

Case	Restructuring of water supply facilities to address aging infrastructure and declining water demand		
Water utility	Saitama City Waterworks Bureau		
General information of the utility (as of 2021)			
Operation type	Public (retail water supply)	Service area (km ²)	217.43
Population served	1,333,897	Distribution (m ³ /d)	373,320
Service coverage (%)	99.9	Pipe length (km)	3,669
NRW (%)	4.7	Number of staff	370
Number of water sources	Surface water (13), Groundwater (16), Others		
Water rates (JPY)	979+385	(in case of 10m ³ of water per month for residential customers with 13mm diameter)	
Summary	At the end of FY 2020, Saitama City formulated the "Saitama City Water Supply Facility Restructuring Plan", which outlines basic policies and initiatives for the restructuring of waterworks facilities over the next 30 years, including the consolidation and downsizing of facilities in anticipation of a future decline in water demand, in order to pass on facilities in good condition to the next generation. Under the "Saitama City Comprehensive Development Plan," which is a high-level plan, the "Saitama City Waterworks Long-Term Concept" and "Saitama City Waterworks Mid-Term Management Plan" were established. The restructuring plan is based on the long-term vision, basic principles, and basic measures of the long-term vision, and presents basic policies for individual projects necessary to realize the vision and basic principles. In addition, major projects and investment plans that should be focused on are reflected in the medium-term management plan, and are to be addressed in conjunction with the plan, including progress management.		
Current Status & Challenges	1. Current Status The City has 7 water treatment plants that use only groundwater as their water source (one of which ceased operation on November 30, 2021), and 13 water distribution plants that use groundwater and water purchased from Saitama prefectural government as their water source, with a total facility capacity of 538,000 m³/day. In recent years, the water treatment/distribution plants have been		

operating at a maximum operating rate of about 75% (the ratio of the maximum daily water supply to the facility capacity) and a facility utilization rate of about 68% (the average daily water supply to the facility capacity), which is sufficient to meet the water demand. In addition to the facility capacity, the water treatment and distribution plants have reserve capacity to ensure a stable water supply even in the event of an emergency, such as the shutdown of facilities due to a disaster, or the shutdown of water distribution trunk lines.

2. Issues

(1) Optimization of Facility Capacity

Based on recent trends, future water demand in is expected to remain at the same level as at present until around FY2030, until which the population is expected to continue to increase, but in the future, the population is expected to decline gradually.

Therefore, if the current facility capacity and reserve capacity are maintained, the costs for operation, renewal, and maintenance of the facilities will eventually be excessive, which will have a significant impact on financial management. This anticipation makes it necessary to optimize facility capacity and reserve capacity in line with future water demand, taking into account emergency capabilities (Figure 1).

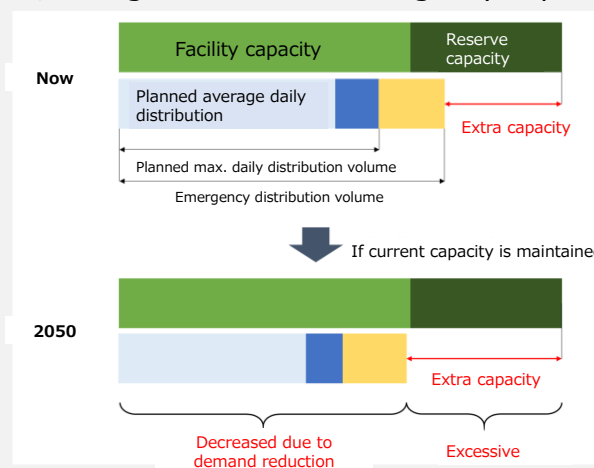


Figure 1 Relationship between facility capacity and water supply volume

(2) Aging of water treatment and distribution plants

Many water treatment plants were constructed in the 1950s, and many water distribution plants were constructed in the 1960s and 1970s. Civil engineering facilities such as water distribution reservoirs and buildings such as administrative buildings are aging, in particular. Currently, appropriate maintenance and management are being carried out to prevent accidents and extend the service life of these facilities,

but they will all be due for renewal in the near future (Figure 2).

