International Disaster Management Systems and Japanese Urban Disaster Management (Part II)

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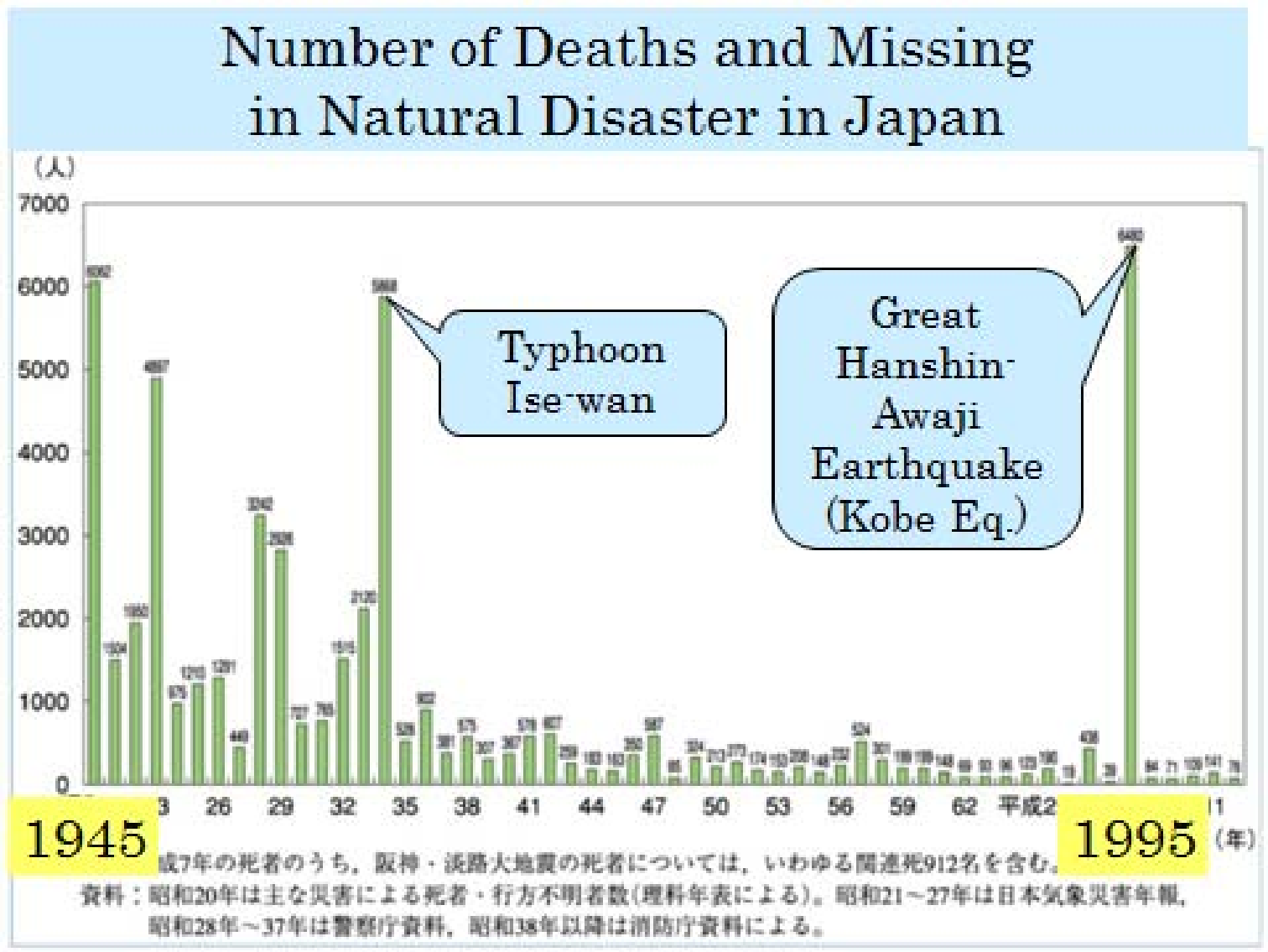
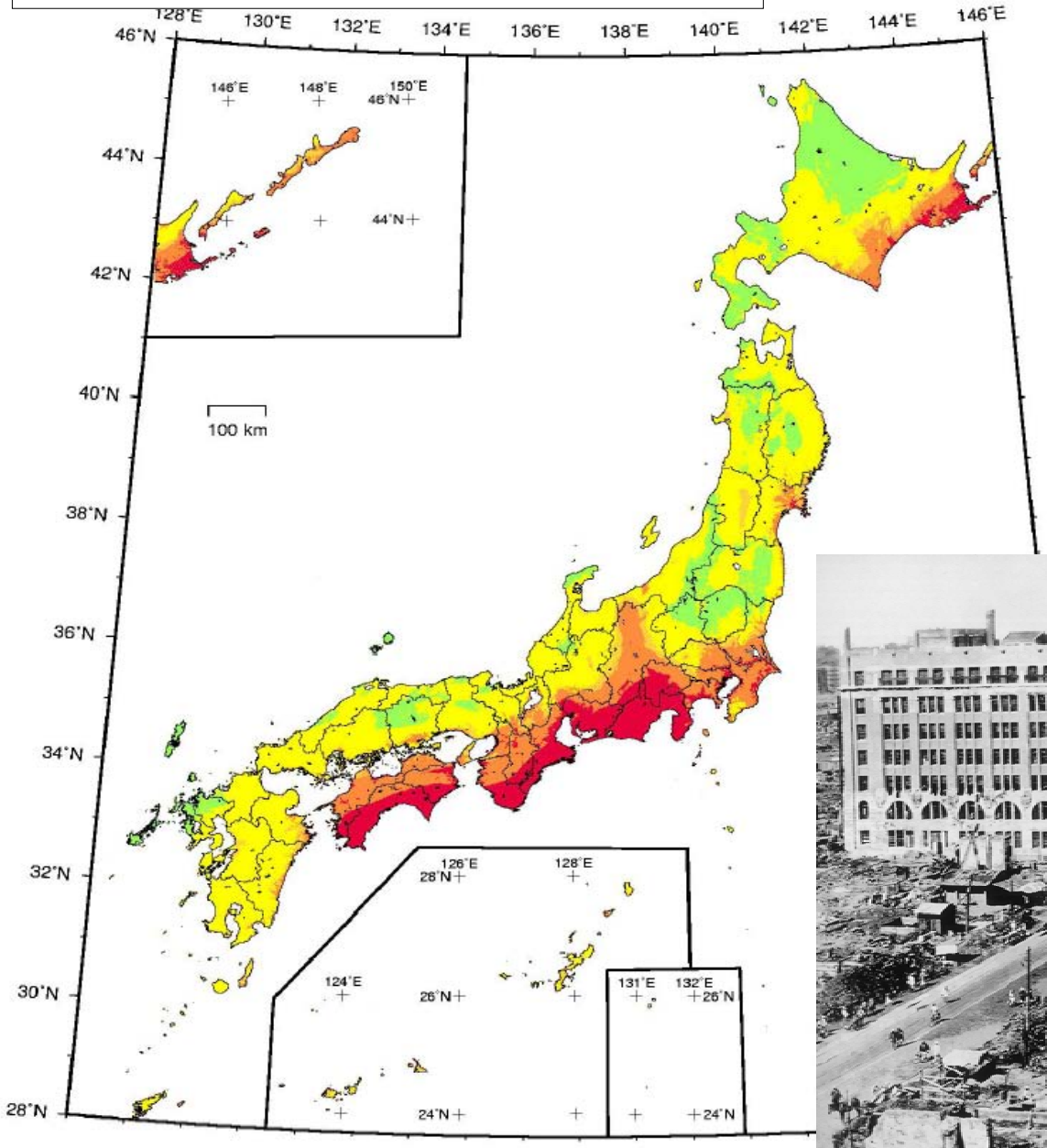
1. History: Disaster Management in Japan



