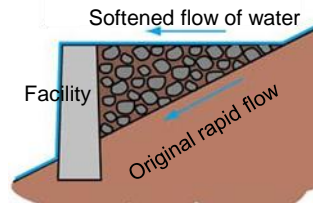
◇ Stream Work



◇ Combination of Hillside Work and Stream Work



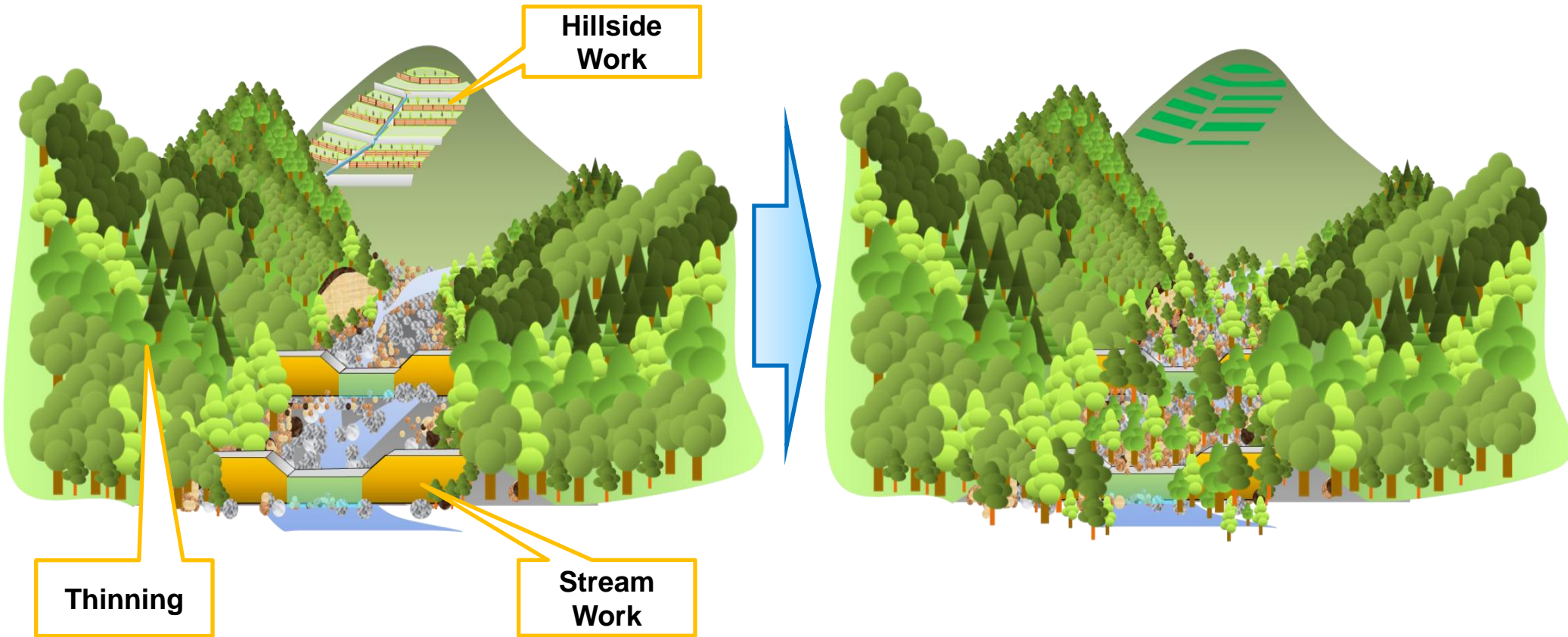
Sediments deposited and stabilized



↑ Figure with the mountain stream seen from the side

Development of safety national land with Erosion Control Projects(cont.)

- In order to improve preventive functions of forests, it is important to design erosion control projects and forest improvement activities as a comprehensive program.



Restoration projects of devastated forest by natural disasters

- Restoration and regeneration of collapse by heavy rain (Syodoshima town, KAGAWA)



Collapse



Under the work



About 20 years after the work

Restoration projects of devastated forest by natural disasters (cont.)

- Restoration and regeneration of collapse by earthquake (Otaki village, NAGANO)



Collapse



Under the work



About 30 years after the work

Restoration projects of devastated forest by natural disasters (cont.)

- Restoration and regeneration of devastated forest caused by eruption with aerial sowing
(Shimabara City, NAGASAKI)



Before the eruption



Collapse



About 7 years after the work



Under the work

Effects of forest against debris flow

- Forest trees captured rocks and driftwood from debris flow at the heavy rain disaster in HIROSHIMA, August 2014.



Effects of Costal Protection Forest against Tsunami caused by the Great East Japan Earthquake

- Costal Protection Forests attenuated the tsunami energy and captured wreckage.

■ Effects of Costal Protection Forests against tsunami damage

○ Hachinohe City, AOMORI



Inundated houses were preserved



Boats and steel pipes were caught

○ Watari Town, MIYAGI



Boats were caught

○ Iwaki City, FUKUSHIMA



Cars were caught

Effects of Costal Protection Forest against Tsunami caused by the Great East Japan Earthquake (cont.)

