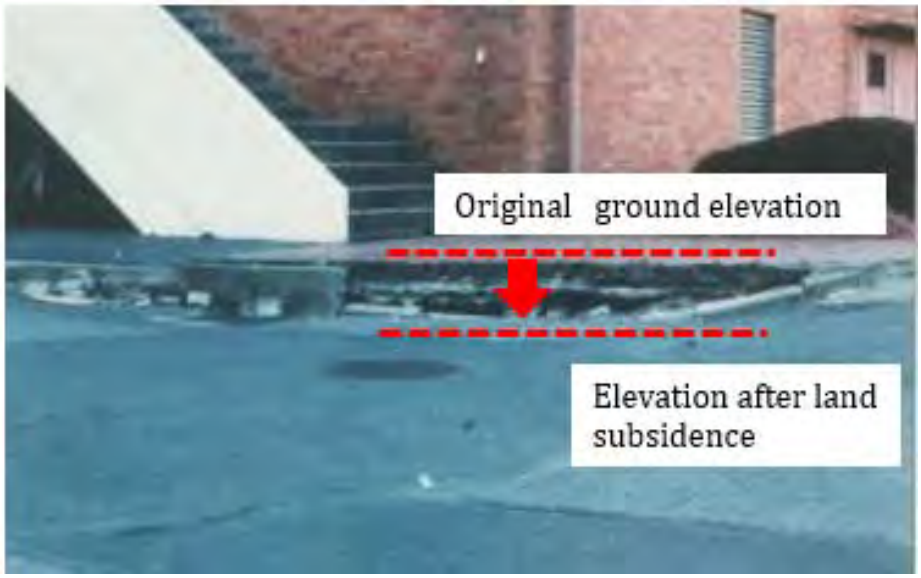
Case Study 3. Sustainable Groundwater Use and Prevention of Land Subsidence: Osaka City and Saitama Prefecture

Contents

1. Introduction

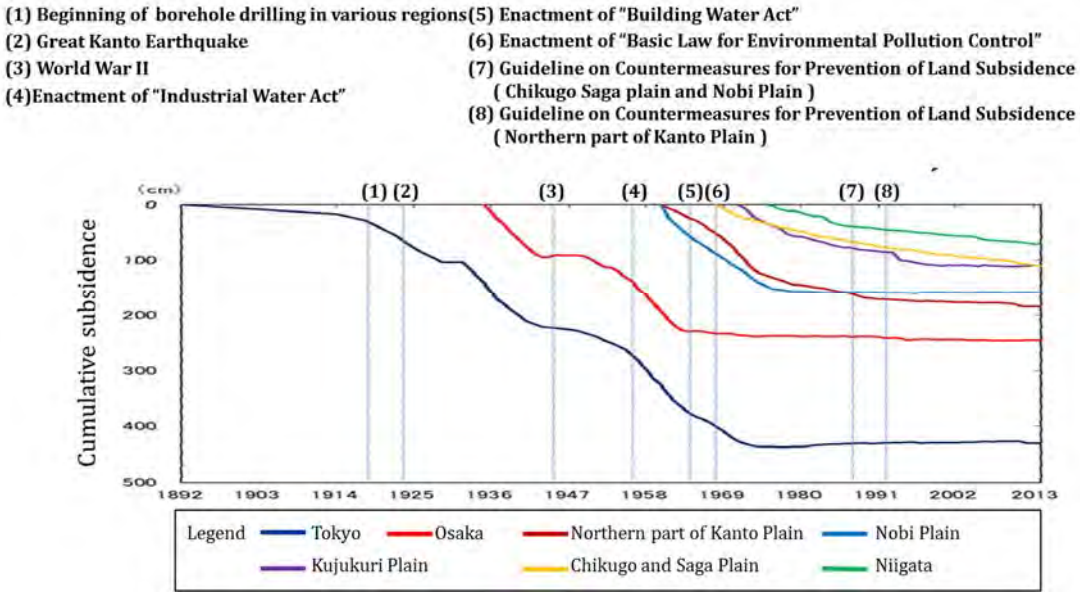
Clean good quality groundwater is an important source of drinking water. Excessive groundwater pumping that exceeds recharged amount sometimes causes land subsidence because of the drop of groundwater level and compressed clay layer. This phenomenon is often observed in alluvial plains.

