Theme 4
Water Pollution and Environmental Management

Preventing damage to human health and lives and creating Sustainable Environment

Contents

1. Introduction

Why is water pollution control important?

Prioritize Economy over Environment and Water Pollution

Destruction of Environment and Severe Pollution

Need to Establish Legal System to Regulate and Improve Quality of Wastewater Discharge

2. Water Pollution

(1) Water Pollution Diseases and Legal System in Japan

"Polluting Industry"

- After the World War II, to achieve heavy industrialization was promoted.
- The Government prioritized infrastructure development for industry over living facilities.
- Large-scale industrial complexes were built in the coastal areas and pollution intensified and spread spatially.

Four major pollution-related diseases emerged because of wastewater from factories and air pollution

Minamata	Itai-Itai
2nd Minamata	Yokkaichi Asthma

2. Water Pollution

(1) Water Pollution Diseases and Legal System in Japan

Local Governments faced the brunt of criticism regarding environmental issues, and had to solve the problems on their own before the national government could act.

From early 1950s, movement to establish pollution-related regulations began, however, it was difficult due to opposition from the industry sector, especially from the mining industry.

From 1953 to 1957, MHW held 20 conferences with the relevant ministry. In 1970, "Pollution Diet" enacted 14 pollution-related laws.

MHW: Ministry of Health and Welfare

2. Water Pollution

(1) Water Pollution Diseases and Legal System in Japan

1) Legal Systems for Dealing with Water Pollution

Water Pollution Prevention Act (1970)

Basic Environment Act (1993)

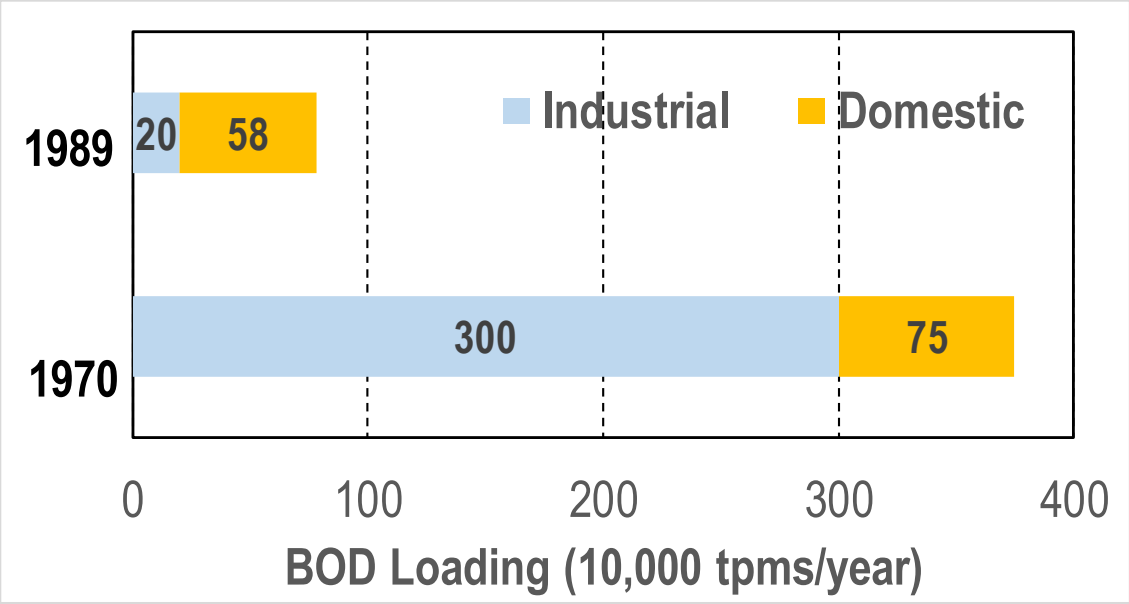
2) Organization Development

- Central Environment Council dealt with environmental policy in general.
- Environmental Agency integrally control pollution regulations under the jurisdiction of 13 ministries.
- Local governments given the responsibility to formulate and implement measures

2. Water Pollution

(2) Wastewater Regulation

2) Factory Effluents



Source: Environmental Strategy of Water, Nakanishi Junko, Iwanami Publications

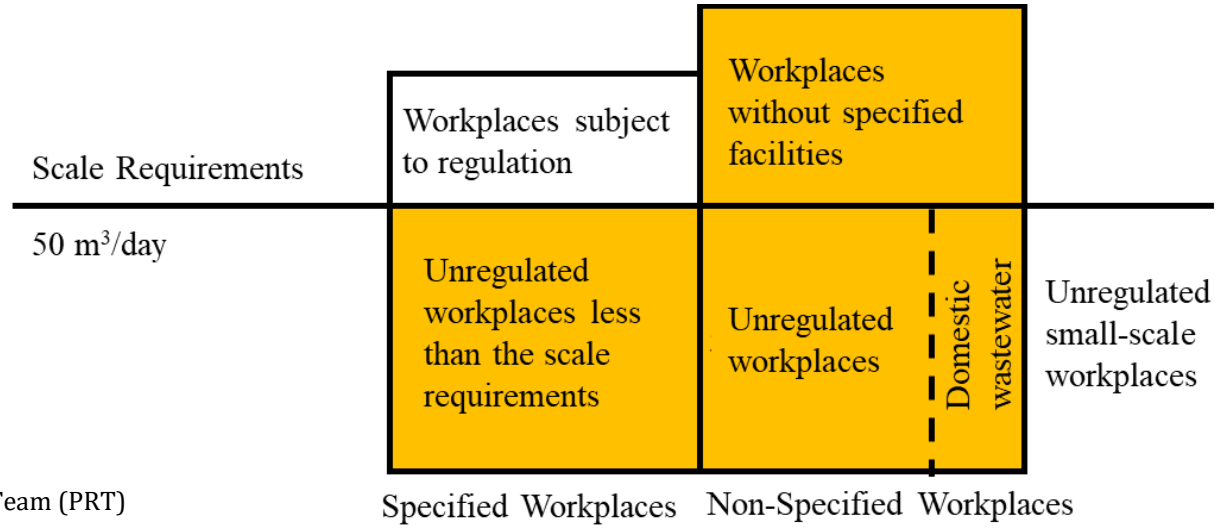
BOD Loading

2. Water Pollution

(2) Wastewater Regulation

2)Factory Effluents

- Regulated by effluent standards and total pollutant load control.
- Obligation to measure and on-site inspection.
- Factories have own treatment facilities before discharging wastewater into public waters, or they are connected to sewerage systems.



Source: Project Research Team (PRT)

Specified Factory Subject to Water Pollution Prevention Act

2. Water Pollution

(2) Wastewater Regulation

3) Agricultural Wastewater

Domestic water treatment:

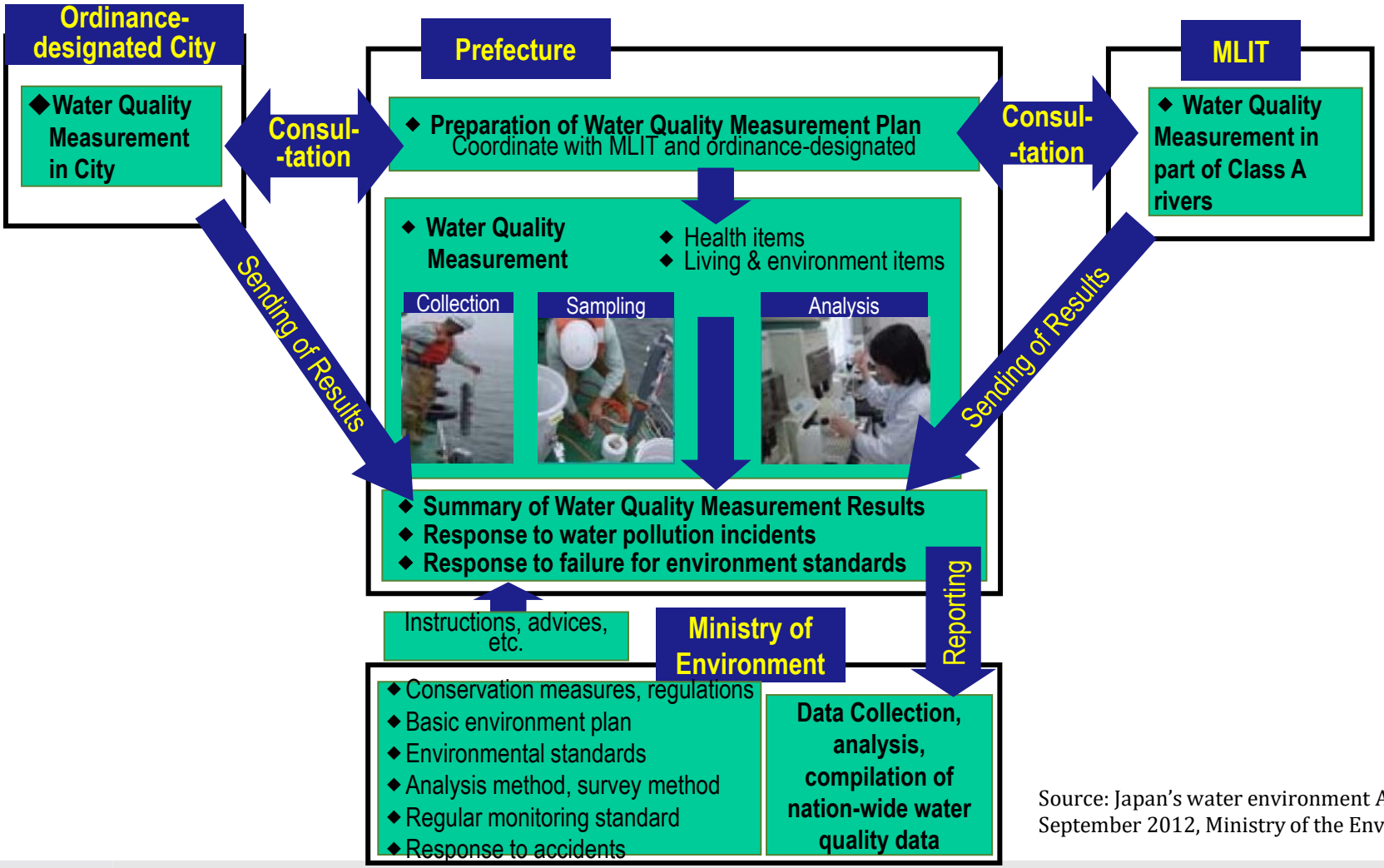
- Johkasou (On-site wastewater treatment)
- Rural Seweregе Systems

Regulation for Pesticides:

- Manufacture, import sell, use only registered pesticides by MAFF.
- Standard for applicable type of crops, time of use, amount of use.

