Flood and Sediment-related Disasters in Japan

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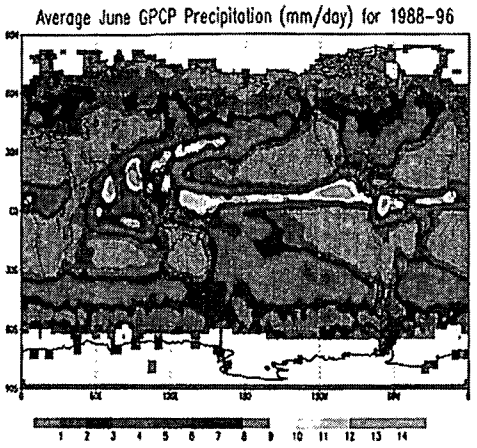
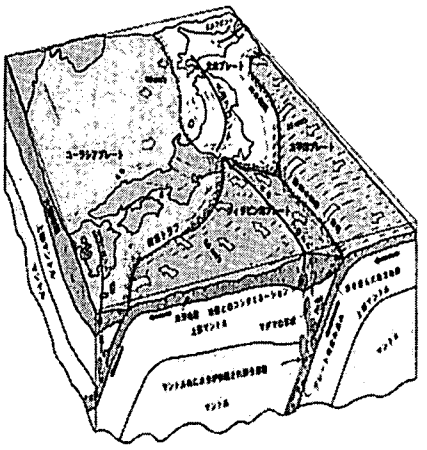
Outline

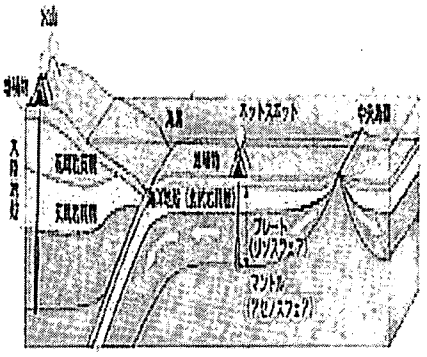
1. Natural and Social Condition in relation to flood and sediment-related disaster
2. Countermeasures for flood and sediment-related disaster in Japan
3. Latest Topics (Amendment to Flood Fighting Law and Establishment of Sediment-related Disaster Law
4. Experiences in Japan

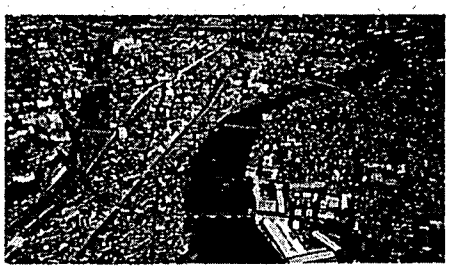
1. Natural Condition (1)
Climate and Orogeny





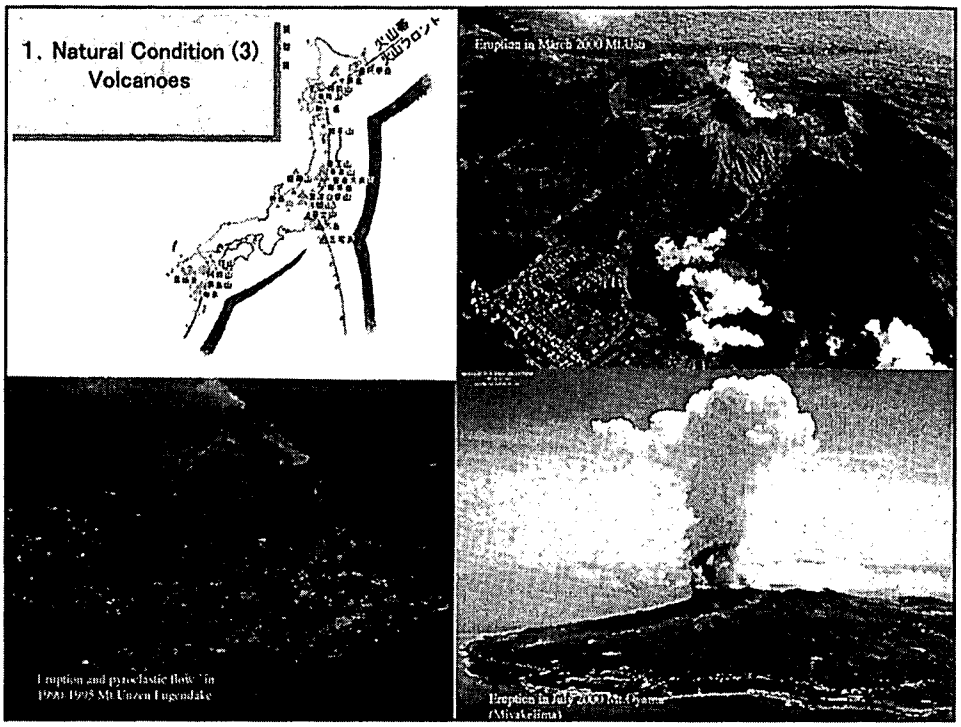
1. Natural Condition in Japan (2)





(Tsurumi River)

(Ara River Basin)



