Disaster Management in Japan related to "Earthquake Hazard Risk Management"

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10 IWSMRR
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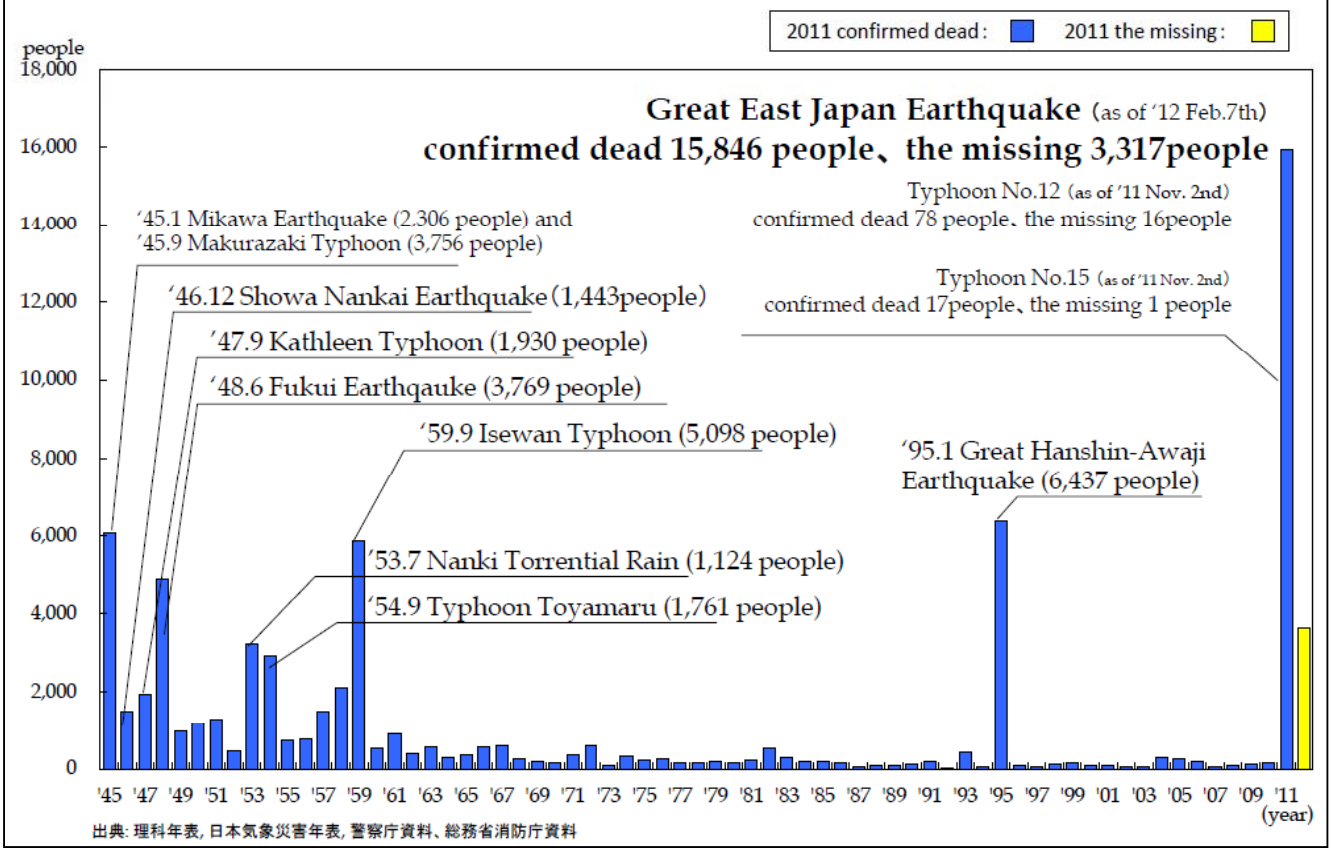
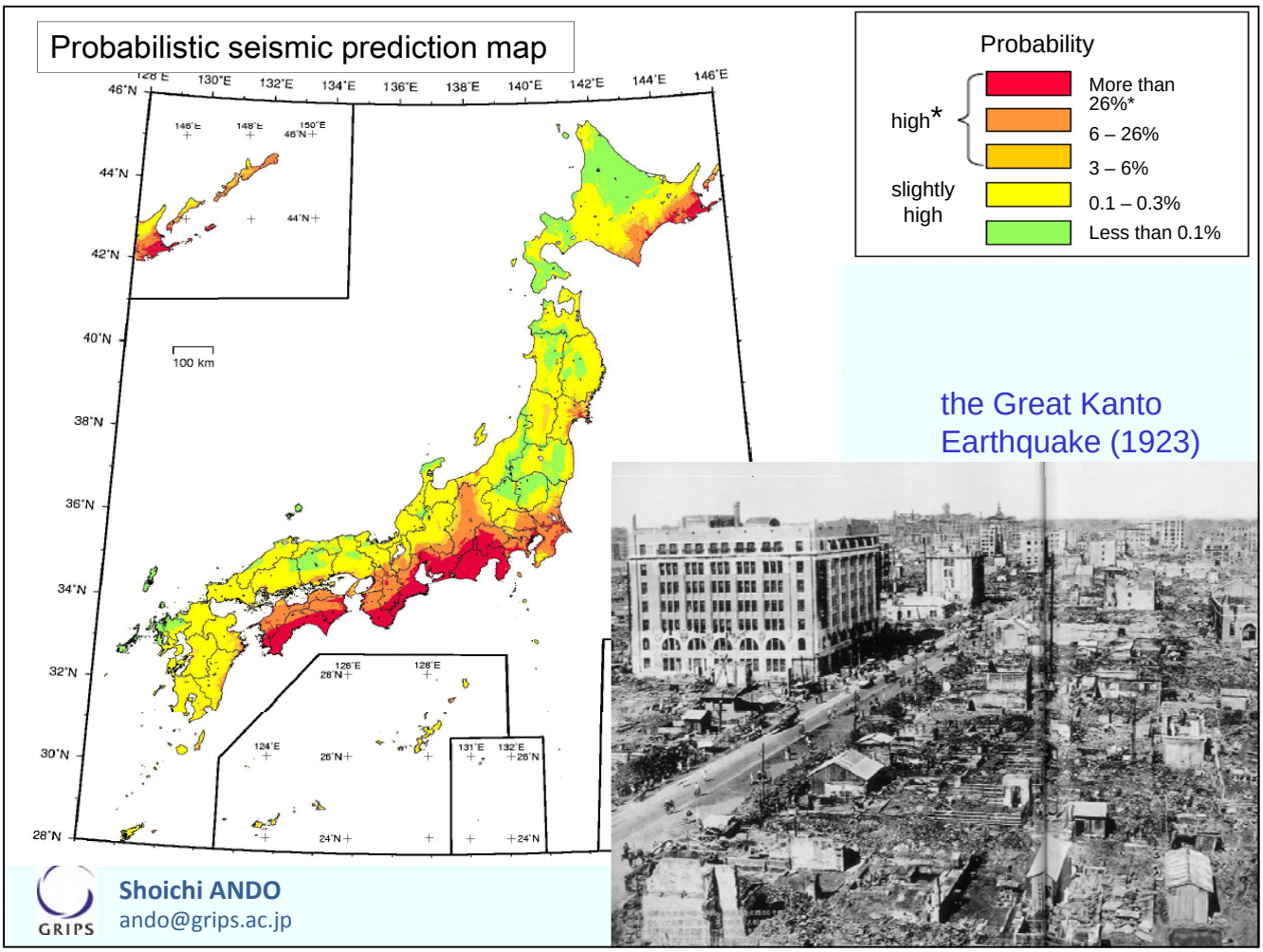
1. History of Japanese Disaster Management





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History of Disaster Management (1946 -)

1946	Nankai Earthquake	1947	Disaster Relief Act
1959	Typhoon Ise-wan	1961	Disaster Countermeasures Basic Act
1964	Niigata Earthquake	1966	Earthquake Insurance Act
1976	Presentation about the possibility of Tokai Earthquake	1978	Large-Scale Earthquake Countermeasures Special Act
1995	Great Hanshin-Awaji Earthquake	1997	Act for Promoting Seismic Retrofitting of Buildings
2004	Niigata-Chuetsu Eq.	2005	Revised Act for Retrofitting
2011	Great East Japan Eq. and Tsunami	2011	Tsunami Prevention Region Development Law

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Development of Earthquake Resistance Measures

<Major earthquakes>

Niigata Earthquake 1964

Tokachi Off-shore Earthquake 1968

Miyagi Off-shore Earthquake 1978

Great Hanshin-Awaji Earthquake 1995

Nigata-Chuetsu Earthquake 2004

Great East Japan (Tohoku) Earthquake 2011

1950 **Enactment of the Building Standards Law**

1959 • Complete revision of the provisions

1971 • Revising and strengthening RC standards

Wooden Construction;
• Strengthening foundation standards

1981 **New Earthquake- Resistance Standards**

• Houses and buildings would never suffer damage from a quake registering an intensity of 5 on the Japanese intensity scale of 7.
• Houses and buildings would never be destroyed by a quake registering an intensity of 6 to 7 on the Japanese intensity scale of 7.

