

# Sewerage Policy and Finances in Lake Basin Management, a Case of Lake Biwa, Japan

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# Lake Basin Management in SDGs



## Goal 6:

Ensure availability and sustainable management of water and sanitation for all

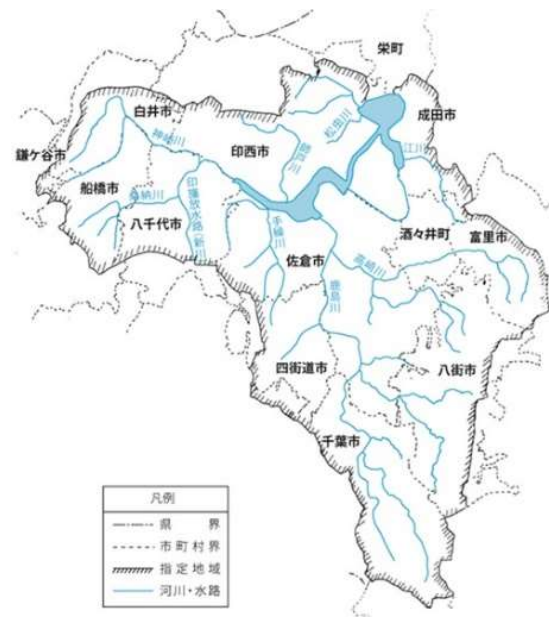
### Target 6.6b:

By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

- Lakes contain over 90% of the world's freshwater.
- Lakes provide many uses for sustainable human livelihoods and economic development, while serving as essential habitats for a great variety of flora and fauna.

# Various Policies for Lake Basin Management

- The purpose varies depending on each lake and region, and a policy framework corresponding to each is required
- However, it is similar that the pollution load of land origin causes stress on the lake environment such as water quality and biological habitat in all lakes.



霞ヶ浦の流域

## Purpose of This Document

This report focuses on sewerage systems their financing.

Sewerage systems are one of the most effective ways to reduce stress from land in terms of lake basin management.

- Appropriate technology according to the stress reduction level is required.
- In terms of improving the living environment, the target requirements are the sewerage maintenance level and the maintenance target area.
- In terms of improving the natural environment (improving the lake environment), the target requirements are water quality targets or stress reduction targets (pollution load reduction targets).
- Goal requirements cannot be achieved without financial resources and policy.

# Background of Water Environmental Problems in Japan

In the late 1880s and early 90s

Water environment problems became apparent, such as the collision between modern industry and agriculture and fisheries in the Ashio Copper Mine Poisoning Case

After the Second World War,

With the development of the heavy chemical industry, agricultural damage caused by industrial wastewater occurred

Since around 1955,

The problem of water pollution due to high economic growth has become apparent.

# Background of Lake Water Environmental Problems

## Lake Biwa

- 1970s Red tide occurred
- 1980s Topography and vegetation of the lakeshore area changed
- 1987- Introduction of exotic fish
- 2000s Growth of aquatic plants and exotic animals and plants has become a problem

## Lake Kasumiga-ura

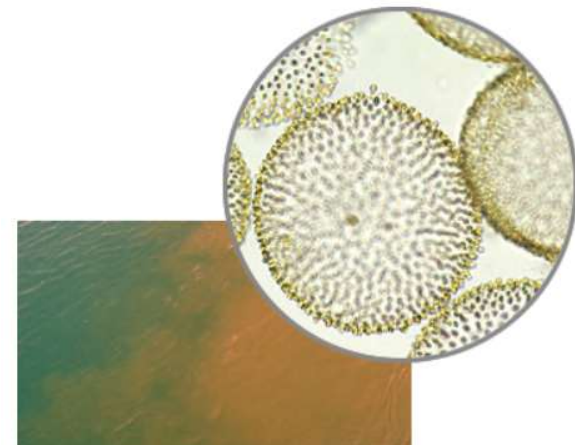
- 1973 Outbreak of blue-green algae occurred, a large amount of cultured carp died and a musty odor occurred in the water supply
- 1978-1980 Outbreak of blue-green algae occurred
- 1979 COD increased
- 2004 Outbreaks of blue-green algae in Kita-ura (North part of the lake)

# Water Pollution in High Growth Period



合成洗剤の追放と粉せっけん使用を訴えるパレード。琵琶湖条例の制定につながった（1979年5月、大津市内）

Parade to promote the use of soap powder



Plankton outbreak

# Various Types of Water Quality Standards

1) Water quality standard for drinking water ([the Water Supply Act](#))

2) Water source water quality standards

[\(the Act on Advancement of Project for Quality Management of Raw Water\)](#)

These standards are set for each purpose of use,

such as the water quality at the water intake of the water purification facility.

3) Water quality standards for discharge to public water areas

[\(the Water Pollution Prevention Act. The law involves penalties.\)](#)

4) Environmental standards ([the Basic Environment Act](#))

The purpose of the law is human health and environmental protection

There are no penalties.



## Laws on Lake Water Conservation

- 1958 Act on water quality conservation in public water bodies  
Law for regulation of industrial wastewater
- 1958 Sewerage Act
- 1967 Basic Pollution Act
- 1970 Water Pollution Prevention Act
- 1983 Purification Tank Act
- 1984 Act on Advancement of Project for Quality Management of Raw Water
- 2015 Act on the conservation and restoration of Lake Biwa

## Shiga Prefecture Ordinance for Lake Biwa conservation

- 1980 Ordinance Concerning the Prevention of Eutrophication of Lake Biwa
- 1992 Ordinance on the Reed Beds around Lake Biwa
- 1992 Anti littering Ordinance
- 1996 Ordinance to Promote Domestic Wastewater Measures
- 2003 Ordinance relating to the Appropriate Leisure Usage of Lake Biwa,
- 2003 Ordinance for Environmentally Friendly Agriculture Promotion
- 2004 Lake Biwa Afforestation Ordinance
- 2005 Ordinance for Prefectural Tax for Lake Biwa Afforestation

