

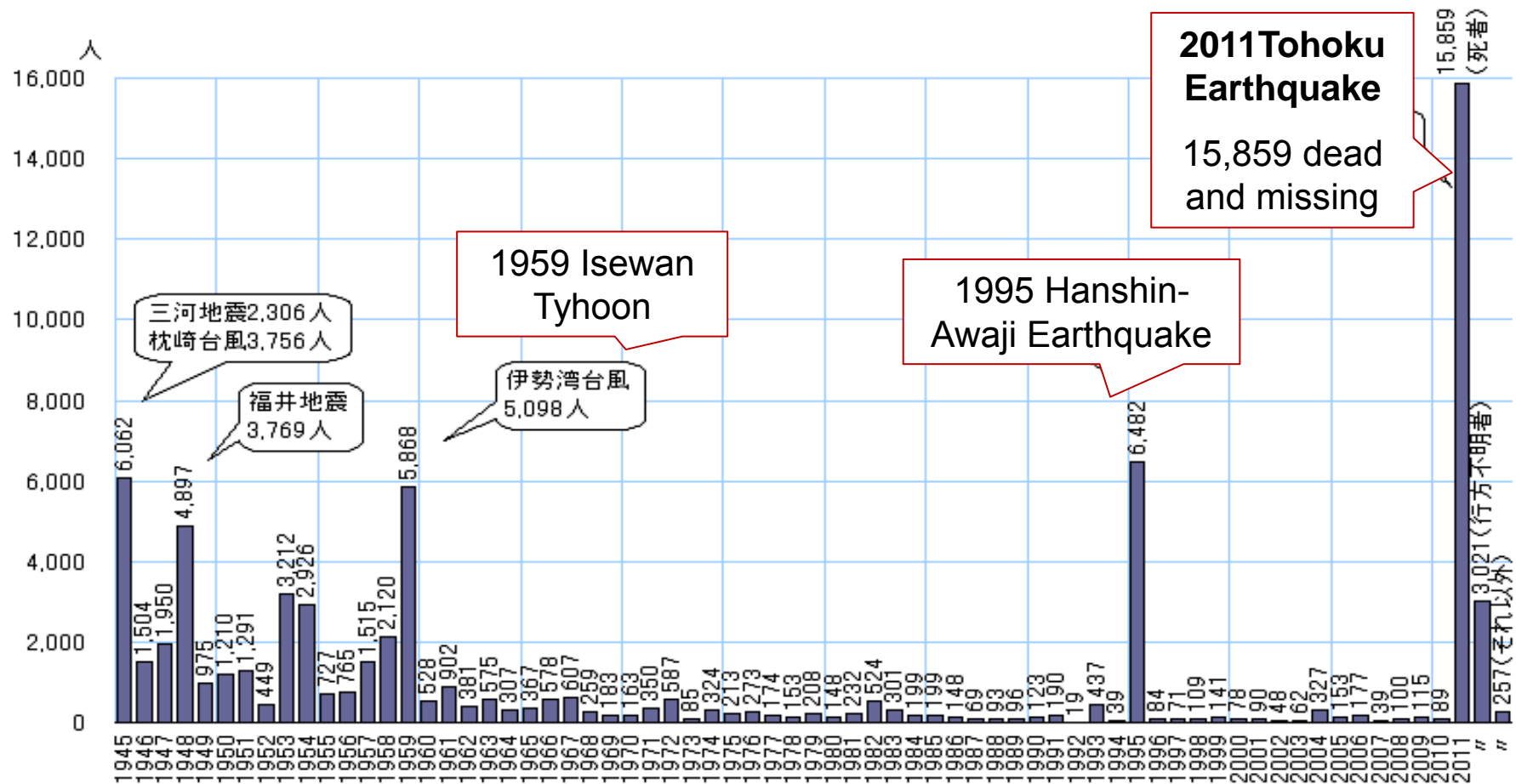
Tsunami Damage and Recovery of the Sanriku Coastal Area

November 15, 2013

Junichi HIROTA
Iwate University

1. TSUNAMI DAMAGE

2011 Tohoku Earthquake and Tsunami: the Largest Natural Disaster in Post-War Japan



Number of Dead and Missing, by Post-War Natural Disaster

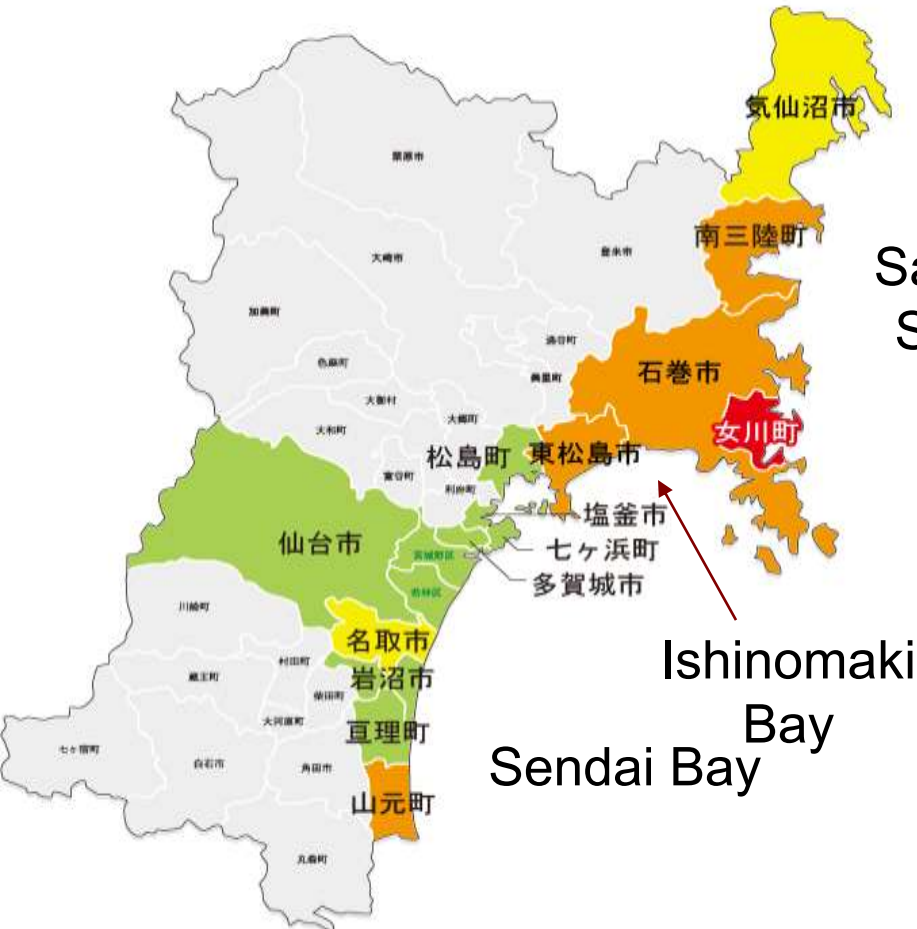
Rate of Dead and Missing, by City, Town and Village (Iwate and Miyagi Prefectures)