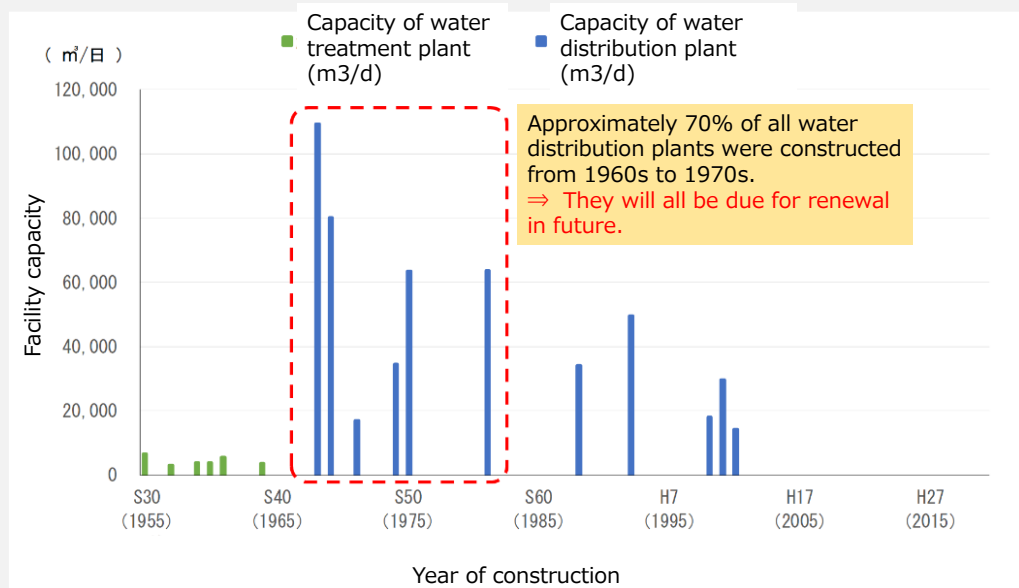


Figure 2 Facility capacity of water treatment and distribution plants by year of construction

Aging water supply facilities lead to increased risk of accidents, such as shutdown of facilities, and thus systematic renewal is becoming necessary to meet the increasing demand for renewal.

Measures & Solutions

1. Consolidation of water treatment/distribution plants and review of facility capacity

To optimize facilities, Saitama City examined the possible consolidation and elimination of water treatment and distribution plants. The City has formed a block system that divides the water supply area into four blocks, and a facility block system that further divides each block. Since the facility block has been developed as a distribution pipe network around a single water distribution plant, the water distribution plants that form the facility block will continue to exist in the future.

Next, based on past drought experience and other factors, the amount of groundwater source required under normal and emergency conditions was determined, and it was decided to abolish the water treatment and distribution plants on the condition that the required amount of groundwater source is secured for each supervisory block. The selection of water treatment/distribution plants to be discontinued was based on comparison and consideration of the current operational status, water distribution pressure under normal conditions, and the impact of backup operations during emergencies, and it was decided to discontinue one water treatment/distribution plant for each supervisory block (Figure 3).

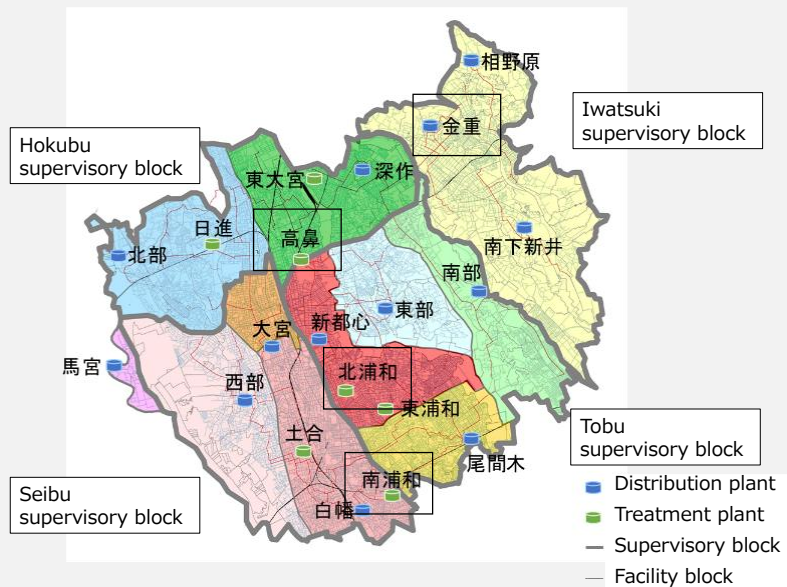


Figure 3 Water treatment/distribution plants to be demolished

In addition, the facility capacity of the water treatment and distribution plants will be downsized in stages by upgrading the distribution pumps to appropriate capacities while securing the reserve capacity needed in case of emergencies such as distribution plant shutdowns or water main breaks (Table 1).

