



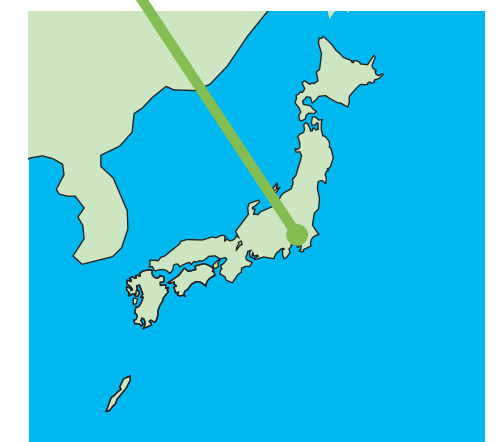
# Waterworks and Sewerage Projects in Kawasaki FY2023 Project Outline

Safe Water,  
Safe Living

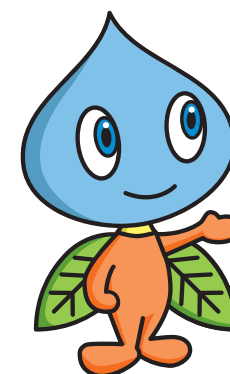


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Kawasaki Waterworks and Sewerage Bureau Characters



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# Water Cycle

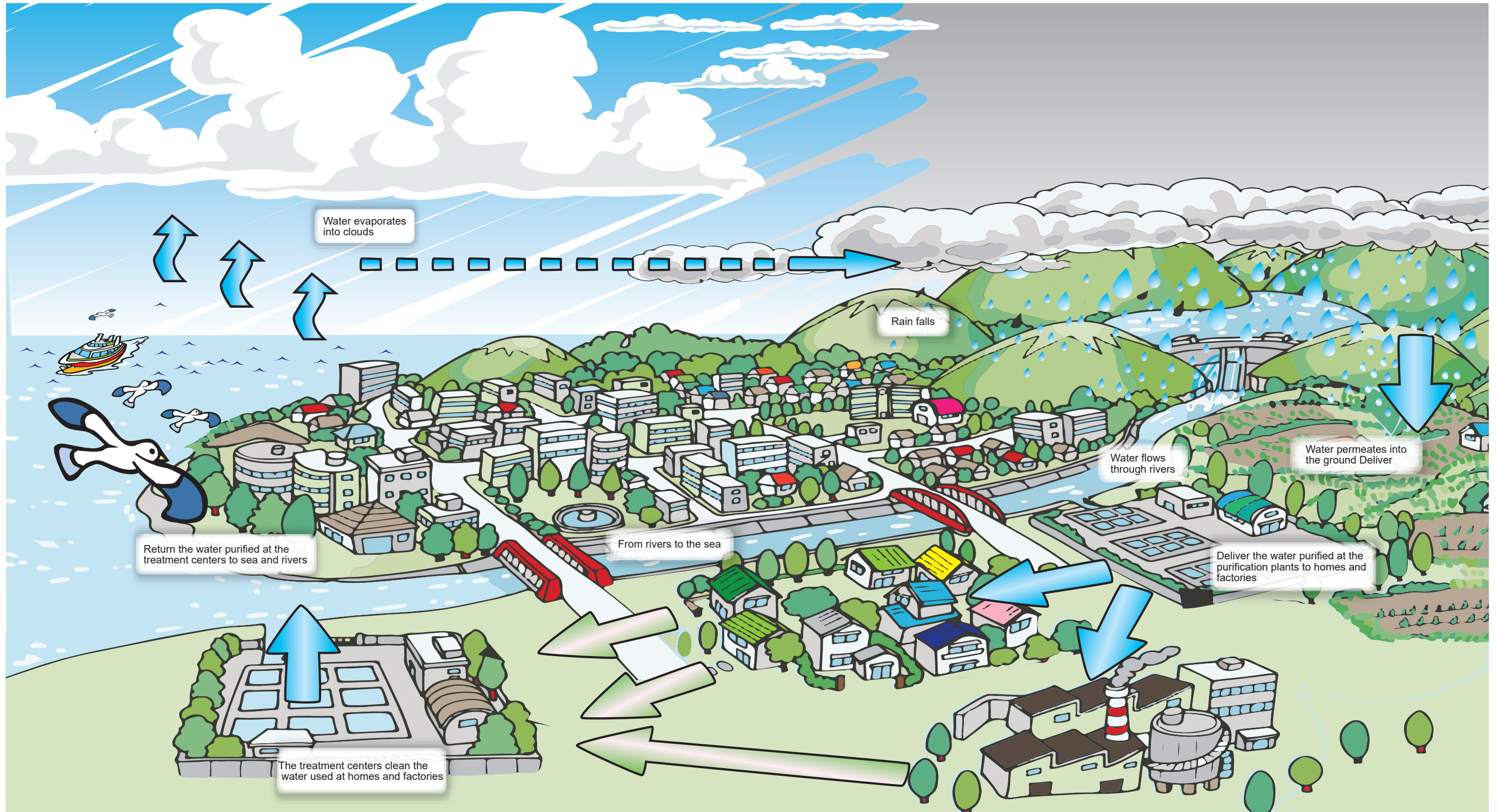
Water is an essential foundation of life—it has been cycling the globe and blessing us since the beginning of time. While of course benefiting from the continual cycle of water in the natural world, the waterworks and sewerage systems that support our daily lives/industrial activities also contribute to a sustainable cycle.

The “Fundamental Law on Water Cycle” stipulates that “water cycle is to be defined the process by which water evaporates, precipitates, flows in bodies of water/permeates into the ground, and then eventually reaches the ocean (particularly through the flow of above/below-ground rivers)”.

The water from Sagami and Tama Rivers serve as the water resource for Kawasaki; after purifying these resources into quality water for drinking and for industrial use, we distribute it to households and factories by utilizing differences in altitude.

And dirty water used in homes and factories is quickly eliminated by the sewage system, creating a comfortable living environment. The removed unclean water is purified into clean water at wastewater treatment centers and is returned to nature including the sea and rivers.

Kawasaki’s Waterworks and Sewerage Systems utilize the blessings of nature and—as one part of the larger cycle of water in nature—work to provide water for drinking/industrial uses as well as to purify wastewater and discharge it back into nature in order to help maintain a sustainable cycle of water.



