

Efforts to Prevent Urban Flood Disaster in Japan

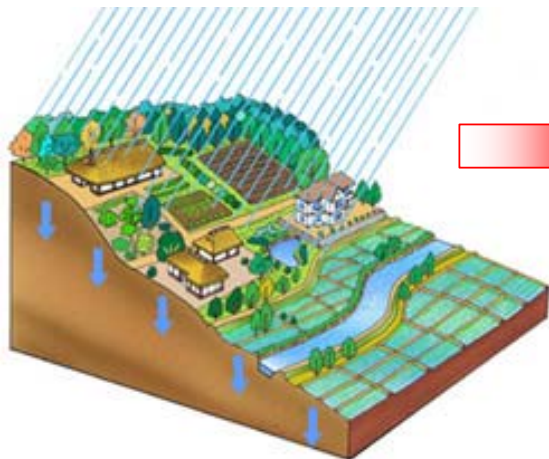
June 9, 2008

River Bureau of the Ministry of Land,
Infrastructure, Transport, and Tourism

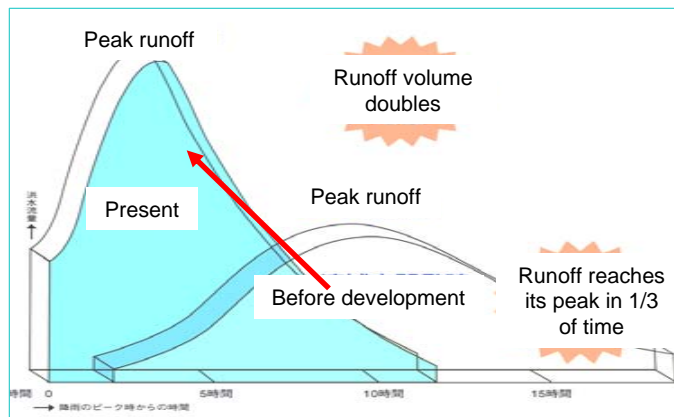
What is Urban Flood Disaster?

Due to urbanization, the function of keeping and retarding water in river basins has become weakened

Before development





After development




- Runoff reaches its peak in shorter time
- Peak runoff increases

**Rapid urbanization in river basins
Flood damages have become
more frequent.**

Transition of Urban Area (Example of the Tsurumi River Basin)

Natural area  Transport networks developed between the two period 

Urban area 

1958



Urbanization rate: 10 %

Population: 450,000

1966



Urbanization rate:
20 %

Population: 700,000

1975



Urbanization rate:
60 %

Population: 1.2 million

2003



Urbanization rate:
85 %

Population: 1.88 million



River basin area : 235 km²

Length of main river : 43 km

Population in the river basin : 1.88 million

Population in the inundation area: 0.3 million

Progress of Coping with Urban Flood Disasters

June 1968 City Planning Law came into force

June 1969 Large-scale flood occurred in the Tsurumi River

January 1970 "Policy on dividing urbanization promotion area and urbanization control area by city planning law and coordination with flood control project" (Director General of City and Regional Development Bureau and River Bureau circular guidance)

Areas in danger of flooding, inundation, tsunami, and high tide
(e.g. Areas without safety level of 50 mm/hour rainfall)
are basically not included in urbanization area

September 1976 Large-scale flood occurred in the Tsurumi River

May 1979 "Implementation of Comprehensive Flood Control Projects for Designated Rivers" (Director General, River Bureau circular guidance)

* Designated Comprehensive Flood Control Rivers: Fushiko River, Mama River, Shinkashi River, Tsurumi River, Sakai River (Kanagawa, Tokyo), Hikiji River, Tomoe River, Nikkawa River, and Ina River

May 1980 "Promotion of Comprehensive Flood Control Measures" (Administrative Vice Minister of Construction circular guidance)

* Designated Comprehensive Flood Control Rivers

(Added after 1980): Naka River, Ayase River, Zanbori River, Kanda River, Mekujiri River, Sakai River (Gifu), Sakai River (Aichi), Neya River, and Yamato River

June 1999 Fukuoka Flood Disaster (Underground shopping mall inundated)

September 2000 Tokai Flood Disaster (Central Nagoya inundated, Urban infrastructure was paralyzed)

June 2003 Law on measures against inundation Damages in designated Urban Rivers were enacted. (came into force in May 2004)

* Designated Urban Rivers: Tsurumi River (April, 2005) Nikkawa River, and Neya River (July, 2006)

Rapid economic growth and urbanization

Demand for residential area increased.

