Encounter with the Hokkaido Nansei-Oki Earthquake

—The catastrophic damage inflicted on Okushiri Island; the traces left by the disaster, and the road to recovery—
1. Outline of the Hokkaido Nansei-Oki Earthquake (earthquake off the southwest coast of Hokkaido)

(1) Date, time, and place

- Date and time: July 12, 1993, 10:17 p.m.
- Epicenter: Lat. 42° 47' N, Long. 139° 12' E
- Depth: 34 km
1. Outline of the Hokkaido Nansei-Oki Earthquake (earthquake off the southwest coast of Hokkaido)

(2) Seismic intensity and magnitude

- **Seismic intensity:** 6 (disastrous)
  
  Note: This is an estimate because there was no seismograph installed.

- **Magnitude:** 7.8

This magnitude was the largest ever observed on the side of the Japan Sea.
2. Outline of damage from the Hokkaido Nansei-Oki Earthquake

(1) Damage from the earthquake

Direct damage by ground vibration

Main damage

- Cave-ins and cracks in roads, and ground subsidence
- Collapse, damage, and destruction of houses, buildings, and breakwaters
- Large-scale landslides and rockfalls
- Medium-scale human damage
Scene of a landslide in the earthquake (Okushiri area)
Scene of a landslide in the earthquake (Okushiri area)
Scene of a landslide in the earthquake (Okushiri area)
Scene of fallen earth and rocks in the earthquake (Okushiri area)
Landslide in the earthquake (Miyatsu area)
Road damaged in the earthquake (Yoneoka area)
Lighthouse that collapsed in the earthquake (Aonae area)
2. Outline of damage from the Hokkaido Nansei-Oki Earthquake

(2) Damage from fire

Secondary damage occurring as a result of direct damage

- Houses, other structures, and possessions destroyed by fire
- Small-scale human damage
Fire immediately after the earthquake (Aonae area)
Town area burned down after the earthquake (Aonae area)
Town area burned to the ground after the earthquake (Aonae area)
Town area ruined in the earthquake (Aonae area)
(3) Damage from tsunamis

Indirect damage that may occur with an earthquake

- Houses, other structures, and breakwaters washed away and destroyed
- Cave-ins, damage, and destruction of roads
- Large-scale human damage

Primary factors in the exponential increase in the amount of overall damage

This kind of damage was the largest in this earthquake.
2. Outline of damage from the Hokkaido Nansei-Oki Earthquake

(3) Damage from tsunamis

- The deeper the focus, the faster the tsunami.
- The shallower the focus, the slower and higher the tsunami.
- The characteristics and direction of the tsunami change according to the submarine topography and other factors.
Town entirely transformed by the earthquake and tsunami (Aonae area)
Town entirely transformed by the earthquake and tsunami (Aonae area)
Town entirely transformed by the earthquake and tsunami (Aonae area)
Village destroyed beyond recognition by the earthquake and tsunami
(Hatsumatsumae area)
Village wiped out by the earthquake and tsunami (Hatsumatsumae area)
Horrors of the earthquake and tsunami (Aonae area)
Residential area eradicated by the earthquake, tsunami, and fires (Aonae area)
Marine plants on a utility pole bear witness to the height of the tsunami (Monai area)
Grass on a utility pole indicates the height of the tsunami (Monai area)
The dreadful trail left by the tsunami seen in the extent of dead vegetation (Monai area)

Signs indicating the extent of the tsunami
2. Outline of damage from the Hokkaido Nansei-Oki Earthquake

(4) The extent of the damage

- Breakdown of main roads and other transportation links
- Outage of lifelines including electricity and water supplies
- Collapse and damage of various facilities caused by landslides
- Buildings, other structures, and possessions washed away, burned down, or lost
- Large-scale fires caused by spreading fires in urban areas and other areas of dense housing
- Other various types of damage across the island

The combination of the three major factors in this disaster, namely the earthquake, fires, and the tsunami, led to catastrophic damage and large numbers of injuries, missing persons, and deaths.
3. Outline of recovery from the earthquake

(1) The need for a basic plan for recovery

- This unprecedented disaster caused damage to the whole island.
- The scale of damage in the main area struck was enormous.

This is not a problem that can be solved with a simple framework for restoration.

Integrated, comprehensive reconstruction of the island is necessary.

Formulation of the basic guidelines:

**Basic Plan for Recovery from the Disaster**
3. Outline of recovery from the earthquake

The three major pillars

- Realizing recovery
- Effective industrialization
- Improvement in the level of recovery

Restoration of livelihoods
Development of a town resistant to disasters
Regional development
3. Outline of recovery from the earthquake

The three major pillars

- Coordination with the basic plans of the town development scheme
- Development of a town resistant to disasters
- Collection of comprehensive, specialized know-how to cope with disasters

Restoration of livelihoods
3. Outline of recovery from the earthquake

(2) Reconstruction and improvement of main stricken areas

- Town development in Aonae area

This area was the most devastated in the earthquake.