# Improving the Lake Water Quality in Lake Biwa

1984 the Act on Special Measures concerning Conservation of Lake Water

The construction of sewerage systems for point source pollution control

Also contributed to improving the living environment, and

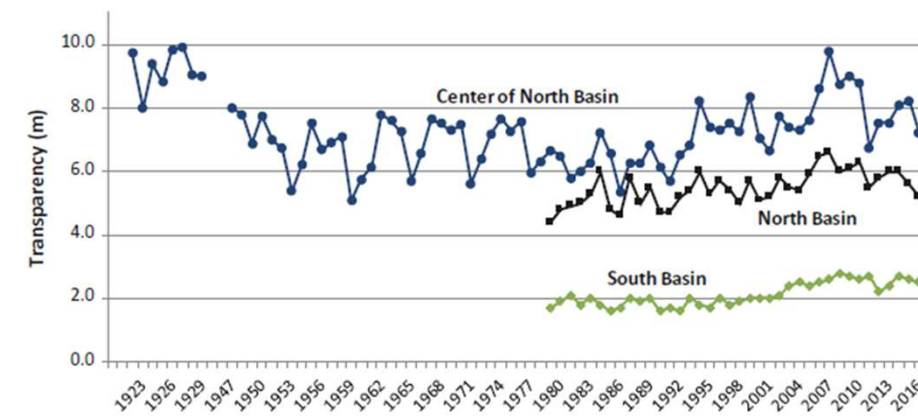
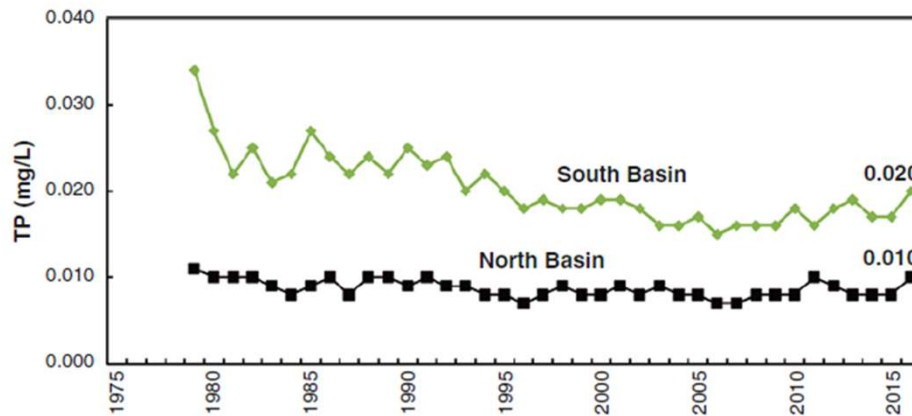
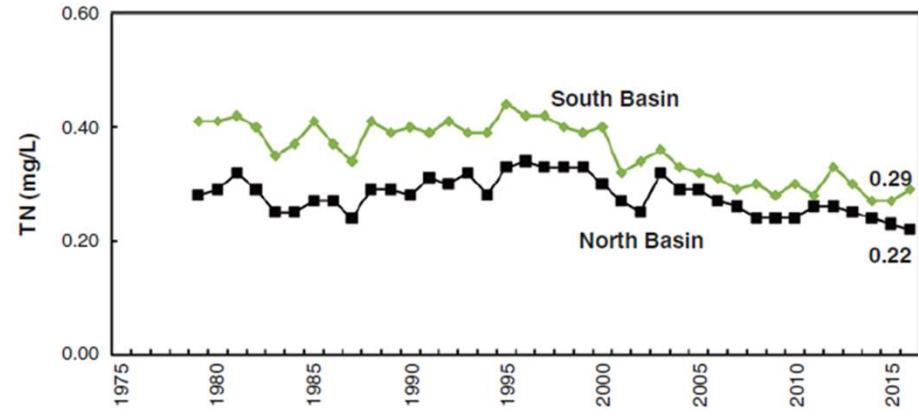
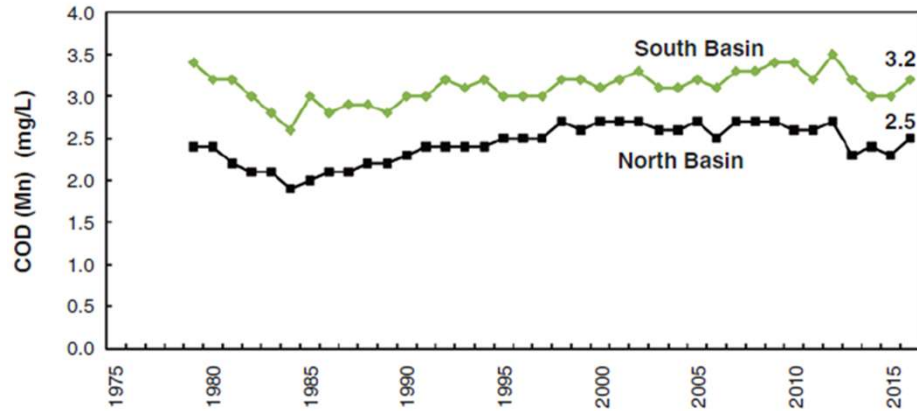
Contributed greatly to the local economy as a public project

The issues of sewerage system

- Huge investment was required
- Long time taken to realize water quality improvement effect

The treatment facilities reduced pollution load and the water quality gradually improved

# Changes of the Water Quality of Lake Biwa



Kawanabe et al., Lake Biwa

# The Beginning of the Sewage System

1884-85 The first public sewerage system in Japan was constructed to address cholera epidemic

Since the 1910s, urbanization progressed rapidly

→ problems the deterioration of the urban sanitary environment  
the epidemic of infectious diseases

a sewage treatment **plant/a flush toilet was needed** to treat human waste  
**it cost a lot**

in **rural** areas: maintained **rural return disposal system**

in **urban** areas : constructed **sewage treatment plants** or **Septic tank**

→some kind of treatment method was spread

# Spread of Sewerage System

Target area: **Urban Area**

**Important Rural Area for water quality conservation**

- It has a terminal treatment plant or connected to a basin sewage system
- Construction and management **by local government** basically

In some case, prefectural government

1962: **only 4%** of the total population was treated by public sewage system

1967 the Sewerage Improvement Emergency Measures Law

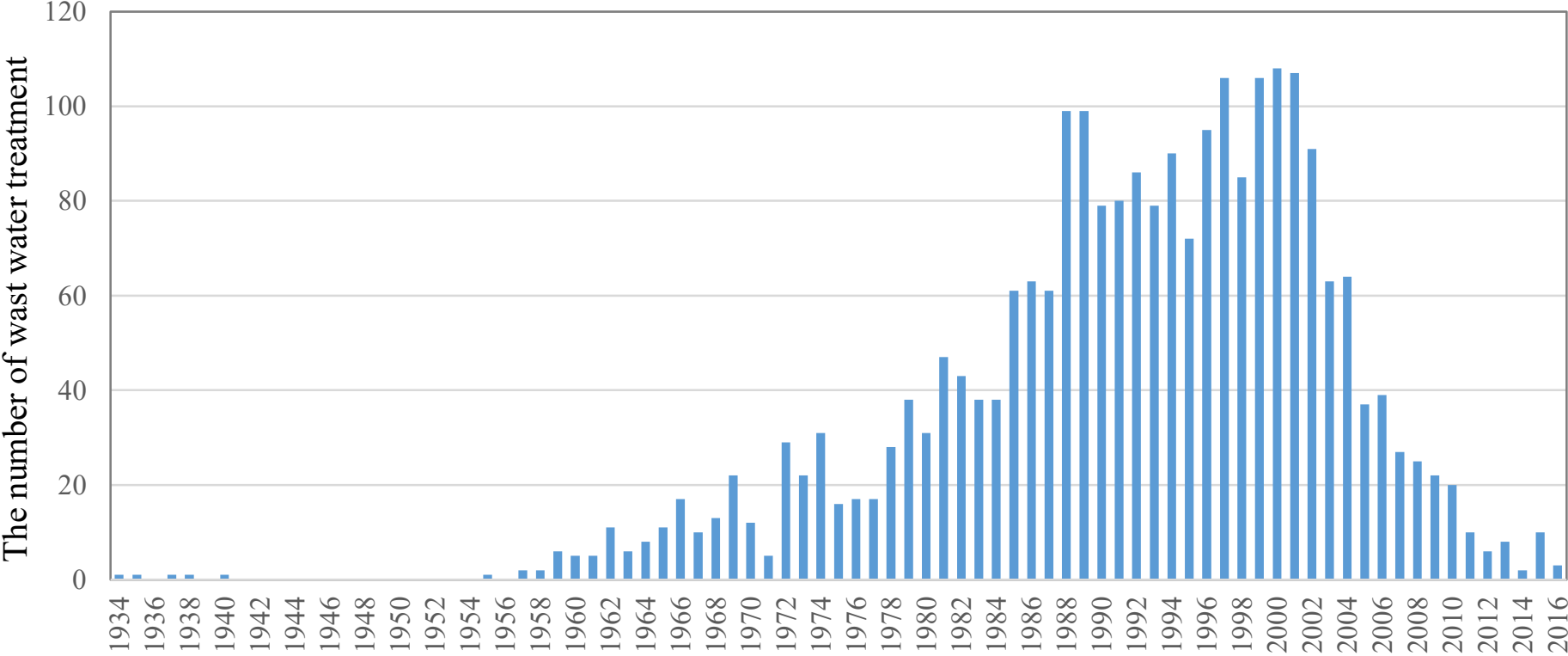
1971 the Third Sewerage Improvement Five-Year Plan

Financial scale	The 1 <sup>st</sup> plan:	300 billion yen
	The 2 <sup>nd</sup> plan:	600 billion yen
	The 3 <sup>rd</sup> plan:	2,600 billion yen

# Plan for Sewerage System Development

Term	First Plan 1963-66	2nd Plan 1967-70	3rd Plan 1971-75	4th Plan 1976-80	5th Plan 1981-85	6th Plan 1986-90	7th Plan 1991-95	Last Plan 1996-2002
背景等	・生活環境施設整備の中 心的役割を担う	・下水道行政の一元化 ・水質汚濁対策としての 第一歩	・下水道法改正 →「公共用水域の水質 保全を目的に追加」 ・流域下水道の法制化	・ナショナルミニマム としての認識 ・特環の制度化	・総量規制への対応 ・三全総の定住圏構想	・維持管理の充実 ・処理水等の有効活用	・中小市町村の整備促 進 ・大都市等における機 能改善、質的向上 ・公共投資基本計画	
Cost billion yen	300	600	2600	6900	8500	11700	16700	23700
Percentage of sewage treatment population普及率								
Goal	27%	33%	38%	40%	44%	①〈処理人口普及率〉 36→44%	①〈処理人口普及率〉 44→54%	66%
Result	20%	23%	26%	30%	36%	① ② 44%	① ② 54%	62%

