

Lecture 2

Case of JAPAN II

—Tokyo Metropolitan Region and Tonegawa—

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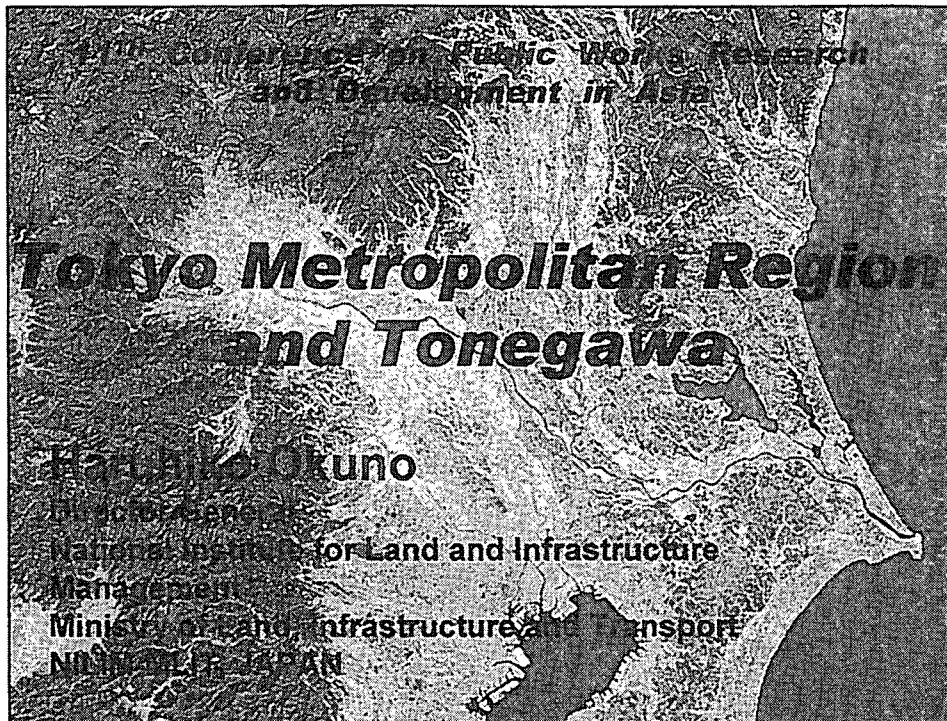
Director-General,

National Institute for Land and

Infrastructure Management

Ministry of Land, Infrastrucutre and

Transport

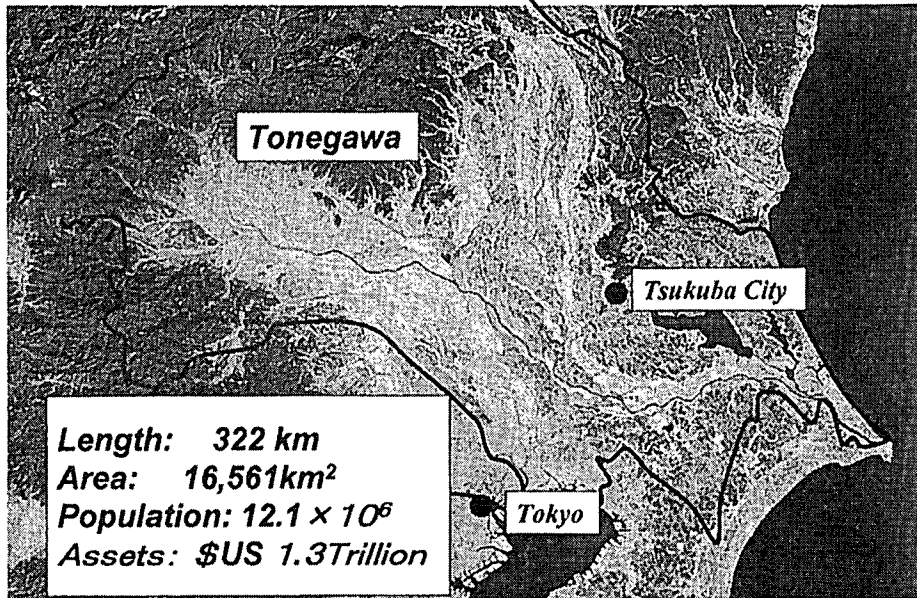


Objectives

- Review the history of Tonegawa riverworks projects (from Edo era circa 1600 - today)
- Review the issues arising from societal developments, and the role of river improvement projects, as exemplified by Tonegawa
- Explore future challenges and directions

