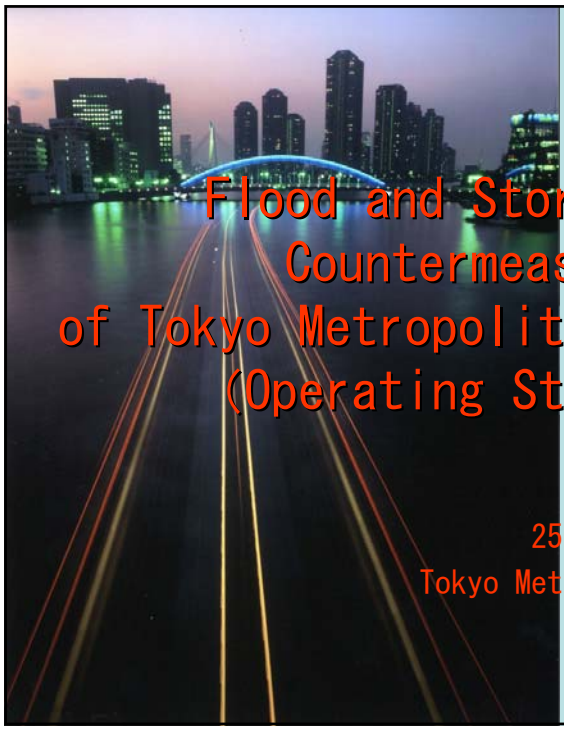


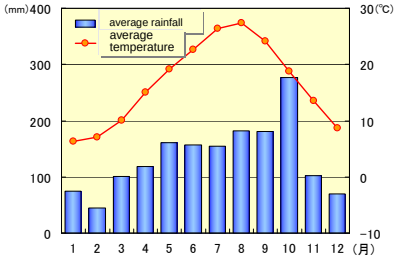
Flood and Storm Surge Countermeasures of Tokyo Metropolitan Government (Operating Strategy)

25 January 2011

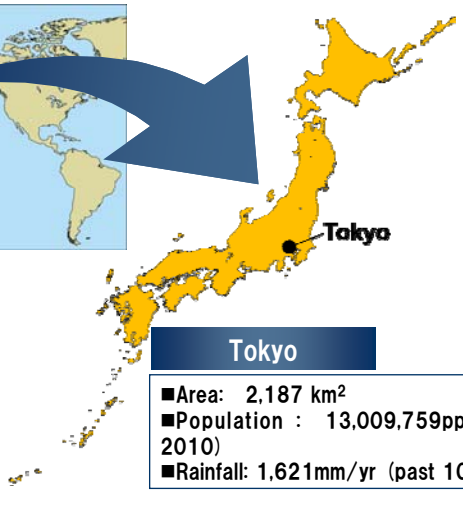
Tokyo Metropolitan Government

1. Overview of Tokyo: Geography and climate

The average annual rainfall is 1,621mm, 2 times greater than the world's average (810mm)



Average Tokyo rainfall and temperature over past 10 years(2000～2009年) 【Tokyo District Meteorological Observatory】



Tokyo

- ■Area: 2,187 km²
- ■Population : 13,009,759ppl (Jan. 2010)
- ■Rainfall: 1,621mm/yr (past 10 yrs)

1. Overview of Tokyo: Major floodings

○Tokyo has suffered damage from Typhoons, severe downpours, and storm surges innumerable times

○While river development is making headway, downpours exceeding design standards have increased in recent years and flooding occurs almost annually

Flood damage

Typhoon Kathleen (1947)

Hourly rainfall　３５mm
Total rainfall　１２７mm
Inundation above floor level 80,041 homes
Inundation below floor level 45,167 homes

Severe rainfall (2005)

Hourly rainfall １１２mm
Total rainfall　２６３mm
Inundation above floor level 3,374 homes
Inundation below floor level 2,453 homes

Storm surge damage

Typhoon Kitty (1949)