Probabilistic seismic prediction map



Probability

high
*
slightly high

- More than 26%*
- 6 – 26%
- 3 – 6%
- 0.1 – 0.3%
- Less than 0.1%

the Great Kanto Earthquake (1923)

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	Act for Earthquake Insurance
1976	Presentation about the possibility of Tokai Earthquake	1978	Large-Scale Earthquake Countermeasures Special Act
1995	Great Hanshin-Awaji Earthquake	1995	Earthquake Disaster Management Special Measures Act

Disaster Countermeasures Basic Act (1961)

1. Definition of jurisdictions and responsibilities for disaster management
2. Disaster management system
3. Disaster management plan
4. Disaster preparedness
5. Disaster emergency
6. Disaster recovery
7. Financial measures
8. State of emergency

Natural Disaster
= Hazard + Human Society

- Disaster is the impact of natural phenomena on human society.
- Natural phenomena (hazards) have hit Japan from time immemorial.
- Because of changes of human society (urbanization, change of birth rate, etc.), the new natural disasters appear at any time.

Definition of jurisdictions and responsibilities of Govt. for DM

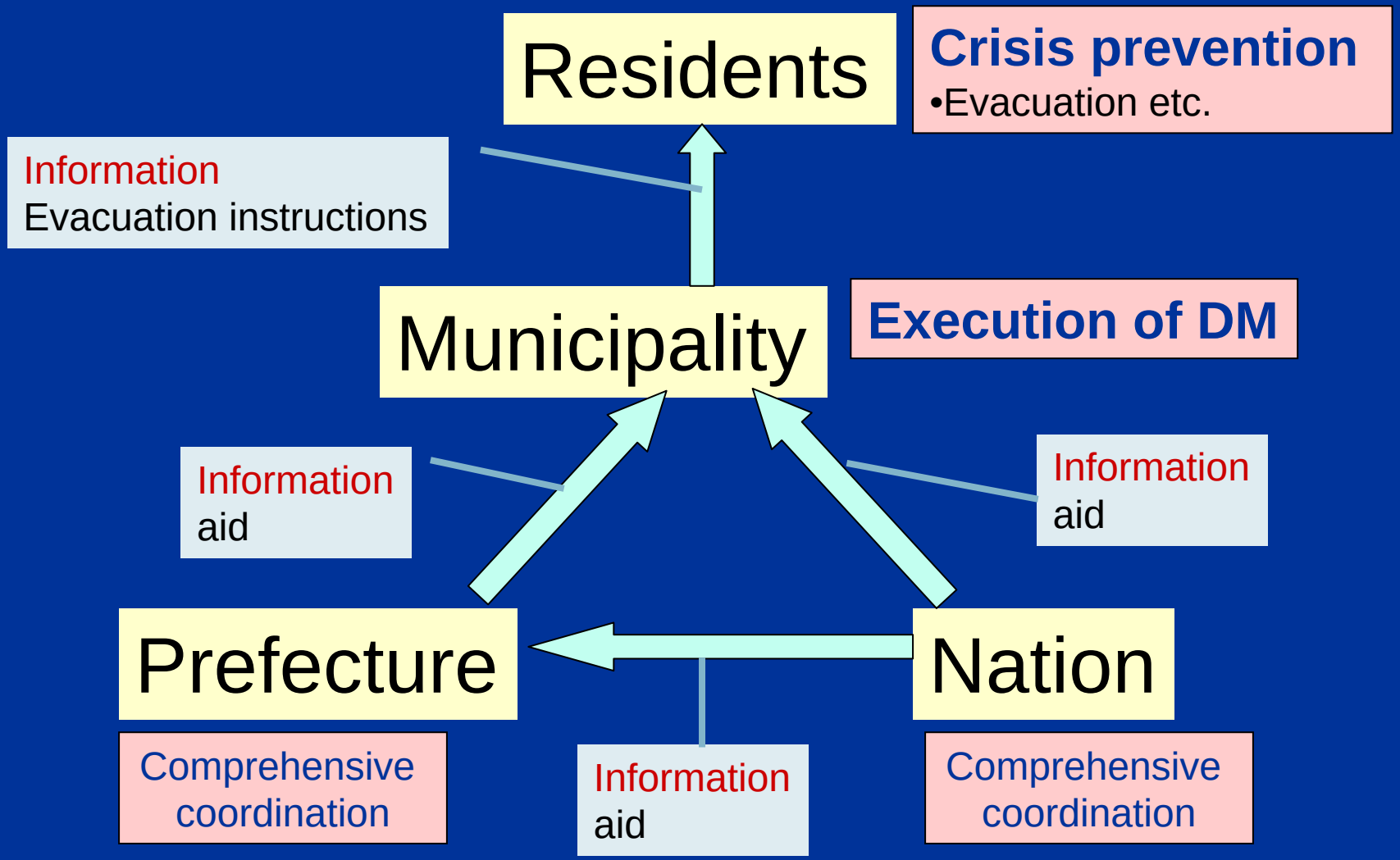
- Municipality primarily responsible for dealing with disaster management operation.
- In the case of catastrophic disaster, Nation and prefecture governments back up the municipality.

Disaster Management Plan

- Basic Disaster Management Plan (National level)
- Disaster Management Operation Plan
- Local Disaster Management Plan

- Including Plans for Disaster preparedness, Disaster emergency, Disaster recovery, Financial measures and State of emergency

Responsibility, Decision and Action in case of a Disaster in Japan



2. Structure of DM Systems for Building/Housing

1) Structural Requirements

2)Fire safety Requirements

Development of Earthquake- Resistance measures

<Principal earthquakes>

Niigata Earthquake 1964

Tokachi Off-shore Earthquake 1968

Miyagi Off-shore Earthquake 1978

Great Hanshin-Awaji Earthquake 1995

Nigata-Chuetsu Earthquake 2004

1950 Enactment of the Building Standards Law

1959
- Complete revision of the provisions

Wooden Construction;
- Strengthening foundation standards

1971
- Revising and strengthening RC 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

1998 Establishment of financial aid for cost of seismic design and improvement (Apartment Houses , Offices and Others)

Establishment of financial aid for cost of seismic design (Detached Houses)

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 Corporatinon at 0.2% reduced interest rate compared with the benchmark rate

2005 Establishment of Abolishment of the Requirements for Actual Age in Reduced Taxation on Housing Loans and Others

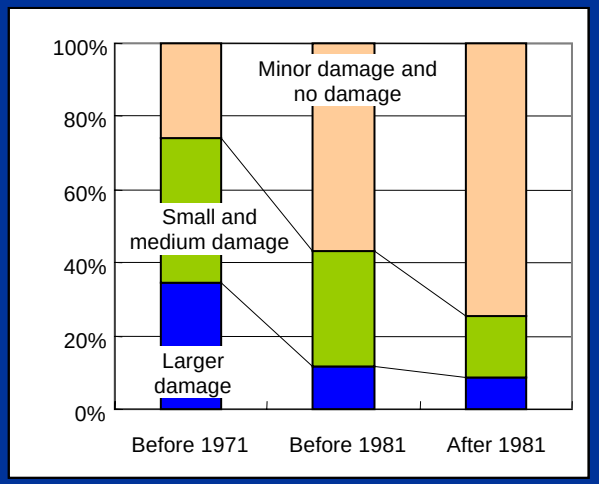
Amendment of the Act for Promotion of Earthquake Retrofitting

Damage to buildings 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	approx 6,700 persons	approx 6,600 persons	approx 4,200 persons
	Amount of economic losses	approx 37 trillion Yen	approx 57 trillion Yen	approx 112 trillion Yen

