



APRU Multi-Hazard (MH) Summer School 2018

**Urban Disaster Risk Reduction:
Japan as a disaster-prone country and
learning from past disasters**

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1. How do you evaluate urban disaster risk?
2. Disaster Life Cycle
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5. Japan as a Disaster-prone Country and Learning from the Past Disasters

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**How do you evaluate urban
disaster risk?**

hurricanes

global warming

complicated urban system

earthquakes

floods

rapid urbanization

heavy rains

a City

sea level rise

population increase

tsunamis

cyclones

high density district extreme weather

typhoons

volcanic eruptions

Q: What is “risk”?

Risk

- A possibility of harm or damage against which something is insured. (Oxford Dictionary of English)

[Example]

Earthquake occurrence risk of Tokyo between 2015 and 2030 is about 30%.

The risk of Tokyo due to the earthquake is increasing because we estimated the number of damaged buildings would be higher than before.

Q: How can you evaluate urban disaster risk?

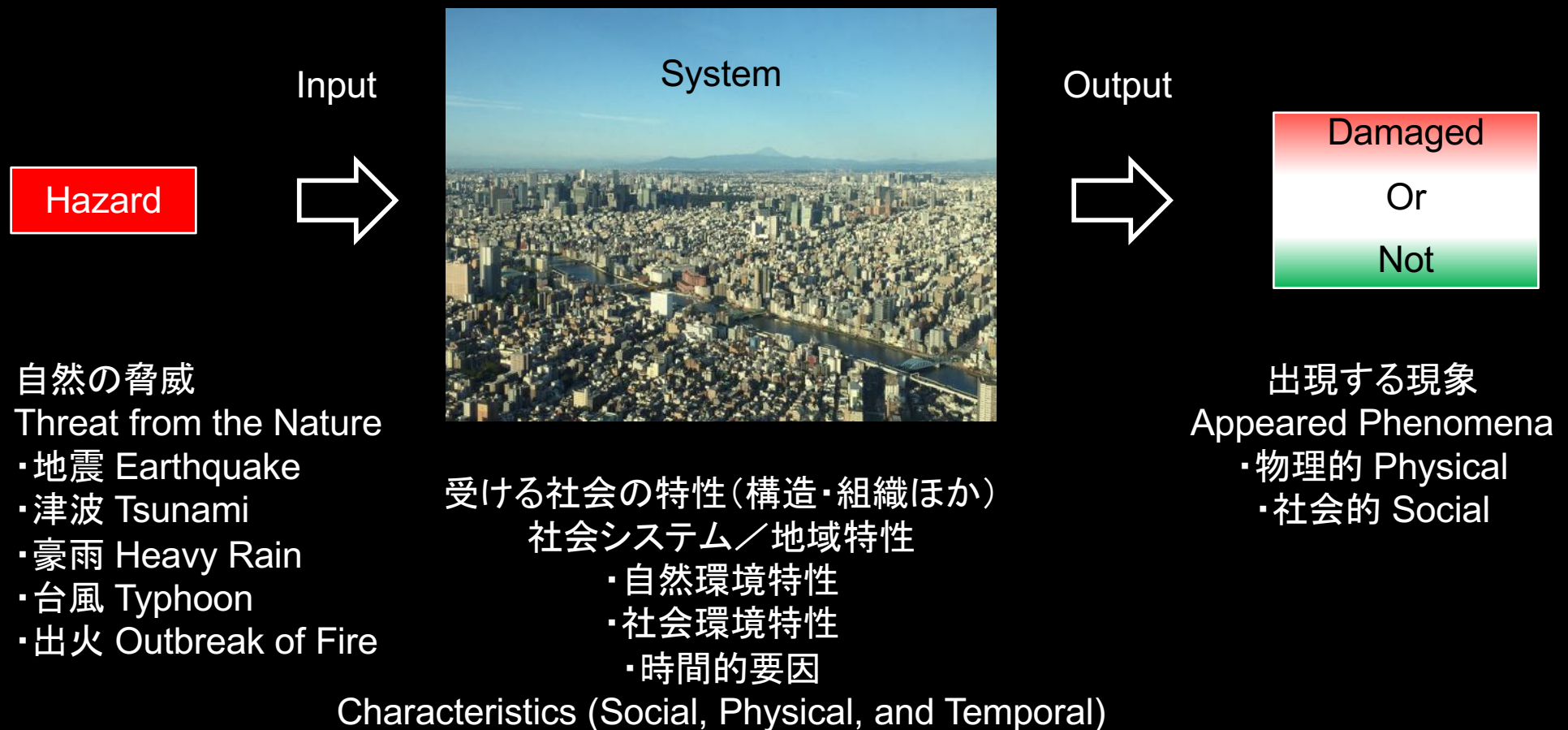
Hint:

