

# *Suibo* as Flood Risk Management

Kenichiro TACHI

Deputy Director, River Planning Division,  
River Bureau, Ministry of Land  
Infrastructure, Transport and Tourism

# What is *Suibo*?

Flood Disaster Prevention in Japan consists of *chisui* and *suibo*, both of which complement each other to strengthen their effects.

治水

*chi sui :*

Flood Control

Flood control mainly through river improvement works such as Levee and dam construction, etc.

水防

*sui bo :*

Flood Damage Prevention

Flood Protection

Flood Fighting

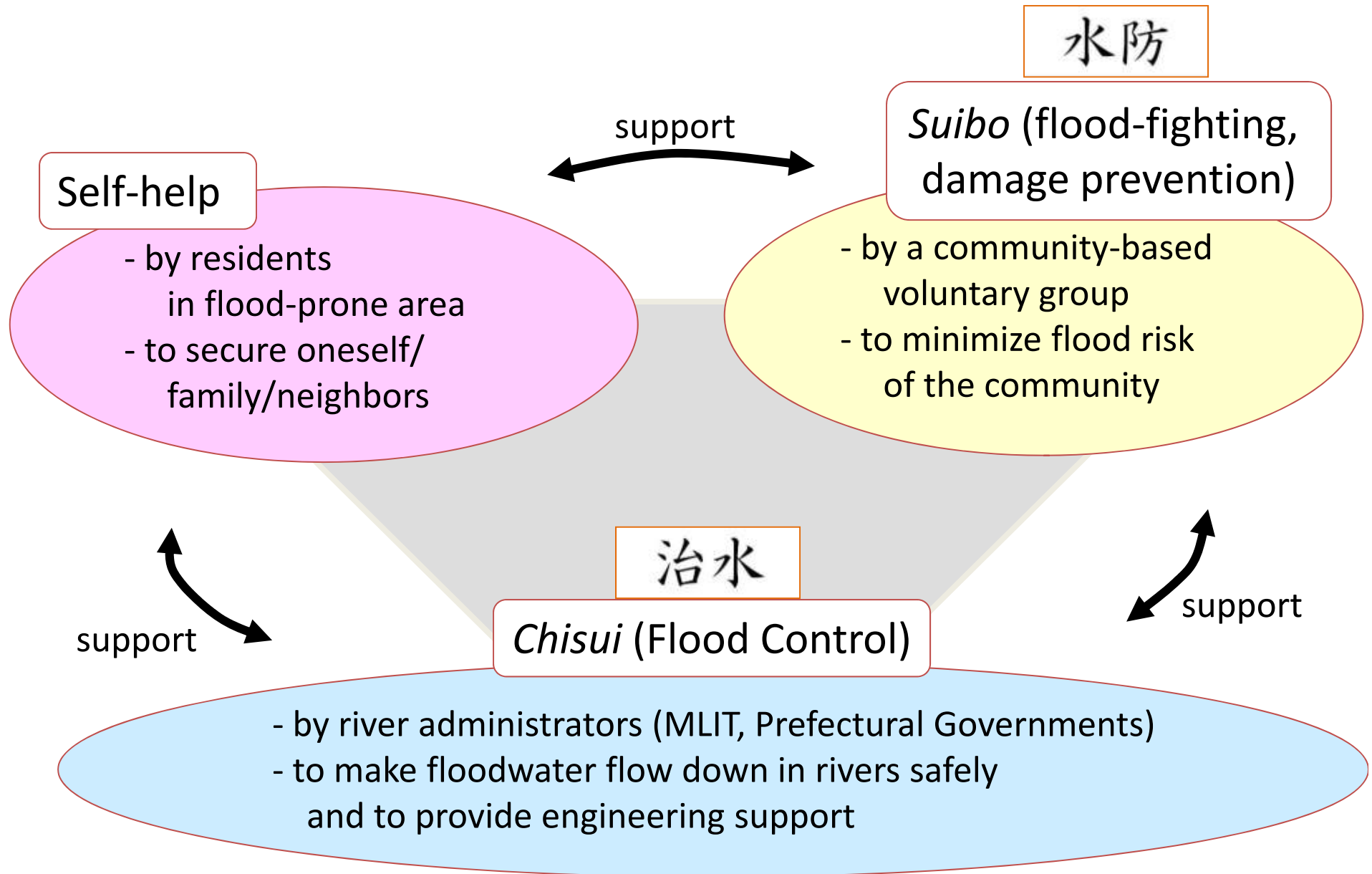
Human activities to protect lives and properties from flooding and minimize damage when a flood disaster is occurring or about to occur.

(Flood Warning, Flood-fighting, etc.)

# *Suibo* (Flood-fighting) Activities



# Responsibilities for Flood Damage Prevention/Minimization



# Responsibilities for Flood Damage Prevention/Minimization

## **Disaster Countermeasures Basic Act (Article 5 and 7-2)**

Residents have to adopt measures to provide for disasters and prepare and to make efforts to participate in voluntary activities to prevent disasters. Municipalities have the responsibility to formulate and implement a Municipal Disaster Management Plan.