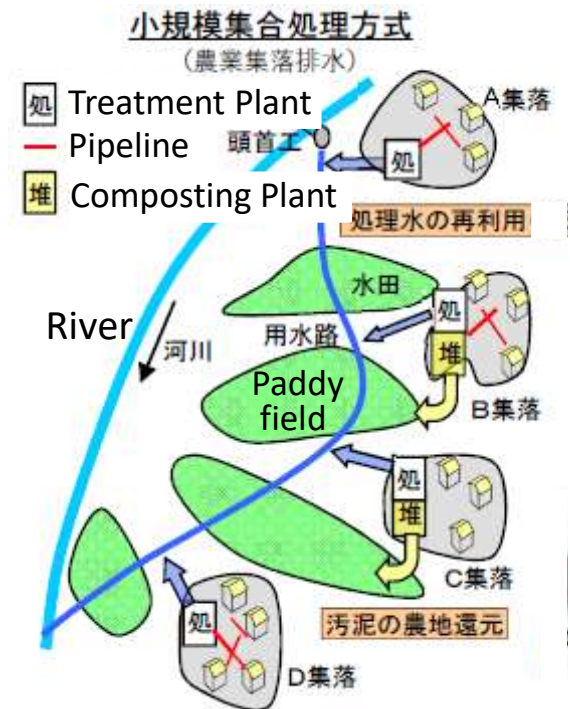
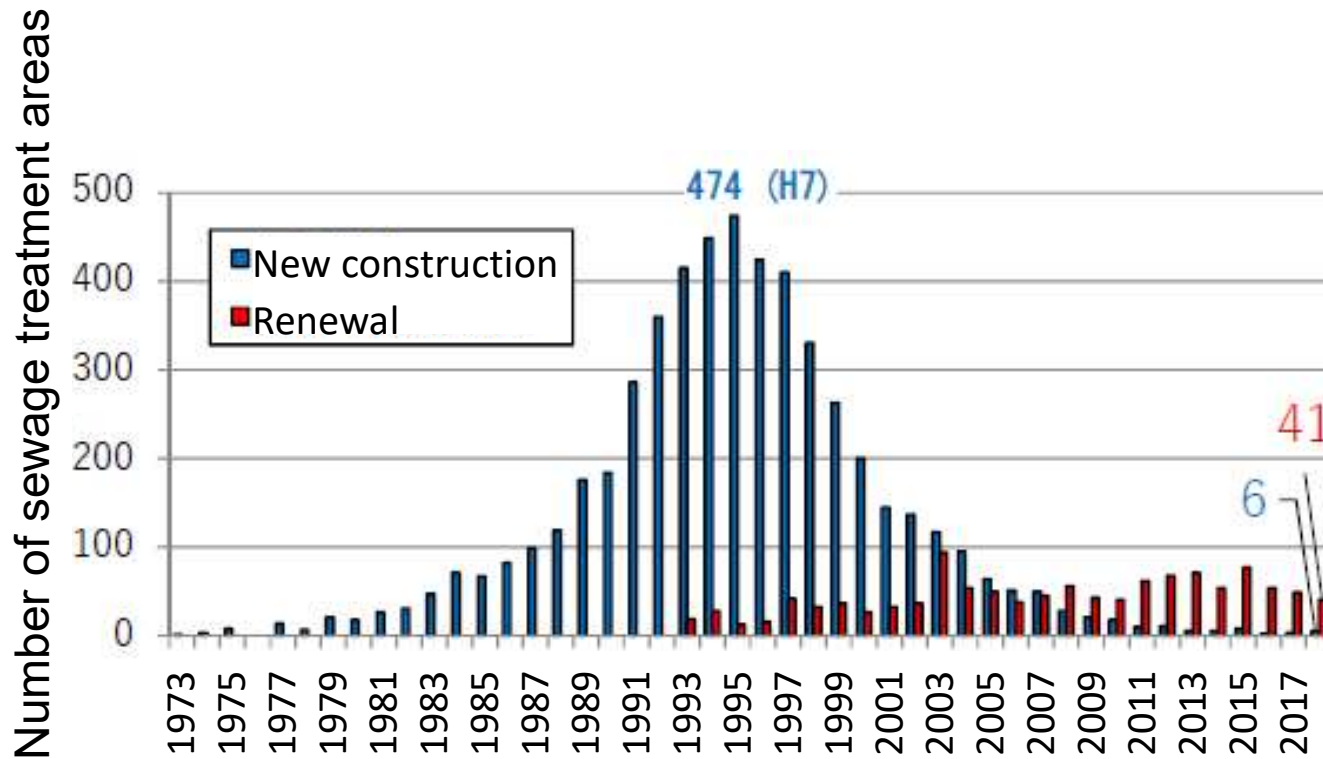
# Trend of Public Sewerage System Construction



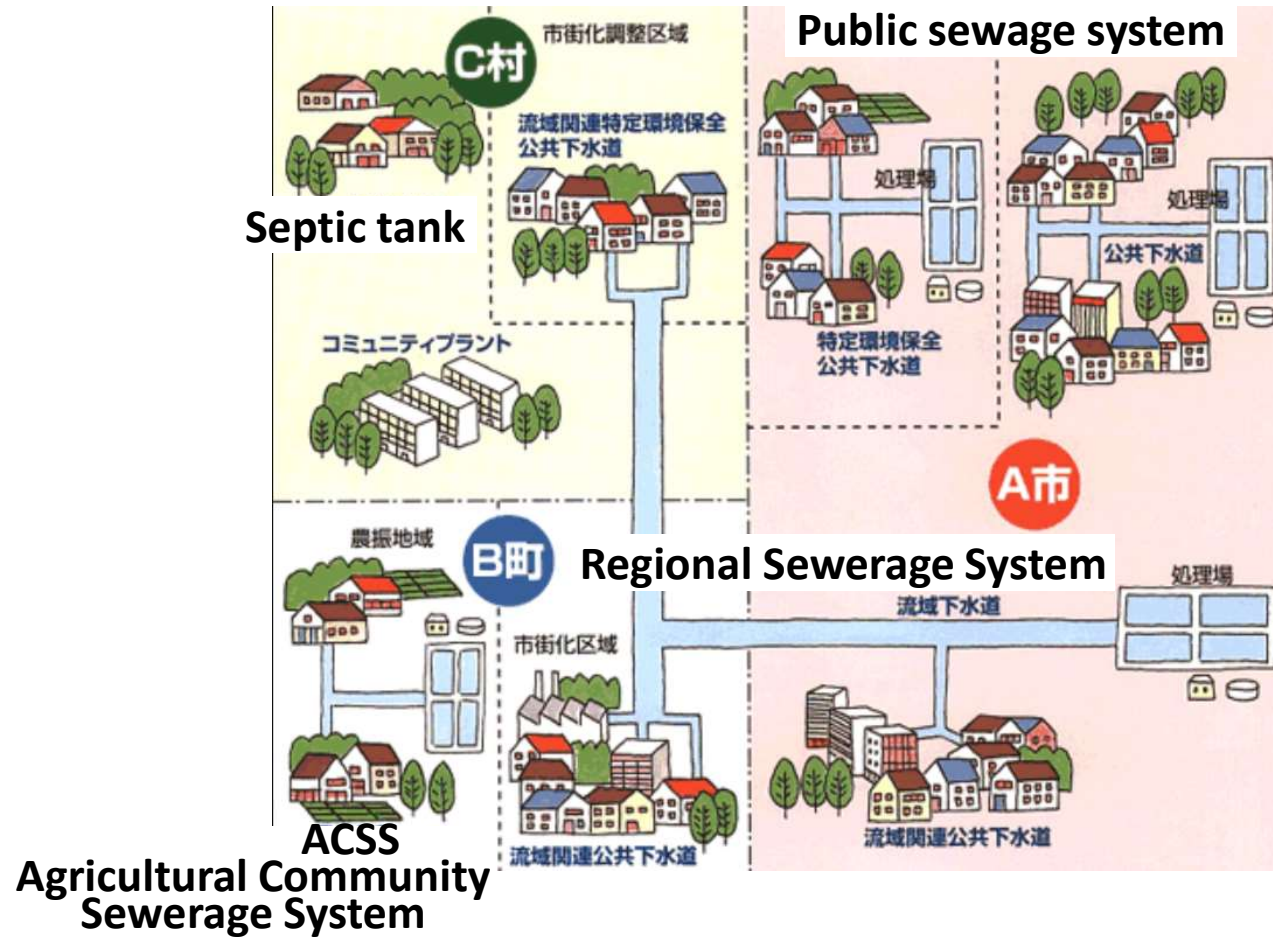


# Promotion of Agricultural Community Sewerage System

Collecting and treating small-scale water in rural area  
 1970s Project start by MAFF