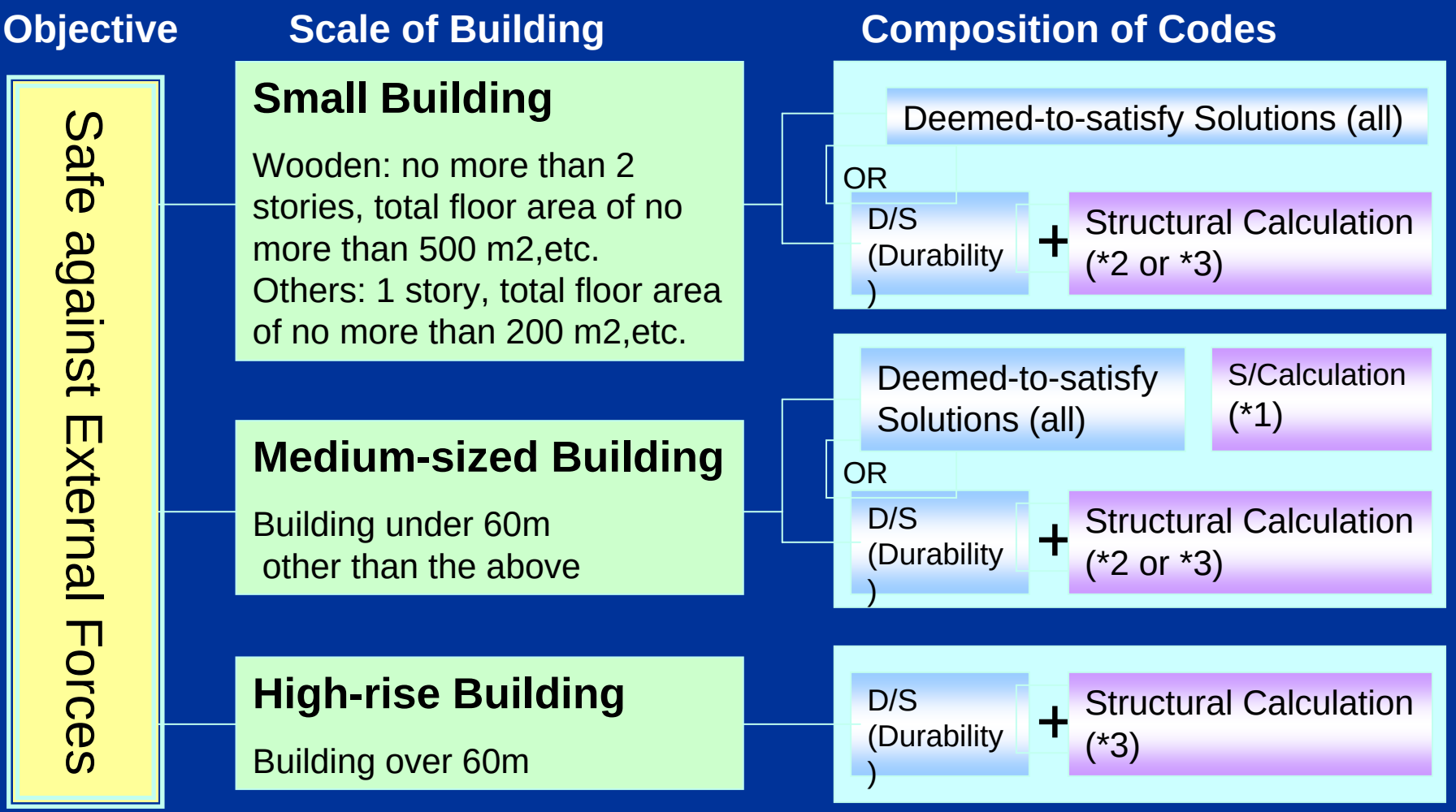
1) Structural Requirements

Great Hanshin-Awaji Earthquake (1995)

History of Amendment

- 1971 Amendment
  - After the Offshore Tokachi Earthquake (1968)
  - Reducing the stirrups spaces for improving ductility of RC columns
- 1981 Amendment -"*Shin-taishin*" Design Method-
  - After the offshore Miyagi Earthquake (1978)
  - Introducing the current design principle/methods
- 1998 Amendment
  - After the Great Hanshin-Awaji Earthquake (1995)
  - Expanding pre-verified methods/technologies (with the introduction of interim inspection scheme)

Composition of Structural Codes



*1) Allowable unit stress calculation *2) Critical strength calculation *3) Approved by the Minister