Urban Disaster Risk = H_____ * V_____ * E_____

The mechanism of disaster occurrence



The mechanism of disaster occurrence



Definition of Urban Disaster Risk

$$\text{Urban Disaster Risk} \\ = \text{Hazard} * \text{Vulnerability} * \text{Exposed Value}$$

Hazard

A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

The hazards of concern to disaster risk reduction as stated in footnote 3 of the Hyogo Framework are “... hazards of natural origin and related environmental and technological hazards and risks.” Such hazards arise from a variety of geological, meteorological, hydrological, oceanic, biological, and technological sources, sometimes acting in combination. In technical settings, hazards are described quantitatively by the likely frequency of occurrence of different intensities for different areas, as determined from historical data or scientific analysis.

Vulnerability

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time. This definition identifies vulnerability as a characteristic of the element of interest (community, system or asset) which is independent of its exposure. However, in common use the word is often used more broadly to include the element's exposure.

Exposed Value/Exposure

People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses.

Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest.

Definition of Urban Disaster Risk

$$\text{Urban Disaster Risk} = \text{Hazard} * \text{Vulnerability} * \text{Exposed Value}$$

Hazard and Vulnerability

ハザードとバルネラビリティ

ハザード
(自然の脅威)

バルネラビリティ
(脆弱性)



Hazard and Vulnerability

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Hazard and Vulnerability

ハザードとバルネラビリティ

ハザード
(自然の脅威)

バルネラビリティ
(脆弱性)