## **River Act (Article 8, 9 and 10)**

治水

River Administrators execute river works in order to increase public benefits or eliminate or diminish public losses caused by water of rivers. Administration of class A rivers shall be performed by the Minister of Land, Infrastructure, Transportation and Tourism. Administration of a class B rivers shall be performed by Prefectural Governors.

## **Suibo Act (Article 3 and 5)**

水防

Municipalities (Flood-fighting Administration Bodies in many cases) have the responsibility to sufficiently perform flood-fighting in their areas. Flood -fighting Administrative Bodies may maintain Flood-fighting teams.



# History of the Development of *Suibo* Activities

Large scale development of alluvial plains for rice production since around the 16th century put people in danger of flooding.

Flood-fighting and flood damage prevention measures have been traditionally organized by villages and other community groups.

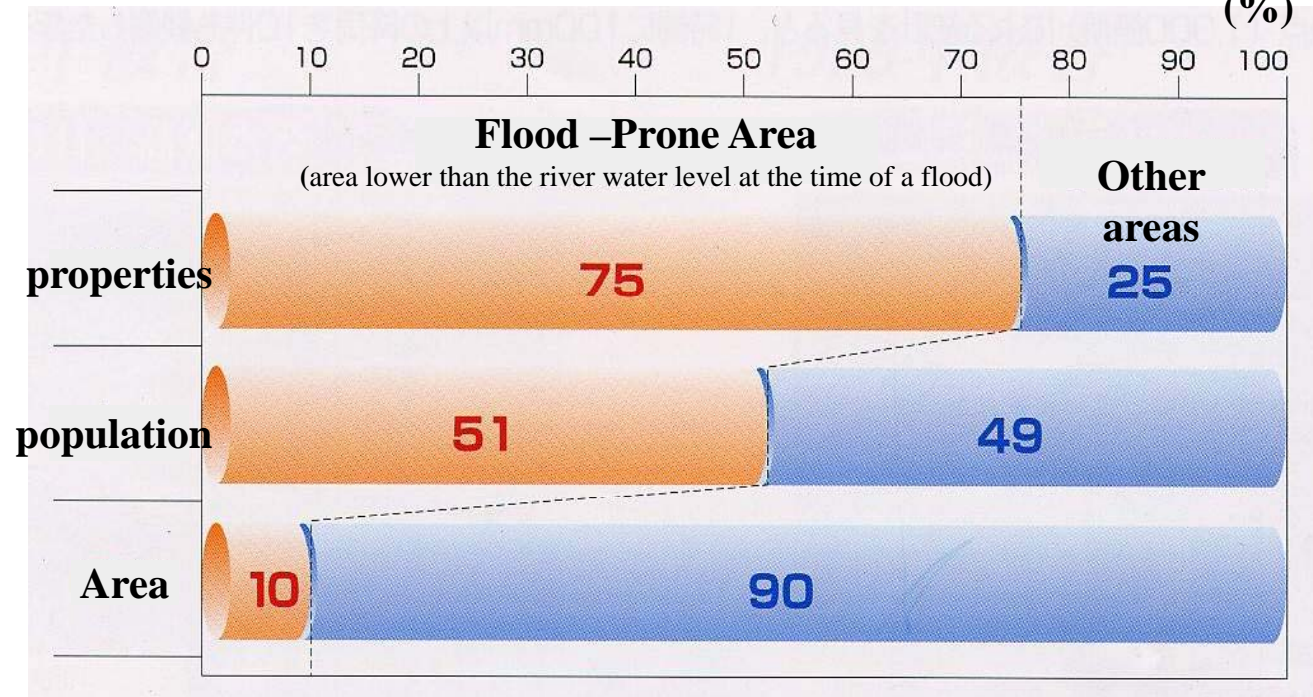
In 1947, after an extensive damage caused by Typhoon Kathleen, the *Suibo* act (flood damage prevention act \*) was enacted, making the efforts into a legally mandated program.

\*Sometimes translated as Flood-fighting Act, Flood Protection Act, Flood Prevention Law, etc.



Ring Levee Development  
in Kiso Region

Concentration of population and assets in flood-prone area (%)



# Suibo-dan (Flood-fighting team)

Flood-fighting activities are executed by *suibo-dan* (Local flood-fighting team, usually based on municipalities).

The members gather as flood-fighters to protect local communities when a flood occurs, though members have their own occupations.