Wooden Construction;
• Revision of wall quantities
• Strengthening foundation standards

1995 **Enforcement of Act for Promoting Seismic Retrofitting of Existing Buildings**

1997 **Act for Densely Built-up Areas Improvement for Disaster Mitigation**

1998 Establishment of financial aid for cost of seismic design and improvement

2000 Establishment of Certification Mark System for Housing performance (**Earthquake resistance grade**)

2002 Establishment of financial aid for cost of seismic improvement (Detached Houses)

2004 Establishment of loan by the Housing Loan Corporation at 0.2% reduced interest rate compared with the benchmark rate

2005 Amendment of the Act for Promoting Seismic Retrofitting of Existing Buildings

2011 **Tsunami Prevention Region Development Law**

Establishment of technical standard notification for tsunami evacuation buildings

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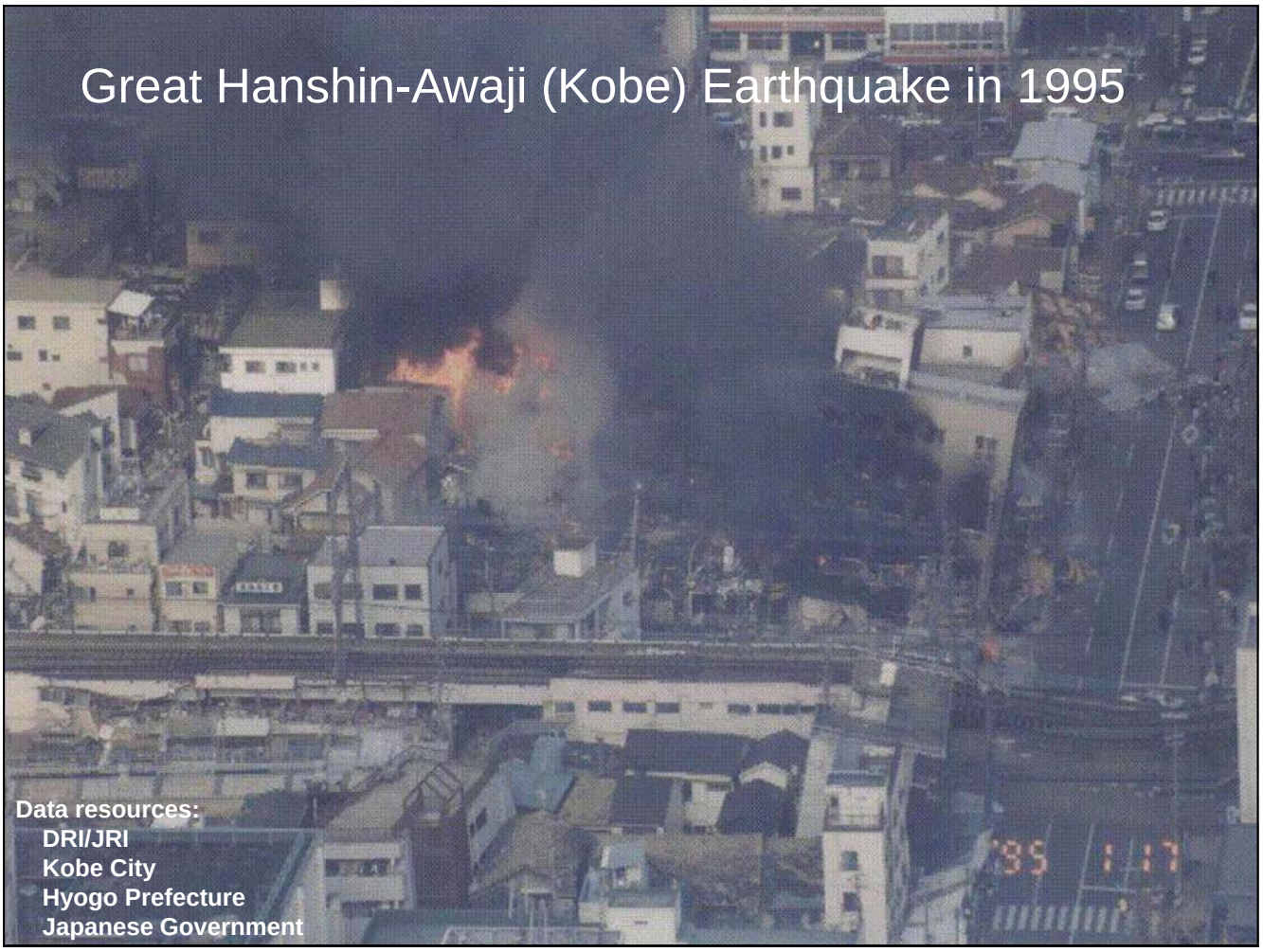
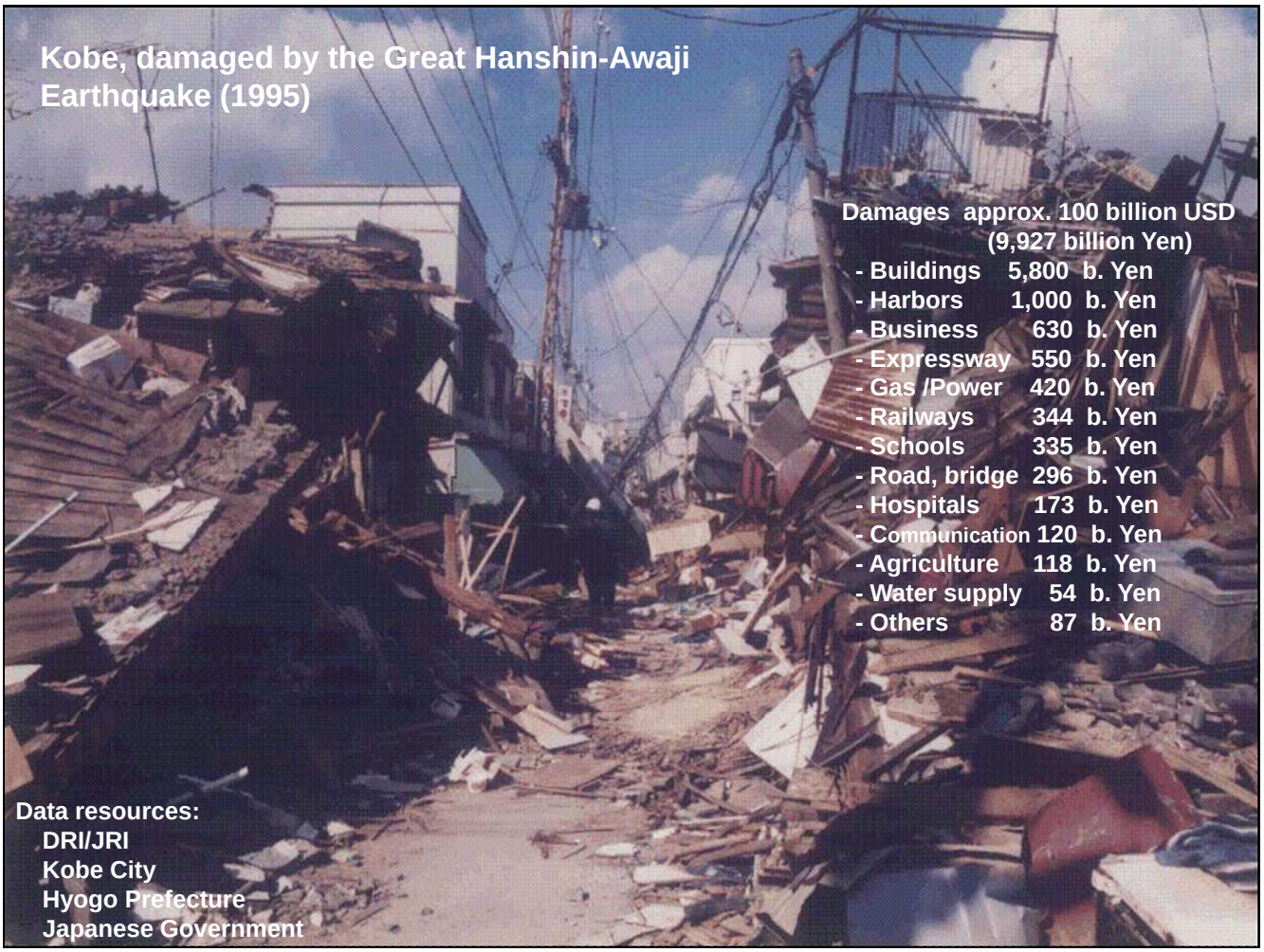
Great Hanshin-Awaji (Kobe) Earthquake in 1995



Data resources:
- DRI/JRI
- Kobe City
- Hyogo Prefecture
- Japanese Government

Kobe, damaged by the Great Hanshin-Awaji Earthquake (1995)