- Application of the Disaster Relief Act
- Framework of government and prefectural authority draft plans for recovery
- Requests and wishes of local residents
- Unified direction to recovery

Realizing recovery focusing on disaster prevention infrastructure
3. Outline of recovery from the earthquake

(2) Reconstruction and improvement of main stricken areas

- Construction of tsunami floodgates
  - Because this is an isolated island surrounded by sea, there is an extremely high chance that another tsunami could again cause widespread damage.

- Need for effective measures against tsunamis

- Installation in the three main rivers on the island and in the Aonae area

- Consolidation of tsunami measures in combination with seawalls
Floodgate constructed as a countermeasure against future tsunamis (Yachi area)

- This gate closes automatically when the seismic intensity detection system registers an earthquake of 4 or over on the seismic scale.
- Prompt measures can be taken against a tsunami.
- These floodgates have been installed at four points in the mouths of the main rivers on the island.
3. Outline of recovery from the earthquake

(2) Reconstruction and improvement of main stricken areas

- Construction of artificial ground
- Adding accessibility to fishing harbors and enabling rapid, safe evacuation of inhabitants and fishermen
- Smooth transfer from sea to harbor and from housing to shelters
- Central disaster-prevention function to develop fishing ports and villages resistant to disasters
Fishing harbor restored with artificial ground for disaster prevention (Aonae area)

Functions as a connecting passage to the town and evacuation areas and makes possible rapid transfer to high ground.

Under the deck is an open-space structure for work related to fishing and for reduction of tsunami loads.
3. Outline of recovery from the earthquake

(3) Wide-area recovery and improvement

Construction of seawalls

Fundamental, effective measure against tsunamis and flood tides

Installation at every strategic point on the island, focusing on the areas that suffered concentrated damage in the tsunami

Basic disaster-prevention function to develop a town resistant to disasters
Seawalls constructed at every strategic point on the island (Inaho area)

Large seawall constructed as a tsunami measure (Hatsumatsumae area)
Around 14 km of seawalls up to 11.7-m high has been constructed for the residential areas on the island, based on the traces left by the tsunami.
3. Outline of recovery from the earthquake

(4) Improvement of communication infrastructure as a part of disaster measures
   - Partial improvement of the administration’s radio system for disaster prevention

Key points of the improvement

- To strengthen the functions of the existing basic system
- To strengthen and enrich the core communication infrastructure in consideration of disaster prevention measures
3. Outline of recovery from the earthquake

(4) Improvement of main infrastructure as a part of disaster measures

- Partial improvement of the administration’s radio system for disaster prevention

To strengthen the functions of the existing basic system

To strengthen the function for communicating all kinds of administrative and disaster prevention information

To improve the accuracy and reliability of communication by refining the quality of the reception

To expand the functions of relay stations and public address systems for more extensive communication
3. Outline of recovery from the earthquake

(4) Improvement of main infrastructure as a part of disaster measures

- Partial improvement of the administration’s radio system for disaster prevention

To coordinate with the earthquake detection system

To allow communication between shelters

To make possible remote control of communication systems from a fire station and to employ shared systems for functions such as emergency broadcasting

After detecting an earthquake registering 4 or over on the seismic scale, these systems are to immediately start up and automatically broadcast watches, warnings or alerts, and evacuation information corresponding to the seismic intensity.
3. Outline of recovery from the earthquake

(5) Other categories of recovery and improvement

Primary school building with an open space below the first floor (Aonae Primary School)

As a tsunami measure, the school building is supported on columns above an open space.

Establishment and maintenance of shelters and escape routes

Escape routes leading to high ground have been set up behind villages near the coast and are equipped with guidance lights to improve visibility at night.

Equipping designated shelters such as schools and halls with emergency generators, emergency lights, radio transmitters and receivers for preventing isolation, and blankets, etc.
To raise awareness of disasters, the following items have been distributed to households, hotels, and guest houses:
1) disaster handbooks, 2) helmets, and 3) bags containing emergency kits.

To leave memorials and records of the disaster to posterity, the Okushiri Island Tsunami Memorial Hall has been built and monuments have been set up in various places.
Primary school adopting a structure with an open space below the first floor (Aonae area)

The structure comprises open space on the ground floor to resist damage by tsunamis.
4. Recovering from the Hokkaido Nansei-Oki Earthquake

(1) Learning from the earthquake

- The horrors of natural disasters and the memory of the tsunami

Recognition of the fact that natural hazards are close-at-hand problems

The tsunami was the greatest menace in the earthquake.
4. Recovering from the Hokkaido Nansei-Oki Earthquake

(2) Preparing against coming disasters

- Cooperation in disaster measures among the administration, communities, and residents

This triangular relationship is the core of organization for comprehensive measures against earthquakes and other disasters.
4. Recovering from the Hokkaido Nansei-Oki Earthquake

(2) Preparing against coming disasters (tsunamis in particular)

● Increasing the disaster awareness of all inhabitants

- Hard-and-fast rule: Take refuge on high ground as soon as possible.
- Thorough awareness that an earthquake will lead to a tsunami

These are the most important lessons from the earthquake.