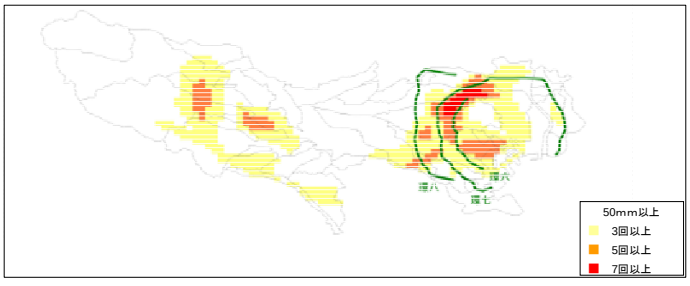
Tide level　A.P＋３．１５
Flood area　９２km²
Inundation above floor level 73,751 homes
Inundation below floor level 64,127 homes

1. Overview of Tokyo: Recent trends in rainfall

1991
～
1997

Torrential rains exceeding 50mm/hr have noticeably increased in recent years (1998-2005)

1998
～
2005

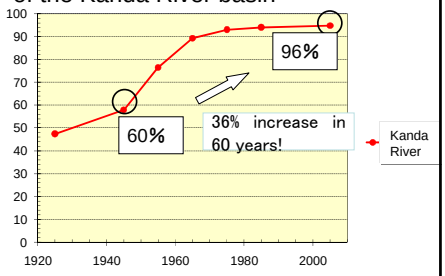


1. Overview of Tokyo: State of urbanization

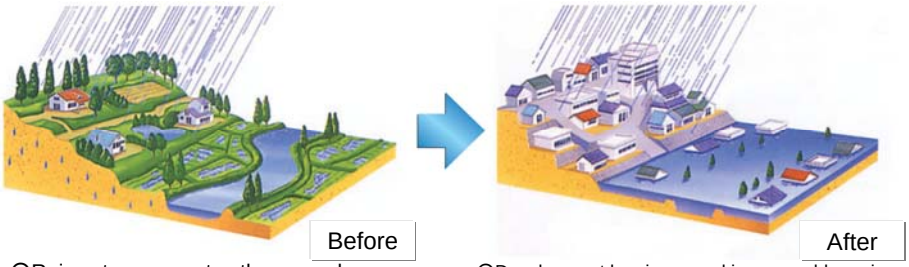
○Tokyo has experienced intense urbanization

○Runoff to rivers has increased accompanying urbanization

(Ex.) Evolution in the urbanization of the Kanda River basin



Visualization of increased runoff caused by urbanization

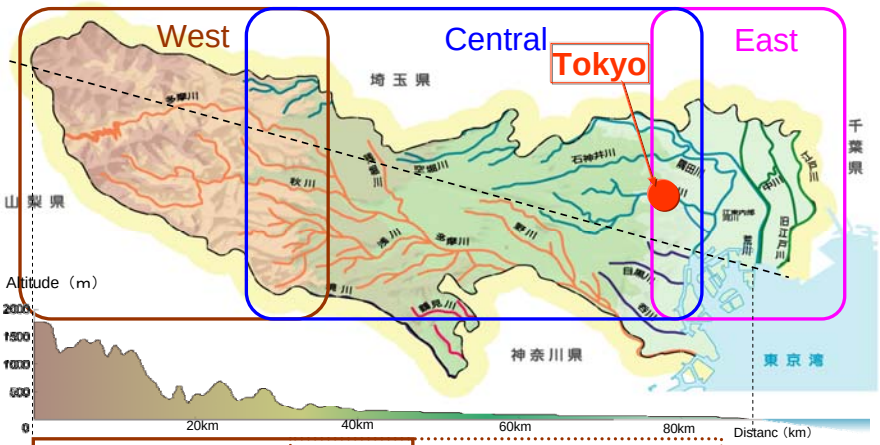


○Rainwater permeates the ground
○Surface water runoff into river is controlled

○Development has increased impermeable regions
○A high volume of surface water runs into river in a short time

2. Tokyo river development: Issues and measures

Implement flood control measures based on geographical and rainfall characteristics