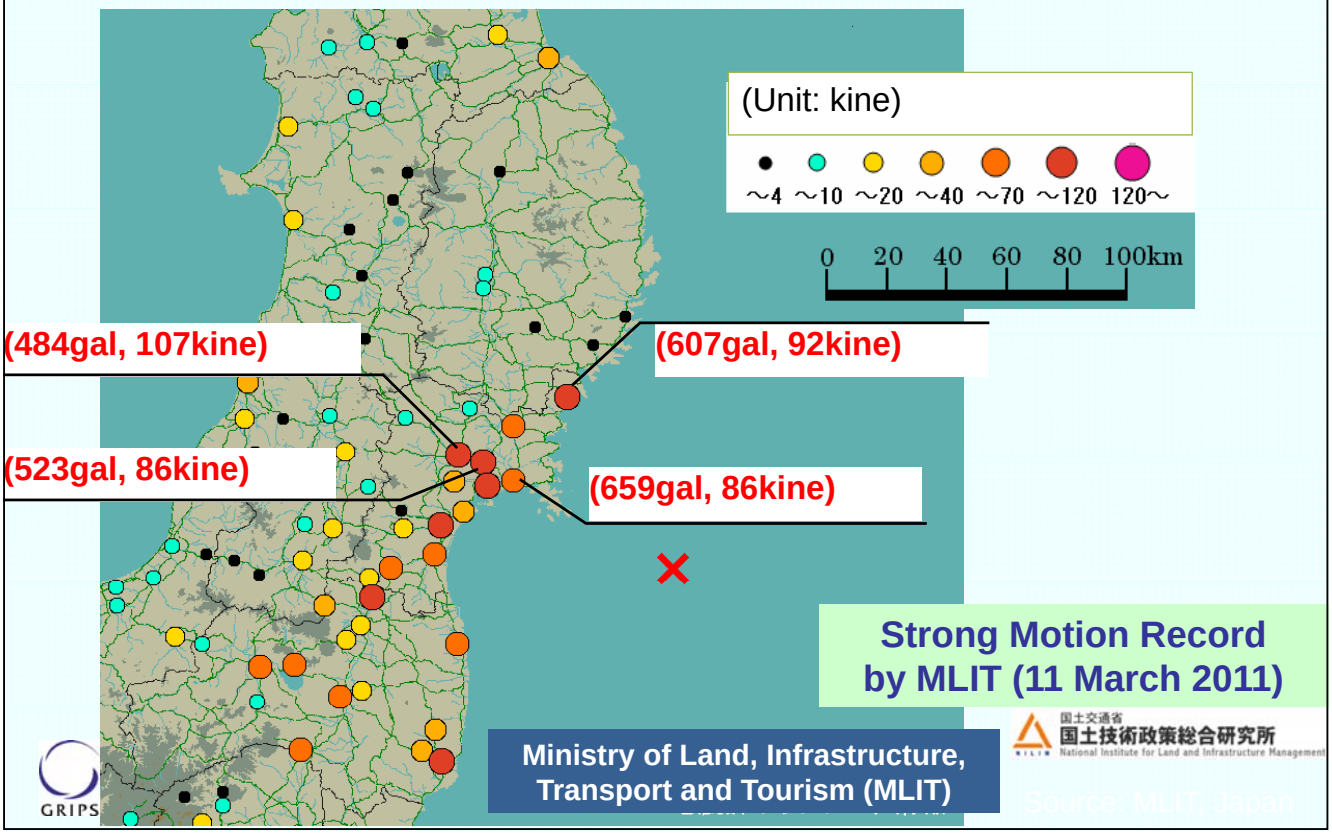


Damages approx. 100 billion USD
(9,927 billion Yen)

- Buildings	5,800 b. Yen
- Harbors	1,000 b. Yen
- Business	630 b. Yen
- Expressway	550 b. Yen
- Gas /Power	420 b. Yen
- Railways	344 b. Yen
- Schools	335 b. Yen
- Road, bridge	296 b. Yen
- Hospitals	173 b. Yen
- Communication	120 b. Yen
- Agriculture	118 b. Yen
- Water supply	54 b. Yen
- Others	87 b. Yen

Data resources:
- DRI/JRI
- Kobe City
- Hyogo Prefecture
- Japanese Government

2. 2011 Great East Japan (Tohoku) Earthquake



Miyako City, Taro area (Iwate)

Before 11 Mar. 2011

After 11 Mar. 2011

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1: Collapsed dike (10m high) 2: Inundated Hotel
3: Collapsed port , 4: Sign board

2011 Miyako, Iwate
(IISEE/BRI) 1

2011 Miyako, Iwate
(IISEE/BRI) 2

Tsunami Disaster

Photo taken at Miyako City, Iwate Prefecture
Courtesy of Tarocho Fisheries Cooperative Association

MIYAGI (Onagawa Town)

Data resources:
Japanese Government

2011 Onagawa, Miyagi 1
(IISEE/BRI)

2011 Onagawa, Miyagi 2
(IISEE/BRI)

Estimated Economic Loss Tohoku 2011.3

Content	Damage(approx.)
Buildings	10.4 trillion yen(135 billion dollars)
Lifeline facilities	1.3 trillion yen (17 billion dollars)
Social basic facilities	2.2 trillion yen (29 billion dollars)
Agriculture, forestry, and fisheries	1.9trillion yen (25 billion dollars)
Others	1.1 trillion yen (14 billion dollars)
Total	16.9 trillion yen (220 billion dollars)

Loss by **Great East Japan Earthquake** 2011.3.11

$1=\77.07

Source: MLIT, Japan

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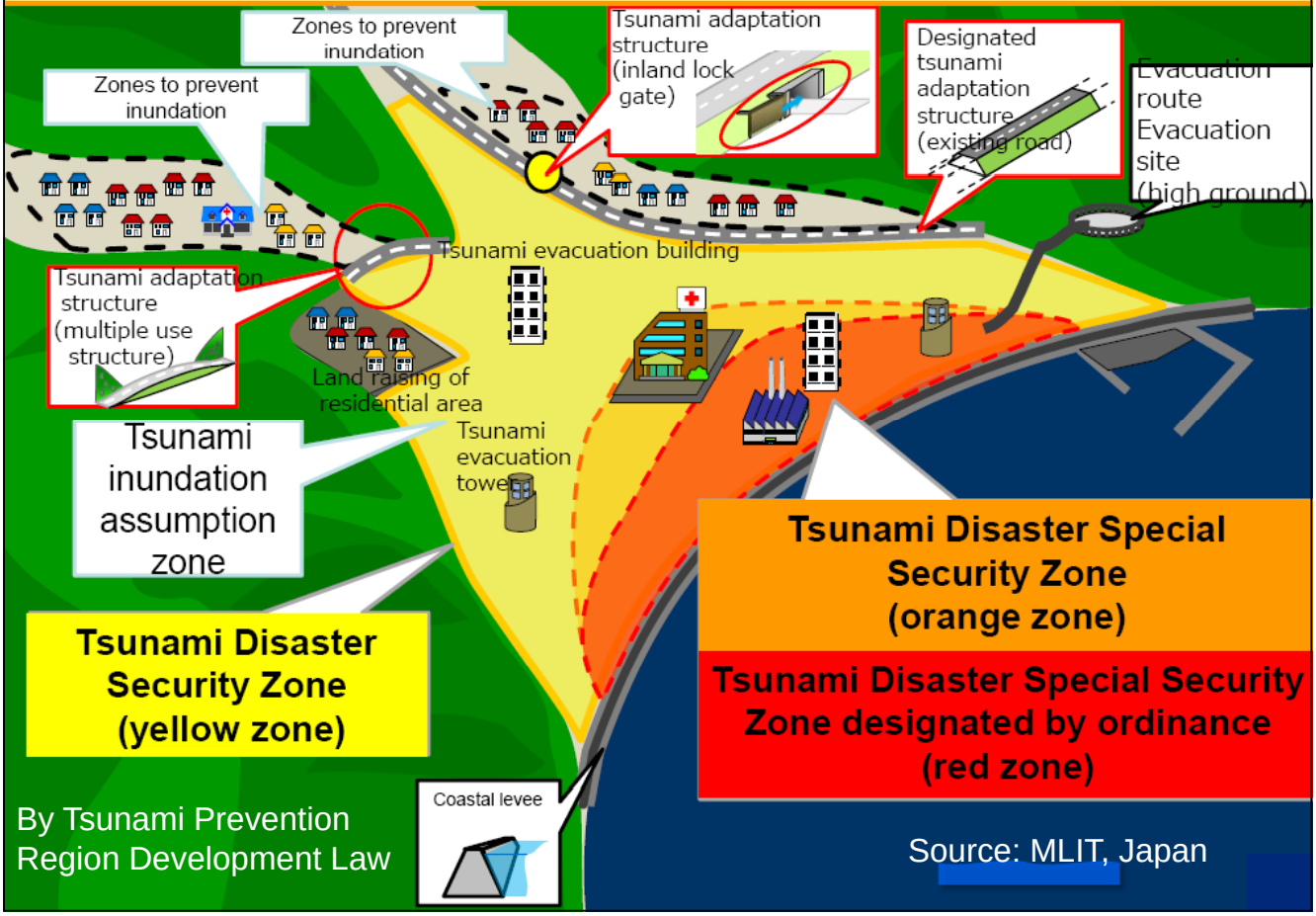
Image of Tsunami-Resilient City



3. Earthquake Observation / Researches in Japan

- Japan Meteorological Agency (JMA)

  It monitors earthquake activities throughout Japan. When an earthquake occurs, the hypocenter is located immediately and tsunami forecasts and other earthquake information are reported.

- National Research Institute for Earth Science and Disaster Mitigation (NIED)

  - K-net: a network of strong-motion seismographs at approximately 1,000 locations nationwide.

  - Hi-net: a network of high-sensitivity seismographs at approximately 800 locations nationwide.

- The Coordination Committee for Earthquake Prediction (Geographical Survey Institute (GSI))

  It monitors earthquake activities throughout Japan.

- Building Research Institute (BRI)

  It monitors earthquake activities throughout Japan. When an earthquake occurs, the hypocenter is located immediately and tsunami forecasts and other earthquake information are reported.

