

# Experience on Integrated Water Resources Management in Urban Area

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- 3. Water Use: Demand management, rainwater harvesting, recycling**
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# 1. Introduction

## What is urban water management?

- water-related problems such as floods, droughts, and deterioration of environment
- becoming more serious due to urbanization
- strengthening governance and
- implementing structural and non-structural measures based on scientific grounds.

# (I) LAND SUBSIDENCE, JAKARTA: FISHING PORT



# MANGROVE PROTECTION



# FLOOD PUMPING STATION



**DAMAGED BY LAND SUBSIDENCE**

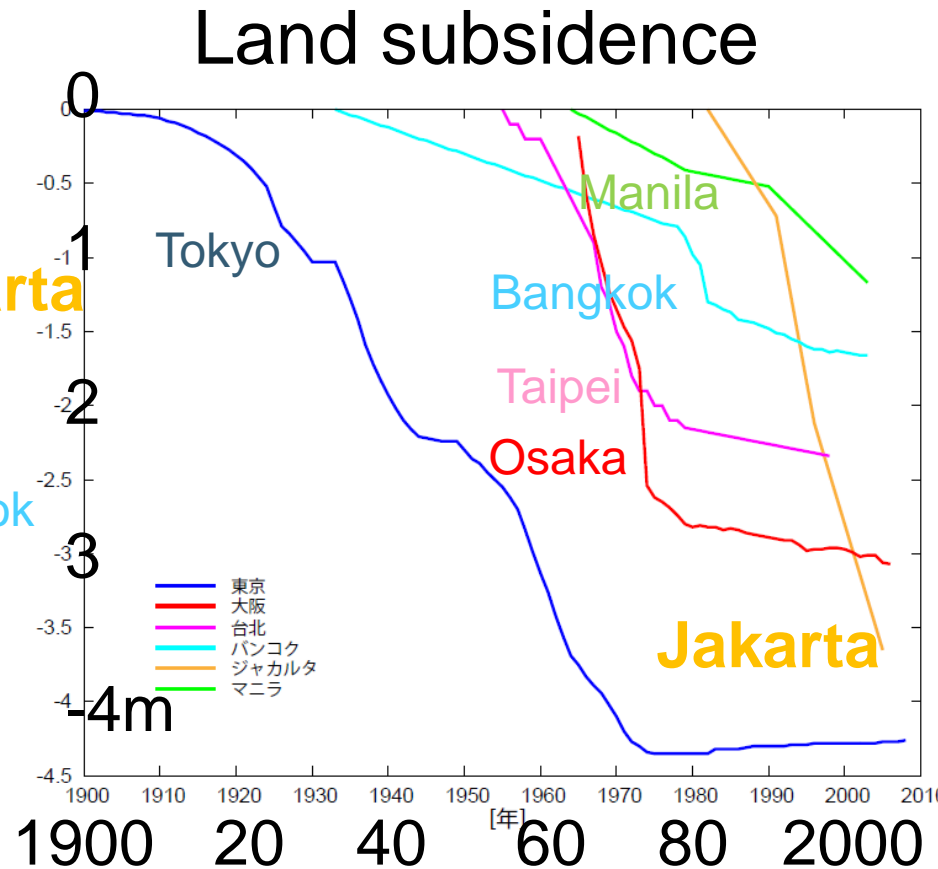
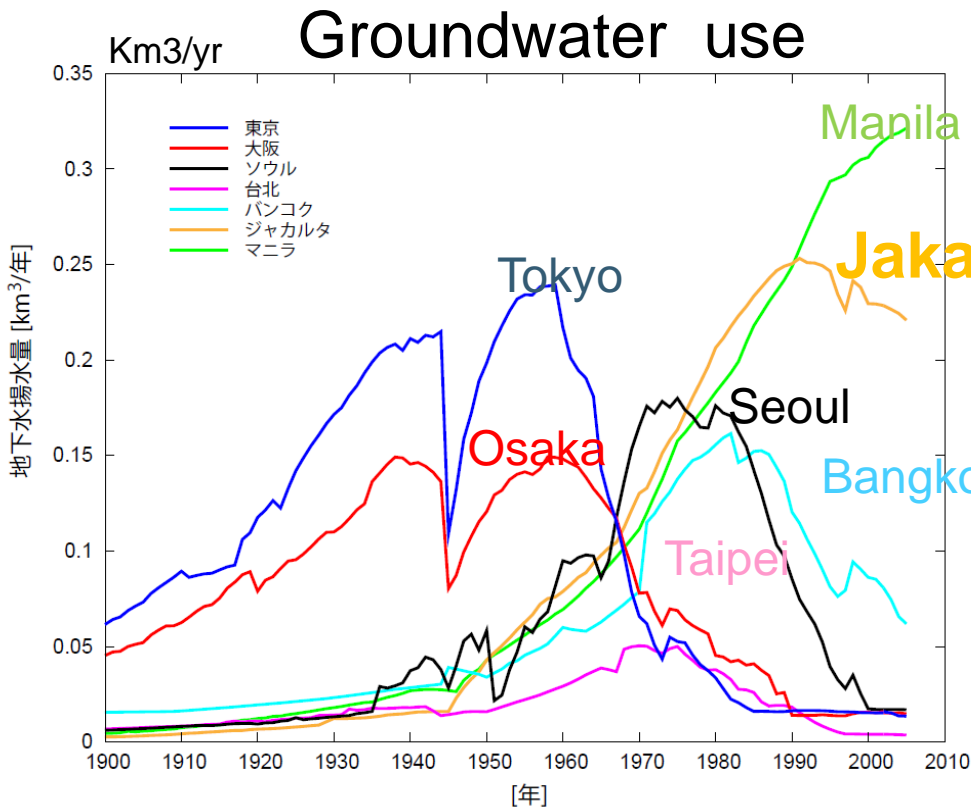


