東京都建設局 bureau of construction

Overview of Tokyo Area Rivers

Asian Network of Major Cities 21 - Flood and Storm Surge Control

Training Program

January 25th, 2011

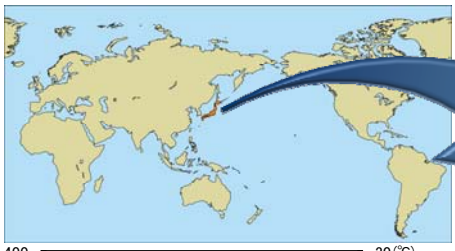
Tokyo Metropolitan Government

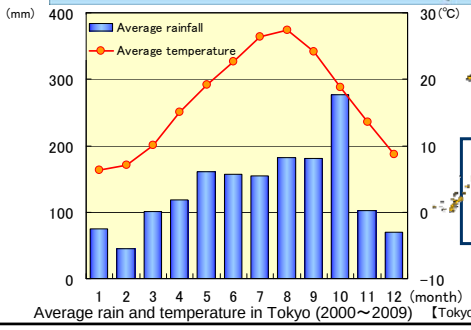
Presentation Flow

1. Overview of Tokyo
2. River Improvements in Tokyo
3. Urban-designed Comprehensive Flood Control
4. Evacuation System and Information Dissemination
5. Future Challenges & Coping Strategies

1. Overview of Tokyo - Location & Climate -

- Tokyo's annual rainfall is 1,621mm, about twice the world average.





Average rain and temperature in Tokyo (2000～2009) 【Tokyo District Meteorological Observatory】

Tokyo

- Area: 2,187 km^2
- Population: 13,009,759 persons (Jan. 2010)
- Rainfall: 1,621mm/year (2000~2009)

1. Overview of Tokyo - Flood Disasters -

- Many flood disasters have occurred due to typhoons, heavy rains and storm surges.
- River improvements are being steadily progressing. However, heavy rains exceeding the current protection level have been increasing in the recent years and Tokyo still experiences flood disasters every year.

Flood Damage

Typhoon Kathleen (1947)

Hourly rainfall	35mm
Total rainfall	127mm
Houses Flooded	
above floor	80,041
below floor	45,167

Local Heavy Rain (2005)

Hourly rainfall	112mm
Total rainfall	263mm
Houses Flooded	
above floor	3,374
below floor	2,453

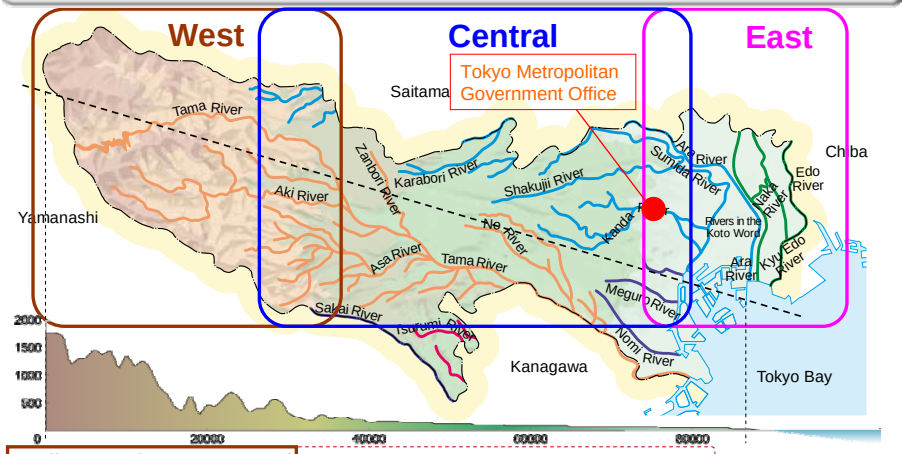
Storm surge

Typhoon Kitty (1949)

Tide level	A.P +3.15
Inundation area	92km^2
Houses Flooded	
above floor	73,751
below floor	64,127

2. River Improvements in Tokyo - Issues & Measures -

- River improvement measures are being implemented according to the local geographical and rainfall characteristics.