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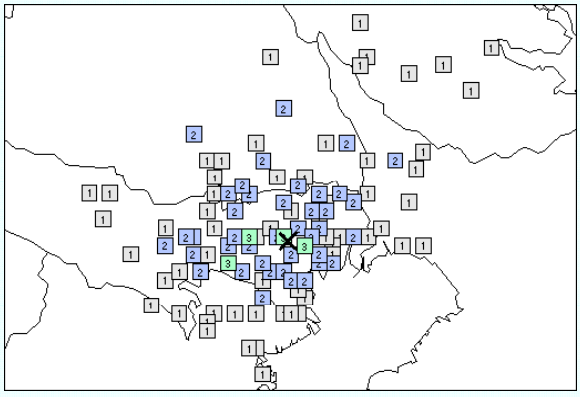
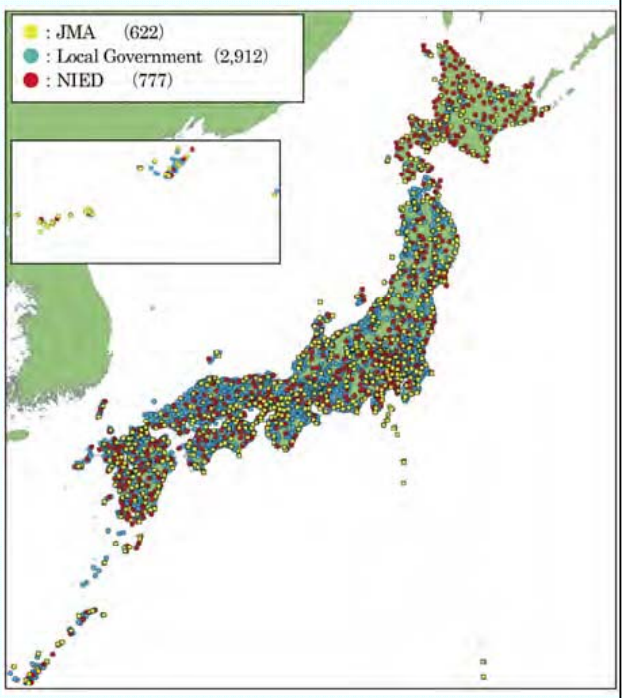
The Japan Meteorological Agency (JMA)

- Earthquake Monitoring
- Earthquake Prediction and warning
- Issuance of Information



Seismic Intensity Map Date: Aug. 18, 2000
Time: 04.53 a.m. (JST) M: 3.6 Depth: 36km



Sites of seimic intensity meters

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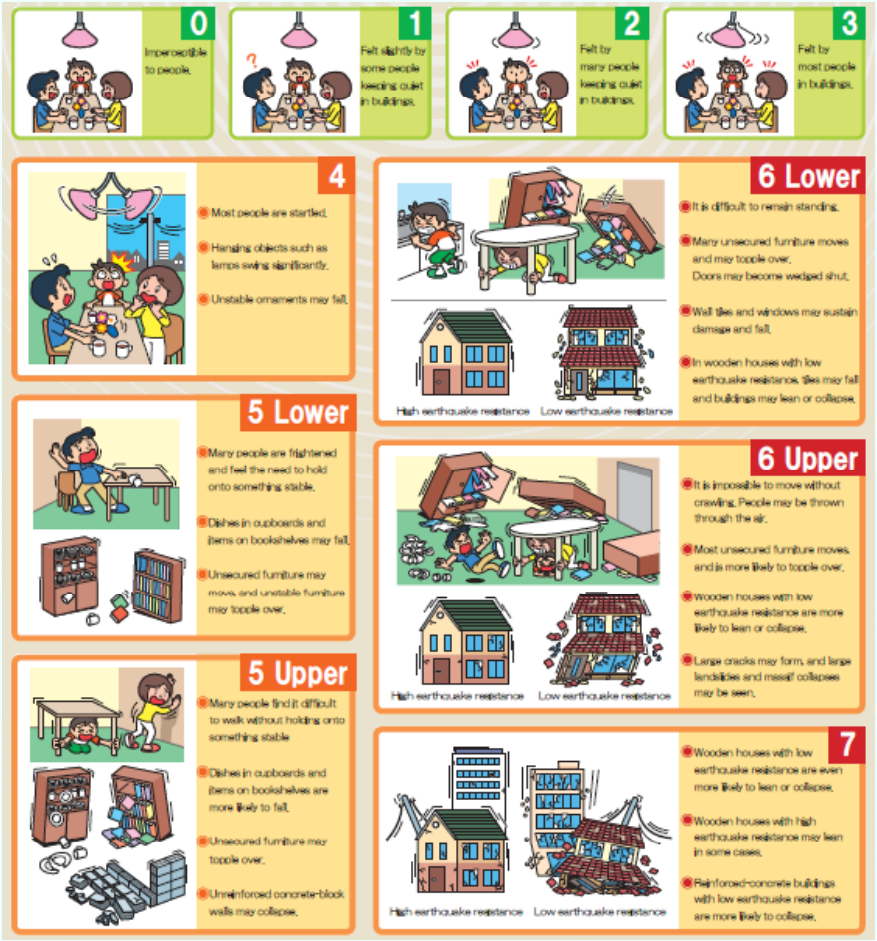
JMA Seismic Intensity Scale



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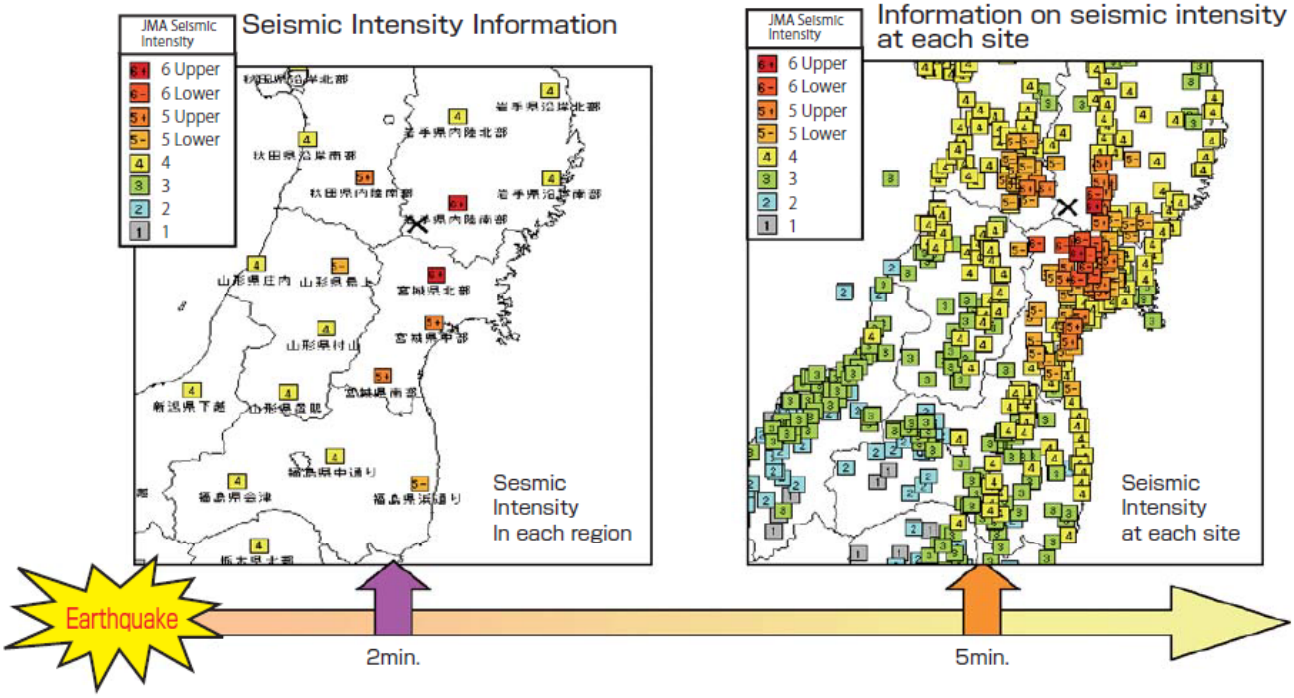
Issuance of Seismic Intensity Information （Iwate-Miyagi Nairiku Earthquake in 2008）



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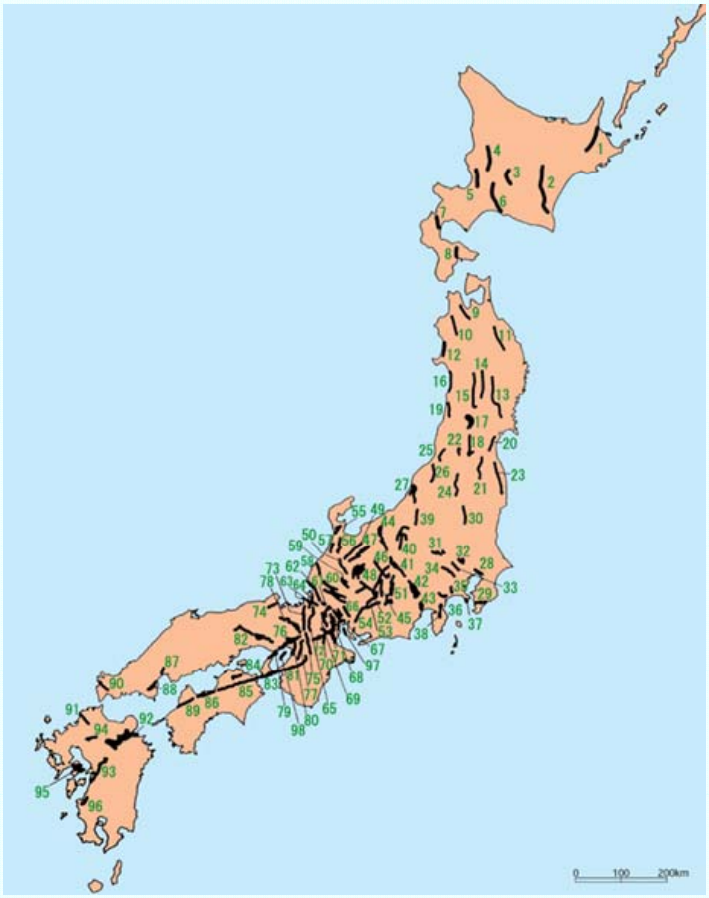
Long term prediction of major active faults

by Ministry of Education, Culture, Sports, Science and Technology (MEXT)