**TOKYO ARAKAWA RIVER, “ZERO METER” AREA  
20% OF 23 WARD AREAS, 1.5 MILLION PEOPLE LIVE**





# LAND SUBSIDENCE IN ASIAN CITIES



(II)  
POLLUTION  
TOKYO

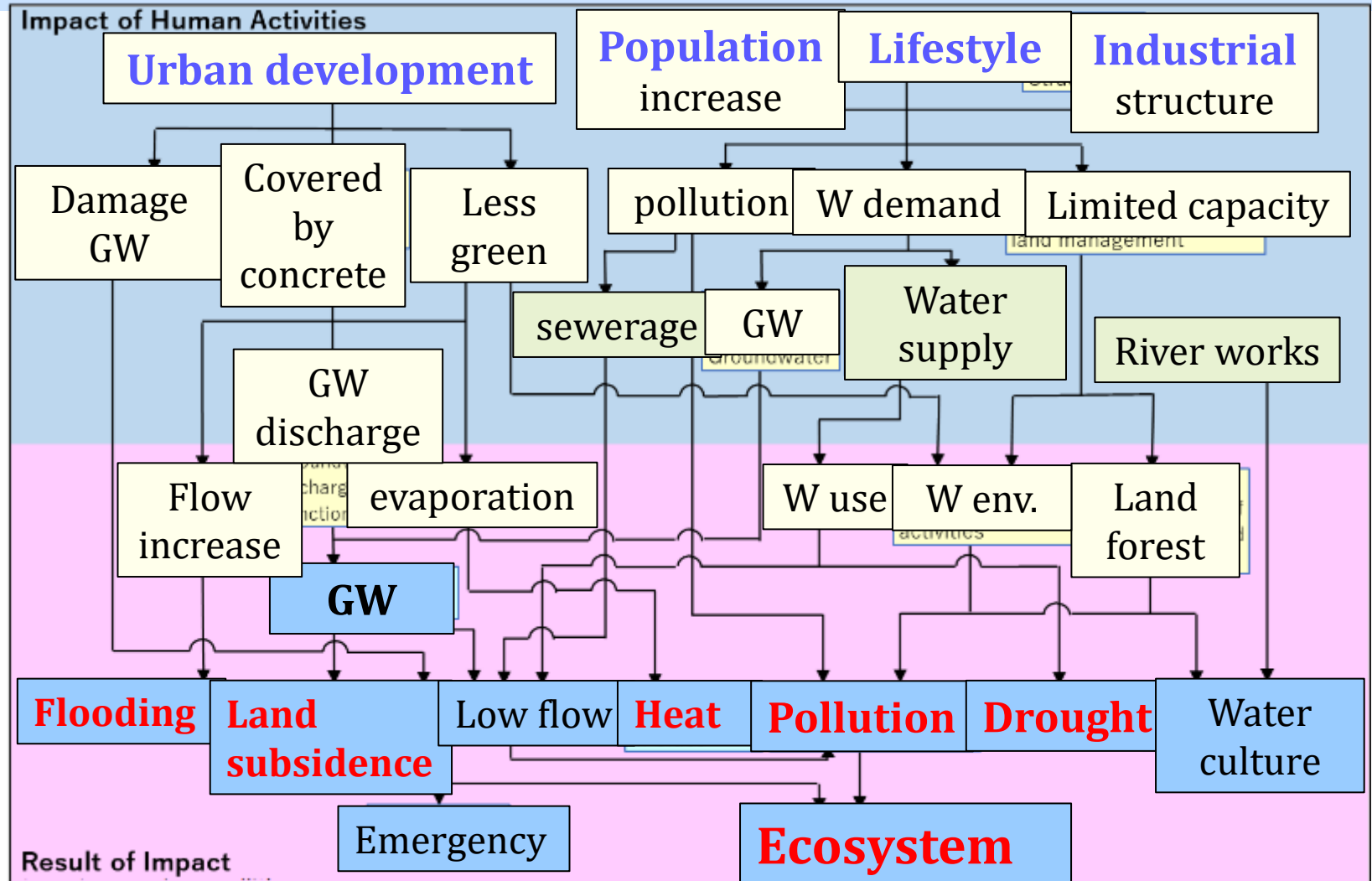


### (III) FLOODING: TOKYO



# 2. Water Cycle in Urban Area

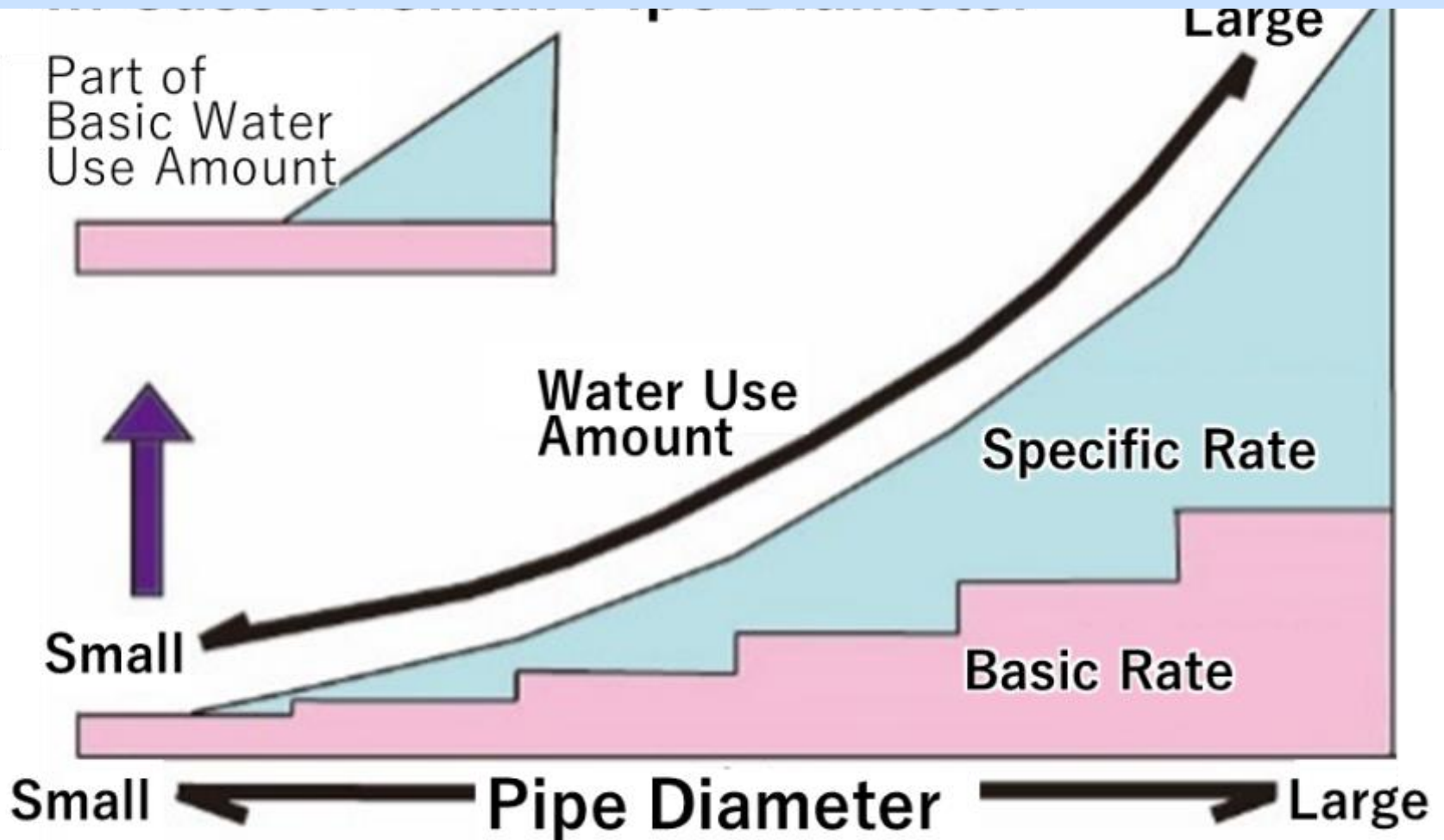
## Impacts of Human Activities on Water Cycle