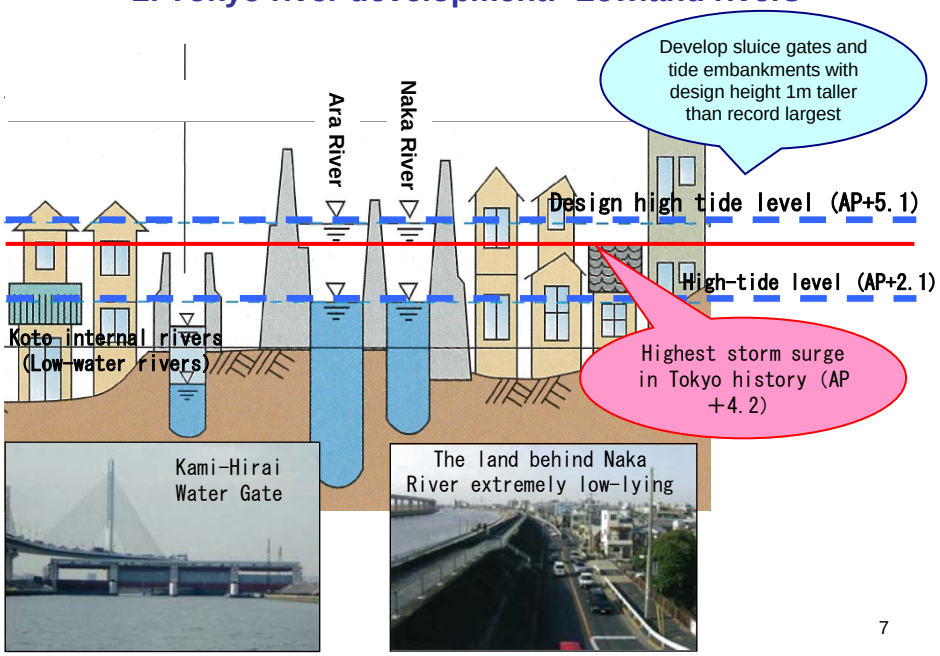
Sediment disaster prevention measures

Flood countermeasures for small- and medium-size rivers

Storm surge & earthquake measures for lowland rivers

Preservation and development of river environment

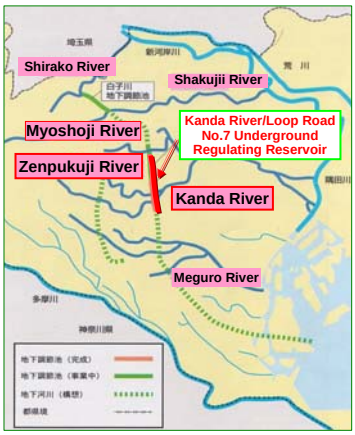
2. Tokyo river development: Lowland rivers



2. Tokyo river development: Small- and medium-size rivers

Develop tunnel-style reservoirs under roads

- Massive tunnel (inner diameter: 12.5m) under major road
- Intakes water from Kanda, Zenpukuji, and Myoshoji Rivers
- Can store a flood of approx. 540,000m3
- Development cost: Approx. ¥100 billion



3. Urban model of comprehensive flood control measures
Basin measures

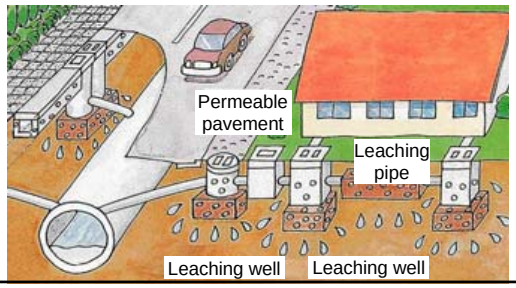
Utilize limited urban space to establish storage and infiltration facilities

Storage facility used as tennis court

Rain runoff control facilities

- Storage facility
- Infiltration facility

Infiltration facilities under roads and housing



4. Evacuation system and information distribution:
Overview of initiatives

○ Provide real-time information about rainfall and river water level
○ Provide evacuation information, including hazard maps and maps of areas likely to flood