Residential areas expanded into lowlands inundated in the past.

Due to development, function of keeping water was weakened.

Widening rivers was difficult because houses stand side by side.

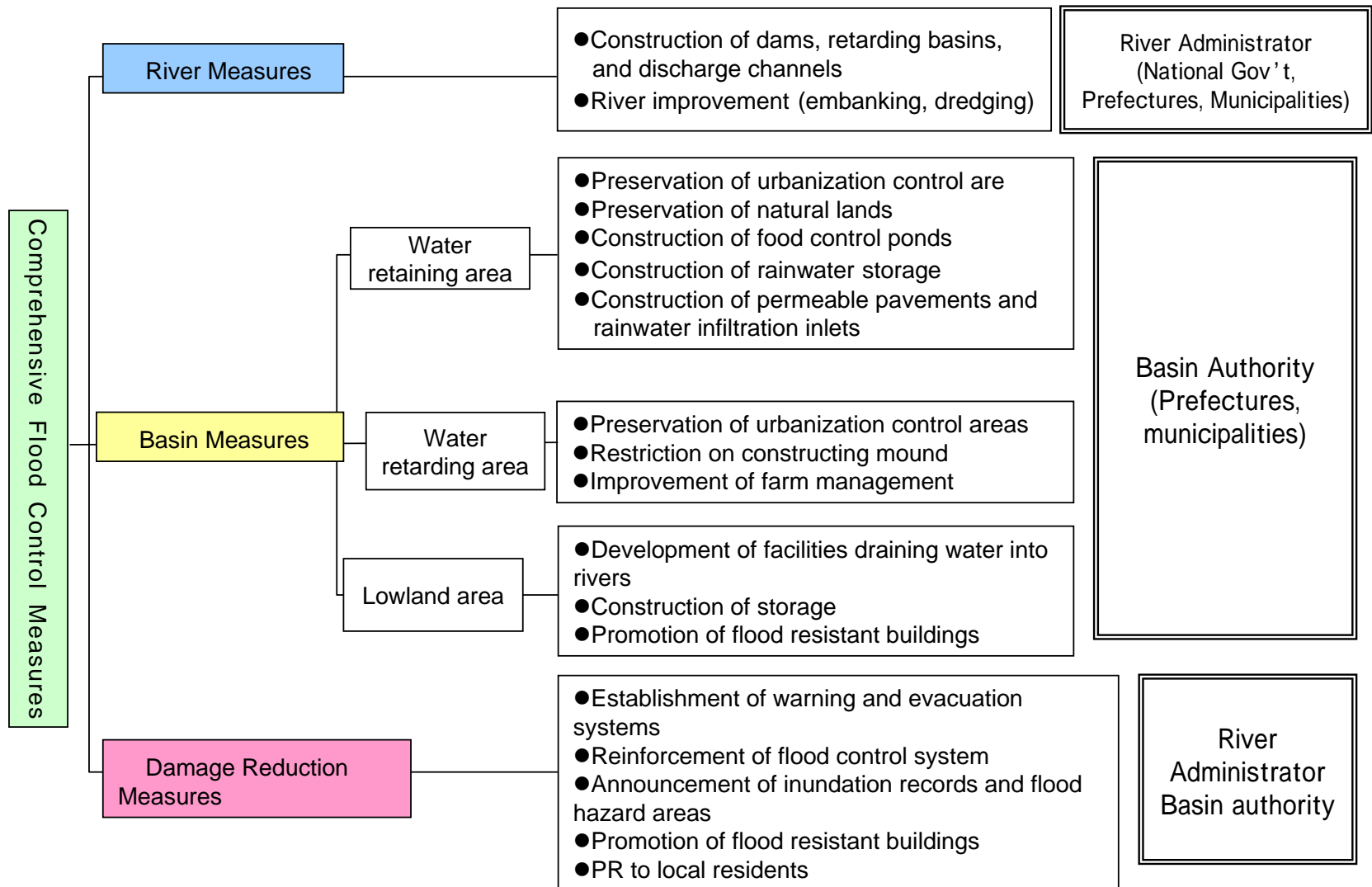
River improvement could not meet the demands.