### 3. Effective Water Use

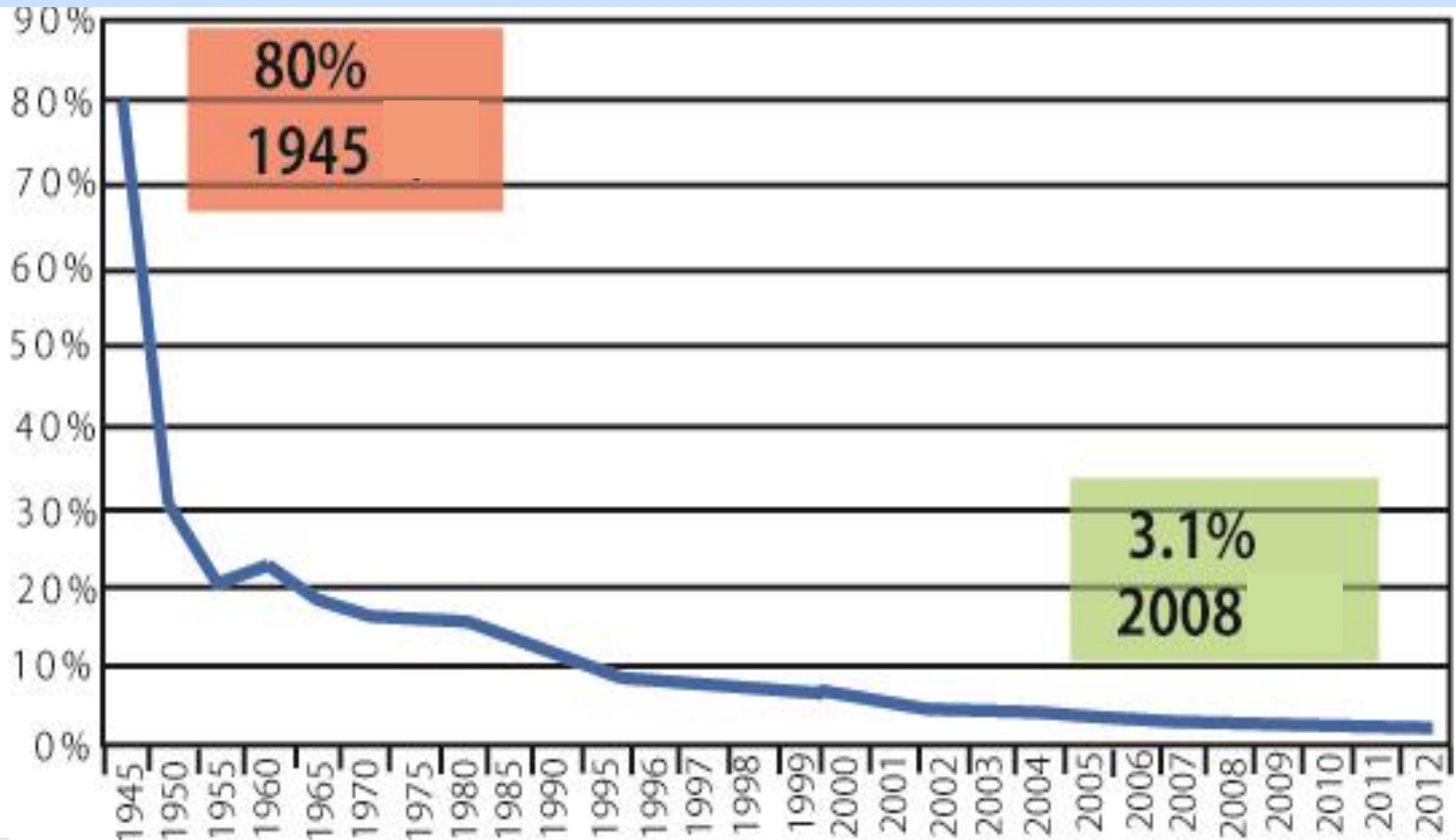
#### (1) Water Demand management

**Two-part Tariff System: to decrease water consumption**

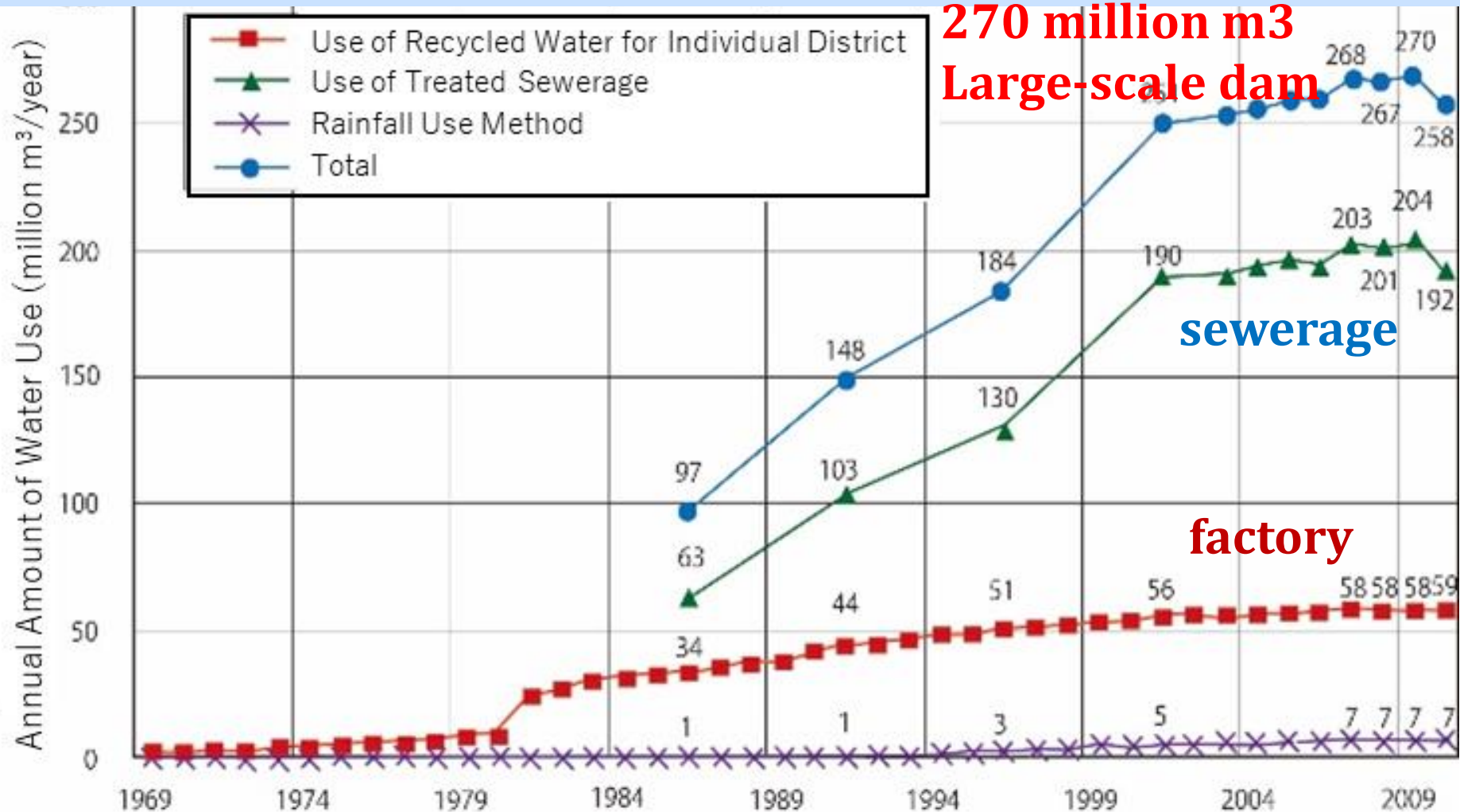


## (2) Improve Leakage in Water Supply

### Leakage Ratio in Tokyo



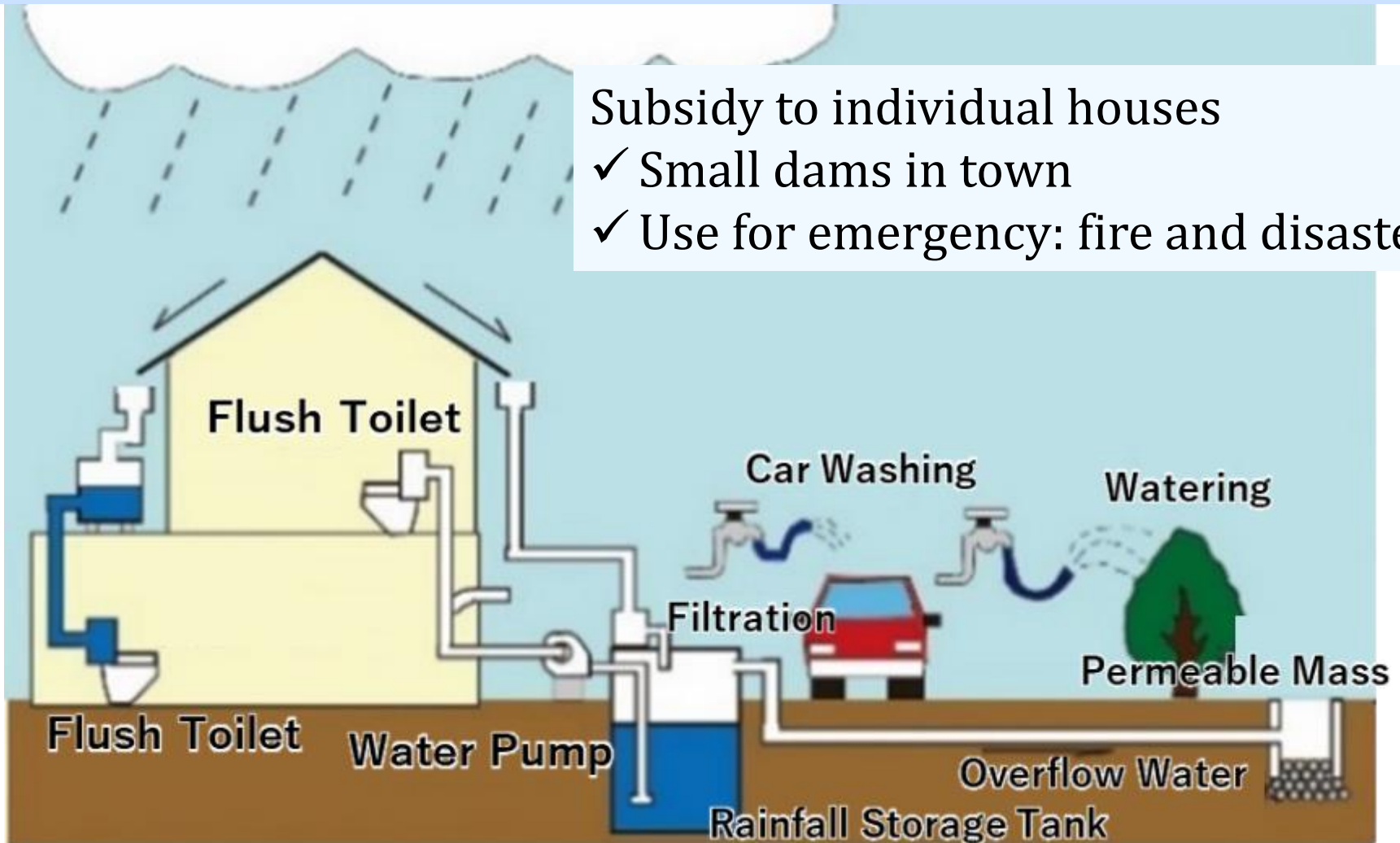
## Rainwater harvesting and recycle: Trends



