

# Disaster by Tsunami and its countermeasures in Japanese fishing villages

1. Middle Japanese sea earthquake 1983
2. South west offshore of Hokkaido earthquake 1993

2005 21<sup>th</sup> January

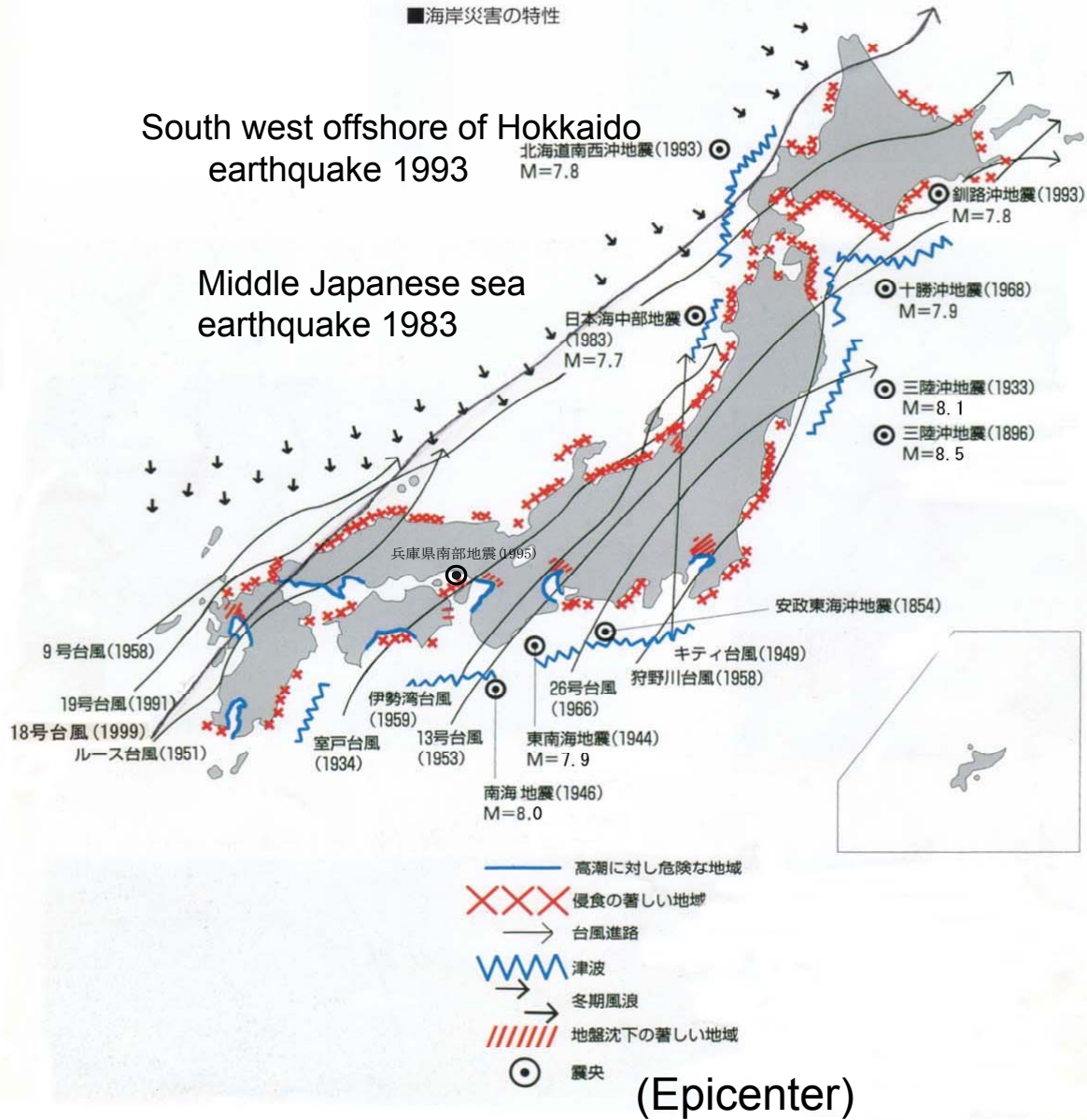
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# Fishing ports, villages, grounds in Japan

- Coast line length 33,468km
- Fishing villages along coast 4,792
- Fishing ports 2,972
- Fishing grounds
- Fishing boats 254,768
  
- These suffer from convulsion of nature in Japan, especially Tsunami.