- However 140km of Costal Protection Forests from AOMORI to CHIBA were damaged by tsunami.

■ Damages of Costal Protection Forests

- Whole forest was disappeared



- Embankment and forest were damaged



【Misawa City, AOMORI】



【Rikuzentakata City, IWATE】

- Damaged roots



【Sendai City, MIYAGI】

- Damaged stems

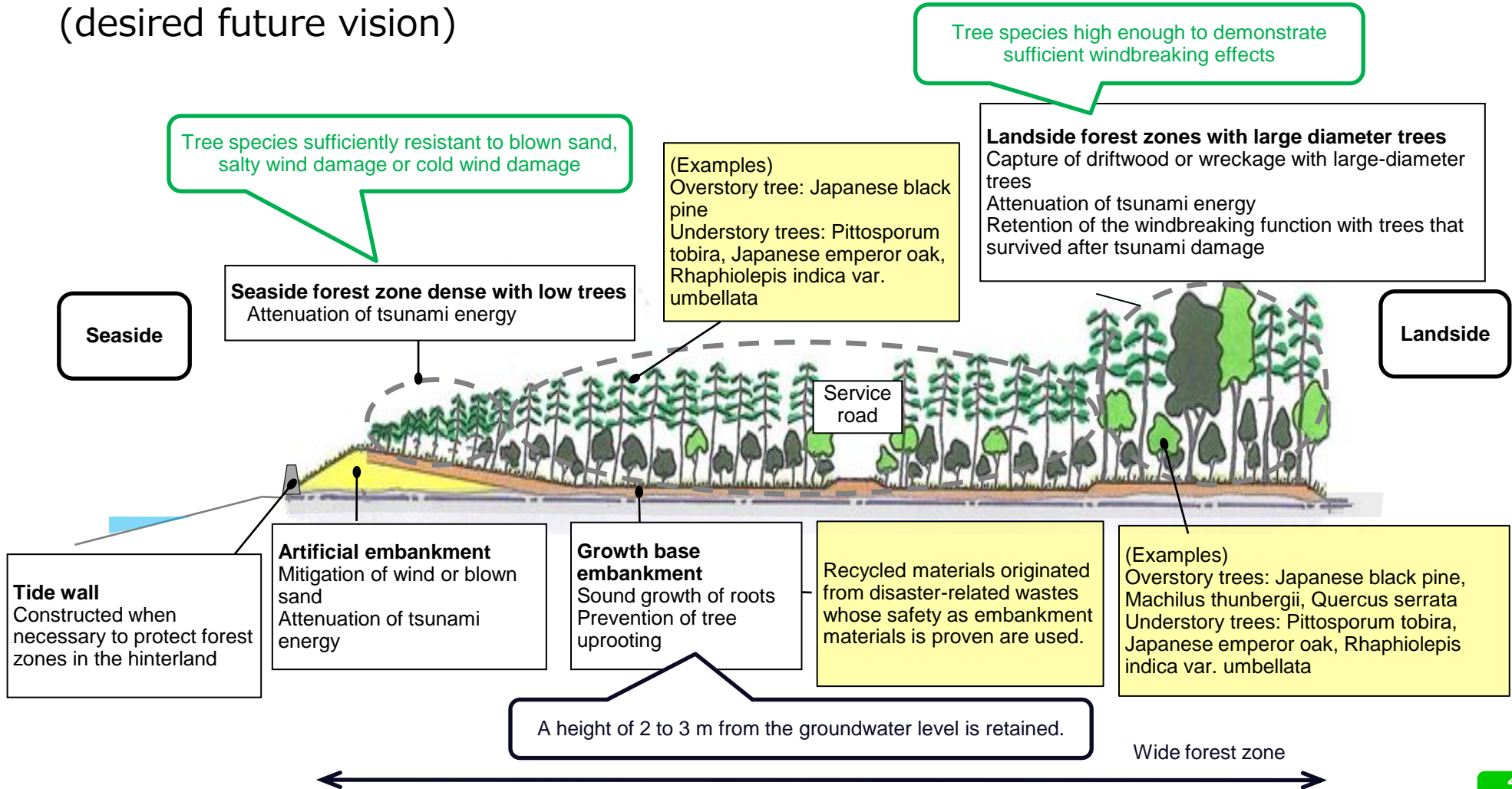


【Noda Village, IWATE】

Restoration of Coastal Protection Forest

- The objective of restoration project is not only improvement of sand and wind prevention but also tsunami damage mitigation.
- Different measures are chosen for each damaged coast taking into consideration of geographical, ecological and social features.

■ Schematic illustration of restoration of coastal protection forest (desired future vision)



4. International Cooperation of Japan

Adaptation of erosion control technology toward oversea projects

■ JICA : Project on forest restoration after the earthquake in Sichuan Province

(from 2010 to 2015)

- Forests in Sichuan Province, China were severely damaged by the earthquake in 2008.
- Japan introduced the erosion control technology and assisted to restore the forest through JICA Technical Cooperation.
- As a result of this project the government of China decided to provide “erosion control forestry” in the Forest Act. Japan could contribute to improve disaster management system of China.



Collapse



After the work



Under the work