## (a) Rainwater harvesting at home

Subsidy to individual houses

- ✓ Small dams in town
- ✓ Use for emergency: fire and disasters

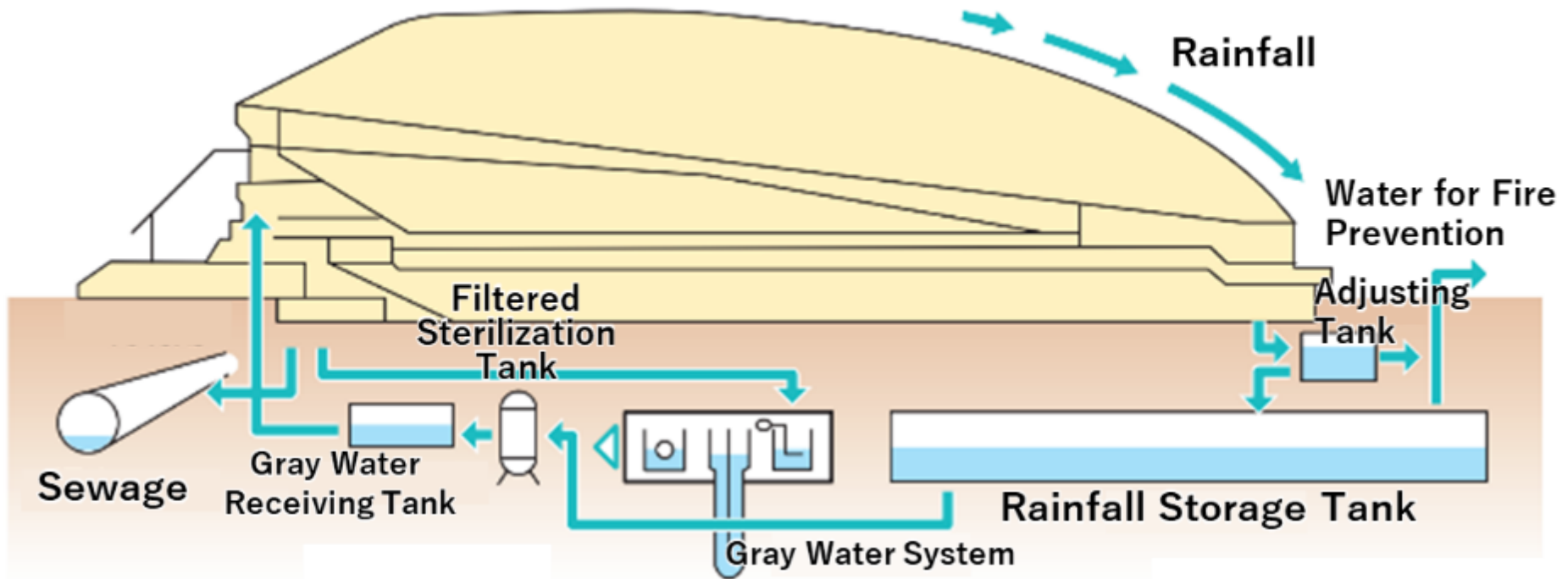




# (b) Tokyo Dome: Rain harvesting



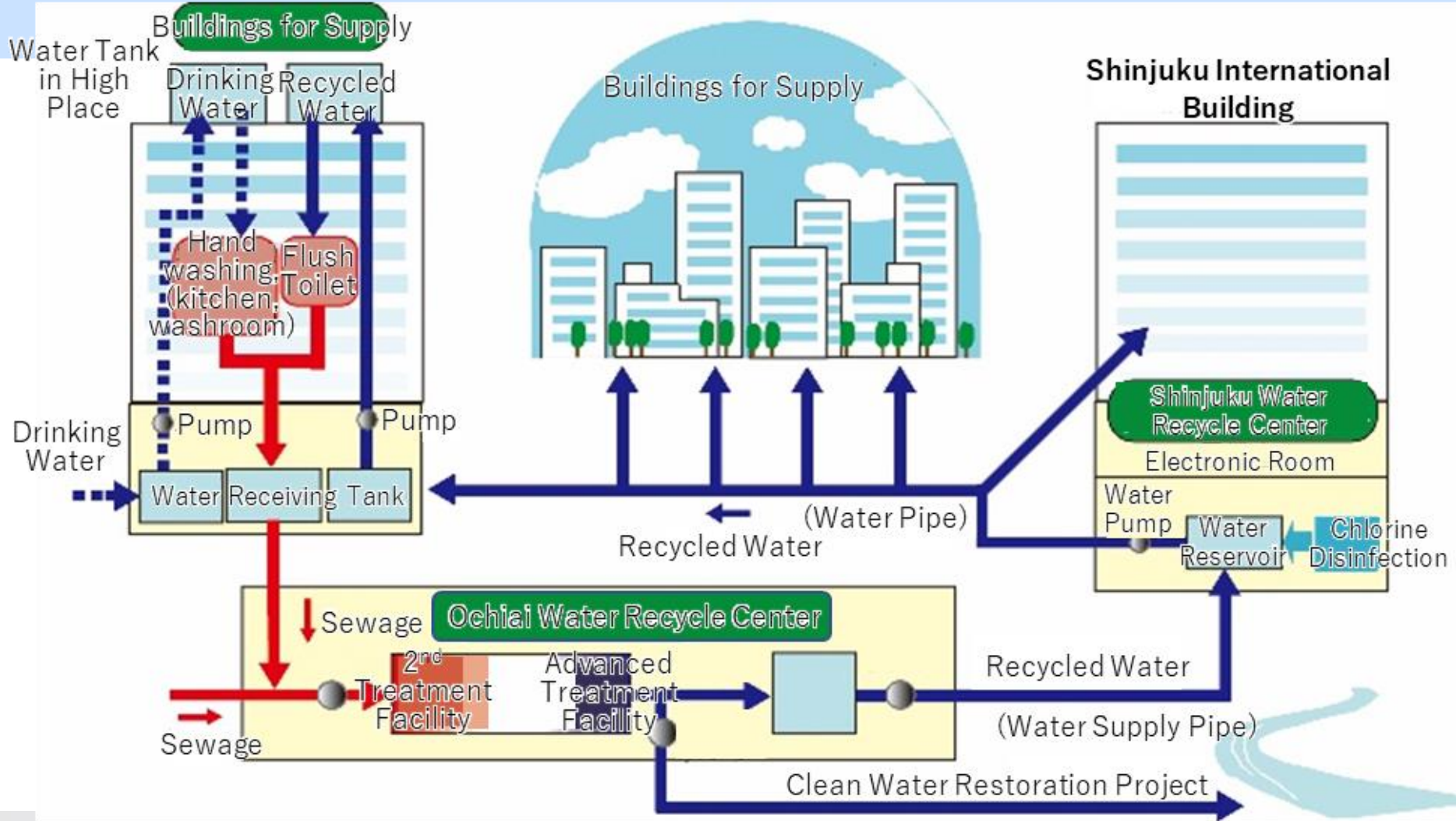
Underground storage tank (3,000 m<sup>3</sup>)  
For toilet flushing, firefighting  
30% rainwater use



[https://ja.wikipedia.org/wiki/%E6%9D%B1%E4%BA%AC%E3%83%89%E3%83%BC%E3%83%A0#/media/%E3%83%95%E3%82%A1%E3%82%A4%E3%83%AB:Tokyo\\_Dome\\_030928a.jpg](https://ja.wikipedia.org/wiki/%E6%9D%B1%E4%BA%AC%E3%83%89%E3%83%BC%E3%83%A0#/media/%E3%83%95%E3%82%A1%E3%82%A4%E3%83%AB:Tokyo_Dome_030928a.jpg)

(Nishi-Shinjuku and Nakano-Sakaue)

### (c) Town scale recycled water system



## 4. Ground water management

### (1) Supply industrial water and regulation

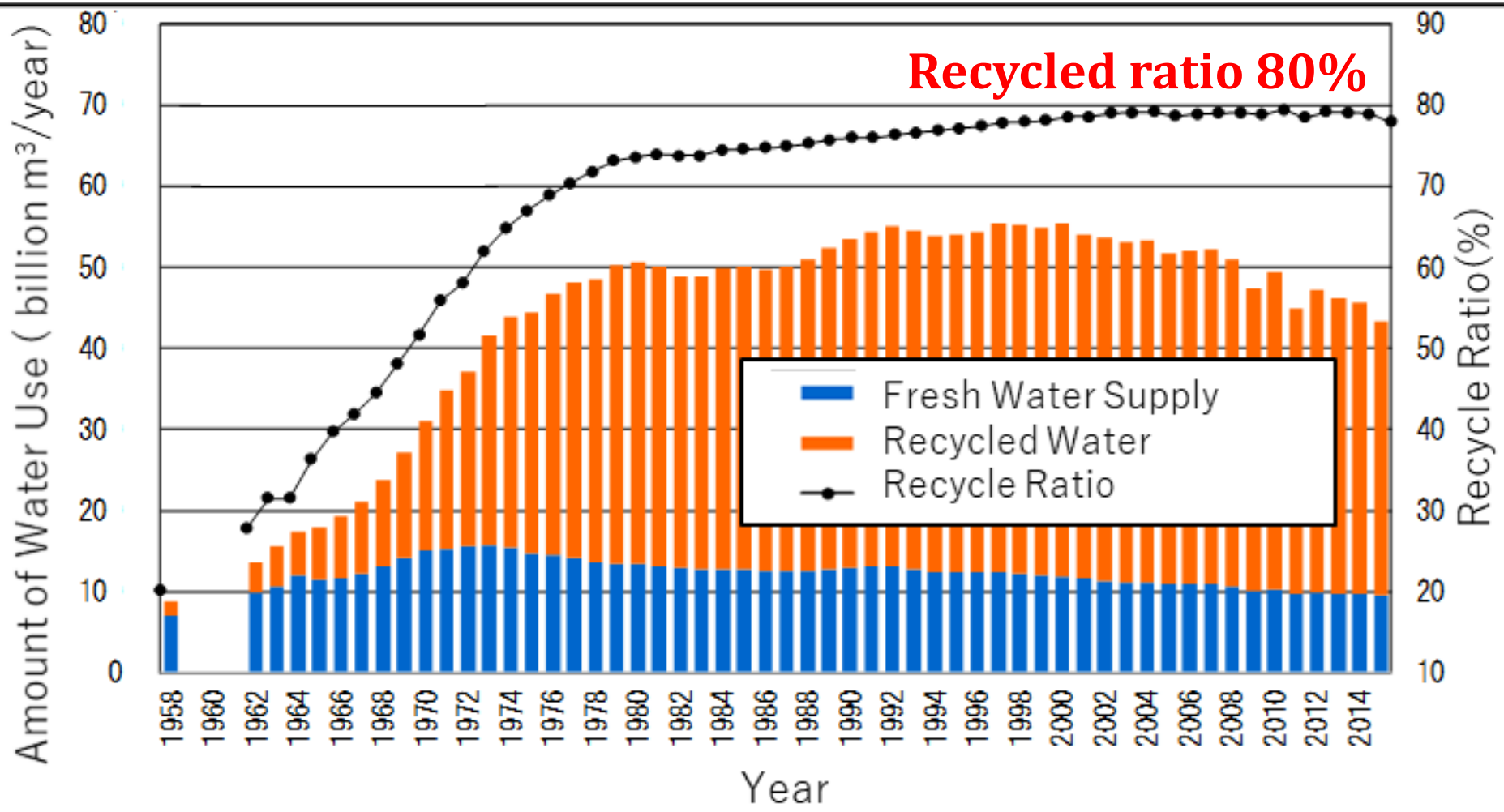
#### 1. Supply industrial water

- a. Developing water sources and **industrial water supply**
- b. **Subsidize industrial water**