# Characteristics of climate in Japan

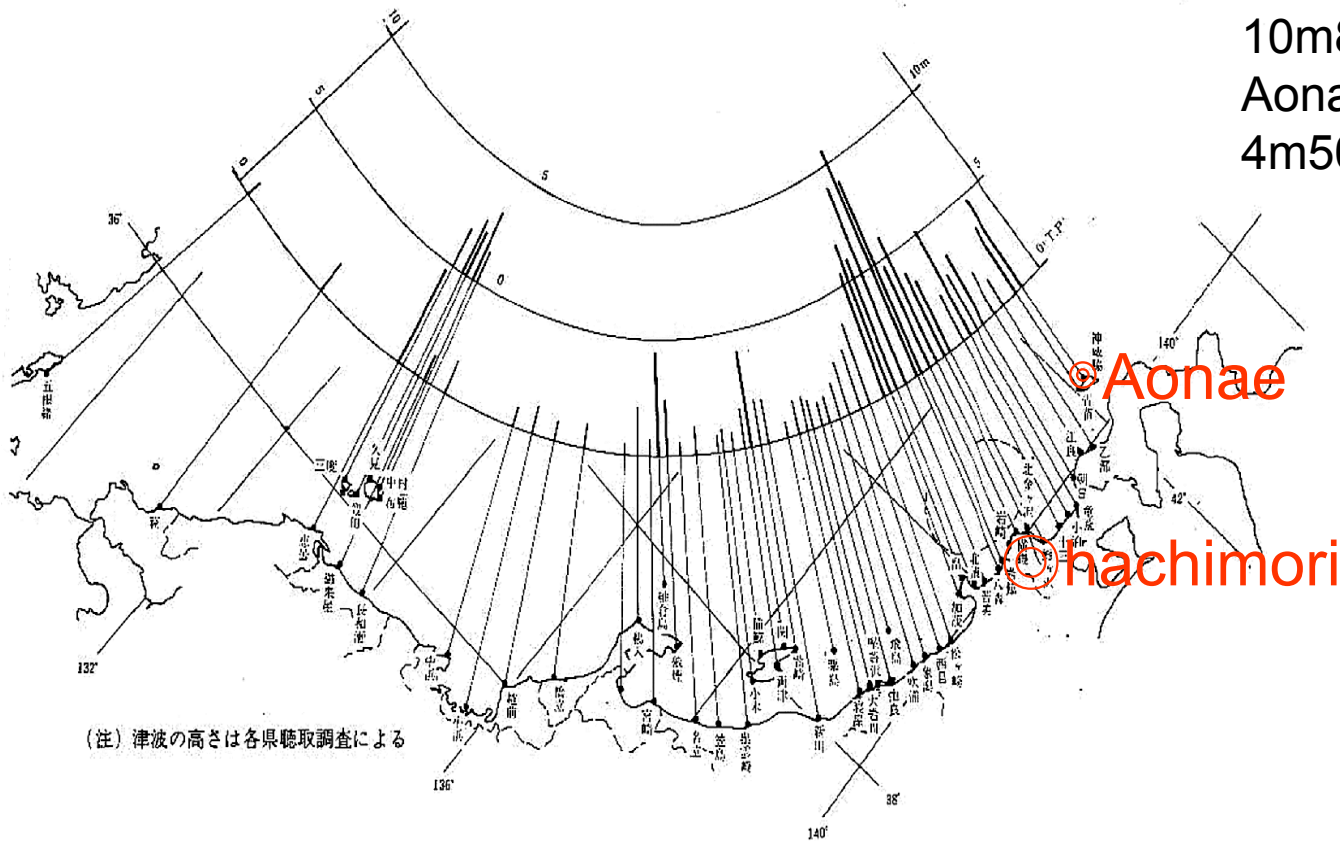


# Middle Japan sea earthquake 1983

- 1983 26<sup>th</sup> May Noon, magnitude 7.7
- Dead 104, damaged house 5,346, amount of fishing port damage ¥3,073million
- Damage ship 2,651 (¥2,064million), fishing implement (¥3,011million)