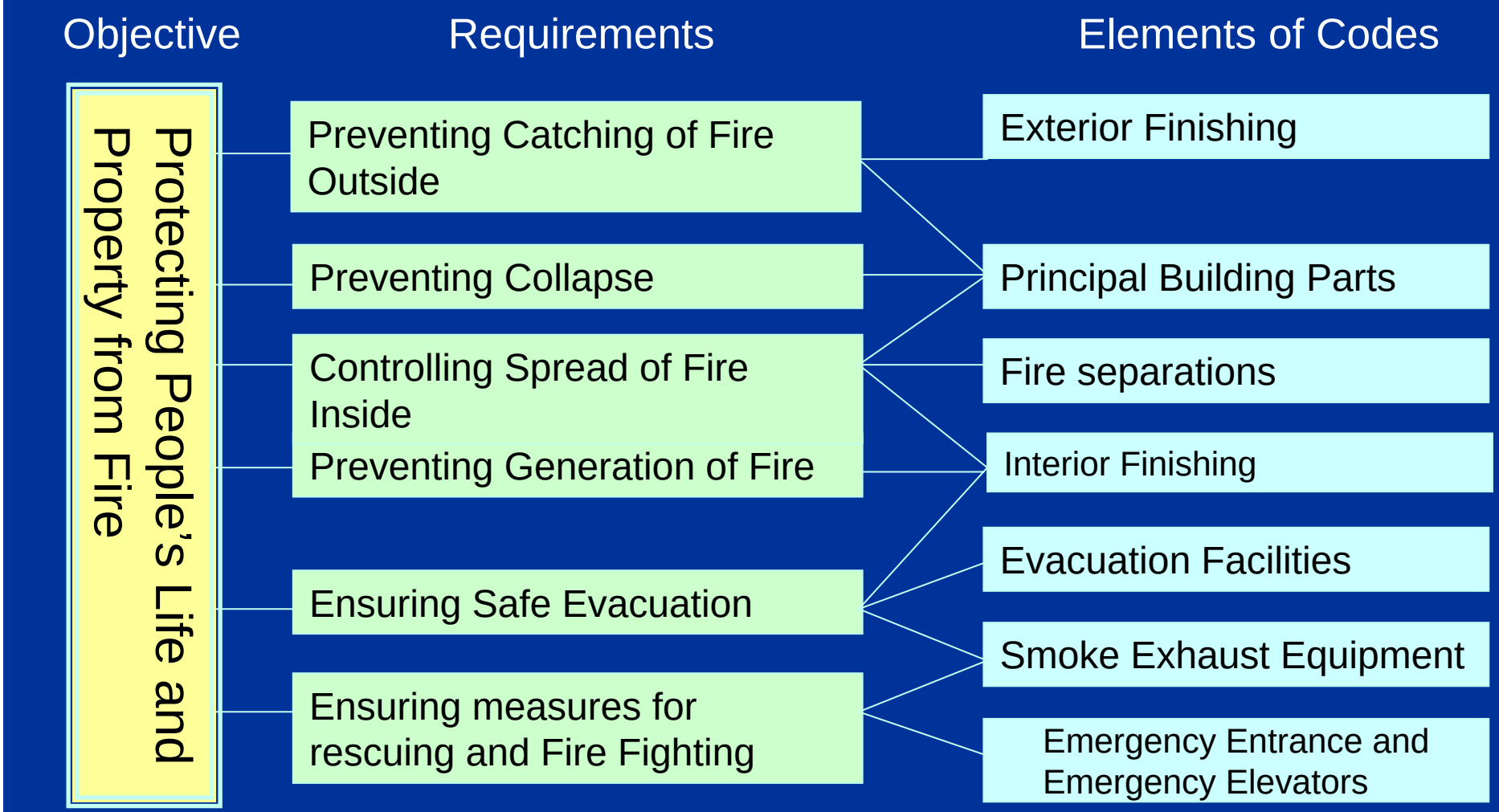
Load and External Force

- Dead load: Load of each element of a building
- Live load: Differs depending on the use of a building
- Snow load: Snow depth should be measured by a Designated Administrative Agency
- Wind pressure: Wind velocity pressure calculated in accordance with regional conditions
- Seismic force: Obtained by calculating the inertial force generated through movement of both ground and the building (allowable unit stress calculation)

2) Fire Safety Requirements

Osaka Sen-nichi Building (1972)

Composition of Fire Codes



Restriction on Construction according to the Fire Zoning

Zoning	Scale of Building	Required Construction
Fire Protection District	Stories; 3 or more	Fireproof Building
	Floor area: more than 100 m2	Fireproof Building
	Other than the Above	Fireproof Building or Quasi-fireproof Building
Quasi-fire Protection District	Stories; 4 or more	Fireproof Building
	Floor area: more than 1,500 m2	Fireproof Building
	Floor area:more than 500m2 (no more than 1,500m2)	Fireproof Building or Quasi-fireproof Building
	Stories; 3	Fireproof Building or Quasi-fireproof Building or Specific Wood Building