Land subsidence causes many problems, including uneven settlement and infrastructure damages resulting from floods. In coastal areas, subsidence may result in tides moving into low-lying areas that are previously above high tide levels. Solving these problems involves enormous cost and land subsidence is irreversible even when groundwater level recovers.



Source: Saitama prefectural government, https://www.pref.saitama.lg.jp/a0505/901-20091202-17.html

Photo 1. Depression Caused by Land Subsidence



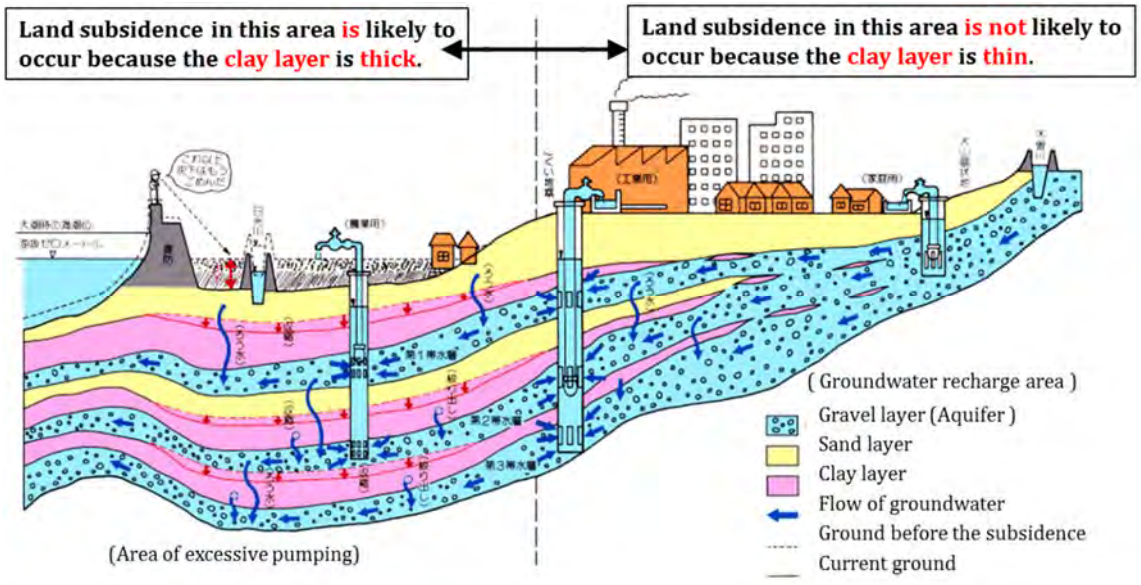
Source: Ministry of the Environment, http://www.env.go.jp/water/jiban/gaikyo/gaikyo26.pdf

Figure 1. Land Subsidence in Japan 1892-2013

This module explains the occurrence of land subsidence caused by excessive pumping of groundwater during the period of high economic growth and the measures taken by some Japanese cities to avoid or stop subsidence.

2. Land Subsidence and Preventive Measures

Japan has taken measures to reduce subsidence mainly by controlling groundwater intake and switching from groundwater to alternative water sources such as industrial water and Bulk Water Supply. Today, land subsidence is a rare occurrence.



Source: Aichi prefectural government, *Outlines of land subsidence*, http://www.pref.aichi.jp/soshiki/mizu/0000035197.html

Figure 2. Phenomenon of Land Subsidence

(1) Causes of Land Subsidence

Land subsidence is caused by excessive groundwater pumping to meet increased water demand. This can lead to serious social problems.

Land subsidence can occur naturally and inevitably but is also a consequence of excessive groundwater pumping.