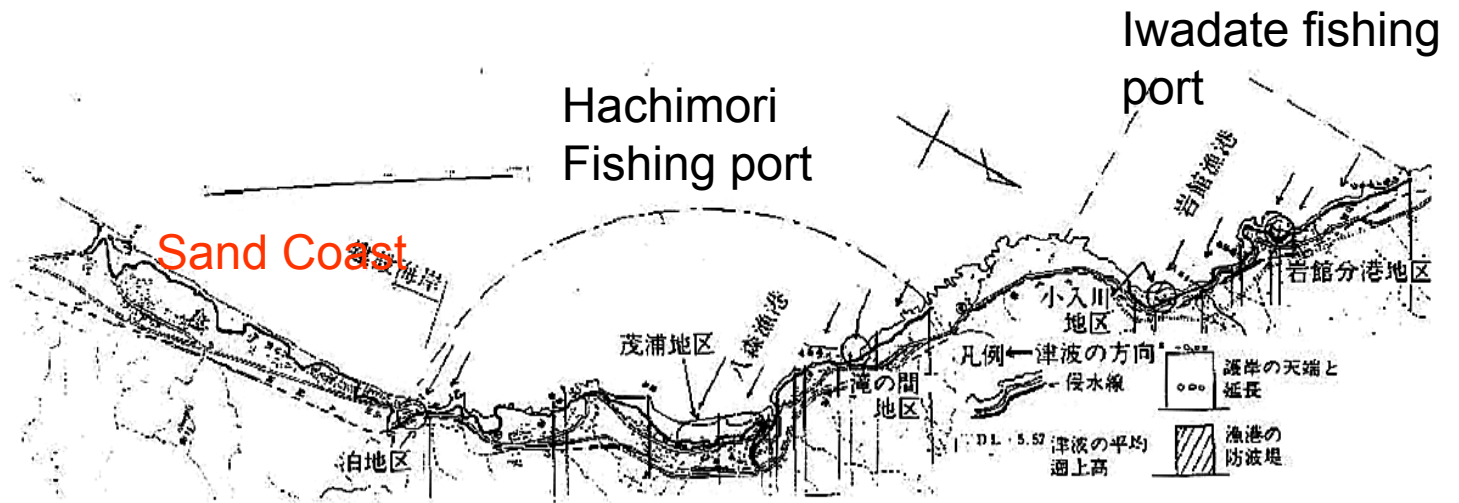
# Height of Tsunami going up

Hachimori fishing port:  
10m80cm  
Aonae fishing port:  
4m50cm

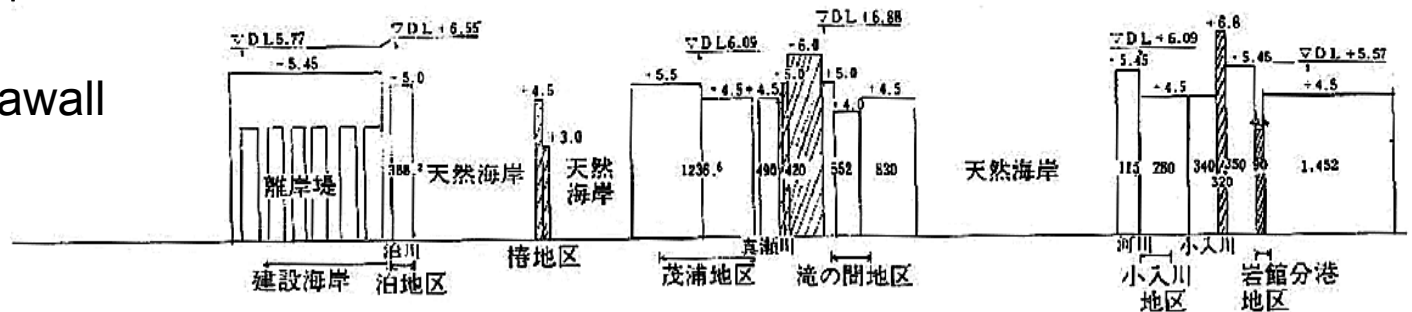


# Hachimori town(Akita pref.)

Rocky coast with terrace



Height of seawall



# Attack by tsunami (Hatake fishing port Akita pref.)



漁船を飲み込もうとしている津波（秋田県畠漁港）