Facilities vulnerable to water disasters, such as underground mall, increased.

Heavy intensive rain increased.

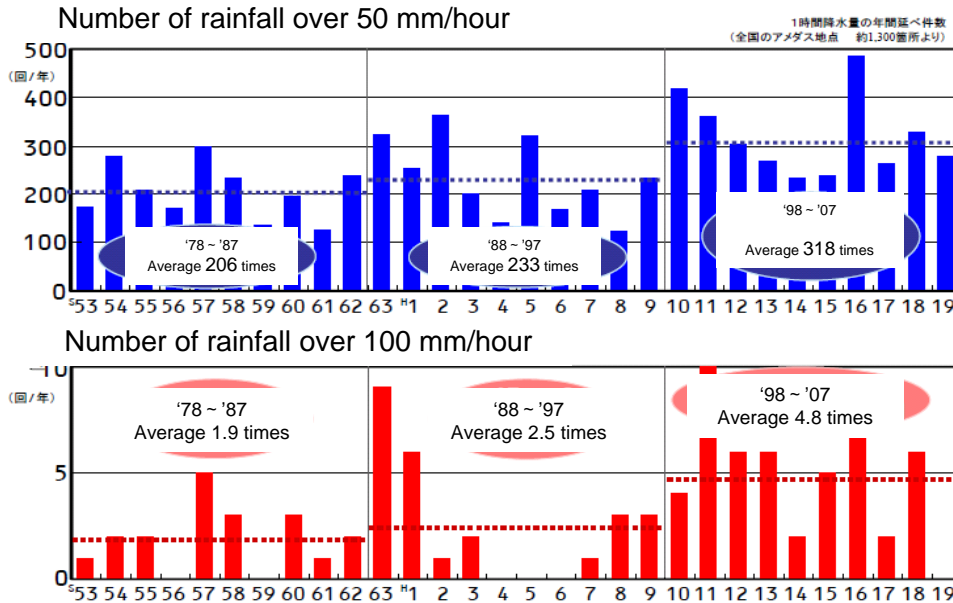
Adaptation to climate change due to global warming

System of Comprehensive Flood Control Measures



Enactment of Law on Measures against Inundation Damages in Designated Urban Rivers (1 / 2)

Heavy Intensive Rains occurred frequently



Urban flood disasters occurred frequently.



**Tokai
Flood
Disaster
in 2000**



**Fukuoka
Flood
Disaster
in 2003**

Flood disasters occurred frequently in urban river basins.

Floods in urban areas cause serious damages paralyzing urban functions and inundating underground malls.

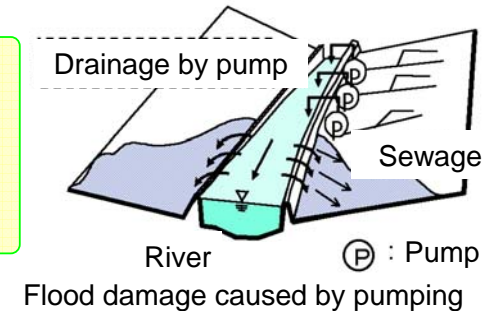
Enactment of Law on Measures against Inundation Damages in Designated Urban Rivers (2 / 2)

- Flood control ponds were buried due to development of residential areas
- Inundation damage was reduced by pumping water into rivers, while it may cause another flood downstream



Buried flood control pond

Although serious flood may occur or is afraid to occur, preventing flood by developing river facilities and flood control dams is difficult because of urbanization