It was recognized for the first time when surveys were conducted after the 1923 Great Kanto Earthquake. The phenomenon was noticed in Osaka City and the Nagoya area around 1930. Therefore, monitoring of land subsidence and groundwater levels started in these areas. The problem did not appear much until the end of World War II (1945) because groundwater pumping decreased during the war. But in the 1950s, substantial land subsidence reappeared and

resulted in serious social problems.

In Japan, the advance of pumping and deep well drilling technologies made it considerably easy to withdraw large amounts of groundwater to meet increasing demands during periods of high economic growth. As a result, land subsidence occurred frequently because groundwater level was lowered and clay layer was compressed. Unless restricted by special law, land owners have the right to utilize groundwater freely under the Civil Code in Japan. The regulations for groundwater and alternative water sources were developed as a measure to reduce land subsidence in Osaka in the 1960s, and in Tokyo in the 1970s.

In Japan, there were discussions on the causes of the land subsidence including: crustal movement, consolidation due to the load of buildings, and decrease in rainwater penetration. Credible data showed the correlation of dropping groundwater level and incidences of land subsidence. Land subsidence incidences dropped with the decline of industrial activities during the Great Depression from 1929 to 1933 and towards the end of World War II from 1943 to 1945. Therefore, excessive groundwater intake is considered to be the main cause of land subsidence in Japan.

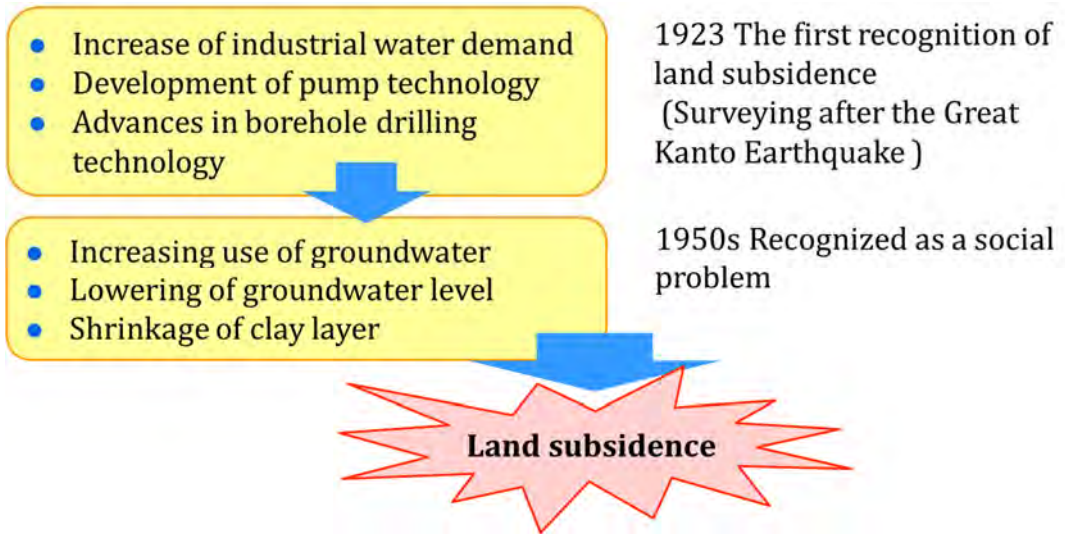


Figure 3. Causes of Land Subsidence

(2) Industrial Water Act and Building Water Act

In Japan, the Industrial Water Act and the Act on the Regulation of Pumping-up of Groundwater for Use in Buildings (Building Water Act) were established to control groundwater intake in areas prone to land subsidence. They provided the legislative framework for measures to prevent land subsidence by significantly decreasing groundwater use.

The key preventive measure against the land subsidence is to regulate groundwater intake. However, general laws do not restrict the rights of land owners to use groundwater from their properties. Two laws were enacted to specifically regulate intake of groundwater for the purpose of preserving this resource and reduce the risk of land subsidence. The Industrial Water Act (1956) regulates intake of groundwater for industrial use in designated areas. The Building Water Act (1962) restricts intake of groundwater for buildings.