Knowledge of flood danger

■Create hazard map

Provide information concerning dangers during disasters

■Provide rainfall information
■Provide river water-level information
■Announce overflow warning information
■Announce sediment disaster warning information

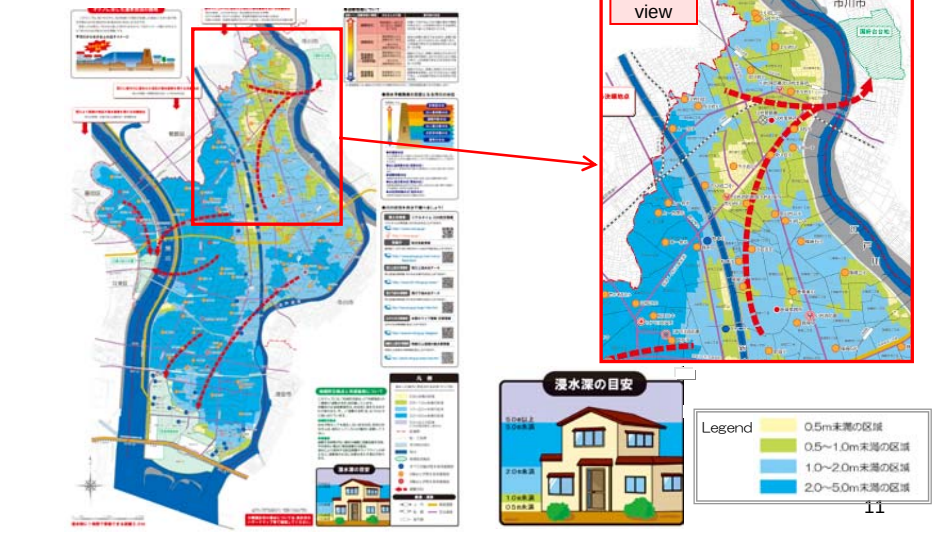
Promote flood prevention and evacuation activities

Minimize damage

4. Evacuation system and information distribution: Knowledge of flood danger

Flood hazard map displaying evacuation routes, etc.