ハザード
Hazard

リスク
Risk

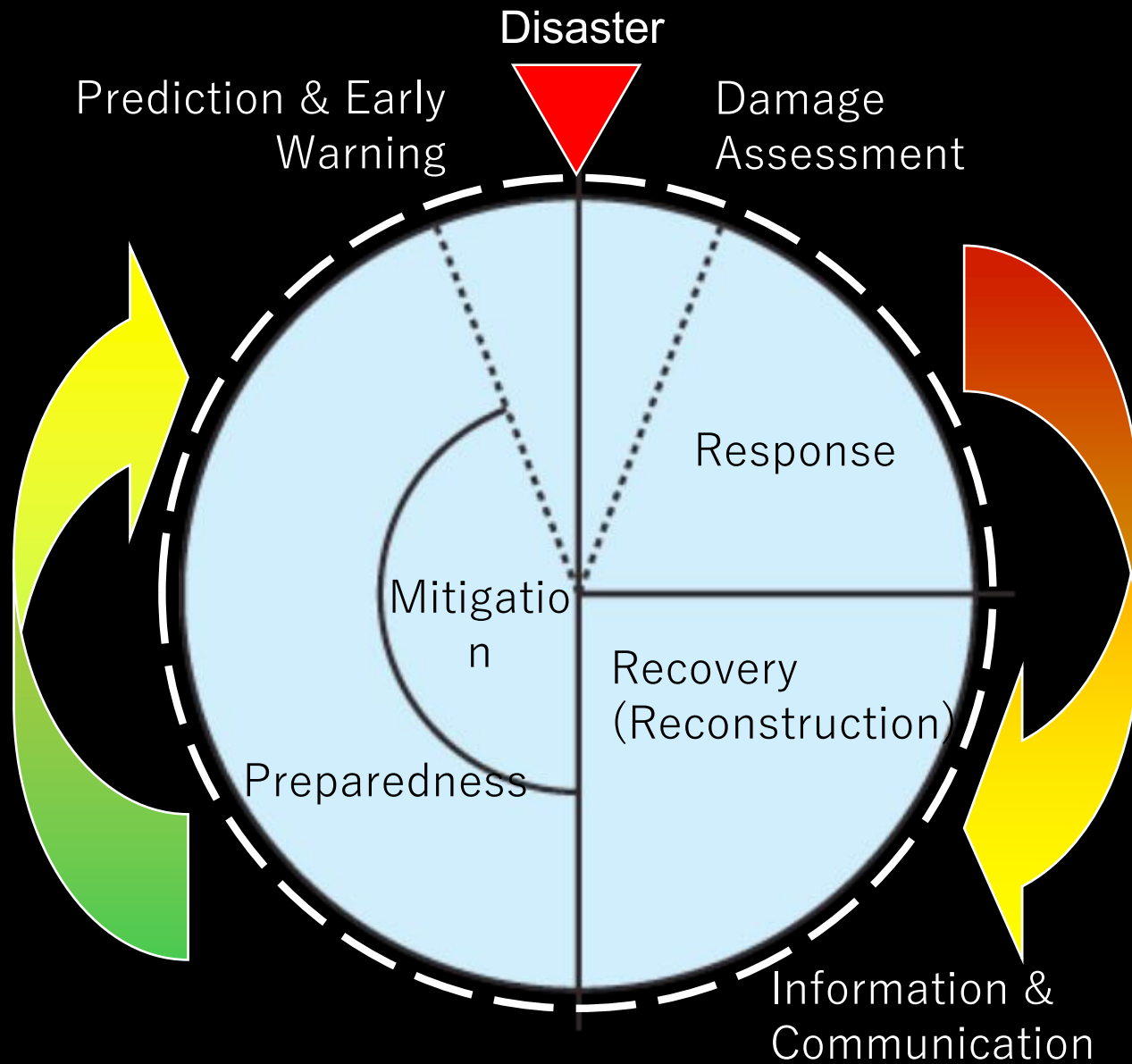
バルネラビリティ
Vulnerability



2

Disaster Life Cycle

Disaster Life Cycle



Q6: What is mitigation and preparedness?

Mitigation

- Activities aimed at eliminating or reducing the occurrence of a disaster and reducing the effects of unavoidable disasters.
- Measures that will reduce the potential for damage to a facility or structure from a disaster event.

(FEMA)

Preparedness

- Activities taken to help save lives and minimize damage by preparing people to respond appropriately when an emergency is imminent. Preparedness includes planning to respond when an emergency or disaster occurs and working to increase resources available to respond effectively.

(FEMA)

Response

- Activities occurring during or immediately following a disaster designed to provide emergency assistance to the victims of the event, reduce the likelihood of secondary damage and to expedite recovery operations.

(FEMA)

Recovery

- Activities traditionally associated with providing Federal supplemental disaster recovery assistance under a disaster declaration. Recovery includes individual and public assistance programs that provide temporary housing assistance, grants, and loans to eligible individuals and government entities to recover from the effects of a disaster.
- (FEMA)

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Sendai Framework and “Build Back Better”

Q: What is a concept of “Build Back Better” ?

Sendai Framework for Disaster Risk Reduction (2015)

The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action.

It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR).

World Conference on Disaster Risk Reduction in Sendai, 2015



Build Back Better (より良い復興)

Sendai Framework for Disaster Risk Reduction(仙台防災枠組), 2015





Sendai Framework for Disaster Risk Reduction 2015 - 2030



Build Back Better (BBB)

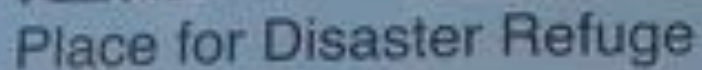
The use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies, and the environment (United Nations General Assembly, 2016).