Tonegawa

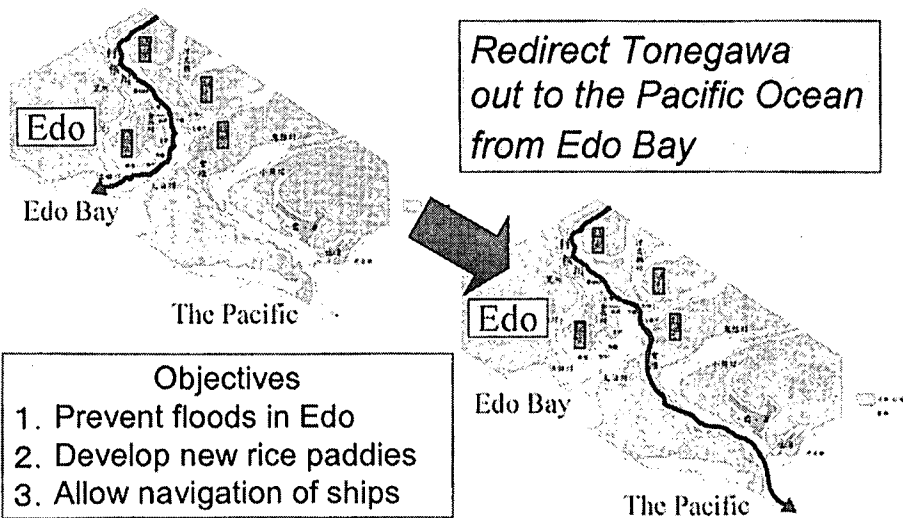
Topography



History of Tonegawa Riverworks

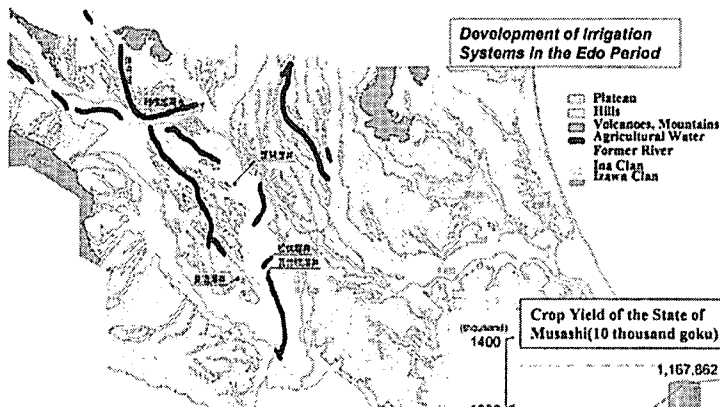
Edo era

Diversion Riverworks (1594~1654)

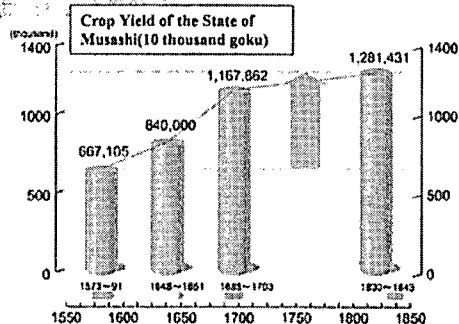


Rice Paddy Development

Edo era

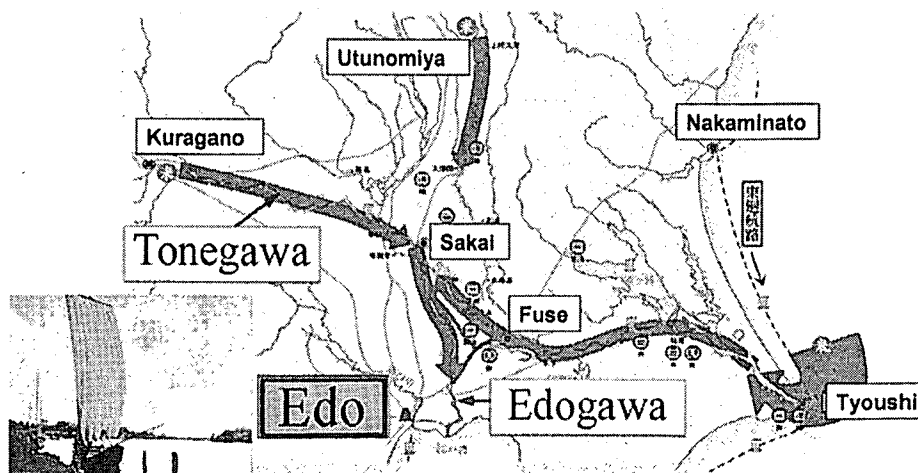


- The Tonegawa Diversion allowed the development of new rice paddies.
- Rice yields doubled, providing solid foundations for Edo's economy.



Navigation

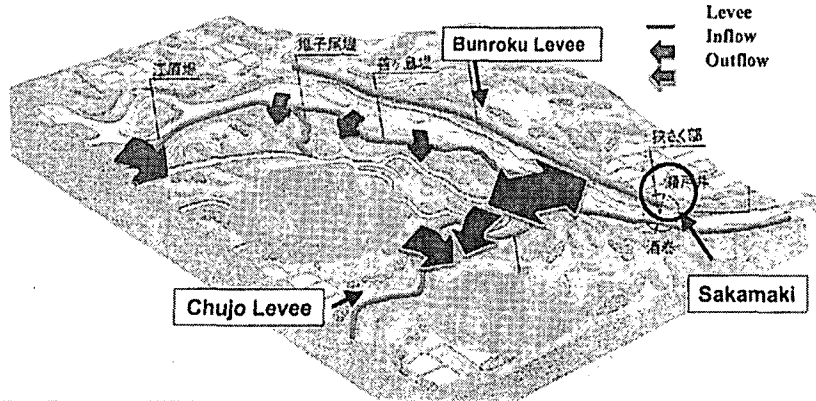
Edo era



- The Tonegawa Diversion also allowed the development of an intricate inland navigation network, to serve as arteries of the Edo economy.