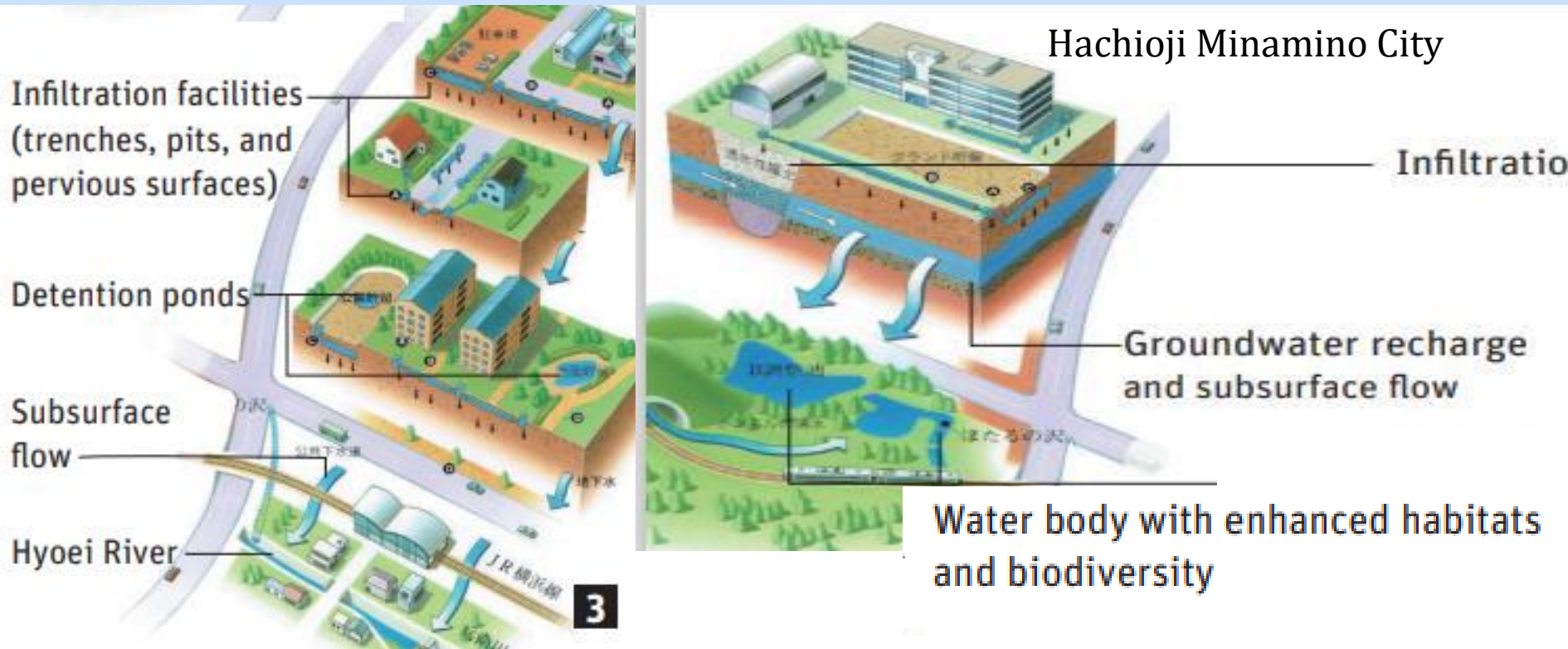
#### 2. Conserve sources of groundwater

- a. **Regulation zones:** land subsidence and other groundwater damage occurred be designated.
- b. Wells with pump outlet of 21 cm<sup>2</sup> (currently 6 cm<sup>2</sup>) and over need governor's **permission**.
- c. Boring new wells unmet the **standard** is prohibited.

## (2) Recycling in industrial water



### (3) Water cycle: Development of housing compound

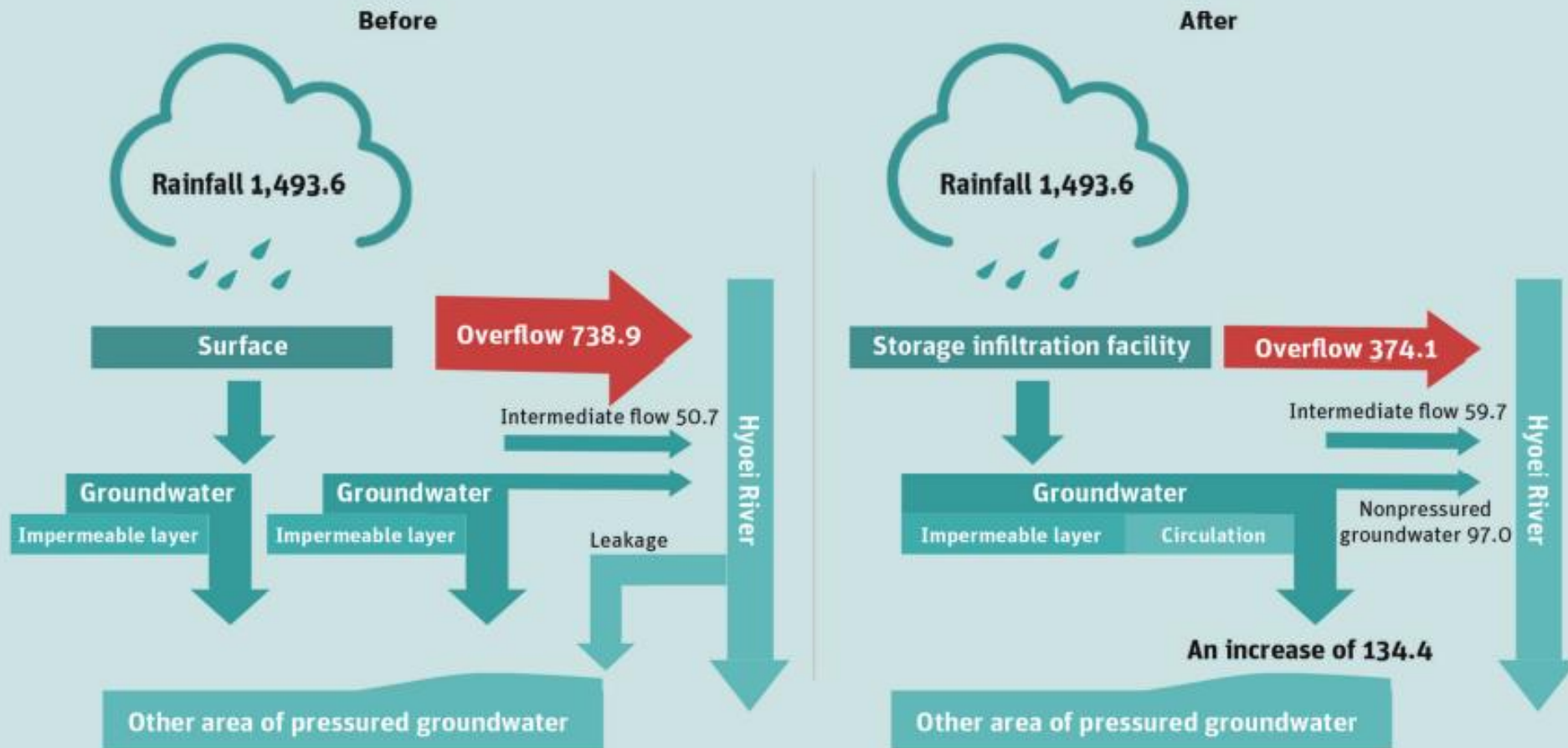


- ✓ Flood peak discharge reduced by 20~40%
- ✓ discharge at droughts increased by 1.5 ~ 2 times