4

1934 Hakodate Great Fire



Hakodate



避難所・避難地

宝くじからの贈りもの

函館市

Present Hakodate City with Green Belt Network

A wide-angle photograph of a large, empty asphalt intersection in Hakodate City, Japan. The road is flanked by a dense line of mature green trees, which form part of the 'Green Belt Network'. On the left, there are several buildings, including a prominent white one-story structure. On the right, a larger building with a dark roof and red vertical banners is visible. In the background, distant mountains can be seen under a blue sky with light, wispy clouds. The overall scene depicts a well-maintained urban environment with integrated greenery.

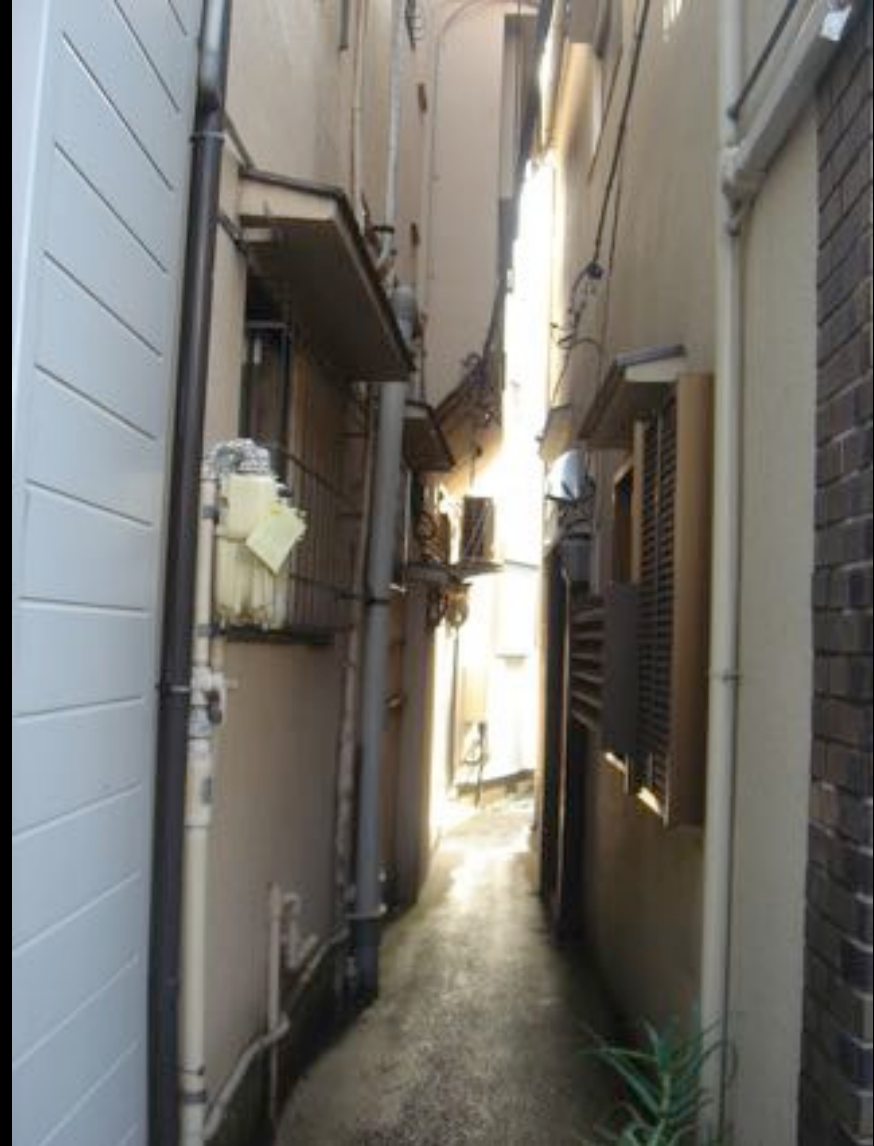
Present Hakodate City with Green Belt Network