Regulating Flow in the Middle Reaches (Chujo Levee)

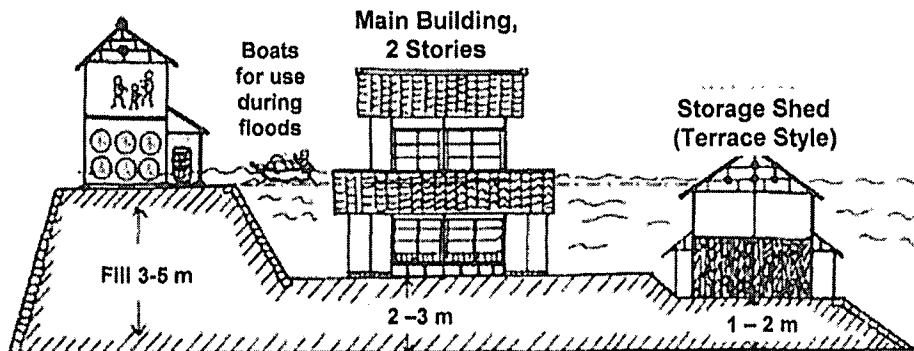
How the Chujo Levee Works



Area: 49 km², Capacity: 120 × 10⁶ m³

Mizuka: A local initiative developed by flood prone areas

Mizuka

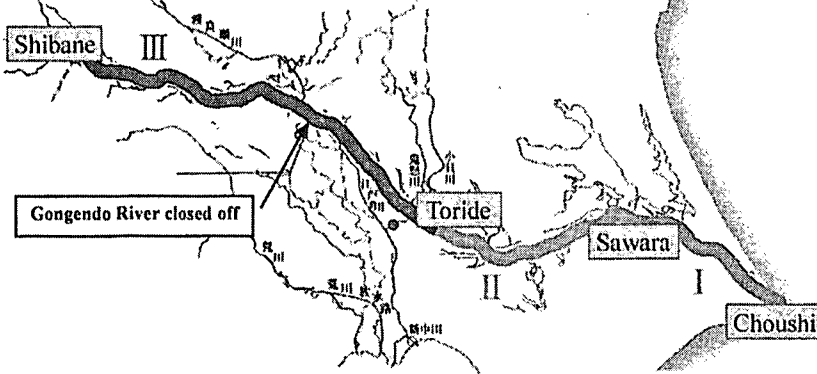


Mizuka: An Evacuation Refuge

Original drawing by Shigeru Miyata, October 1, 1960

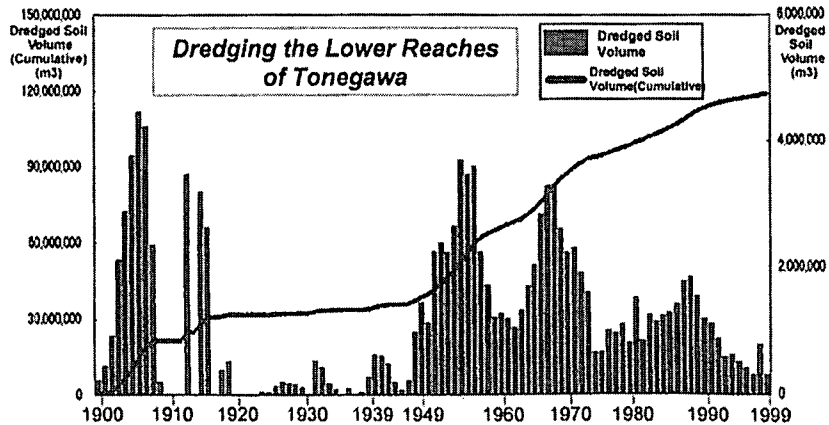
The First Modern River Improvements (1900~1930)

Tonegawa Improvements, Phases I, II and III

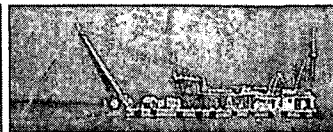


1900 Tonegawa Improvement Plan
Dredging and levee works from
the lower to the upper reaches

Dredging Enhancing Drainage Capacity in the Lower Reaches



Dredged soil volume between
1900-1930 exceeded the
Panama Canal excavation.



Dredger "Shimousa" currently in use.

