

# Implementation by Nagoya City Measures to make Horikawa River Limpid



***Summary meeting for the 29th stage***

Nagoya City

Greenification & PublicWorks Bureau River Planning Div.

Waterworks and Sewerage Bureau Sewerage Planning Div.

Environment Bureau Local environmental measures Div.

Implementation by  
Nagoya city  
Greenification &  
PublicWorks Bureau





# Initiatives for clarification of *Horikawa River*

-①Removal of Sludge-

# ◆ Removal of Sludge in Horikawa River

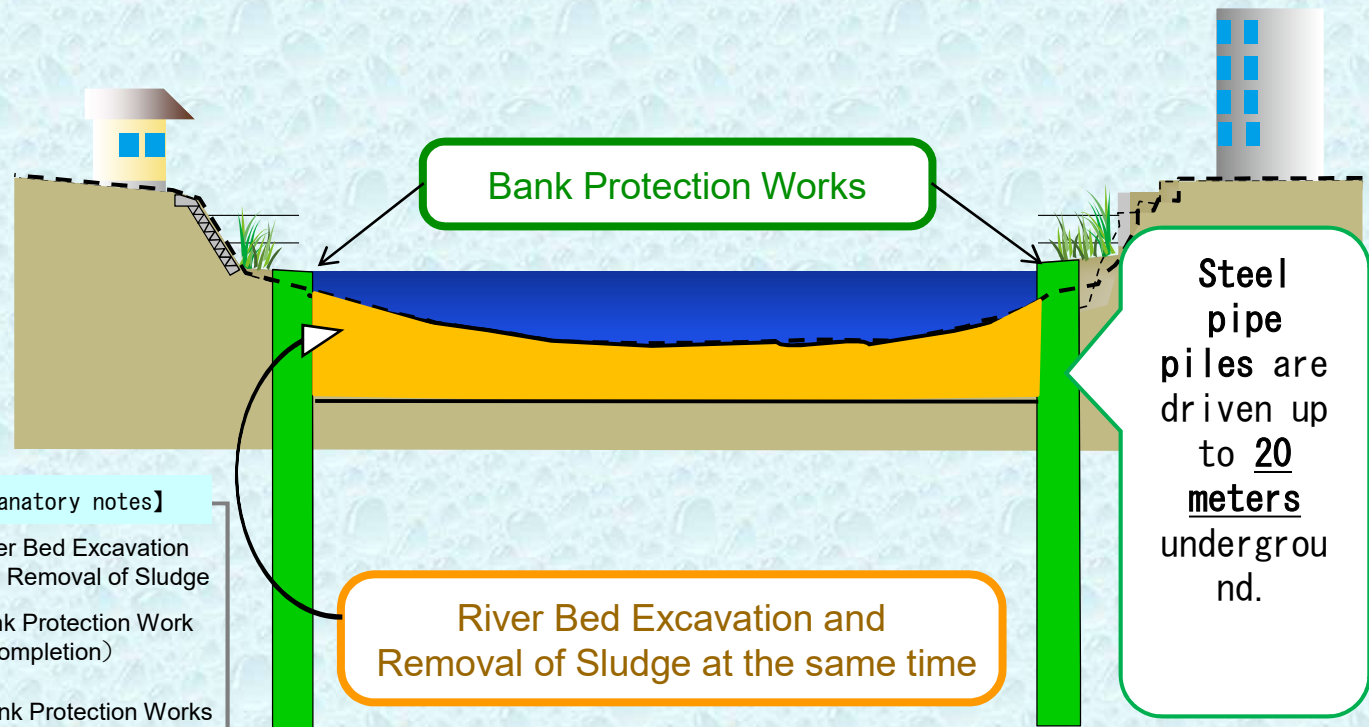
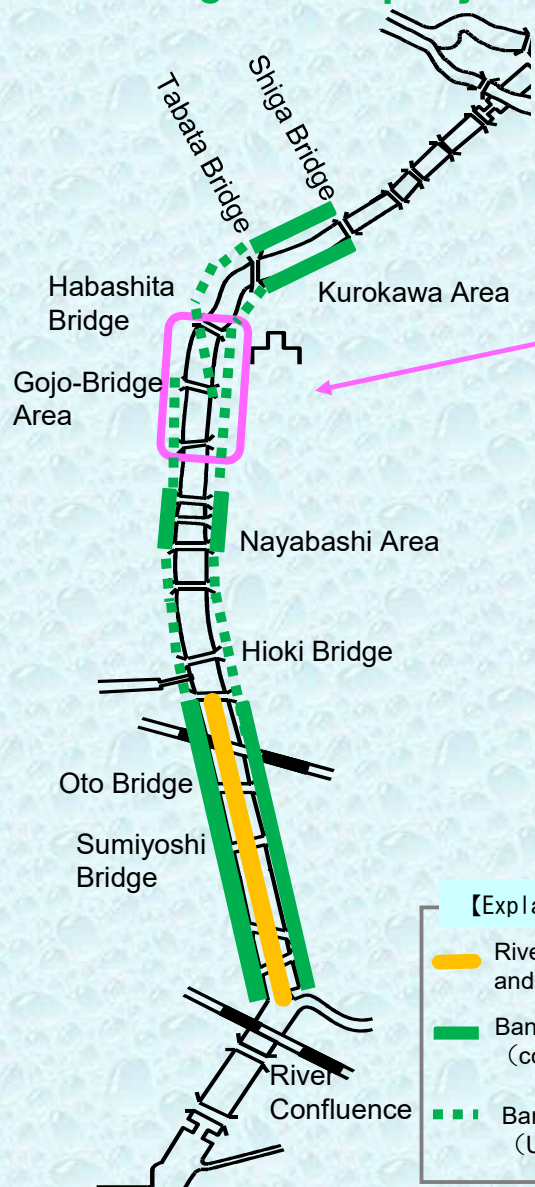
## • Development of Bank Protection in River management project

→ • After Bank Protection Works, River bed Excavation and **removal of sludge** are implemented at the same time

⇒ Development from downstream+

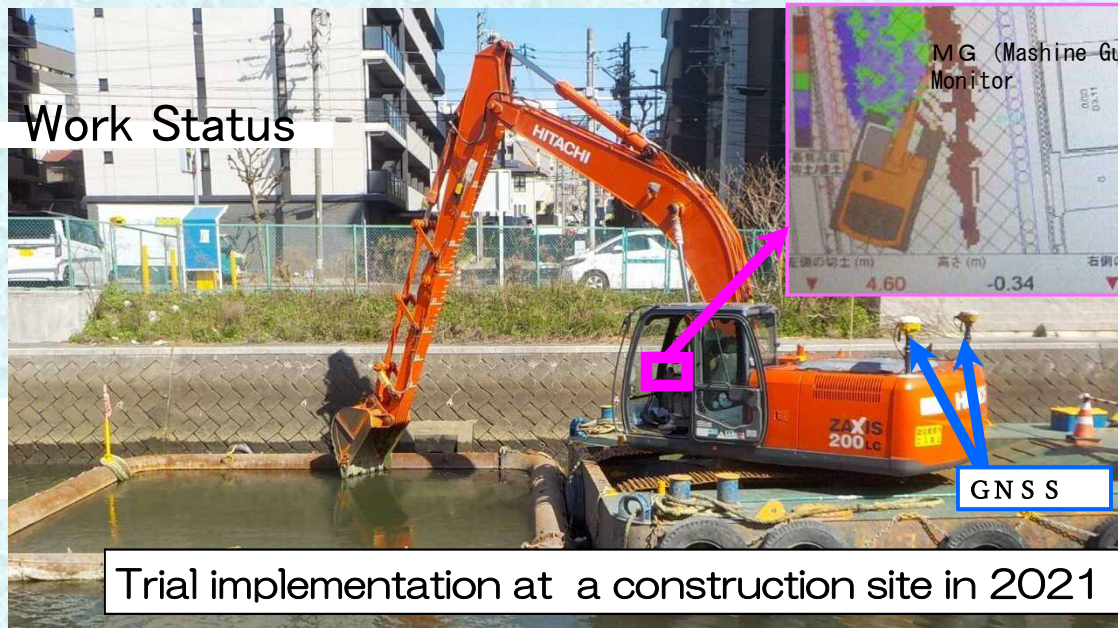
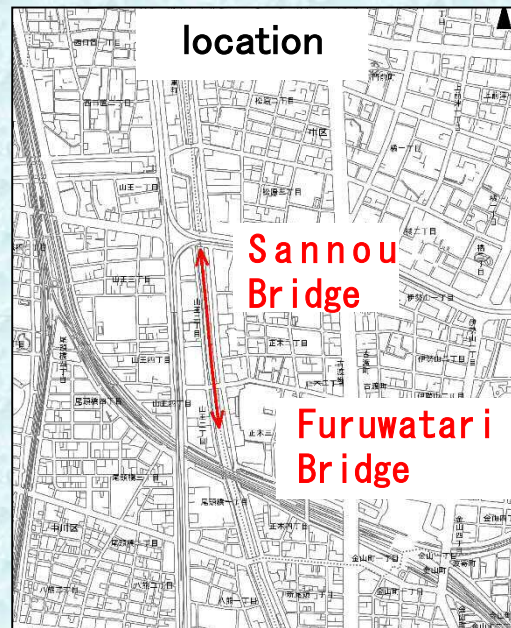
Development in Gojo-Bridge Area (2018-)