2. Water Pollution

(3) Water Quality Monitoring to Ensure Clean Water



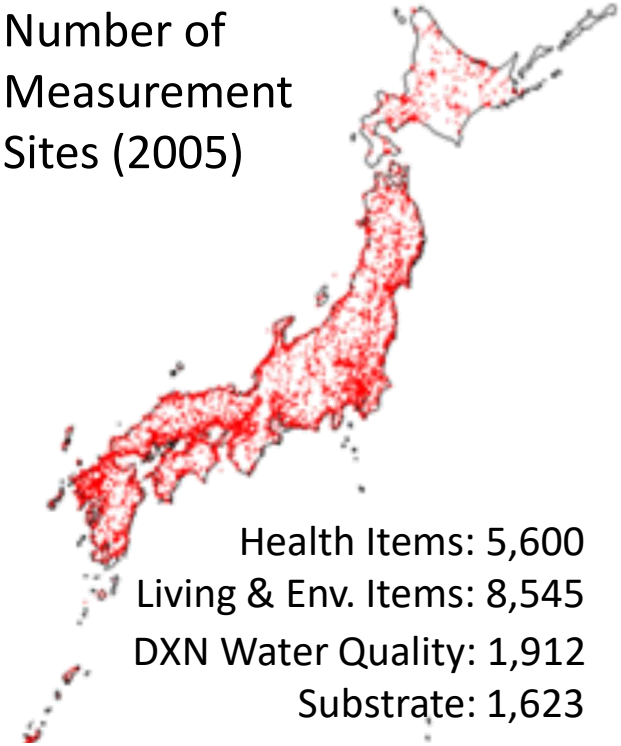
Source: Japan's water environment Administration, September 2012, Ministry of the Environment

Regular Monitoring System

2. Water Pollution

(3) Water Quality Monitoring to Ensure Clean Water

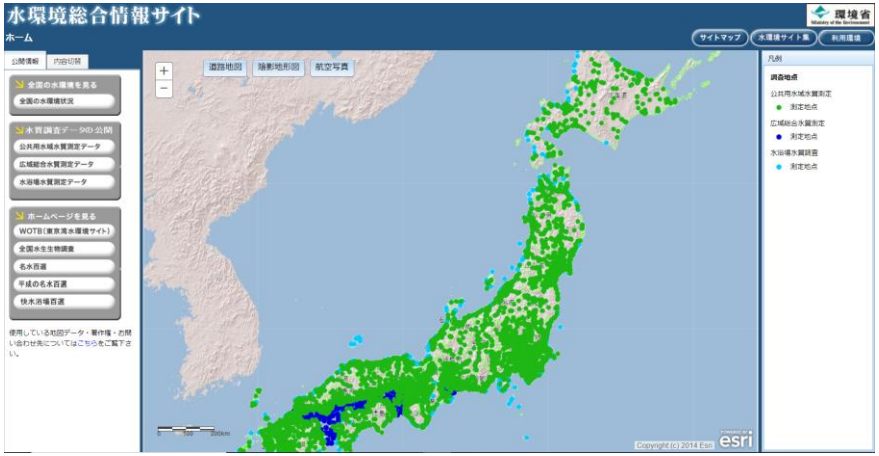
Number of Measurement Sites (2005)

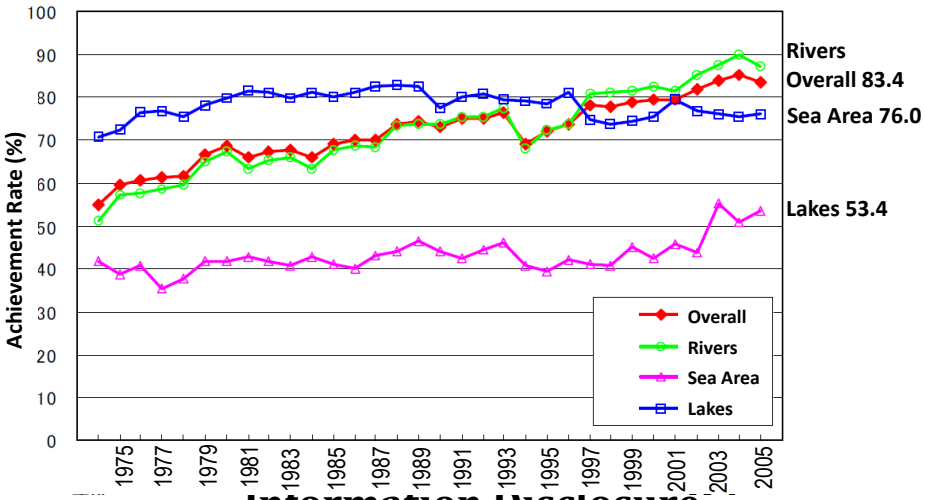


Health Items: 5,600
Living & Env. Items: 8,545
DXN Water Quality: 1,912
Substrate: 1,623

Measurement Site in Japan

Source: Japan's water environment Administration, September 2012, Ministry of the Environment



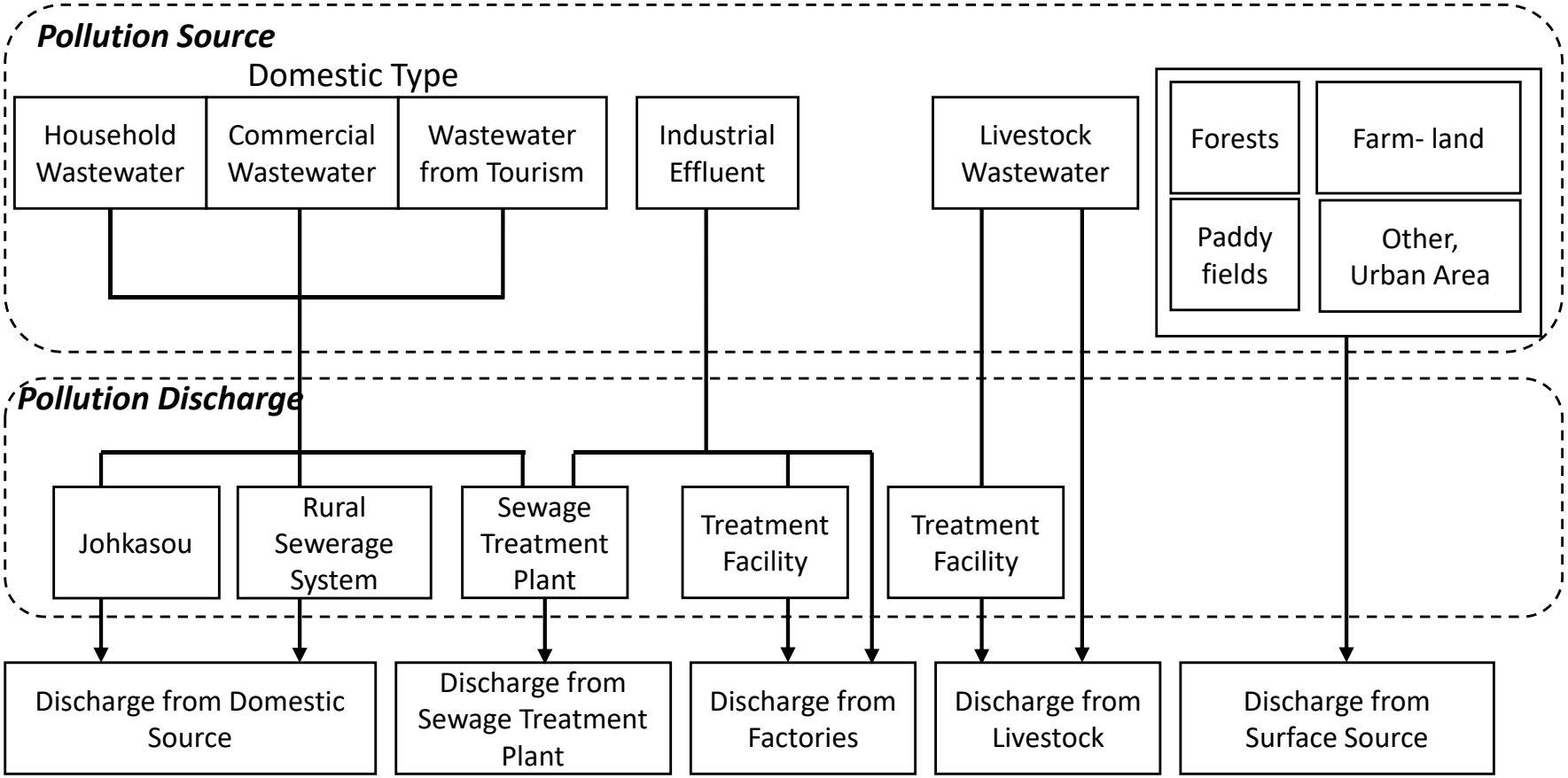


Information Disclosure

3. Securing Clean Surface Water

(1) Improving Water Quality Discharged into Public Water Bodies

1) Pollution Sources



Source: Prepared based on Guidelines and Commentary on the Comprehensive Basin-wide Planning of Sewerage Systems, MLIT, 2015