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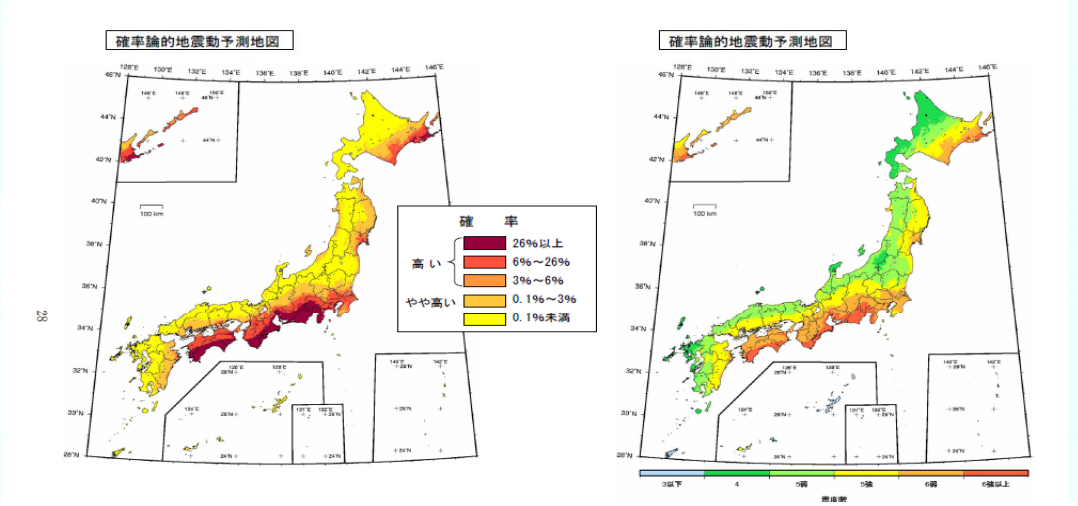
Seismic Hazard Map

A Seismic Hazard Map shows the predicted likelihood of a strong ground motion occurring in a given area within a set period of time.



Probabilities of intensity 6 and over Within 30 years

The intensities with 3 % probability within 30 years

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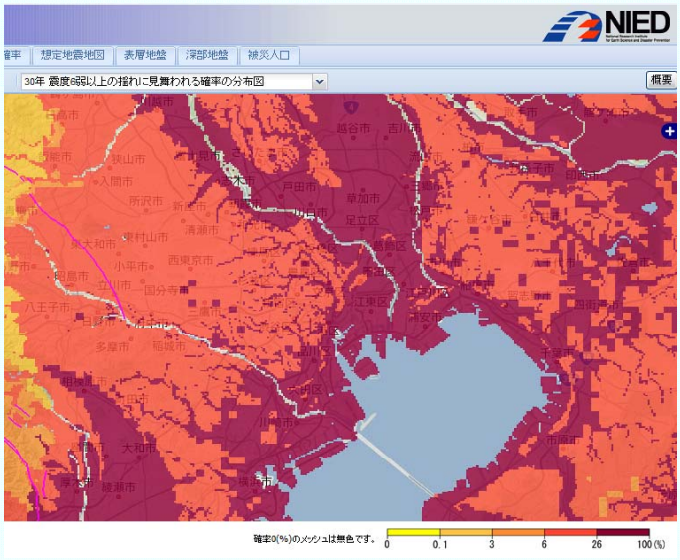
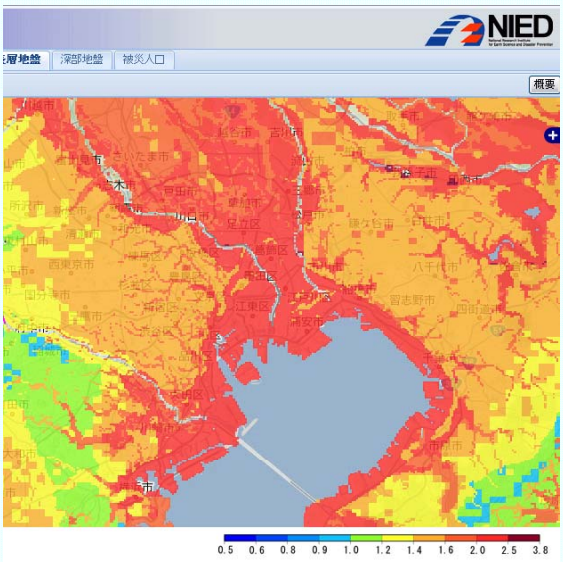
J-SHIS (Japan Seismic Hazard Information Station) by NIED

http://www.j-shis.bosai.go.jp/?lang=en



Intensity 6 and more in 30 years around Tokyo



Surface Ground Amplification

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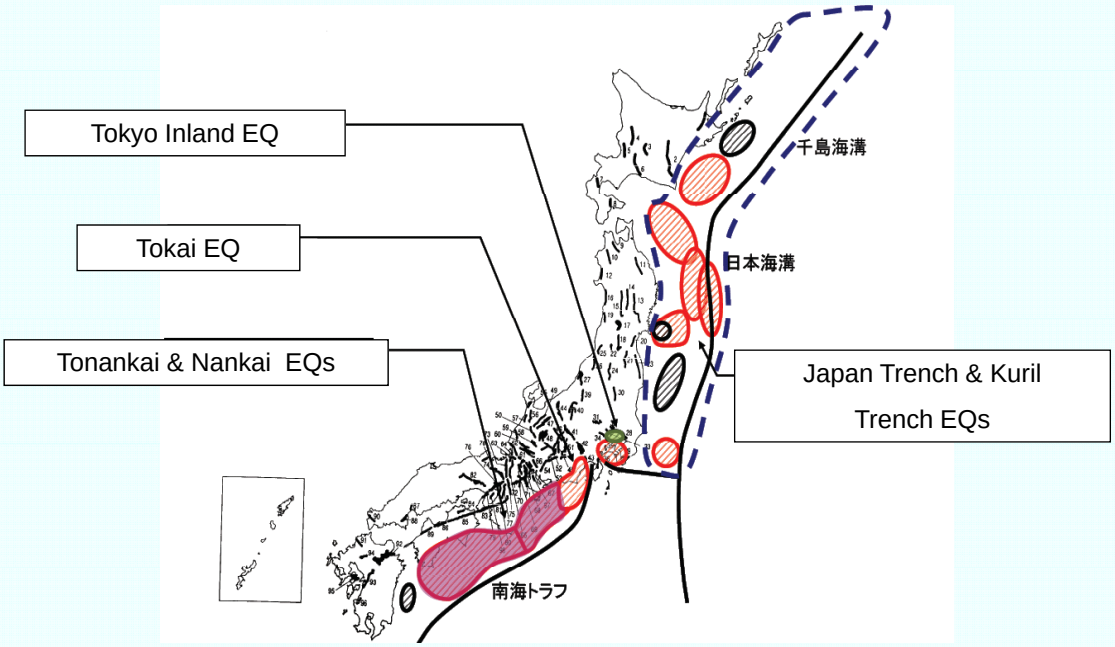
Earthquake and Tsunami Countermeasures



Large-Scale Earthquake Countermeasures Special Act (1978)

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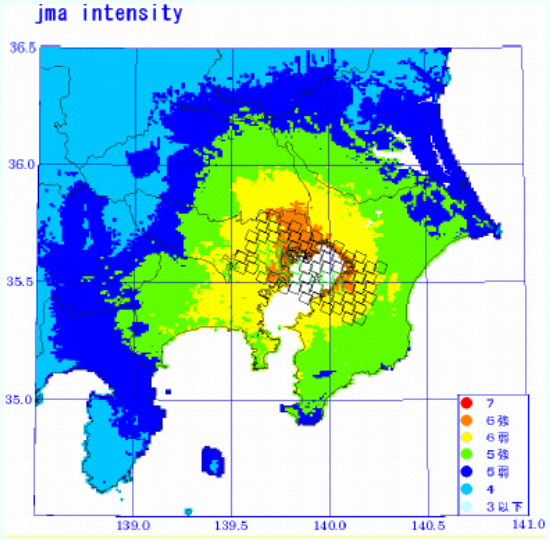
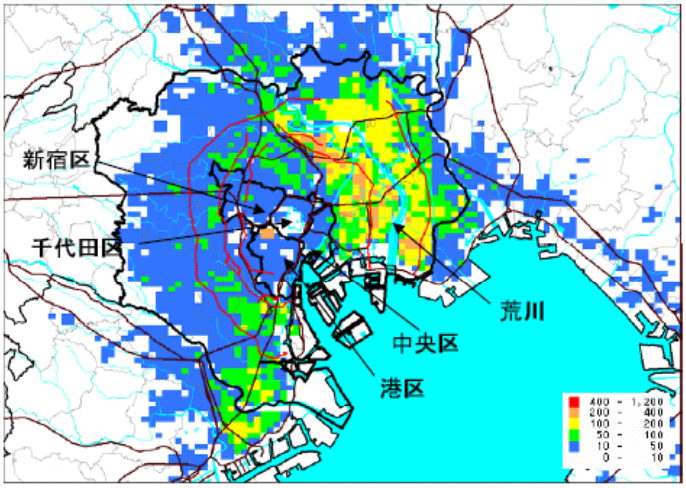
Damage Summary 1 (Northern Tokyo-bay Eq.)