Development of bank protection + Removal of sludge





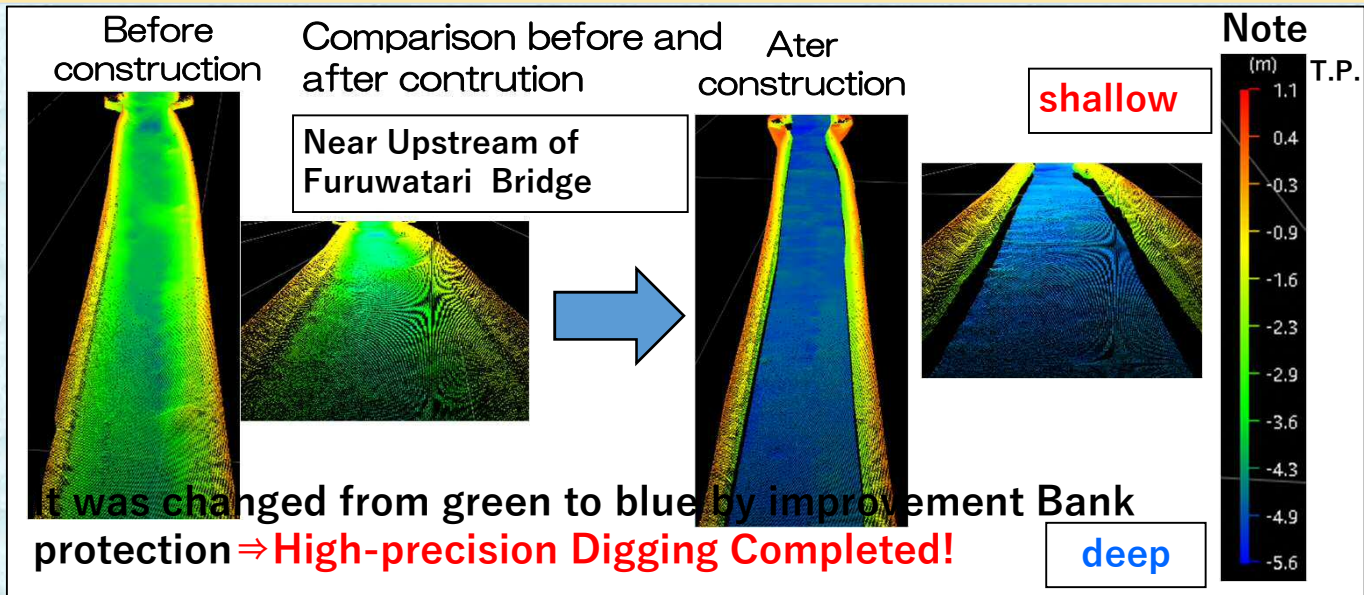
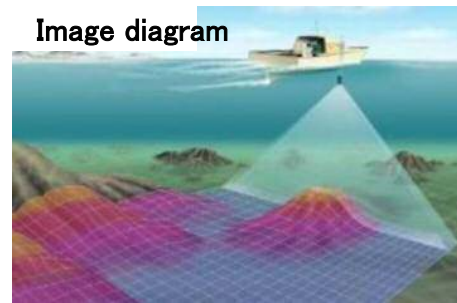
# ◆ Removal of Sludge in Horikawa River Improvement work of Bank Protection



Trial implementation at a construction site in 2021

## Carry out construction using 3D data by 3D survey (ICT construction)

Carry out short time and high precision and plane 3D survey by Acoustic measuring device (narrow multi-beam)



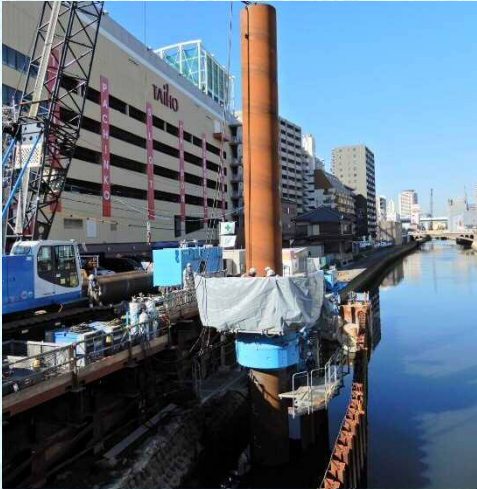


# Improvement work of Bank Protection No.1

## ◆ Removal of Sludge in Horikawa River

### ① 【Hioki Bridge Waterfront Square】

(Upstream of Hioki Bridge)

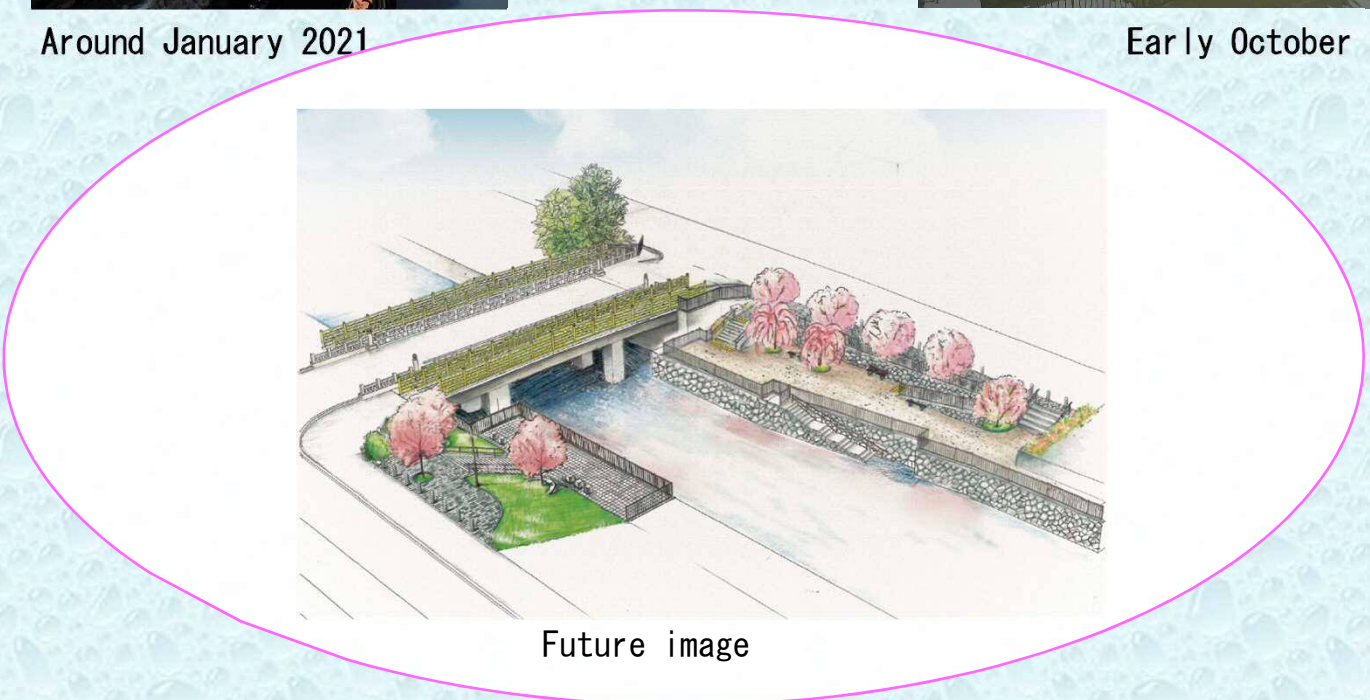


Around January 2021



Scheduled to be completed at the end of October

Early October 2021



Future image



# Improvement work of Bank Protection No.2

## ◆ Removal of Sludge in Horikawa River

### ② 【0to Bridge Hydrophile Square】

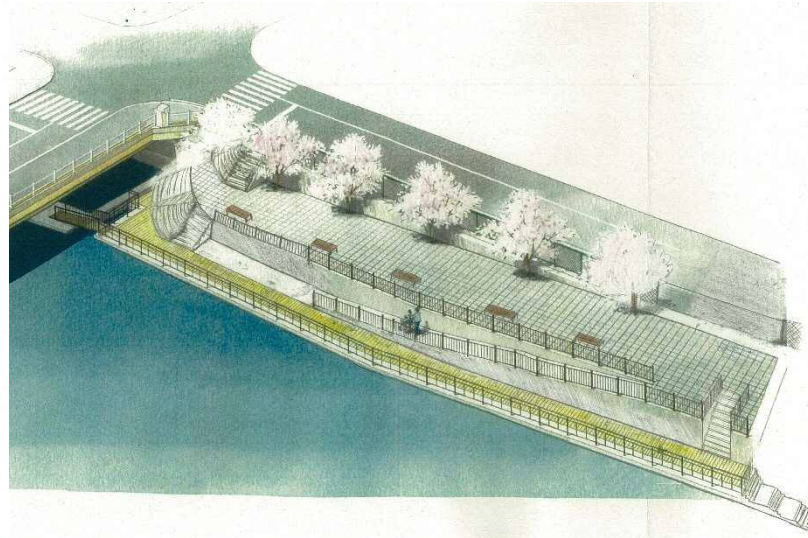
(Downstream of 0to Bridge)



**completed**

Around May 2020

The End of September 2021



Future image



# Initiatives for clarification of *Horikawa* River

-② Developments of  
Shallows and Depths-



# ◆ Developments of Shallows and Depths

Setting wooden piles and ripraps generates variable stream on the river for enforcing river's self-purification function and creating habitats with growth of plants.





# Construction of Shallows and Depths

Construction in 2010  
(Downstream of Meoto Bridge)



Construction in 2012  
(Downstream of Kurokawa No.2 Bridge)



Construction in 2013  
(Upstream of Kurokawa No.2 Bridge)



Construction in 2015  
(Downstream of Ruriko Bridge)





# Construction of Shallows and Depths

Construction in 2016  
(Downstream of Meoto Bridge)



Construction in 2018  
(Downstream of Kizune Bridge)



Construction in 2020  
(Downstream of Sinhori Bridge)

Photos of the follow-up  
are on the next page.



Some of the creatures seen in the upstream of Horikawa River



Pale chub



Japanese  
mitten crab



Little egret



Mallard

## Improvement

- Variety and amount of fish have increased. (pale chub etc.)
- Benthos have increased. (shrimp etc.)
- Plants have grow up more.