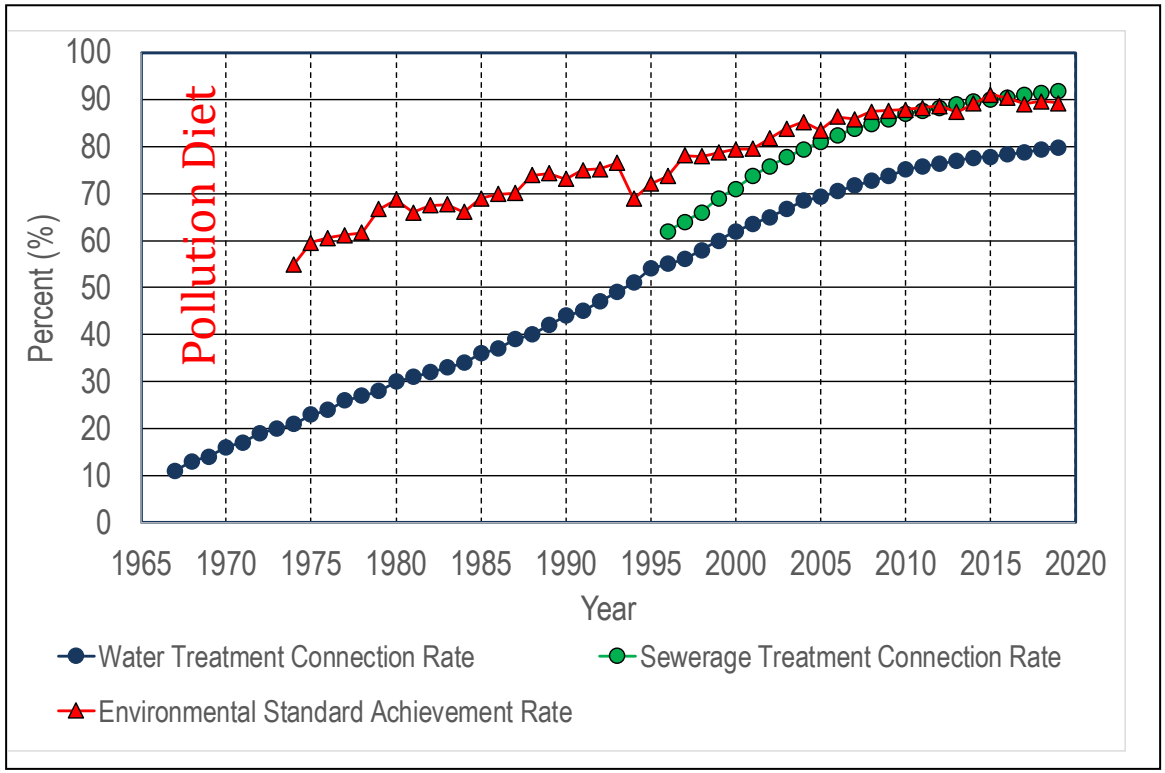
Sources of Pollution and Discharge

3. Securing Clean Surface Water

(1) Improving Water Quality Discharged into Public Water Bodies

2) Domestic Wastewater Treatment in Japan

- Wastewater treatment connection rate was 90.9% in 2017.



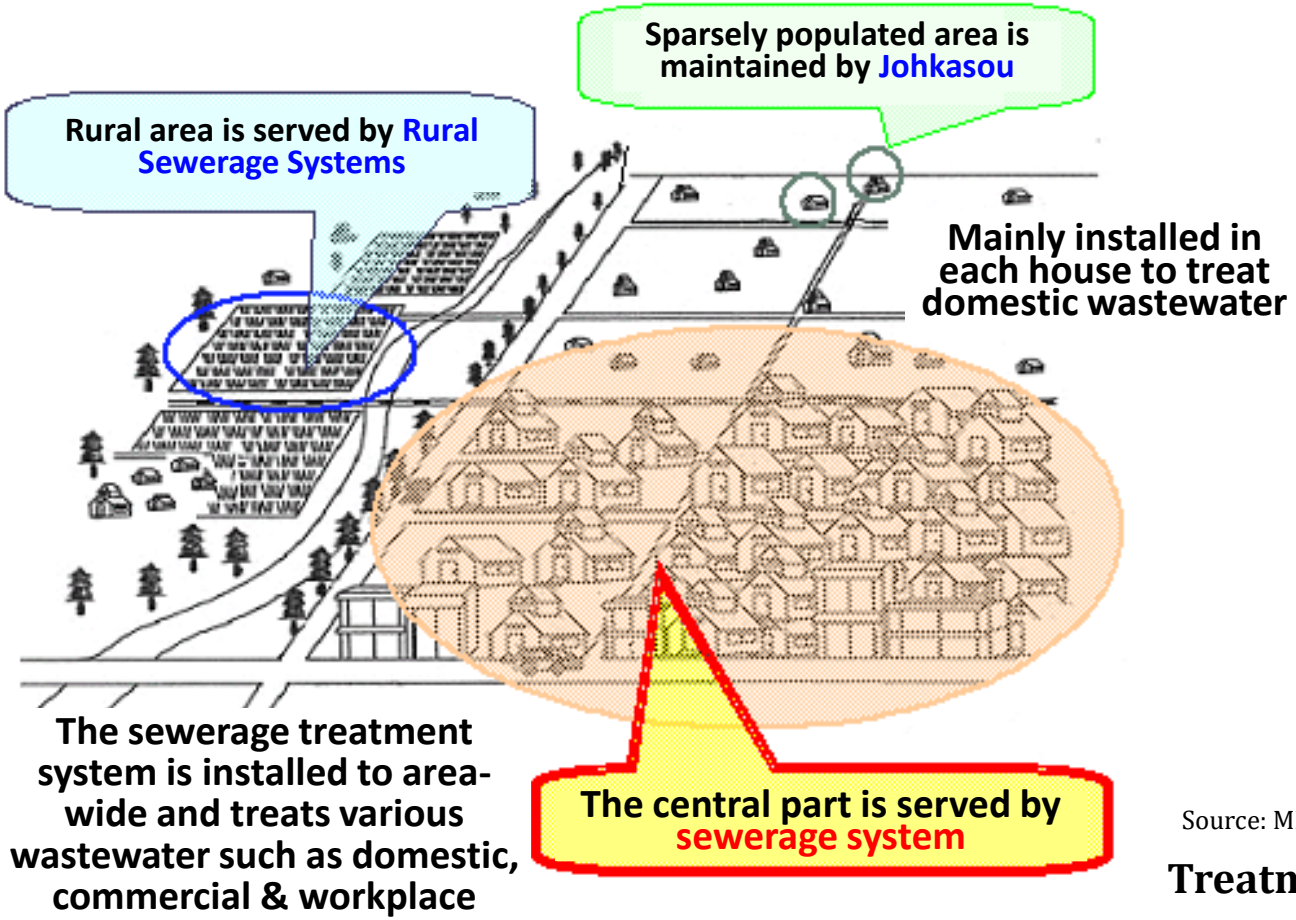
Source: Promotion of Sewerage Development, MLIT, with additions and corrections

Wastewater Treatment Connection Ratio

3. Securing Clean Surface Water

(1) Improving Water Quality Discharged into Public Water Bodies

2) Domestic Wastewater Treatment in Japan



Source: MLIT Website

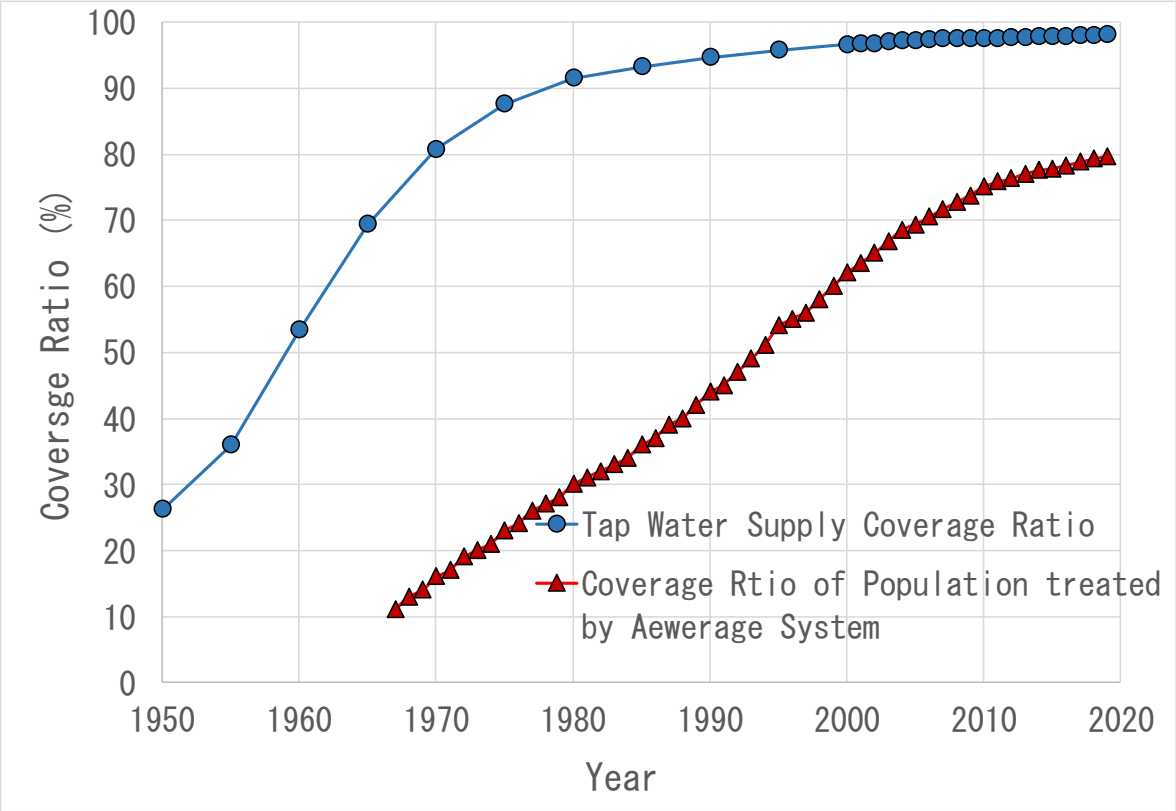
Treatment Facility Development

3. Securing Clean Surface Water

(1) Improving Water Quality Discharged into Public Water Bodies

2) Sewerage Treatment

- Sewerage Treatment Coverage Ratio is 79.7% as of 2019. It has increased by 70% in 50 years since 1965.



