Integrated Urban Flood Risk Management in Japanese Cities:
Challenges, opportunities, and lessons learned for global cities

Hiroaki FURUMAI, Professor
Research Center for Water Environment Technology,
Graduate School of Engineering,
University of Tokyo

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Outline of Presentation

1. **Recent trends**: Urban flood disasters in Japan and the need for a new approaches
2. **Solutions & good practices**: Efforts to address urban floods in Japan
3. **Lessons for global cities:** Key challenges and opportunities for urban flood risk management

1. Recent Trends:

Urban flood disasters in Japan and the need for a new approaches

High Concern on Urban Flood Risk

Among of several flood situations, urban flood has attracted more attention.

- Urban floods take place by river overflow and high tide.
- In addition, flood in urban area is also caused by **limited capacity of drainage system** under **heavy rainfall** condition.

Flood: Hazard situation in which an area of land becomes covered with water
Fluvial Flood/River Flood : Hazard caused by river overflow when water level in river became higher than bank and its breakage.
Pluvial Flood/Surface Flood: Hazard caused by limited capacity of the drainage system

1. Recent Trends:

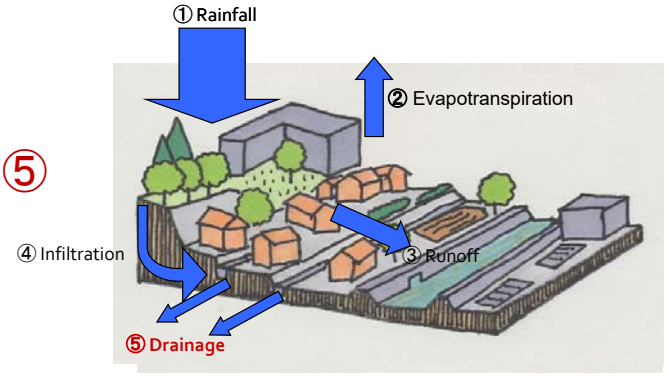
Urban flood disasters in Japan and the need for a new approaches

Runoff Process in Urban Area

Hydrological process

- Rainfall ①
- Evapotranspiration ②
- Runoff ③
- Infiltration ④

Drainage process ⑤
Rainfall loss
Surface runoff
Pipe Hydraulics
Storage facility
Pumping facility