# Construction of Shallows and Depths

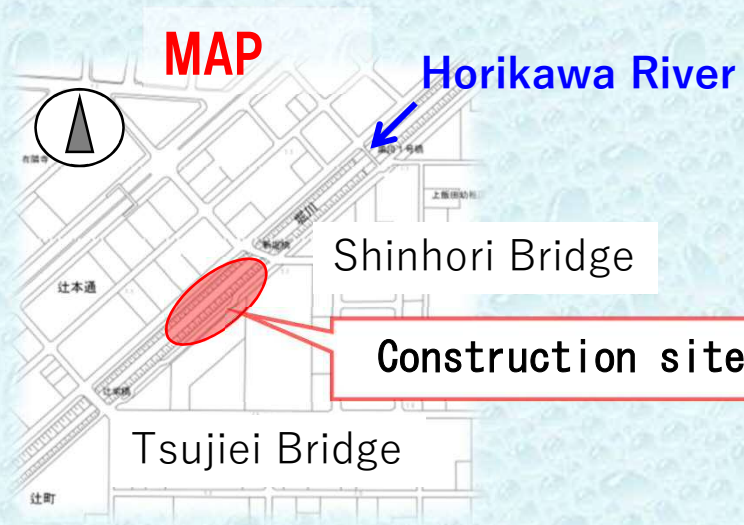
Follow-up of the Shallows and Depths constructed in March 2021



March 2021



September 2021



close-up

In this construction project, we utilizing fused stone which is recycled from incinerated ash of waste.



## Initiatives for clarification of *Horikawa River*

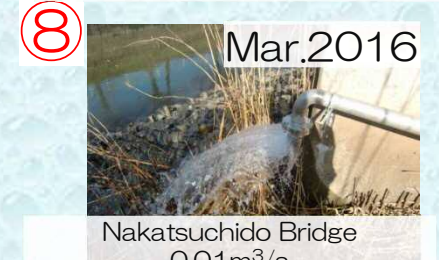
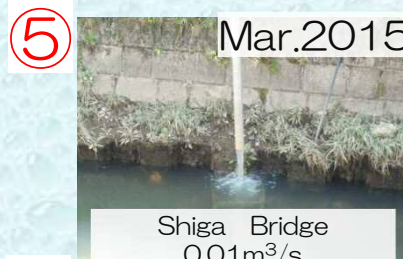
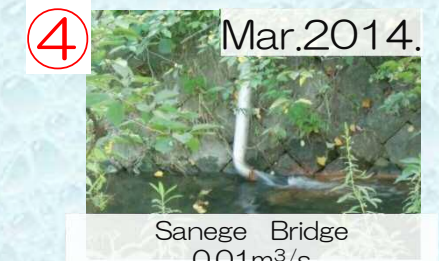
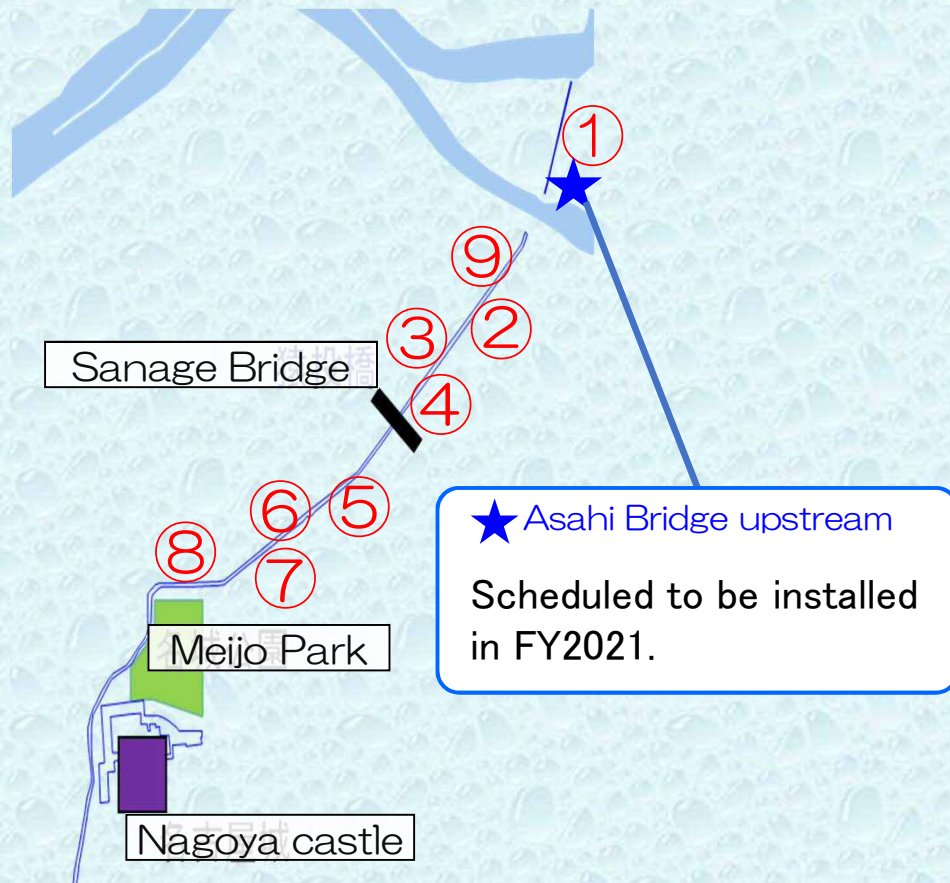
-③ Use of shallow groundwater -



# ◆ Use of shallow groundwater

▪ Scheduled to be installed in Moriyama Ward in FY2021.

(★ in the following map )



※②③  
The wells are broken.  
⇒ We are studying to repair



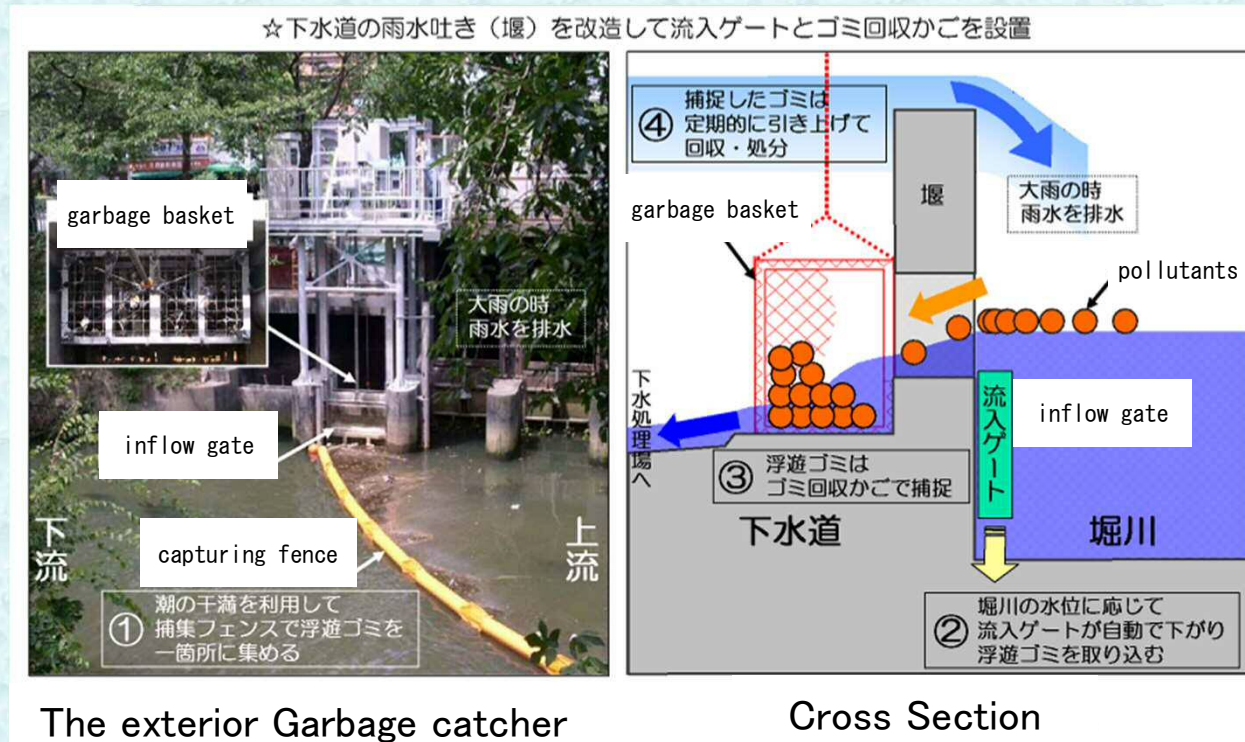
# Initiatives for clarification of *Horikawa River*