## Activities of the flood-fighters :

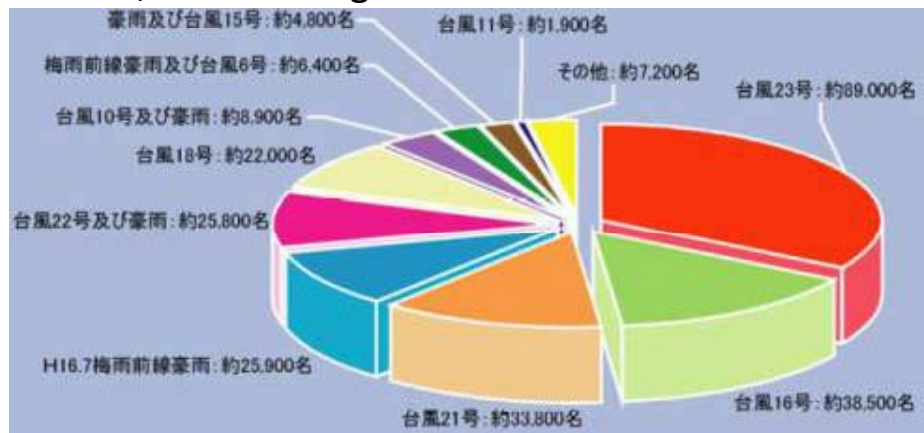
### Normal Days:

Preparation of flood-fighting storage,  
communication tools  
Flood Drill

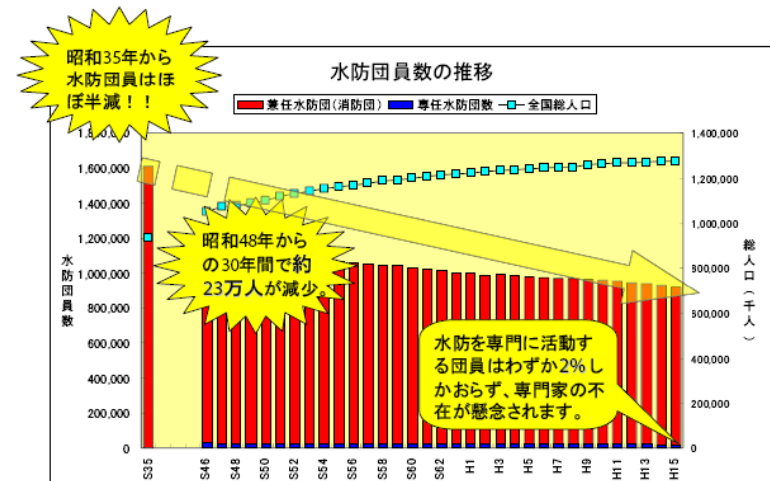
### During Flood :

Warning, Patrol  
Implementation of Levee protection  
activities

265,000 flood-fighters were mobilized in 2004.



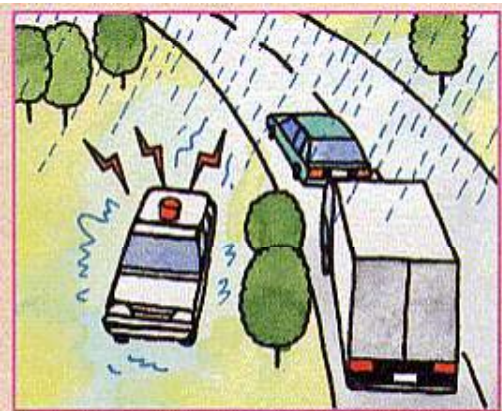
The present number of flood-fighters is 900,000.





# Authorities given to flood-fighting activities by the *Suibo Act*

1. Priority of passage for emergency motor vehicles (Article 18)
2. Emergency passage for flood fighting organizations (Article 19)
3. Right to set restricted areas (Article 21)
4. Right to order inhabitants and others to engage in flood fighting activities (Article 24)
5. Right to have priority use of communications facilities (Article 27)
6. Emergency public expropriation right (Article 28)
7. Right to order eviction (Article 29)