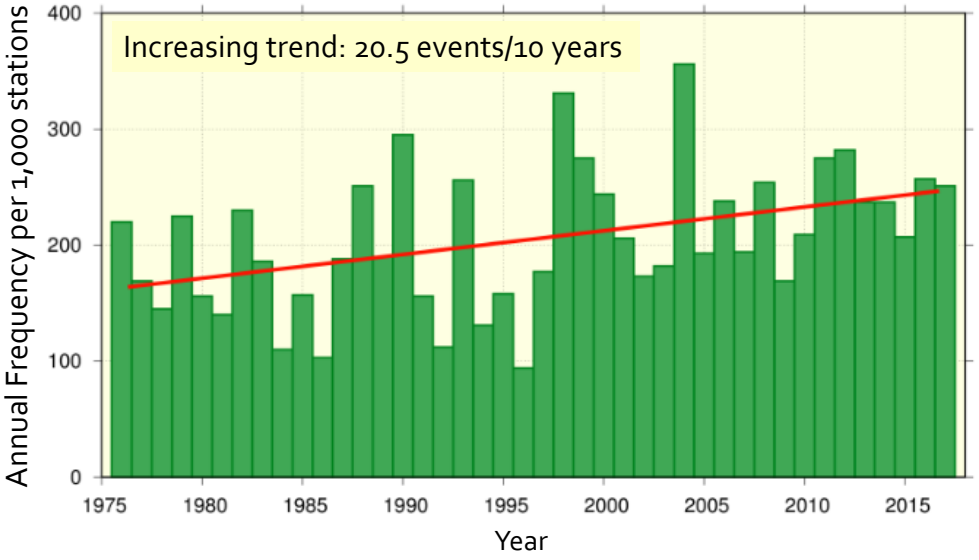
Runoff process in urban area

1. Recent Trends:

Urban flood disasters in Japan and the need for a new approaches

Torrential rainfall events nationwide in Japan

Frequency of event with rainfall intensity more than 50mm/hr



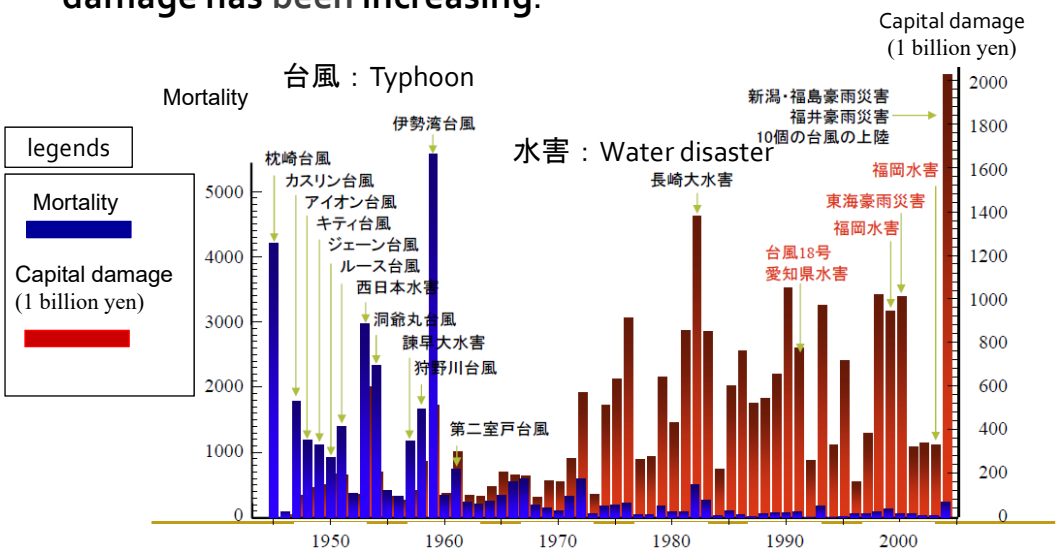
Data from Automated Meteorological Data Acquisition System (AMeDAS)

1. Recent Trends:

Urban flood disasters in Japan and the need for a new approaches

Increasing Tendency of Flood Damage in Urban Area

By various measures, **mortality has decreased** but capital **damage has been increasing**.



(http://www.salagrande.net/tominaga.pdf)

1. Recent Trends:

Urban flood disasters in Japan and the need for a new approaches

- Need for **new criteria and goals** for urban flood risk management
- Need for **integrated approach** for urban flood risk management

1. Recent Trends:

Urban flood disasters in Japan and the need for a new approaches

New criteria for urban flood management

New criteria were set at the 3 levels of viewpoints, aiming for alleviation from flood damage.

1) Protection of human lives

Since underground space is really dangerous for human lives at flood situation, it is essential to protect from inundation in the region with underground mall near stations.

2) Conservation of city functions

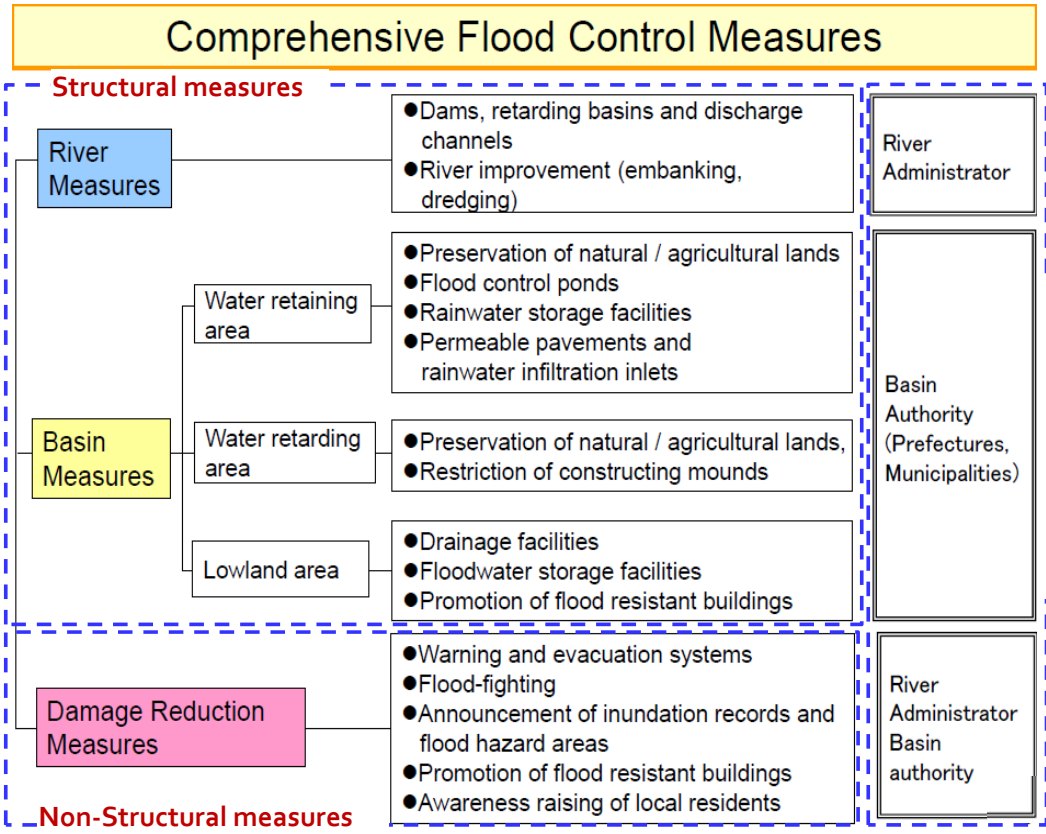
Flooding roads cause interference of car traffics. Therefore, less than 20 cm was selected as flood depth without severe interference to traffic function.