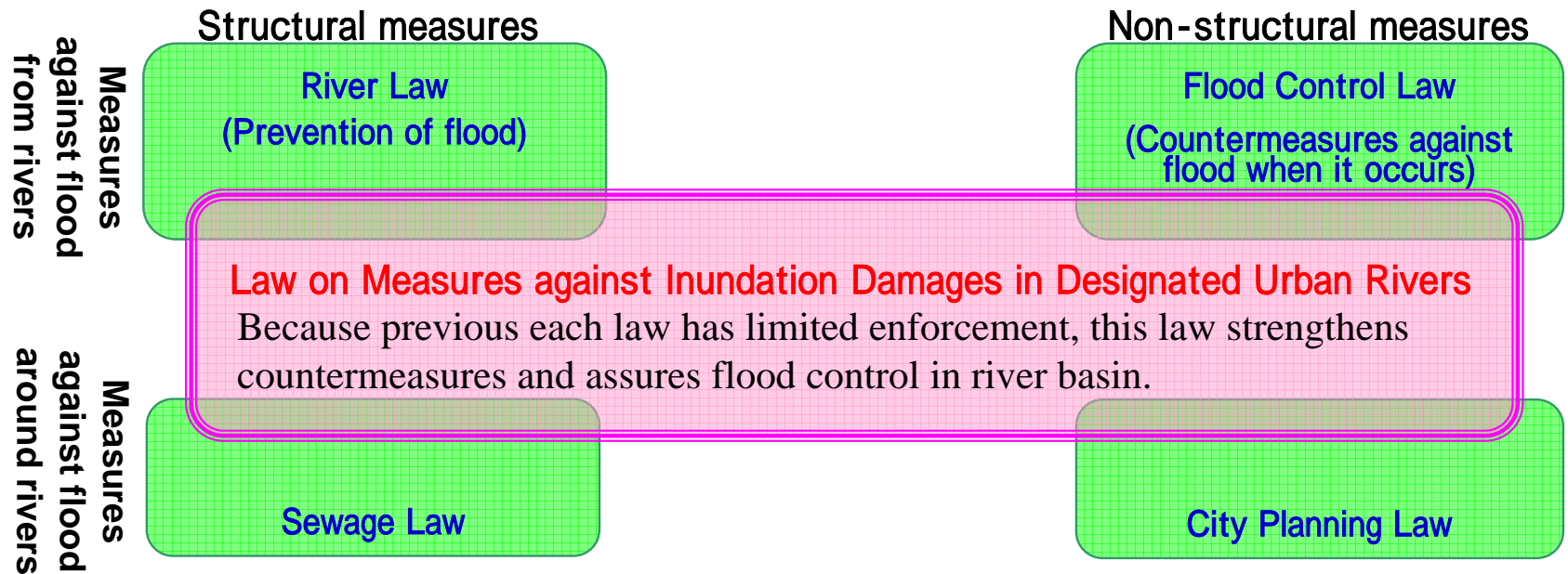


New comprehensive flood control measures are needed in urban river basins

River and sewage administrators and municipalities jointly implement flood control measures effectively

**Enactment of Law on Measures against Inundation Damages
in Designated Urban Rivers**

Outline of Law on Measures against Inundation Damages in Designated Urban Rivers



Designate urban river (basin)

- Urban area covers more than 50% of river basin
- Average annual damage (occurred or predicted) exceeds 1 billion yen (=\$10mil)
- Because of urbanization, it is difficult to control flood by constructing river facilities or flood control dams

Formulate river basin flood control plan

- 4 members (river and sewage administrators, governors, and mayors) make the plan together

Implementation of measures

Flood Control by Law on Measures against Inundation Damages in Designated Urban Rivers

Permission for actions that prevent rainwater infiltration

Mayor's permission is required for actions that prevent rainwater infiltration (actions that increase rainwater runoffs) in non-residential areas larger than 1,000 m².

Report of actions that impact preserving flood control reservoirs

The mayor designates reservoirs larger than 100 m³ as preserving flood control reservoirs in order to maintain its function permanently

Development of rainwater storage and infiltration facilities by the river administrator

The river administrator is allowed to establish and administrate rainwater storage and infiltration facilities in the basin based on statutory plan even in areas distant from the river.

Optimization of drainage pump operation

A plan is made related to operation of sewage pumps for the designated urban rivers

Flood control measures for underground areas

Administrators of underground areas make efforts to prepare and inform evacuation plans

