

APEC Workshop
Tsunami Disaster Risk Reduction in APEC economies
16 August 2016, San Borja 1 room, 1st floor,
Lima Convention Center, Peru



An Overview of Tsunami DRR Policy in Japan after the Great East Japan Earthquake

Tsunami DRR Policy in Japan after the Great East Japan Earthquake, 2011

1. The Great East Japan Earthquake, 2011 and priorities in tsunami DRR
2. Policies facing the risks of Nankai Trough Earthquake
3. Towards an integrated Tsunami DRR: structural and non-structural measures
4. Learning from the history and good practices

1. The Great East Japan Earthquake, 2011 and priorities in tsunami DRR

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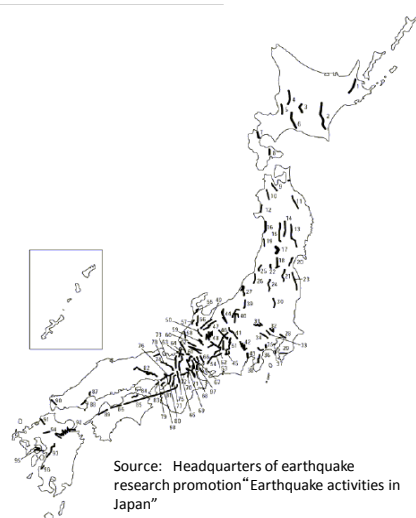
Recent Earthquakes in Japan

Earthquakes in Japan s

Year	Earthquake and Tsunami
1995	The Great Hanshin Awaji Earthquake
1997	Satsuma region in Kagoshima prefecture earthquake
1998	Northern region in Iwate prefecture earthquake
2000	Niijima and Kozushima earthquake
2000	Tottori-seibu earthquake
2001	Geiyo earthquake
2003	Miyagi-ken-oki earthquake
2003	Northern Miyagi earthquake
2003	Tokachi-oki earthquake
2004	Nigata-ken Chuetsu earthquake
2005	Fukuoka-ken seihou-oki earthquake
2005	Miyagiken-oki earthquake
2007	Noto Hanto earthquake
2007	Nigata-Chuetsu-oki earthquake
2008	Iwate-Miyagi inland earthquake
2008	Iwate coastal area earthquake
2009	Suruga Bay earthquake
2011	The Great East Japan Earthquake

Source: Cabinet office
Recent earthquakes with seismic intensity of six or greater are listed.

Active faults in Japan



Major Tsunami disasters affecting Japan

		Magnitude	Death & missing
1896	Meiji-Sanriku Tsunami	M8 ¼	22,000
1933	Showa-Sanriku Tsunami	M8.1	3,064
1944	Tonankai Earthquake	M7.9	1,223*
1946	Nankai Earthquake	M8	1,443*
1960	Chile Earthquake Tsunami	M9.5	142*
1968	Tokachi Oki earthquake	M7.9	52
1983	Nihonkai Chubu earthquake	M7.7	104*
1993	Hokkaido Southwest Earthquake	M7.8	230*
2011	The Great East Japan Earthquake	M9	21,839

Source: Cabinet Office, Japan

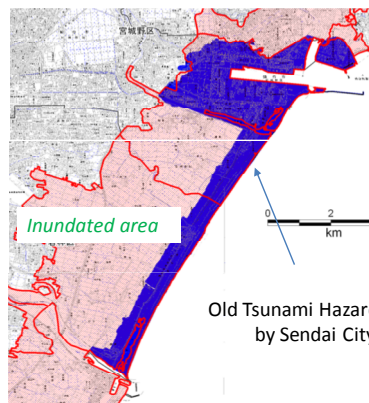
*including those killed not by tsunami



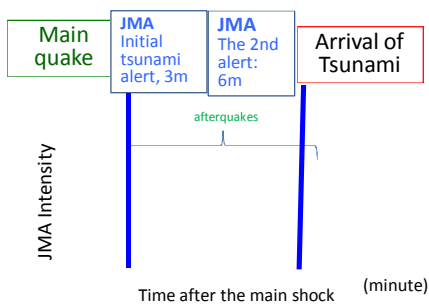
Hachinohe Port Breakwater



Taneichi Seashore Dyke



Old Tsunami Hazard Map by Sendai City



Source: Yozo GOTO, University of Tokyo

Principles of Tsunami DRR

After the Great East Japan Earthquake

1. Facing Mega tsunami disasters:
 Maintain the socio-economic services of minimum needs including those of governments, hospital as well as for securing human life, as the top priority
 → *An integrated tsunami DRR is necessary through a policy mix of land use, evacuation facility, DRR infrastructure, and so on.*
The key is evacuation