# Hachimori fishing port



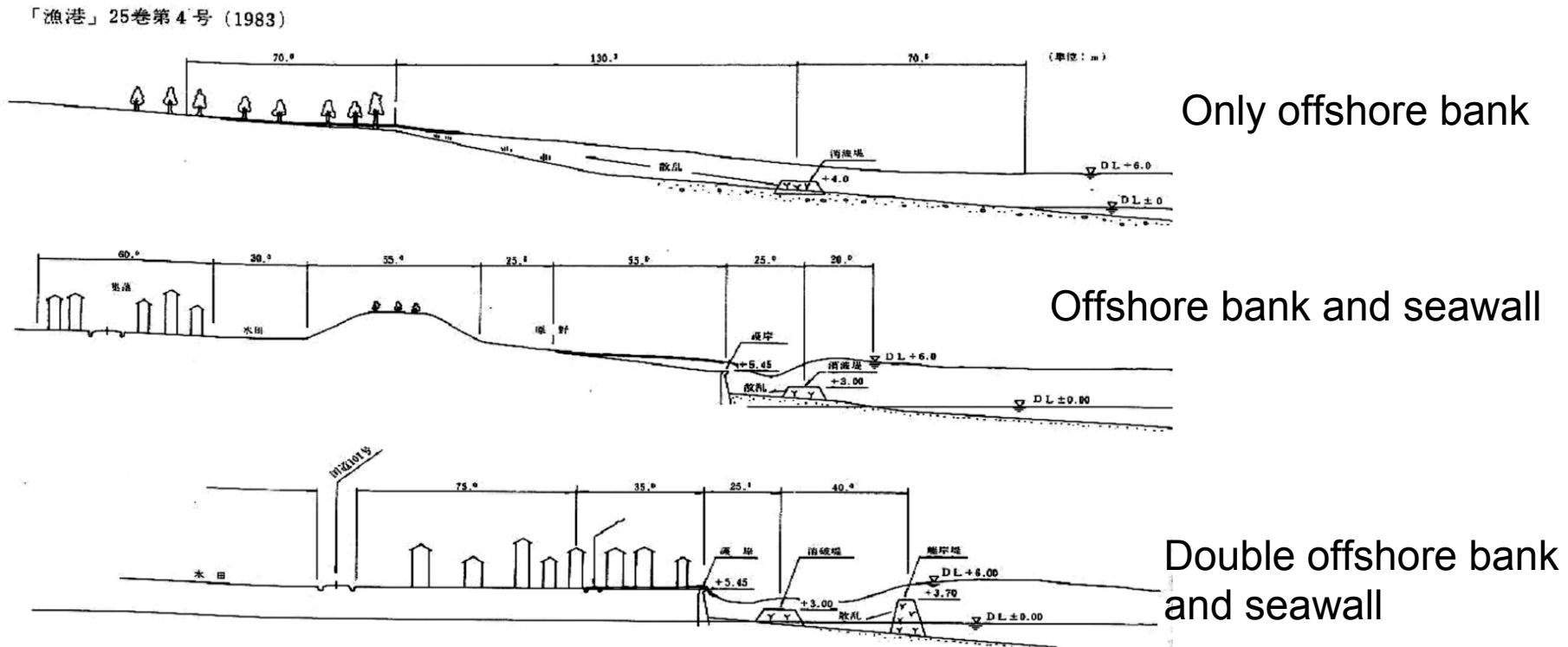
津波による漁船の被害（秋田県八森漁港）

After tsunami attack



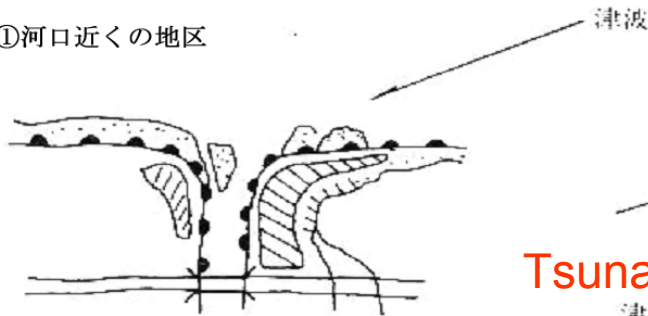
# Different of tsunami height with embankment

There are three embankment types at hachimori sand coast.