Sediment Disaster Control

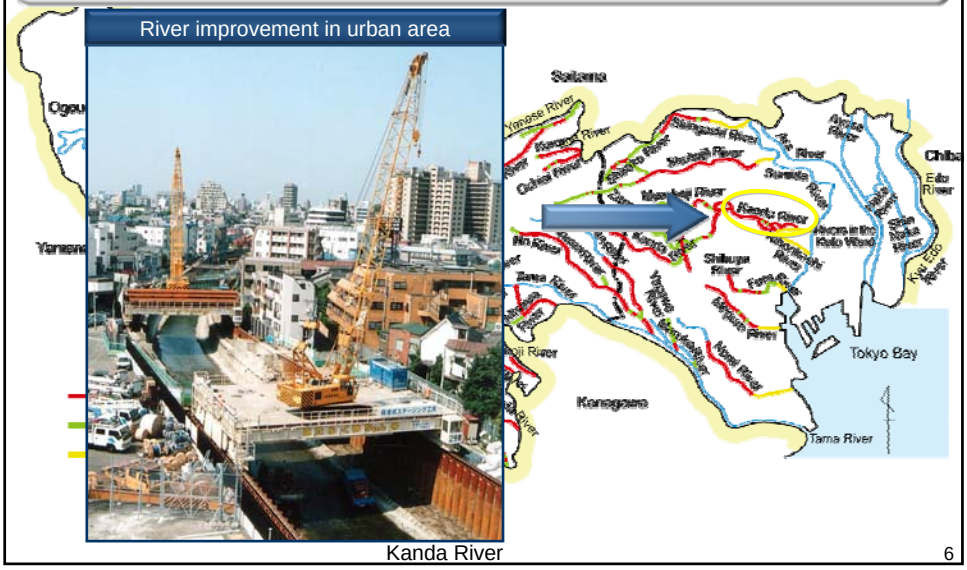
Flood Control in Small & Medium Rivers

Storm Surge/Earthquake Measures in Lowland Rivers

Conservation and Improvement of River Environment

2. River Improvements in Tokyo
- Small & Medium River Measures -

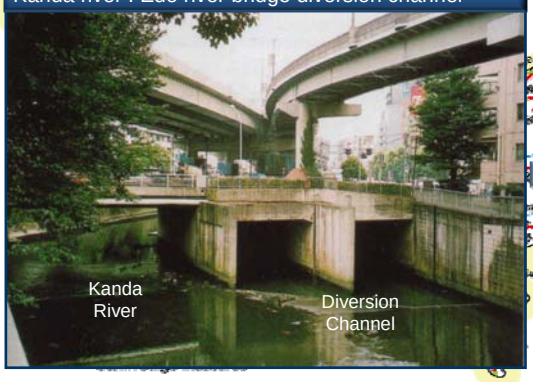
- Small and medium rivers are improved to accommodate once in 3 year rain (50mm/hr)
- Principal projects are river channel improvements and development of underground regulating reservoirs and diversion channels.