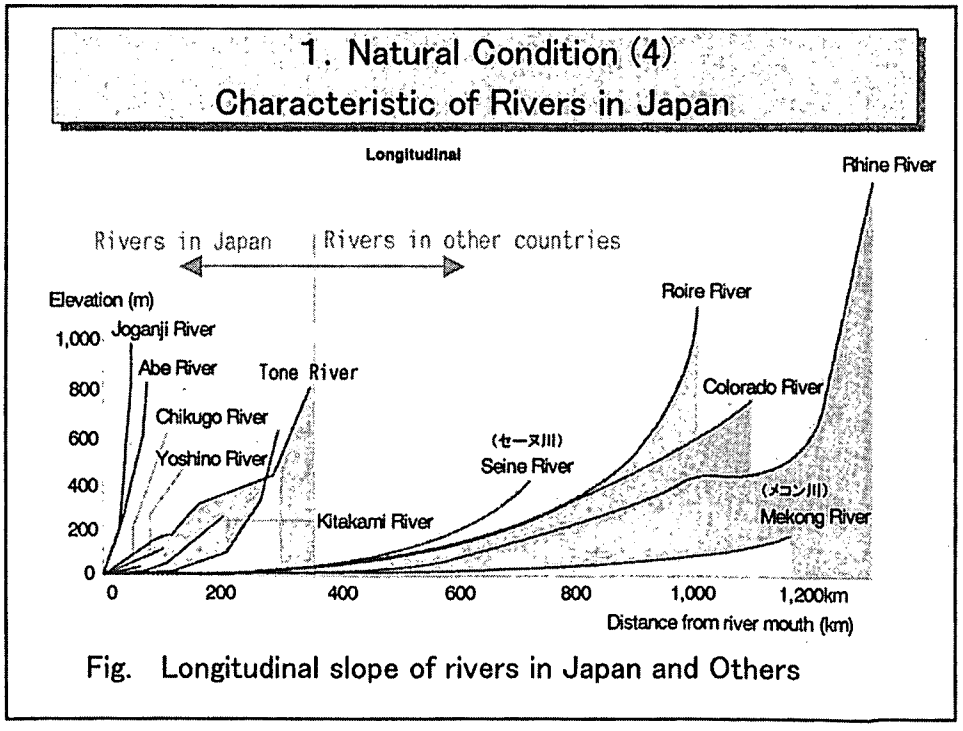
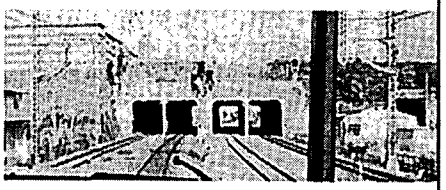
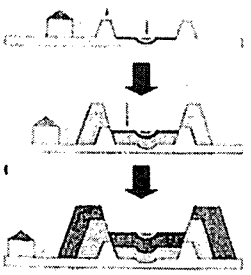