# The fishing villages that suffered heavy damage were following topographical features

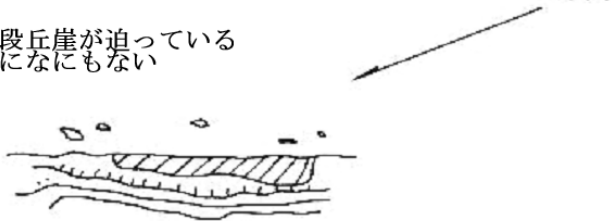
①河口近くの地区



Near estuary

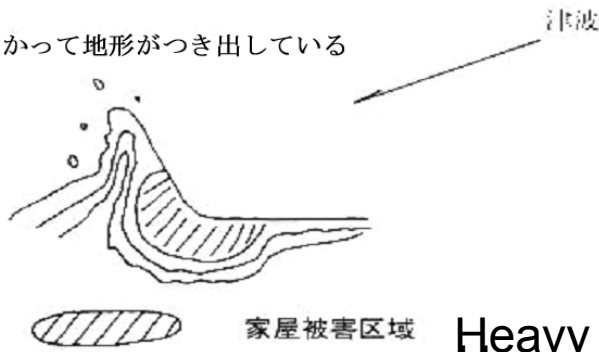
Tsunami direction

②海岸段丘が迫っている  
前面になにもない



Coast terrace with no guards  
Bank, embankment

③海に向かって地形が突き出している



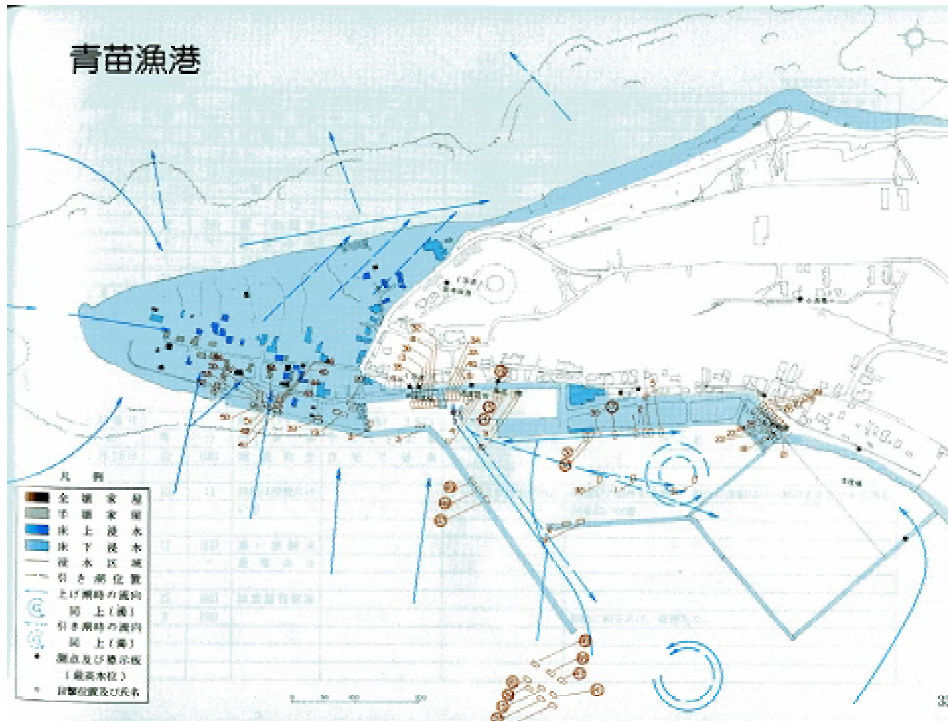
Cape stick out to tsunami direction

Heavy damage

H  
e  
a  
v

# Aonae fishing port in Hokkaido was damaged by Middle Japan sea earthquake 1983

( Aonae fishing port that would suffer damage again 1993 hokkaido south west offshore earthquake)



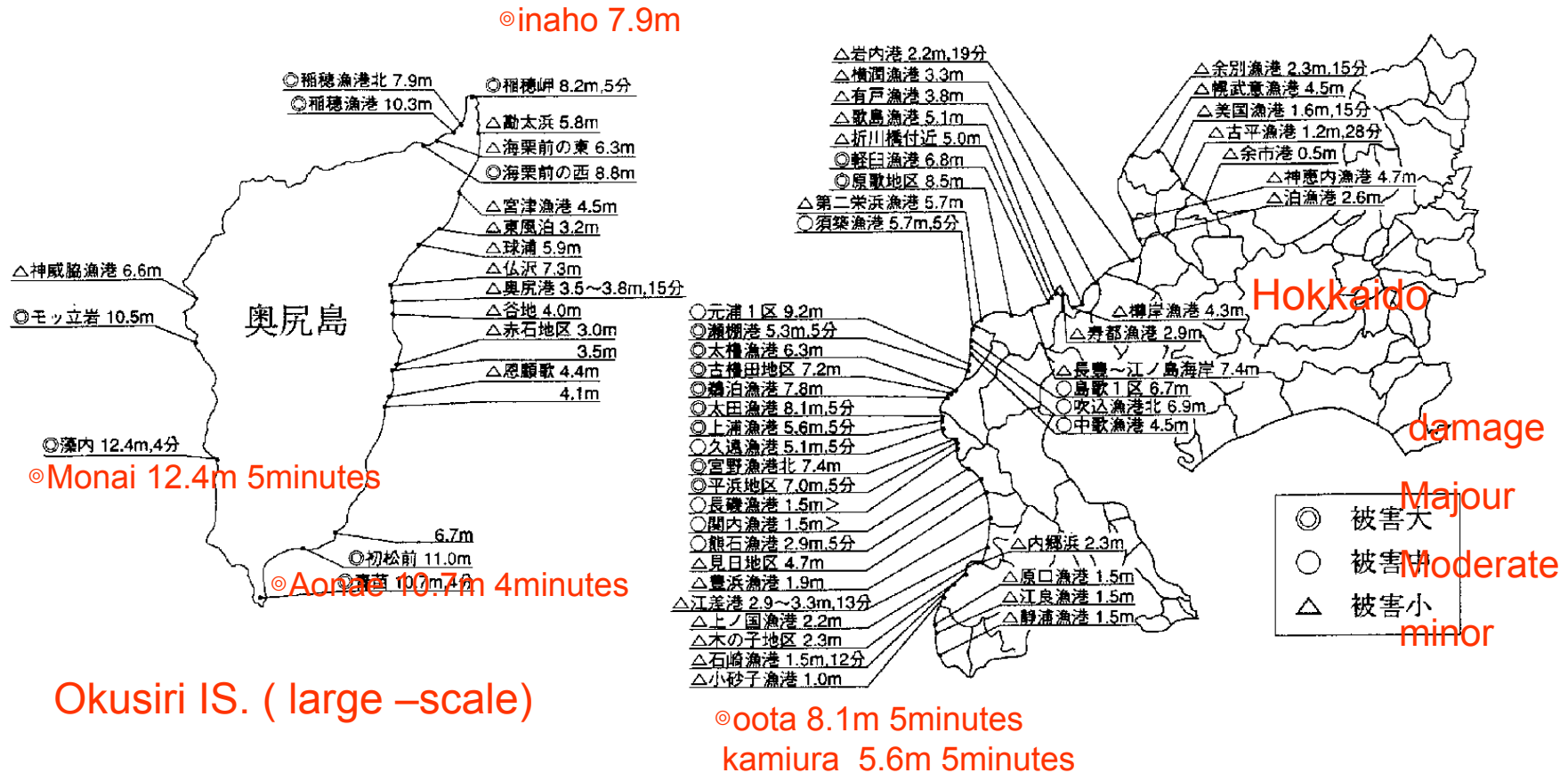
Fishing boats were pushed up to quay

Flood area and tsunami direction  
Tsunami from south and south-east  
Tsunami arriving time 10minutes after  
It would mean important for evacuation.