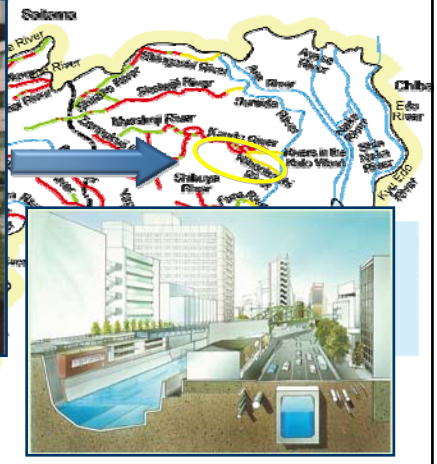


2. River Improvements in Tokyo
- Construction of Diversion channel-

Diversion channel utilizing the space beneath roads along a river

Kanda river : Edo river bridge diversion channel



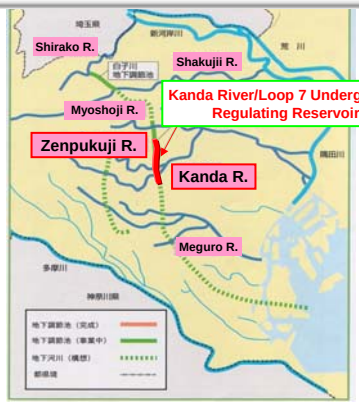


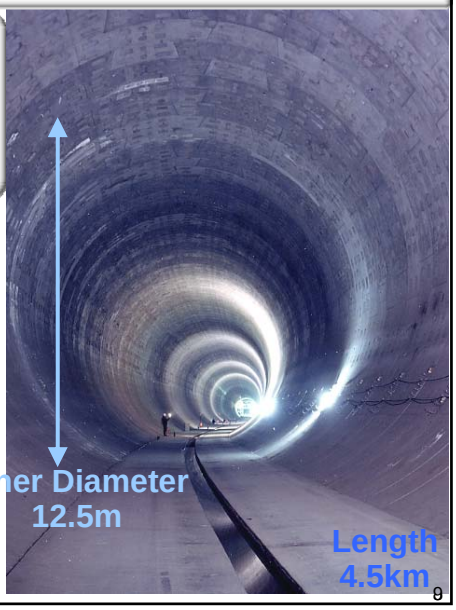
Kanda River　　Diversion Channel

2. River Improvements in Tokyo
- Kanda River/Loop 7 Underground Regulating Reservoir -

Tunnel-type regulating reservoir utilizing the space under a road

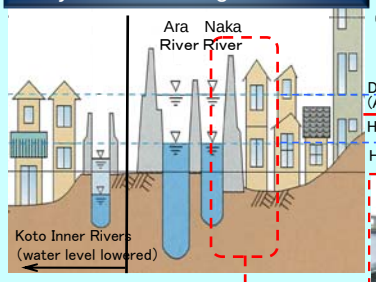
- 12.5m inner diameter tunnel beneath a main highway.
- Take in the flood water from Kanda River, Zenpukuji River and Myoshoji River.
- Stores about 540,000m^3 of flood water.
- Maintenance expense : About 100,000,000,000 yen





2. River Improvements in Tokyo
- Storm Surge, Koto Inner Rivers & Earthquake Measures -

Tokyo's Storm Surge Measures



Gates and tidal defenses are designed to withstand 1m above the historically recorded level!

Design high tide level (AP+5.1)

Historical record level in Tokyo (AP+4.2)

High tide level (AP+2.1)

Naka river's surrounding area has extremely low elevation

Naka river tidal defense

Kamihirai sluice gate

Storm surge measures

Almost completed

Currently most projects implemented are:

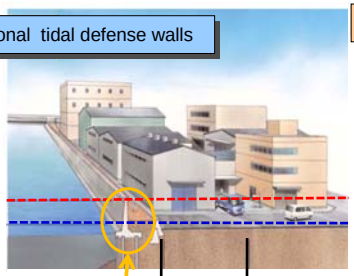
- Super Levees
- Earthquake Reinforcement

2. River Improvements in Tokyo
- Sumida River Super Levees-

Super levees in harmony with urban community development

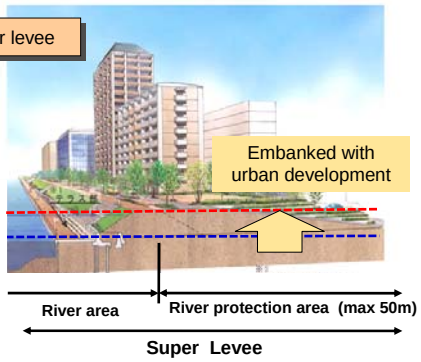
- Thick embankment built together with the urban development.
- Concrete tidal defense walls are being replaced by super levees.

Conventional tidal defense walls



■ Safe against flood but cannot view the river

Super levee



■ Urban river is improved together with the urban development

2. River Improvements in Tokyo
- Sumida River Super Levees-

Ohkawabata Area: Before & after development

3. Urban-designed Comprehensive Flood Control
- Urbanization -

- Urbanization in Tokyo has progressed dramatically.
- Stormwater runoff into rivers has increased due to urbanization.