-④Change of collected pollutants -



# Removal of inflow of pollutants

## ◆ Garbage catcher (Near Johoku Bridge) since 2006





## ■ Removal of pollutants

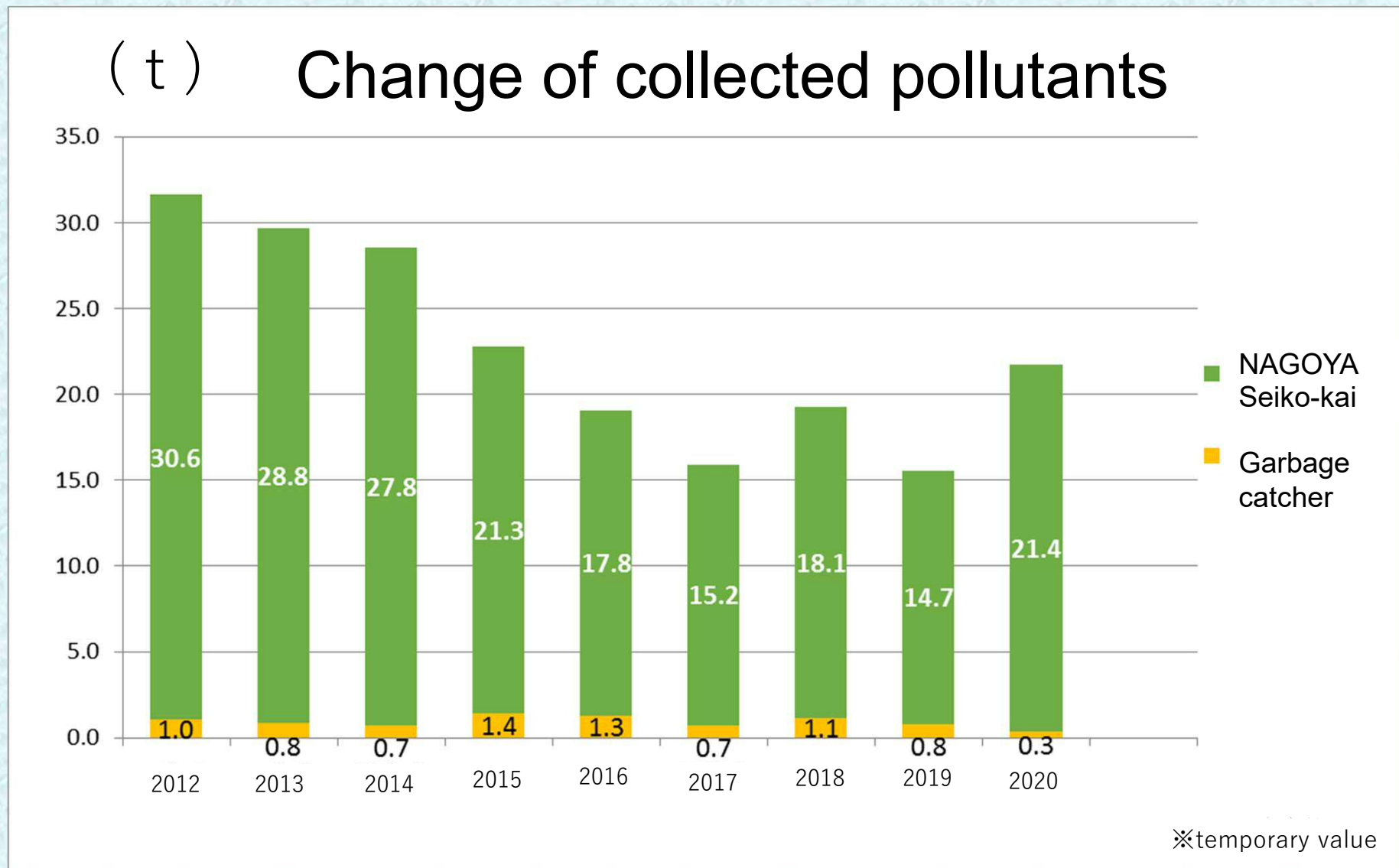
2 Cleaning by NAGOYA *Seiko-kai* (Public interest incorporated association for cleaning Nagoya Ports)



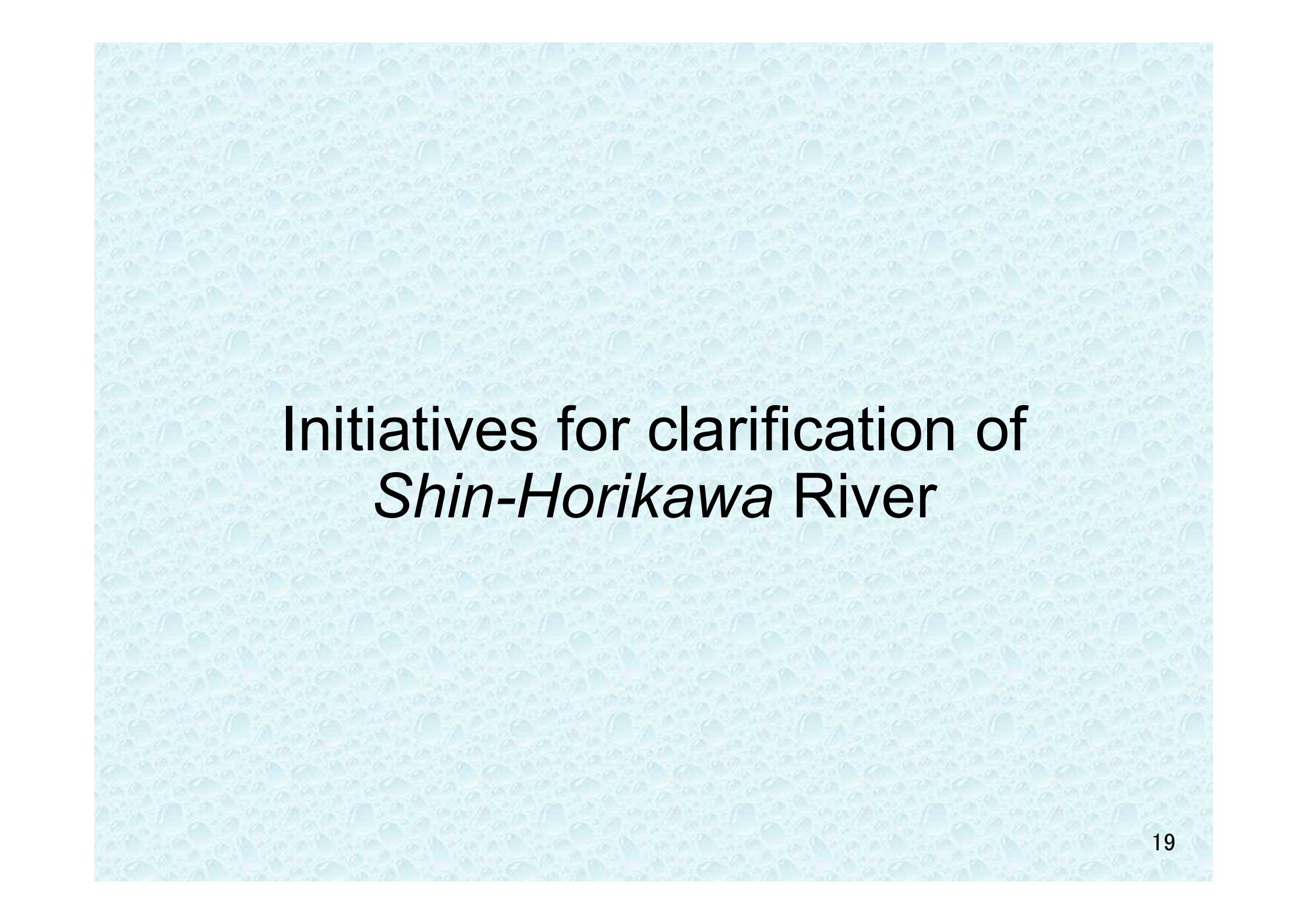


# Collection of pollutants

## 3 Change of collected pollutants







# Initiatives for clarification of *Shin-Horikawa* River



# ■ Survey and study for improvement of water environment of the Shin-Horikawa River (2020)

For improvement the water environment of the Shin-Horikawa River, we verified and evaluated the effectiveness of various water purification measures in consideration of experts opinions, and formulated future purification policies.

## List of experts

Name	Belong to		Specialized field
Kenji Daito	Daido University	Professor	Environmental Geotechnics, Sedimentology
Akihiro Tominaga	Nagoya Institute of Technology	Professor	River Engineering Hydraulics
Naoki Matsuo	Chubu University	Professor emeritus	River Engineering Environmental Hydraulics
Akihiko Yagi	Aichi Institute of Technology	Visiting professor	Limnology
Naoko Yoshida	Nagoya Institute of Technology	Associate Professor	Environmental Microbiology



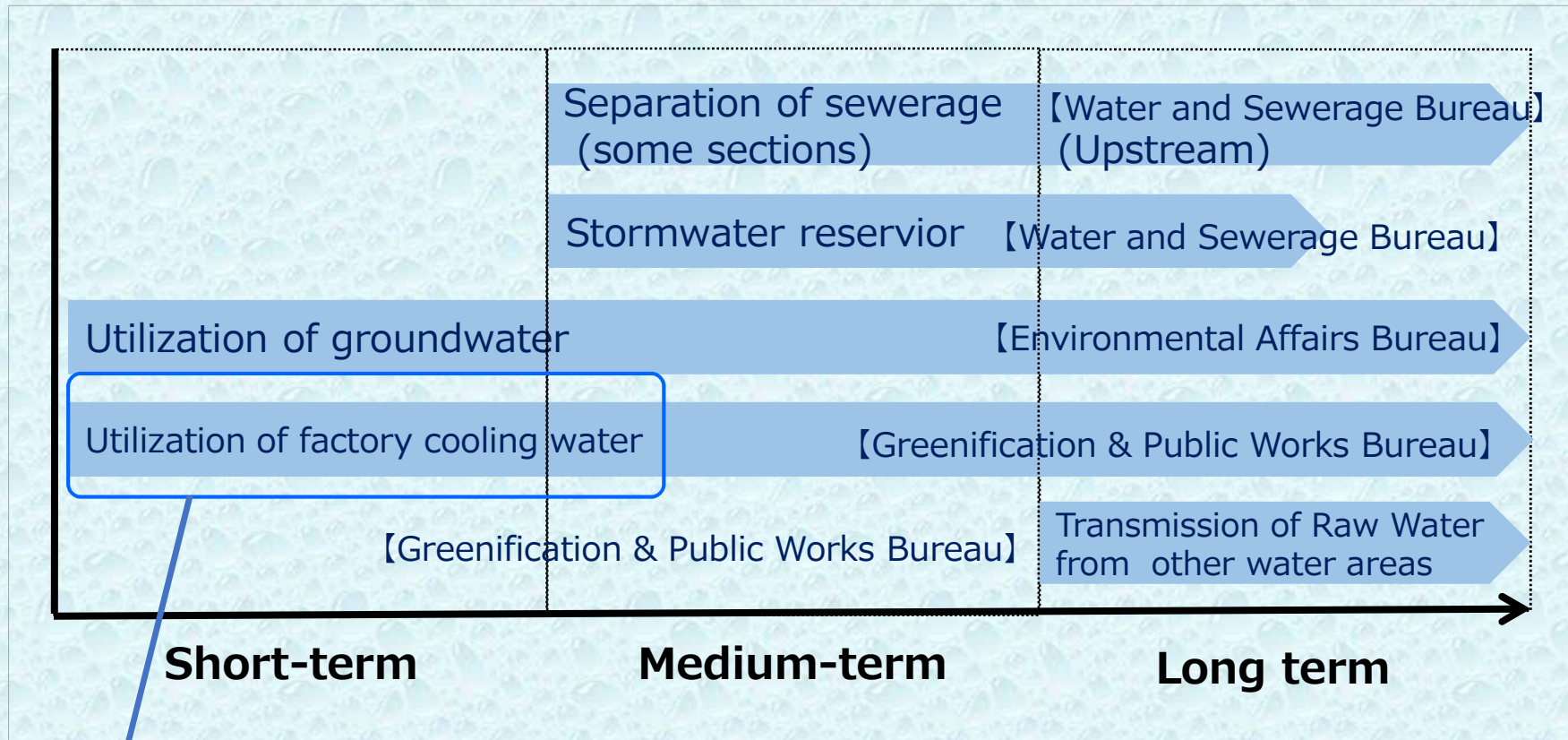
## ■ Future policy for improving the water environment of Shin-Horikawa River

- ① Installing **separate sewer system** that reduces the pollution load as wide as possible
- ② Working on sewerage measures that will be effective early  
**ex: installing rainwater reservoirs**
- ③ **Discharging groundwater and factory cooling water** that supplies oxygen for the bottom of the river
- Checking the result of ①, ② and ③ continuously
- ④ **Water conveyance from the other basin** according to the improvement of water quality at the intake place



# ■ Survey and examination for improving the water environment of the Shin-Horikawa River

<Assumed schedule>



Conducted an interview survey with riverside operators regarding the amount and quality of discharged water in FY2021.