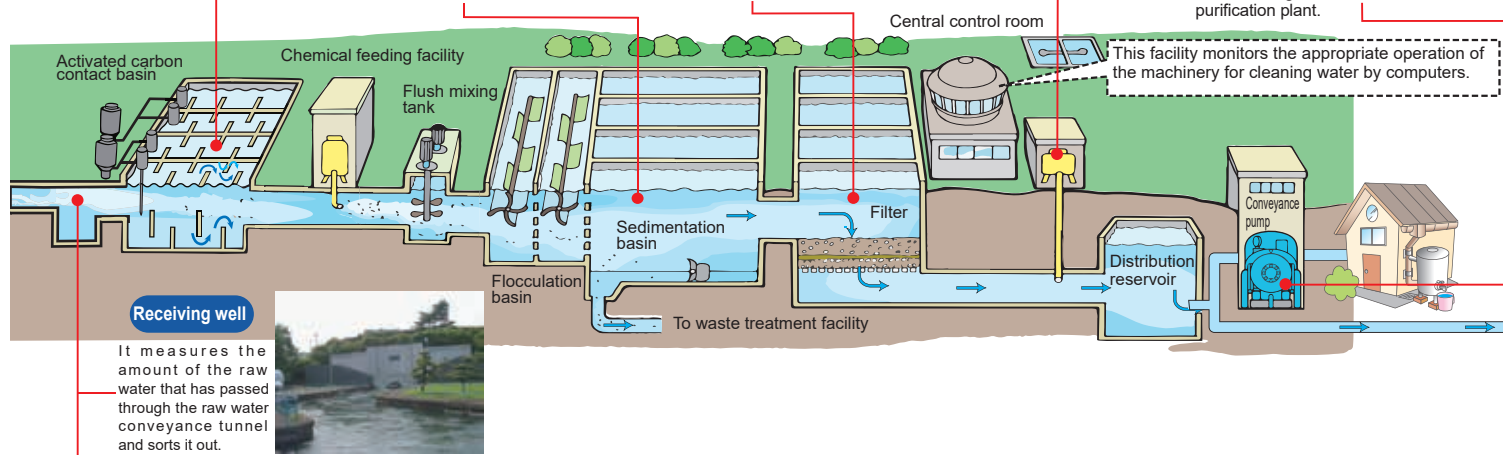
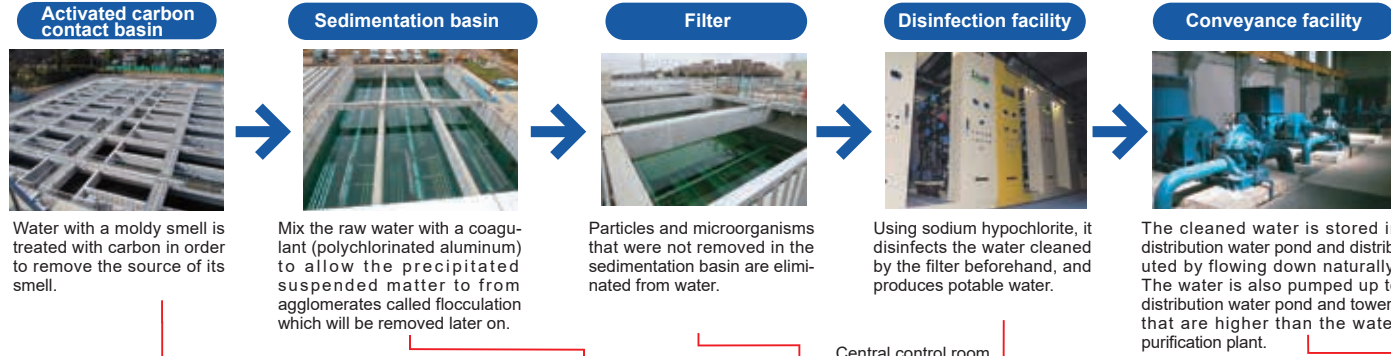




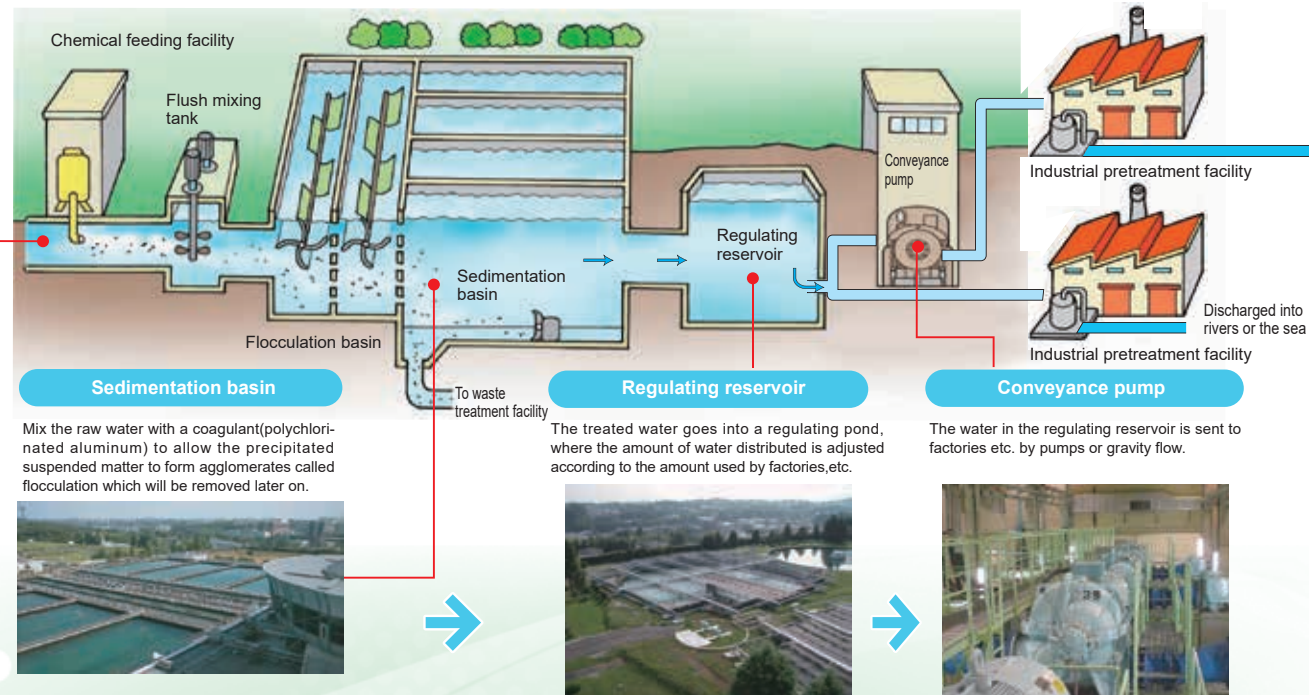
# Structure of Waterworks, Industrial Water System and Sewerage System

Using an array of advanced water treatment technologies at our purification plants, we work to provide safe drinking water, as well as quality water for industrial use. In addition, we also treat the wastewater we receive from households/factories at our sewage treatment plants and then discharge the treated wastewater back into Tokyo Bay and the Tama River.