(Ex.) Urbanization in Kanda River Basin

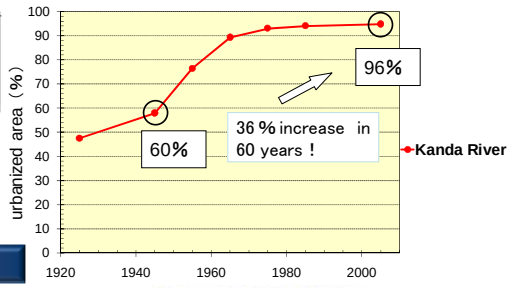
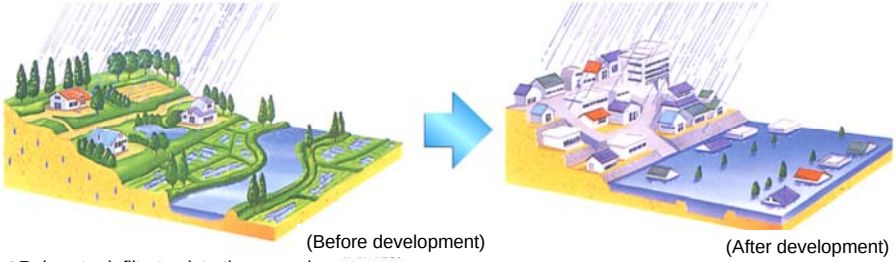


Image of runoff increase



(Before development)
- Rainwater infiltrates into the ground
- Surface water running into river is reduced

(After development)
- Impermeable area increases due to development
- Large amount of runoff flows into rivers in short time

3. Urban-designed Comprehensive Flood Control
- Basin Measures -

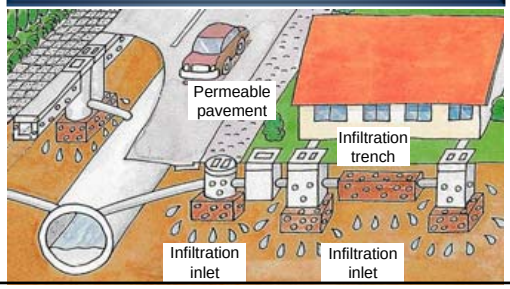
Installation of storage/infiltration facilities utilizing the limited spaces available in the city

Runoff control facilities

- Storage
- Infiltration

Storage facility normally used as tennis courts

Infiltration facilities in roads and houses



4. Evacuation System and Information Dissemination
- Outline of the actions -

- Provide real-time information on rainfall and river water levels
- Provide flood evacuation information such as inundation maps and hazard maps

Notification of Flood Risks

- Publishing hazard maps

Provision of Disaster Information

- Provision of rainfall information by Tokyo Amesh
- Provision of river information
- Flood warning based on water level forecasting
- Sediment disaster warning indicating based on critical line indicating sediment disaster occurrence