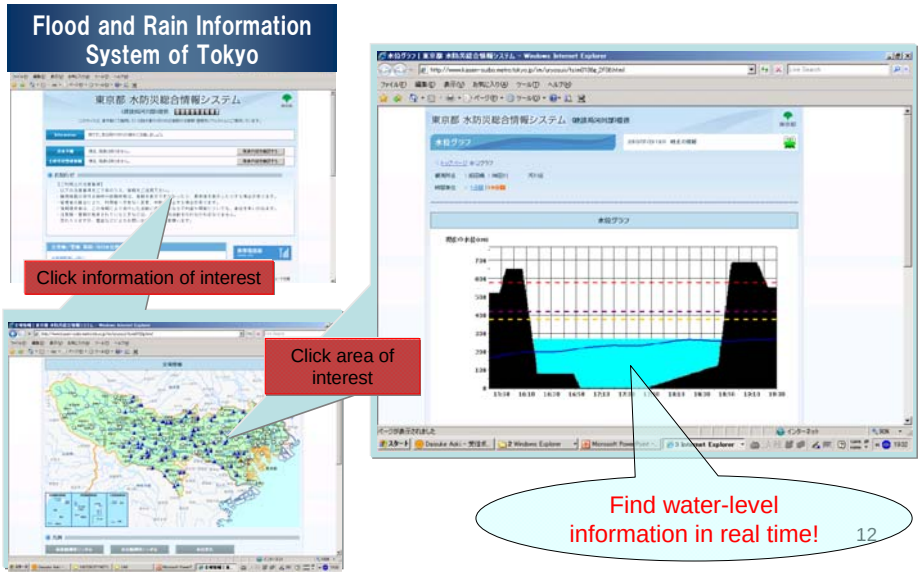
Release a flood hazard map



4. Evacuation system and information distribution: Provide disaster prevention information

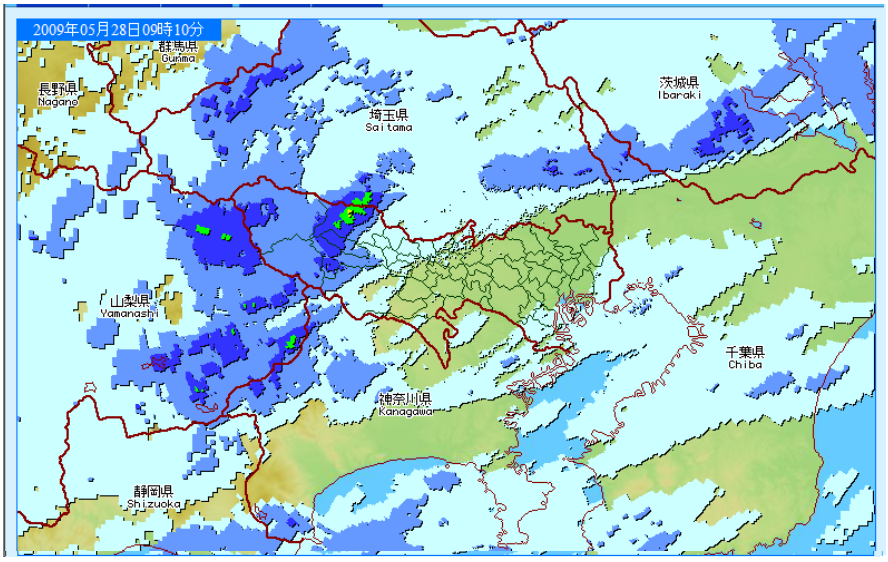
Provide disaster prevention information via Internet (Flood and Rain Information System of Tokyo)

Flood and Rain Information System of Tokyo



4. Evacuation system and information distribution: Provide disaster prevention information

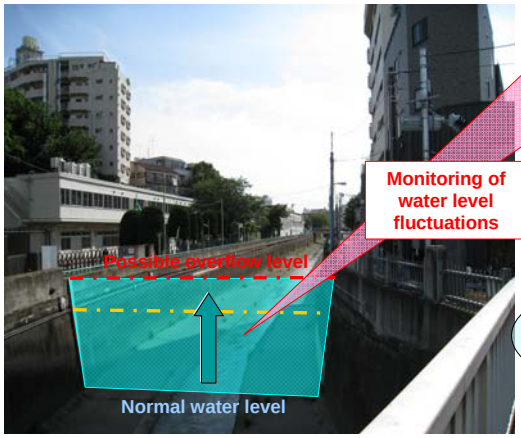
Provide disaster prevention information via Internet (Tokyo Amesh)

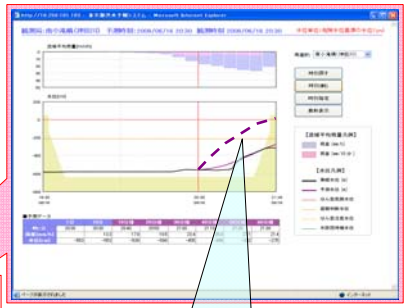


4. Evacuation system and information distribution: Utilize prediction system

A system that predicts the occurrence of flooding (Kanda River flood forecast)

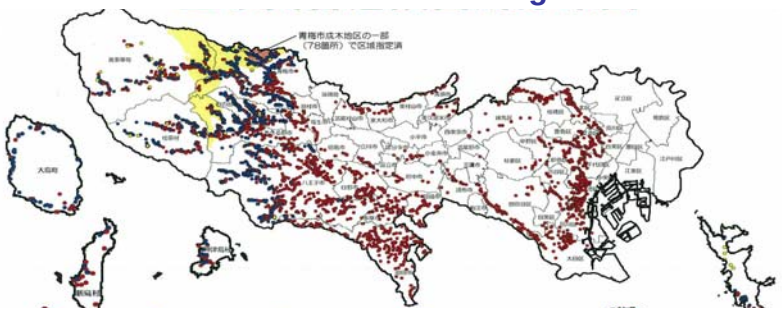
●What is the Kanda River flood forest?
It predicts river water level one hour in advance and, in the event of potential flooding of the Kanda River, announces overflow warning information





In the event of potential flooding,
⇒ Overflow warning information is released!