# South west offshore of Hokkaido earthquake 1993

- 1993 12<sup>th</sup> July 22o'clock  
magnitude 7.8
- Dead 201, damaged house 21,160,  
amount of fishing port damage  
\26,341million
- Damage ship 1,300(\1,323million),fishing  
implement (\13,467million)

# Tsunami height and attack time after earthquake , and level of damage







Amplify ratio the lower, port basin area the larger

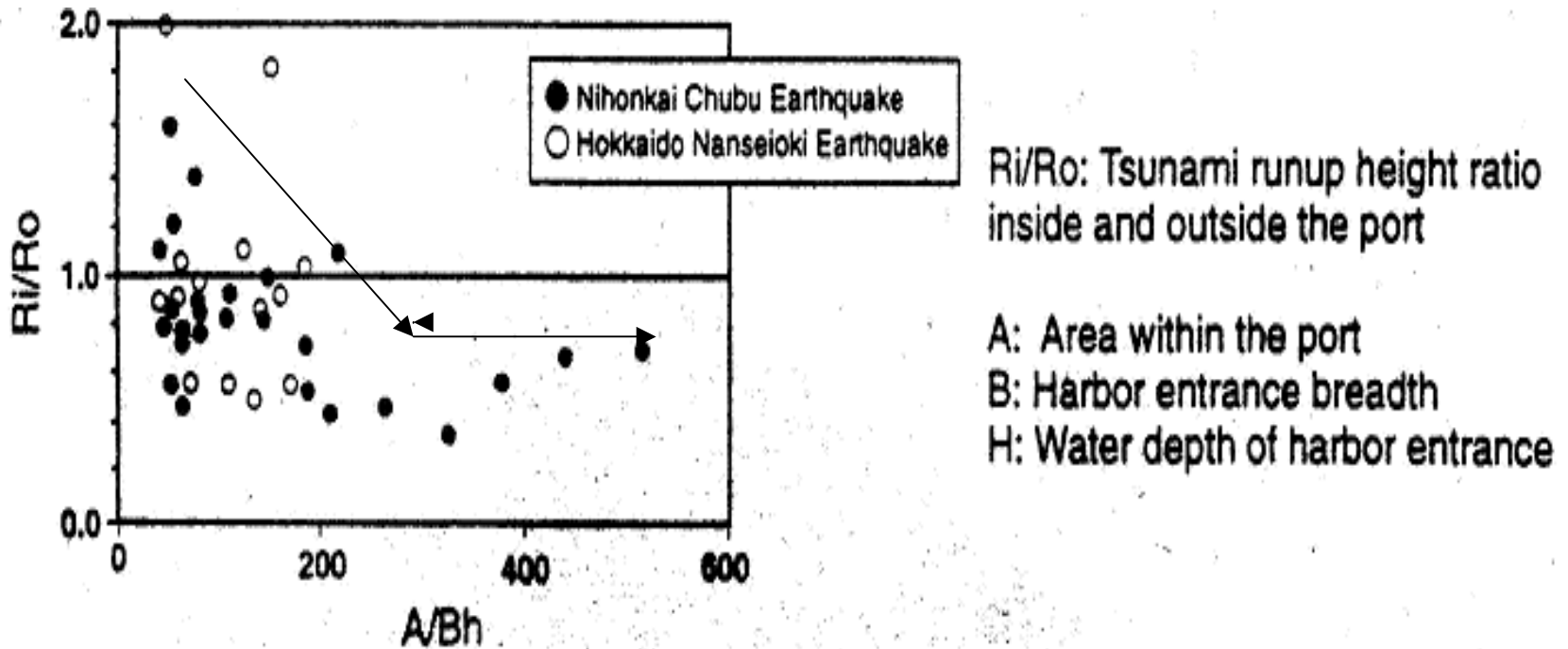
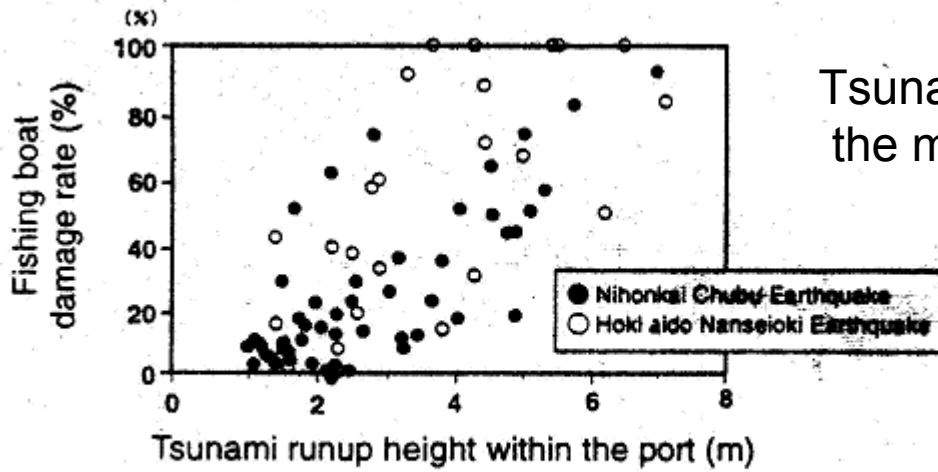