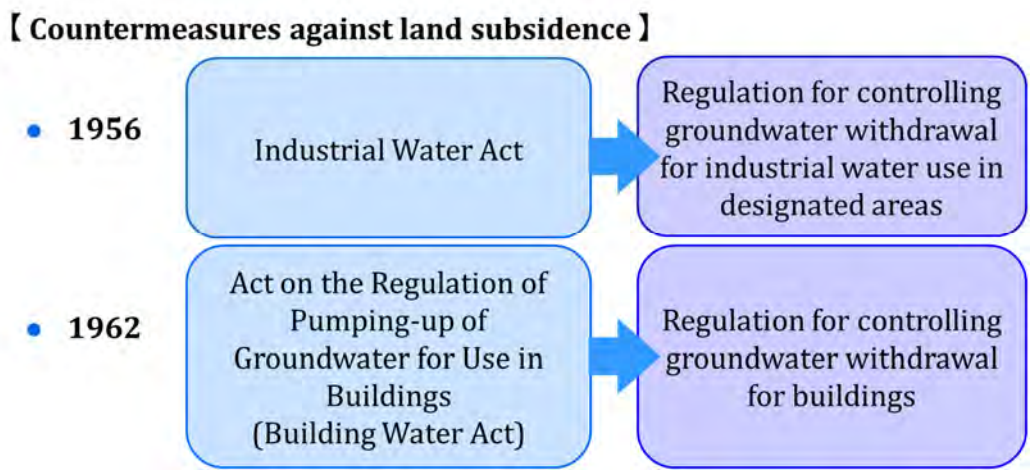
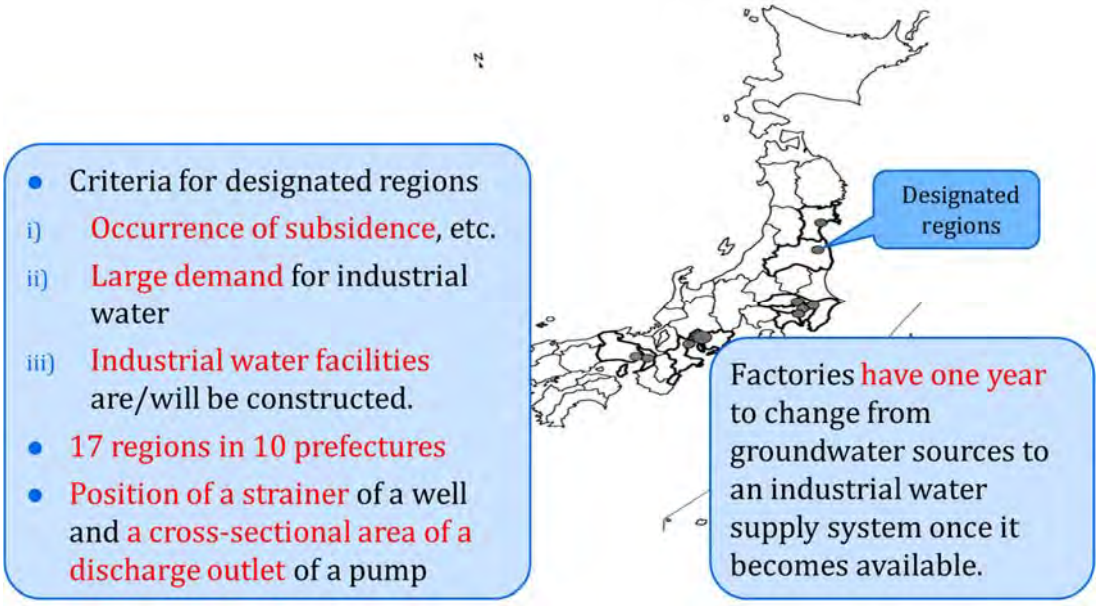


Figure 4. Legislations on Groundwater Use

The Industrial Water Act is designed to ensure rational supply of water for industry, conserve groundwater and prevent land subsidence. In the designated areas (some parts of 10 prefectures, Miyagi, Fukushima, Saitama, Chiba, Tokyo, Kanagawa, Aichi, Mie, Osaka and Hyogo as of 2015), intake of groundwater above certain amount from an industrial well requires the approval of the prefectural governor and if necessary, on-site inspection by the local utility. The Industrial Water Act allows pumping from extremely deep aquifers which are technically difficult and not economically viable. This is an effective deterrent.