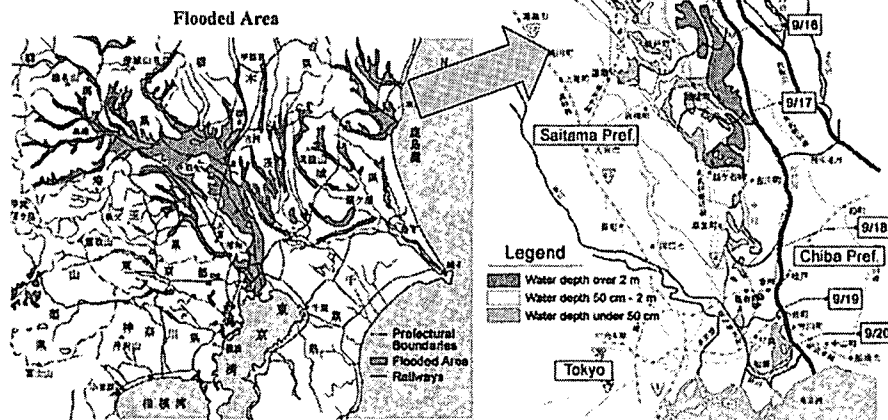
Construction of Retarding Basins in the Middle and Lower Reaches

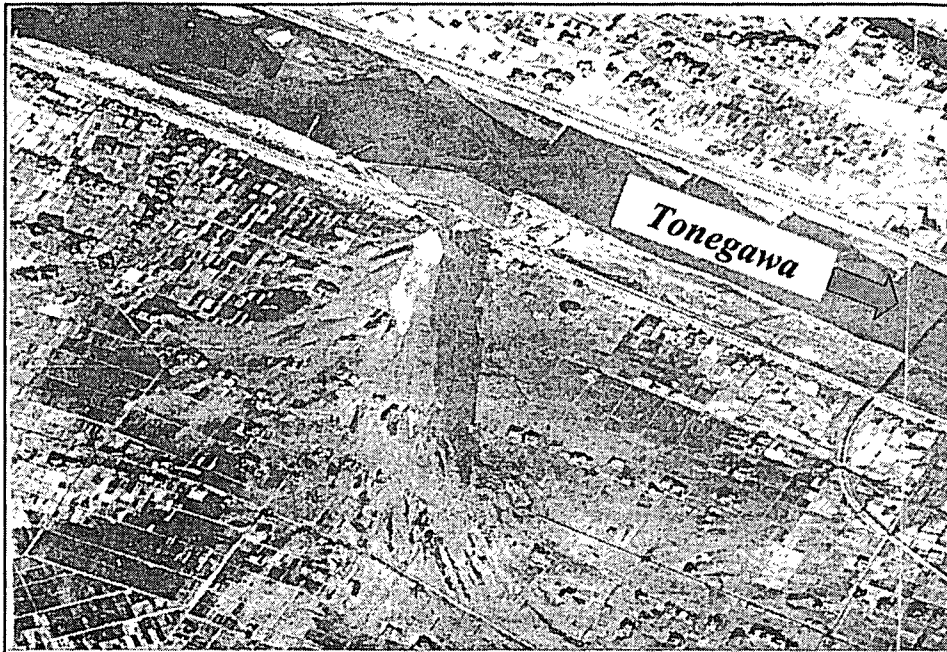


**Watarase Retarding Basin
(Construction began in 1911)**

Damage from Typhoon Kathleen (1947)

Point of Levee Collapse	Tonegawa 134.4 km (right bank)
Flooded Area	440 km ²
Population within the Flooded Area	600,000
Damage	Approx. 7 billion yen (as of 1947) (general property + agricultural products)