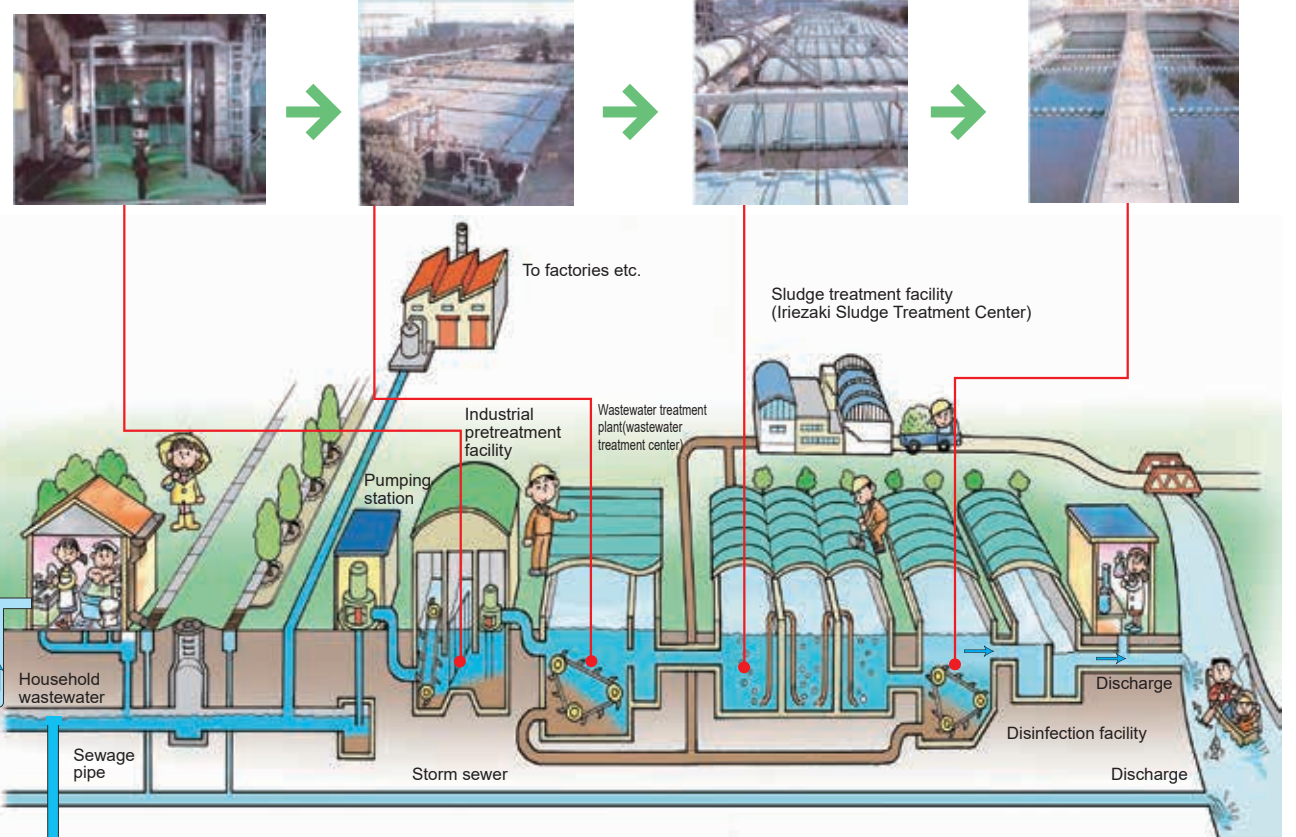
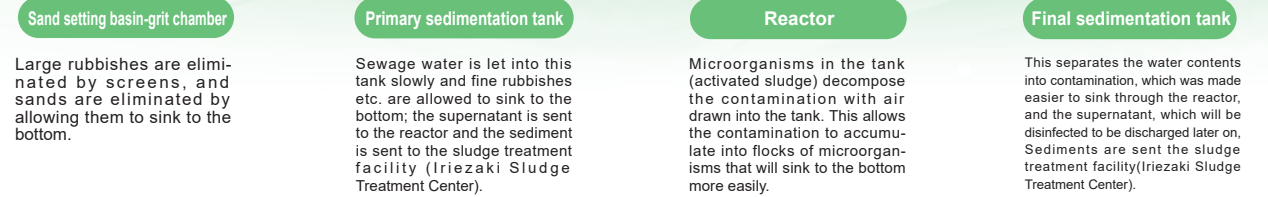
## Structure of Waterworks



## Structure of Industrial Water System



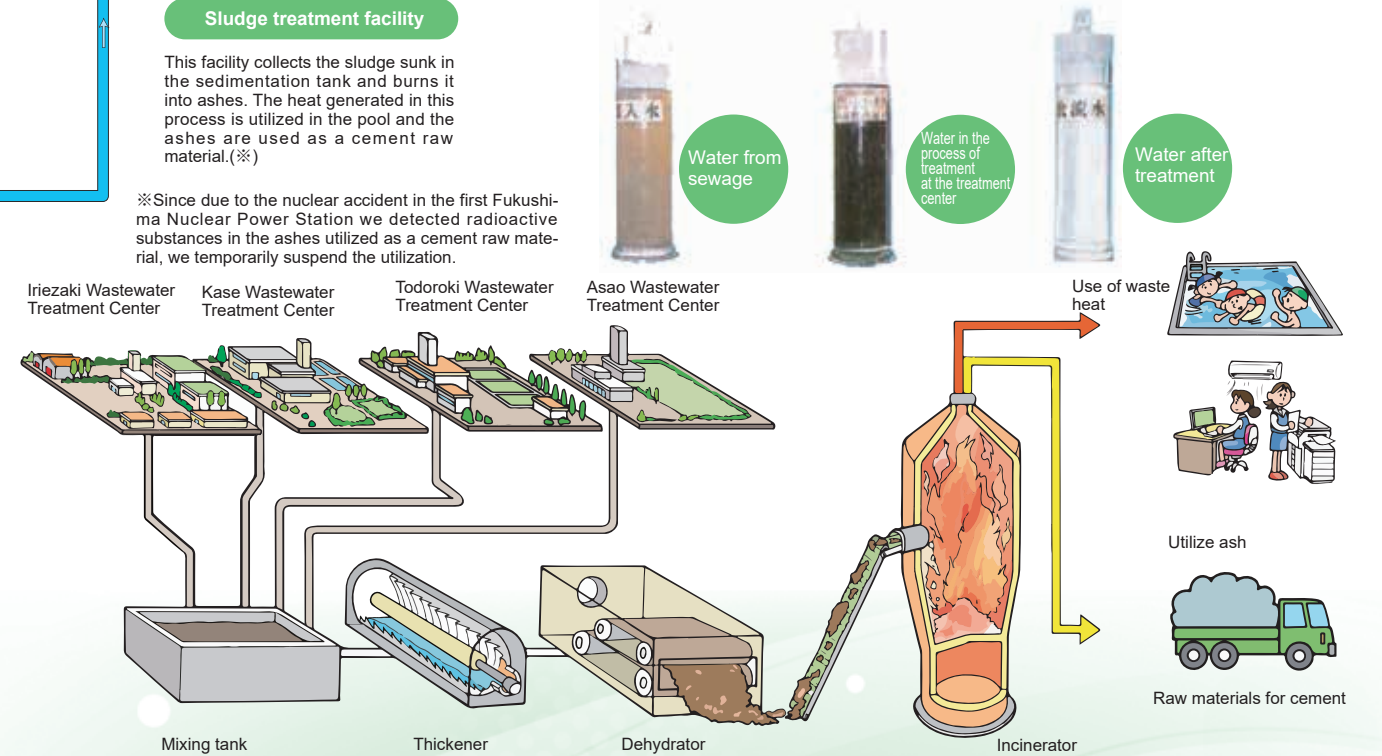
## Structure of Sewerage System



## Sludge treatment facility

This facility collects the sludge sunk in the sedimentation tank and burns it into ashes. The heat generated in this process is utilized in the pool and the ashes are used as a cement raw material. (\*)

※ Since due to the nuclear accident in the first Fukushima Nuclear Power Station we detected radioactive substances in the ashes utilized as a cement raw material, we temporarily suspend the utilization.











# Overview of Industrial Water System in Kawasaki

The industrial water resources in Kawasaki City include river water of the Tama River and Sagami River originally from Sagami Lake and Tsukui Lake, treated into quality industrial water at Nagasawa Purification Plant and Ikuta Purification Plant, and delivered to plants and factories in Keihin Industry Belt, taking advantage of altitude differences.