宮城県
1:700,000
0 10 20 30km
MAPIO / Copyright©NijiX

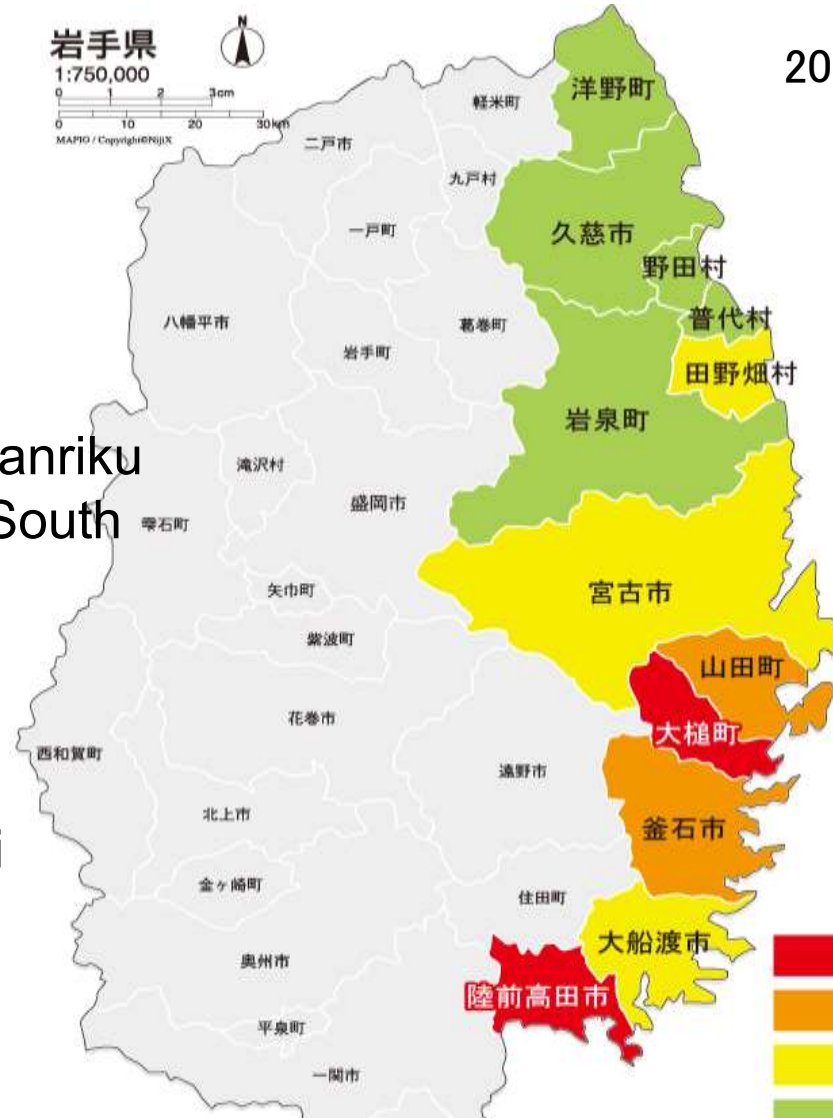
Dead and Missing, Percentage of
Population as of March 2011

岩手県
1:750,000
0 10 20 30km
MAPIO / Copyright©NijiX

2011.4.17 現在



Sanriku
South



Sanriku
North

Sanriku
South

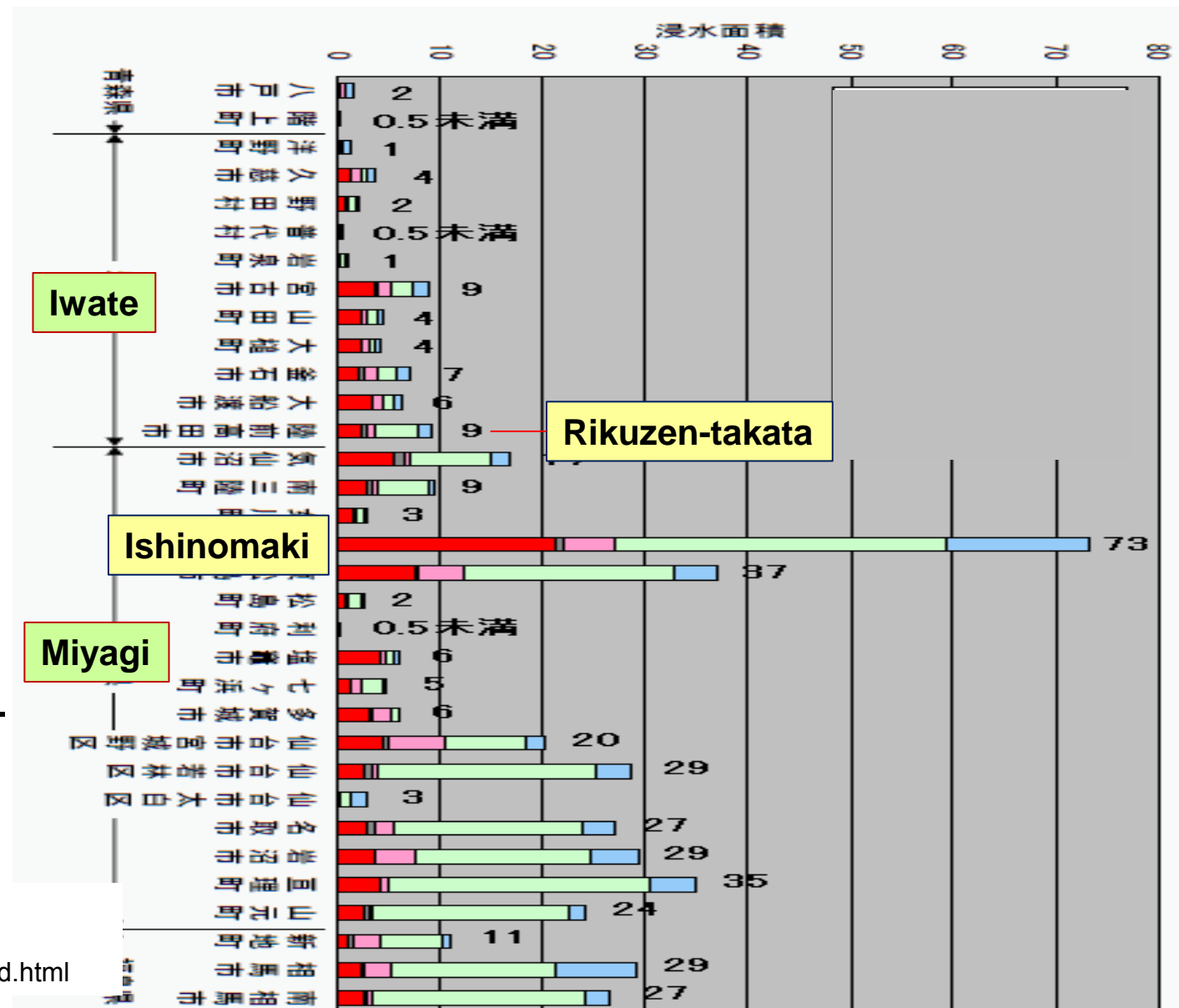


Damage in Southern Sanriku, Especially Serious

Area Flooded by Tsunami (by City, Town and Village)

In Iwate, Flooded area was smaller, but the rate of buildings(red) flooded was higher.

In Miyagi, Flooded area was larger, and most of the flooded area was agricultural land(green),..