The Collapsed Tonegawa Levee October 28, 1947

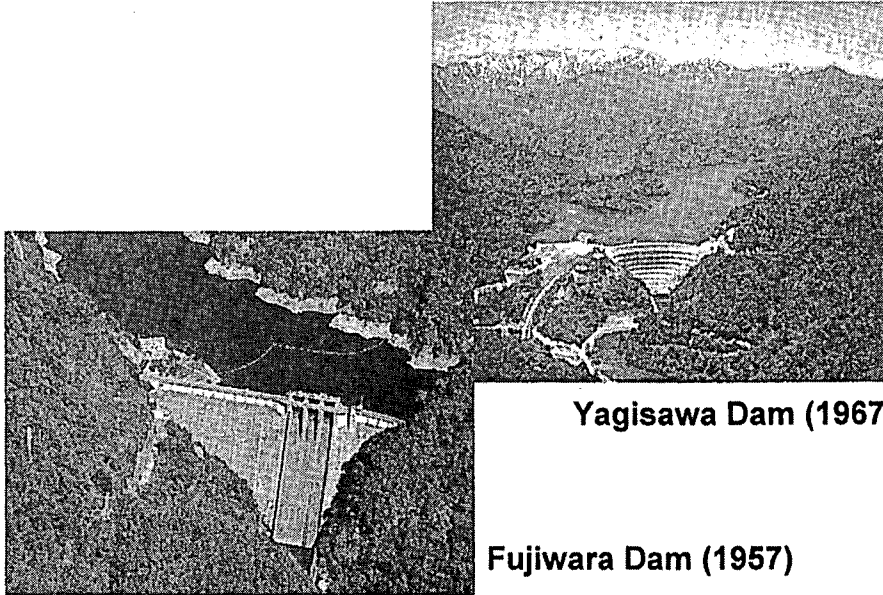
Sabo Projects at the Headwaters

Sabo Facilities for Erosion Controls



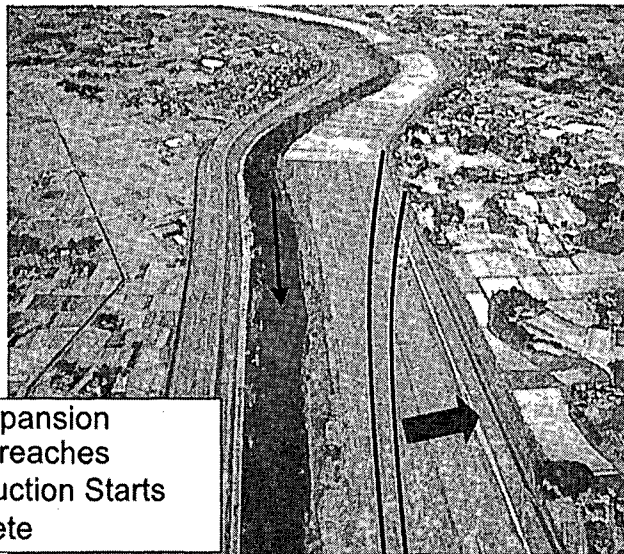
Ashio Sabo Dam
(Watarase River)