## Development of housing compound: Hachioji Minamino City



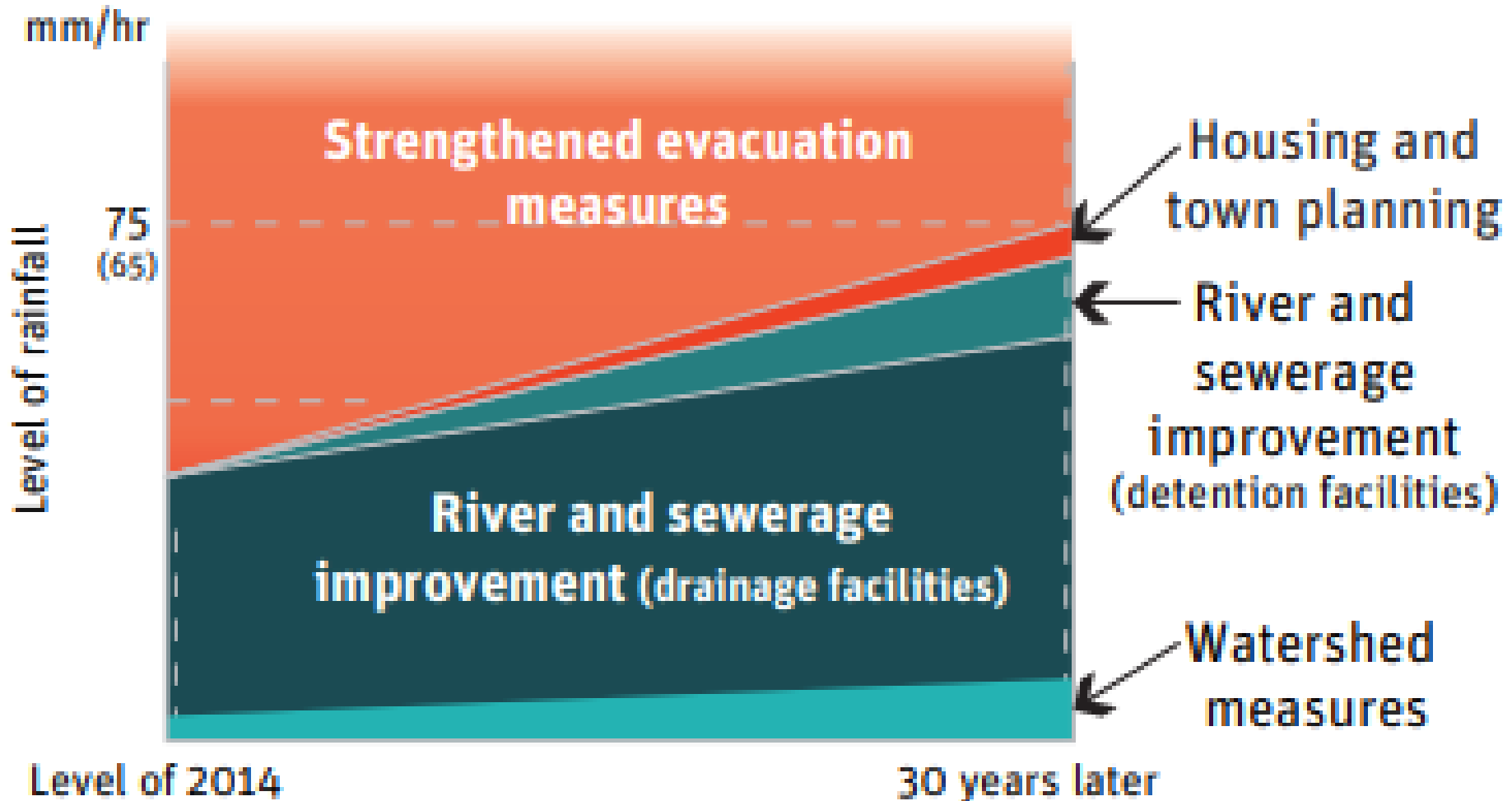
## Development of housing compound: Hachioji Minamino City



Source: UR 2018.

# 5. Flood Protection

## Comprehensive Flood Protection: Tokyo Basic Policy for Heavy Rain Management





## Joint project

### Myoshoji River No.1 Adjustment Pond

- Integrated project of housing and flood protection
- land ownership shared by UR and local gov.
- Reservoir, implementation and O&M costs



## 6. Improving Water Environment

### (1) Green Infrastructure: Nature oriented approach

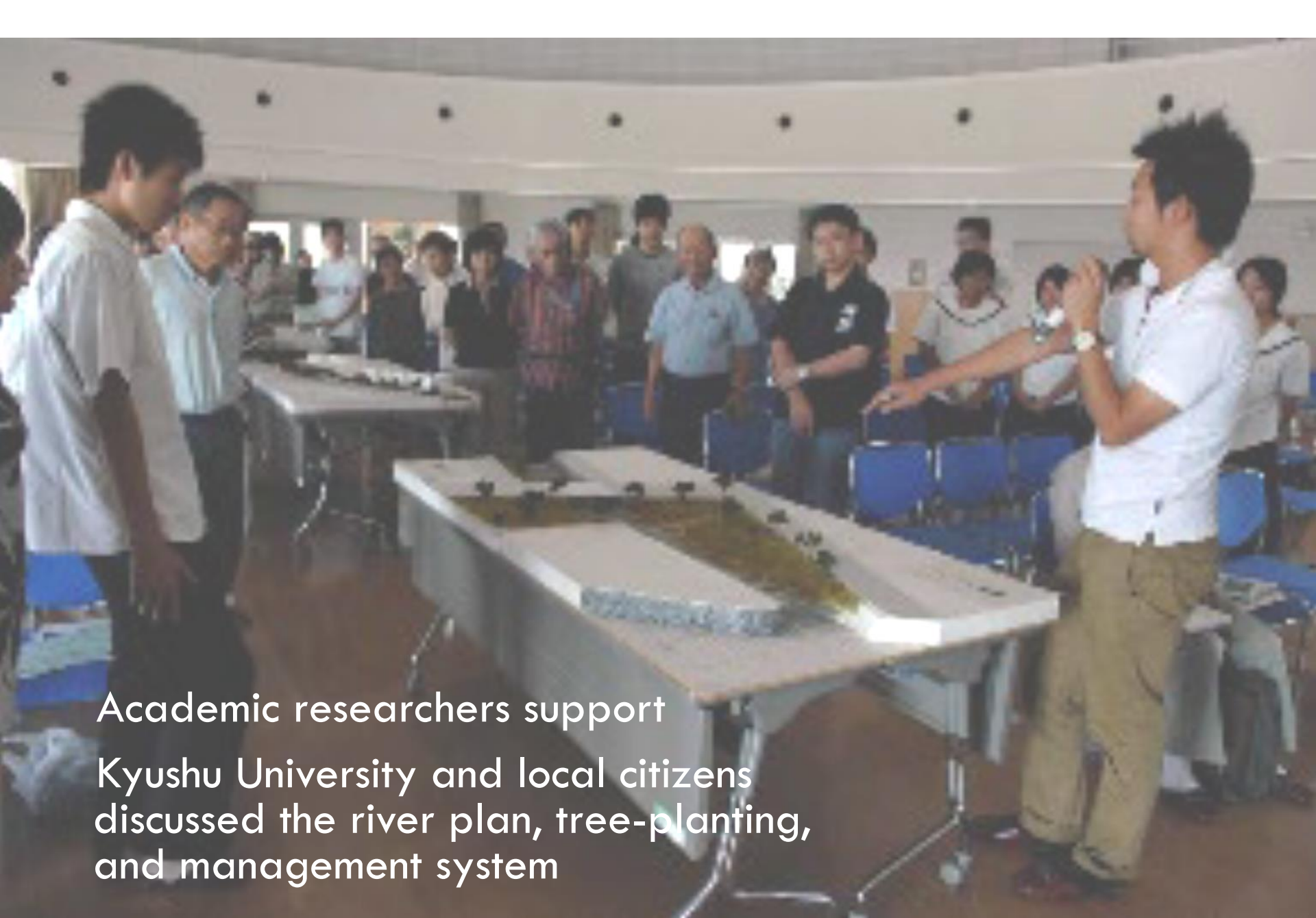


- to preserve and create ecosystems and landscapes by utilizing functions of nature
- From the 1990s, stems from reflection of gray infrastructure
- “cost-effective”.
- Flood protection is the leading area of Green Infrastructure in Japan

## Kamisaigogawa river in fukutsu city

- children play in rivers and people walk around
- environmental education for school children
- local community cleans river and cuts grasses





Academic researchers support  
Kyushu University and local citizens  
discussed the river plan, tree-planting,  
and management system