Regulations in Designated Urban River Basin

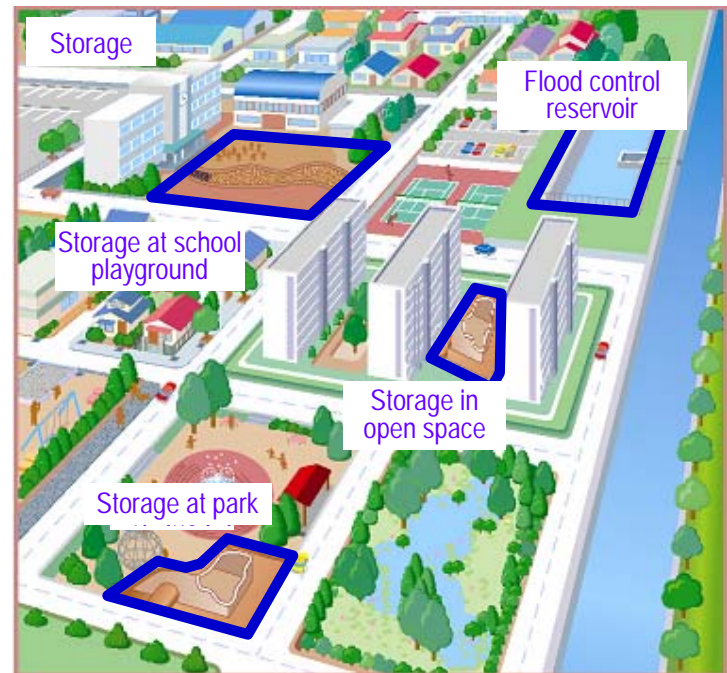
Mandatory efforts required to basin communities

Local residents living within a designated urban river basin should cooperate with the measures implemented by the river administrator, as well as make self-efforts for temporary rainwater storage and its infiltration into underground.

The owner and administrator of flood control reservoir in designated urban river basin need to make efforts to maintain function to temporary store rainwater.

<Example of flood control reservoir (storage facilities)>

<Mandatory efforts for rainwater storage and infiltration>

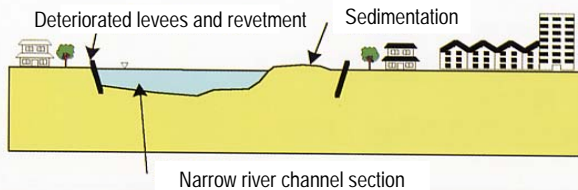


Case 1: River Management (Tsurumi River Basin)

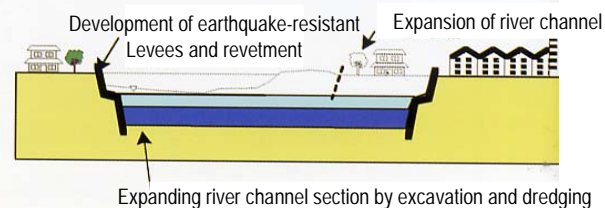
Widening River Channel



Before Dredge Works
Tsurumi River (Kanagawa Pref.), Near Shiozurubashi



After Dredge Works



Development of flood control reservoir for disaster prevention



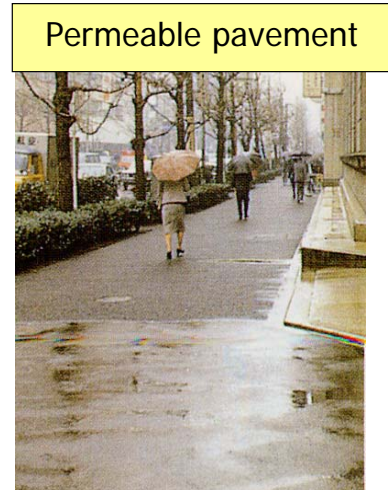
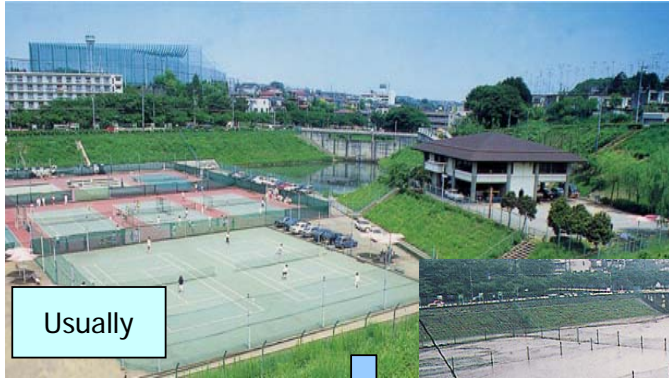
Tsurumi River
Multi-Purpose
Retarding Basin