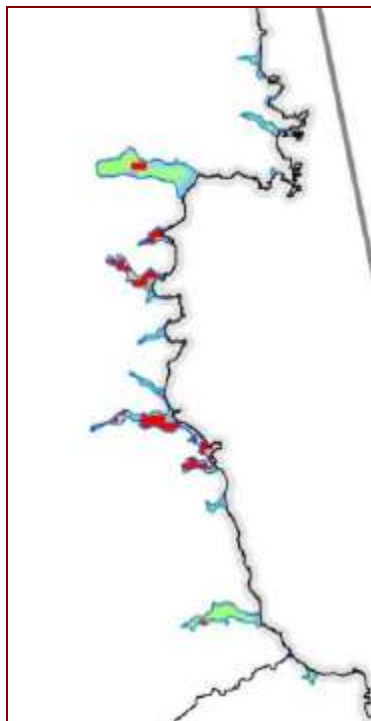


(出所) 社会実情データ図録

(原資料) 国土地理院

<http://www2.ttcn.ne.jp/honkawa/4363d.html>

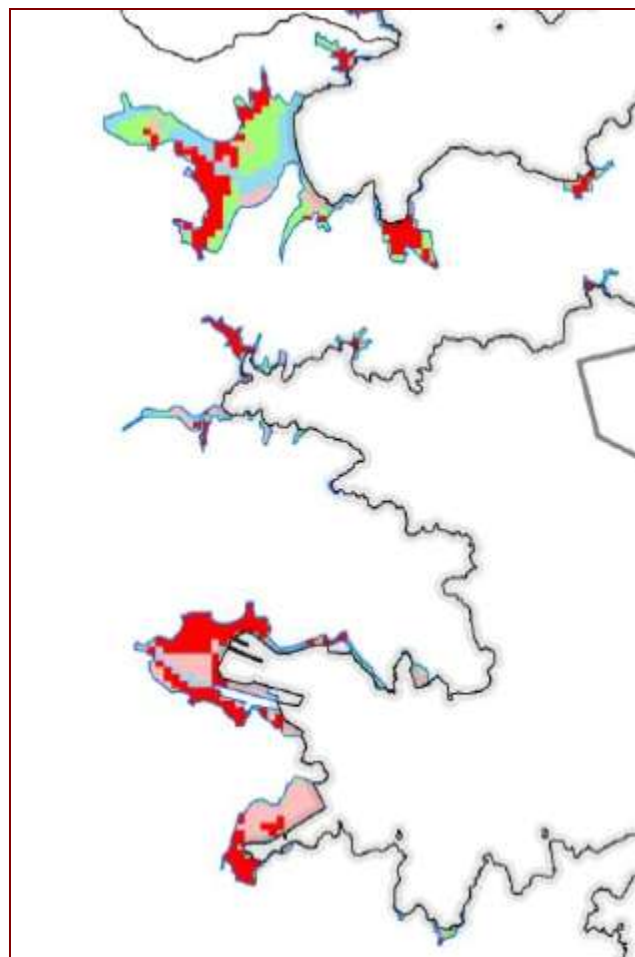
Maps of North and Central Sanriku Flooded Area



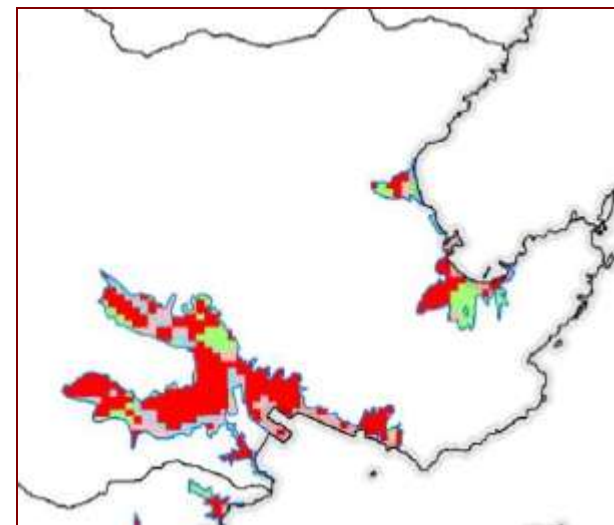
Tanohata-mura,
Iwate Prefecture

0 1 5 km

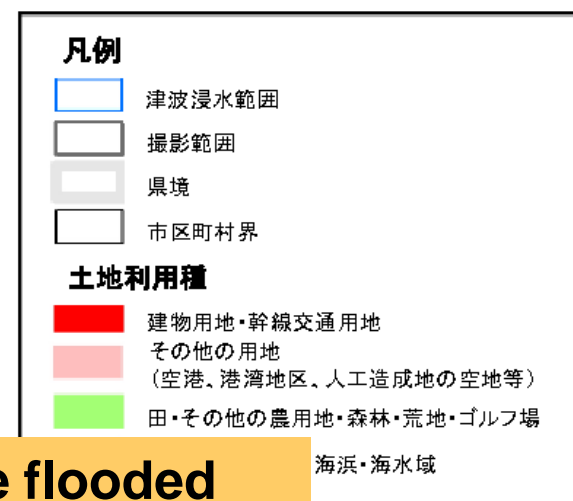
国土地理院:津波浸水範囲の土地利用
<http://www.gsi.go.jp/common/000060279.png>



Kamaishi, Iwate
Prefecture



Otsuchi, Iwate
Prefecture



Many buildings were flooded

Shimakoshi of Tanohata-mura in Northern Sanriku



島越

Most of houses were destroyed and passed away by Tsunami

Only two houses remained, and temporarily
used as shelters.



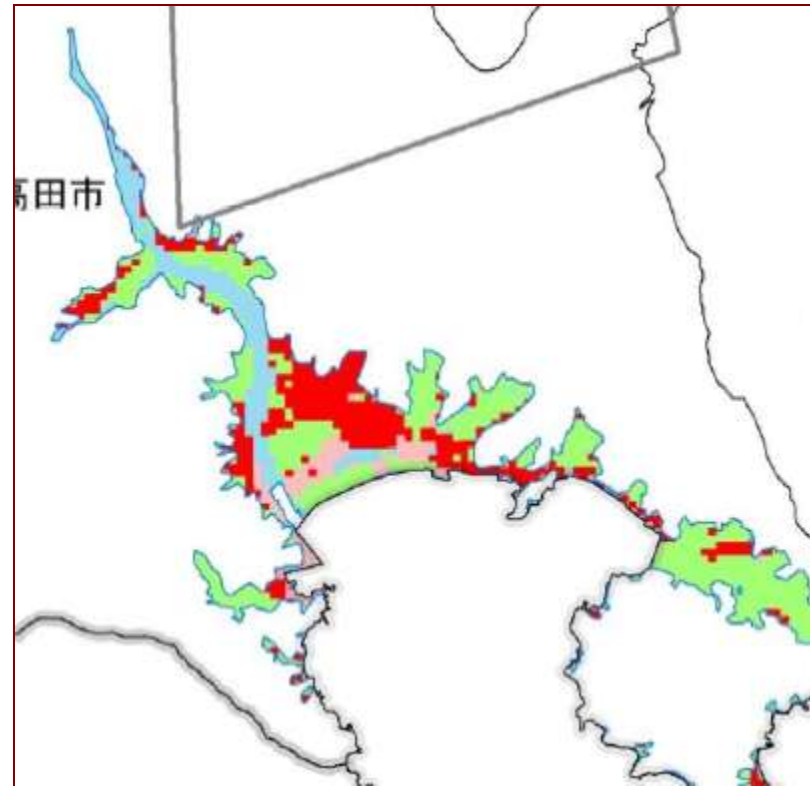
Sanriku Tetsudou Kouka Bridge

April 2, 2011. (Photo by Hirota)

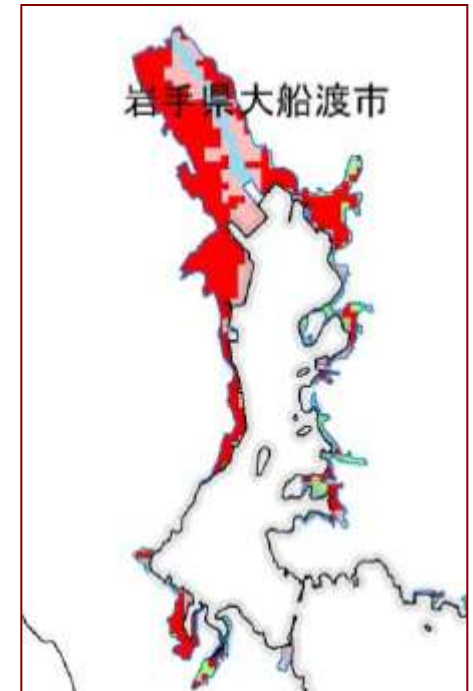
Flooded areas of Southern Sanriku Area

Much of Flooded area was land with buildings.