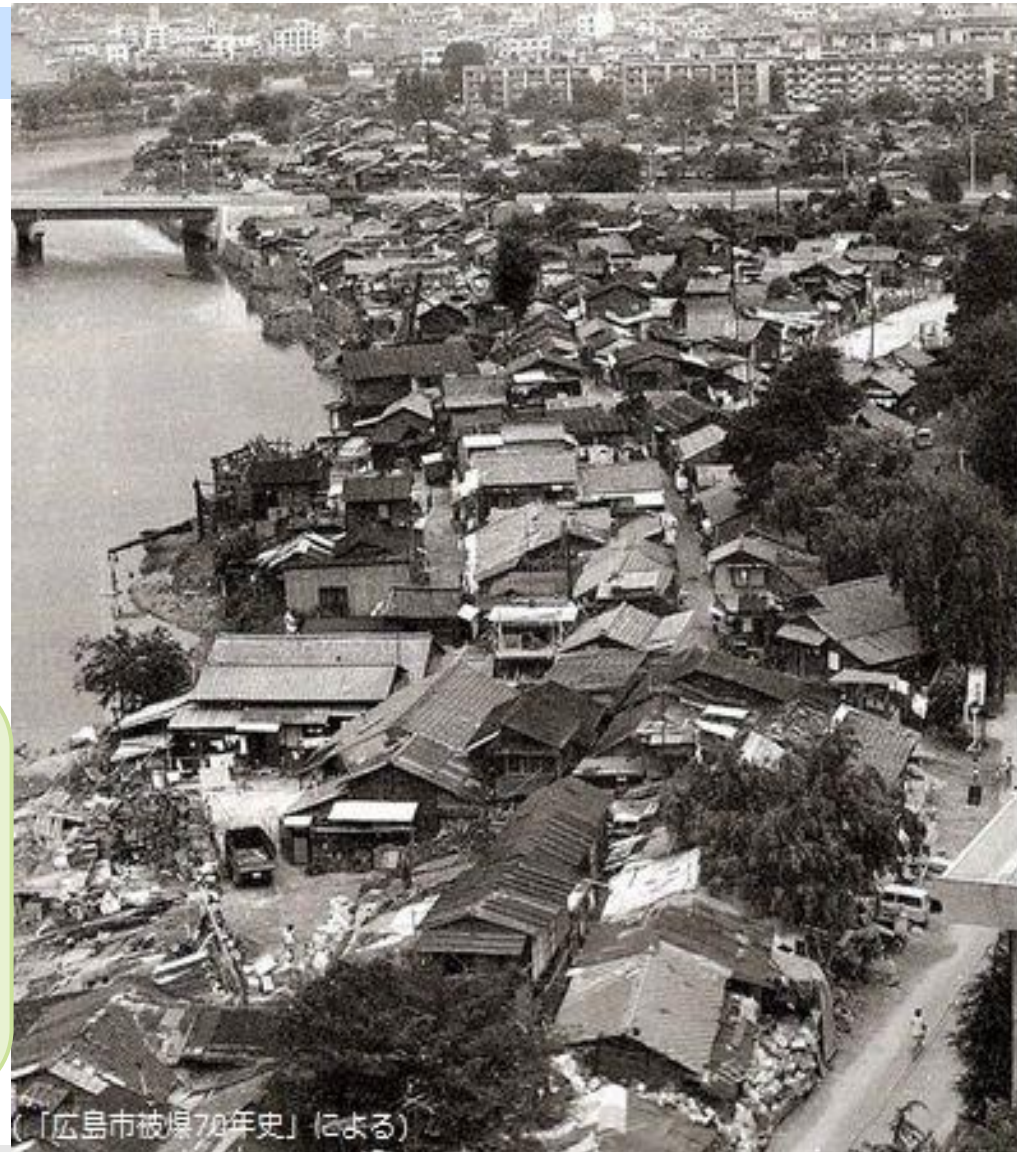
## (2) Urban Poor

**Post-World War II  
“Atomic Bomb Slums”  
In Hiroshima**  
victims of the bomb &  
repatriates



**Coping with Housing  
Shortage and flood  
protection**

- 4500 high-rise affordable housing
- Flood protection works



## Affordable apartments and river works



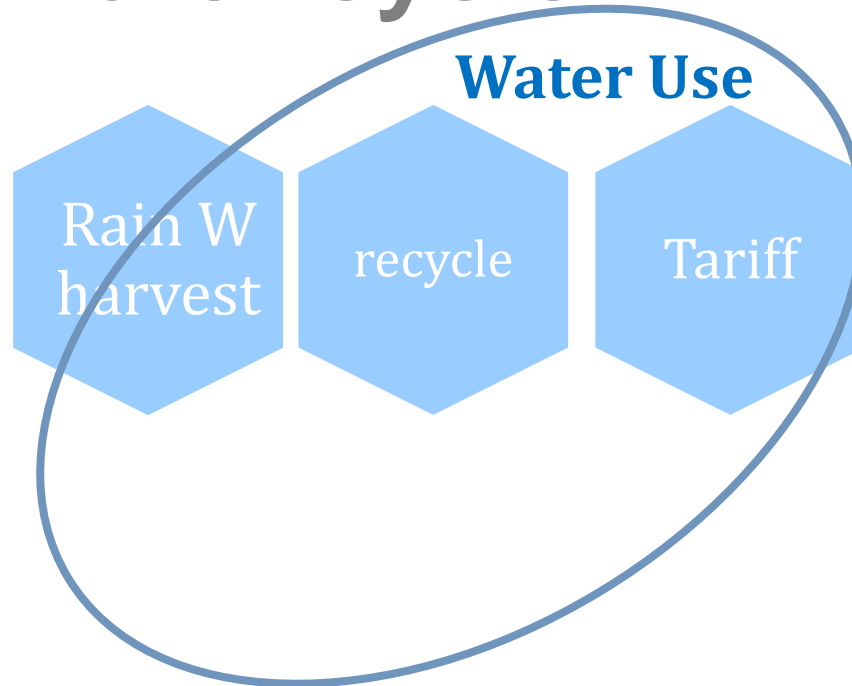
## Current Response to the Urban Poor in River

- homeless have built temporary huts & settled down on rivers
- In Arakawa, MLIT office is patrolling to provide guidance to the urban poor