Estimation of intensity
of Tokyo Inland EQ (M7.3)



Estimation of damage to houses
and buildings in Central Tokyo



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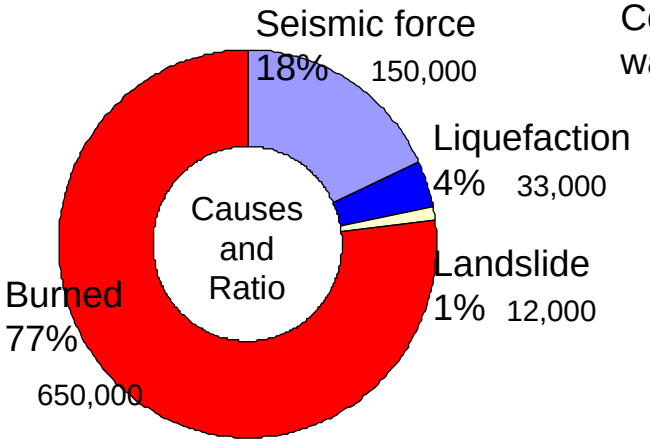
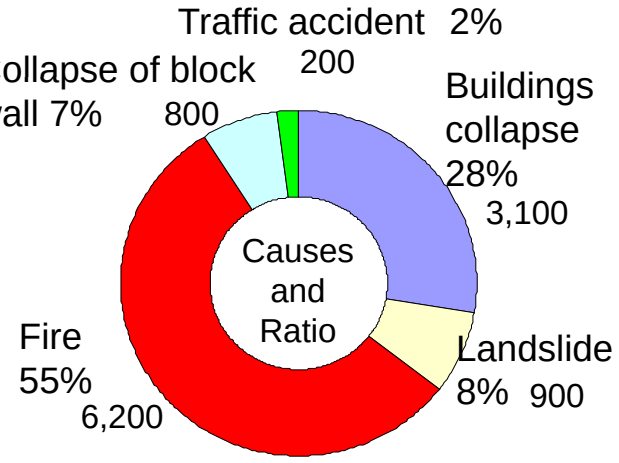
Damage Summary 2 (Northern Tokyo-bay Eq.)

Estimate Supposition : Winter, 6 p.m. , Wind V=15m/s

1) **Collapsed or burned buildings** 850,000



2) **Death toll** 11,000



◇Debris produced 96 million tons

◇Injured 210,000
Serious injured 37,000

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4. Countermeasures against Earthquake Disasters

1. Rebuilding to earthquake-resistant and fireproof buildings

It is clear that urban areas where rate of fireproof building is high and density of building is low, become very safe from disasters. Remarkable improvement in rate of collapsed houses and semi-collapsed houses was found after enforcing the new earthquake-resistant planning rules (1981). It's found that the promotion of rebuilding is effective to make safe urban areas.

2. Developing urban fire-block zones

An "urban fire-block zone" is surrounded by main roads, railways, rivers and fireproof buildings in order to stop the spread of fire. Therefore, people don't need to refuge or fires don't spread in the city when an earthquake occurs.

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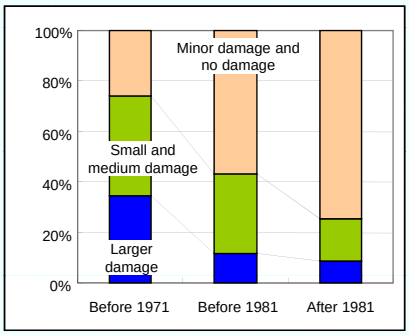
Damage to buildings and others caused by a great earthquake

(The Great Hanshin-Awaji Earthquake Disaster in 1995)

- Damage situation after the Great Hanshin-Awaji Earthquake

	Number of persons killed
Persons seemed to have been crushed to death by collapsed buildings, furniture or others	4,831 (88%)
Persons seemed to have been burnt to death	550 (10%)
Persons killed by other causes	121 (2%)
Total	5,502 (100%)



- Great earthquakes presumed to occur in the future

		Tokai Earthquake	Tonankai and Nankai Earthquakes	Epicentral Earthquake at Tokyo capital
Anticipated damage	Casualties from quakes	approy 6,700 persons	approy 6,600 persons	approy 4,200 persons
	Amount of economic losses	approy 37 trillion Yen	approy 57 trillion Yen	approy 112 trillion Yen

Source: MLIT, Japan

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Measures for promoting Fireproof Buildings and the Urban Structure

Before Fire-proof Improvement

Source: MLIT, Japan

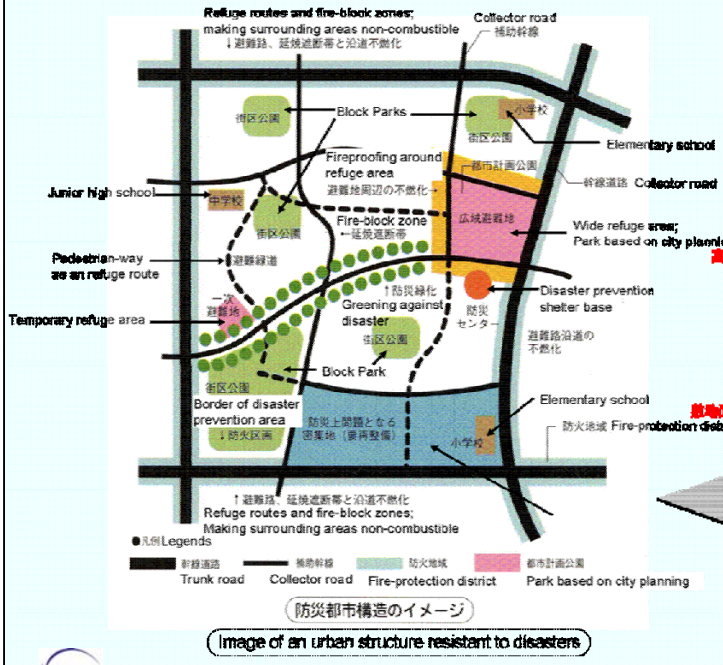
Measures for promoting Fireproof Buildings and the Urban Structure

After Fire-proof Improvement

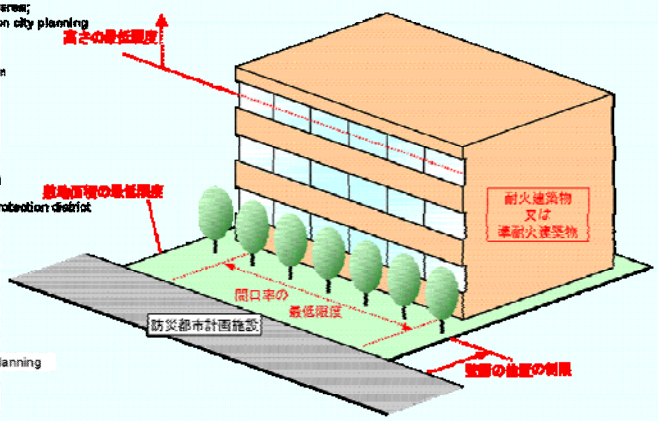
Source: MLIT, Japan

Act for Densely Built-up Areas Improvement for Disaster Mitigation

The act was enforced in 1997 and reformed in 2003 to promote totally to improve densely built-up areas which have the high risk of disasters.