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Japan as a Disaster-prone Country and Learning from the Past Disasters

Vulnerability: Wooden House Congested Districts



Japanese Traditional House Made of Wood and Paper



Timeline of Critical Disastrous Events



Great Fires in Old Tokyo

17,18C



Sakata
Fire

1976

Great Kobe
Earthquake

1995



1872

1923

1945

1986

Ginza Fire

Great Tokyo Earthquake

Disaster Prevention Base
In Eastern Tokyo



Public Open Space in Ryogoku to Prevent Fire Spread



Walls to Prevent Fire Spread in Waki, Tokushima

Udatsu
卯建(うだつ)
うだつがあがらない



1. Urban Structure Readjustment



Showa Avenue



Sumida Park (the First Water Front Park)



AFO

4. Providing Modern Apartments (Doujunkai)











Great Kobe Earthquake (Hyogo)

1657

1872

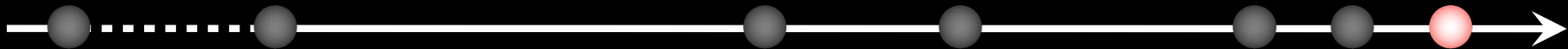
1923

1945

1976

1986

1995



Timeline of Critical Disastrous Events



Great Fires in Old Tokyo

17,18C

World War II

1945

Sakata
Fire

1976

Great Kobe
Earthquake

1995

1872

Ginza Fire

1923

Great Tokyo Earthquake

1986

Disaster Prevention Base
In Eastern Tokyo



3. History of Natural Disasters in Japan (1888 - 2010)

Japan is located in one of the most disaster-prone areas in the world, and we Japanese have experienced many disastrous events throughout history. Thus Japanese society and cities are skilled at disaster management. Each disaster has helped develop and strengthen our disaster management system. Although we occasionally experience catastrophic disasters, the number of deaths and missing persons due to disasters has been declining as a result of gradual improvement of the various aspects of our disaster management system.

This map displays the distribution of major disasters in Japan from 1888 to 2010. About sixty disasters are classified into four types: earthquake or tsunami, volcanic disaster, windstorm or flood, and heavy snowfall.

2009 **Tsunami** (M9.0) in the Tohoku Region : 16
→ 2011 - Specified special disaster Countermeasures Act

1948 **Tsunami** (M7.5) in the Kanto Region : 1,194
→ 1950 - Building Standards Law

2010 **Heavy Snowfall** : 23

1983 **Tsunami** (M7.0) : 127

1999 **Tsunami** (M9.0) in the Kanto Region : 147
→ 2000 - Act on Promotion of Earthquake Disaster Countermeasures for Southern Disaster-Prone Areas

1970 **Tsunami** (M7.0) : 147

1967 **Tsunami** (M7.0) : 136

1946 **Tsunami** (M7.0) in the Kanto Region : 1,442
→ 1947 - Disaster Relief Act

1976 **Tsunami** (M7.0) in the Kanto Region : 175

1904 **Mt. Tokorojima Earthquake** : 16

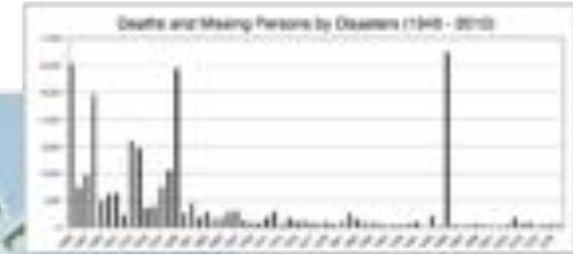
1979 **Mt. Tokorojima Earthquake** : 1
→ 1979 - Act on Special Measures for Active Volcanoes