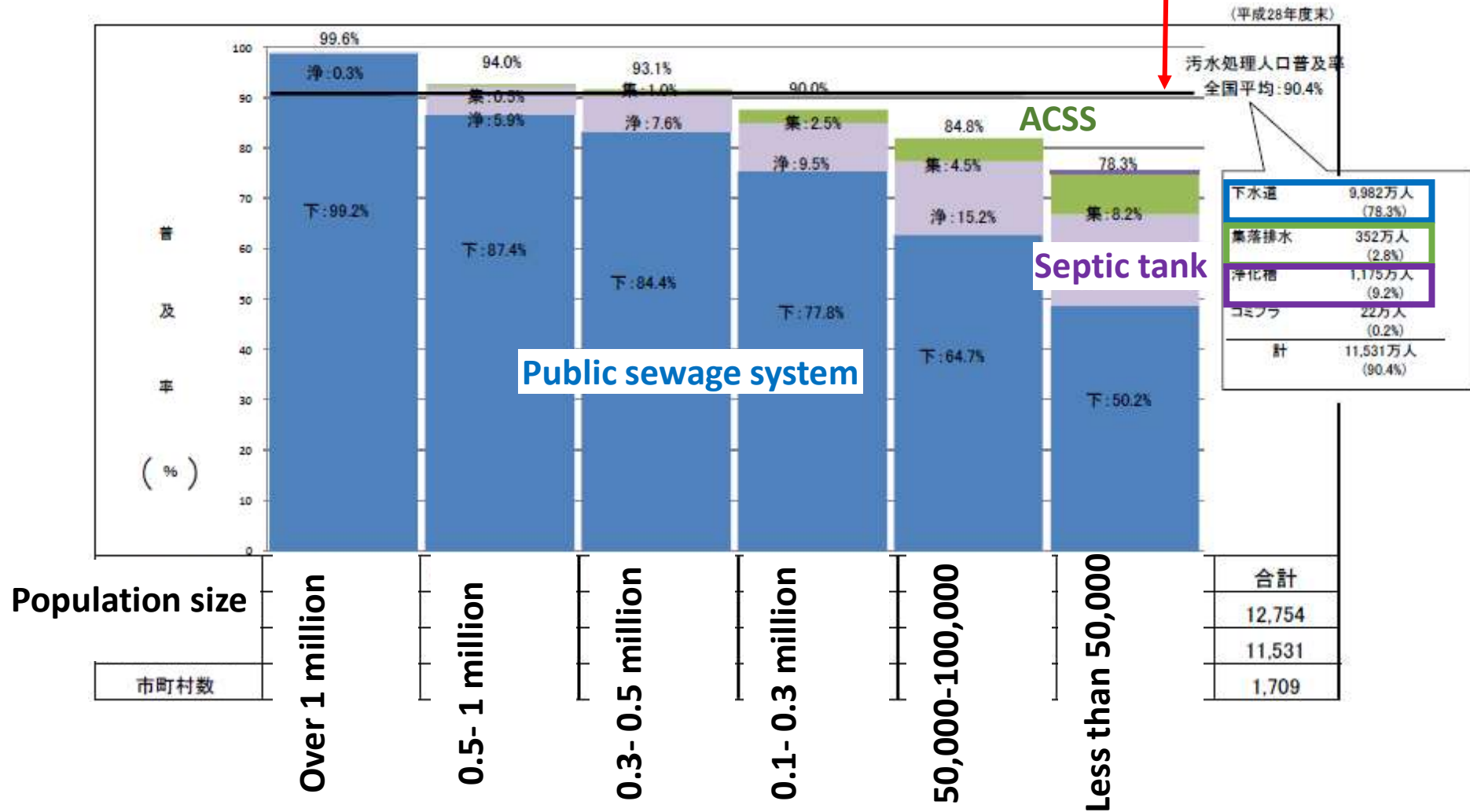
# Type of Wastewater Treatment System



MLITT, Type of sewerag system < <https://www.mlitt.go.jp/crd/sewehte/shikumi/img/p90-1.gif> >

Average percentage of the sewage treatment population  
**90.4%**

## Percentage of Each Type System



2005- The progress of urbanization and frequent torrential rains,  
→ **integrated and efficient inundation measures** were needed

## Waste Water Treatment System in Shiga Pref.

1969 The earliest sharing system started was the Otsu City Public Sewerage

1982 Eight systems started

1986-2000 Development progressed

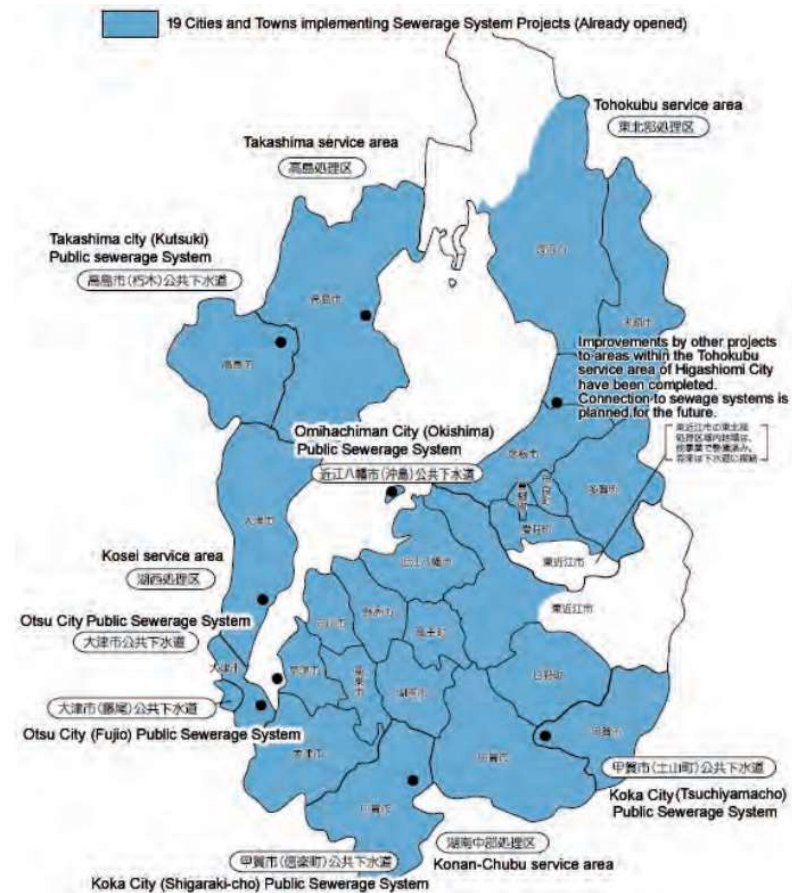
There are 39 sewerage system in 19 municipalities

1 is a regional sewerage (covers 4 areas)