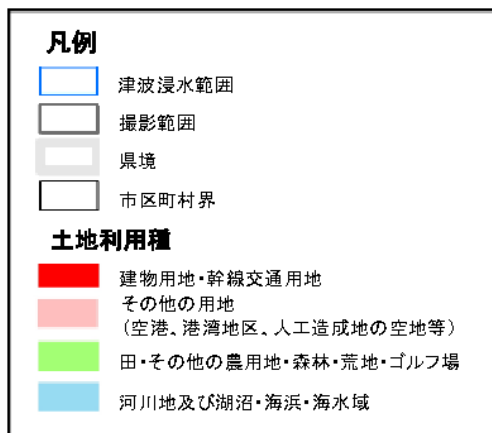
In Rikuzentakata, many paddy fields were also flooded.



Rikuzen-takata city



Ofunato city



国土地理院: 津波浸水範囲の土地利用
<http://www.gsi.go.jp/common/000060279.png>

Rikuzentakata, Iwate

Dead and Missing: 1,771 person
Rate Dead and Missing: 10.4%

The city area was completely destroyed.

Almost 30% of city employees were killed, and city hall was destroyed. The government also stopped functioning.



国土地理院: 平成23年(2011年)東北地方太平洋沖地震による被災地の空中写真

http://cyberjapandata.gsi.go.jp/h23taiheiyo-ok/photo/kokudo45s/thumb/C16/CTO-2010-6X-C16_0010.jpg



In front of JR Rikuzentakata Station

March 28, 2011. (Photo by Hirota)

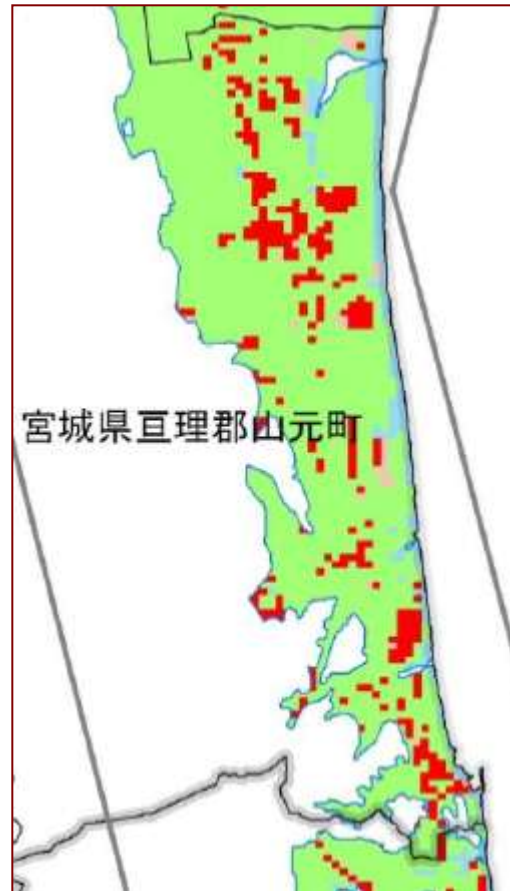
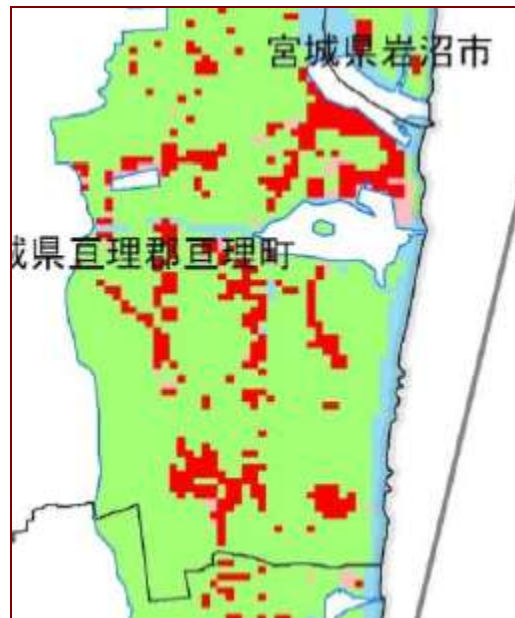


March 28, 2011. Rikuzentakata City Hall (Hirota)



March 28, 2011 (Hirota)

Flooded Maps in Sendai Bay Areas,

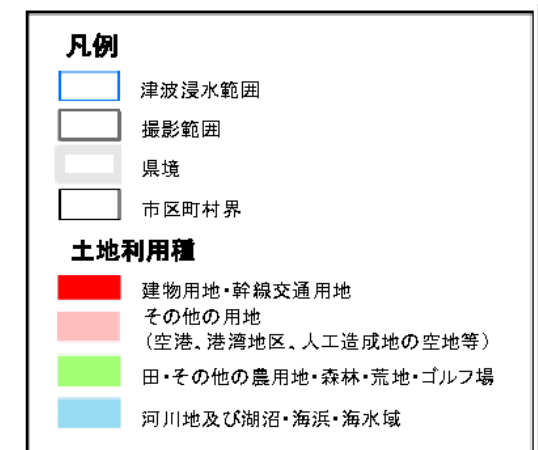


0 1 5 km

国土地理院: 津波浸水範囲の土地利用
<http://www.gsi.go.jp/common/000060279.png>

A large area of paddy fields (green) was flooded.

Agricultural settlements (red) suffered devastating damage.



Shinhama Village of Yamamoto town, Miyagi Prefecture

Communities and paddy fields on the coast were damaged, and a large area was flooded.

Inland public facilities were safe, but city hall sustained earthquake damage.

Rate dead and missing 4.6%

Disaster victims 15.4%



Shinhama Village in Yamamoto Town : May 25, 2011

Only basement of houses are left.