3. Japanese Experiences and Causes of Disaster

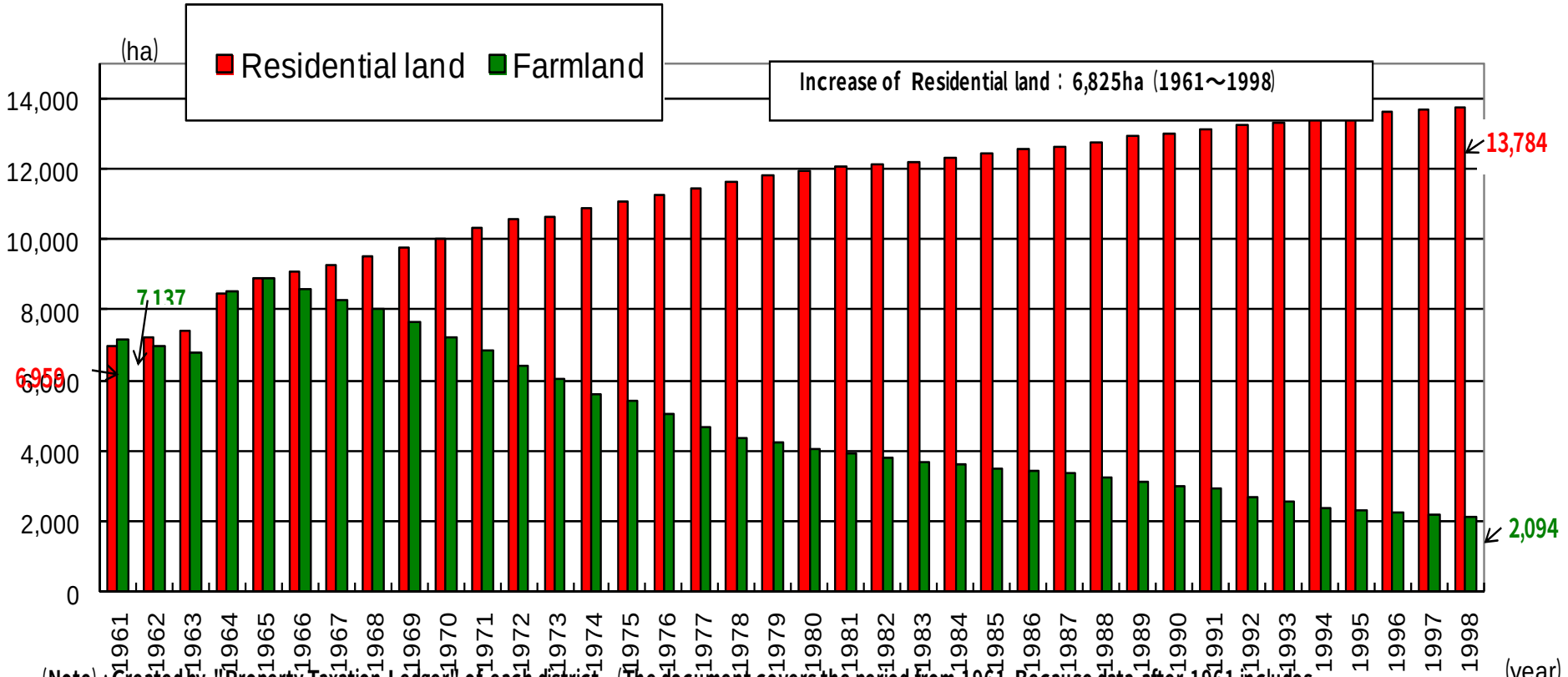
Flood by Typhoon 6 (July 2002) Kiso river

Downpour in Nagoya (Sept. 2000)

Usual view in Nagoya

Decrease of farmland and Rapid urbanization

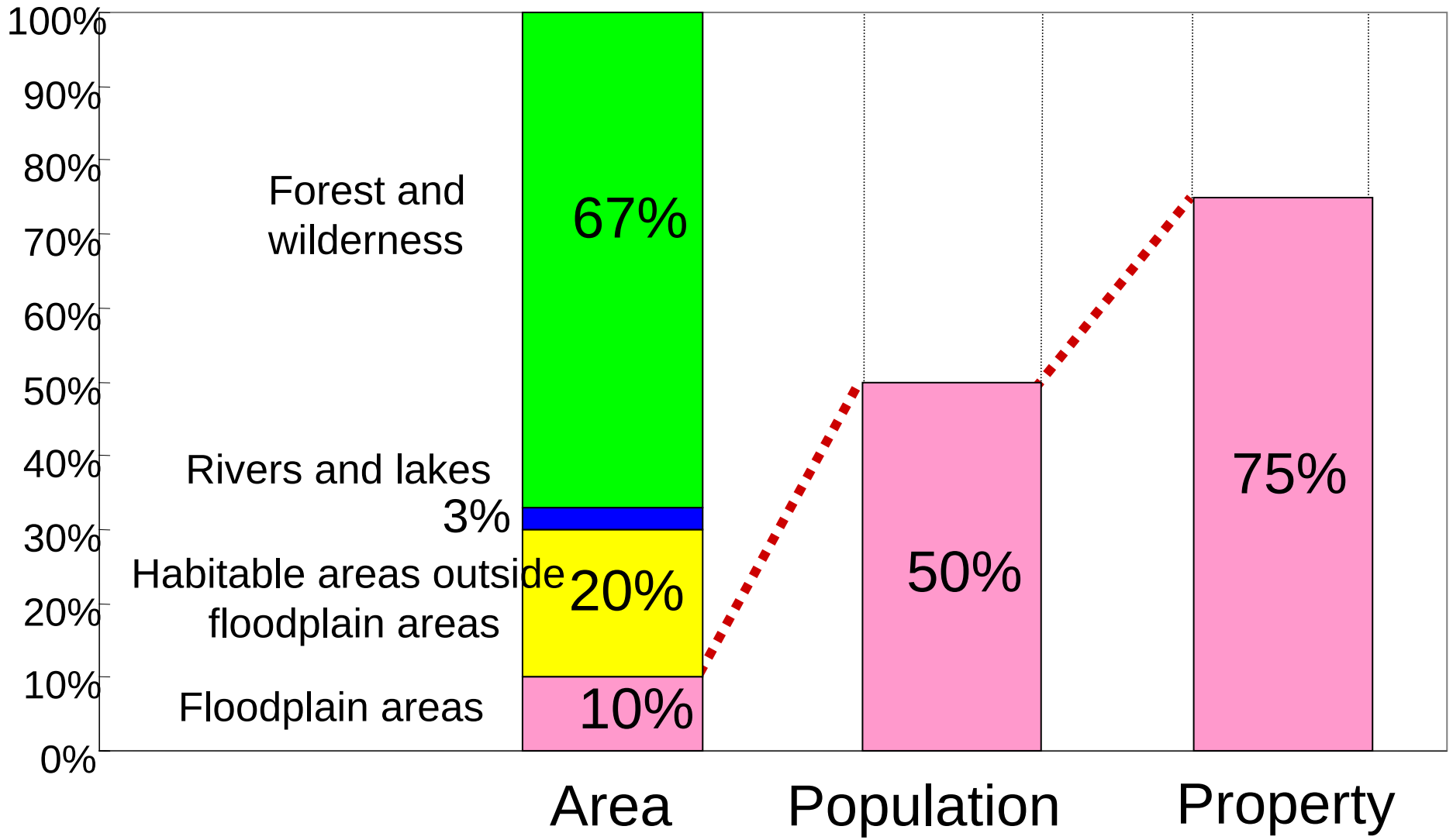
Changes of residential land and farmland in Nagoya city (1961～1998)