Fig. Longitudinal slope of rivers in Japan and Others

1. Natural Condition (5)
Characteristic of Rivers in Japan
(River with bed above ground)





1. Natural Condition (6)
Characteristic of Rivers in Japan

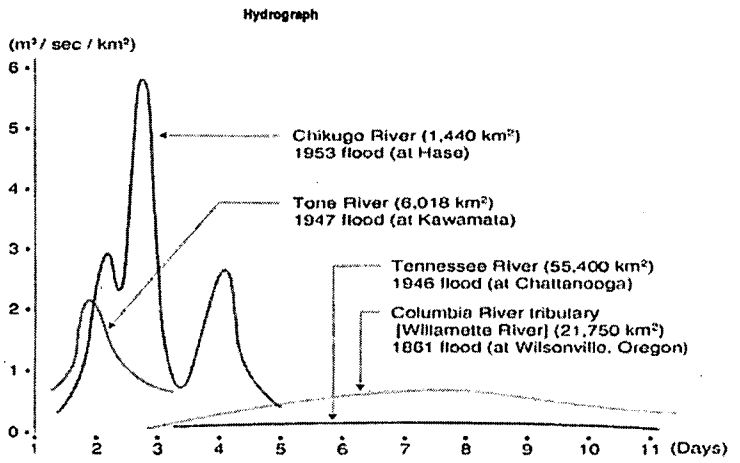


Fig. Characteristic of flood runoff in Japan

1. Natural Condition (7)
Characteristic of Rivers in Japan

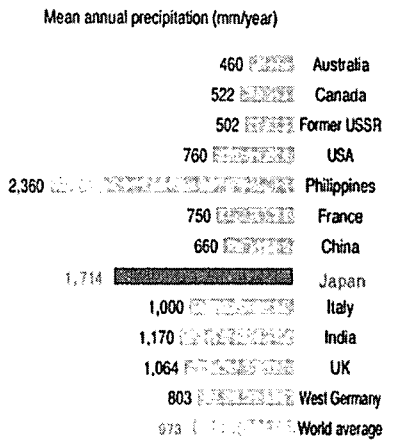


Fig. Precipitation in the world

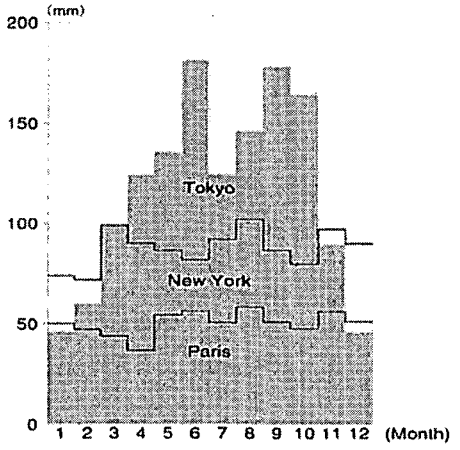
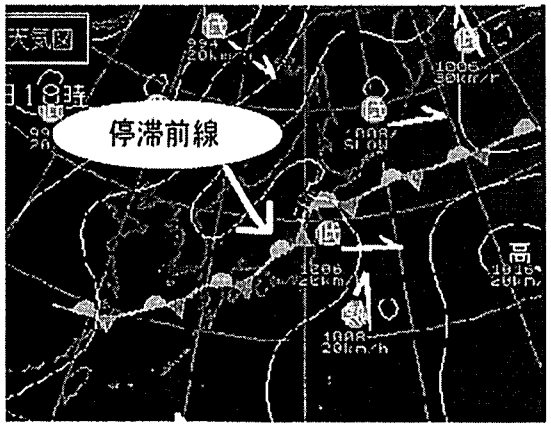
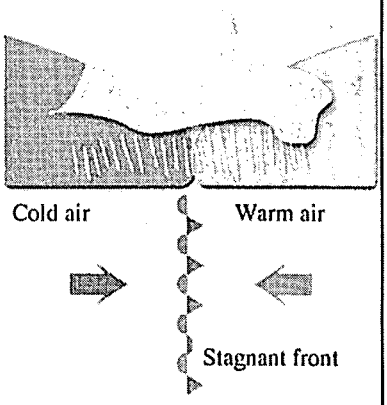