Photo by Hirota

Paddy Field and Drainage Pump, Shinhama Village



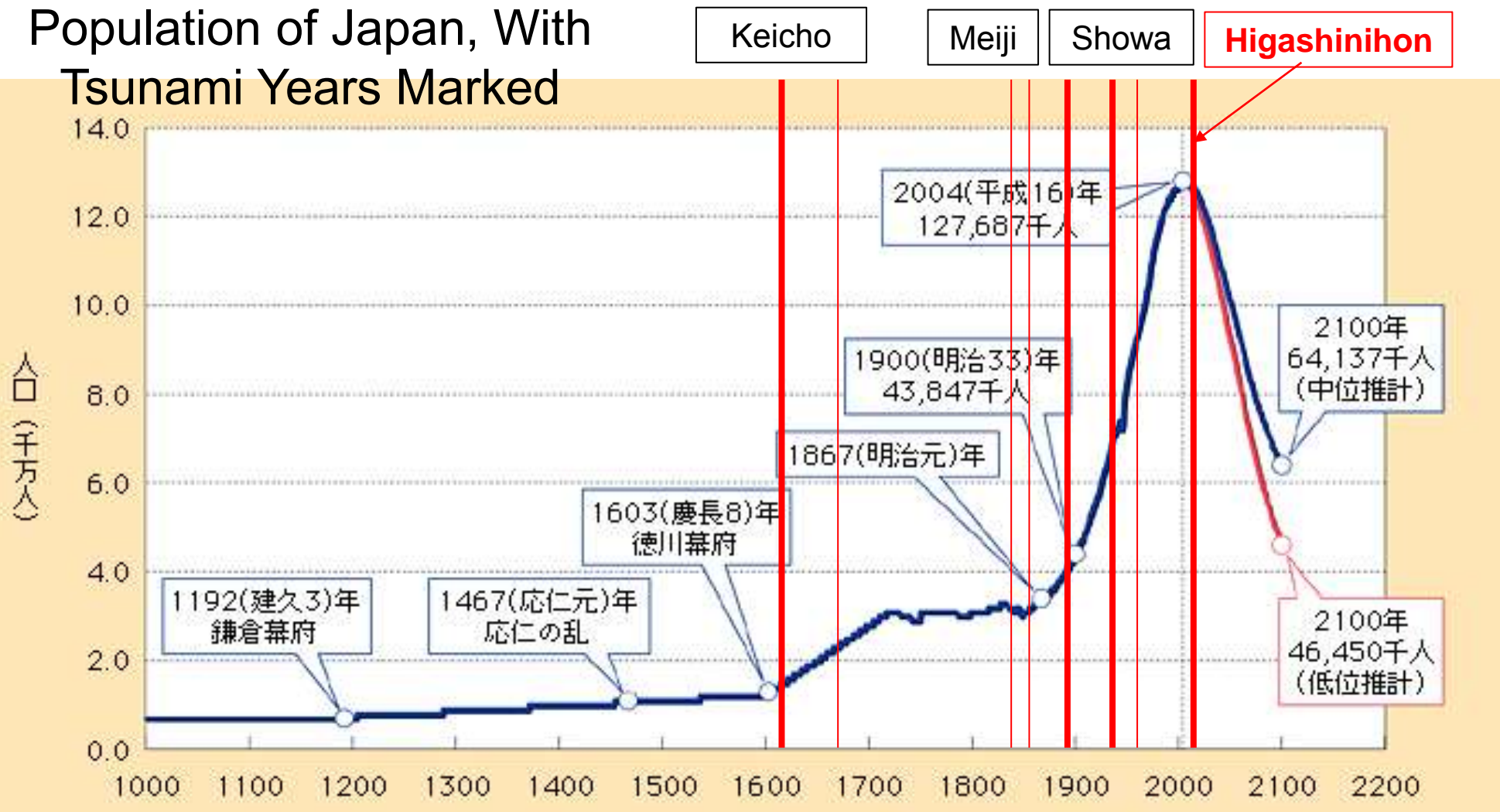
: May 25th , 2011

Photo by Hirota

2. TSUNAMI COMES BACK

Every 60 to 80 Years: A Great Tsunami Comes!

Population of Japan, With
Tsunami Years Marked



Meiji Sanriku Tsunami (1896)

Dead and Missing
(person)

Iwate 18,158

Miyagi 1,452

All Japan 21,920



Kamaishi city

Showa Sanriku Tsunami(1933)

Dead and Missing
(person)

Iwate 2,713

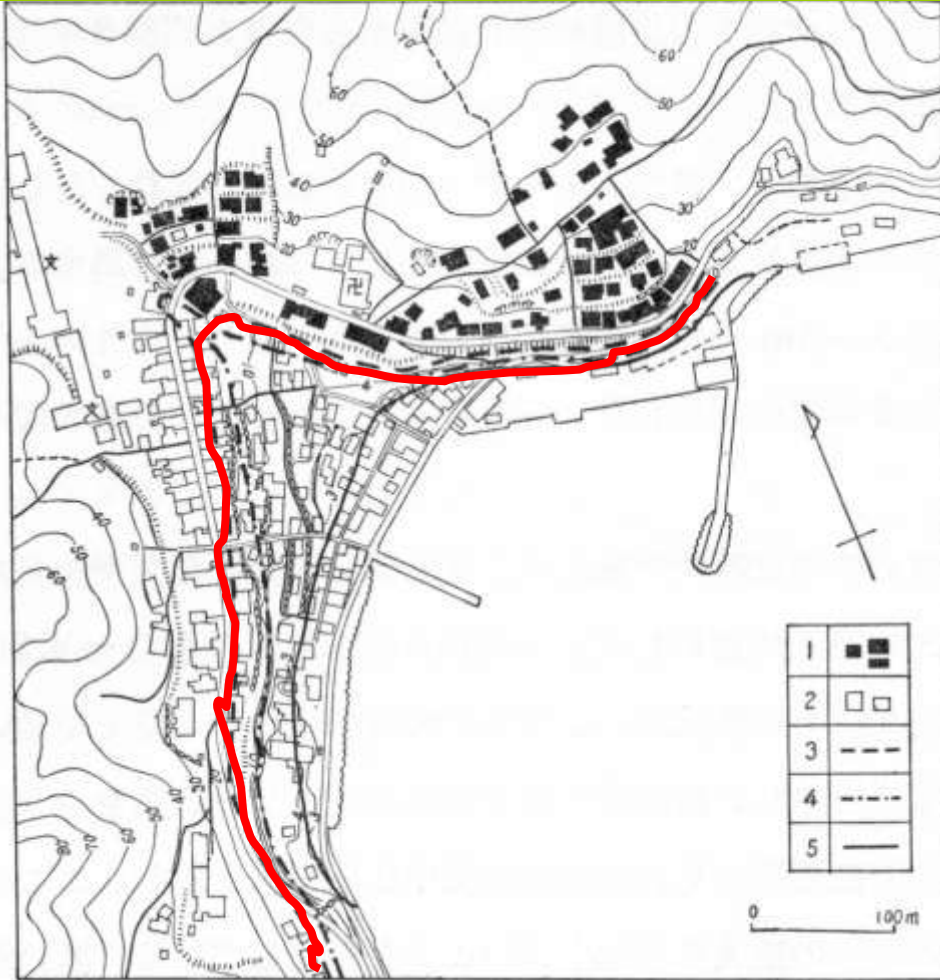
Miyagi 308

All Japan 3,064



釜石市HP : http://www.city.kamaishi.iwate.jp/kyoudo/kamaishi/tsunami_shouwa.html

Movement to Higher Ground: Kojirahama Village, Toni-cho, Kamaishi (After Showa Tsunami)



Higher Ground Plans, Kojirahama Area, Toni-cho (1933)

建設省国土地理院(1961):チリ地震津波調査報告書



Kojirahama Area, Toni-cho (2002)