●Urgent passage



●Request for cooperation to flood-fighting activities



●Communication for flood fighting activities



●Public expropriation



# Flood-fighting Drill

Ground crack repair by trivet-shaped binding of bamboo booms with sandbag



Circular sandbag loading work



“Kizuki-mawashi” flood-fighting technique



Timber groin method



Protection of bank using plastic sheets



Deployment of sandbags

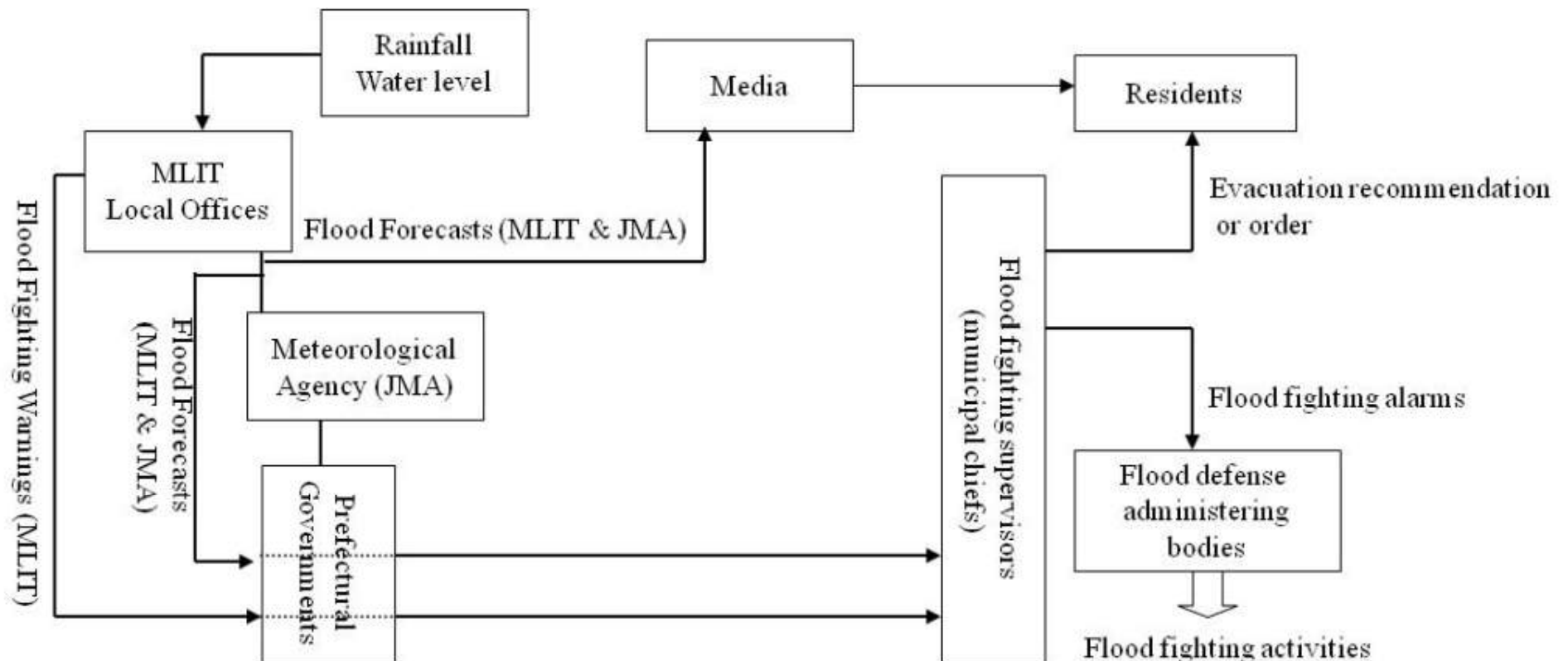


# Flood Forecasts, Flood-fighting Warnings

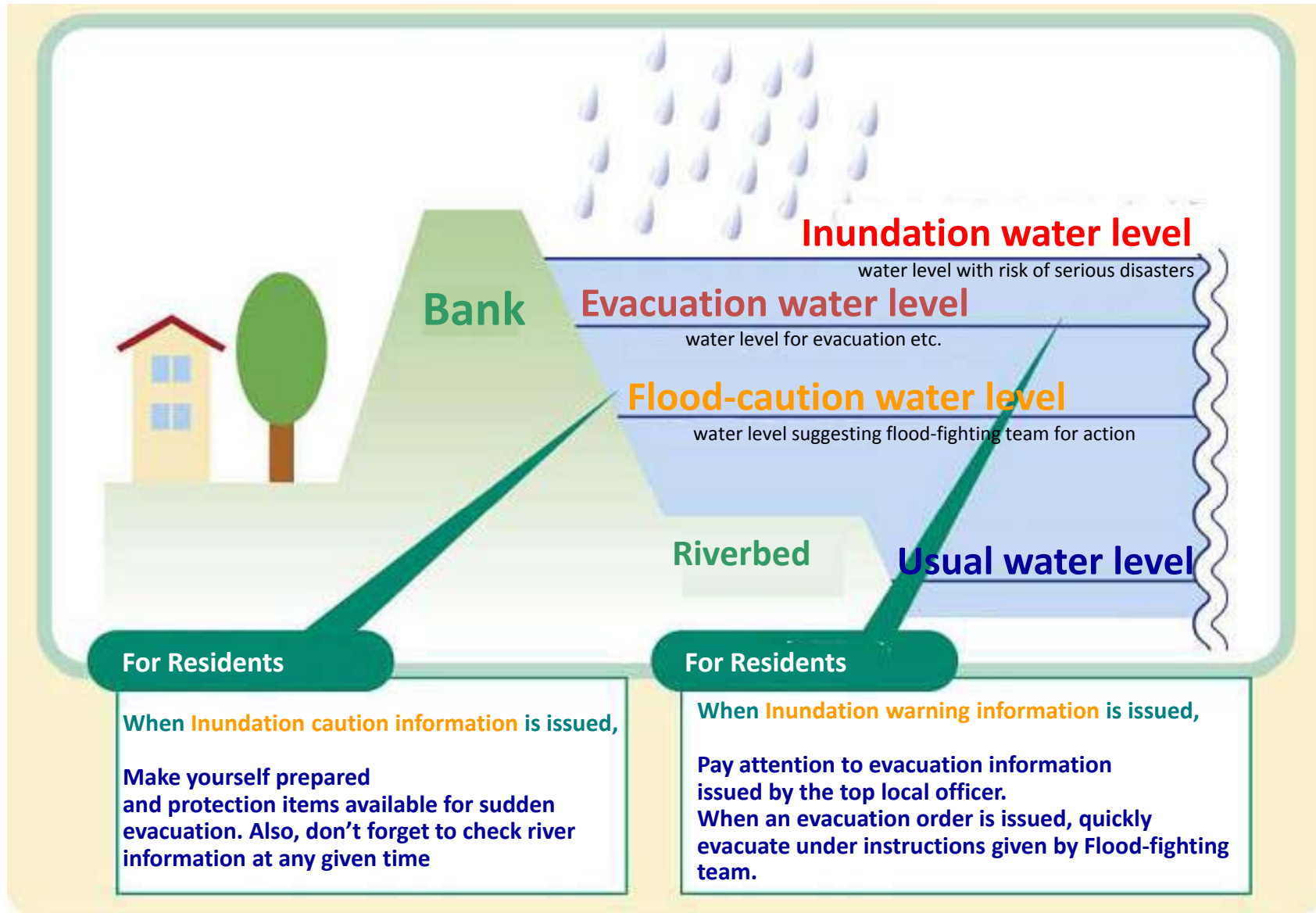
MLIT and the prefectural governments in cooperation with the Meteorological Agency provide **flood or possible flood forecasts** to residents. (Article 10 -13 of the *Suibo Act*)