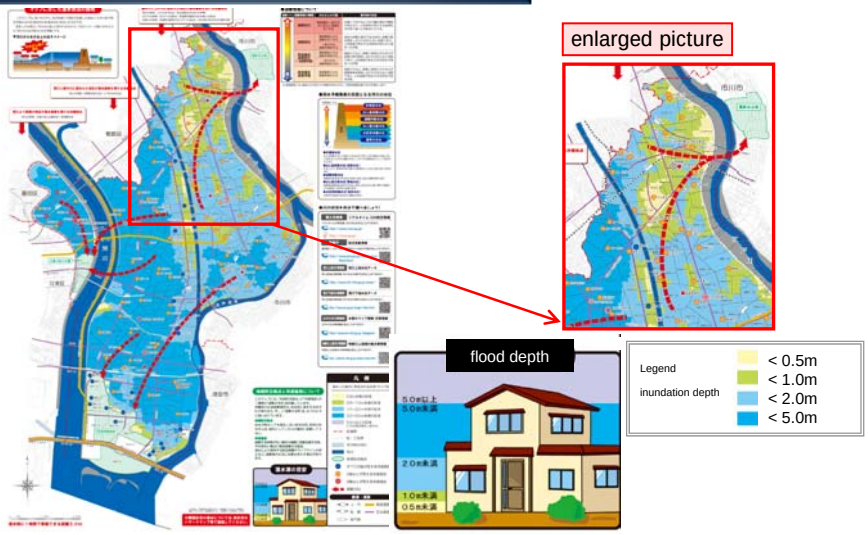
Support flood fighting and evacuation

Minimizing Damage

4. Evacuation System and Information Dissemination
- Notification of Flood Risks -

Flood hazard maps indicating evacuation routes

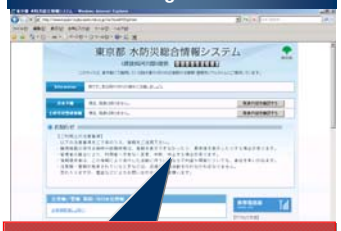
Publishing flood hazard maps



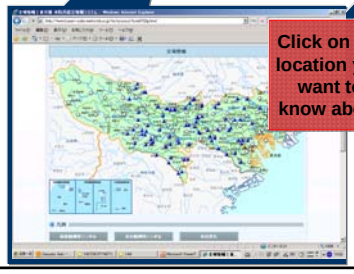
4. Evacuation System and Information Dissemination
- Provision of Disaster Information -

Disaster prevention information on internet
(Integrated Information System for Flood Damage Prevention)

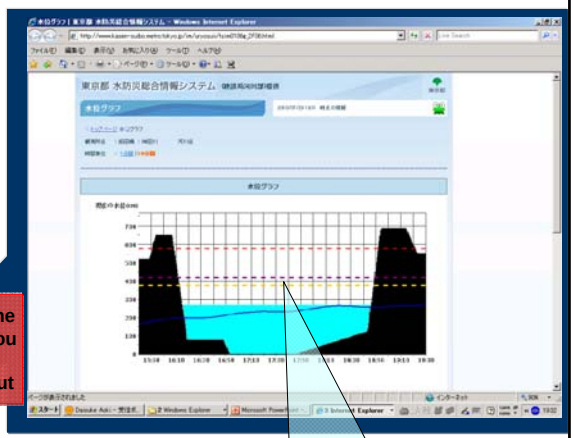
Integrated Information System for Flood Damage Prevention



Click on the data you want to see



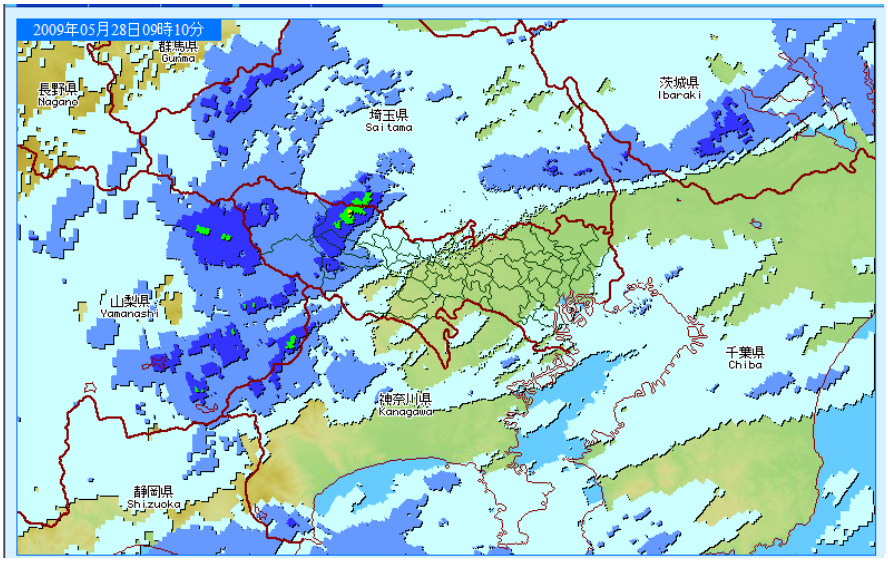
Click on the location you want to know about



You can get real-time water level data for wherever you want!