Since Kawasaki City's industrial water system started its operation in 1937, as the Japan's first publicly owned industrial water service, the industrial water system, as a fundamental facility for the industrial economy, has undergone several expansion projects to cope with the increasing demand for water due to the development of industrial activities. In March 1966, when the fourth expansion project was completed, the system had a daily water supply capacity of 626,000m<sup>3</sup>. Subsequently, with the background issues such as large-scale renewal of aging industrial water supply facilities, improvement of earthquake resistance, and discrepancies between water supply capacity and distribution volume, we have been promoting restructuring of the industrial water supply business since 2006, the water supply capacity was reduced to 520,000m<sup>3</sup> per day, and major facilities were upgraded and renewed in April 2010.

On the other hand, socioeconomic conditions are changing dramatically. So we need to keep a close eye on future water demand trends and respond to changes in the business environment, such as increasingly severe natural disasters and moves toward the realization of a decarbonized society. Currently, we have started to study ways to update the scale of our facilities to meet future demand trends. These efforts include renewal and earthquake resistance of facilities and pipelines, reinforcement of major backbone pipelines, countermeasures against power outages and flooding, global warming countermeasures, and many others.

## >> Industrial Water Resource

The industrial water resources in Kawasaki City includes river water of the Sagami River and Tama River water systems, ground water in tama Ward and bulk water.

## >> Water Resource Facilities

The Sagami River water system takes its water from the Sagami Lake and Tsukui Lake consisting of the Sagami Dam and Shiroyama Dam managed by Kanagawa Prefecture. These water resources are used not only for tap water and water resources for industrial use, but power generation. The Tama River water system takes surface water at the Inada Intake Station, which flows into the Nikaryo Reservoir from Kamigawara Dam. Ground Water is pumped up from 7 bored wells located in Tama Ward, making use of them as industrial water resources.

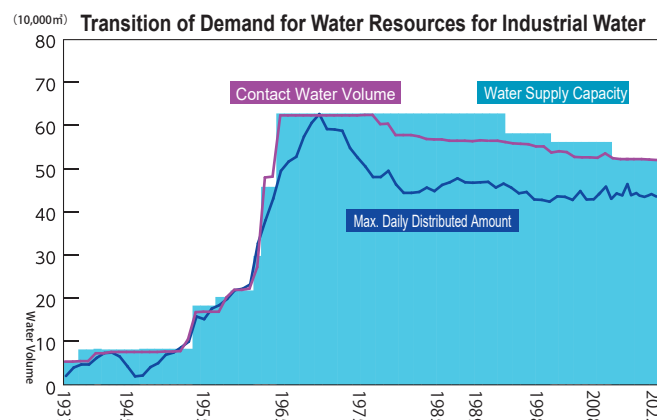
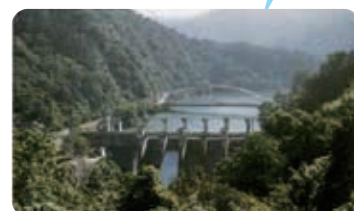
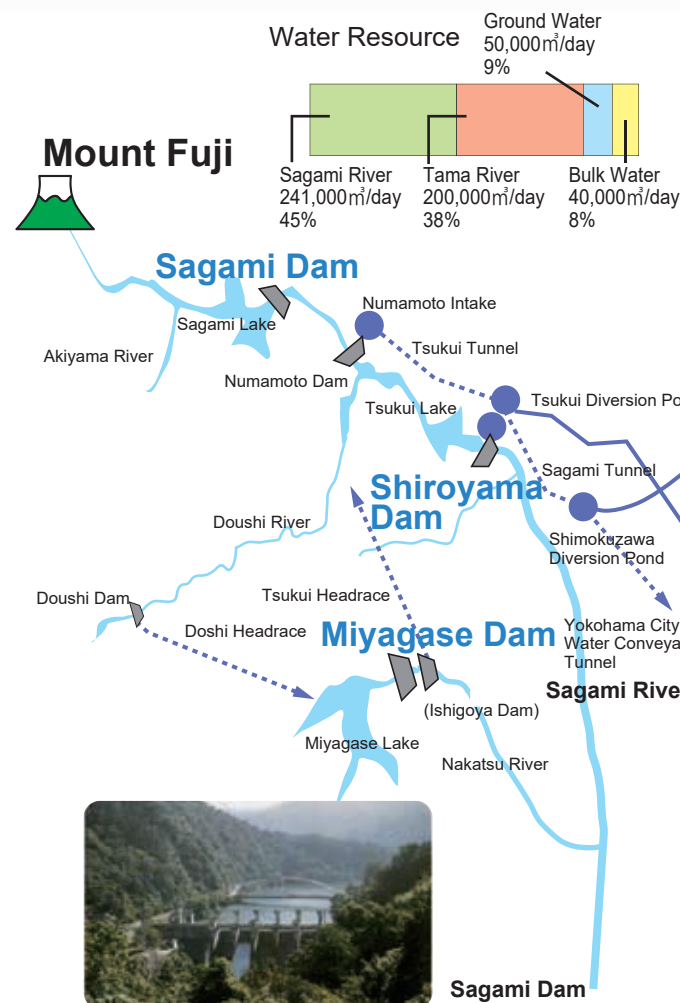
## >> Purification Plants

Water taken from rivers is treated for industrial use at water purification plants. Two purification plants located in Kawasaki City have a daily treatment capacity of 480,000 m<sup>3</sup> worth of the water resources for industrial use. Ground water does not need to be treated as the water resource for industrial use.

## >> Transmission/Distribution Facilities

The purification plants and the Hirama Distribution Station have regulating reservoirs which store part of the water resources for industrial use to regulate a distributed amount and a water distribution pressure. The Hirama Distribution Station receives bulk water and controls water distribution.

The water resources for industrial use are fed through 3 transmission pipes from the purification plants; the extended length of the transmission pipes is about 53 km. The distribution pipes have been laid down about 43km in total length, centering around the coastal areas having many factories which consume the water resources for industrial water.