Special disaster-resistant districts improvement system



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Source: MLIT, Japan

Disaster Prevention Map in English / Portuguese

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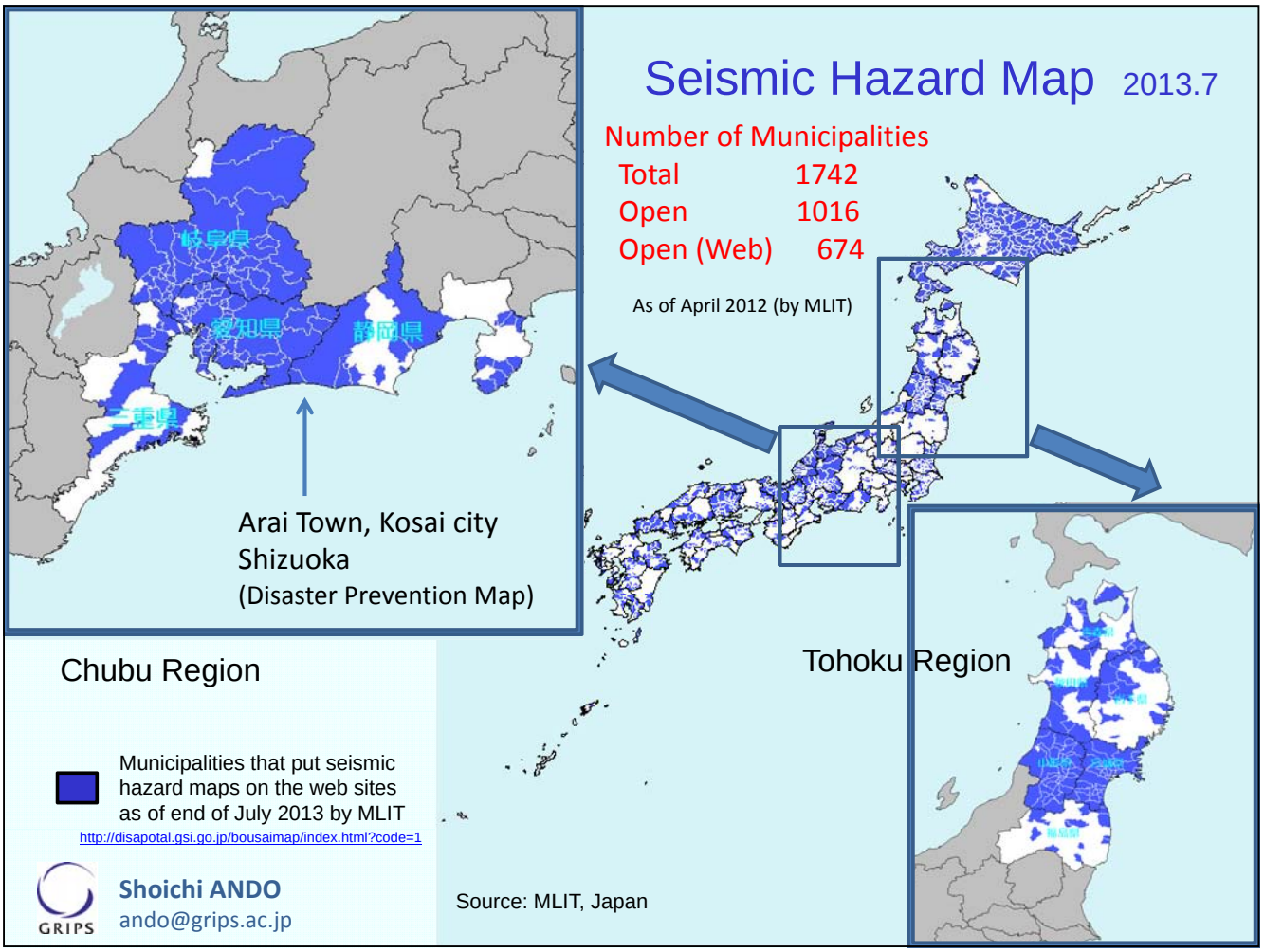
Disaster Prevention Map Arai Town, Shizuoka


Seismic Hazard Map 2013.7
Number of Municipalities
Total 1742
Open 1016
Open (Web) 674
As of April 2012 (by MLIT)
岐阜県
愛知県
静岡県
三重県
Arai Town, Kosai city
Shizuoka
(Disaster Prevention Map)
Chubu Region
Tohoku Region
Municipalities that put seismic hazard maps on the web sites as of end of July 2013 by MLIT
http://disapotal.gsi.go.jp/bousaimap/index.html?code=1
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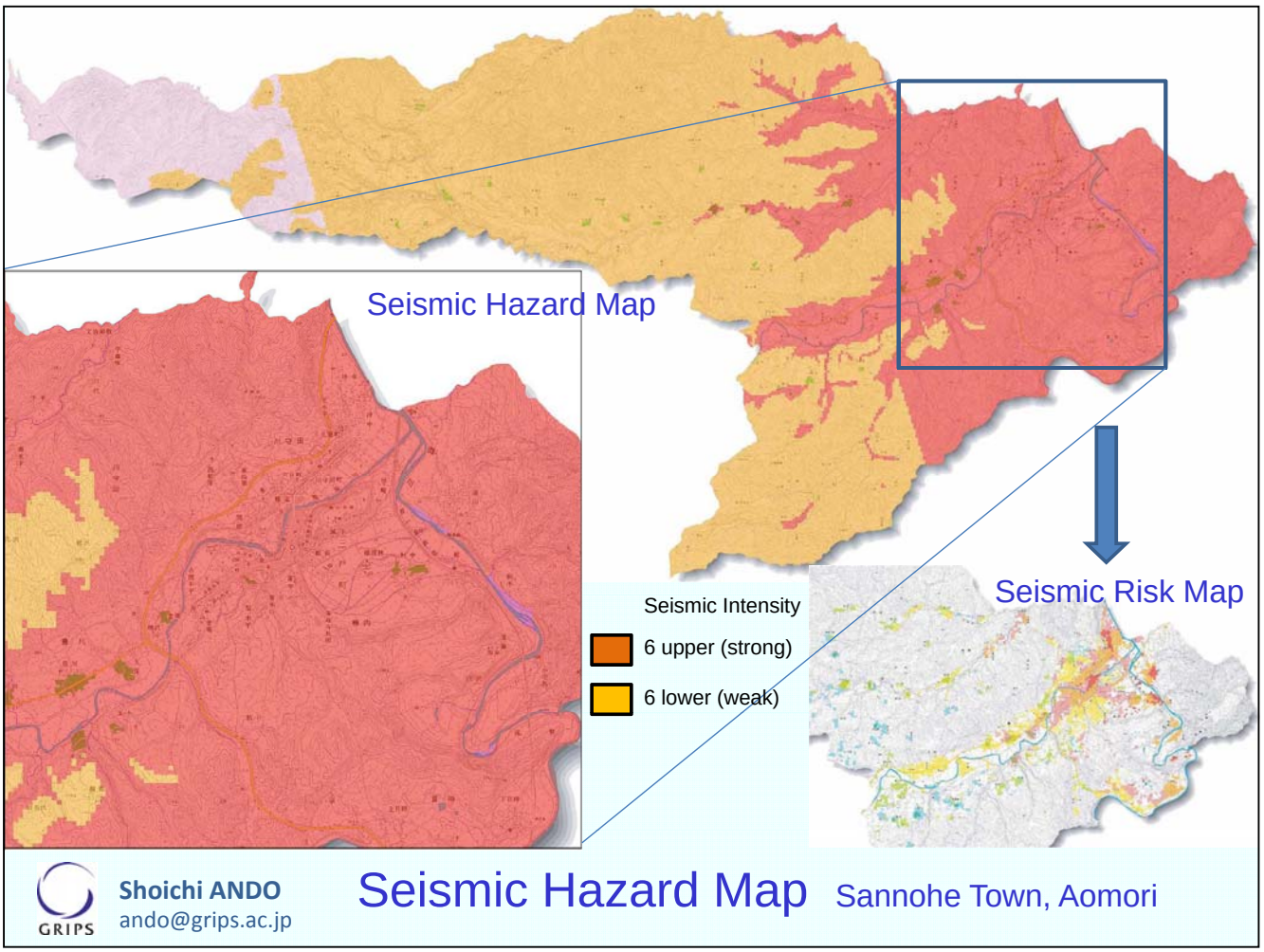
Source: MLIT, Japan


Seismic Hazard Map
Seismic Risk Map
Seismic Intensity
6 upper (strong)
6 lower (weak)
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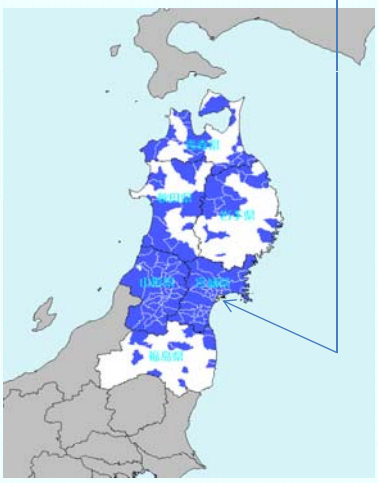
Seismic Hazard Map
Sannohe Town, Aomori

Seismic Hazard Map

Rifu Town, Miyagi



http://www.town.rifu.miyagi.jp/www/contents/1239846040327/html/common/other/49e692b9013.pdf