Source: MLIT Website

Changes in Water Supply and Sewerage Treatment Coverage Ratio

3. Securing Clean Surface Water

(1) Improving Water Quality Discharged into Public Water Bodies

3) Category of Sewerage System

Public Sewerage System
Treats sewage in urban areas

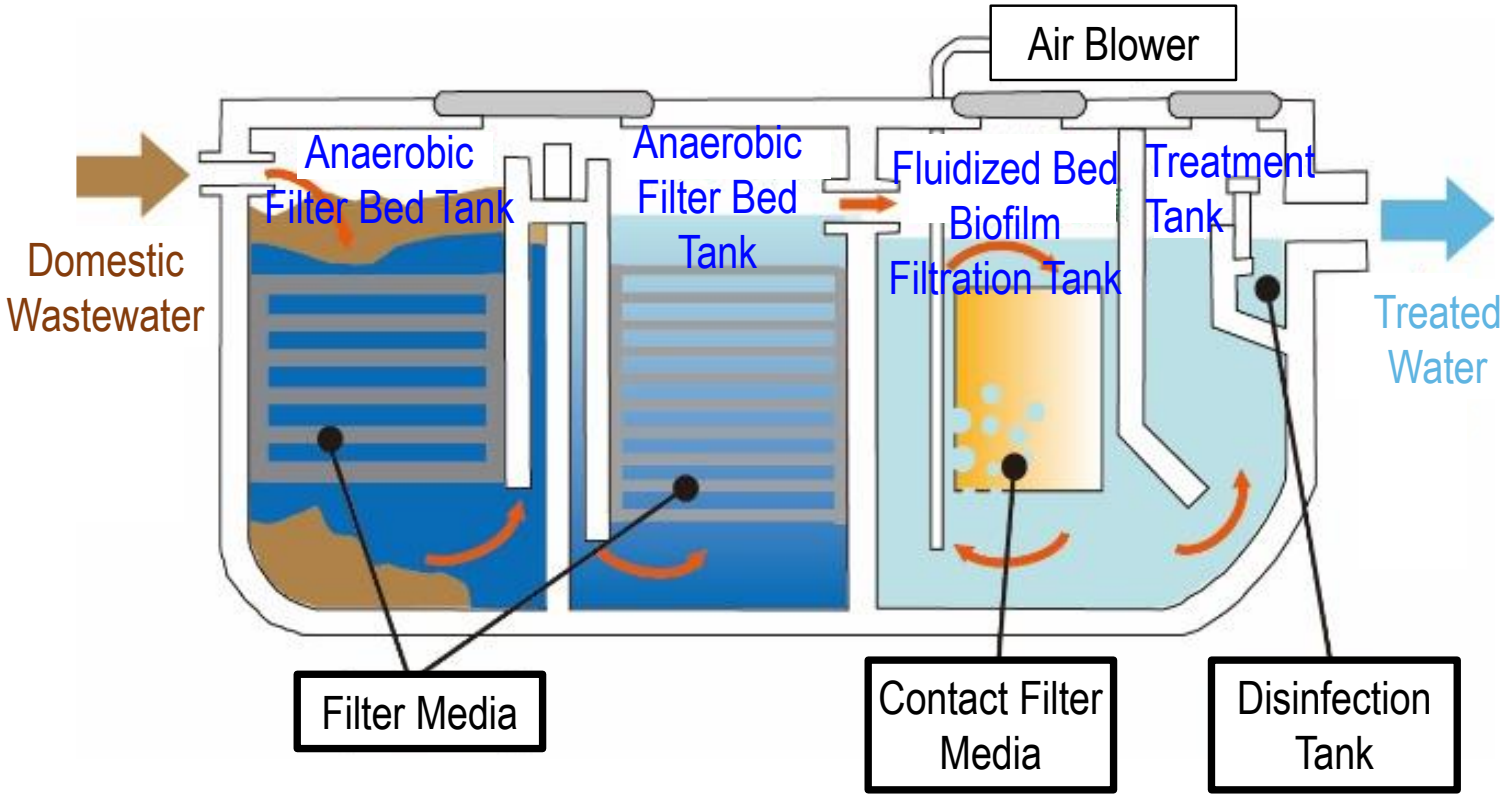
River Basin-wide Sewerage System
Receives & treats sewage from sewerage systems managed by multiple local governments

Urban Sewerage System
Drain sewage mainly from rainwater in urban areas

3. Securing Clean Surface Water

(1) Improving Water Quality Discharged into Public Water Bodies

4) Domestic Water Treatment in Rural Area



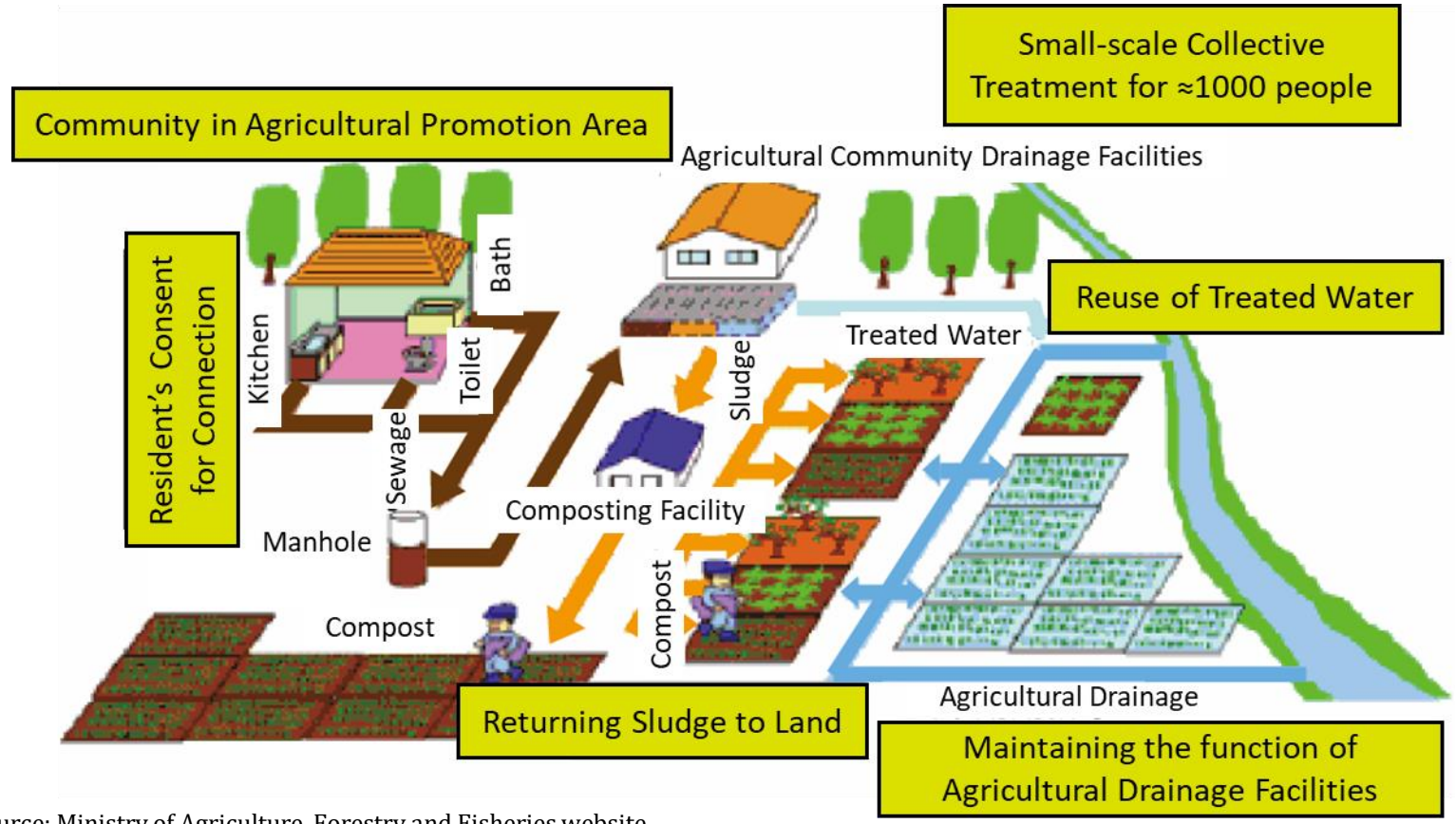
Source: Website of Cleanup Federation in Wakayama Prefecture

Domestic Water Treatment by Johkasou

3. Securing Clean Surface Water

(1) Improving Water Quality Discharged into Public Water Bodies

5) Rural Sewerage System and Drainage



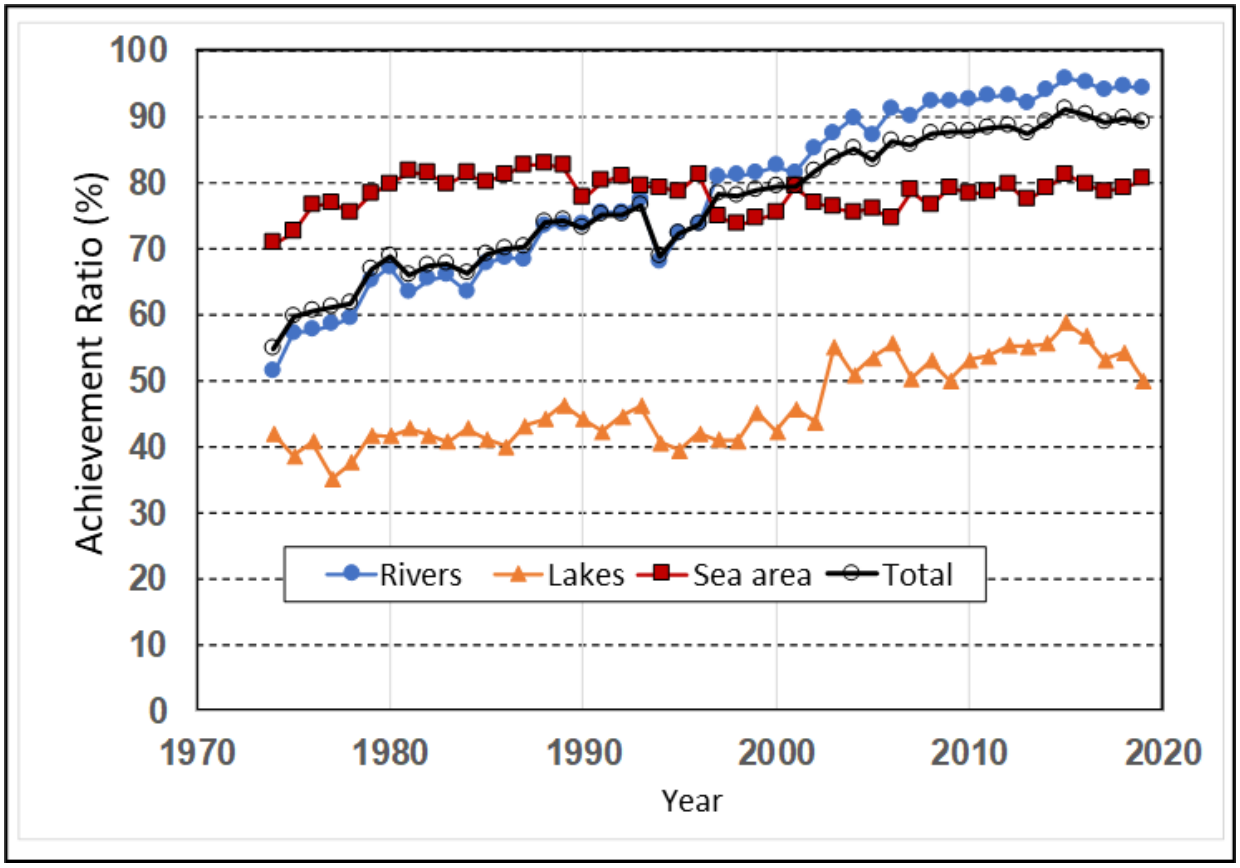
Source: Ministry of Agriculture, Forestry and Fisheries website