Fig. Monthly precipitation in Tokyo, Paris and New York

1. Natural Condition (8)
Stagnant front and rainfall





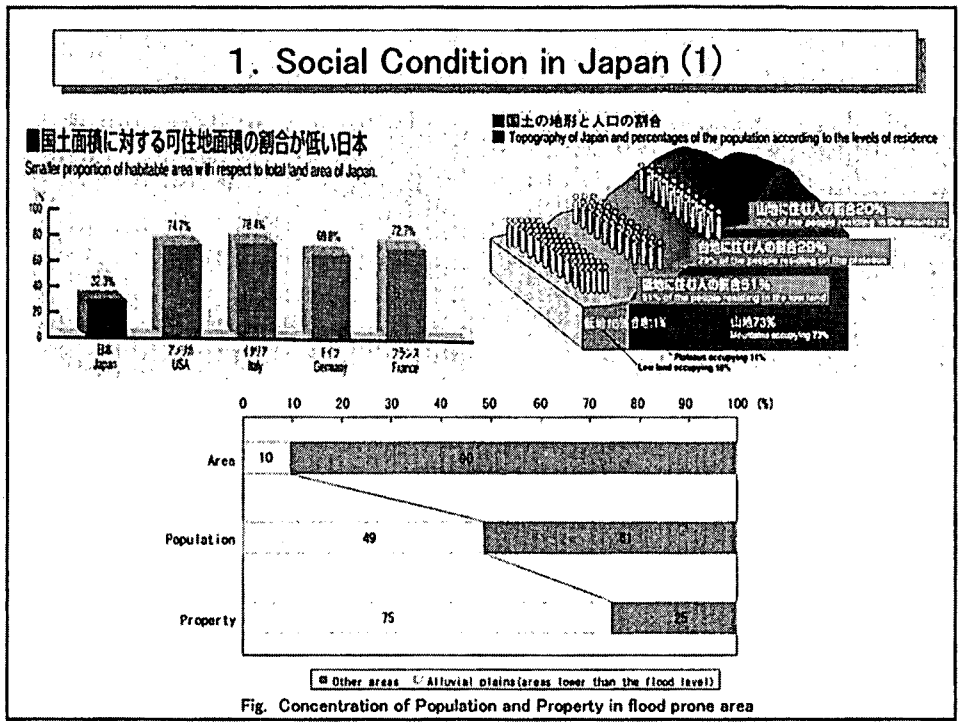


Fig. Concentration of Population and Property in flood prone area

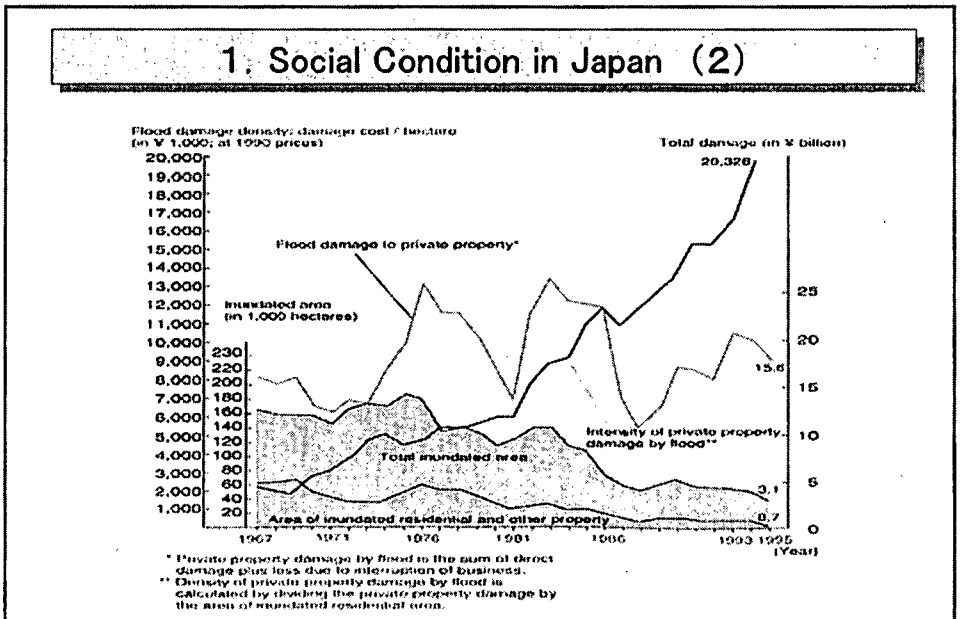
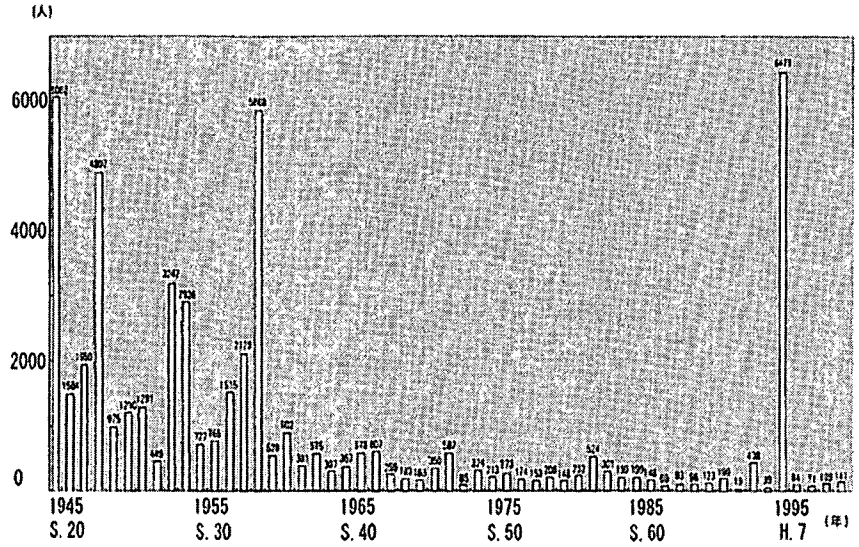


Fig. Changes in intensity of private property damage by flood

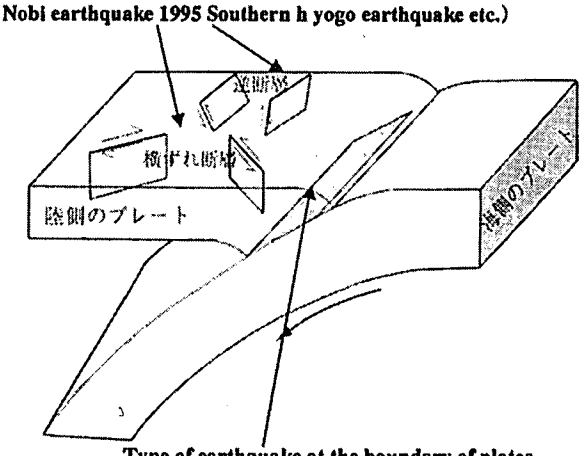
2. Countermeasures for flood disaster in Japan (1)

Death and missing by natural disaster



2. Countermeasures for flood disaster in Japan (2) Characteristic of earthquakes in Japan

Type of the earthquake at the inland active fault
(cf.1891 Nobi earthquake 1995 Southern h yogo earthquake etc.)



Type of earthquake at the boundary of plates
(cf.1923 Kanto earthquake etc.)

2. Countermeasures for flood disaster in Japan (3)

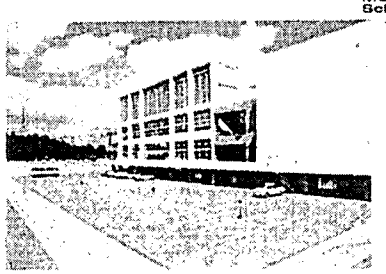
- Flood control measures
  - Means of civil works technologies measures (Structural measures)
    - Channel improvement (arrangement of embankments or floodways, channel excavation/dredging, channel widening)
    - Construction of flood control facilities (dam, retarding pond, regulating reservoir)
    - Arrangement of rainwater storage/infiltration facilities
    - Arrangement of facilities for the drainage of inner basins
    - Arrangement of forest zones along the river and others
  - Legal and systematic means (Non-Structural measures)
    - Implementation of flood forecasting and warning
    - Preparation and publicizing of hazard maps
    - Flood-fighting activities
    - Distribution of flood prevention information
    - Land use/building regulations and others

2. Countermeasures for flood disaster in Japan (4) Examples of Storage and infiltration facilities

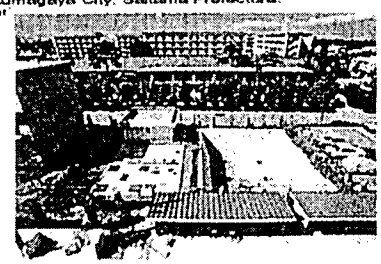
At ordinary times

In the event of a heavy rain, rainwater is detained to control flow into rivers

Municipal Kumagaya Nishi Elementary School (Kumagaya City, Saitama Prefecture; Ai River



Pilotl Type
The underground structure of the building and the parking lot absorb water and let it drain gradually so that flooding and water invasion can be avoided.



Storage Plus Filtration
The storage function of the adjusting pond and the filtering of the well serve to both control outflow and process the drained water.