18 are public sewerage

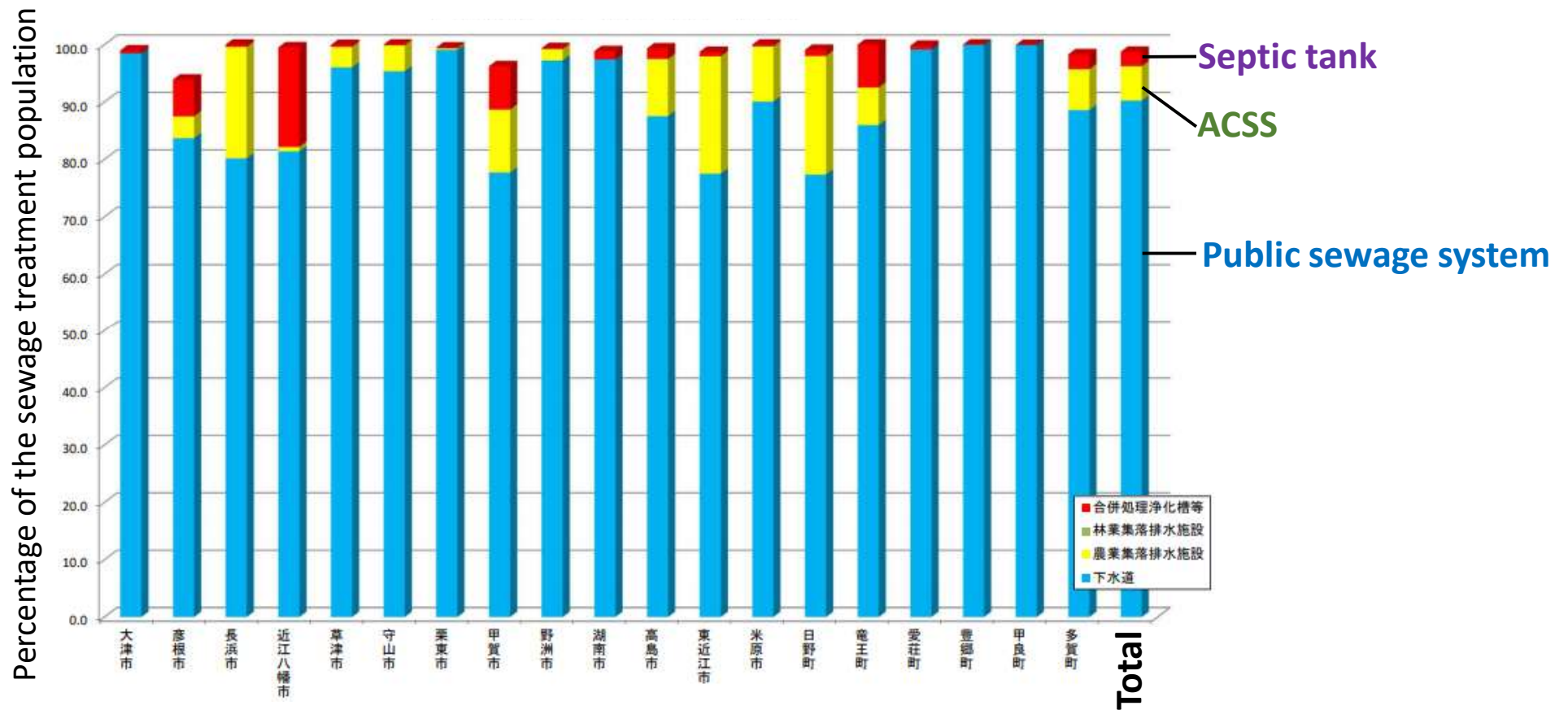
20 are public sewerage for specific environmental conservation.

# Public and Regional Sewerage System in Shiga Pref.



滋賀県、Lake Biwa Guidebook < <https://www.pref.shiga.lg.jp/ippan/kankyoshizen/biwako/13473.html> >

# Different Type of System in Each City/Town in Shiga Pref.



Shiga prefecture, Percentage of the sewage treatment population in Shiga Pref.  
 < <https://www.pref.shiga.lg.jp/file/attachment/5157236.pdf> >

# Finance System of Sewage Treatment

## Background

Water environment pollution

**Expansion policy of domestic demand**

1958 Sewerage Act was enforced

1978 In Fourth National Comprehensive Development Plan

water resource development / conservation, comprehensive management of water system

1960's-

Secured a budget and actively promoted sewage treatment system

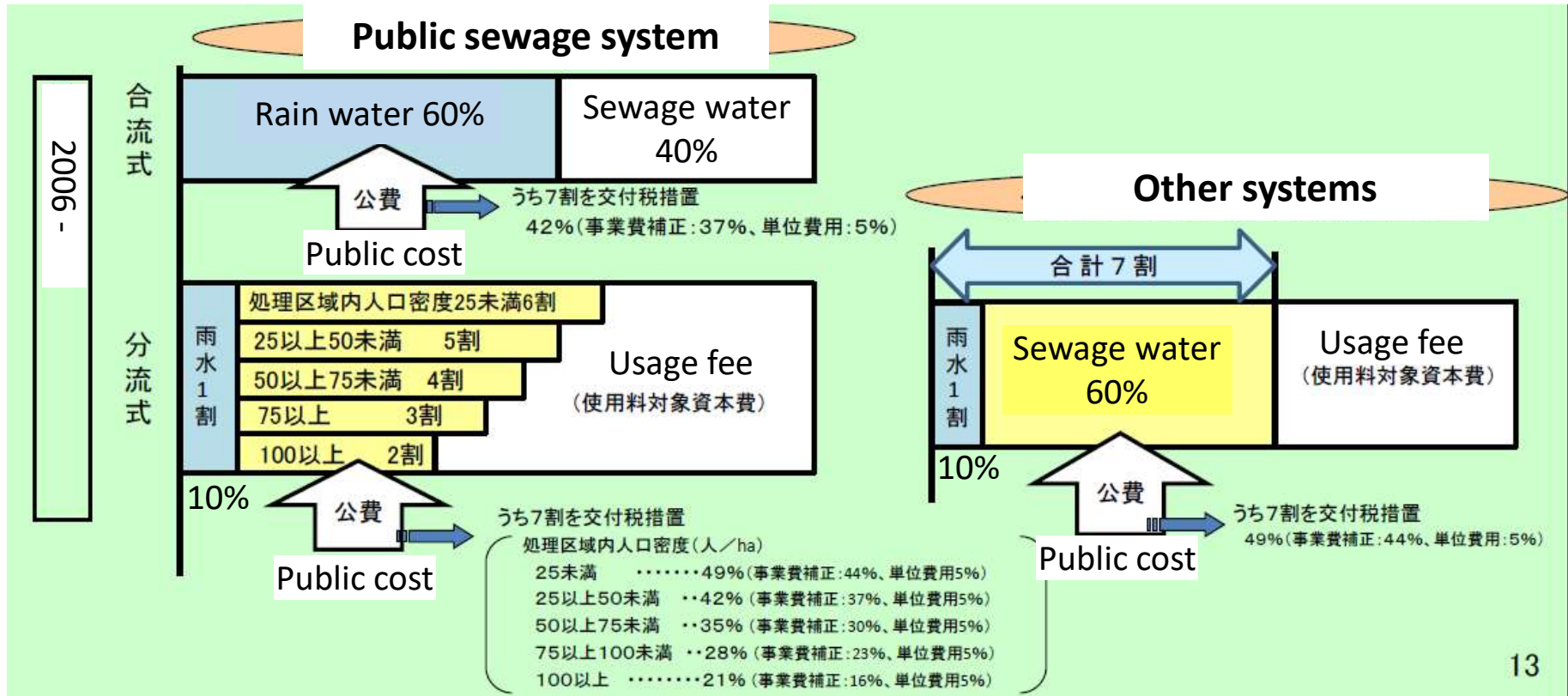
## Type of Sewage Treatment Financial resources

	Construction cost	Maintenance cost	
		Repayment of Debt principal and interest	Daily Maintenance
<b>Public sewage system</b>	<ul style="list-style-type: none"> <li>National grant</li> <li>Local grant</li> </ul>	<ul style="list-style-type: none"> <li>Usage Fee</li> <li>General budget of local government</li> </ul>	
<b>Regional Sewerage System</b>	<ul style="list-style-type: none"> <li>National grant</li> <li>Prefectural grant</li> <li>Local grant</li> </ul>	<ul style="list-style-type: none"> <li>Usage Fee</li> <li>General budget of local government</li> <li>+</li> <li>Maintenance fee of Regional Sewerage System</li> </ul>	