数値地図(平成14年2万5千分の1地形図図式)₂₁

Kojirahama Area, Toni-cho, Kamaishi



April 27, 2005, before Tsunami



March 14, 2011, after Tsunami

3. RECOVERY PLAN

Rikuzentakata Recovery Plan

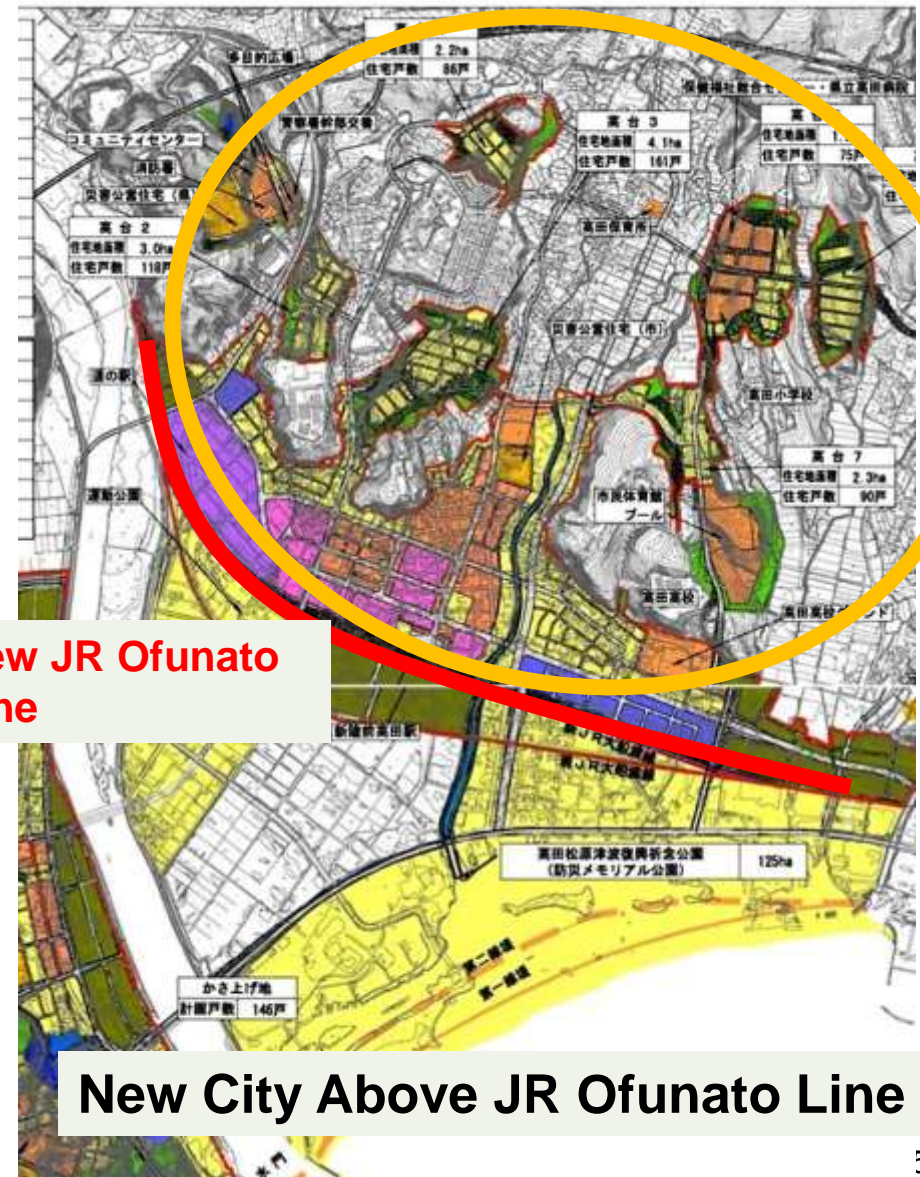


Before Thunami



Just After Thunami

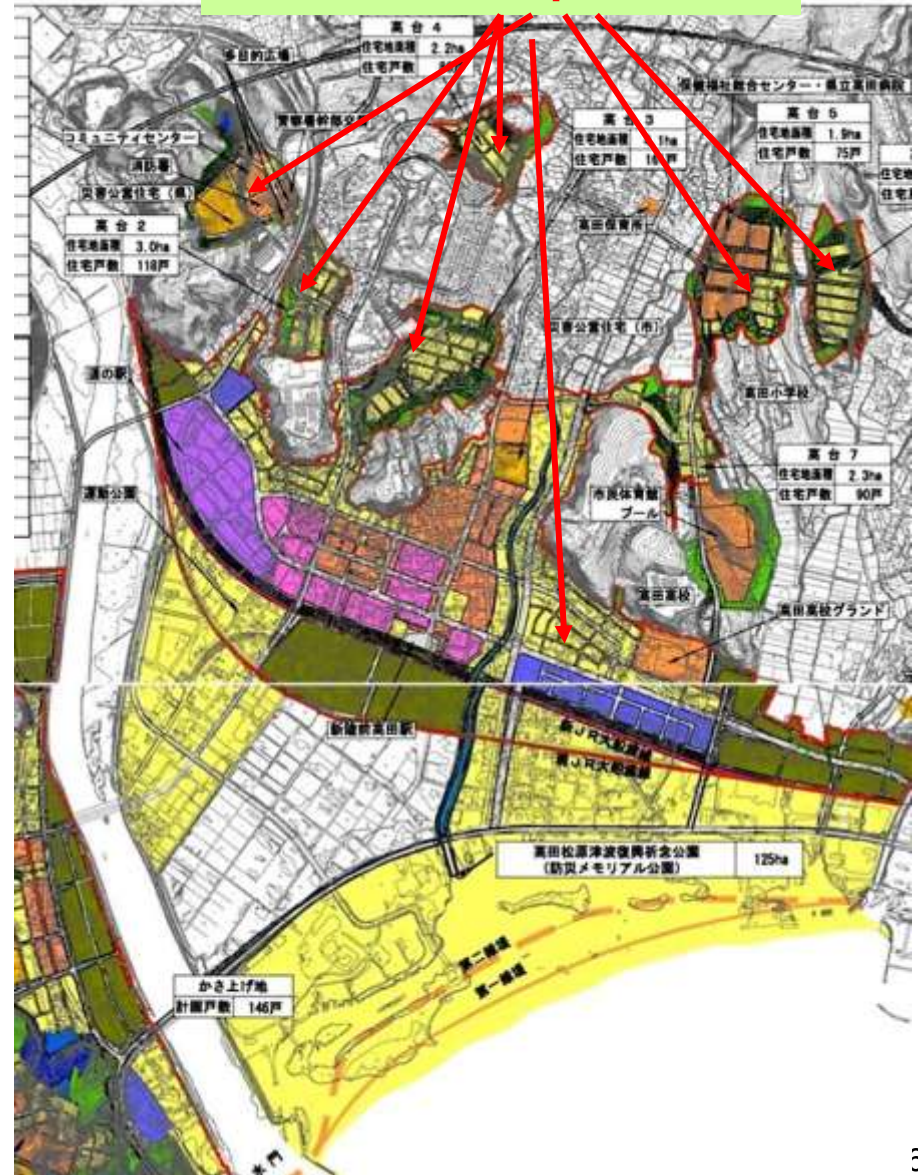
Rikuzentakata Recovery Plan



Rikuzentakata Recovery Plan

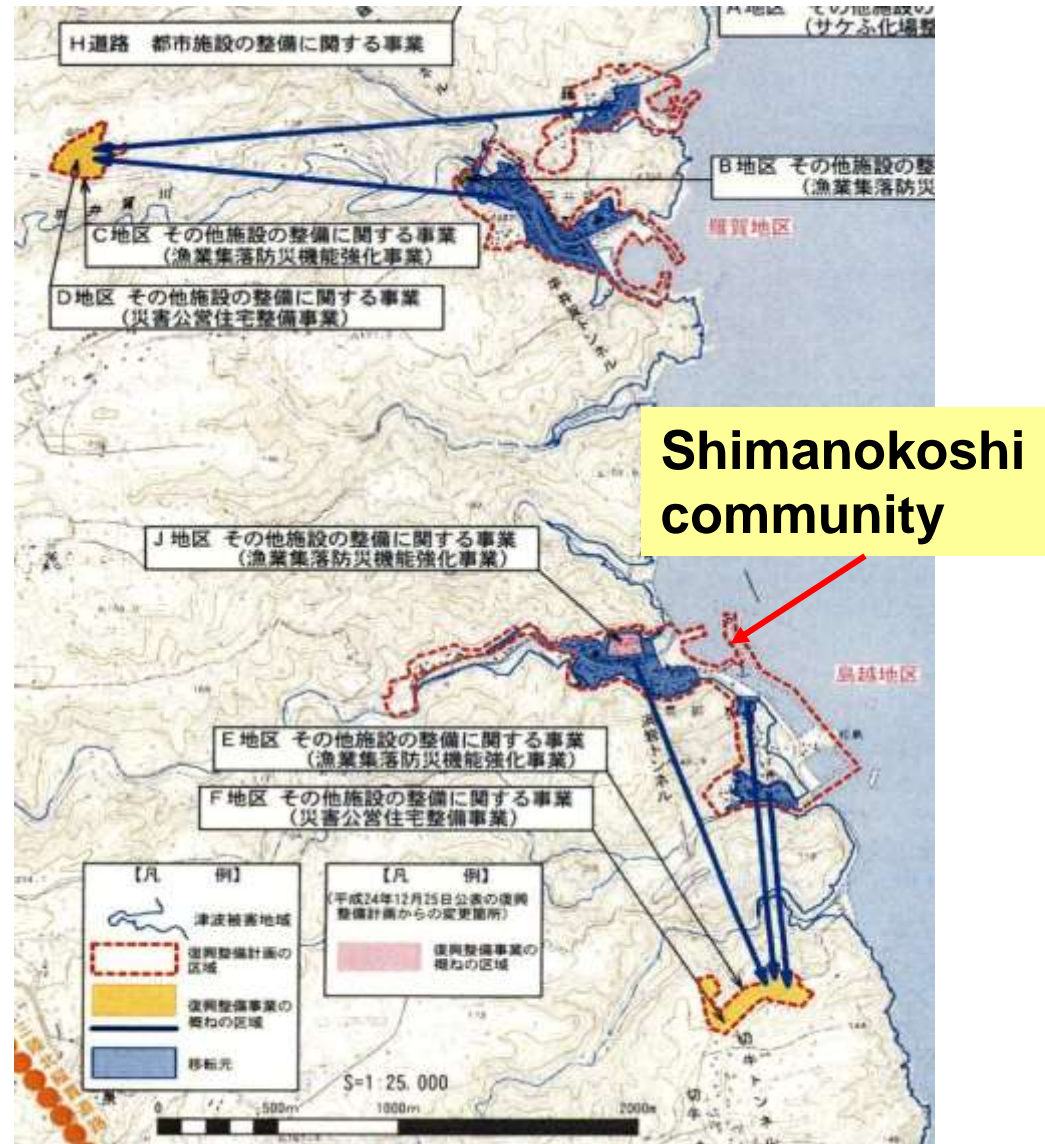
Residence Areas Dispersed