Source: Ministry of Economy, Trade and Industry, *Overview on groundwater protection, 2009*, http://www.meti.go.jp/policy/local_economy/kougyouyousui/chikasuitaisakunogaikyo21fy.pdf

Figure 5. Designated Regions under the Industrial Water Act

As the Industrial Water Act deals with existing and newly constructed wells in restricting groundwater usage, there were discussions on how to regulate them. The Act exempts existing wells and all wells with discharge outlet cross section of ≤ 21 cm^2. This was to exempt household wells. The required distance between wells also does not apply to these wells. The water shortfall resulting from these regulations was expected to be covered by industrial water supply.

Article 14 of the Industrial Water Act stipulates that the prefectural governor shall prevent users from pumping groundwater even from approved wells for a specified period of time in the event of an emergency to conserve the resource. Article 22 provides the authority to the Minister of Economy, Trade and Industry, the Minister for the Environment or prefectural governors to inspect well sites. In practice, on-site inspections are conducted with authorization by prefectural governors in all designated areas.

The Industrial Water Act requires that the regulated areas to be designated jointly by the Minister of International Trade and Industry[1] and the Minister of Construction[2]. In addition, it is necessary to consult with the minister in charge of each industry in establishing and revising

[1] The Ministry of International Trade and Industry changed its name to the Ministry of Economy, Trade and Industry in 2001.
[2] The Ministry of Construction was merged with other Ministries to form the Ministry of Land, Infrastructure and Transport in 2001. The Ministry changed its English name to the Ministry of Land, Infrastructure, Transport and Tourism in 2008.

the permission standards. The Act was placed under the joint administration of the Ministry of Economy, Trade and Industry (METI); however when the Ministry of the Environment (MOE) was established in 1971, the aforementioned provisions were deleted and the Act is now jointly administrated by the METI and MOE.

Column: Prevention of Land Subsidence through the Industrial Wastewater Regulations

In addition to the legislations mentioned above, the Water Pollution Control Act enacted in 1970, played an important role in reducing groundwater consumption. The Water Pollution Control Act regulates the total quantity of pollutant discharged rather than the concentration, making the practice of diluting the effluent no longer acceptable. This significantly, albeit unintentionally, reduced the amount of groundwater used by industry and the occurrence of land subsidence.

Large scale industrial water consumers reduced water discharge, introduced effluent treatment and promoted water reclamation and reuse. As a result, the amount of water intake stabilized even though this is not the original intention of the law.

According to the *Report by Industrial Site and Water of Census of Manufacture* published by the Ministry of Economy, Trade and Industry "recovered water" is used significantly more compared to other water sources, reaching 80% of total industrial consumption in Japan today.