Rural Sewerage System and Drainage

3. Securing Clean Surface Water

(2) Improving Water Quality in Closed Water Bodies Prone to Water Quality Degradation

1) Achievement of Environmental Standard



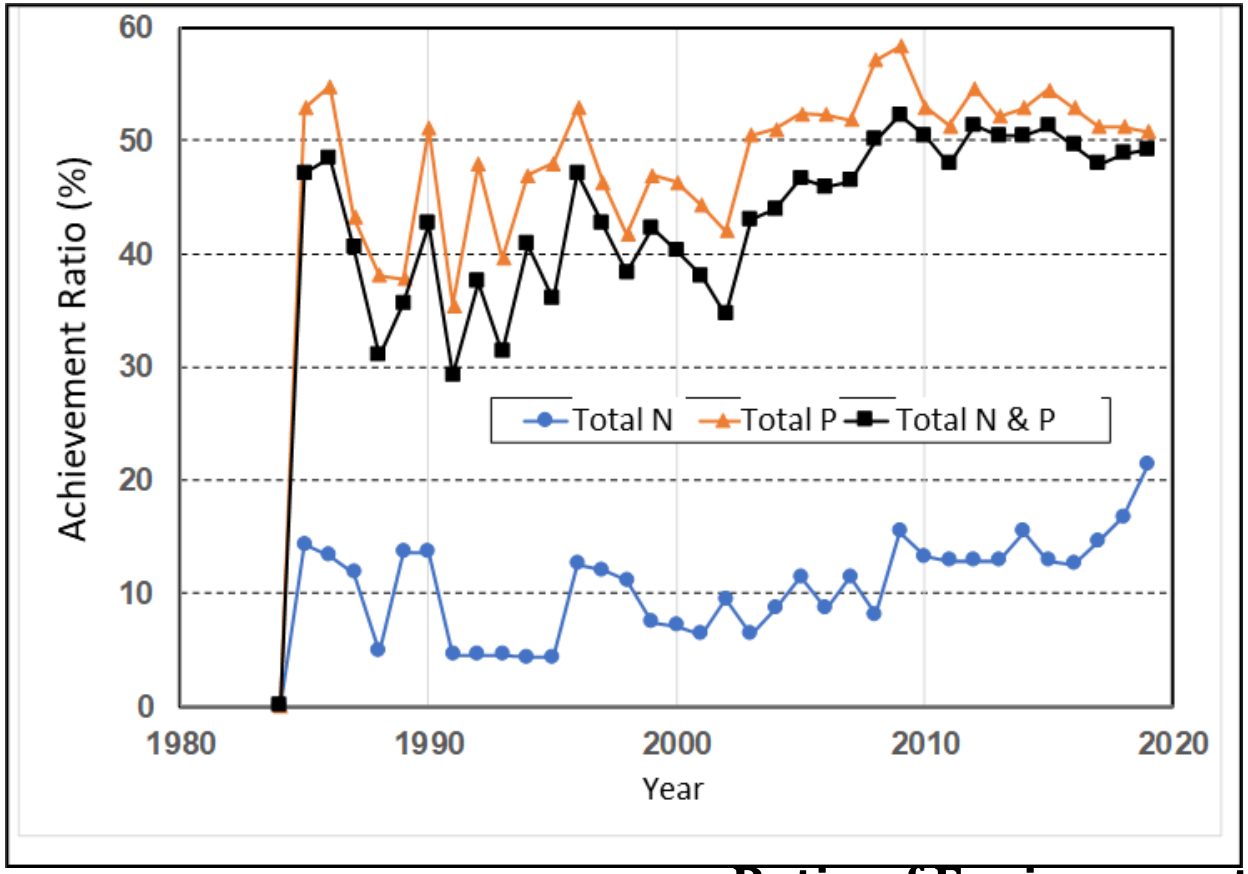
Source: 2019 Water Quality Measurements of Public Waters, Ministry of the Environment

Ratio of Environmental Standards Achievement (BOD or COD)

3. Securing Clean Surface Water

(2) Improving Water Quality in Closed Water Bodies Prone to Water Quality Degradation

1) Achievement of Environmental Standard



Source: 2019 Water Quality Measurements of Public Waters, Ministry of the Environment

Ratio of Environmental Standards Achievement for T-N and T-P in Lakes

3. Securing Clean Surface Water

(2) Improving Water Quality in Closed Water Bodies Prone to Water Quality Degradation

2) Runoff Water Improvement Promotion Plan

Point Source Loads

- Increase coverage area of sewerage system, Johkasou (on-site wastewater treatment).

Non-point Source Loads

- Measures for Load Source: Preventing load generation by human activities, removing load substances accumulated in source area.
- Measures for Discharged Load: Controlling rainwater runoff and purifying discharged water.
- Measures at Water Area to be Conserved: Prevent pollution runoff flowing into rivers by purification.

4. Financial Resources for Measure Against Water Pollution

(1) Cost Sharing

- Sewerage Facilities: publicly owned company financially independent
- Construction cost: borrowing through local government bond
- Beneficiaries pay principle

Type	Construction Costs	
Public Sewerage	Government Funds (Grant Rate: ½ of major pipes, ½ or 5.5/10 of treatment plants)	
	Local Funds	Local government bonds (Appropriation rate 100%) Contribution from users Prefectural subsidies
River-basin Sewerage	Government Funds (Grant Rate: ½ of major pipes, ½ or 2/3 of treatment plants)	
	Local Funds	Local government bonds (Subsidies: Appropriation rate 60%, Local government finance: Appropriate rate 90%) Local government cost: Local Government bonds (Subsidies: Appropriation rate 60%, Local government finance: Appropriation rate 90%) Transfer to General Account (cities, towns, villages) Transfer to General Account (Prefectures)

4. Financial Resources for Measure Against Water Pollution

(2) Financial Resources for Facility Development

Key issues for sewerage facility development:

- Principle of public fund for rainwater treatment and users fee for sewerage.
- Improving financial management of publicly owned companies for sewerage system.
- Financial support for developing sewerage system in rural areas (subsidies, grants, other incentives).
- Collect sewerage usage fees at same time as water usage bills.

4. Financial Resources for Measure Against Water Pollution

(3) Polluter-Pays Principle

The Polluter-Pays Principle

- Countries where the government bears cost of pollution control is unfair in international competition.
- "Guiding Principles concerning International Economic Aspects of Environmental Policies" OECD, 1972.

Basic Environment Law

Water Pollution Prevention Act

- Private businesses were required to invest in water pollution control measures.
- Government provided loans for these facilities.

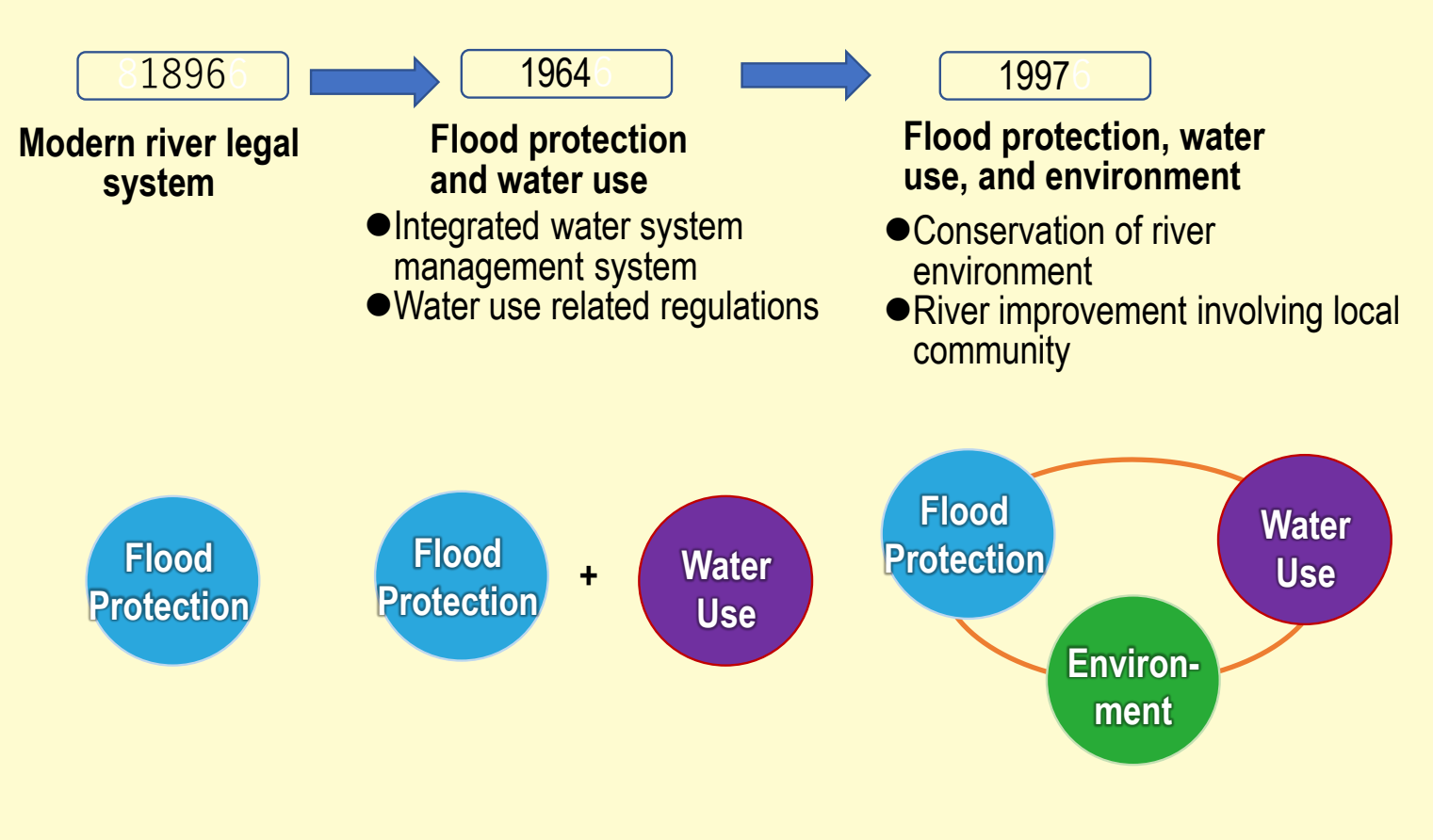
5. River Environmental Management

(1) Trends in River Environment Improvement

1958-	River water quality survey for addressing water pollution
1975	River Council report on River Environment Management
1983	Start formulating Basic Plan of River Environment Management
1990	Initiative of "Nature-friendly River Work"
1990	National Survey on Natural Environment in River and Water Shore
1997	Revision of the River Law (include river environment)
2002	Formulating and promoting Nature Restoration Projects
2013	Formulating and promoting Nature Restoration Projects
2013	River Cooperation Organization System (people's participant)