Dam Construction in the Upper Reaches



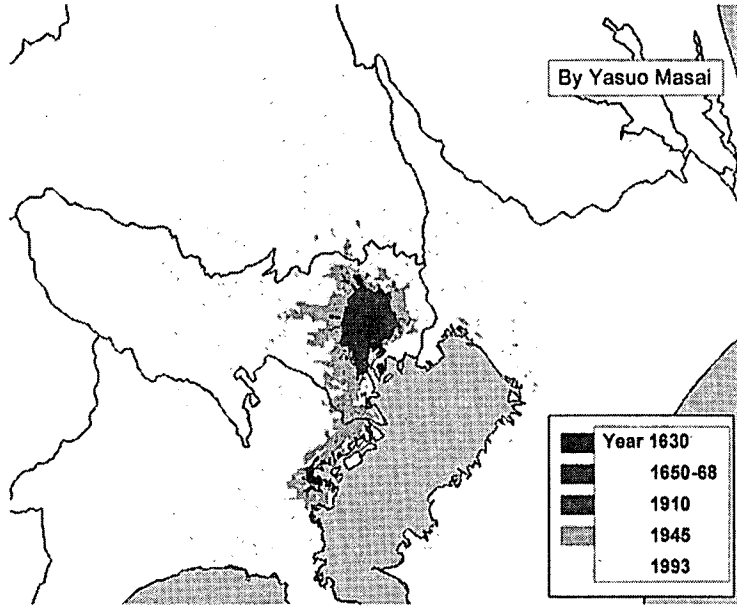
River Width Expansion

Enhancing River Drainage Capacity

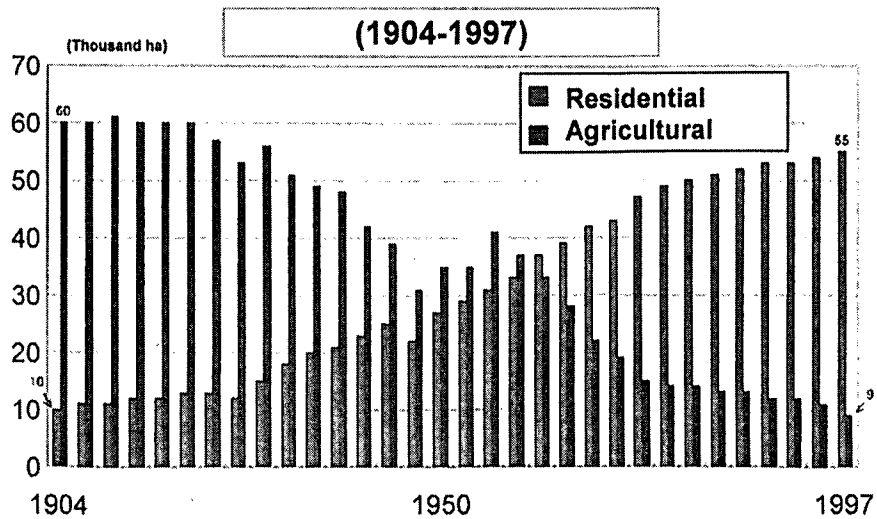


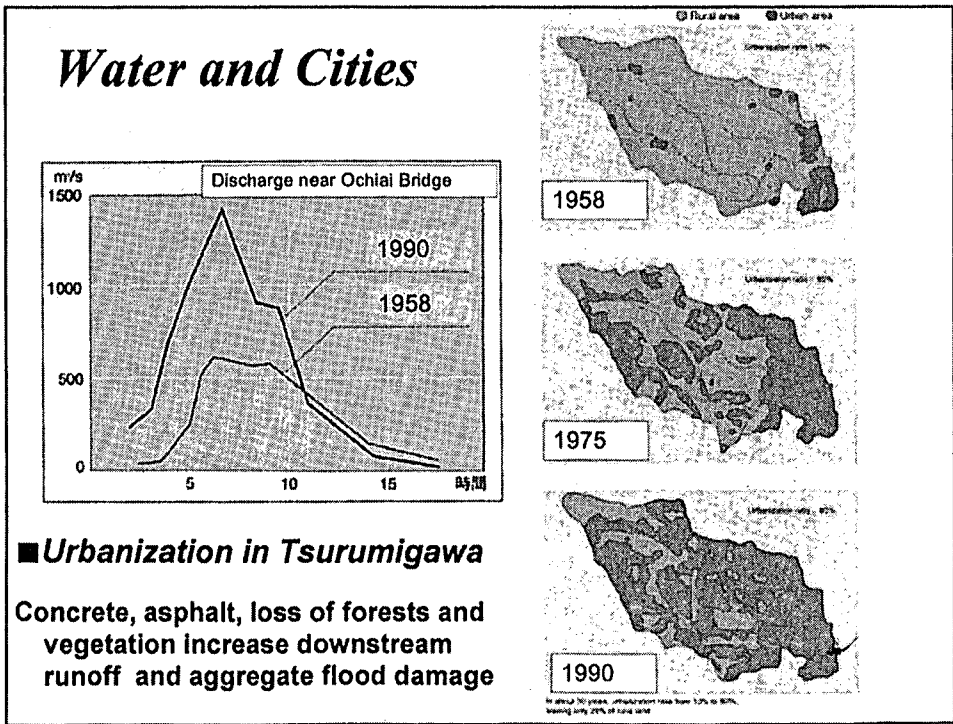
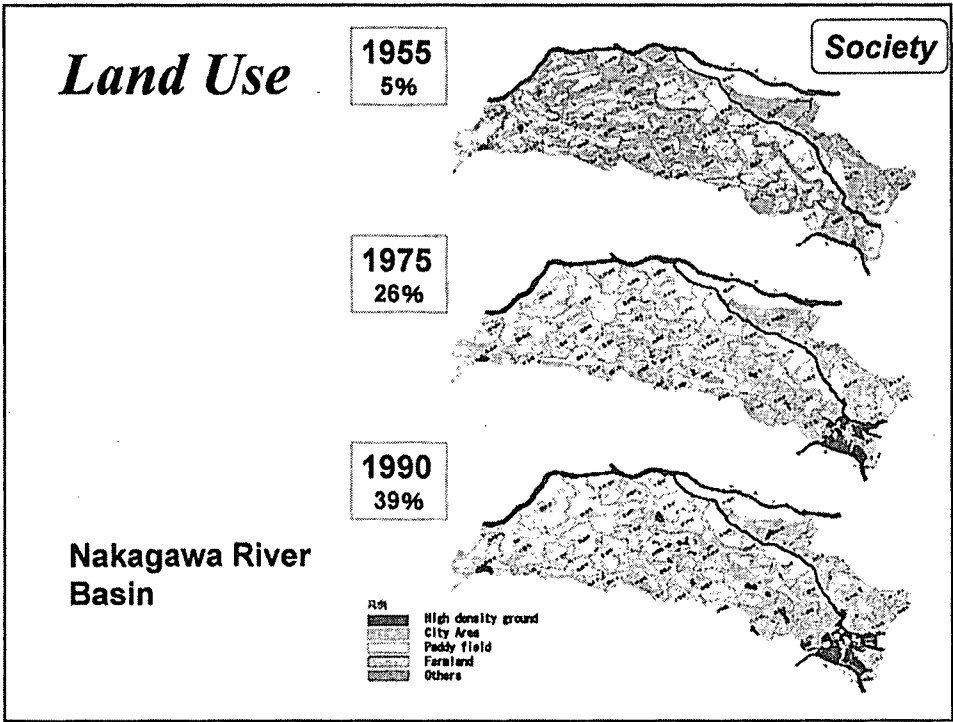
River width expansion
in the middle reaches
1949: Construction Starts
1967: Complete

Expansion of Edo-Tokyo Region



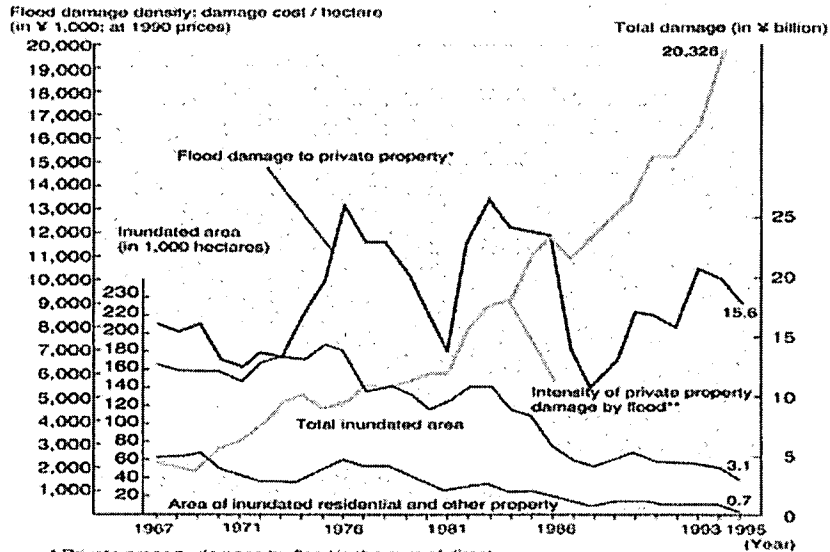
Changes in Tokyo's Residential and Agricultural Lands