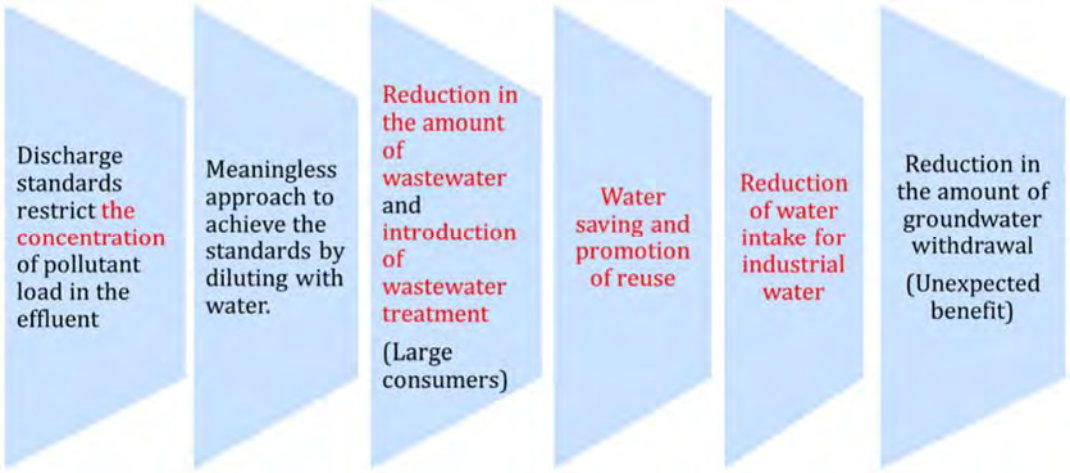


Figure 6. Effect of the Enactment of Water Pollution Control Act in 1970

The Building Water Act is established to prevent land subsidence and to safeguard lives and properties. Similar to the Industrial Water Act, the Building Water Act requires the approval of the prefectural governor in the regulated areas (in Osaka, Tokyo, Saitama and Chiba prefectures)

for intake of water above a certain amount from the well of a building (for air conditioning, toilet, car wash, public bath). This practically bans pumping large amounts of groundwater.

These two Acts were established targeting groundwater use which may have impact on public welfare. They address concerns involving relatively large areas, across boundaries of cities, towns and villages, notwithstanding that groundwater use is private right. Many municipalities (311 cities, towns or villages of 27 prefectures out of 47, as of March 2015) outside of the designated areas enacted ordinances to restrict the intake of groundwater according to the local conditions and needs.

(3) Alternative Water Sources

Alternative sources such as industrial water supply were provided in order to regulate groundwater usage.

The reuse of sewage effluent for industrial water supply is a practical alternative, since the water quality does not have to be as high as that of drinking water. Dam construction to secure alternative water sources also reduces the pressure on groundwater use. The regulation of groundwater use was implemented with provision of these alternatives.

(4) Comprehensive Preventive Measures: *Guidelines for Prevention of Land Subsidence*

In Japan, the *Guidelines for Prevention of Land Subsidence* was established to promote region wide measures where land subsidence was significant.

Preventive measures for land subsidence must be comprehensive and must be implemented for the entire groundwater basin. Provision of alternative water sources and sustainable water use shall be included in the comprehensive measure. The *Guidelines for Prevention of Land Subsidence* was established as a decision by ministers exclusively for Nobi, Chikugo-Saga (1985) and the northern part of the Kanto Plain (1991).

The *Guidelines* focus on (1) conservation of groundwater by restricting excessive pumping, securing alternative water resources, (2) promotion of comprehensive preventive measures, appropriate for actual conditions in the area, including prevention of accidents and recovery from damage caused by land subsidence.

In 2005, the conference of ministers concerning the *Guidelines for Prevention of Land Subsidence* and subcommittees for Nobi, Chikugo/Saga and the northern part of the Kanto Plain were convened to discuss urgent measures to prevent land subsidence specific for each region.

Table 1. Prevention of Land Subsidence in Nobi, Chikugo Saga & Kanto

	Nobi Plain	Chikugo Saga Plain	Northern part of Kanto Plain
Name	Outline on Measures for Prevention of Land Subsidence in Nobi Plain	Outline on Measures for Prevention of Land Subsidence in Chikugo Saga Plain	Outline on Measures for Prevention of Land Subsidence in Northern part of Kanto Plain
Decision year / revision year	1985 / 1995	1985 / 1995	1991
Target value of groundwater	270 million m^3 / year	9 million m^3 / year	480 million m^3 / year
Target areas	Some areas of Gifu Prefecture, Aichi Prefecture and Mie Prefecture	Some areas of Fukuoka Prefecture, Saga Prefecture	Some areas of Ibaraki, Tochigi, Gunma, Saitama, and Chiba Prefecture

Source: Ministry of Land, Infrastructure, Transport and Tourism,
http://www.mlit.go.jp/mizukokudo/mizsei/mizukokudo_mizsei_tk1_000065.html

(5) Monitoring of Groundwater Level and Land Subsidence

Understanding the hydrogeology, periodical monitoring of the total discharge volume, land subsidence and groundwater level, are important to restrict groundwater consumption and to prevent further land subsidence.