MLIT and the prefectural governments also provide **flood-fighting warnings** to guide flood-fighting activities. (Article 16 of the *Suibo Act*)

Information flow (for class-A rivers)



# Water level Information



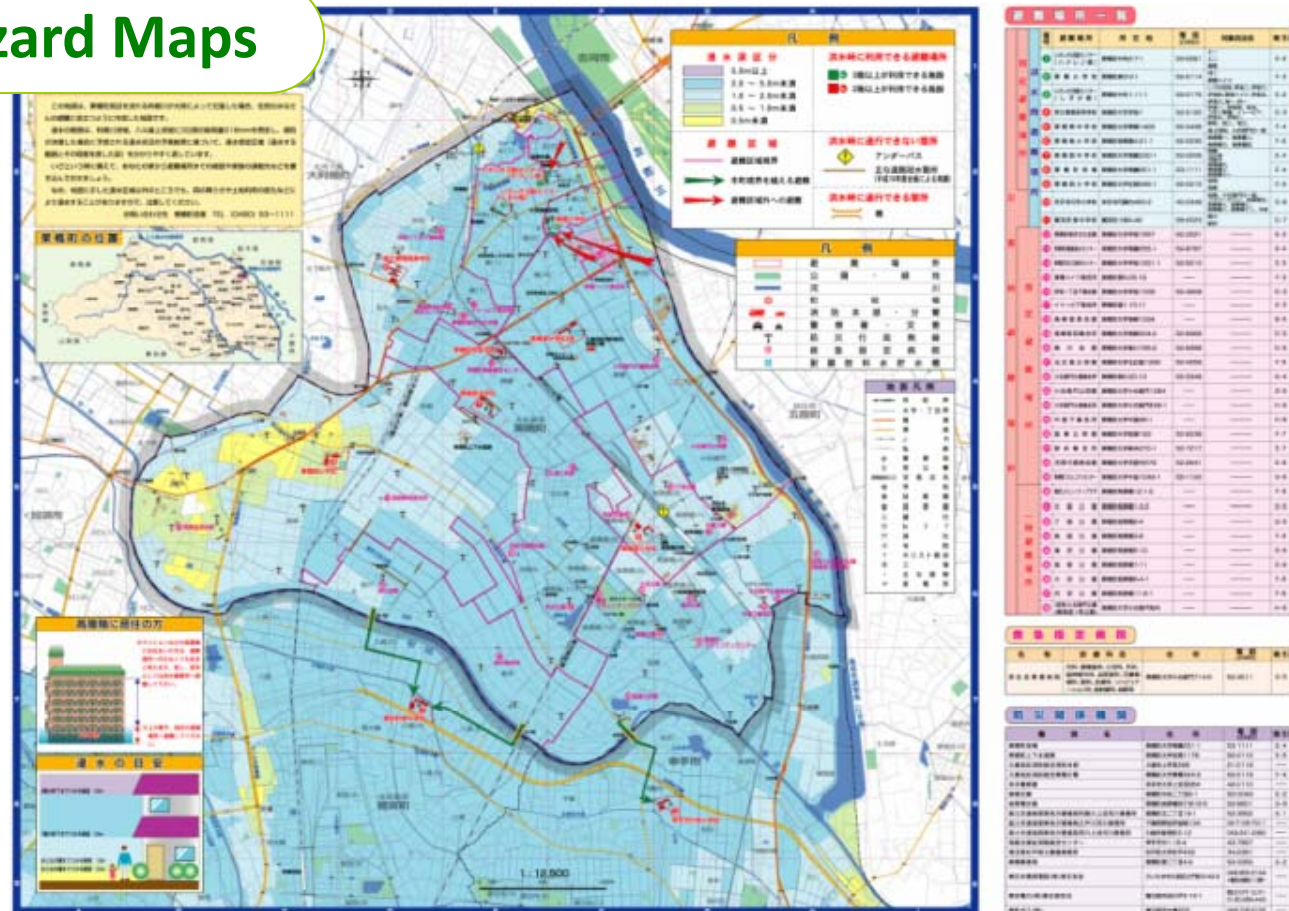


# Publication of flood-prone area

MLIT and the prefectural governments designate, as flood prone areas, those areas that may be inundated in the event of flooding. (Article 14 of the *Suibo Act*)

The municipalities prepare and disseminate flood hazard maps to residents on the basis of flood-prone area maps. (Article 15 of the *Suibo Act*)

## Flood Hazard Maps





# Recent revisions of the *Suibo* act

Partial Improvements of the *Suibo* act to strengthen local capability of “flood disaster risk management” in response to recent disasters.