- Original residence areas will be dispersed into different area on higher ground.
- Existing communities will be broken up and new communities will have to be formed.



Tanohata-mura village recovery plan

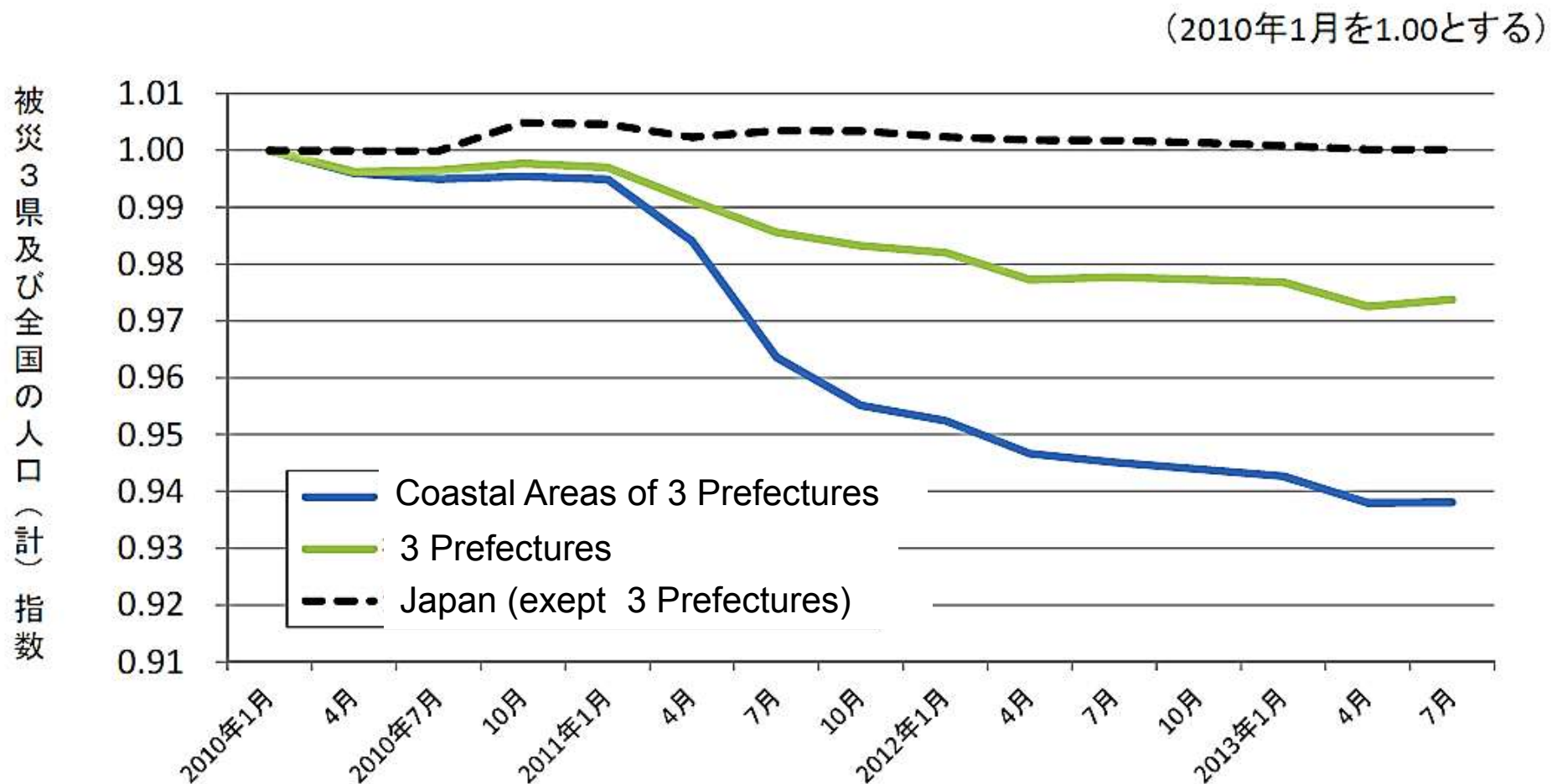
- Part of the communities will move as a group to higher ground.
- The original communities will be separated into over two places on higher ground and nearer the ocean.