5. River Environmental Management

(2) Revision of the River Law



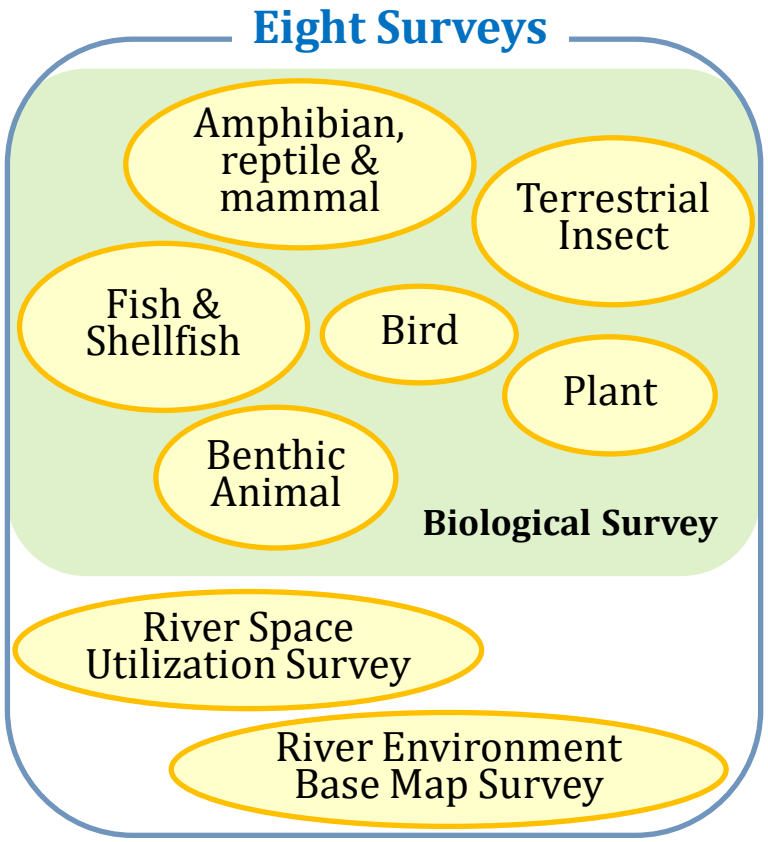
Source: New developments in river environment administration, MLIT

History of River Law Revision

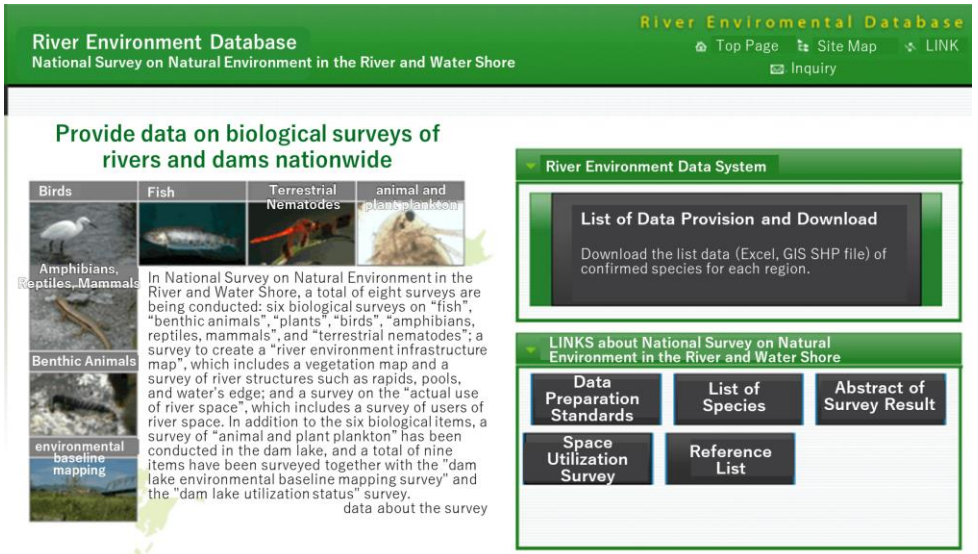
5. River Environmental Management

(3) River Environment Survey

National Survey on Natural Environment in the River and Water Shore



- Results made public as a database
- Used for river development and maintenance plan study



Source: MLIT National Institute for Land and Infrastructure Management website

5. River Environmental Management

(4) Plan to Manage the River Environment

Tama River Environmental Management Plan – Space Management

A. Development Improvement Zone
Developments such as sports facilities and recreational facilities will be actively provided.

B. Facility Utilization Zone
A zone primarily for development, but also for educational facilities.

C. Improvement and Nature Zone
A zone used half for development and half for nature-oriented purposes.

D. Nature Utilization Zone
A zone primarily for nature-oriented facilities, but with some development also included.

E. Nature Preservation Zone
A zone for preserving natural ecosystems. Facilities for active use by humans will not, in principle, be constructed.


① Evacuation space


② Local facility-based recreational space


⑤ Nature-oriented recreational space


⑥ Educational space


③ Regional facility-based recreational space


④ Sports and health promotion space


⑦ Sensitivity development space


⑧ Ecosystem preservation space

Source: Guidebook to the Plan to Manage the Natural Environment of the Tama River, MLIT, March 2002

5. River Environmental Management

(4) Plan to Manage the River Environment

Tama River Environmental Management Plan –Water Surface Management

Waterside Spaces

1) Waterside Activities Space

The waterside zone is located adjacent to area designated as 2)local facility-based recreational spaces, 3)regional facility-based recreational spaces, and 4)sports and health promotion spaces, where people can safely fish, play in the water, and so on

2) Waterside Nature Utilization Space

This zone is located adjacent to areas designated as 5)nature-oriented recreational spaces, 6)educational spaces, and 7)sensitivity development spaces, where people can safely observe nature and go on nature walks.

3) Waterside Nature Preservation Space

This zone is located adjacent to areas designated as 8)ecosystem preservation spaces, where a sound natural environment is protected to sustain plant and animal habitants.

Source: Guidebook to the Plan to Manage the Natural Environment of the Tama River, MLIT, March 2002

5. River Environmental Management

(5) Management of River Water Quality

River Law (1964)

- Maintaining and improving water quality by diluting or purifying wastewater and preventing saltwater intrusion,
- Maintaining river channels and prevention of blockage of river mouth,
- Maintaining water level for water intake and navigation, and
- Growth and breeding of aquatic animals and plants.

River Water Purification Methods

- Purification using gravel
- Purification using rapids and pools
- Thin laminar flow purification method
- Vegetation purification method

5. River Environmental Management

(5) Management of River Water Quality

Sumida River Water Quality Improvement

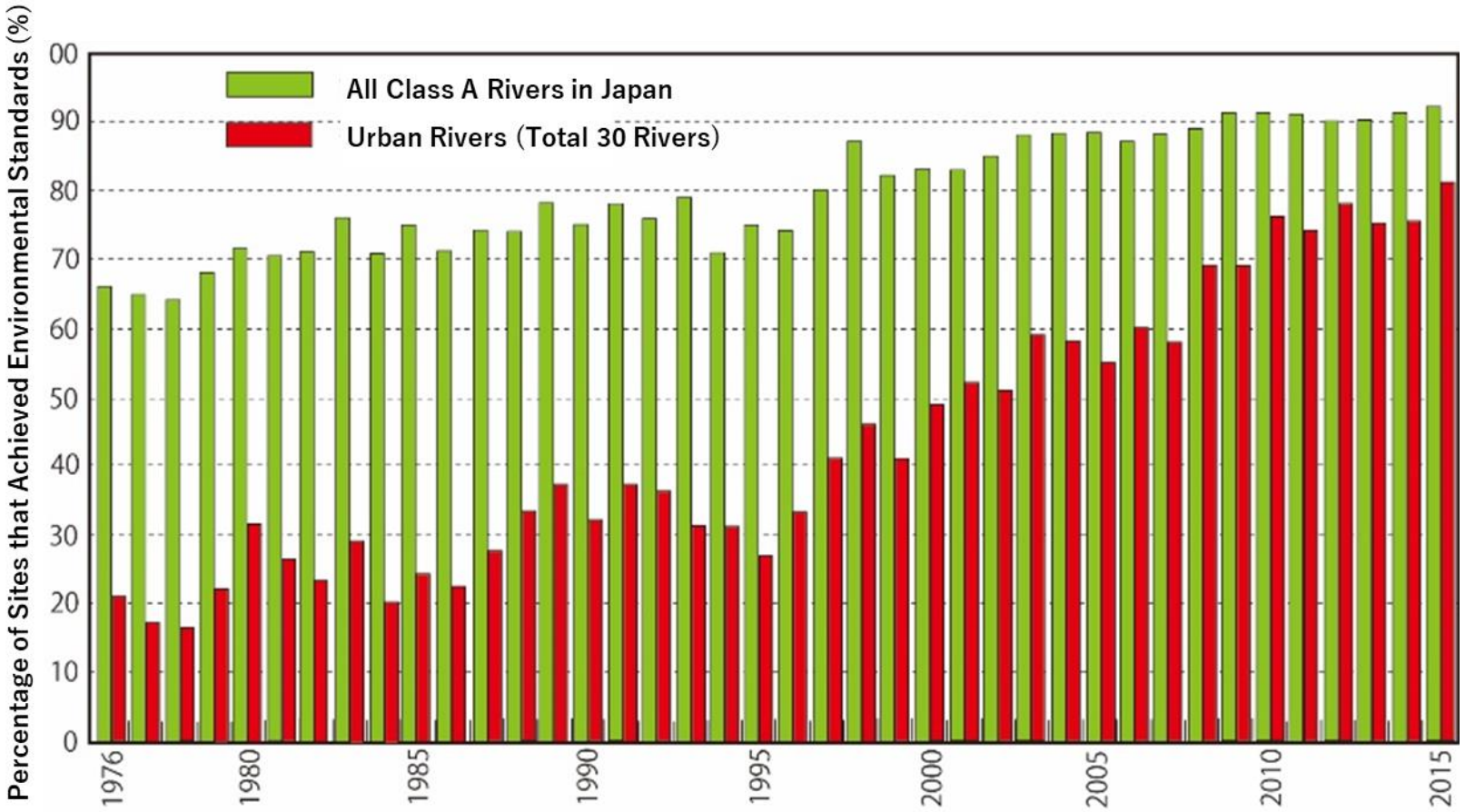
- In 1940, chemical plants and dyeing factories increased. BOD increased to 5-10 mg/l.
- By 1952, the river became so polluted that fish could no longer thrive.
- Toxic gases and malodors caused mild coughing, red eyes, loss of appetite and headaches in peoples living nearby.