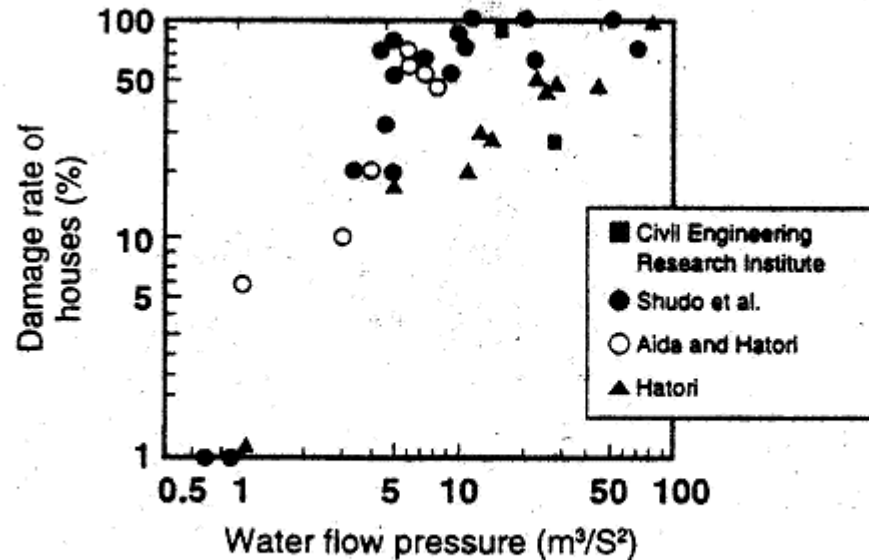
Figure 4 Area within the port and tsunami runup height



Tsunami higher fishing vessel damage the major

Tsunami runup height within the port and fishing boat damage rate

Tsunami flood the stronger house damage the mayor



$$\text{Water flow pressure} = \text{Tsunami height} \times \text{Runup velocity of tsunamis}$$

Relationship between the water flow pressure and the damage rate of houses

# Photo after tsunami



Aonae fishing port



Kamiura fishing port

# Photo after tsunami



Ota fishing port

# Basic Concept of a Disaster Restoration Plan at Aonae fishing village

1. Construction of a fishing port and village resistant to disasters
2. Regional revitalization centering on the fishery industry
3. Construction a port and village with a high level amenities

# Construction of a fishing village resistant to disasters

1. Countermeasures against earthquake and tsunami disasters (bank height H11.8m, H6.0m, ground H6.0m)
2. Countermeasures against fire
3. Evacuation system( arrival from anyplace to 6.0m height within 3minutes)
4. Information system on disaster prevention( At seismic intensity 4, simultaneously and automatically The alarm for tsunami are announced)
5. Safe keeping of fishing boats