# Summary

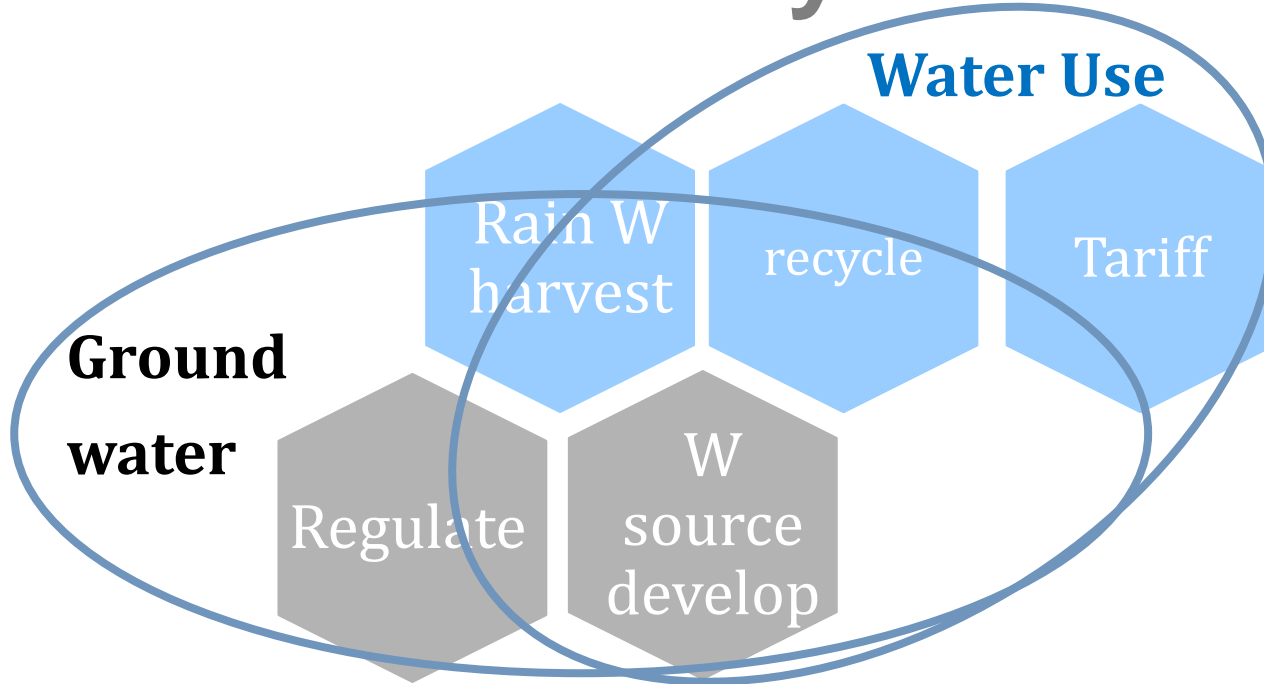
## Restore water cycle





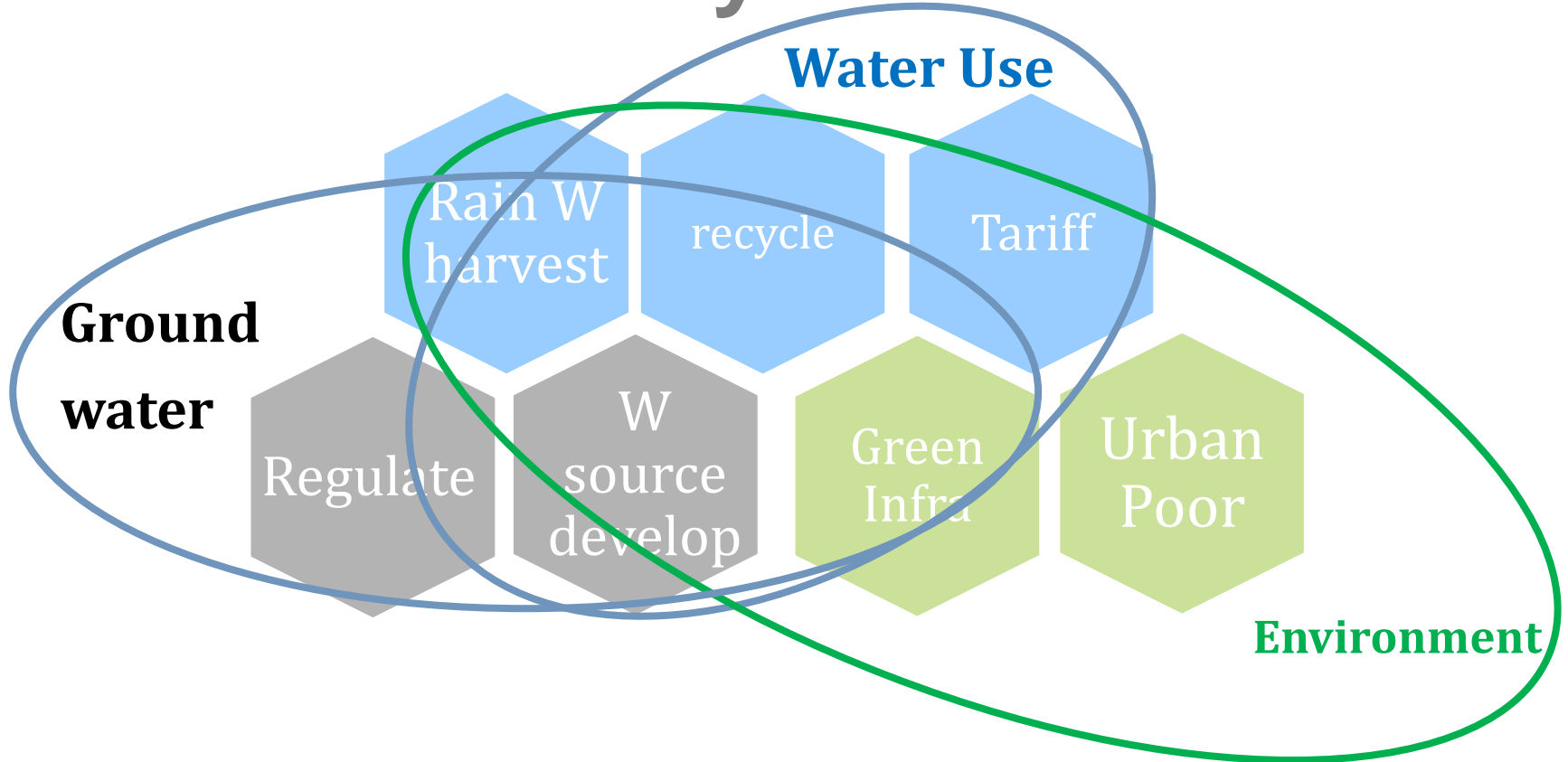
# Summary

## Restore water cycle



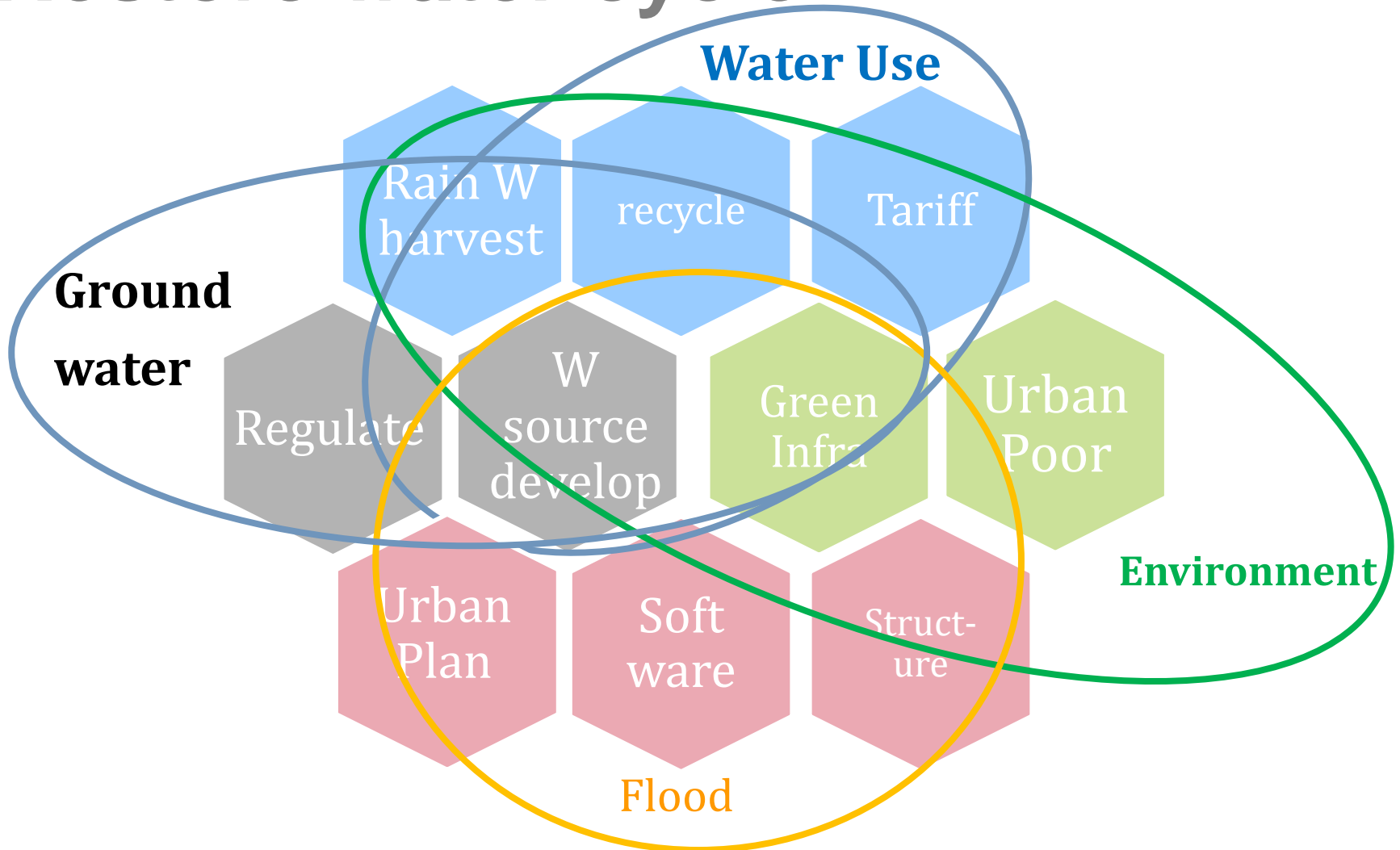
# Summary

## Restore water cycle



# Summary

## Restore water cycle



# Thank you, Mikio Ishiwatari, PhD

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## 7. Lessons Learned (1)

- (1) To resolve various urban related issues, the water cycle should be restored.

The concentration of urban population, expansion of urban areas, and increase in socioeconomic activities have caused deterioration of the water cycle in urban areas. These affect various areas in terms of the quality and quantity of water, the riparian environment, and groundwater.

- (2) Water demand management and water recycling should be promoted.

Water demand could be managed by tariff systems and other software measures. The reduction of water leakage and use of rainwater and recycled water should be promoted. A review of the production process and recycling water is also required for industrial water supply.

## Lessons Learned (2)

- (3) To mitigate the flood damage, comprehensive measures should be taken.

Urbanization caused a decline in water retention capacity and an increase in peak flood discharge. Flood risk is increased by climate change. Thus, integrated approaches to improve river facilities, river basins, and flood damage mitigation should be undertaken. Cooperation among related organizations should also be consolidated.

- (4) To conduct efficient development, the private sector's expertise should be utilized.

For example, parks and piloti-type housing complexes were developed above regulation ponds to store floodwaters in Tokyo. The government organizations provided incentives to the private sector. This has enabled the effective use of expensive land in urban areas.

# Lessons Learned (3)

- (5) To improve the water environment, multiple approaches should be taken in terms of water quality, discharge, ecosystems, and recreation.

A decline in water quality during high economic growth in Japan has resulted in ecosystem deterioration, and residents have avoided access to rivers. Various efforts to improve the water environment have been implemented to integrate “river space” and “town space,” improve the waterfront environment, and conserve the ecosystem. Flood protection facilities have also contributed to urban development by providing recreational functions. Involving the local community and private organizations in implementing these initiatives was necessary. This collaboration led to the creation of a good space uniting the “river” and “town,” which promoted tourism and rejuvenated the area.

# Lessons Learned (4)

(6) **Developing green infrastructure can achieve multiple benefits.**

Flood protection works contribute to achieving various objectives using natural functions. These objectives include disaster management, improvement of the living environment and waterfront, conservation of ecosystems, promotion of regional development, and mitigation of climate change.

(7) **To improve issues of the urban poor in rivers public housing should be provided with river improvement works.**

There were many slum areas along rivers in urban areas in Japan during post-WWII periods. Japan resolved these problems by providing affordable public housing for the urban poor with implementing flood protection works.