< <https://www.mlit.go.jp/common/001305323.pdf> >



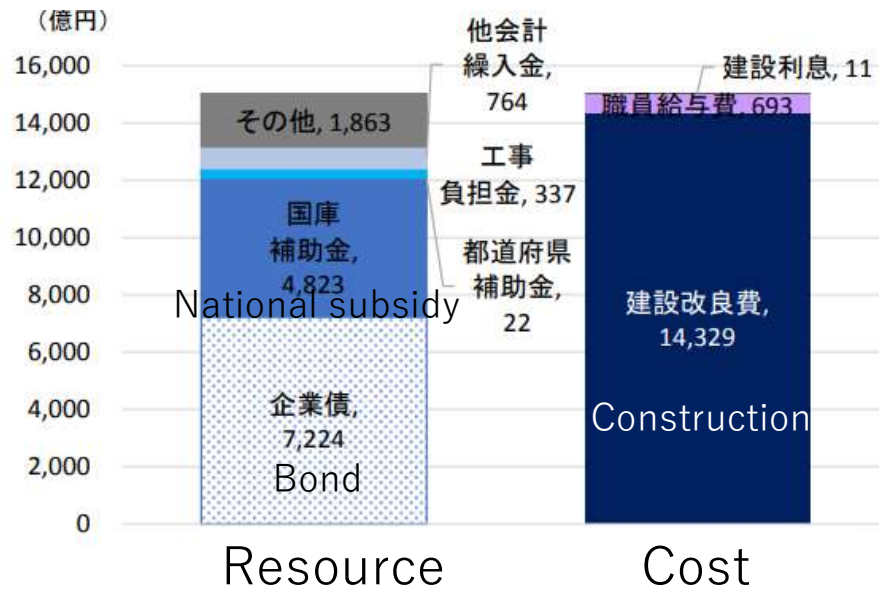
# Cost of National Gov., Local Gov. and User



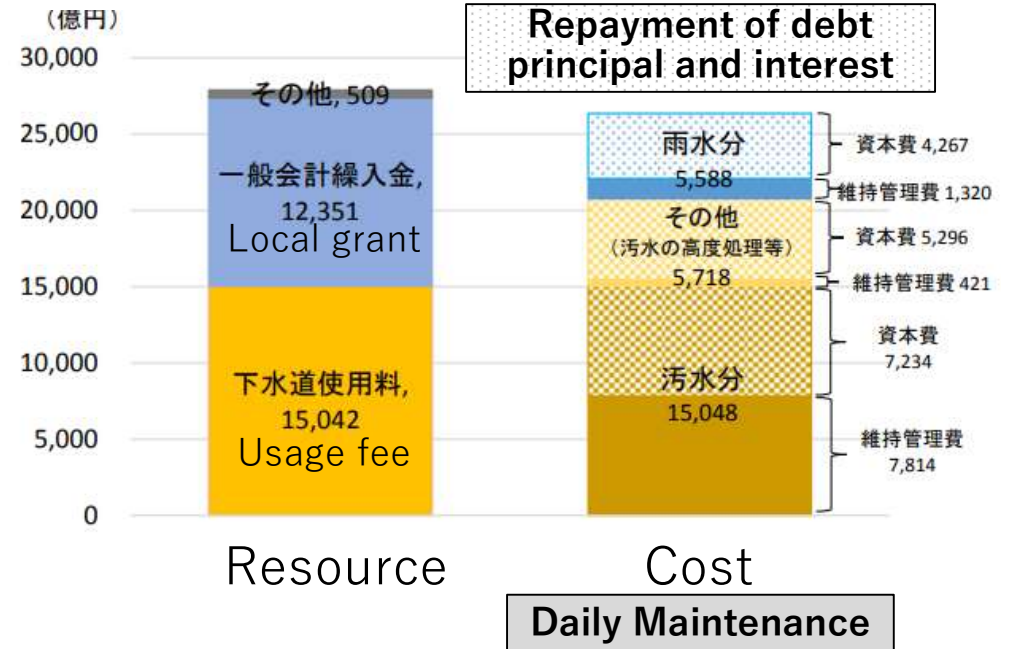
Population density

# Construction and management/operation costs

## Construction



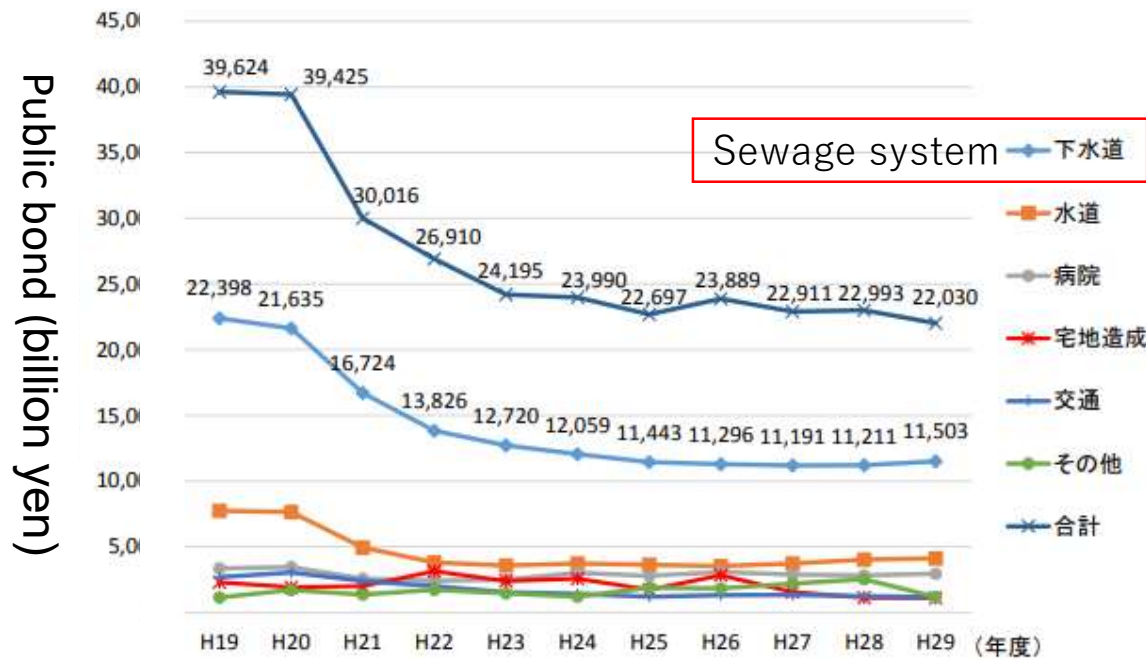
## Management/Operation



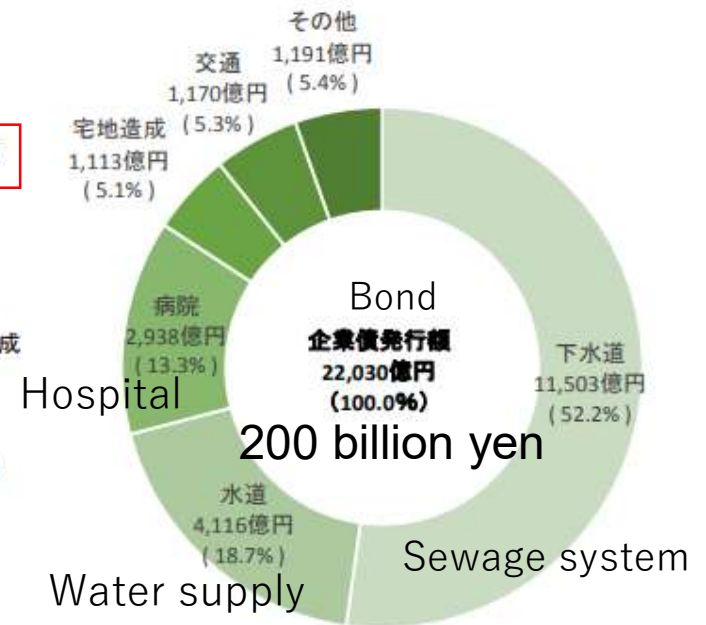
国土交通省、下水道財政の概況 < <https://www.mlit.go.jp/common/001305323.pdf> >