2. Other tsunamis with smaller intensity
 protect assets and economic activities as well as human life
 → *improving coast conservation facilities ,and so on*

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Tsunami Countermeasures after the Great East Japan Earthquake

Major frameworks

The Act on Promotion of Tsunami Countermeasures

- enhancing tsunami observation systems
- education and training
- construction of necessary facilities

The Act on Development of Areas Resilient to Tsunami Disasters

- formulation of comprehensive plans and restriction of development in areas that will potentially be inundated by tsunami

Modification of the Disaster Countermeasures Basic Act

- enabling local governments to designate emergency shelter areas, and so on

2. Policies facing the risks of Nankai Trough Earthquake

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Damages by major earthquakes in the past and future

Figures are provisional.

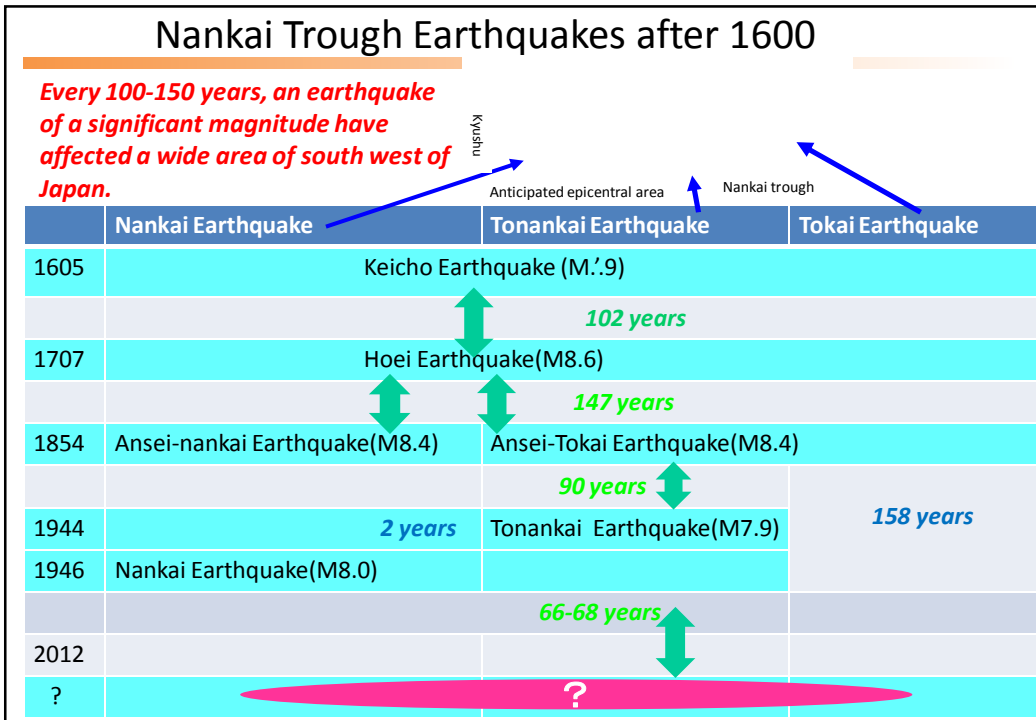
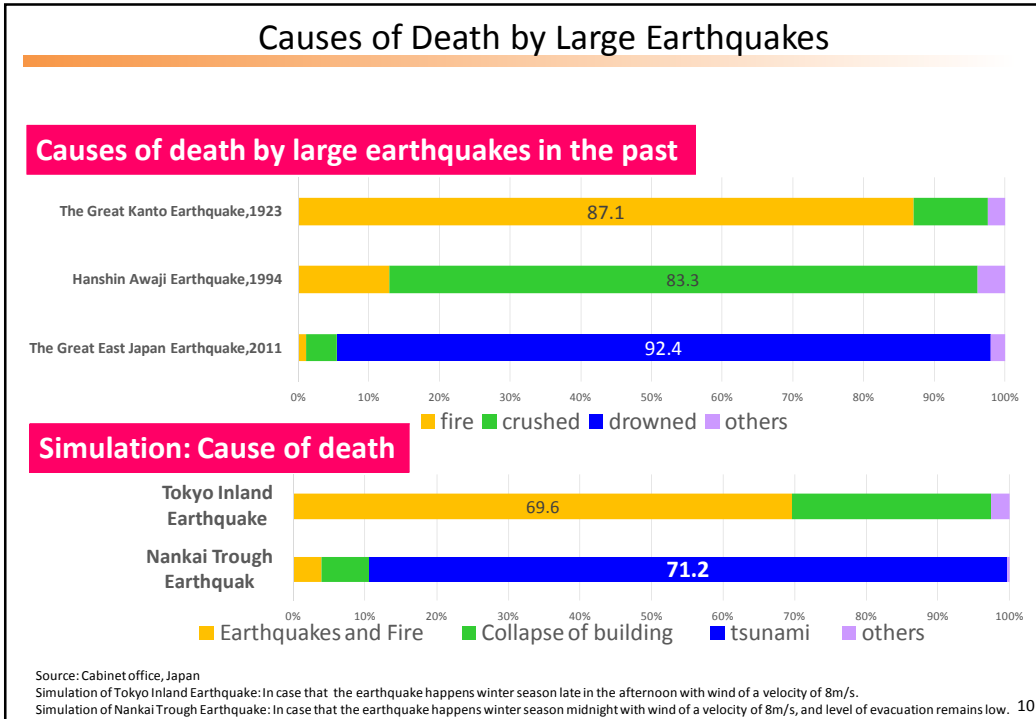
Earthquake	Number of local governments to be affected by quakes of nearly level 5 or stronger		Number of death and the missing(person)	Number of Totally destroyed houses
	Prefectures	Municipalities		
1. Hanshin-Awaji Earthquake (1994, Jan, 17)	1	-	6,437	104,906
2. Nigata-Chuetu Earthquake (Oct.23,2004)	5	59	68	3,175
3. The Great East Japan Earthquake (March, 11,2011)	17	389	21,839	121,809
4. Kumamoto Earthquakes (April 14 th and 16 th ,2016)	8	80	81 ⁽²⁾	6,961
5. Nankai Trough Earthquake (Simulation)	39	1,238	Approx.323,000	Approx.1,632,000
6. Tokyo Inland Earthquake (Simulation)	9	325	Approx.23,000	Approx.198,000