Short term : 1 to 5 years  
 Medium term: 5 to 10 years  
 Long term : 10 years or more



## ■ Cooperation with Nagoya Chamber of Commerce (Shin-Horikawa River Future Vision Study Group)

Purpose: Nagoya Chamber of Commerce calls Horikawa River, Nakagawa Canal, and Shin-Horikawa River as "Nagoya-3 Rivers".

And also "Nagoya-3 Rivers" attractiveness improvement project" is one of the priority initiatives for community development. Since Shin-Horikawa River is the least utilized in "Nagoya 3-Rivers", we are working to formulate a vision with academics, citizen groups, riverside companies, etc.

Composition	
Committee member	Professor Hideshima, Nagoya Institute of Technology, HSC Secretary General Hattori Riverside companies, etc.
Observer	Environmental Affairs Bureau -Regional Environment Policies Division Housing & City Planning Bureau -Community Development Planning Division Greenification & Public Works Bureau -River Planning Division Waterworks & Sewerage Bureau -Sewerage Planning Division
Secretariat	Nagoya Chamber of Commerce



## ■ Cooperation with Nagoya Chamber of Commerce (Shin-Horikawa River Future Vision Study Group)

Schedule : Orientation cruise in Shin-Horikawa River (May 2021)  
Review meeting (scheduled to be held 4 times from July 2021 to February 2022)  
Release of Shin-Horikawa River Future Vision (scheduled for late March 2022)



Orientation cruise (May 28)



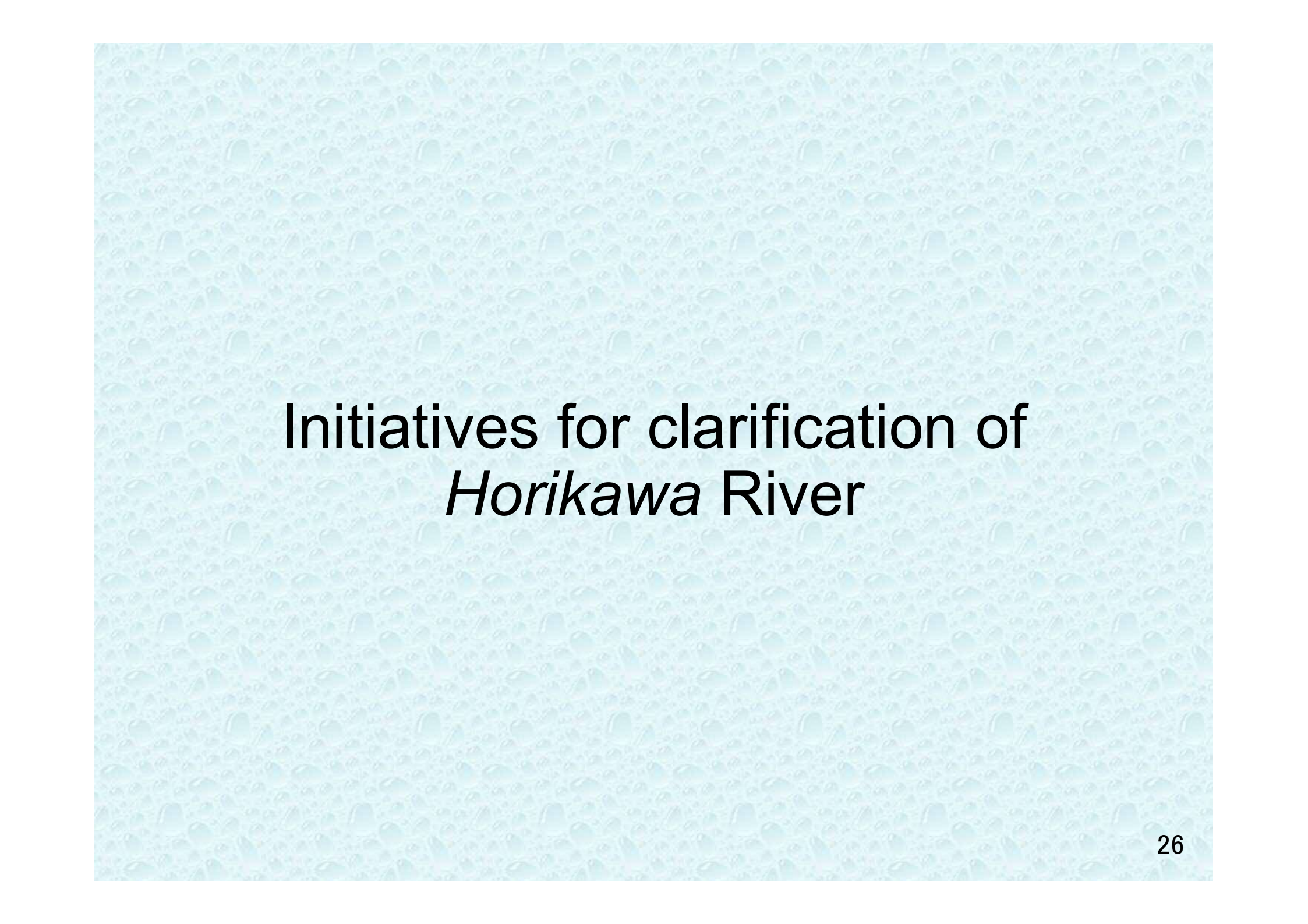
First Meeting (July 27)





Implementation by  
Nagoya City  
Waterworks and Sewerage Bureau

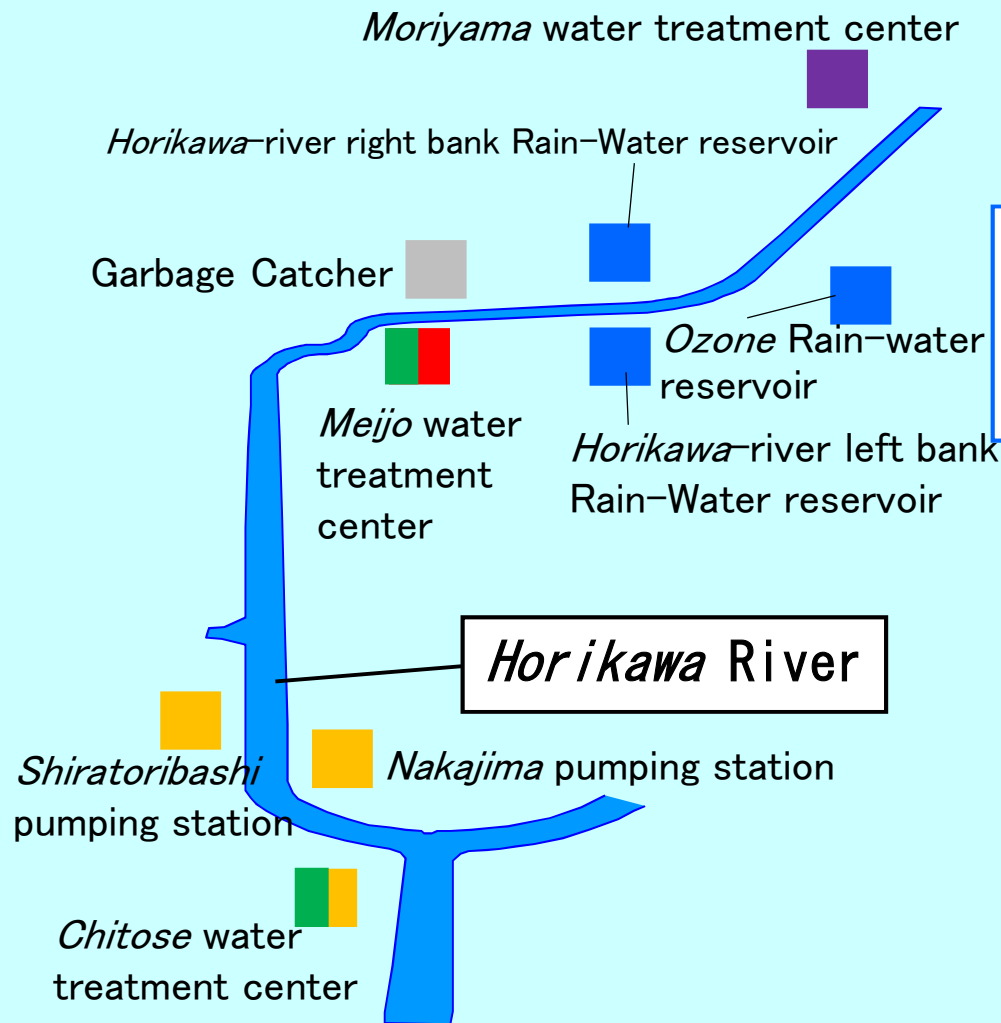




# Initiatives for clarification of *Horikawa* River



# Initiatives for clarification of Horikawa River



**Advanced wastewater treatment**  
*Meijo* water treatment center (disk filter)

**Advanced facilities of primary treatment**  
*Meijo* water treatment center  
***Chitose* water treatment center**  
 (Under construction)