2. Countermeasures for flood disaster in Japan (5)
Designated Rivers for Flood Forecasting

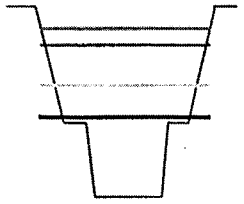
The Number of Designated Rivers

As of 1997, 84 systems, 146 rivers

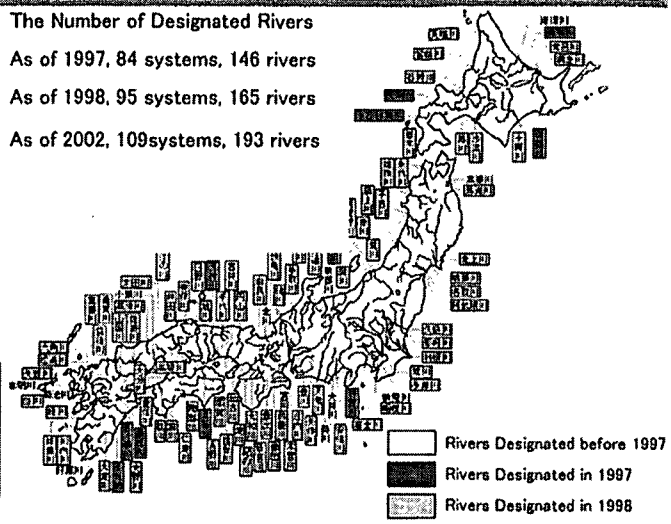
As of 1998, 95 systems, 165 rivers

As of 2002, 109systems, 193 rivers

Water level Criteria for Warning



- Designated water level
- Warning water level
- Dangerous water level
- High water level



- Rivers Designated before 1997
- Rivers Designated in 1997
- Rivers Designated in 1998

Others: Rivers Designated after 1998

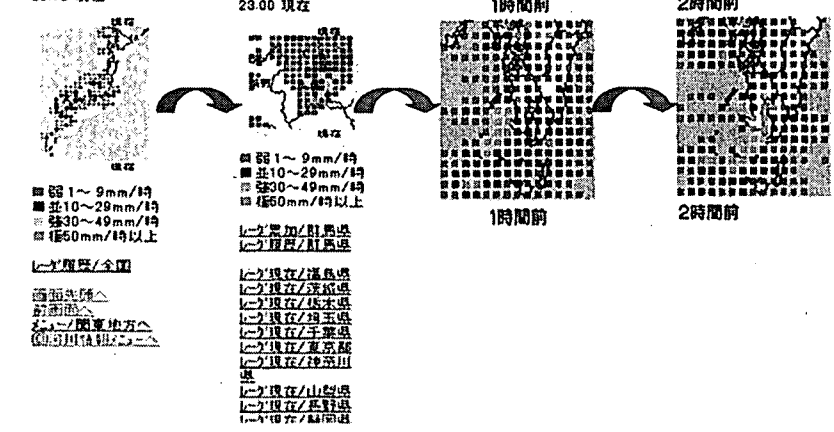
2. Countermeasures for flood disaster in Japan (6)
River Information Service via Cell Phone

Present (Whole Japan)

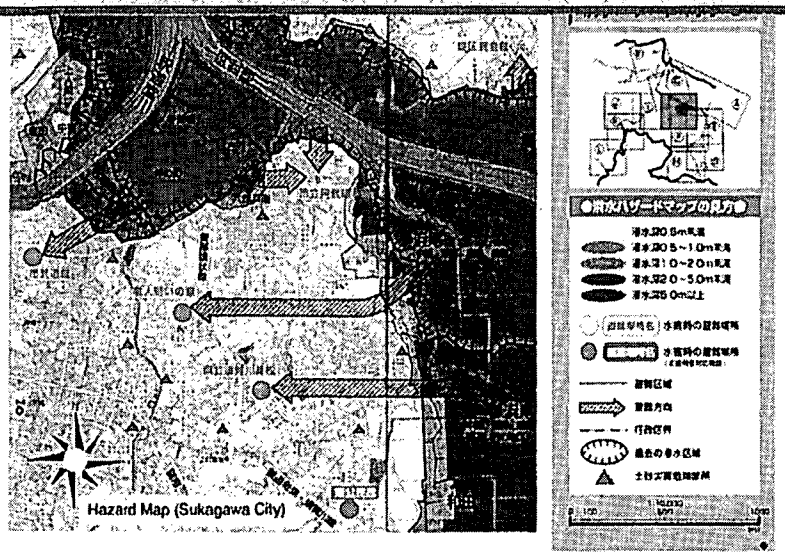
Present (Region)

1 hour before

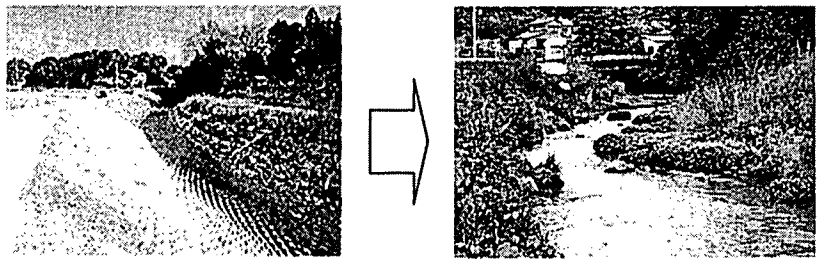
2 hour before



2. Countermeasures for flood disaster in Japan (7)
Examples of flood hazard map



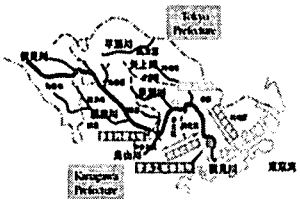
2. Countermeasures for flood disaster in Japan (8)
Examples of river restoration