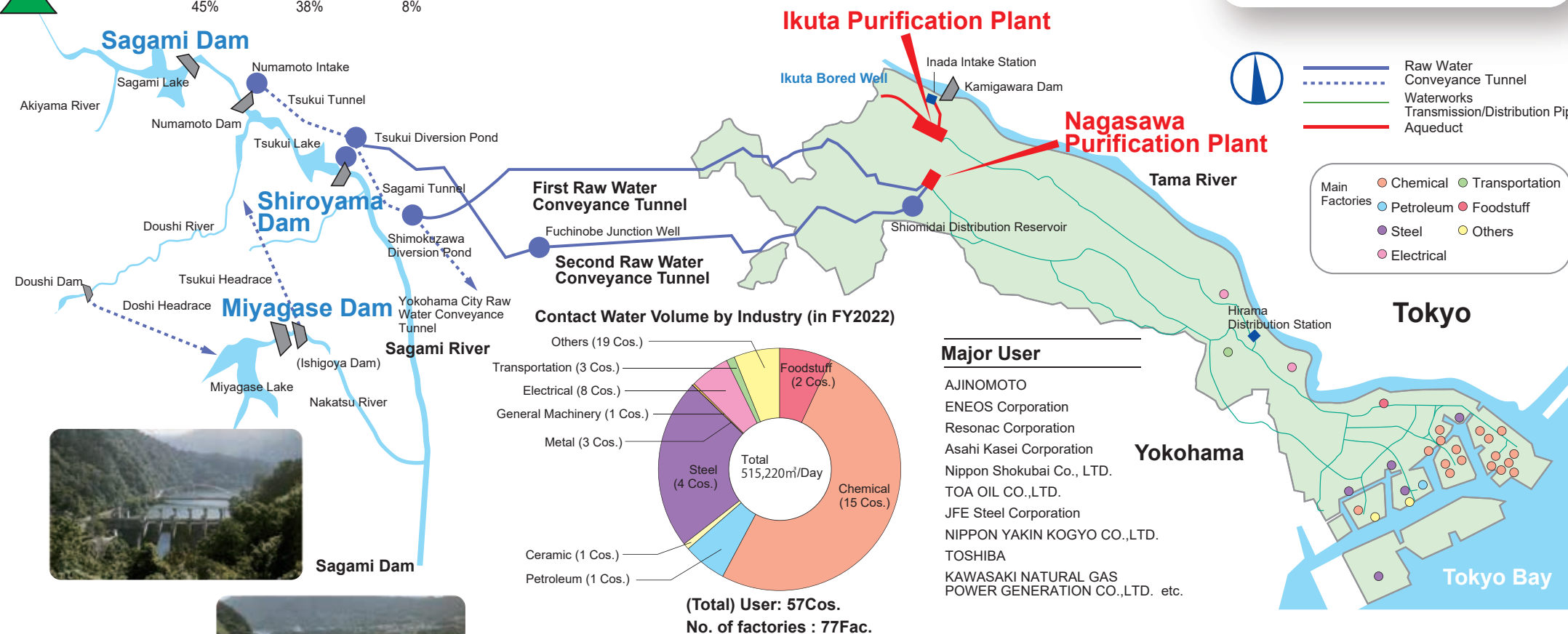
**Inada Intake Station**  
River water of the Tama River diverted to the Nikaryo Reservoir by the Kamigawara Dam is taken at the Inada Station.



**Ikuta Bored Well**  
Ground water is pumped up from 6 bored wells (shallow wells) in Tama Ward.



The water resources for industrial use are more economical than tap water and used for cooling, cleaning, etc. at the petrochemical factories, ironworks, etc. in the Keihin Industrial Zone in the coastal areas. (Photo: Coastal area, adjacent to Higashiogishima)



**Nagasawa Purification Plant**  
Started passing water in June 1954. The original water is river water from the Sagami River, the treatment method is coagulation sedimentation process, and the water supply capacity is 235,000 m<sup>3</sup>/day. A regulating reservoir and other facilities were constructed under the Restructuring Plan.



**Ikuta Purification Plant**  
Started passing water in 1962. The water source is river water and groundwater from the Tama River. The river water is treated by ultra-fast coagulation sedimentation process (groundwater is not processed), and the water supply capacity is 245,000m<sup>3</sup>/day. A regulating reservoir and other facilities were constructed under the Restructuring Plan.



**Nagasawa Purification Plant Regulating Reservoir**  
Constructed under the Restructuring Plan and put into full operation starting from FY2013. Reservoir and other facilities were constructed under the Restructuring Plan.



**Ikuta Purification Plant Regulating Reservoir**  
Constructed under the Restructuring Plan and put into full operation starting from FY2013. Reservoir and other facilities were constructed under the Restructuring Plan.



**Hirama Distribution Station**  
Regulates a distributed amount and a distributed pressure to the coastal areas having many factories which consume the water resources for industrial use. In accordance with our restructuring plans we renovated the regulating reservoirs and other facilities, and they were put into full operation from FY2016.



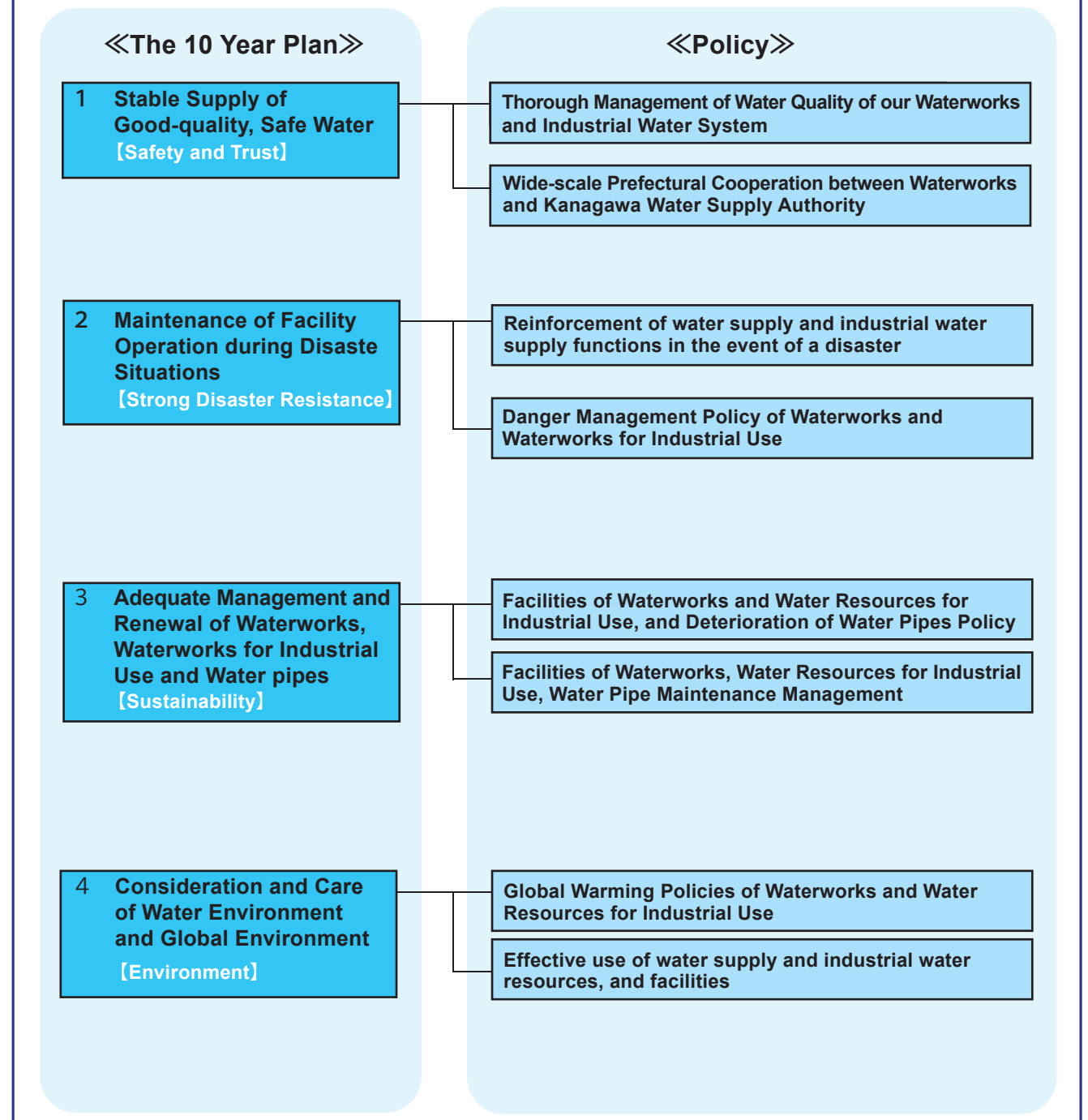
# Approach to a Safe and Stable Water Supply by the Waterworks and Industrial Water System

In order to provide a constant supply of water for both industrial usage as well as tap water necessary for the daily use of Kawasaki citizens and places of work, we are continuing to develop the thoroughness of our water quality management, as well as establishing secure earthquake-proof measures.