1. The death tolls for no.1 and no.2 include those "related to" the disasters.

2. Thee number of the killed in no.4.Kumamoto is the aggregate of 49 persons directly killed and inspected by the police, and the other 32 including those who passed due to the injury or stress getting worth after the disaster and others.

3. Regarding no.1 Hanshin Awaji earthquake, definition of earthquake intensity scale is not the same as others

4. No.5 and No6 are based on the cases with the maximum simulated damages.



A simulation of the Damages by a Nankai Trough Earthquake

Earthquake intensity distribution, Hight of tsunami, Inundated areas

Level 7	151 municipalities
Tsunami of 10m or higher	21 municipalities

Number of collapsed building, Number of the killed and missing

Number of the killed and missing	323 thousands
Number of collapsed building,	million 386 thousands houses

Damages on infrastructure and lifeline

Power failure	24.2-27.1 million
Interruption of telephone services	8.1-9.3 million lines

Impact on daily life

Number of evacuees	4.4-9.5 million
Shortage of food	14-32 milliosn meals, for three day

Economic damages

Damages on assets	169.5 trillion yen
Effects over economic activities	50.8 trillion Yen

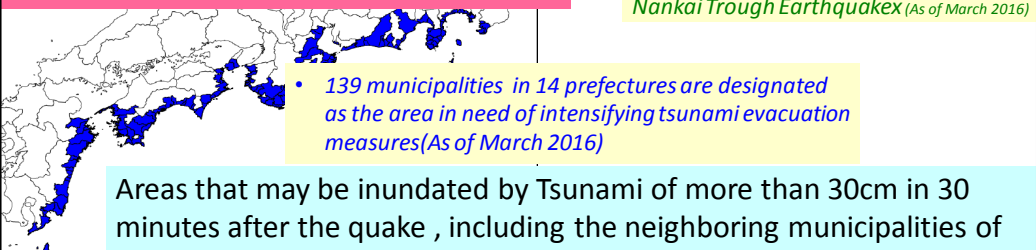
Source: Cabinet Office, Japan

Area designation for Nankai Trough Earthquake Countermeasures

Designated areas to promote countermeasures

Areas that may be
 -affected by the quakes of seismic intensity at 6 or more
 -hit by Tsunami of 3 meters or higher and the dikes height remain low.

Designated areas for intensified Tsunami evacuation measures



Basic Policies against the Nankai Trough Earthquake Disaster Management			
Damage reduction goal in 10 years	Death toll	Simulation 332 thousands	More than 80 % reduction
	Totally collapsed buildings	2.5 million units	More than 50 % reduction
Earthquake Counter measures			
1) Earthquake-resistant building, 2) Making buildings Fire-resistant, 3) Measures against land slides, soil liquidation 4) Earthquake-resistant life-lines and infrastructure			
Tsunami Counter measures			
1) Building tsunami-resilient community, 2) securing safe evacuation			
Comprehensive Disaster Management System			
1) Enhancing disaster management education/drills, 2) Collaboration with volunteers 2) Upgrading disaster reduction capability, 4) Measures against long-period earthquake motion			
Preparing for response			
1) Establishing disaster response systems, 2) Rescue and emergency response, 3) Medical plans, 4) Firefighting activities, 4) Securing emergency transportation, 6) Procurement of food, water and life support necessities, 7) Securing fuel supply, 8) Measures to the evacuees, 9) Measures to hard-to-reach-home workers (commuters), 10) Measures for life-line and infrastructure recovery 11) Hygiene and public health, epidemic prevention measures, 12) Plans for the remains, 13) Measures for disposition of disaster debris, 14) Collection of disaster information, 15) Provision of disaster information, 16) Securing and stabilizing social order, 17) Effective use of various space 18) Establishing wide-area cooperation and support system			
Prevention of confusion in the areas directly hit by a disaster and other areas			
1) Securing main traffic networks, 2) Securing business continuity of the private sector, 3) Securing services continuity of the national and local public entities			
Measures against various mode of disaster occurrence			
Measures for various challenges in the region			
1) Securing safety of skyscrapers, underground shopping malls, department stores, and terminal stations, 2) Securing safety of the sea level area, 3) Securing safety of nuclear plants, 4) Securing safety of petrochemical complex, 5) Response to local communities highly likely to be isolated, 6) Prevention and reduction of damage in the local business and logistics in the water-front areas, 7) Measures for cultural heritages			

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3. Towards an integrated Tsunami DRR: structural and non-structural measures

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Facilitating Evacuation from Tsunami

Tsunami Evacuation Building

Municipalities designate some existing buildings for evacuation in case of tsunami



Shizuoka city, Shizuoka Pref.

Tsunami Evacuation Towers



Tsunami Evacuation Tower, Kujukuri Town, Chiba, Pref.



Pedestrian bridge with a space for evacuation Yoshida town, Shizuoka Pref.



Tsunami evacuation towers, Kuroshio Town, Kochi, Pref.



Life saving small hill Fukuroi city, Shizuoka pref.

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Facilitating Evacuation from Tsunami

Installation of evacuation routes, steps, signposts on the areas to be inundated



Evacuation route to a hill
Kushimoto-cho, Wakayama prefecture



Evacuation drill



Steps for evacuation leading to the road
Sanriku coastal road



Sings announcing the risks of tsunami
Sanriku road office



Sign announcing tsunami inundation area
Tosa National road office



Sign board on Tsunami evacuation
Sanriku-cho, Miyagi prefecture

Thanks to the evacuation drill at the school, the school children had safely evacuated from the tsunami before the arrival to the area.