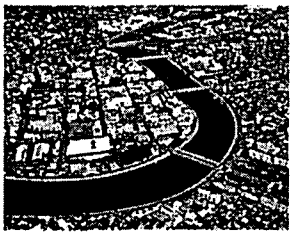


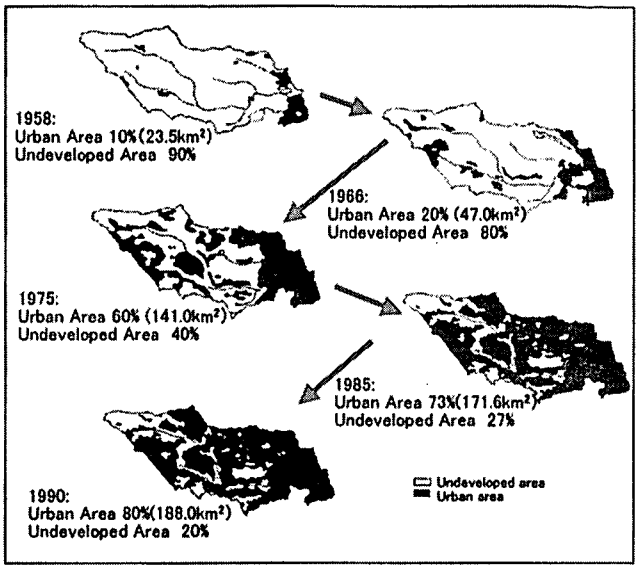
Before implementation
It was shallow in water depth, and the flow was also monotonous, with articulated blocks being exposed on the

One year and 10 months after implementation
Grassy-leaved sweet flag (Acorus gramineus) and rosegold pussy willow (Salix gracilistyla) have grown thickly on the waterside. (April 1995)

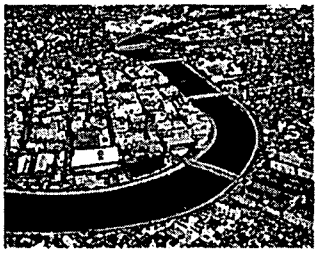
2. Countermeasures for flood disaster in Japan (9)
Trends of Urbanization in Tsurumi River Basin







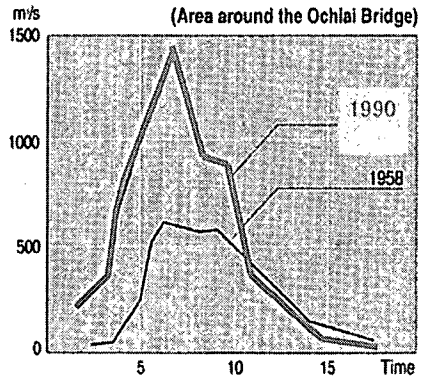
2. Countermeasures for flood disaster in Japan (10)
Discharge Distribution Plan (The Tsurumi River)



Design Flood Discharge (1,940m³s)

- Distributed Discharge (Basin) (640m³s)
  - Water Retention Area (290m³s)
  - Water Storage Area (290m³s)
  - Low-lying Area (60m³s)
- Distributed Discharge (River) (1,300m³s)
  - Channel Discharge (1,100m³s)
  - Planned Retarding Basin (200m³s)

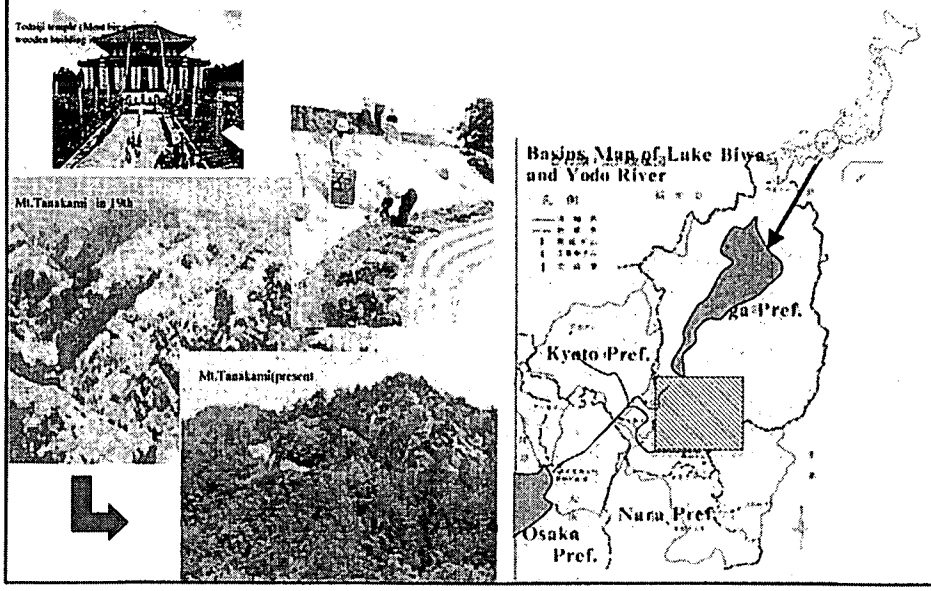
2. Countermeasures for flood disaster in Japan (11)
Flood Peak Discharge and Change of Flood Arrival Time