Land subsidence can be caused not only by human activities but also by inevitable natural events. As the mechanism of land subsidence is well understood, it is necessary to conduct surveys of subsurface structures to help identify the reason for the occurrence.

Japan has developed a nationwide observation network to monitor the effects of restriction on groundwater abstraction and alternative water supply. Monitoring of groundwater level is conducted once a month using telemeters with precision of ±1.0 cm.

The Ministry of the Environment gathers information annually from prefectures and designated cities on preventive measures and outcomes. The status of groundwater use and land subsidence is compiled in a database, which is accessible on the website of the Ministry of the Environment; National Ground Environment Information Directory.

In Japan, land subsidence is almost completely halted. However, the lowering of land surface from this process is permanent. Flood control and drainage of inner basins must be planned and implemented based on the level of sunken ground and this involves huge social costs. Therefore, it is important to take measures before subsidence progresses in a significant way.

Until recently, Japan did not have any law that clarifies the fundamental principle and policy for the water cycle including groundwater. Groundwater has been generally construed as “private water” associated with the ownership of the land. The 2014 Basic Act on Water Cycle recognizes the concept of water, including groundwater, being owned and shared by the public. A committee was organized to discuss the enactment of individual laws based on this Basic Act.

3. Case 1: Osaka City

(1) History of Groundwater Use and Land Subsidence

In Osaka City, land subsidence attracted attention in the 1930s and 1940s. A decade later, more significant subsidence occurred as the country entered into economic expansion.

In the 1930s and 1940s, land subsidence in the western area of Osaka city caused major social problems such as building fractured by uneven settlement or ground slipping, and damage by high tides. The phenomenon was less obvious when economy activities slowed down but reappeared after WWII. It became serious again around 1950 as the economy began to recover. There are few data on land subsidence before 1964, but subsidence exceeding 270 cm as of 1964 in the Konohana Ward, drew attention to the problem.