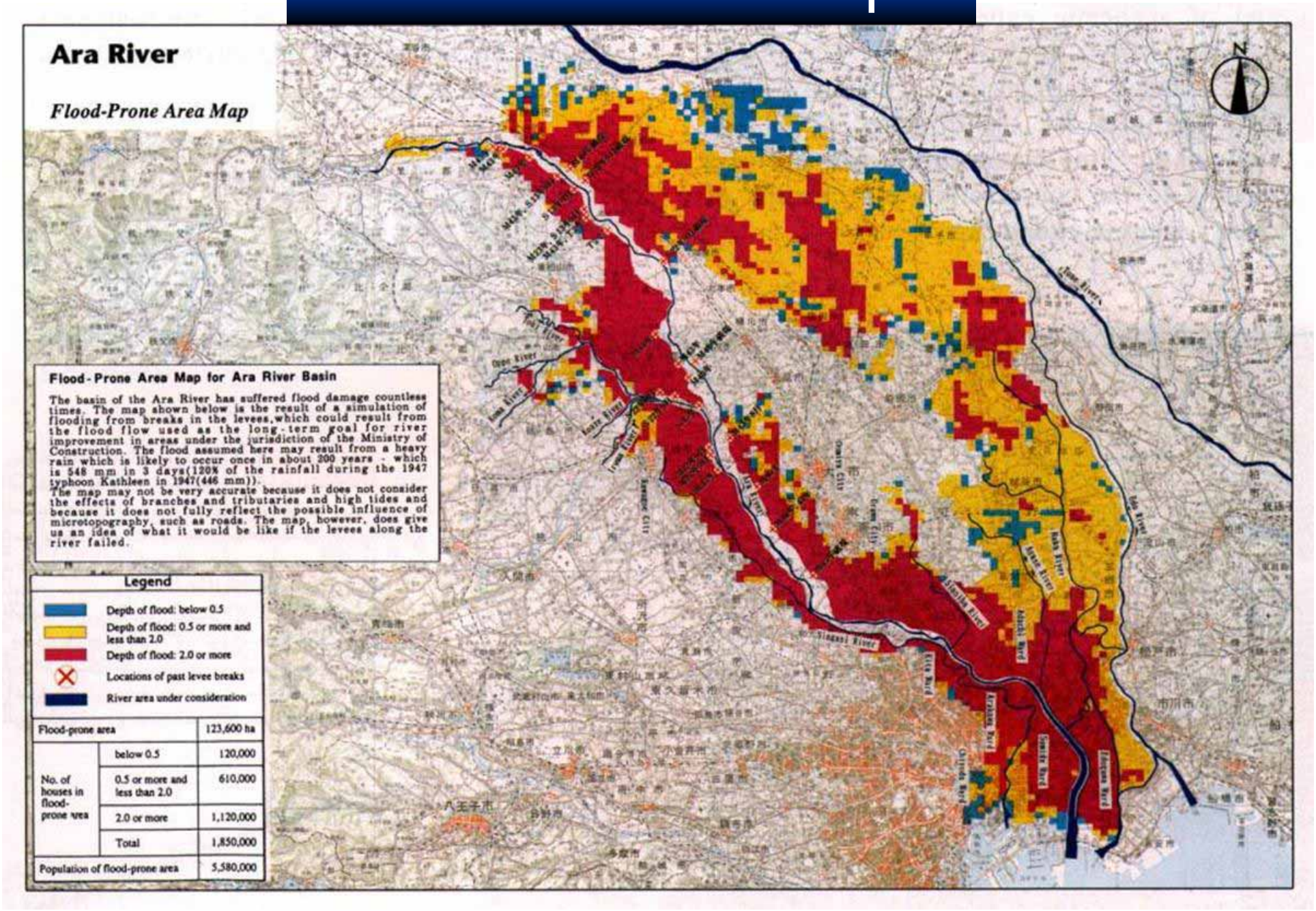
(Note) : Created by "Property Taxation Ledger" of each district. (The document covers the period from 1961. Because data after 1961 includes land under tax-free point.