**Rain Water reservoir for pollution control**  
*Ozone* Rain-water reservoir  
*Horikawa*-river right bank Rain-Water reservoir  
*Horikawa*-river left bank Rain-Water reservoir

Set of Garbage removal facilities

**Shrinkage of Rainwater screen slit**  
*Shiratoribashi* pumping station  
*Nakajima* pumping station  
*Chitose* water treatment center

**Reclaimed wastewater supply**  
*Moriyama* water treatment center

Garbage Catcher (Corporation with Greenification & PublicWorks Bureau)

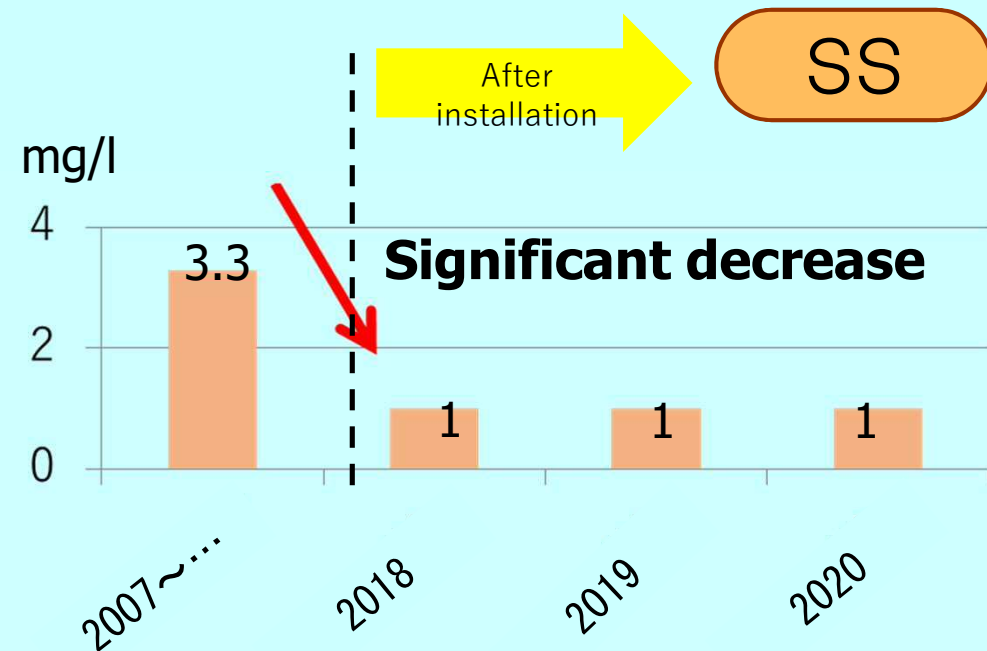
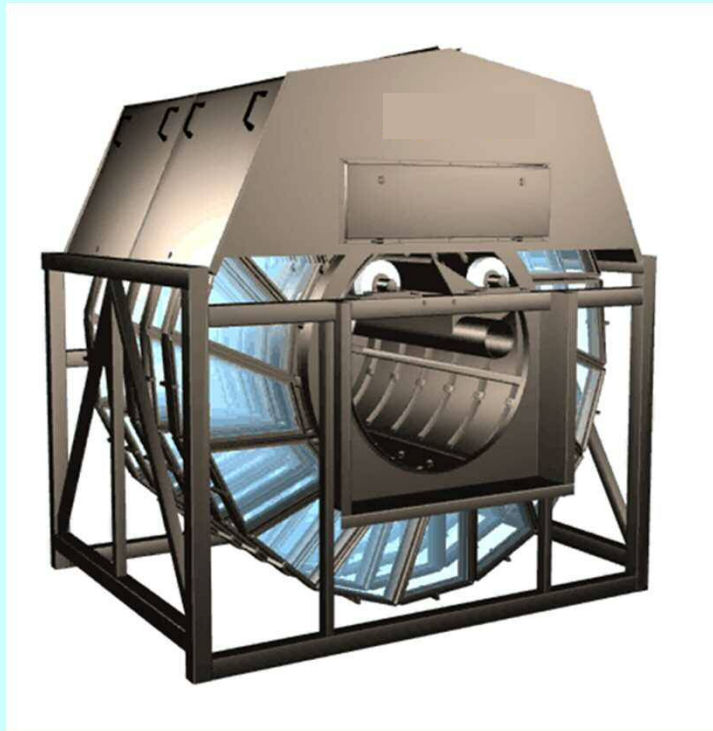




# Advanced wastewater treatment

## ◆ *Meijo water treatment center*

(wastewater treatment capacity : 50,000m<sup>3</sup>/day) Started operation in 2010



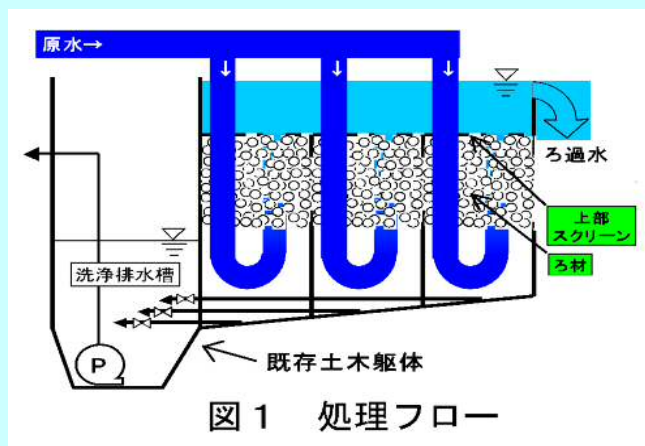
Minute Suspended Solids (SS) in treated water are removed more by **the filtration devices (disk filter)**



# Advanced Facilities of primary treatment (Improvement of combined sewer system)

We changed the primary treatment of rain water from Settling treatment to Filtration treatment, remodeled the part of existing first settling basin and installed advanced facilities of primary treatment in the water treatment centers.

- ◆ **Meijo Water Treatment Center** (primary treatment capacity 99,400m<sup>3</sup>/day)
  - Started operation in 2019
- ◆ **Chitose Water Treatment Center** (primary treatment capacity 84,900m<sup>3</sup>/day)
  - Construction started in 2021



◆ Removal Rate of BOD 20%–30%

➡ **50%–60% Improvement**





# ■ Rain-water Reservoir for pollution control (Improvement of combined sewer system)

We construct rainwater storage facilities to reduce pollution load for *Horikawa River* in rainy weather by storing high polluted first flush rainwater temporarily.

*Ozone* rain water  
Reservoir for  
pollution control



Started operation in 2006  
(12,000m<sup>3</sup>)

*Horikawa*-river right bank  
Rainwater  
Reservoir for  
pollution control



Started operation in 2010  
(13,000m<sup>3</sup>)

*Horikawa*-river left bank  
Rainwater  
Reservoir for  
pollution control



Started operation in 2019  
(14,000m<sup>3</sup>)

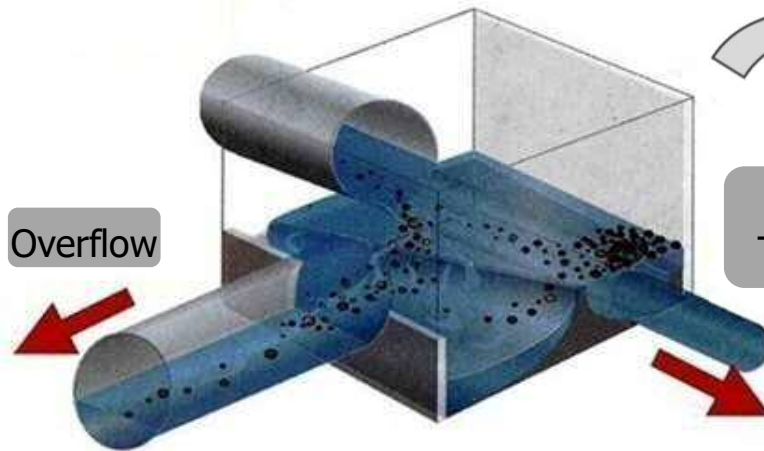
# Removal and Reduction of inflow of pollutants

## ◆ Improvement of combined sewer system (Installation of Garbage Removal Device)

The number of installation of  
Garbage Removal Device (end of FY2020)

Total Plan	Installed	Future plan to install
127	125	2

Before



Overflow

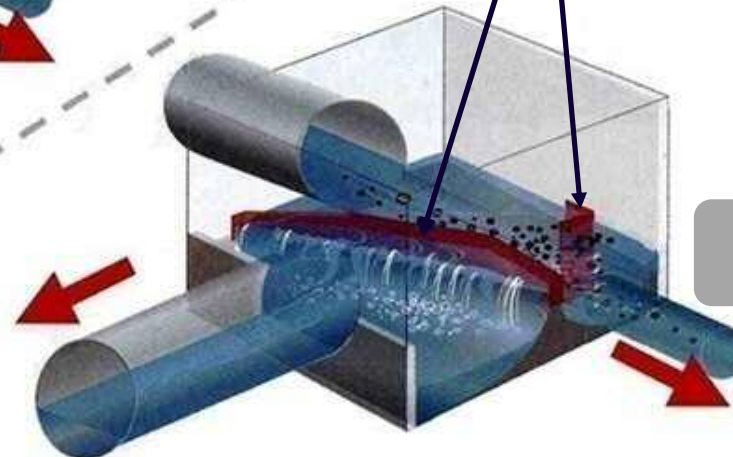
**Garbage in sewerage overflows together with rainwater**

**•Rainwater treated by the garbage removal devices overflow into river**

Wastewater Treatment Plant

**Garbage Removal Device**

After



Overflow

Wastewater Treatment Plant

**•Removed garbage is treated at Wastewater Treatment Plant together with sewerage**





# ■ Shrinkage of Rainwater screen slit (Improvement of combined sewer system)

Rainwater screens are the facility to remove comparatively big garbage, and installed in water treatment centers and pumping station.  
More garbage is removed by shrinkage of rainwater screen.