4. Evacuation system and information distribution: Sediment disaster warning areas

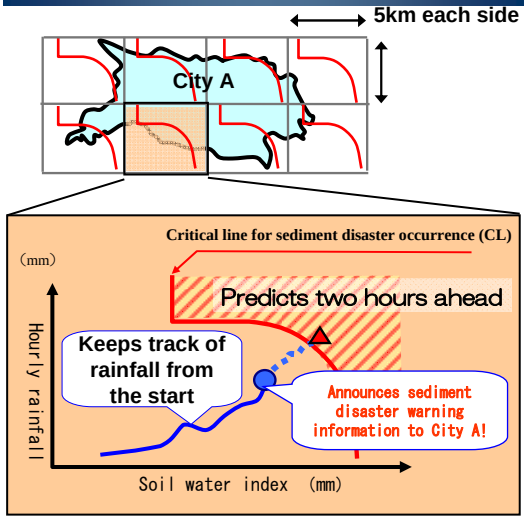


Potential steep-slope collapse areas	Potential avalanche streams	Potential landslide areas
強い雨に打たれること等により、斜面が突然崩れ落ちるのが、がけ崩れです。	集中豪雨等により水を含んだ大量の土石・砂が、一瞬のうちに谷沿いに津波のように流れ出るのが、土石流です。	粘土質など滑りやすい土質を境に、その上部の地面が動き出し、斜面の一部がゆっくりと滑り落ちるのが、地すべりです。
		

4. Evacuation system and information distribution: Utilize prediction system

A system that predicts the occurrence of sediment disaster (sediment disaster warning information)

Distribution mechanism for sediment disaster warning information



Tokyo is broken into 5km-sided blocks (total: 128)

↓

Predict danger of sediment disaster occurrence for each block

↓

Confirm blocks predicted to go over CL

↓

Announce sediment disaster warning information


Sediment disaster (landslide)
September 6, 2007 Fujiwara region, Hinohara
Evacuation facility


Sediment disaster (landslide)
August 9, 2006 Nishigotanda, Shinagawa City

4. Evacuation system and information distribution: Potential sediment disaster areas

Dangerous areas: Approx. 3,700 locations

- Potential avalanche streams Approx. 700
- Potential steep-slope collapse areas Approx. 3,000
- Potential landslide areas Approx. 40

After completing a detailed investigation

The estimate rose to around 8,000 locations

5. Future response plan

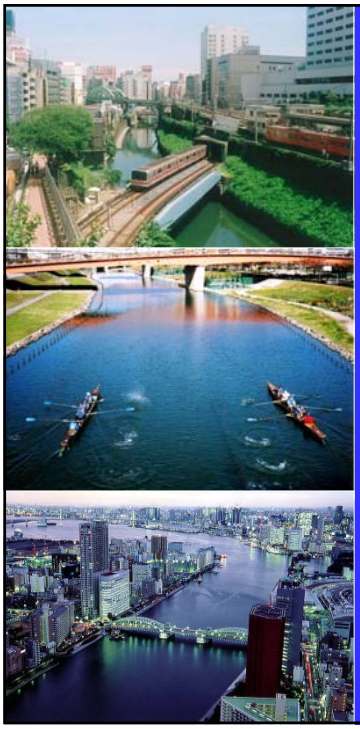
Effects of climate change

- Increased rainfall
- Rise in ocean water level
- **Increase in intensity of tropical cyclones**

■Consider the nature of future rivers, based on climate change and accelerated schedules of flood prevention measures

■Promote comprehensive flood prevention that include storage and infiltration measures

■Promote such measures as spreading the word on the dangers of flooding and providing real-time information



東京都建設局 bureau of construction

Thank you for your attention.