3) Protection of private properties

Flood depth of 45-50 cm is given as a tolerable level to damage to typical housing in Japan.

1. Recent Trends:

Urban flood disasters in Japan and the need for a new approaches



2. Solutions & good practices

Efforts to address urban floods in Japan

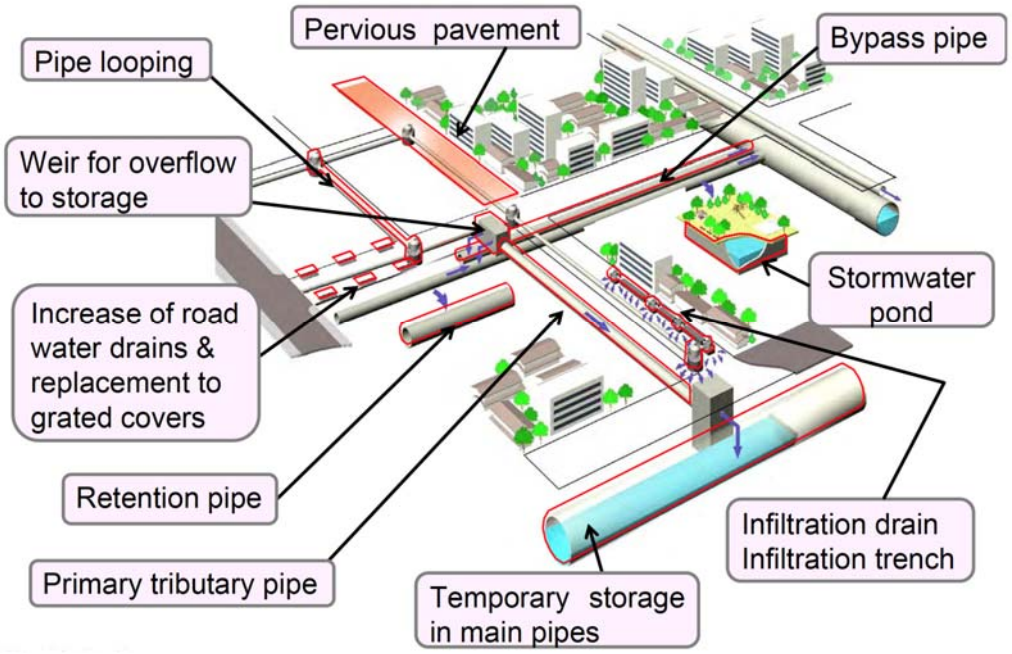
Good practices of Integrated Urban Flood Risk Management include (but not limited to):

- Integration of **various elements** (river, sewerage systems and coastal hydraulics) for monitoring and prediction of hazards.
- Integration of wide variety of **structural** (hardware) and **non-structural** (software) measures.