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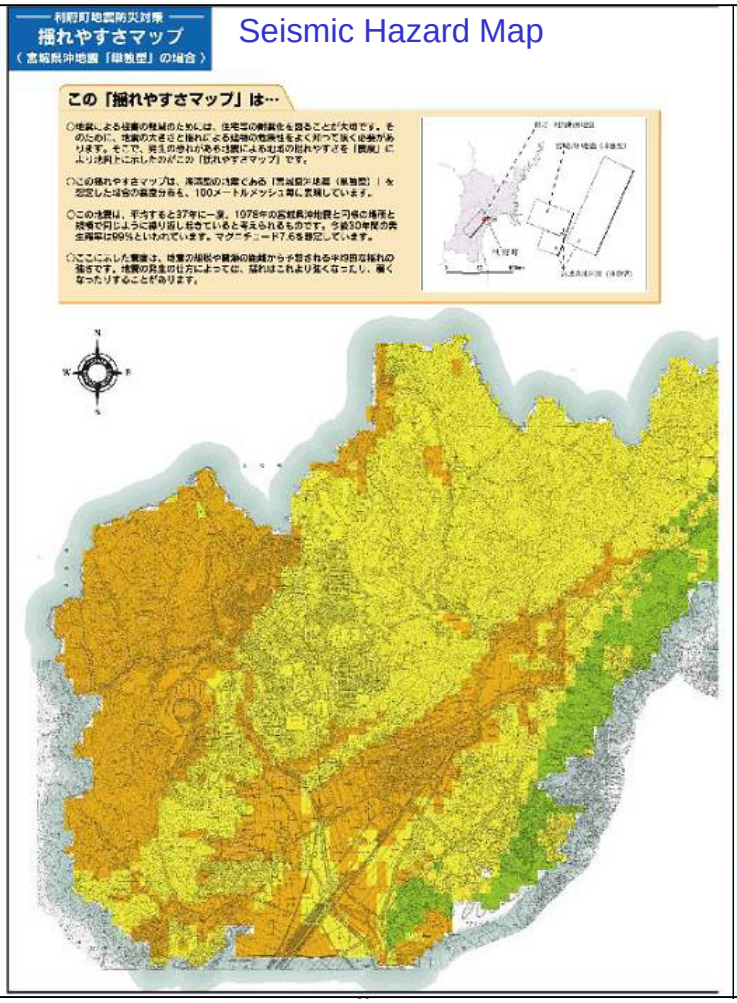
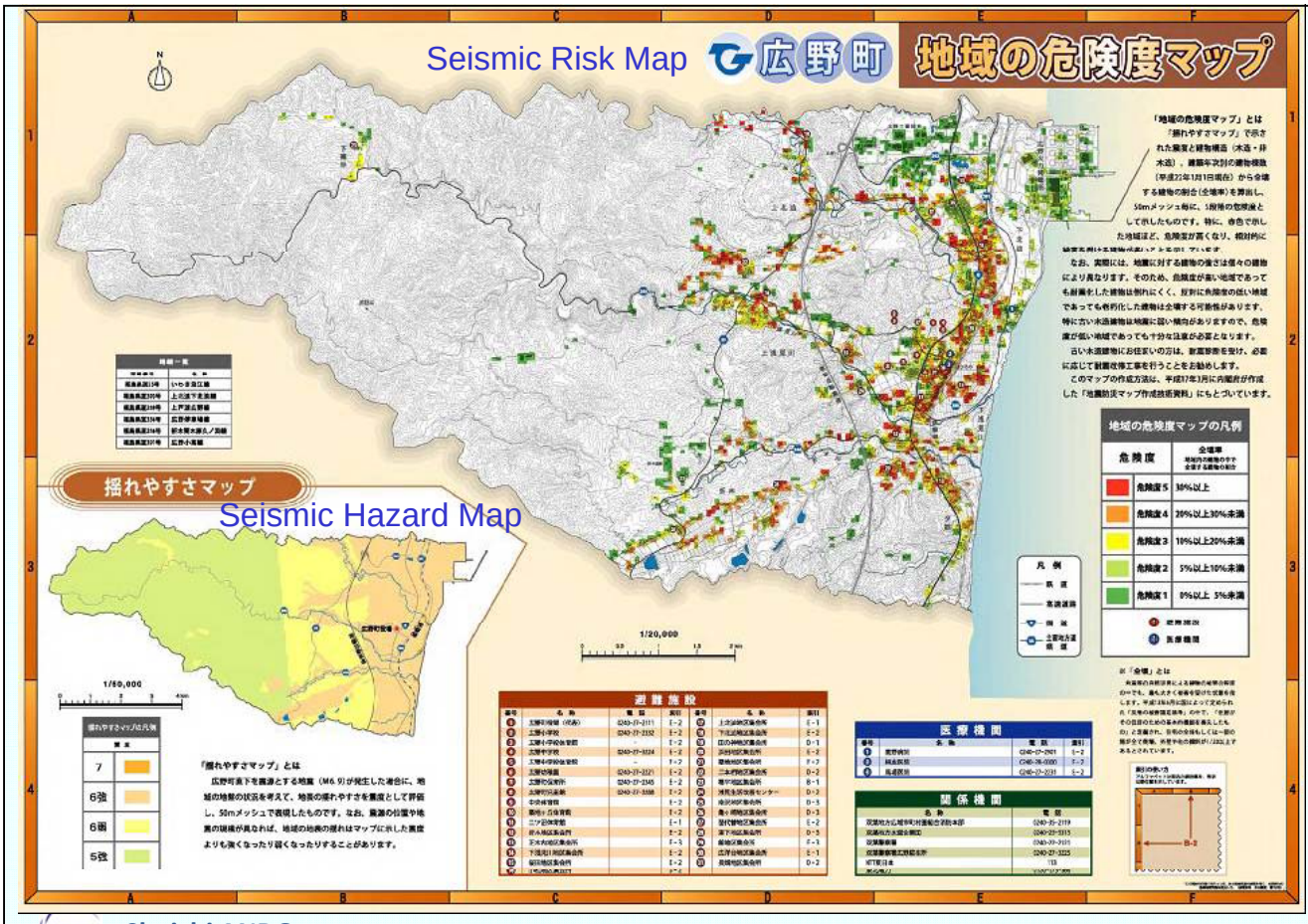
Seismic Hazard Map



Seismic Risk Map



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Seismic Hazard Map Hirono Town, Fukushima

5. Reference (Evaluation Method for Liquefaction Potential)

国土交通省
Ministry of Land, Infrastructure, Transport and Tourism

Press Release

NILIM released Software for Calculation of Soil Liquefaction Potential
(Download begins including English Language Version)

NILIM provides new software entitled “Spreadsheet for Liquefaction Potential Estimation on Detached Housing Land”. It is downloadable from NILIM Homepage or below URL.
http://www.nilim.go.jp/lab/jbg/takuti/takuti.html

This software is developed mainly for the use of calculation based on the “Technical Guideline for Evaluation of Liquefaction Damage Potential on Housing Sites” which was released by City Bureau of MLIT on April, as a result of the investigation after the Great Eastern Japan Earthquake Disaster. However, it is usable for people and researchers in every earthquake country by input any value of investigated soil conditions and estimated seismic scales. NILIM hopes that the software would contribute in facilitating disaster prevention on liquefaction in the world.

National Institute for Land and Infrastructure Management (NILIM)

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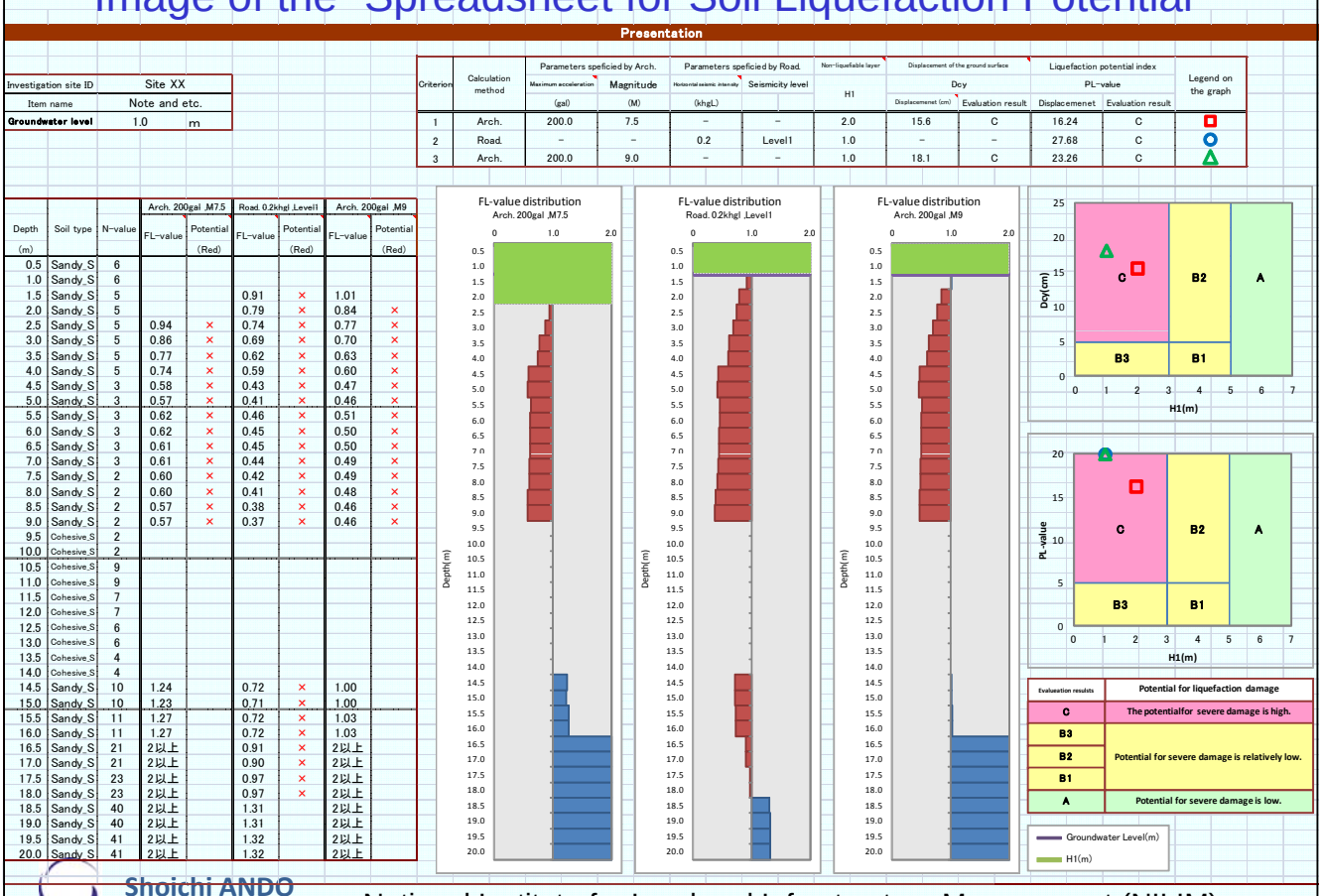
Image of the “Spreadsheet for Soil Liquefaction Potential”



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END
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