(Source) : "100 years of history in Nagoya City—Long term statistics data collection—" (Nagoya City) (1961-1988)
"Nagoya City Statistics Almanac" (Nagoya City) (Since1989)

Land Use in Japan



Flood Hazard Map

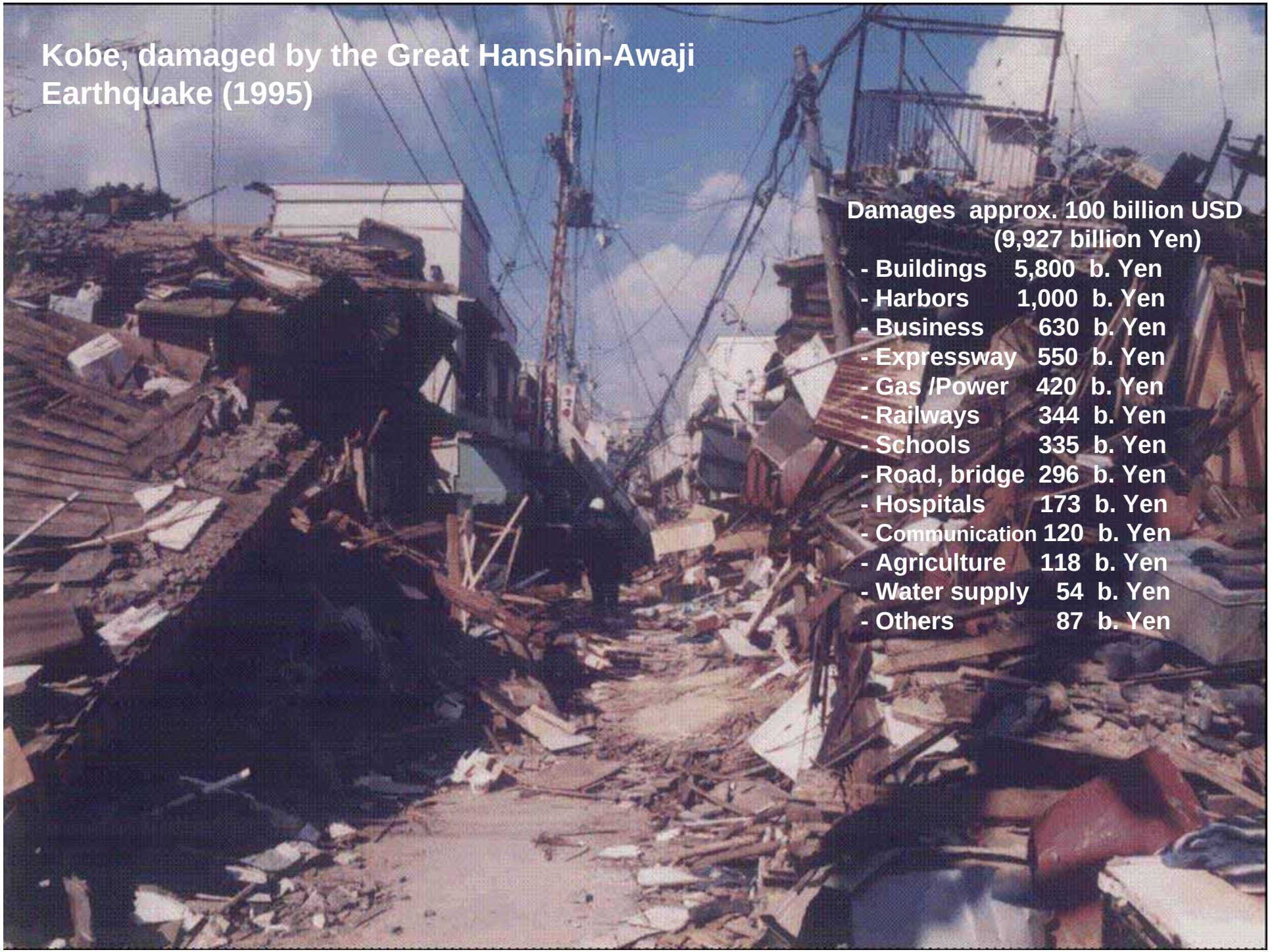


Flood-prone area		123,600 ha
No. of houses in flood-prone area	below 0.5	120,000
	0.5 or more and less than 2.0	610,000
	2.0 or more	1,120,000
	Total	1,850,000
Population of flood-prone area		5,580,000

Lessons learned from the Great Hanshin-Awaji (Kobe) Earthquake in Jan. 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