- Increased damage potential due to **the concentration of population and assets in urban areas**, e.g. damage to underground facilities.
- Frequent occurrence of **flooding in small - middle-sized rivers and sediment disasters** caused by localized torrential rain.
- Increase of **victims of vulnerable people** due to the growing proportion of elderly people.
- Increase of **vulnerability of communities** due to weakening local community bonds and aging flood-fighters.



- Establishment of **better warning and evacuation system** including preparation in normal days.
- Improvement of flood **information dissemination** to ensure safe evacuation.

# Submergence at the underground facilities in urban areas



Oct. 2004  
Azabu-juban Sta.  
(Tokyo metro)



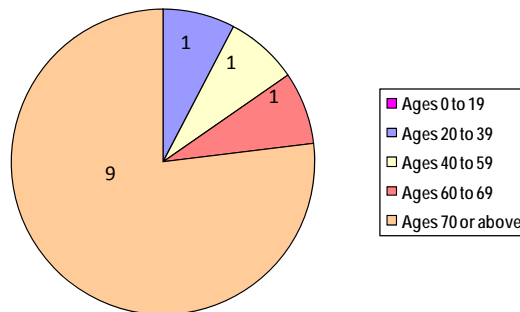
Jul. 2003  
Hakata Sta.  
(Fukuoka municipal subway)

# Increased proportion of the elderly among victims

- The proportion of the elderly among victims is high in recent flood damage.
- In light of the aging of Japan's population, and especially the increase of elderly people living alone, the fact that casualties may increase because the elderly require time to evacuate when flood damage occurs is a matter of concern.

- The heavy rainfall in Niigata and Fukushima in July 2004 caused 16 deaths and 14 injuries.  
(according to a survey by the Fire and Disaster Management Agency)
  - Among the 12 victims in Sanjo City and the former Nakanoshima-machi, 9 were elderly aged 70 or older
  - Some were living alone or were bedridden; however, only about half of the young people who support the fire company could assemble because they were at work.

<Configuration of victims by age>



- The elderly make up 60 to 80% of the total victims of recent disasters.

<Proportion of the elderly to the victims of recent disasters>

|   | Dead or lost (A) | Elderly victims out of dead and lost (B) | B/A   |
|---|------------------|--|-------|
| 2004: Heavy rainfall in Niigata and Fukushima | 16               | 13                                       | 81.3% |
| 2004: Heavy rainfall in Fukui                 | 5                | 4  | 80.8% |
| 2004: Niigataken Chuetsu Earthquake           | 68               | 45                                       | 66.2% |
| 2005: Typhoon No. 14                          | 29               | 20                                       | 69.0% |
| 2006: Heavy snowfall                          | 152              | 99                                       | 65.1% |
| 2007: Niigataken Chuetsu-oki Earthquake       | 14               | 11                                       | 78.6% |

Source material: Damage report related to each disaster created by the Cabinet Office

Source) White Paper on Disaster Management 2008 (Cabinet Office)

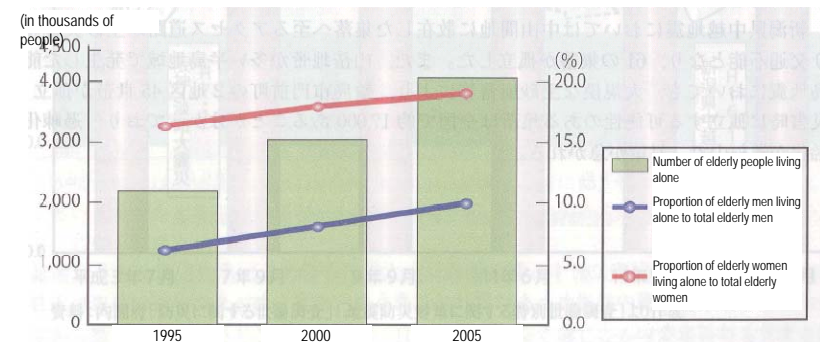
- The proportion of elderly people living alone to total elderly people is on the increase.
  - One to ten elderly men and one to five elderly women live alone.

- The heavy rainfall in August 2008 (Okazaki City and Koda-cho, Aichi Prefecture) caused 2 deaths in Okazaki City, both of whom were elderly people.
  - On August 29, one woman aged 76 was drowned at home.
  - A woman aged 80 who was lost since August 28 was found dead on August 31 at Himakajima (Minamichita-cho) (according to a survey by the Fire and Disaster Management Agency).