Source: Prof.Toshitaka Katada, Gunma University
Photo taken by a local resident in Kamaishi City, Iwate Prefecture

(津波襲来直前に鶴住居地区住民が撮影)

Evacuation drills at community level

from a casebook of tsunami evacuation drills fry Cabinet office, Japan, 2015



Evacuation drill in Kyotango city, Kyoto pref.
Assisting persons in need of care



Evacuation drill during night in Kamakura, Kanagawa pref.



More than 30 fishing boats evacuating off the coast in Shiranuka-cho, Hokkaido pref.



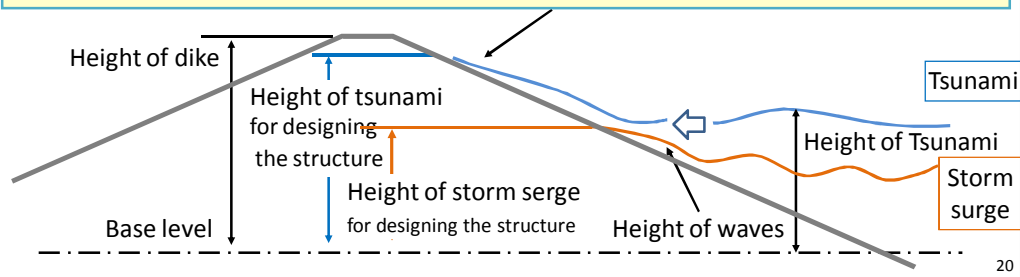
A "Tsunami walking" to learn the height of inundation in Oiso Town, Kanagawa pref.

Construction of Dikes against Tsunami

Defining the height of risks of tsunami, which could occur every several decades or centuries (by individual coastal areas)

- historical studies of the height of tsunami
- simulation of the height of tsunami caused by the earthquakes that may happen in a high probability

- Designed height of the dike is defined by comparing the height of tsunami with that of storm surges
- The height is decided by considering use and environment of the sea, scenic beauty, economic aspect, convenience for maintenance, and so on from an integrated viewpoint (by achieving consistency among relevant ministries and neighboring coasts)



Improving Coast Conservation facilities

- Sea Dikes and river dikes
- Anti seismic structure
- Prevention of liquefaction
- Automatisation of opening & closing of water gates, and lock gates
- Remote control



Lock gate, Shizukawa Town, Miyagi Prefecture



Coastal dike, Watari town, Miyagi prefecture)

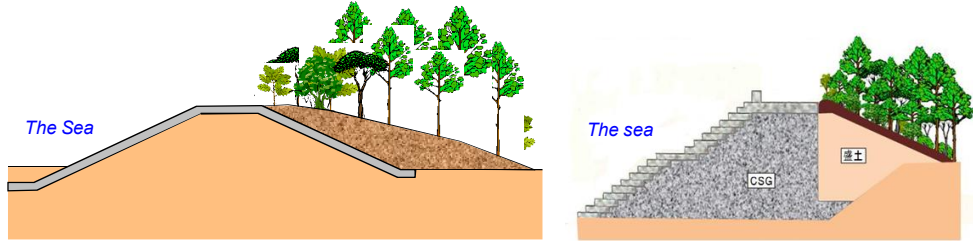


Water gate, Mihama town, Aichi Prefecture

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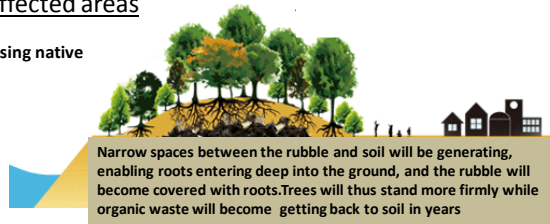
Green Seawall

○Environment and landscape friendly **Green Dikes** resilient against Tsunami and