# Public debt of Sewage Treatment

## Changes in the amount of public bonds



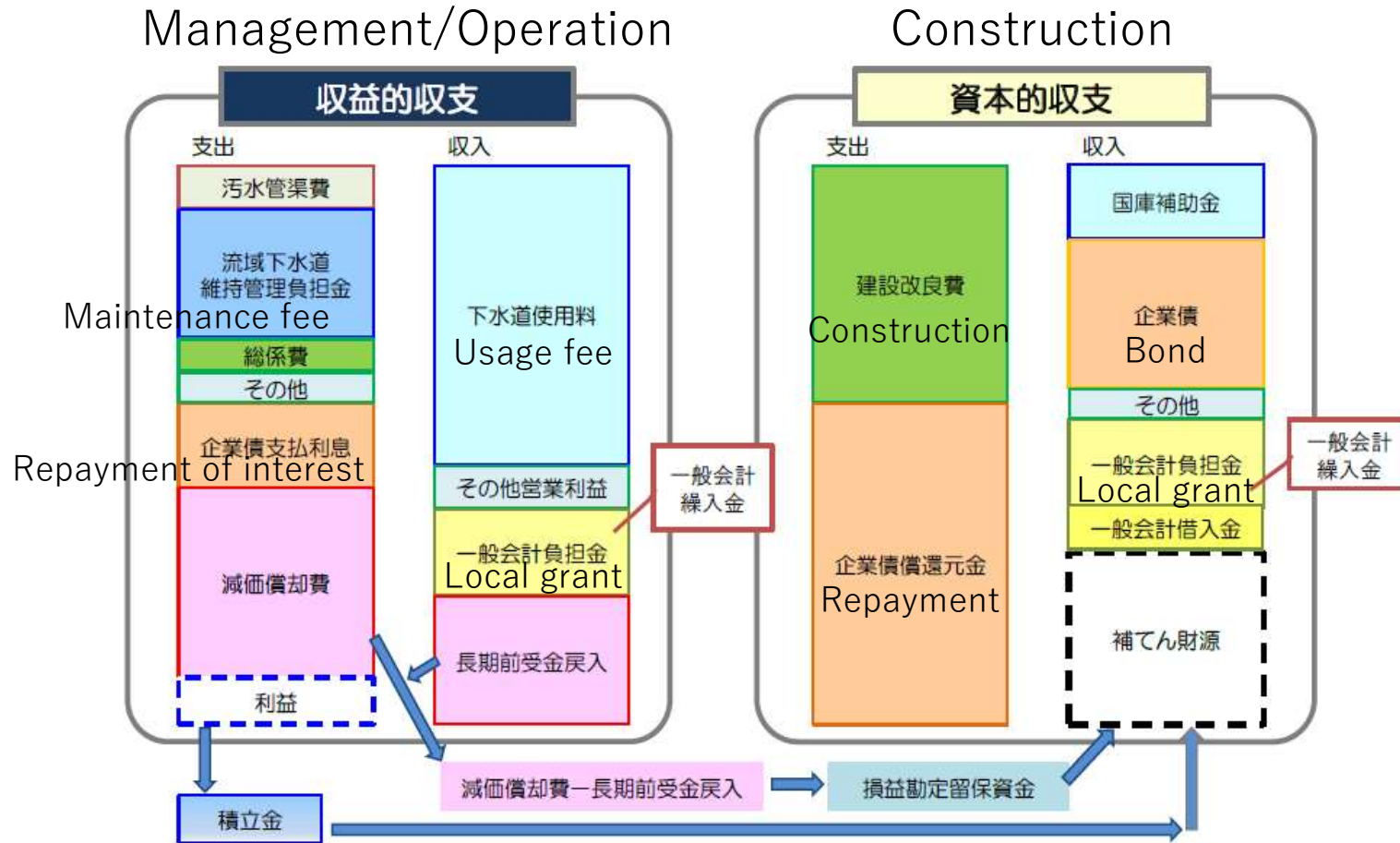
## Use of public corporate bonds



※下水道の企業債発行額は、公共下水道、特定環境保全公共下水道、特定公共下水道、流域下水道の他、農業集落排水施設等の下水道事業を含む

出典：総務省「地方公営企業年鑑」をもとに作成

# Balance of payments for sewage system in Kusatsu city



# Case of Shiga Pref.

		Area (ha)	Population (people)	Population density (people/ha)	Usage fee (20m <sup>3</sup> /mounth)(yen)	Coverage rate of usage fee
A city	PS	5,313	331,076	62	3,691	73.8%
A city	PSD	214	5,217	24	3,761	29.5%
B city	PS	1,881	83,587	44	3,264	36.0%
B city	PSD	266	7,117	27	3,264	22.4%
C city	PS	1,927	62,901	33	3,374	57.2%
C city	PSD	1,536	32,070	21	3,374	44.5%
D city	PS	1,248	56,389	45	3,196	46.8%
D city	PSD	240	6,414	27	3,052	19.4%
E city	PS	1,797	107,551	60	2,649	64.5%
E city	PSD	631	17,352	27	2,649	38.1%
F city	PS	1,333	72,315	54	2,765	65.8%
F city	PSD	211	5,164	24	2,266	26.3%
G city	PS	1,628	66,819	41	2,412	60.7%
H city	PS	1,929	38,367	20	2,853	42.7%
H city	PSD	820	32,612	40	2,853	42.7%
I city	PS	900	37,337	41	3,572	84.3%
I city	PSD	314	10,203	32	3,579	84.3%
J city	PS	1,680	52,466	31	3,035	52.6%
J city	PSD	80	787	10	3,035	52.6%
K city	PS	969	23,354	24	3,695	37.5%
K city	PSD	1,081	18,403	17	3,695	34.6%
L city	PS	1,655	58,630	35	3,307	65.8%
L city	PSD	886	27,642	31	3,306	42.1%
M city	PS	1,006	18,783	19	3,132	33.4%
M city	PSD	758	16,982	22	3,131	33.5%
N town	PS	399	8,258	21	2,366	34.9%
N town	PSD	295	8,506	29	4,785	46.5%
O town	PSD	388	10,396	27	2,921	37.6%
P town	PSD	906	21,007	23	3,010	43.0%
Q town	PSD	369	7,407	20	3,089	43.6%
R town	PSD	403	7,367	18	2,913	25.4%
S town	PS	210	4,791	23	3,678	60.3%
S town	PSD	120	1,893	16	3,678	52.0%

PS: Public sewage system

PSD: Public sewage system for designated area

50-75people /ha	PS・Above average	Less than 50%
25-75people/ha	PSD・Above average	
Less than 25 people/ha		

# Only Two Laws refer to financial security

## Sewerage Act

<Municipal contribution>

Prefectural governments may make municipalities that benefit from sewerage bear all or part of the costs required for their installation, renovation, repair, maintenance and other management.

<Financing for public and basin sewers>

The national government shall endeavor to provide the necessary funds to local public bodies that install or reconstruct sewerage systems.

## Water Pollution Prevention Act

< Responsibilities of national and local governments >

The State shall endeavor to provide the technical and financial assistance necessary to promote the measures for domestic wastewater measures taken by local governments.

< National support >

In order to contribute to the prevention of pollution of public water areas and groundwater, the national government will endeavor to collect funds, provide technical advice and other assistance necessary for the installation or improvement of treatment facilities for sewage, etc. at specific business sites.