Breaking point: Hirota River in the Yahagi River System (Koda-cho)

<Changes in the proportion of elderly people living alone to total elderly people (by gender)>



Source material: National Census by the Ministry of Internal Affairs and Communications

Source) White Paper on Disaster Management 2007 (Cabinet Office)

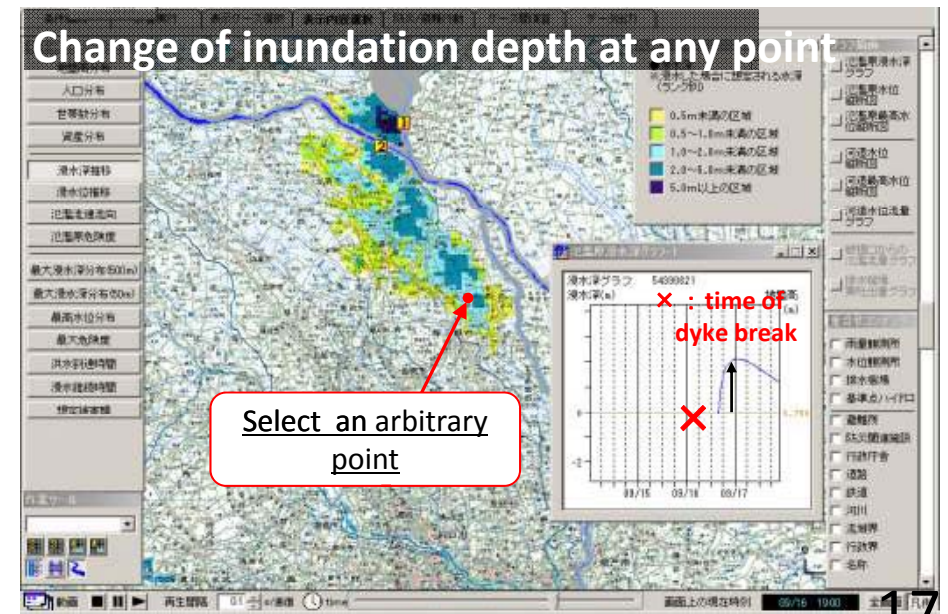
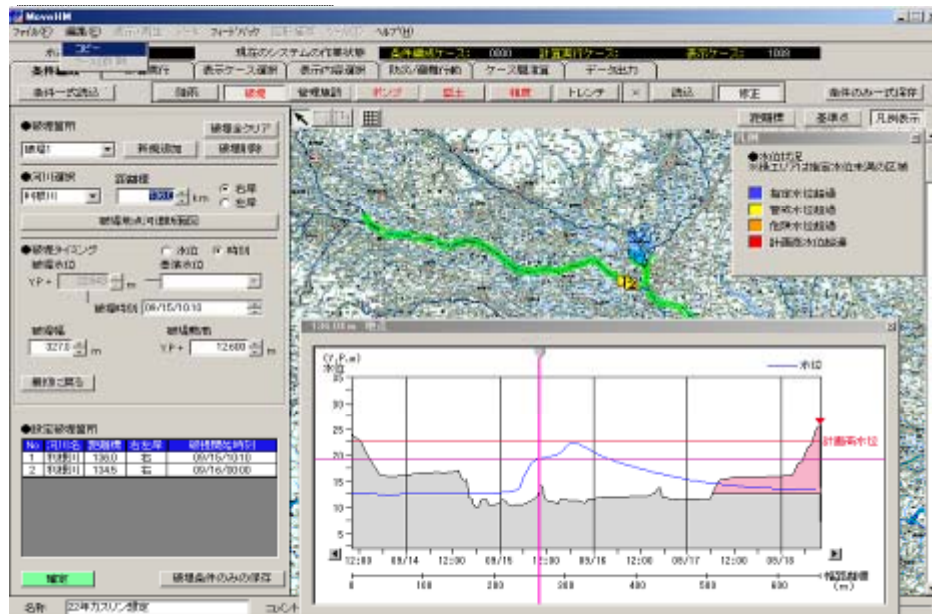
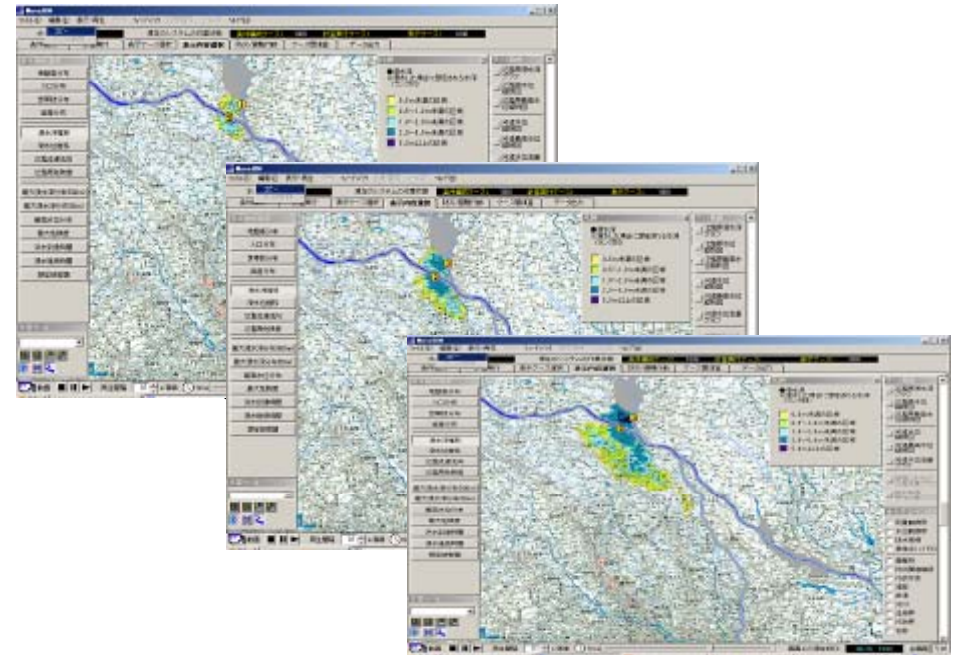
# 2005 Revision of the *Suibo* Act