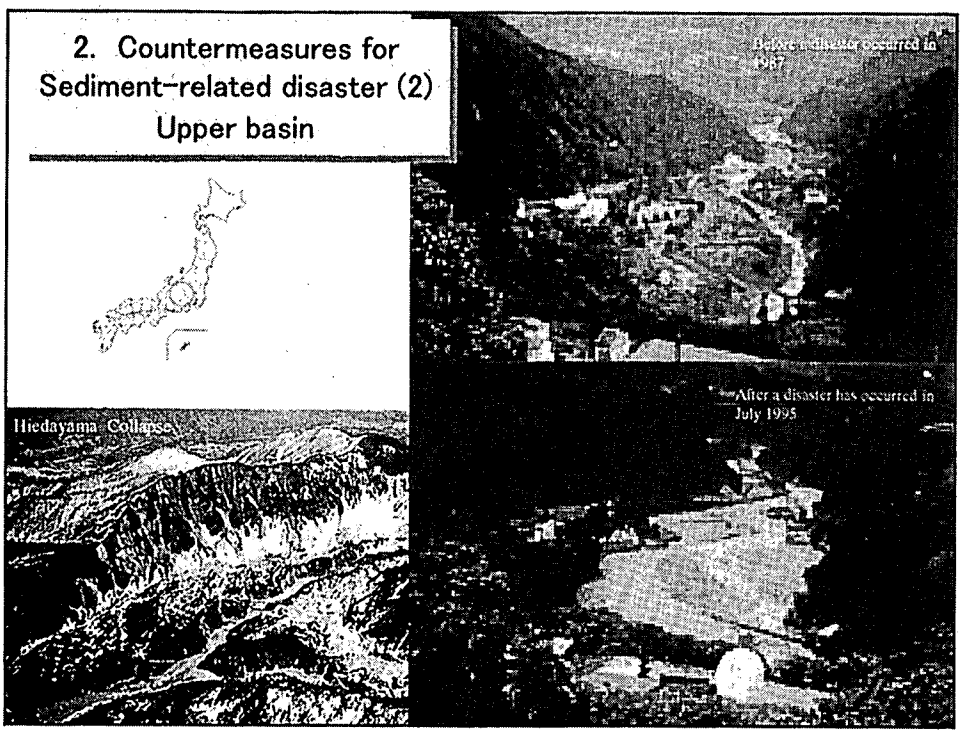


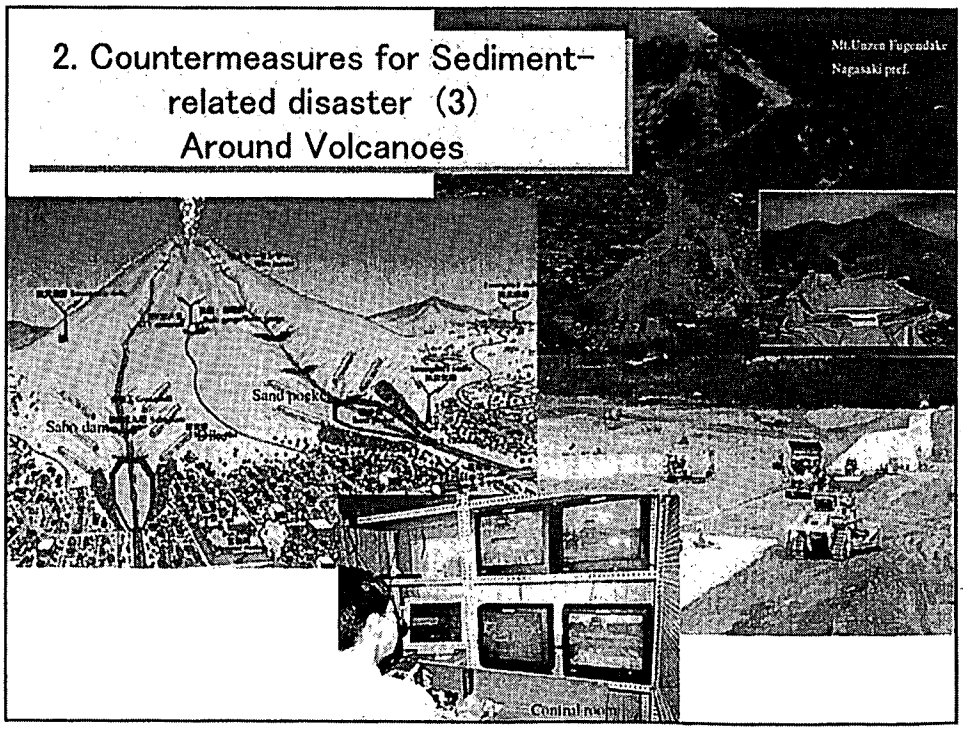
The Amplification of Flood Size due to Urbanization

It is predicted that even with the same rainfall, before the progress of urbanization due to the expansion of city land (1958), the flood peak outflow volume had approximately doubled (1990), and the weakness of the Tsurumi River basin with respect to flooding can be inferred.