Flood

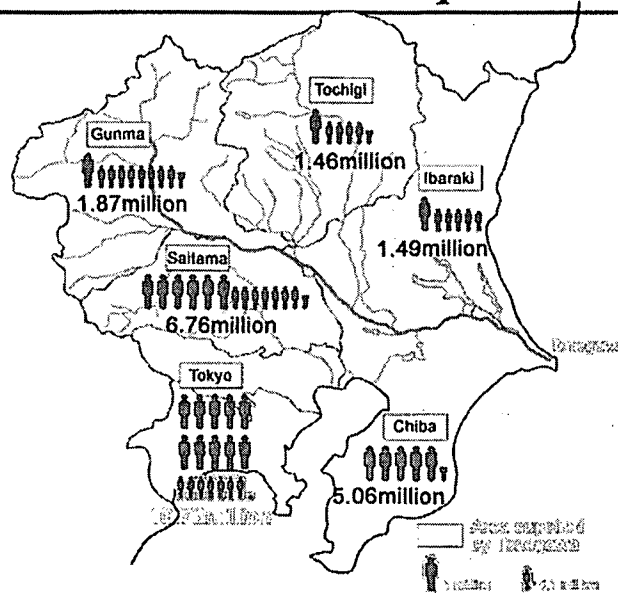
Current Problems



* Private property damage by flood is the sum of direct damage plus loss due to interruption of business.
 ** Density of private property damage by flood is calculated by dividing the private property damage by the area of inundated residential area.

Tonegawa Supplies Water to 27 Million in the Metropolitan Area

Current Problems



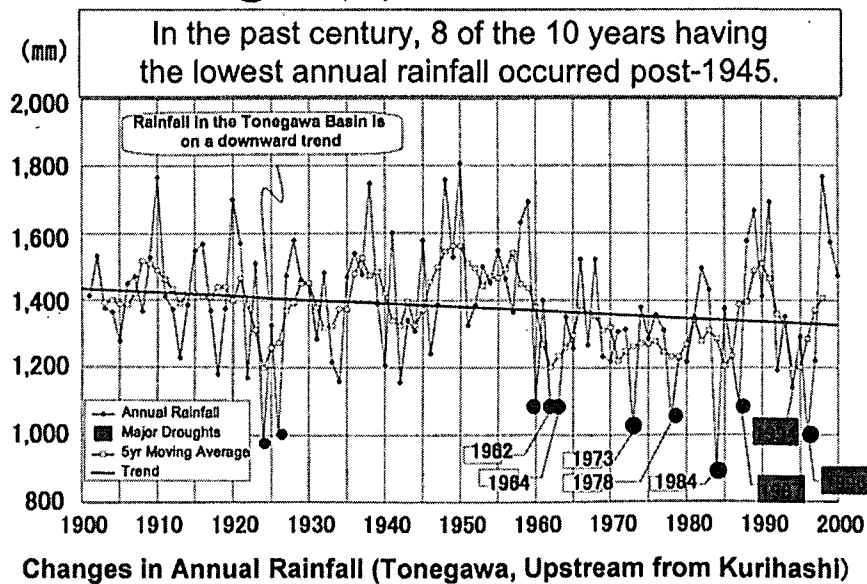
Drought (1)

Current Problems

City	Present cycle of water shortage	Target level
Tokyo	3 years	10 years
San Francisco	11 years	Maximum Water shortage to date
New York	7 years	Maximum Water shortage to date
London	15 years	50 years

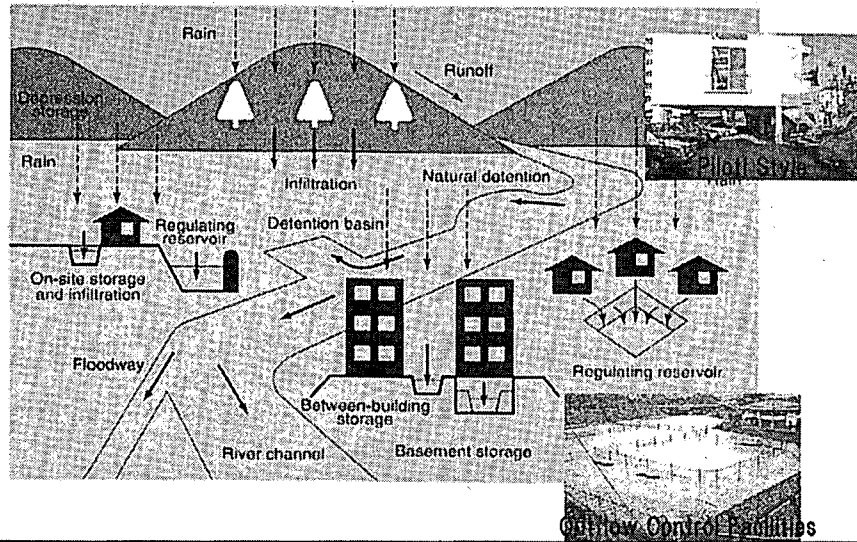
Drought (2)