In order to maintain and develop our waterworks and industrial water system for the future generations, we established "Kawasaki City Waterworks Vision" in March 2017. It is a vision to be shared for the next ten years, overviewing our future for the next 30 to 50 years. Its implementation plan, "Kawasaki City Waterworks Mid-term Project Plan" for FY2017–FY2021, The project was formulated in March 2017 and has been steadily implemented.

In March 2022, after properly evaluating the results of the implementation of the five-year medium-term plan, we formulated the "Kawasaki City Water Supply and Sewerage Business Medium-term Plan (2022-2025)" based on the current status and challenges of the business while accurately grasping changes in the business environment. The main policy organization of the mid-term plan of the waterworks and water resources for industrial usage is shown underneath.

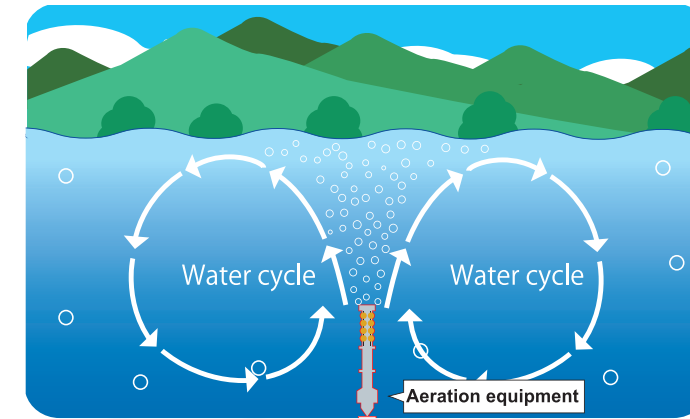
## The Main Policy Organization of the Mid-term Plan of the Waterworks and Water Resources for Industrial Usage



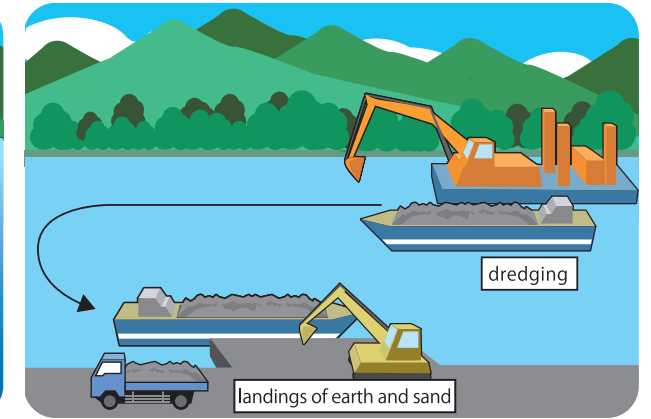
# Thorough Management of Water Quality of our Waterworks and Industrial Water System

## » Preserving Water Quality at their Reources [waterworks and industrial water system]

At Sagami Lake and Tsukui Lake, which are the main natural resources of water in Kawasaki City, an excessive eutrophication can cause uncommon occurrence of Blue-Green Algae growth and consequently pollutes the water quality. In order to prevent this occurrence, we are working with other prefectural waterworks in order to control the growth of Blue-Green Algae, as well as asking support from agencies around this area to prevent water pollution. Implement dredging operations to prevent a disaster in the upper stream of Sagami Lake and maintain water storage capacity.



Aeration equipment

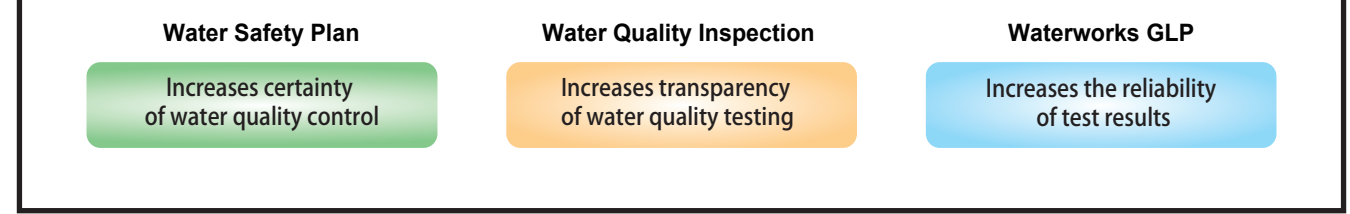


Dredging a water storage reservoir

## » Our Efforts in securing Safe, Palatable Water [waterworks]

Water quality inspections of water sources and response to water quality incidents are conducted by the Regional Water Quality Control Center established at the Kanagawa Regional Waterworks Corporation, while water quality inspections of water taps from water purification plants are conducted by Kawasaki City, with a coordinated inspection system based on information sharing. As part of our efforts to provide safe and delicious water, we operate a "Water Safety Plan," a method of risk management at all stages from the water source to the tap, to enhance the certainty of water quality management, and have formulated a "Water Quality Inspection Plan" to indicate the items, location, and frequency of water quality inspections to ensure the appropriateness and transparency of water quality inspections. We have also acquired certification under the "Waterworks GLP" standard to ensure the accuracy of water quality inspections, and are working to improve the reliability of inspection results. Furthermore, we are working to reduce the residual chlorine concentration in order to produce good-tasting water with less chlorine odor.

## Towards a safe and palatable water supply



Water sampling operations for periodic water quality inspections



Water-quality test operation

Water Service System Without Receiving Tank to Public Elementary and Junior High Schools [waterworks]

In regard to the service for public elementary schools and junior high schools, in cooperation with the board of education we are currently working on establishing a direct connection with water pipes instead of using water tanks. This system provides constant, safe and palatable water and allows us to pass on the potable tap water to the next generation. It is also effective with regards to energy consumption as pumping facilities need less electricity to create pressure in the water pipes.