- ◆ *Shiratoribashi* pumping station  
*Nakajima* pumping station  
*Chitose* water treatment center

- ◆ Rainwater screen slit

40mm → 25mm

- ◆ Prevention of inflow of pollutants



# Supply of reclaimed wastewater

**Moriyama water treatment center** supply reclaimed water treated by membrane filtration to *Horikawa* river.

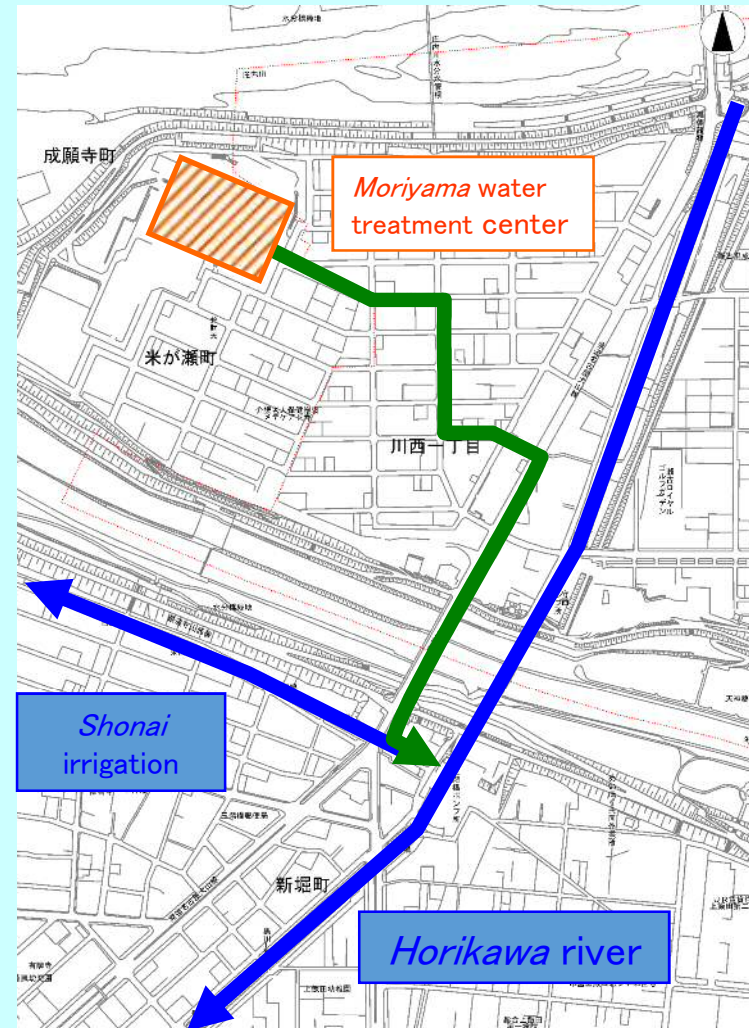
Water supply :Up to 4,000m<sup>3</sup>/day(0.046m<sup>3</sup>/s)



Flat membrane unit aerobic tank



Flat membrane unit



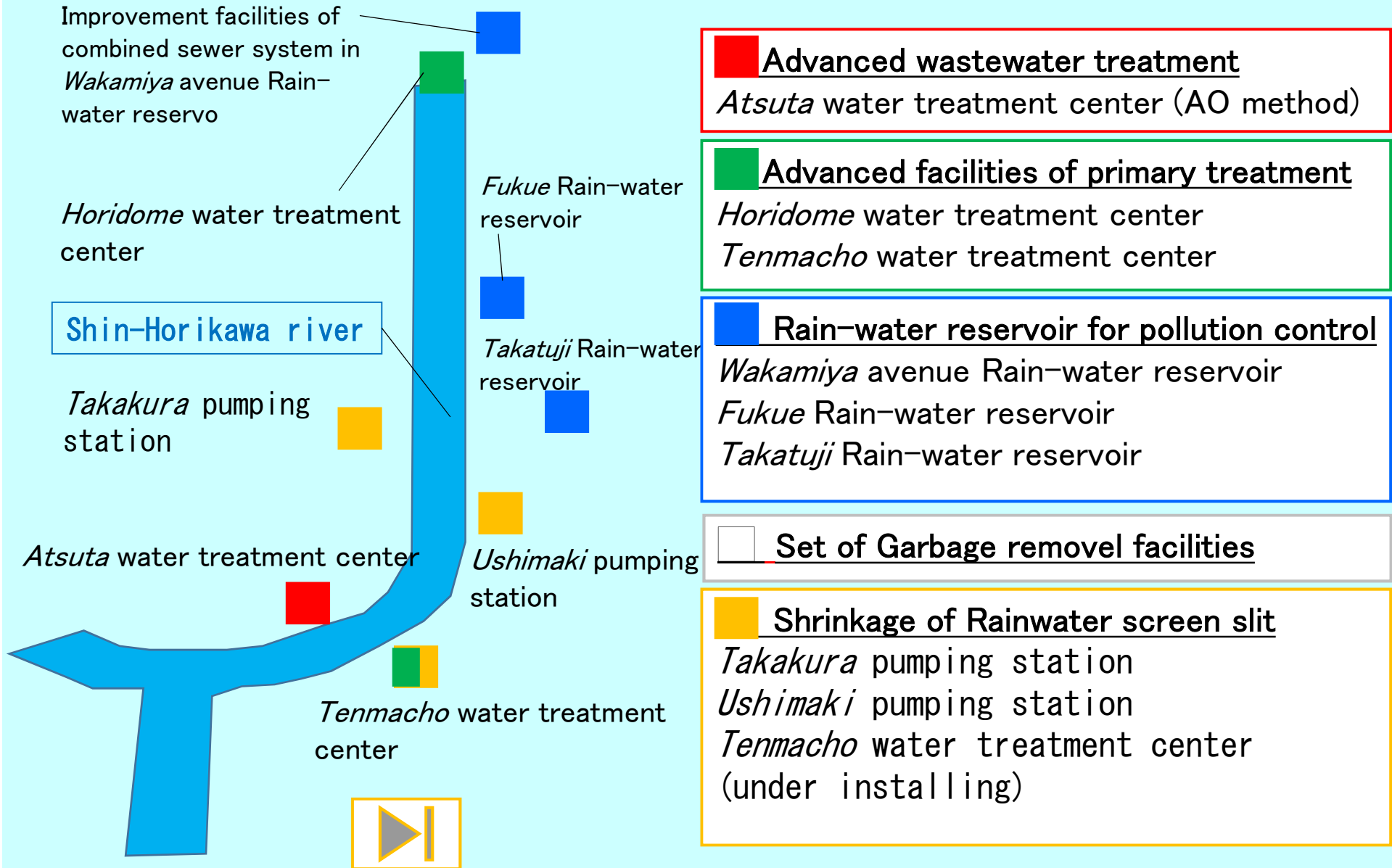
※Watering period is almost irrigation period (April ~ October)  
(Except the period for Shonai irrigation channel (November ~ March))





# Initiatives for clarification of *Shin-Horikawa* River

# Initiatives for clarification of *Shin-Horikawa River*

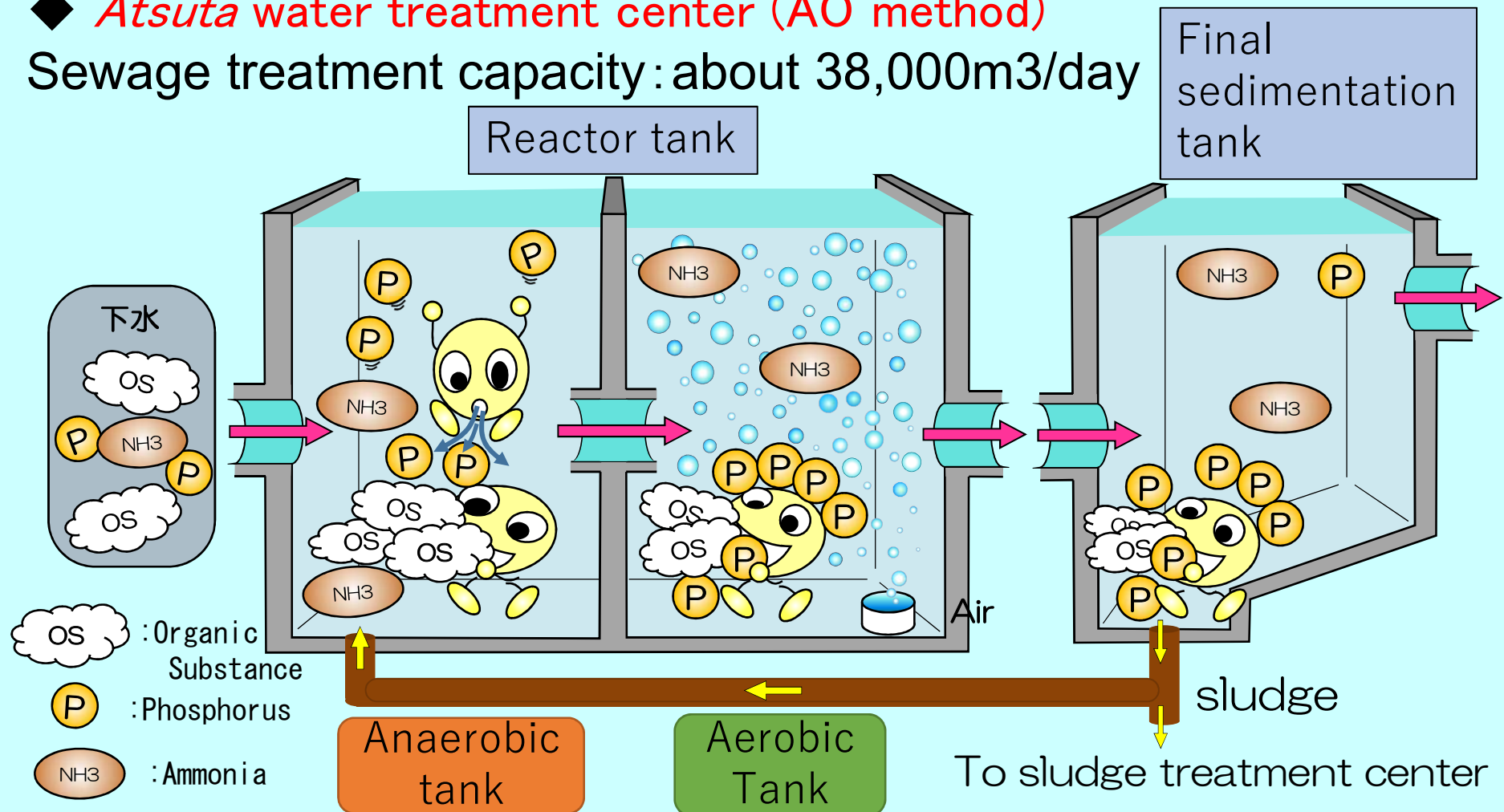




# Advanced wastewater treatment

## ◆ *Atsuta* water treatment center (AO method)

Sewage treatment capacity: about 38,000m<sup>3</sup>/day



The process can remove nitrogen and phosphorus which causes eutrophication more than normal conventional activated sludge process.