- Designation of rivers to publish “flood-prone areas” and to conduct flood forecasts were expanded to small - middle-sized rivers.
- Mandatory publication of flood hazard maps by municipalities included in the flood-prone areas.
- The forecasts of inundated area and water depth after inundation starts, in addition to conventional forecasting of water levels and flows, for rivers designated by MLIT.



# Real time simulation of inundation

Installation of a real time simulation system, which provides its results for forecasting of inundation depth and area based on observed data and projection of rainfall and water level of river in case of flooding is on going.



# 2005 Revision of the *Suibo* Act

- Mandatory formulation for the facility manager, of **evacuation plans for underground facilities** in flood-prone areas to ensure smooth and rapid evacuation.
- Mandatory prescription in local disaster prevention plans, of the **ways to transmit flood forecast information to the people in facilities** where aged people and infants mainly use.
- Strengthening of **flood-fighting team system**
  - Introduction of “flood fighting cooperative bodies” (designated public-interest corporations and incorporated nonprofit organizations) to assist flood-fighting activities.
  - Introduction of retirement benefits for part-time members of flood-fighting teams.



● Flood-prone areas

● Flood forecast transmission methods

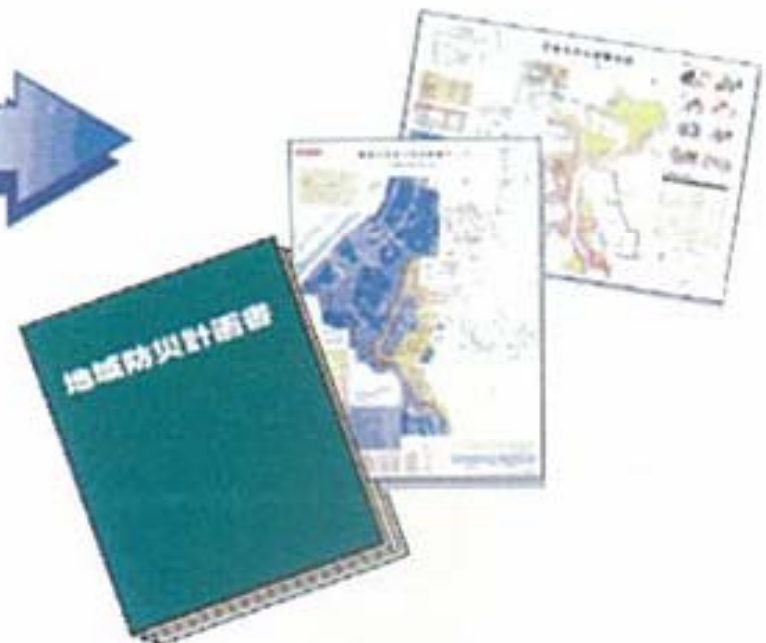
● Necessary measures for safe evacuation, such as provision of shelters

City/town/village

City/town/village disaster prevention meetings

City/town/village disaster prevention meetings are called for in the flood-prone areas as required activities needed to secure the transmission of flood forecasts, provide shelters and other smooth and rapid evacuation facilities in cities, towns and villages as part of disaster prevention plans.

The city/town/village heads will make thorough efforts to let residents know the location of shelters, etc. provided for in the plans. In this case, it is desirable to use flood hazard maps to provide information to residents. When evacuation of a wider area beyond the boundary of the city/town/village is necessary, the operation rules for the council of the city/town/village meeting, if any, are to be stipulated.





**City/town/village**  
(Flood-fighting manager)

Supply of the disaster information  
to administrators of underground  
shopping mall, etc.



**Underground space**





# Conclusion

- In Japan, flood control works (*Chisui*) and flood damage prevention and flood-fighting activities (*Suibo*) have been two major components for flood risk management, due to its historical background of the alluvial plain developments.
- The *Suibo* Act prescribes a variety of aspects of flood risk management, from the assistance of flood-fighting teams to information dissemination of flood hazards.
- In response to recent disasters, several improvements have been done to the *Suibo* act to strengthen local capability to manage flood risks.