**Other laws do not describe financial measures for lake conservation**

## Other Finances

-Budget based on the plan required by law-

Achievement rate of environmental quality standards for lakes was low

1984 Act on Advancement of Project for Quality Management of Raw Water

**11 domestic lakes** have been designated

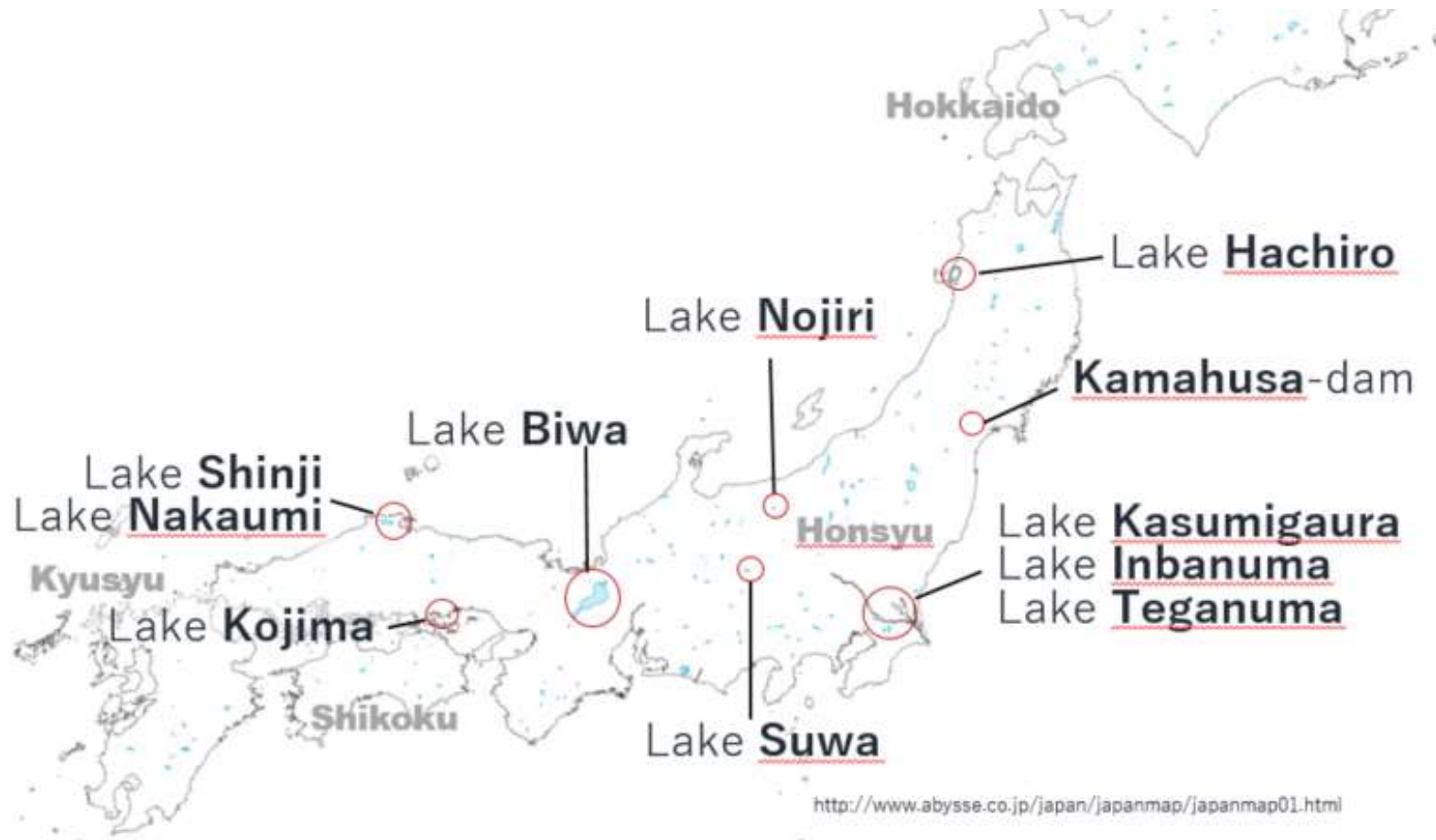
These lakes revise the water quality conservation plan every five years.

There is no budgetary measure under the law

-with **no financial support from the Ministry of the Environment**

It's **useful for securing prefectural finances**

## Designated Lakes





## Other Finances

-Budget based on the plan required by law-

2003 Law for the Promotion of Nature Restoration

### Aim of the act

regaining previously damaged ecosystems and other natural environments

Established Lakes,

Lake Kasumiga-ura, Lake Nakaumi, Lake Izu-numa / Uchi-numa

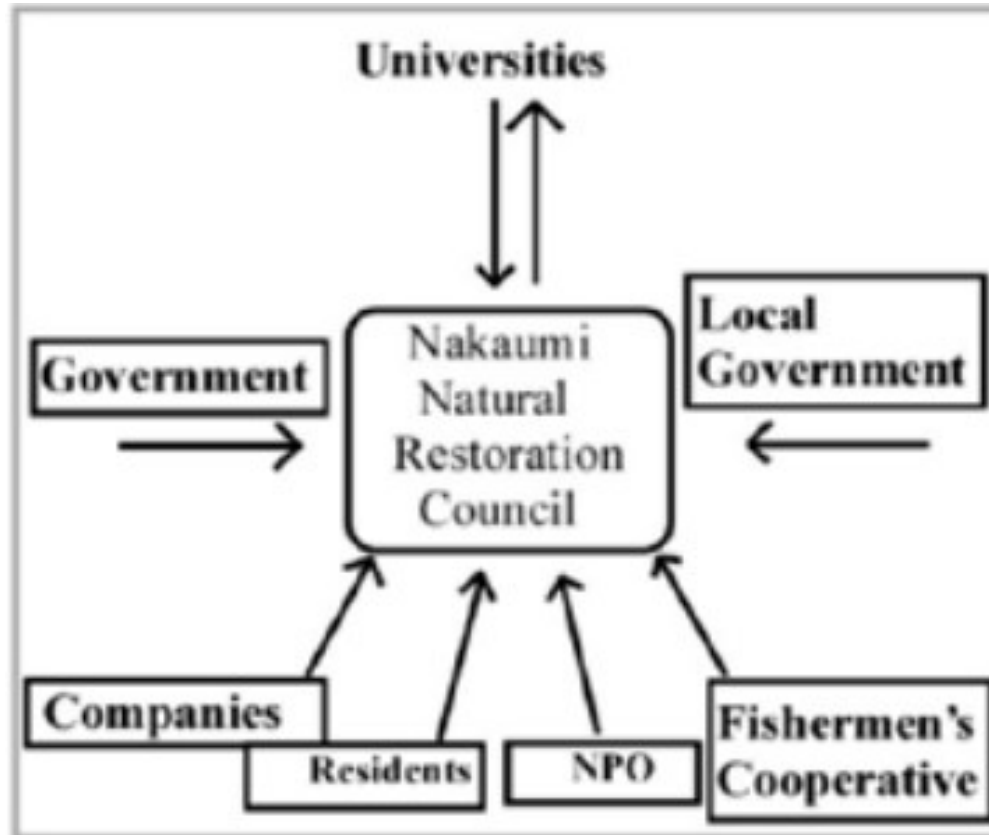
Lake Mikatagoko

These lakes have a Nature Restoration Council based on the law

have formulated a Nature Restoration Plan

The law states that "the national and local governments will endeavor to take financial measures", but there is no financial support from the national and prefectural governments.

## Case of Organization of Nakaumi Nature Restoration Council



中海自然再生協議会、PDFアイコン中海自然再生全体構想 <[https://www.nakaumi-saisei.org/file/zentaikousou\\_en.pdf](https://www.nakaumi-saisei.org/file/zentaikousou_en.pdf)>

## Other Finances

- Budget based on prefectural tax

The prefecture has established its own ordinance,

- collects taxes for the purpose of conserving lake basins,
- uses them as financial resources for conservation

For example,

Ibaraki Prefecture:

2008 The Ibaraki Prefecture Forest and Lake Environmental Tax Ordinance

Shiga Prefecture:

2009 Lake Biwa Forestry Prefectural Tax Ordinance, which collects 800

## Other Finances

- Budget for Civic Activities and Council Management

The relevant governments have contributed contributions to carry out civic activities and council management.

For example,

Shizuoka Prefecture and Hamamatsu City

contribute 7 million yen a year to promote civic activities for the conservation of Lake Sanaru

Ishikawa Prefecture, 2 cities and 2 towns

500,000 yen each is contributed to in the basin, management of the Kahokugata Environmental Measures Period Alliance

Kagoshima Prefecture, Ibusuki City, and Minamikyushu City

to run a council for the conservation of Lake Ikeda.

## Conclusion

- There are three types of sewage treatment systems in Japan
- Water quality improved by sewage treatment
- Sewerage cost a lot of money and took a long time to spread
- Local governments have borrowed a lot for the construction of sewage treatment system
- Regarding the financial resources of sewerage, the payment ratio of the national government, local governments, and beneficiaries is important.
- Currently repayment of debt as maintenance cost

When introducing sewerage,

**It is necessary to carefully consider securing financial resources and sustainability.**