Case of some affected areas

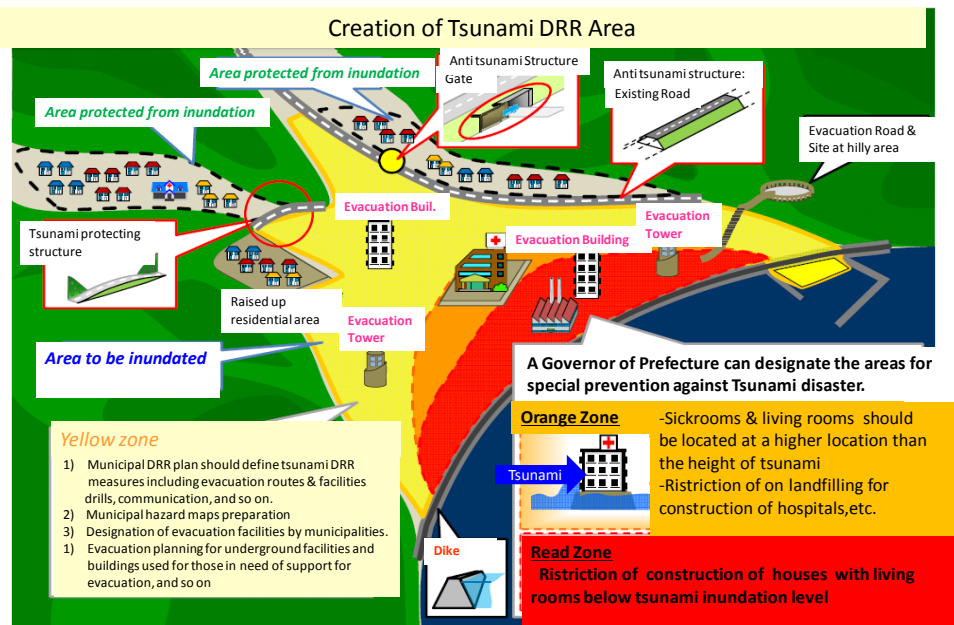
Tide break forest by using native trees including oak



(Source: Life saving forest seawall promotion conference ,Tohoku

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The Act on Development of Areas Resilient to Tsunami Disasters

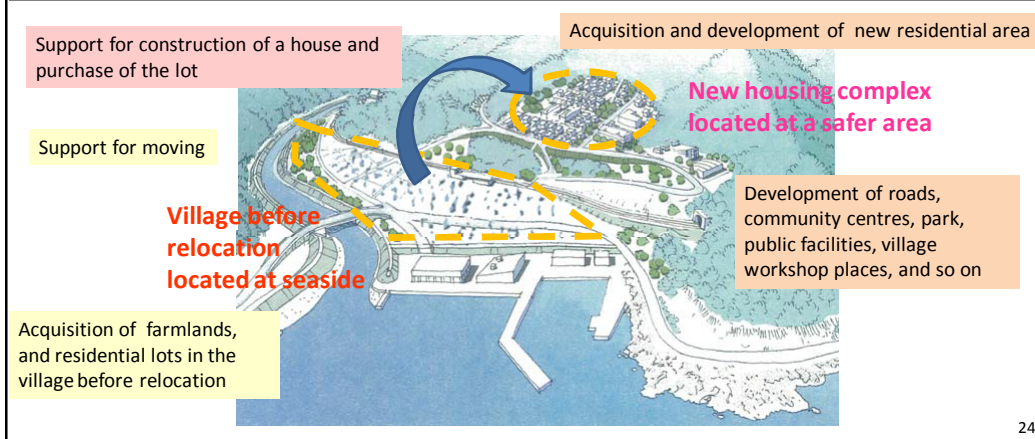


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Project promoting collective relocation for DRR

Case of the affected areas by the Great East Japan Earthquake

- Acquisition of the housing lots in inundated area by the local government so that the area with a high risk of tsunami inundation will never be used as residential area by building restriction
- Development of new residential areas for relocation by the local government, and the individual residential lots will be offered or rented to the residents collectively relocating from high risk areas



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4. Learning from the history and good practices

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Tsunami DRR towards the future by learning from the History

Aneyoshi District, Miyako City, Iwate Prefecture

A stone monument warning
"Never build houses below
this height"



Height 60m



Hirokawa village, Wakayama Prefecture

Spanish Version (pdf 2.5MB)



Inamura-no-hi museum and brochure



Goryo's house used as a museum
promoting Anti-Tsunami education

Learning from the lessons from The Great East Japan Earthquake



Sendai 3/11 Memorial Centre



*Muchas Gracias.
Thank you very much.*