1993 **Tsunami** (M7.0) : 1,461

1987 **Tsunami** (M7.0) : 10

1981 **Tsunami** (M7.0) : 10

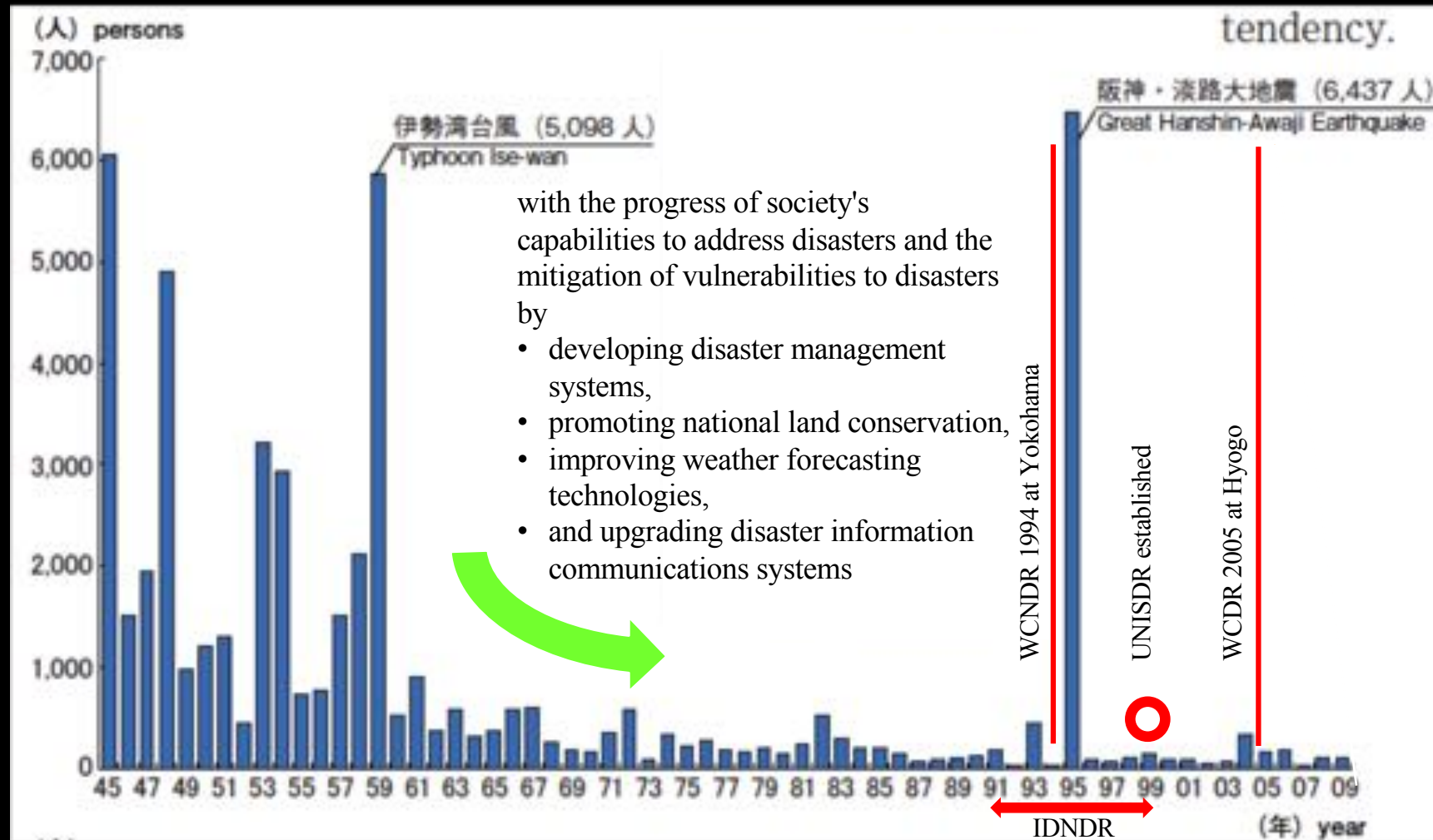
1945 **Tsunami** (M7.0) : 1,716



Year	Disaster (Magnitude)	Number of Deaths and Missing
1948	Earthquake (M7.5) in the Kanto Region	1,194
1949	Earthquake (M7.0) in the Kanto Region	1,442
1950	Earthquake (M7.0) in the Kanto Region	1,442
1951	Earthquake (M7.0) in the Kanto Region	1,442
1952	Earthquake (M7.0) in the Kanto Region	1,442
1953	Earthquake (M7.0) in the Kanto Region	1,442
1954	Earthquake (M7.0) in the Kanto Region	1,442
1955	Earthquake (M7.0) in the Kanto Region	1,442
1956	Earthquake (M7.0) in the Kanto Region	1,442
1957	Earthquake (M7.0) in the Kanto Region	1,442
1958	Earthquake (M7.0) in the Kanto Region	1,442
1959	Earthquake (M7.0) in the Kanto Region	1,442
1960	Earthquake (M7.0) in the Kanto Region	1,442
1961	Earthquake (M7.0) in the Kanto Region	1,442
1962	Earthquake (M7.0) in the Kanto Region	1,442
1963	Earthquake (M7.0) in the Kanto Region	1,442
1964	Earthquake (M7.0) in the Kanto Region	1,442
1965	Earthquake (M7.0) in the Kanto Region	1,442
1966	Earthquake (M7.0) in the Kanto Region	1,442
1967	Earthquake (M7.0) in the Kanto Region	1,442
1968	Earthquake (M7.0) in the Kanto Region	1,442
1969	Earthquake (M7.0) in the Kanto Region	1,442
1970	Earthquake (M7.0) in the Kanto Region	1,442
1971	Earthquake (M7.0) in the Kanto Region	1,442
1972	Earthquake (M7.0) in the Kanto Region	1,442
1973	Earthquake (M7.0) in the Kanto Region	1,442
1974	Earthquake (M7.0) in the Kanto Region	1,442
1975	Earthquake (M7.0) in the Kanto Region	1,442
1976	Earthquake (M7.0) in the Kanto Region	1,442
1977	Earthquake (M7.0) in the Kanto Region	1,442