Water Service System Without Receiving Tank Sticker

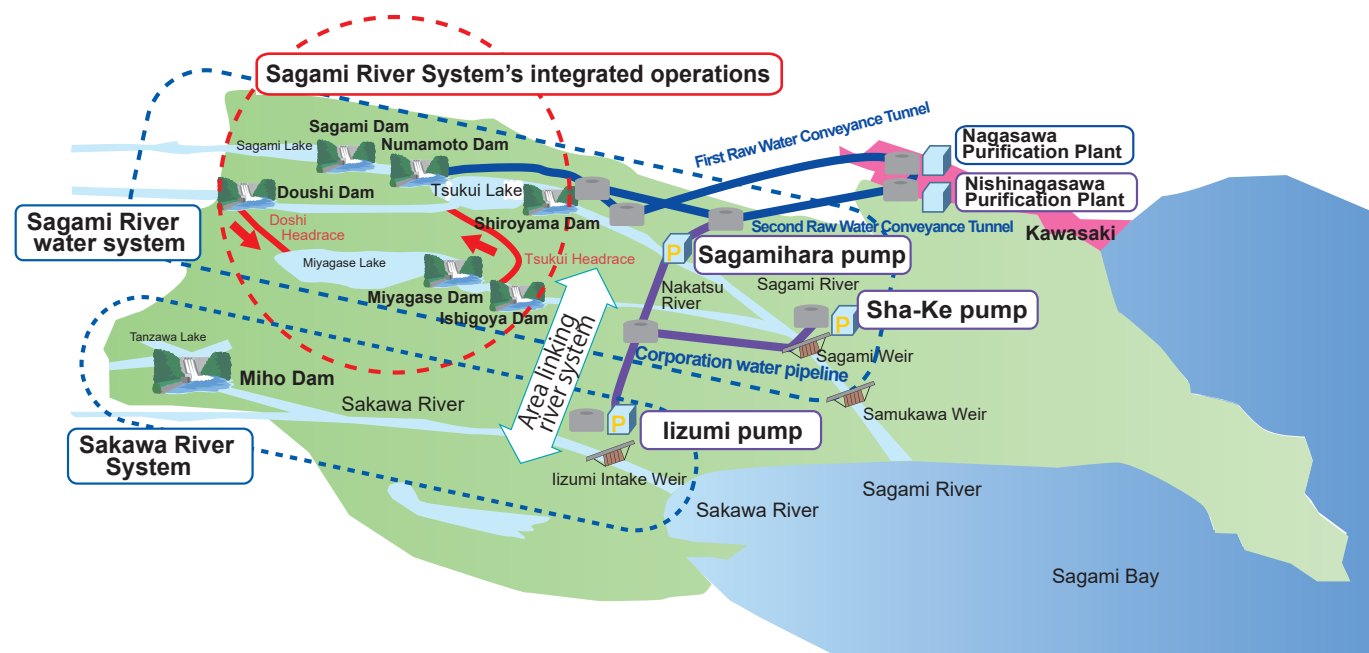


Water Service System Without Receiving Tank PR poster

Wide-scale Prefectural Cooperation between Waterworks and Kanagawa Water Supply Authority

Use of Water Transportation due to Mutual Cooperation of Dam Usage [waterworks and industrial water system]

We will continue to provide a stable water supply by connecting Sagami, Shiroyama and Miyagase dams by waterway for effective use. Moreover, in cooperation with other facilities of prefectural waterworks alongside both Sagami and Sakawa rivers, this stabilized water supply will continue to grow.



Water operations image outlining the interconnected dams, etc.

Reinforcement of water supply and industrial water supply functions in the event of a disaster

Earthquake-proofing Facilities [waterworks and industrial water system]

Earthquake-proofing of water purification facilities is now 100% effective due to the reconstruction plan of facilities and the completion of earthquake proof renovations at Nagasawa Purification Plant. We will continue to improve the earthquake resistance of water distribution reservoirs and distribution towers. Moreover, earthquake-proofing of industrial water facilities is 100% completed, as regulation reservoirs in Nagasawa and Ikuta Purification Plants and Hirama Distribution facility have been already renovated to be earthquake-proof. Seismic upgrades for the water purification facilities were also completed in the fiscal year of FY2017.



Earthquake-proofing Facilities (Sueyoshi Distribution Reservoirs)

Earthquake-proofing Water pipes. [waterworks]

Earthquake-proofing water pipes is also in action, and we aim to renew approximately 40km a year – the focus being mainly renewal of water pipes and earthquake-proofing deteriorating pipelines. Since the seismic retrofitting of supply routes to important facilities (evacuation centers such as municipal elementary, junior high, and senior high schools, and important medical institutions) has been largely completed, we have positioned pipelines buried along emergency transportation roads and pipelines along supply routes to facilities such as fire stations and police stations that must continue supplying water even during disasters according to disaster prevention plans as "new critical pipelines" since FY2023, and will continue to improve their earthquake resistance efficiency and effectiveness.



Earthquake-proofing Water pipes

Establishment of Emergency Water Supply Bases [waterworks]

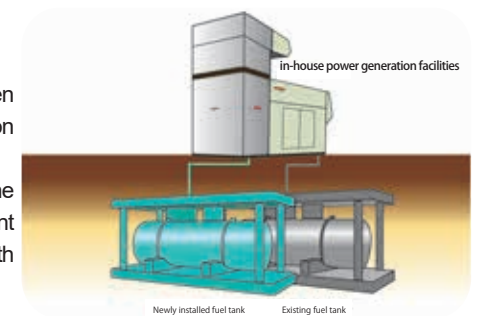
Please refer to Page 23 "Ensuring drinking water supply".

Maintenance of Drinking Water during Natural Disasters [waterworks]

Please refer to "Emergency water supply locations" on Page 23.

Power outage countermeasures for facilities [waterworks and industrial water system]

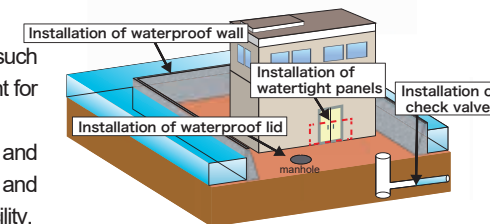
To prepare for power outages in the event of earthquakes and other disasters, we have been installing double commercial power sources and emergency private power generation equipment, etc. In the event of power outages caused by the Great East Japan Earthquake and other recent disasters, which took a long time to restore power, we will further increase the number of fuel tanks for emergency in-house power generation facilities installed at important facilities and other facilities, and will further increase the number of fuel tanks in conjunction with the replacement of in-house power generation facilities.



Expansion of fuel tanks

Flooding countermeasures for facilities [waterworks and industrial water system]

Of the facilities that are included in the expected flooding area in the event of a flooding disaster such as a river flooding, we will avoid or reduce damage based on the results of damage assessment for facilities with a high priority for implementation of inundation countermeasures (flood proofing). Countermeasure methods are classified into "flood prevention measures" to prevent flooding and avoid damage and "flood reduction measures" to mitigate damage and enable early restoration, and flood countermeasures (flood proofing) are implemented using methods appropriate for each facility.



Flooding measures for facilities (example)

Facilities of Waterworks and Water Resources for Industrial Use, and Deterioration of Water Pipes Policy

Reinforcement of Disaster Response Capability and Cooperation in Times of Disaster [waterworks and industrial water system]

Please refer to "Strengthening Disaster Response Capabilities and Cooperation in Times of Disaster" on Page 23.