Current Problems

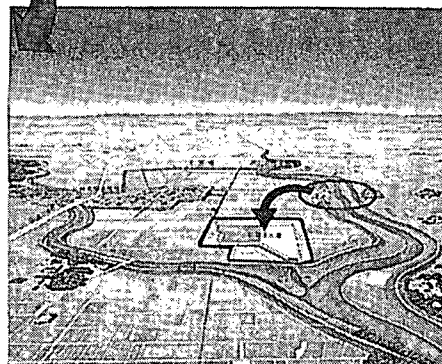
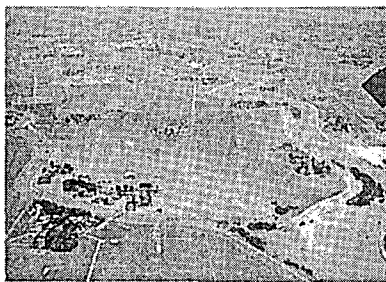


Comprehensive Flood Control Measures

■ Concept of comprehensive flood control

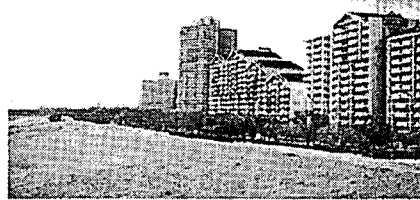


Construction of Retarding Basins

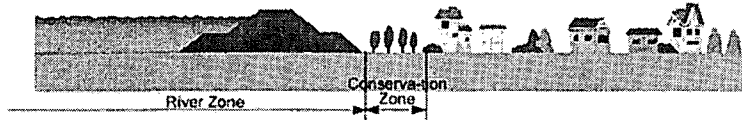


- Relocate communities to higher ground
- Construct retarding basins

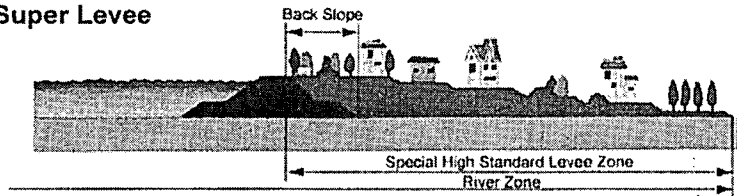
Super Levees



● Traditional Levee



● Super Levee

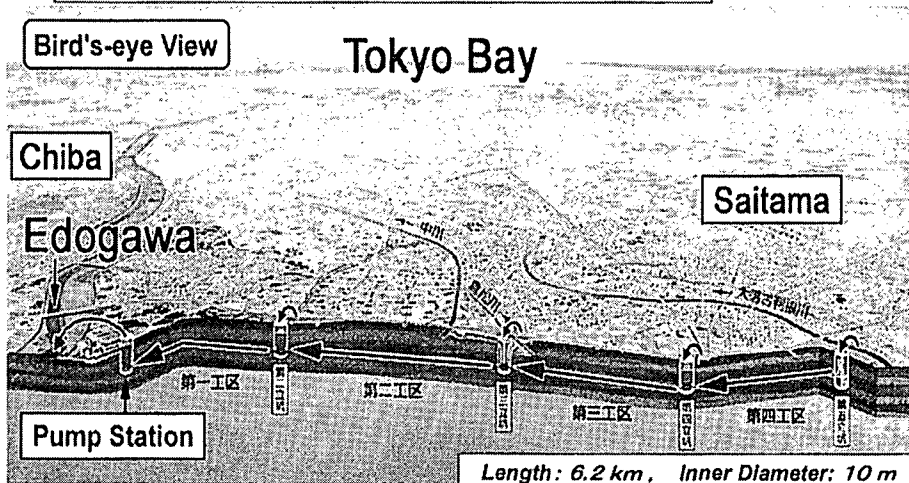


Metropolitan Area Perimetric Diversion Channel

- Objective:
- Prevent flood damage
 - Provide good residential lots

Bird's-eye View

Tokyo Bay



History and Achievements of Our Research Institute

1925: Seismic Design Theory on Gravity Dams by Dr. Mononobe

**1926: Establishment of The First Hydraulics Laboratory in Japan
(Akabane Branch)**

**1952: Establishment of The Largest Testing Center in the Orient
using river/dam hydraulics model
(Shinozaki Experimental Lab.)**

**1961: Developed the storage routing model ,
the water-level gauge (Suiken Model 61);
Establishment of the Laboratory using large-scale river/coast
hydraulics model (Kashima Hydraulic Lab.)**

Conclusion (1)

At Tonegawa, levees, reservoirs and irrigation channels were developed to secure water and safety.

The flood plain was converted into residential lots and farmland to support livelihoods.

Population growth and urbanization led to increases in discharge volume and assets within the flood plain.

Potential damage during major floods has not decreased.

Comprehensive programs covering the entire basin, combining structural and nonstructural measures are necessary.

Conclusion (2)

Man has constantly modified nature to meet his needs , thereby coexisted with nature.

As this relationship continues in the future, it is important to implement measures that meet with the demand of the era.