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1981	Earthquake (M7.0) in the Kanto Region	1,442
1982	Earthquake (M7.0) in the Kanto Region	1,442
1983	Earthquake (M7.0) in the Kanto Region	1,442
1984	Earthquake (M7.0) in the Kanto Region	1,442
1985	Earthquake (M7.0) in the Kanto Region	1,442
1986	Earthquake (M7.0) in the Kanto Region	1,442
1987	Earthquake (M7.0) in the Kanto Region	1,442
1988	Earthquake (M7.0) in the Kanto Region	1,442
1989	Earthquake (M7.0) in the Kanto Region	1,442
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1991	Earthquake (M7.0) in the Kanto Region	1,442
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1993	Earthquake (M7.0) in the Kanto Region	1,442
1994	Earthquake (M7.0) in the Kanto Region	1,442
1995	Earthquake (M7.0) in the Kanto Region	1,442
1996	Earthquake (M7.0) in the Kanto Region	1,442
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2000	Earthquake (M7.0) in the Kanto Region	1,442
2001	Earthquake (M7.0) in the Kanto Region	1,442
2002	Earthquake (M7.0) in the Kanto Region	1,442
2003	Earthquake (M7.0) in the Kanto Region	1,442
2004	Earthquake (M7.0) in the Kanto Region	1,442
2005	Earthquake (M7.0) in the Kanto Region	1,442
2006	Earthquake (M7.0) in the Kanto Region	1,442
2007	Earthquake (M7.0) in the Kanto Region	1,442
2008	Earthquake (M7.0) in the Kanto Region	1,442
2009	Earthquake (M7.0) in the Kanto Region	1,442
2010	Earthquake (M7.0) in the Kanto Region	1,442
2011	Earthquake (M9.0) in the Tohoku Region	16

Data Source: "Disaster Management in Japan" (Cabinet Office, Government of Japan, 2011)

Number of Deaths and Missing Persons in Disasters



Importance of Learning from Past Disasters

Urban Disaster Risk Reduction
Japan as a disaster-prone country and learning
from past disasters