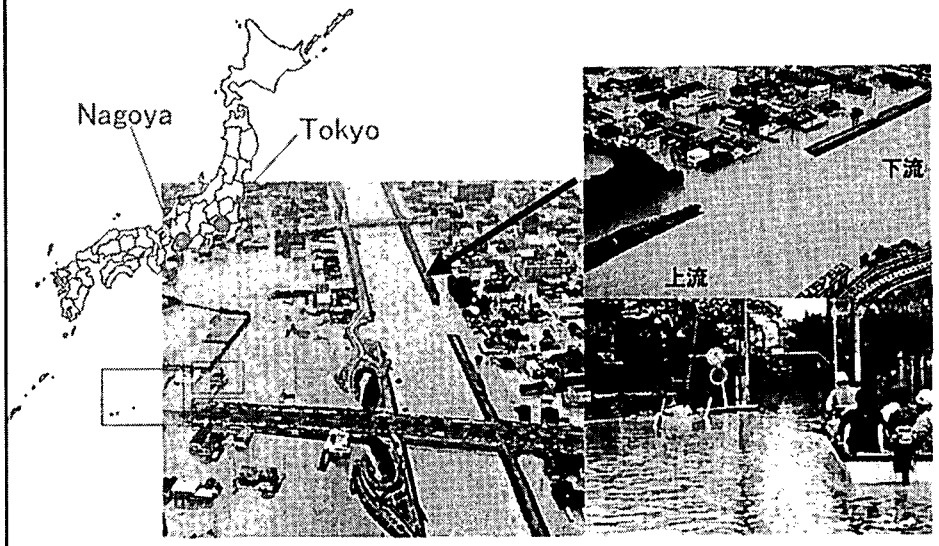
2. Countermeasures for Sediment-related disaster (1)




2. Countermeasures for Sediment-related disaster (2) Upper basin
Before a disaster occurred in 1987
Hiedayama Collapse
After a disaster has occurred in July 1995


2. Countermeasures for Sediment-related disaster (3) Around Volcanoes
Mt.Unzen Fugendake Nagasaki pref.
Sand pocket
Sabo dam

3. Latest Topics (1)
Flood Disaster in Tokai Region (12th Sep. 2000)



3. Latest Topics (2)
Amendment to Flood Fighting Law

Main point of the amendment

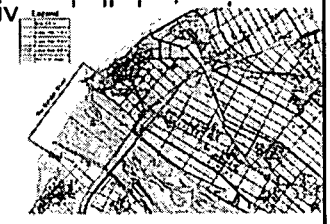
(1) Designated river for flood forecasting and warnings is extended to the rivers administered by prefectural governor.

(2) The administrator of the designated riv... the predicted inundation area.

- Predicted inundation area
- Depth of predicted inundation

(3)Cities or municipalities' disaster prevention conference shall establish

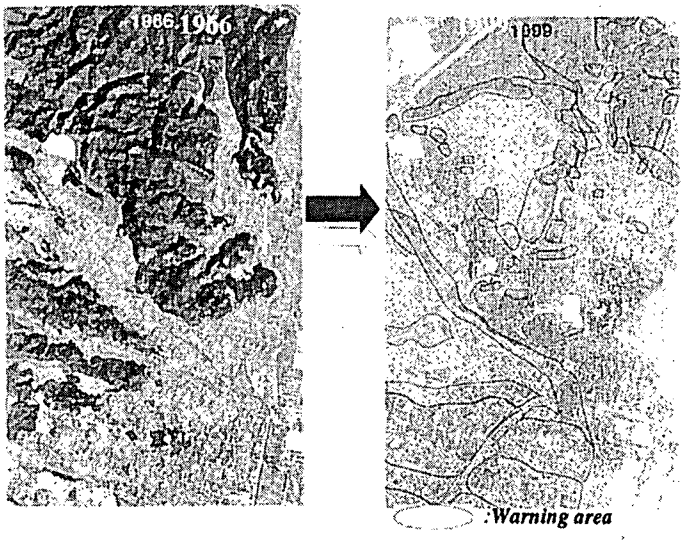
- The way of flood forecasting dissemination
- Evacuation place in each predicted inundation area



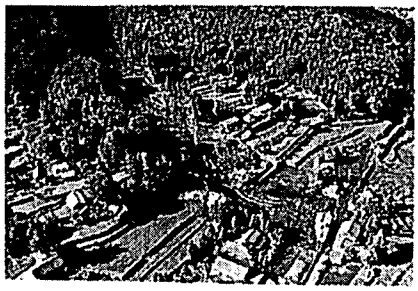
Predicted inundation area map (the Kurobe river)

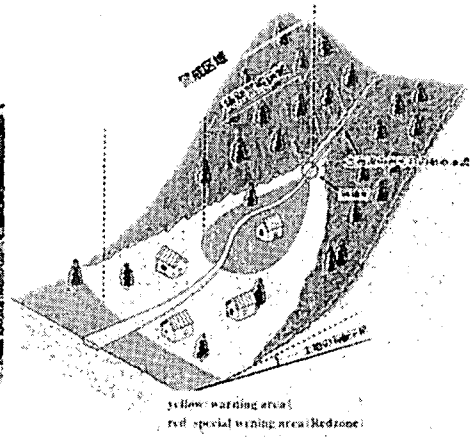
3. Latest Topics (3)
Sediment-related disaster in Jun.1999 in Hiroshima prefecture (1)

3. Latest Topics (4)
Sediment-related disaster in Jun.1999 in Hiroshima prefecture (2)



3. Latest Topics (5)
Sediment-Related Disaster Prevention Act





4. Conclusion:Experiences in Japan

1. Commonality of natural and social condition
   - Japan also experienced rapid population increase and concentration of population in urban area
   - In the future, the population in Asia and Africa increase rapidly and concentrate in flood and sediment disaster prone area
2. Limitation of Structural Countermeasures
   - High cost of structures
   - Take long time to construct structures
   - Impossible to prevent all disasters
3. Suggestion
   - Have recognition of the basin
   - Inform about the disaster prone area and Land use for not living there
   - Establishment of warning and evacuation system
   - Importance of Three Principal — Share part among Government, Local government and other Organizations, "Governmental Help", "Mutual Help"

     → Importance of Community