Efforts to improve water quality through legislation

- Sewerage system development
- Pipeline from the Tone River via the Arakawa River to secure the water supply, and as diluted water to purify the Sumida River.
- Dredging since 1958 which continues to this day.

5. River Environmental Management

(6) Efforts to Improve Water Quality in Urban Rivers



Source: MLIT website

Achievement Percentage of Environmental Standards in Class A Rivers and Urban Rivers

5. River Environmental Management

(6) Efforts to Improve Water Quality in Urban Rivers

Clean Stream Renaissance 21 (1993) and the stage 2 (2001)

- Water quality improvement goals by local governments, river management offices (RMOs), sewerage offices, and related organizations.
- Water quality improvement targets according to condition of each river.

5. River Environmental Management

(7) Water Quality Improvement in Ayase River

- The dirtiest river in Japan since 1980s for 15 years.
- Collaboration with local communities, no longer the worst in 2000.

1973

Source: MLIT Edogawa River Office Website

2021

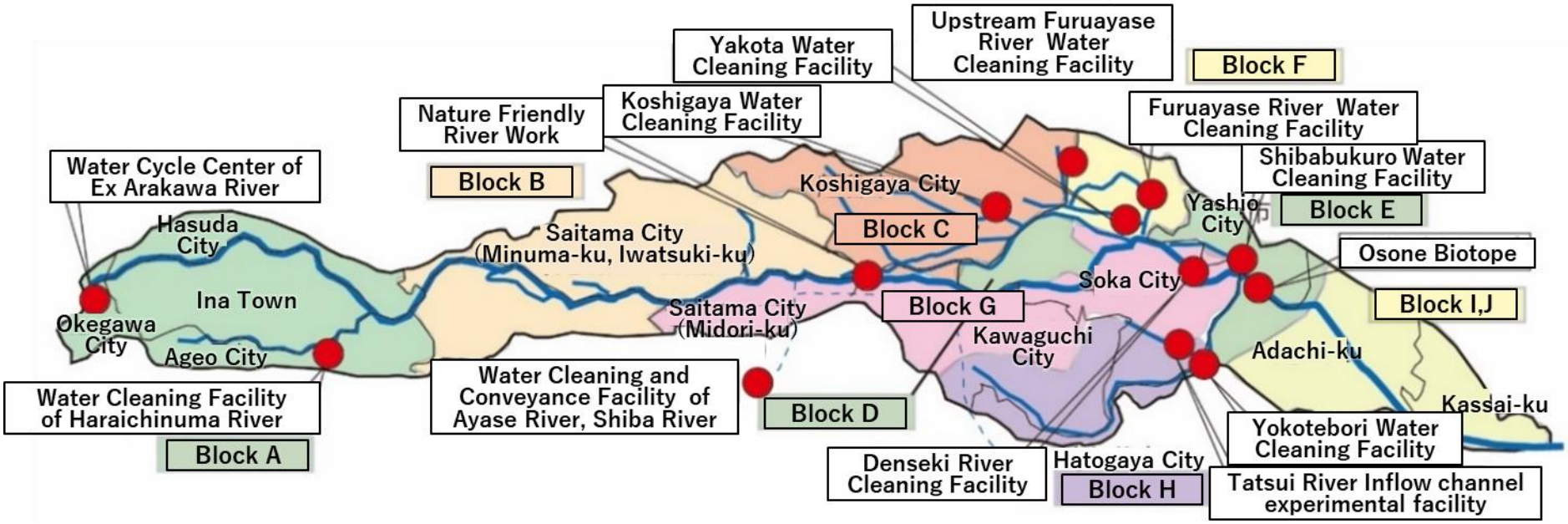
Source: Edogawa River Office Website

Collaboration & Education with Local Residents

5. River Environmental Management

(7) Water Quality Improvement in Ayase River

- Divide the river basin into 10 blocks to plan and implement measures respectively for improving water quality according to the standard.



Source: Based on MLIT Edogawa River Office Website; and Ayase River Seiryu Renaissance II Annual Report 2011, Ayase River Seiryu Renaissance II Regional Council, November 2011

Countermeasures by Blocks in the Ayase River Basin

5. River Environmental Management

(8) Nature-Friendly River Work

Public needs for restoring natural environment in early 1990s

"Nature-Friendly River Works" Initiative by MLIT

- "Nature-friendly River Works" initiative (MLIT, 1990)
- "Basic Guidelines for Creating Nature-friendly Rivers" (2006)
- "Technical Standards for River Channel Planning for Small and Medium Rivers" (2008)

Source: MLIT

Nature-Friendly River Works (Before and After Construction)

5. River Environmental Management

(9) Use of Traditional Construction Methods

- Nature-friendly materials that blend in with surroundings
- Highly adaptable to waterfront topography

Seigyu (water control)
Source: Kofu Rivers and National Highways Office website

Fascine Mattress (erosion control)
Source: Shinano River Downstream Office website

5. River Environmental Management

(9) Use of Traditional Construction Methods

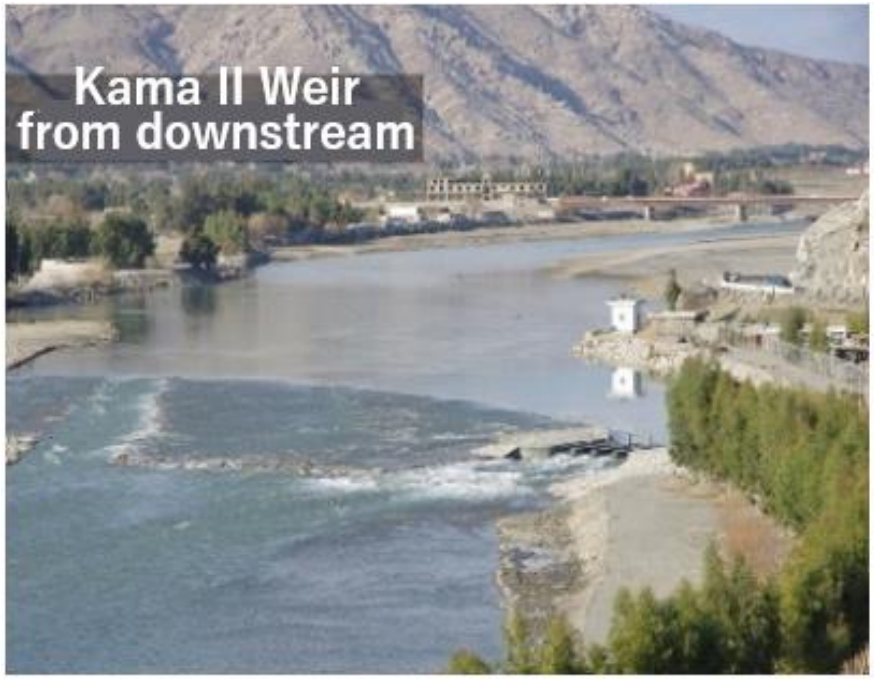
Source: Hokkaido Development Bureau website

Riparian Forest (flow control)

5. River Environmental Management

(9) Use of Traditional Construction Methods

- Weir using traditional construction method and apply to overseas.



Kama II Weir (Afghanistan)

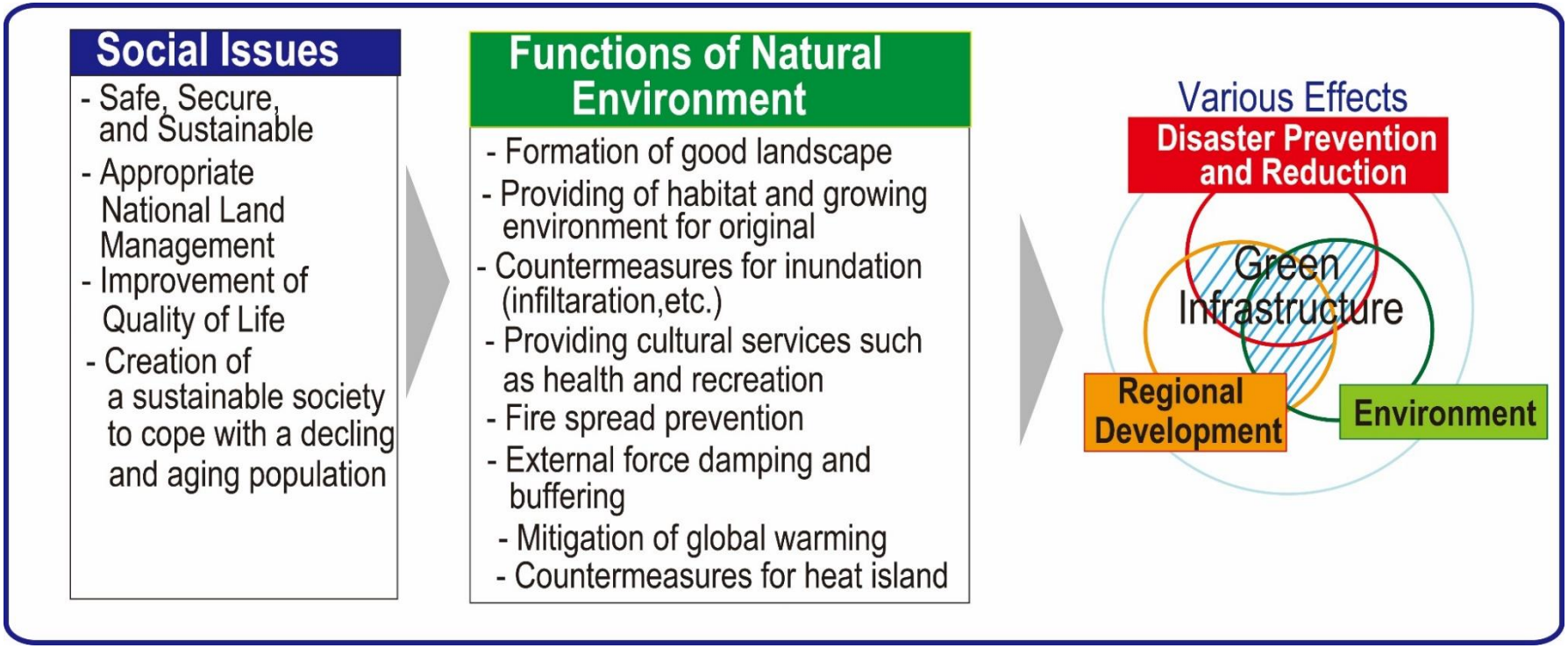
Yamada Weir (Japan)