2. Solutions & good practices

Efforts to address urban floods in Japan

Adopting a wide variety of structural (hardware) and non-structural (software) measures



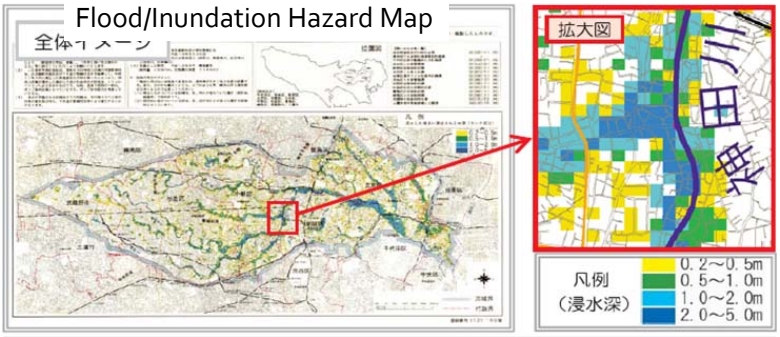
2. Solutions & good practices

Efforts to address urban floods in Japan

Adopting a wide variety of structural (hardware) and non-structural (software) measures

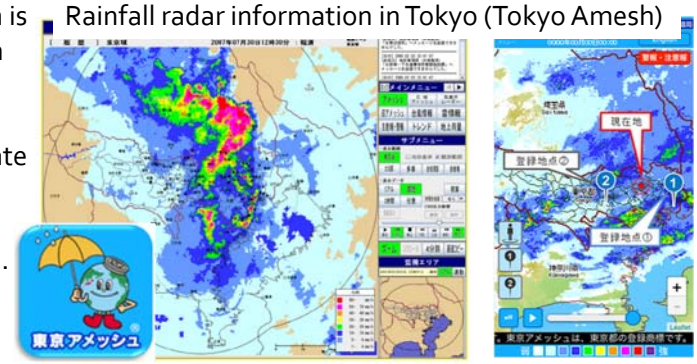
Hazard map shows areas of potential flooding in order to assist residents in preparing against water damage and evacuating quickly.

Flood/Inundation Hazard Map



Real-time rainfall information is essential for proper operation of pumping stations and wastewater treatment centers. It also provide accurate and accessible rainfall information to support customer to prepare for flood.

Rainfall radar information in Tokyo (Tokyo Amesh)



2. Solutions & good practices

Efforts to address urban floods in Japan

Adopting a wide variety of structural (hardware) and non-structural (software) measures

Stormwater storage pipes and water level monitoring system

Wada-Yaoi storage sewer pipe

Interior diameter : 8.5m
Storage capacity: 150,000m^3
Service area
573 ha area in the Kanda River area including a high flood damage area.

Water level monitoring

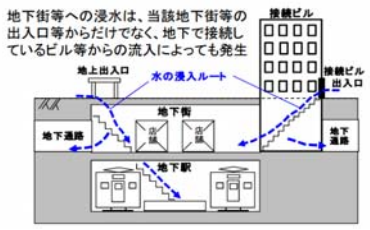
Water level display panel

2. Solutions & good practices

Efforts to address urban floods in Japan

Facilitating public participation and institutional arrangement for consensus building

- It is necessary to **promote awareness** of various actors on urban flood and to promote flood control and evacuation measures.
- It is required to **formulate a flood prevention plan** and an **evacuation plan** based on the agreement of various stakeholders.



＜Underground flood risk＞

Promotion of understanding by 3D flood viewer

Discussion on flood response through workshops with subway operators and underground mall managers

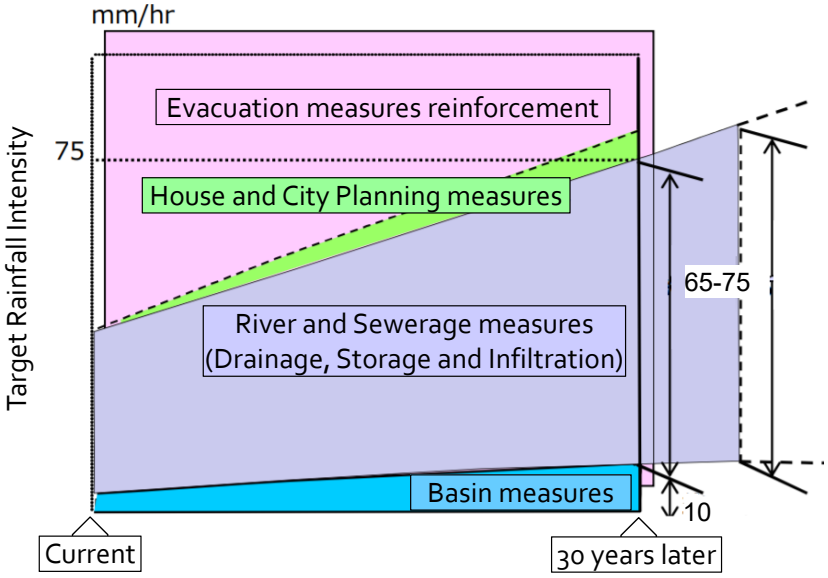
2. Solutions & good practices

Efforts to address urban floods in Japan

Establishing integrated "Watershed Target/Goal", "Basic Policy", and "Long-term plan" for urban flood risk management.