# Framework of recover Aonae fishing village and port

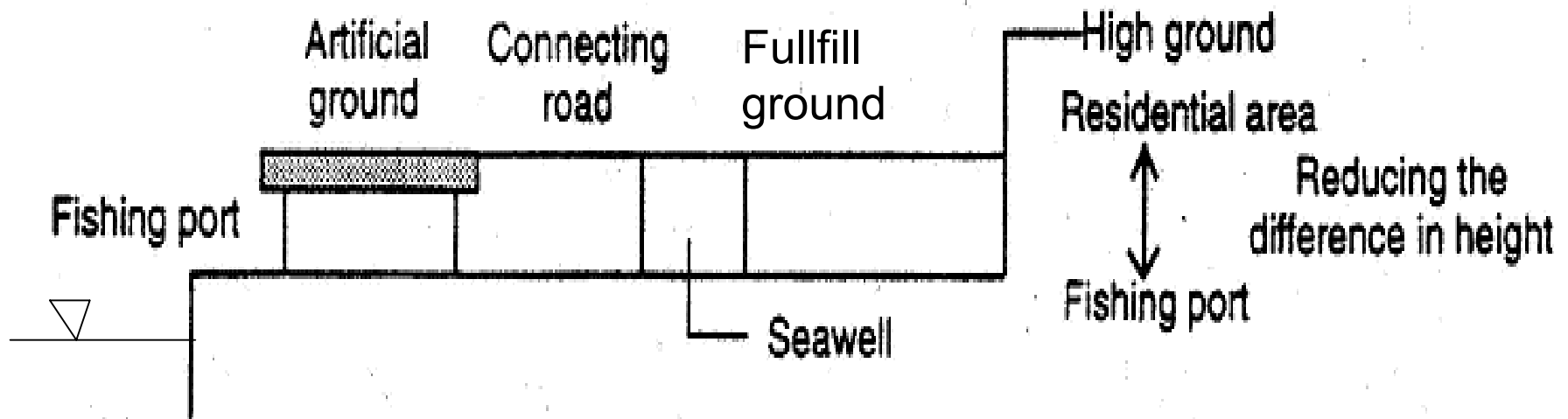
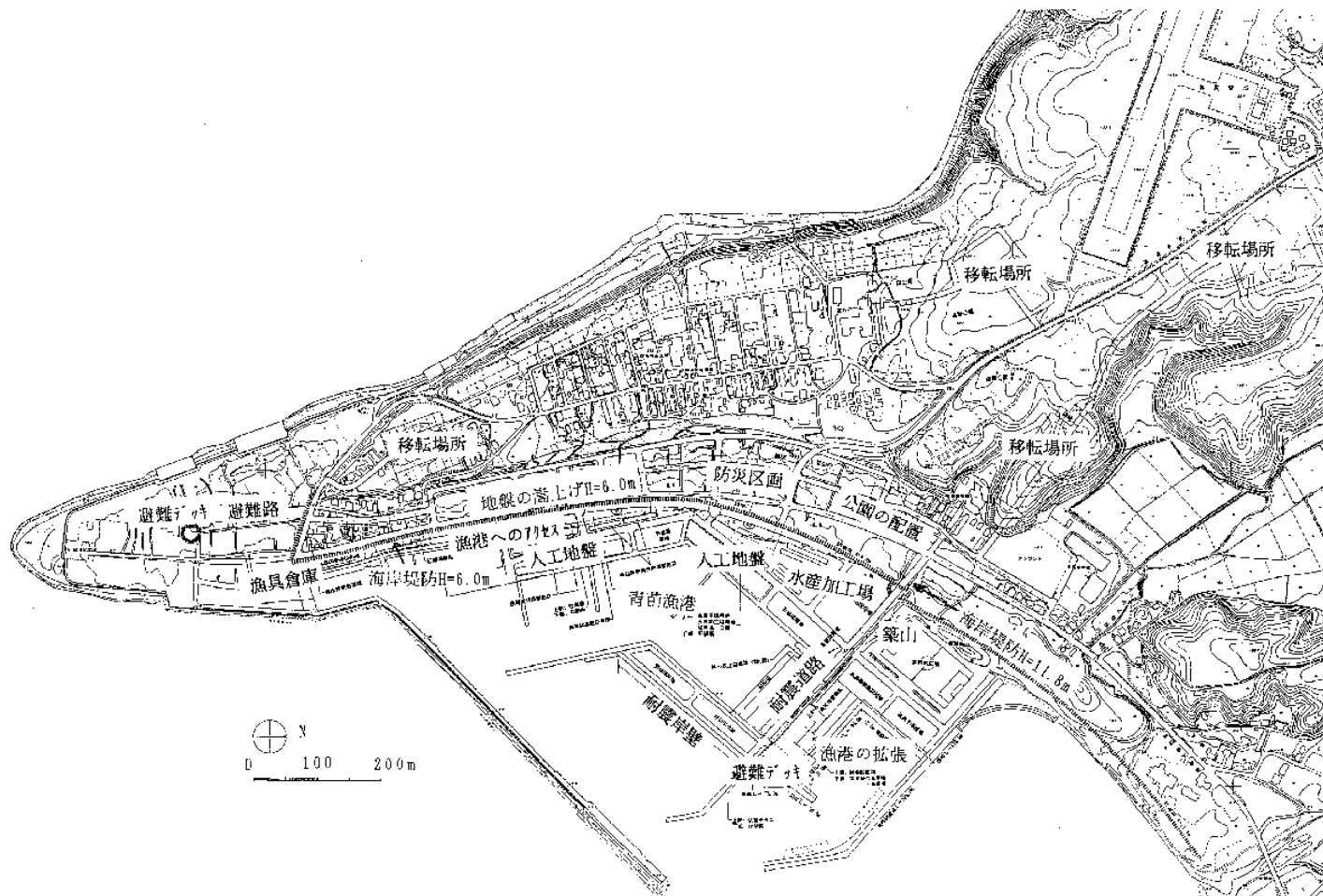


Figure 7 Countermeasures against tsunamis and houses

# Aonae recover master plan



# Photo after recover at Aonae



Artificial ground



fill mound and high ground

# Photo after recover at Aonae



Fullfill mound and seawall  
Cooperative shed



Artificial ground

# Countermeasures of tsunami at fishing villages

1. Fishing ports and breakwater facility is effective for tsunami
2. Topography weakness is recovered by fishing port facility or another
3. Improvement Hazard map
4. Alarm instrument
5. Evacuation road