# Advanced Facilities of primary treatment (Improvement of combined sewer system)

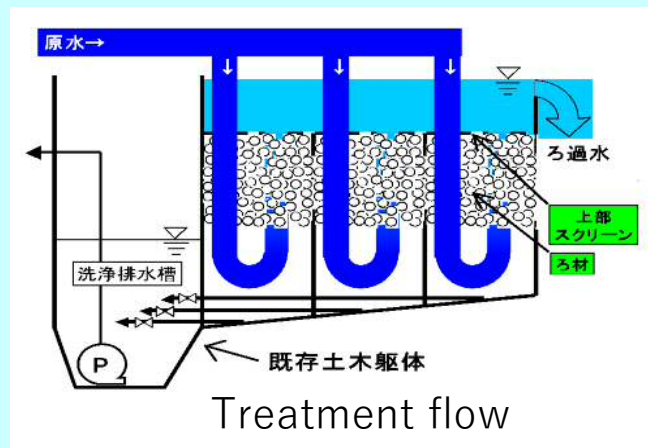
We changed the primary treatment of rain water from Settling treatment to Filtration treatment, remodeled the part of existing first settling basin and installed advanced facilities of primary treatment in the water treatment centers.

## ◆ *Tenmachi Water Treatment Center* (treatment capacity 168,000m<sup>3</sup>/day)

- Started operation in 2011

## ◆ *Horidome Water Treatment Center* (treatment capacity 277,200m<sup>3</sup>/day)

- Started operation in 2018



## ◆ Removal Rate of BOD 20%–30%

➡ **50%–60% Improvement!**





# ■ Rain-water Reservoir for pollution control (Improvement of combined sewer system)

We construct rainwater storage facilities to reduce pollution load for *Shin-Horikawa* River in rainy weather by storing high polluted first flush rainwater temporarily.

**Takatuji Rain-water reservoir**



Started operation in 1987  
(30,000m<sup>3</sup>)

**Fukue Rain-water reservoir**



Started operation in 1999  
(26,000m<sup>3</sup>)

**Improvement facilities of combined sewer system  
in Wakamiya avenue Rain-water reservoir**



Started operation in 2002  
(19,000m<sup>3</sup>)



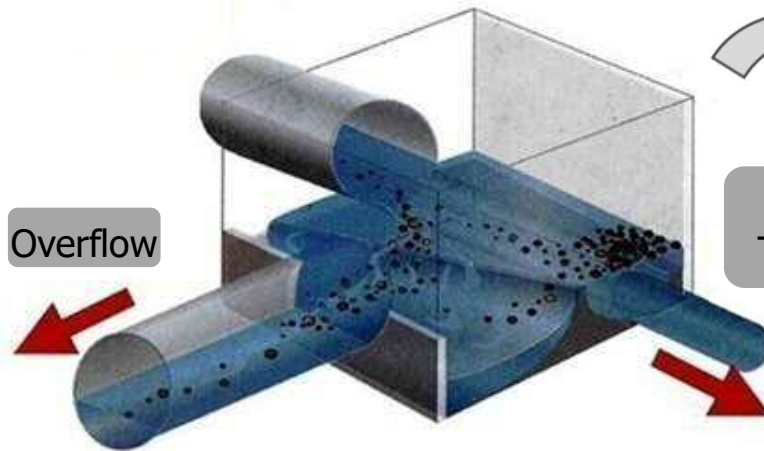
# Removal and Reduction of inflow of pollutants

◆ Improvement of combined sewer system  
 (Installation of Garbage Removal Device)

The number of installation of  
 Garbage Removal Device (end of FY2020)

Total Plan	Installed	Future plan to install
45	45	completion

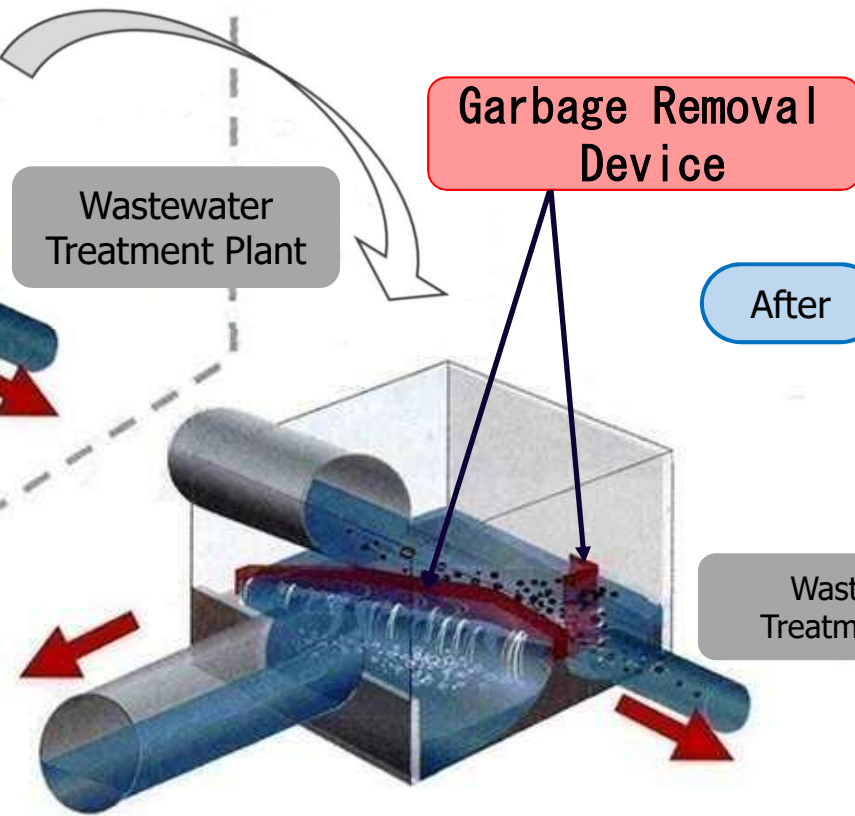
Before



Overflow

**Garbage in sewerage overflows together with rainwater**

•Rainwater treated by the garbage removal devices overflow into river



After

Wastewater Treatment Plant

Overflow

•Removed garbage is treated at Wastewater Treatment Plant together with sewerage





# ■ Shrinkage of Rainwater screen slit (Improvement of combined sewer system)

Rainwater screens are the facility to remove comparatively big garbage, and installed in water treatment centers and pumping station.  
More garbage is removed by shrinkage of rainwater screen.

- ◆ *Takakura* pumping station  
*Ushimaki* pumping station  
*Tenmachi* water treatment center

- ◆ Rainwater screen slit

40mm → 25mm

- ◆ Prevention of inflow of pollutants



# Additional initiatives for clarification



# ■ Further water clarification

## In the upper and middle area of Horikawa and upstream area of Shin-Horikawa

We are trying the following measures mainly now.

① Measures which show the effect early, such as the construction of rainwater trunk sewer which has the function to retain the non-treated sewage temporarily before overflow to the river.

② Sewer separation at the model district. (Sewer separation at the limited area.)



Urban development using the waterfront(Horikawa)

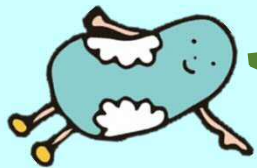
# Implementation by Nagoya City Environment Bureau



# ■ Examination of groundwater conduction plan to Shin-Horikawa River in FY2020

## Image of groundwater use

Discharging groundwater from bottom layer is expected to improve water quality



< main effects >

- Improvement of dissolved oxygen concentration in the bottom layer.
- Reduction of stratification.  
( Difference in salinity between surface and bottom layers)

High Water Level

Tokyo Peil  
1.20m

Low Water Level

Tokyo Peil  
-1.37m

Treated water (+untreated water)

Seawater coming in at high tide

Seawater is always stagnant

River bed

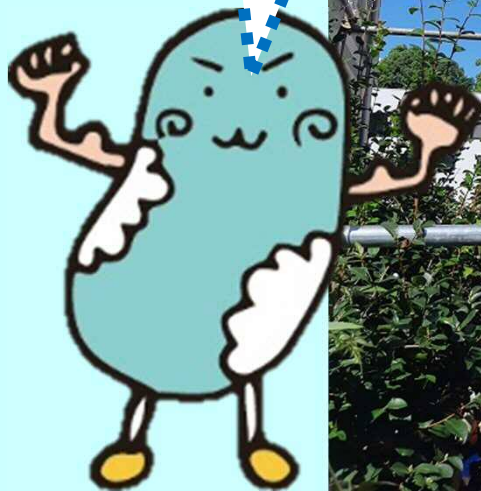
Hydrophilic space or oxygen dissolution equipment, etc.

Groundwater flow

Well P

# Investigation about using ground water in Shin-Horikawa(2021)

In 2021, we are investigating geological features in the riverside area of Shin-Horikawa.



## Investigation spot





Thank you for your attention