Onmawashi Park
Flood Control Reservoir

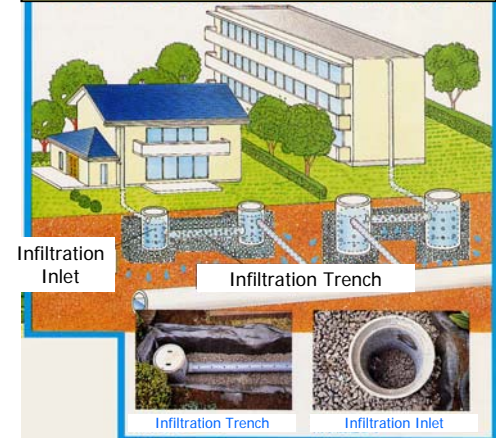


Case 2: Basin Management (Tsurumi River Basin)

Flood Control Reservoir for Disaster Prevention (Kirigaoka Flood Control Reservoir)



Infiltration inlet and trench



Conservation of natural pond function (by acquisition of forested areas)



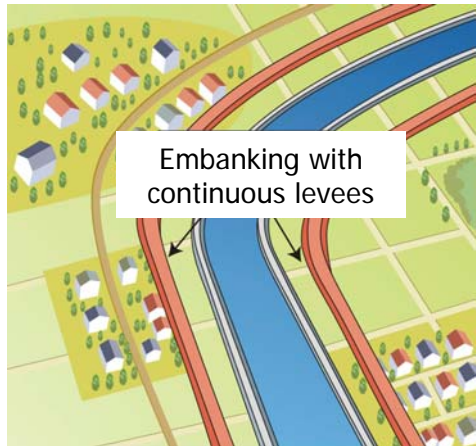
Flood Control Project Integrated with Land Use

Summary

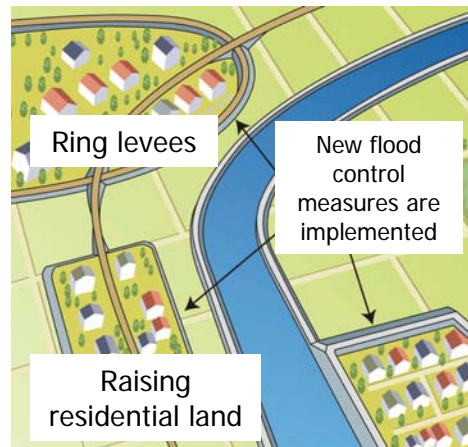
Implement efficient and effective flood control measures for residence **considering land use conditions** in the areas where swift flood-prevention measures are difficult to be implemented

Embanking with ring levees, raising residential land, and constructing storage facilities in order to reduce above-floor flood damages, under conditions of the follows:

1. The areas suffered from flood damages significantly in recent years.
2. These flood control measures are included in the river development plan in consideration of the opinions of local communities.
3. The total cost of the project does not exceed the cost of embankment with normal continuous levees.
4. The areas where inundation is accepted are designated as disaster hazard areas.



Huge cost and long time are required for completion with relocation of houses.



Flood damages in residential areas are reduced efficiently in a short period of time by embanking with ring levees and raising residential land.

Example (Ring Levee along Omono River)