4. CHALLENGES FOR RECOVERY

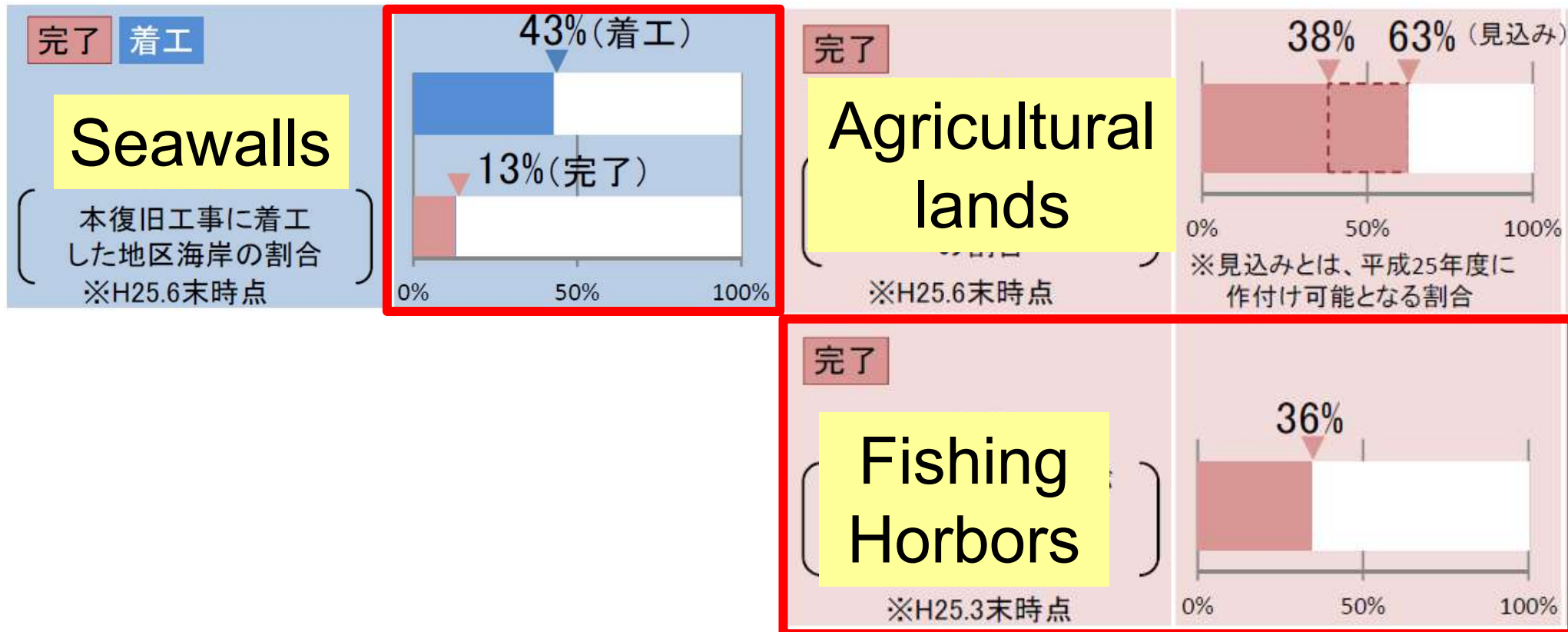
Challenges for Recovery (1) Population Loss

Three Prefectures Hit by the Disaster Suffering from Drastic Population Loss



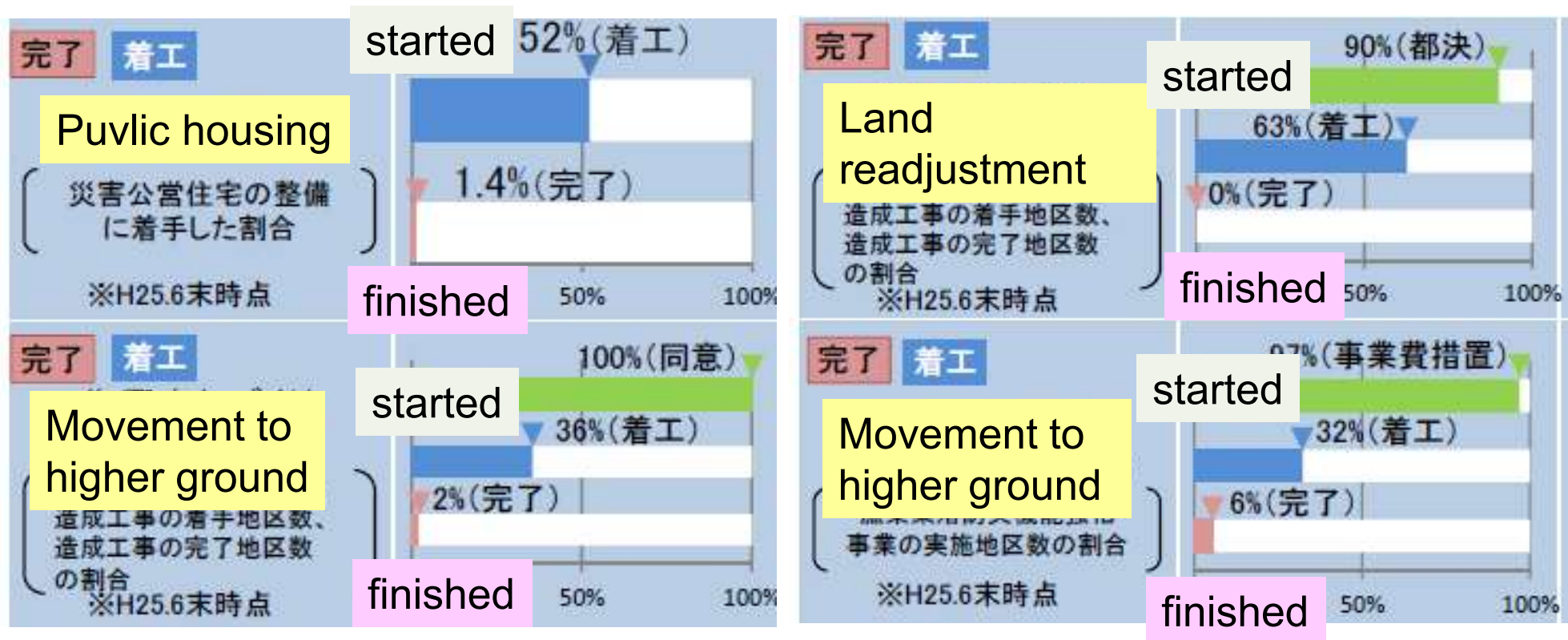
Challenges for Recovery (2) Public Infrastructure

Seawalls and Fishing Harbors are poor recovered.



Challenges for Recovery (3) Housing recovery

- Projects for public housing, movement to higher ground and land readjustment have just begun.
- It will take time to complete these projects.



Challenges for Recovery (4) Community recovery

- Above mentioned

Challenges for Recovery (5) Nature Restoration

- *Only a few plans focus on nature restoration.*

□ Restoration of Otomoura (Rikuzentakata)

- In 1968, tidelands were made into paddy fields.
- The paddy fields were destroyed in 2011 tsunami.
- It was decided to restore tidelands.
- Before 1968, tideland was paradise for clamming, etc.



東海新報社:

http://www.tohkaishimpo.com/scripts/index_main.cgi?mode=kiji_zoom&cd=nws8465

Restoration of Tidelands (Otomo, Rikuzentakata)



国土地理院「平成23年(2011年)東北地方太平洋沖地震正射画像」

<http://saigai.gsi.go.jp/h23taiheiyo-zort/block/kamaishi.jpg>

IN CLOSING

Sanriku Fukko (Reconstruction) National Park

Established in May 2013 to contribute to the recovery of Sanriku area, the park is 220 km long. In the north, there are magnificent cliffs that have been praised as “Alps of the Sea.” In the south, complicated terrain forms an elegant ria coast.



Children and Students of Otsuchi town at Otsuchi ARIGATO Rock Festival, July 28, 2013



Thank you for Attention!