Table 1 Policy for securing facility capacity

Item		Policy
During normal operations		Ensure that the facility capacity corresponds to the planned maximum daily water supply volume for each period. The facility capacity shall be capable of ensuring a water distribution water pressure of 0.196 Mpa or higher in each supervisory block.
During emergency	In case of trunk distribution main accident	In the event of trunk distribution main leakage or other accident that disrupt water supply, the water treatment plants and water distribution plants within the same block will back up the insufficient water supply to ensure the reserve capacity necessary to supply 100% of the planned maximum daily water supply volume.
	In case of water distribution plant failure	In the event that a water distribution plant is shut down due to a disaster or accident, the water treatment plants and water distribution plants within the same block will back up the shortfall to ensure the reserve capacity necessary to supply more than 80% of the planned daily maximum water supply. Since excessive reserve capacity at a water distribution plant will be costly for renewal and maintenance, each water distribution plant will secure up to 30% of the capacity required under normal operations. In the event of a shortage of reserve capacity within the same block, backup capacity shall be secured from water treatment and distribution plants in adjacent blocks.

2. Systematic renewal in consideration of operational workload balancing

Although the statutory service life of water supply facilities is defined

by the Enforcement Regulations of the Local Public Enterprise Act, actual facilities can be used for a longer period than the statutory service life by ensuring safety through appropriate maintenance and management. Therefore, in anticipation of future increases in renewal demand and associated maintenance costs, the City has decided to level out renewal project by setting its own standard renewal period and lengthening the renewal implementation period.

The standard years for renewal of facilities and equipment were established based on a survey of actual renewal results in the city and examples in other entities (Table 2). The concept of the renewal period based on the standard renewal period is that, in principle, facilities and equipment should be used for a longer period than their legal useful life through appropriate maintenance and management, and their renewal should be based on the standard renewal period (Figure 4).

Table 2 Standard renewal year of facilities and equipment

Category	Statutory useful life (years)	Standard renewal year
Distribution reservoir (PC, SUS)	60	100
Distribution reservoir (RC)	60	60
Control centers, etc.	50 (60)	Seismic-resistant: 80 Non seismic-resistant: 60
Intake pump	15	20
Distribution pump	15	30
Filtering machine	20	60
Electricity receiver and distributor	20	30
Monitoring and control equipment	Conventional type: 15 LCD: 10	20
Self power generator	15	30

[Example] In case of renewing a distribution reservoir (PC) built in 2000

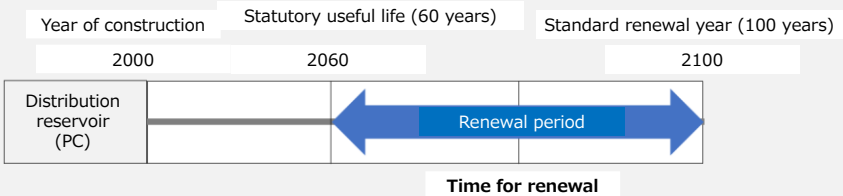


Figure 4 Concept of renewal period

Future Plans

As described above, Saitama City have prepared a maintenance schedule plan based on the facility maintenance policy indicated in the "Saitama City Water Supply Facility Restructuring Plan". In implementing the projects in this plan, the City will strive for appropriate progress management through the PDCA cycle, along with

	the evaluation of target indicators in the mid-term management plan. Since water demand forecasts are subject to significant fluctuations depending on future social conditions, it is necessary to make estimates as appropriate and revise them accordingly after considering the impact of the results on the currently planned discontinuation of water treatment and distribution plants.
References	Saitama City, Saitama City Waterworks Long-term Concept 2021-2030 Saitama City Water Supply Facility Reconstruction Plan https://www.city.saitama.jp/001/006/002/048/001/index.html