TMG Basic Policy of Heavy Rainfall Countermeasures

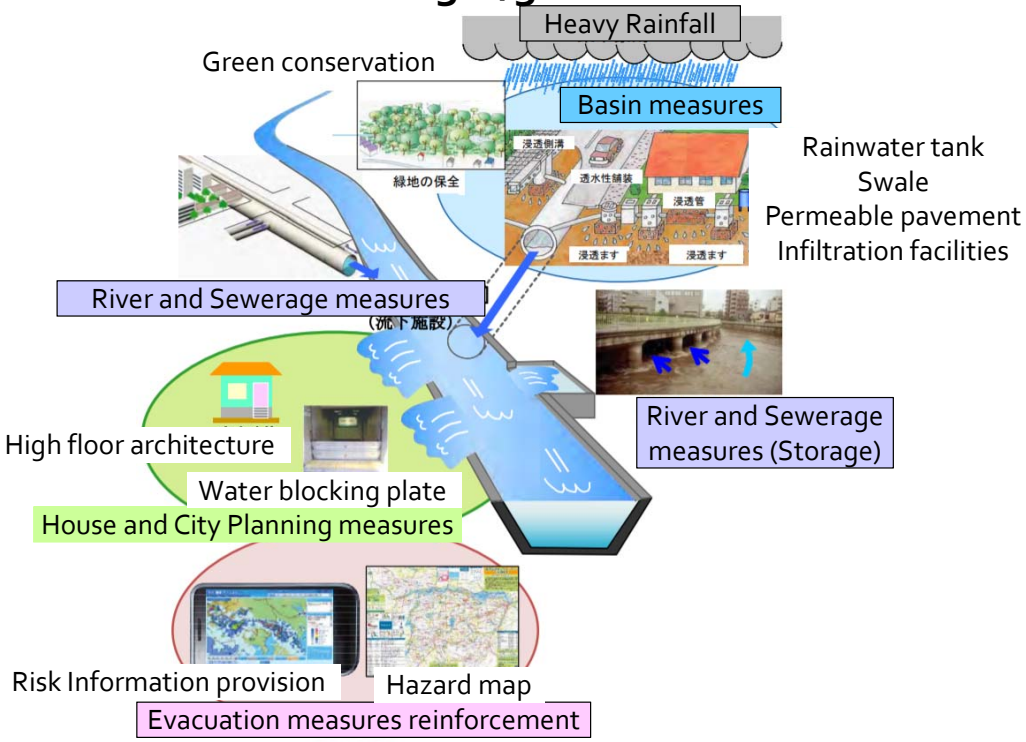
1) Target/Goal in response to 20 years return period (65-75 mm/hr)
2) No inundation of housing



2. Solutions & good practices

Efforts to address urban floods in Japan

Integrated urban flood risk management by various actors for target/goal



3. Lessons for global cities

Key challenges and opportunities for urban flood risk management

Key Lessons

To enhance urban flood risk management in face of rapid urbanization, changing weather patterns, and climate change, there is a need for Japan and global cities to:

1. **adopt wide variety of structural (hardware) and non-structural (software) measures**
2. **facilitate public participation and institutional arrangement for consensus making**
3. **establish integrated "Watershed Target/Goal", "Basic Policy", and "Long-term plan".**

3. Lessons for global cities

Key challenges and opportunities for urban flood risk management

Key Challenges

1. **Insufficient funding**
2. **Challenge of cost recovery**
3. **Sustainability of services**
4. **Limited of technical skills**
5. **Inadequate enforcement**

Future Steps & Opportunities

- **Integrating climate change into flood risk assessments**
- **Publicizing and Sharing the target/goal among all actors**
- **Promoting citizen's knowledge and recognition**
- **Implementing the cost effective measures**