4. Evacuation System and Information Dissemination
- Provision of Disaster Information -

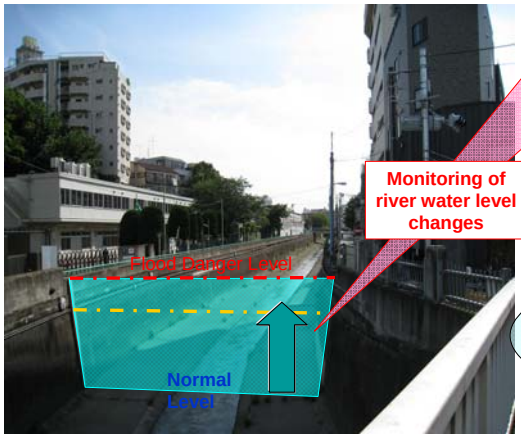
Disaster prevention information on internet（Tokyo Amesh）

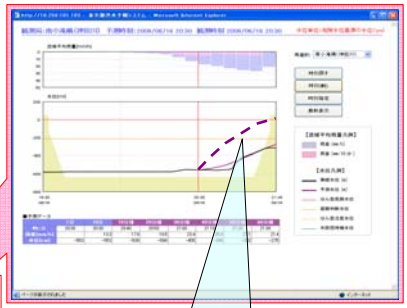


4. Evacuation System and Information Dissemination
- Operation of Forecasting Systems-

Forecasting systems for floods
(Kanda River flood projection information)

● **Kanda River flood projection information**
●Flood warning is announced once it has determined that there is an increased risk of the Kanda River overflowing using predicted river water level for 1 hour later.





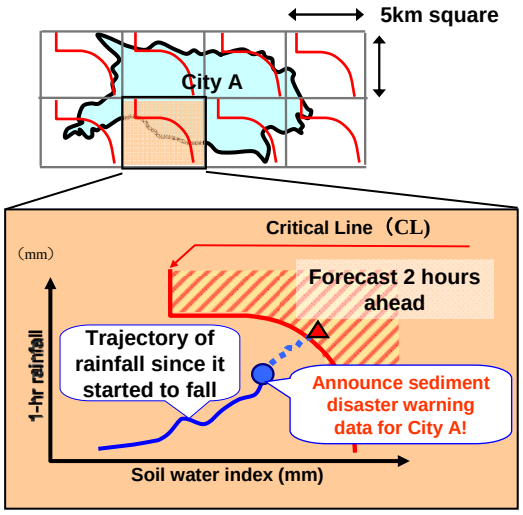
Monitoring of river water level changes

If there is a risk of flooding
⇒**Flood warning is announced!**

4. Evacuation System and Information Dissemination
- Operation of Forecasting Systems-

Forecasting systems for sediment disasters
（Sediment disaster warning ）

How SEDIMENT DISASTER WARNINGS are announced



Divide entire metropolitan area up into 5km square blocks (total of 128 blocks)

Forecast risk of sediment disaster occurring in each block

Check any blocks that are forecast to exceed CL

Announce sediment disaster warning data

5. Future Challenges & Coping Strategies

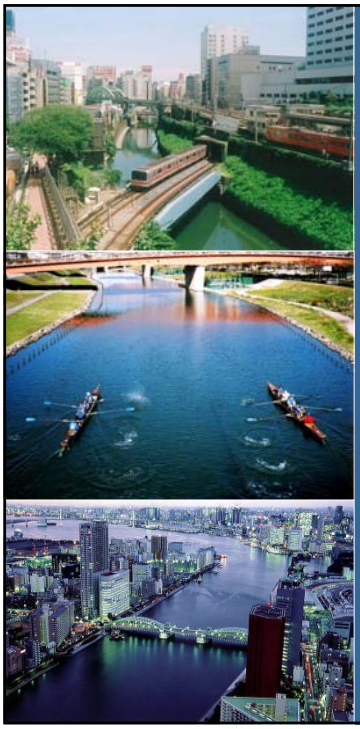
climate change impacts

Increase in rainfall

Sea level rise

Intensification of tropical cyclones

- Accelerate flood control measures, and examine future state of rivers in light of climate change
- Promote comprehensive flood control measures including infiltration facilities, etc.
- Promoting software measures including notification of flood risks and provide real-time information, etc.



東京都建設局
bureau of construction

Thank you very much
for your attention!