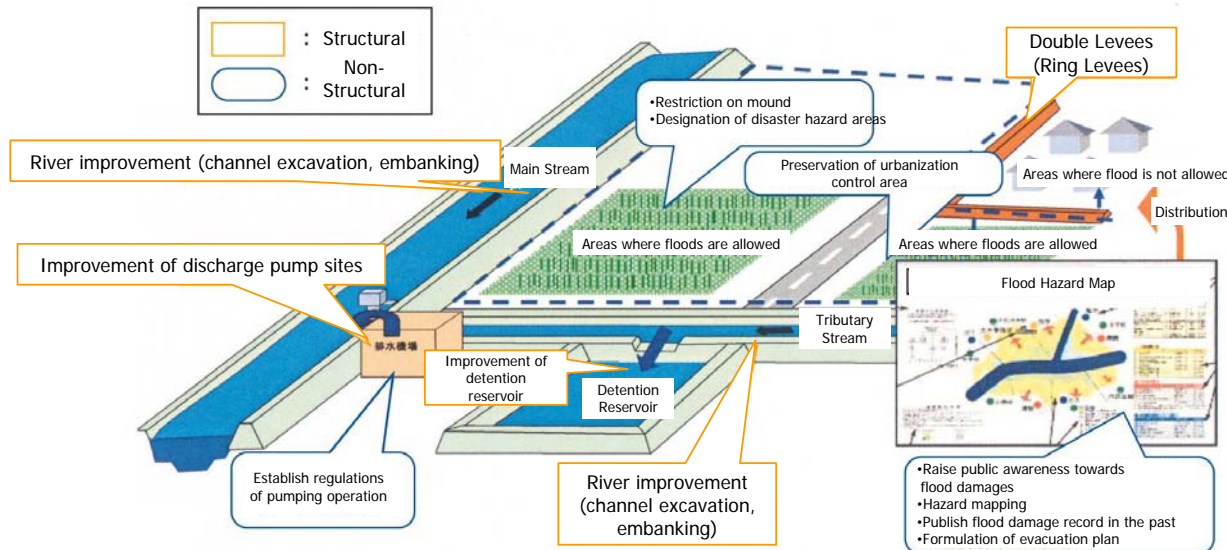


Comprehensive Emergency Project to Reduce Inundation outside of River Area

Summary

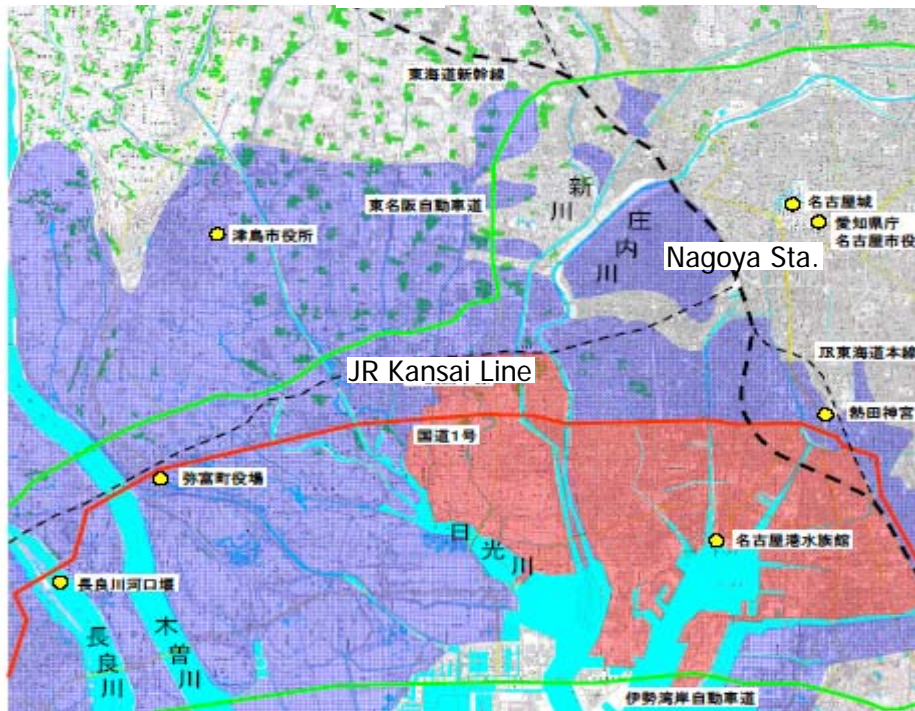
Reduce inundation damages outside of levees by implementing structural and non-structural measures **less than 5 years** with cooperation between river administrators and local governments

- Complete the project approximately within 5 years
- Satisfy following conditions:
 1. At least 50 houses in the area are protected against above-floor flood damages by this project
 2. The river administrator formulates and implements a comprehensive inundation control plan which integrates structural and non-structural measures
 3. Satisfy approval standards of either the principal river improvement project or comprehensive flood control project for designated rivers
- Projects in progress in Ukawa (Niigata), Imanoura River (Shizuoka), Inoo River (Tokushima) and Mizuba River (Aichi)



Restriction on Building Construction by Building Standards Law

- Article 39 of the Building Standards Law stipulates that local governments are allowed to designate disaster hazard areas and restrict building construction by their ordinances.
- Currently, 70 sites including Nagoya and Sapporo Cities designated flood hazard areas. Most areas were designated as a result of flood damages.



Disaster Hazard Areas in Nagoya
Designated in 1961, after Typhoon Ise-Wan

<Regulations>

- Regulate construction of houses and hospitals along the shore
- Regulate the levels of the ground floors of houses and public facilities and of the entrances to underground areas