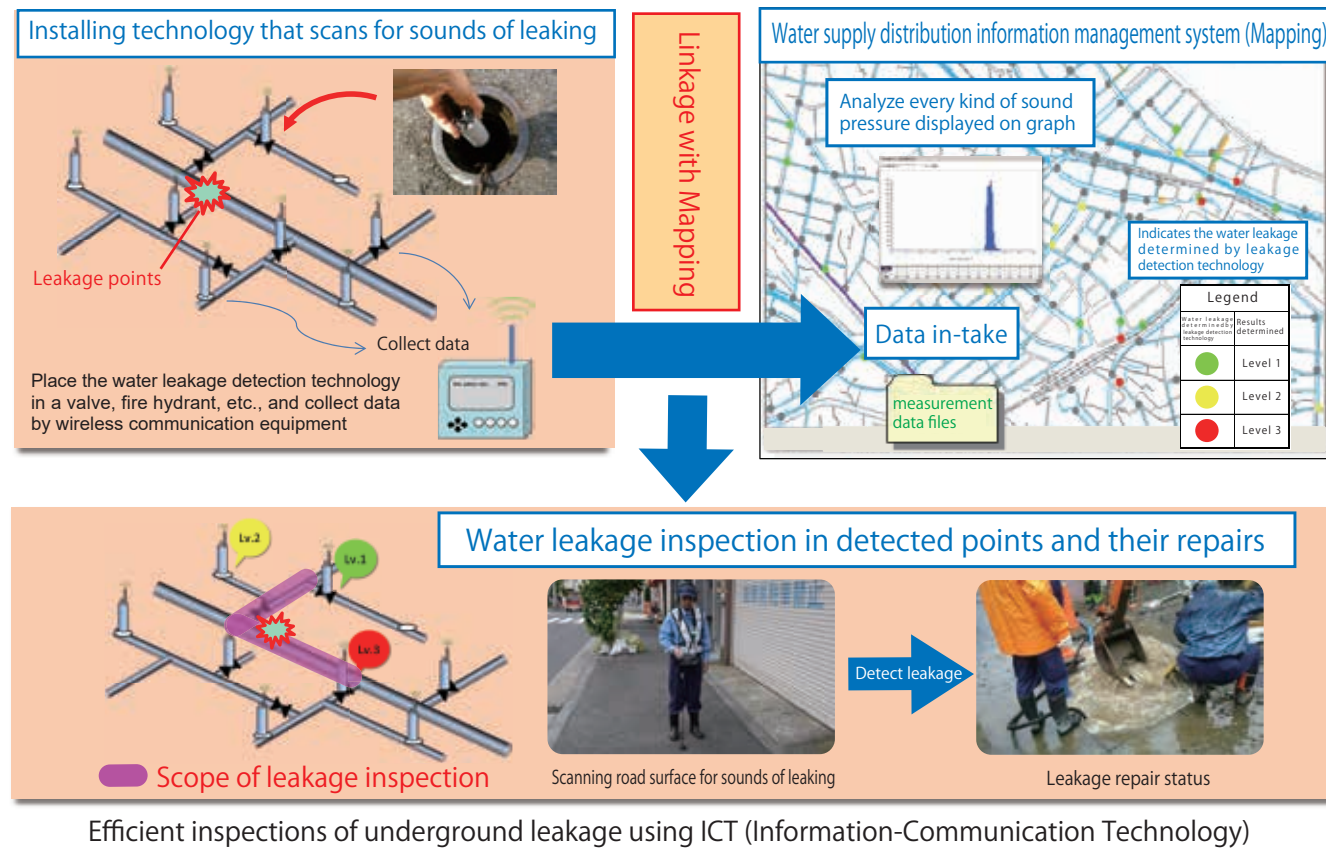
## Facilities of Waterworks and Water Resources for Industrial Use, and Deterioration of Water Pipes Policy

### Water Pipe Plan Renewal and Renovation [waterworks and industrial water system]

The renewal of the waterworks and industrial water system water pipes is currently in progress. For small-diameter pipelines with a bore size of 350 mm or less, we will continue to promote the renewal of aging water distribution pipes (pipelines with functional maintenance and earthquake resistance issues due to their materials and joint types). Regarding core conduits with a diameter over 400mm, we will systematically renew them while ensuring their full and long-lasting use and considering their degree of importance, earthquake-proofing etc., material quality, and coupling types. The total length of water pipelines is 2,500 km, and we will promote the renewal of pipelines that are due for renewal, with an annual target of renewing approximately 40 km.

### Maintenance and Management of Water Pipes [waterworks and industrial water system]

Regarding items included in the water distribution pipeline, to guarantee pristine functionality, we are continually conducting systematic inspections, investigations, exchanges, etc. Furthermore, we also run leakage prevention counter measures by means of underground leakage investigations, etc. that use ICT (Information-Communication Technology).



### Maintenance of water supply pipes [waterworks]

Since aging water pipes may affect water quality and cause secondary disasters such as road cave-ins due to leakage, we are renewing aging water pipes on public roads and parts of private property (from the road boundary to a horizontal extension of 2 m for water pipes). In addition, new distribution pipes will be installed along public roads where water pipes are not buried and where water pipes are congested, in order to eliminate the congestion of old water pipes.

## Global Warming Policies of Waterworks and Industrial water system

### Effective Use of Reusable Energy [waterworks and industrial water system]

Please refer to "Small Scale Generation of Hydro-Electricity" on Page 39, and "Installation of solar power generation systems and generation of electricity" on Page 40.

### Energy Saving Measures [waterworks and industrial water system]

Please refer to "Adoption of Energy-Saving Apparatus" and "Natural Flow of Water Intake, Water Supply and Distributed Water" on Page 39.

## Effective Usage of resources and facilities for Waterworks and Industrial water system

### Effective Utilization of Generated Sludge [waterworks and industrial water system]

Please refer to "Effective use of soil generated from water purification and sewage sludge" on Page 40.

## Overview of portable water resource facilities

Name	Effective storage capacity(million m <sup>3</sup> )	Type	Commissioning Entity
Sagami Dam	48.2	Concrete gravity dam	Kanagawa Prefectural Public Enterprises Agency
Numamoto Dam	1,534	Concrete gravity dam	Kanagawa Prefectural Public Enterprises Agency
Shiroyama Dam	51.2	Concrete gravity dam	Kanagawa Prefectural Public Enterprises Agency
Miyagase Dam	183	Concrete gravity dam	Kanto Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism
Miho Dam	54.5	Soil impervious wall type rockfill dam	Kanagawa Prefectural Public Enterprises Agency

## Overview of waterworks facilities

### Purification facilities

Name of Purification Plants	Installed capacity( m <sup>3</sup> /day)	Treatment method
Nagasawa purification plant	280,000	Rapid sand filtration method

### Distribution facilities (distribution reservoir)

Name of distribution reservoirs	Effective storage capacity( m <sup>3</sup> )
Nagasawa Distribution Reservoirs	40,622
Shiomidai Distribution Reservoirs	27,262
Ikuta Distribution Reservoirs	47,698
Saginuma Distribution Reservoirs	109,608
Sueyoshi Distribution Reservoirs	72,082
Kurokawa Distribution Reservoirs	14,784
Kurokawa High-Zone Service Area Distribution Reservoirs	1,998



Takaishi Elevated Distribution Reservoir

### Distribution facilities (elevated distribution reservoir)

Name of elevated distribution reservoir	Effective storage capacity( m <sup>3</sup> )
Takaishi Elevated Distribution Reservoirs	6,280
Yurigaoka Elevated Distribution Reservoirs	514
Hosoyama Elevated Distribution Reservoir	1,899
Chiyogaoka Elevated Distribution Reservoirs	3,504
Miyazaki Elevated Distribution Reservoirs	2,926



Chiyogaoka Elevated Distribution Reservoir

## Overview of Industrial water facilities

### Water resource facilities

Name of facilities	Amount of water intake ( m <sup>3</sup> /day)	Water system
Suge wells sinking for Industrial water	50,000	Groundwater
Inada Water Intake Station	200,000	Tama River surface water

### Purification facilities

Name of purification plants	Installed capacity ( m <sup>3</sup> /day)	Treatment method
Nagasawa Purification Plant	275,000	Coagulation-sedimentation process
Ikuta Purification Plant	200,000	Ultra-high rate coagulates sedimentation process

※Groundwater is not purified.

### Distribution facilities (regulation reservoir)

Name of regulating reservoir	Effective storage capacity( m <sup>3</sup> )
Nagasawa Regulating Reservoir	6,920
Hirama Regulating Reservoir	6,197
Ikuta Regulating Reservoir	6,626