Source: Peshawar Association website, Provided by Asakura City

5. River Environmental Management

(10) Green Infrastructure Initiatives

- Disaster management
- Environmental improvement
- Regions' attractiveness
- Carbon-neutral society



Source: Green Infrastructure Portal Site, MLIT

5. River Environmental Management

(11) Efforts in Maruyama River

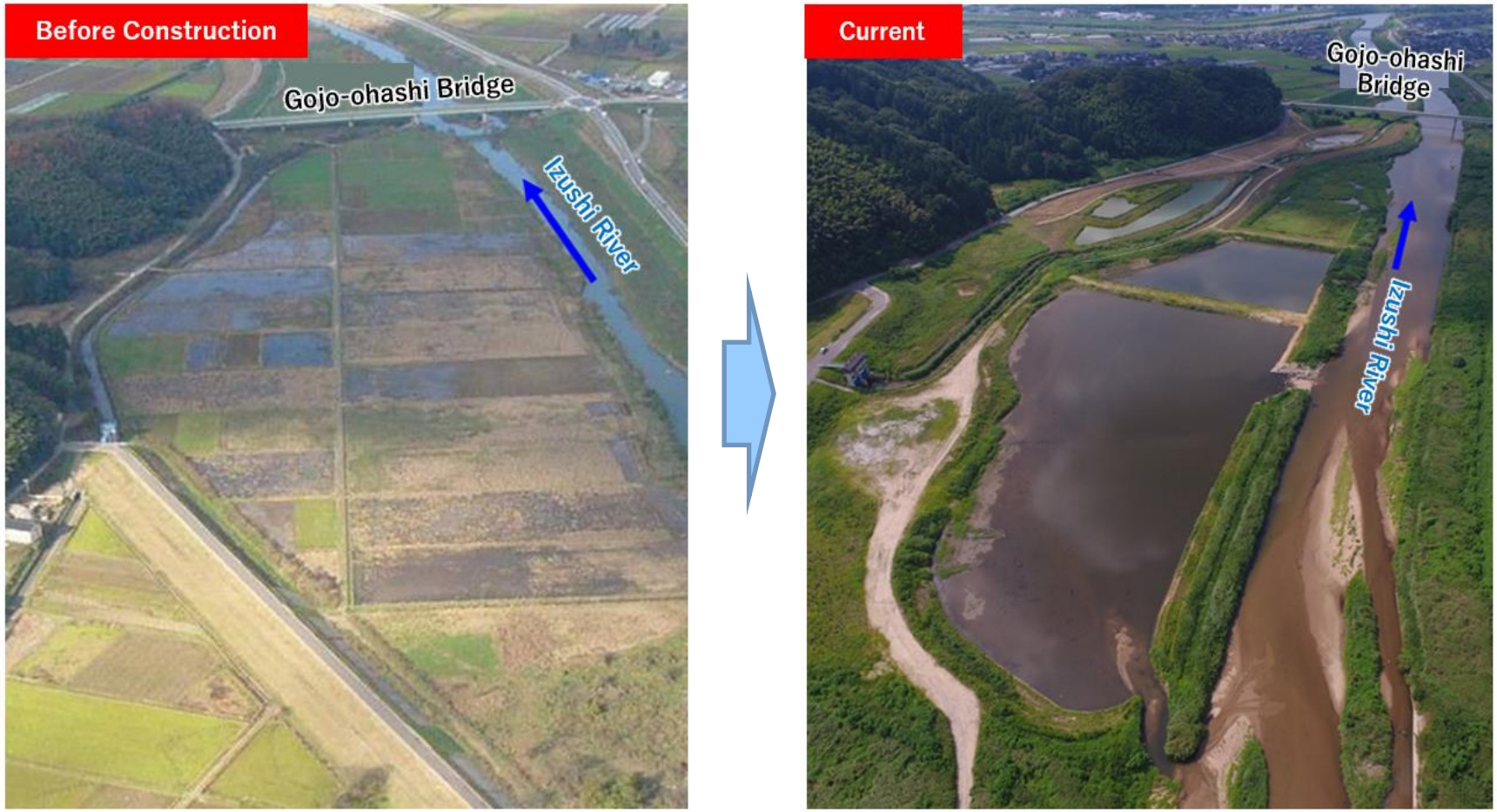
- Ecological network based on the river formed in cooperation with local community.

Source: MLIT Kinki Regional Development Bureau Toyooka River National Highway Office Website

Efforts in Maruyama River

5. River Environmental Management

(11) Efforts in Maruyama River



Source: MLIT Kinki Regional Development Bureau Toyooka River National Highway Office Website

Wetlands revived in Kayo area

5. River Environmental Management

(11) Efforts in Maruyama River

Ecological survey with children

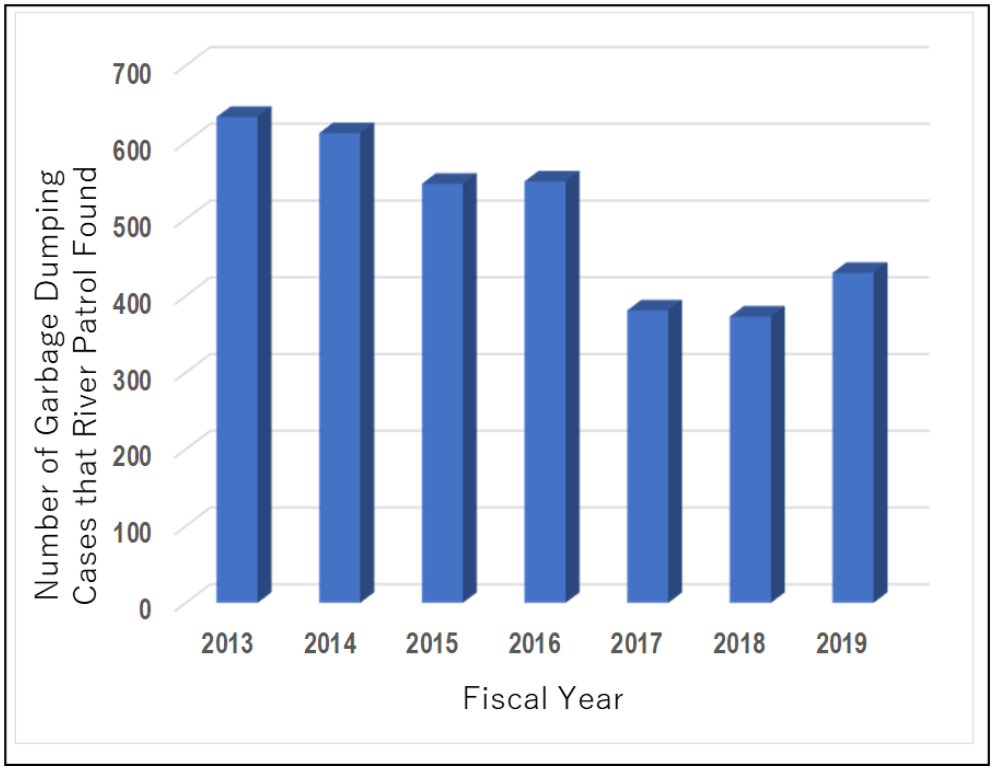
Stocks feeding in the wetlands

Source: MLIT Kinki Regional Development Bureau Toyooka River National Highway Office Website

5. River Environmental Management

(12) Measures against Illegal Dumping of Waste

- River administrators work with NPOs & local governments for "trash pickup" activities, daily river patrols, reporting illegal dumping to police & public relations.



Source: Created based on the Arakawa-Karyu River Office website

Number of Garbage Dumping Cases in Lower Reaches of Arakawa River

6. Lessons Learned (1)

(1) Establishing a legal system and enforcement mechanisms can regulate adverse environmental effects.

Water pollution affects human health and lives and may destroy ecosystems and the environment. In Japan, government policies prioritizing economic growth resulted in the emergence and spread of disastrous pollution-related diseases. During the high economic growth, water pollution caused by effluents from factories led to the outbreak of pollution-related diseases, such as Minamata and Itai-itai, affecting tens of thousands of people. The legal systems and local government ordinances cover water quality standards, monitoring, and penalties. Local governments can conduct on-site inspections of factories and impose on penalty for illegal actions.

(2) Pesticide use should be regulated as they deteriorate the quality of river water and groundwater.

In Japan, various standards have been established to regulate pesticide use. The permissible pesticides should also be registered, and crops for which the pesticides can be used, the time when they can be used, and the permissible amount for use are specified.

6. Lessons Learned (2)

(3) Domestic wastewater should be treated to achieve quality that meets the standard values.

In Japan, local governments have formulated basic plans to develop basin-wide sewage systems. Treatment methods can be optimized by the conventional sewerage system and Johksou, on-site treatment facility at the household level, taking into account the population density, topographic conditions, and economic efficiency.

(4) For closed water bodies such as lakes and marshes, more stringent measures are essential for preserving water quality.

In lakes, marshes, inland bays, land-locked seas, and other closed water areas, improving water quality is difficult once deteriorated. There are two types of pollution loads: point and non-point sources. For the latter, improvement measures are required over large areas because the discharge points of pollutants are difficult to be identified. The act was enacted, followed by the setting of long-term targets, formulation of short-term plans, and implementation of water quality improvement for lakes and marshes in Japan.

6. Lessons Learned (3)

(5) Green infrastructure can contribute to the creation of a carbon-neutral society and resolution of various social issues.

Green Infrastructure or nature-based solutions, which utilize the diverse environmental functions, highlight the region's attractiveness based on the river's characteristics, local nature, and culture as well as mitigating disaster damage. In Japan, the River Law was revised to make the environment an internal objective for river improvement projects.