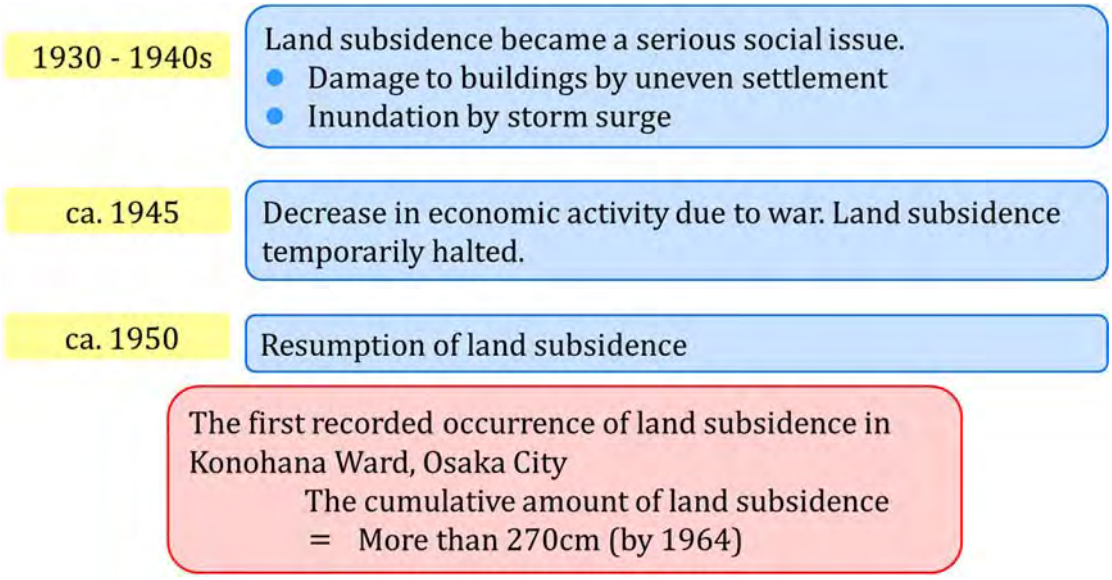


Figure 7. History of Groundwater Use and Land Subsidence in Osaka City

(2) Industrial Water Supply

Osaka City started the supply of industrial water in 1954 to reduce land subsidence. After the enactment of the Industrial Water Act two years later, the restriction of groundwater pumping started, which led to the slowing down of subsidence.

In 1954 Osaka City constructed a treatment plant to supply industrial water as an alternative to groundwater use. The City could use funding from a subsidy allocated to countermeasures against storm surges in western Osaka because a subsidy for countermeasures against land subsidence had not yet been established.

Following the effort by Osaka City, the Industrial Water Act was enacted in 1956 to restrict groundwater pumping and the Act expanded the supply areas. Supply of industrial water by the Osaka Coastal Industrial Water Supply Authority started in 1959. By 1968, intake of groundwater was banned. All these measures helped to control land subsidence.

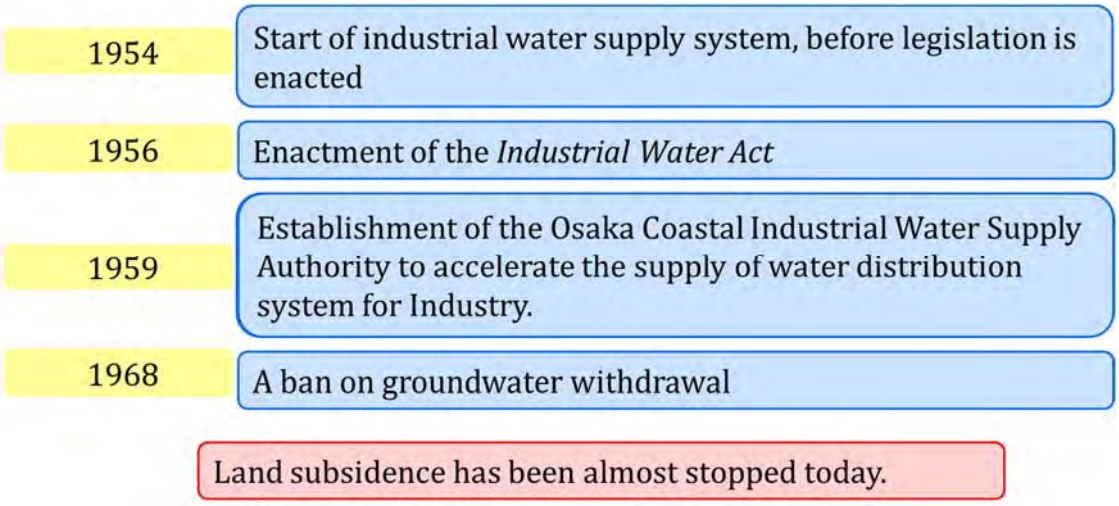


Figure 8. History of Industrial Water Supply

4. Case 2: Saitama Prefecture

(1) History of Groundwater Use and Land Subsidence

In the eastern part of Saitama Prefecture, land subsidence occurred due to its soft soil layer. The pumping volume is restricted and a monitoring system is set up in this area.

Eastern Saitama Prefecture has soft fine grainy soil, so even a small drawdown of groundwater level could cause land subsidence. This area is designated to be regulated by the *Guidelines for Prevention of Land Subsidence*. Saitama Prefecture regulates the pumping of groundwater very strictly under the Ordinance for Living Environment Conservation.

The prefecture is divided into six zones and has 36 monitoring stations which measure groundwater level in real time and provide centralized control with a telemeter. The monitoring system also measures land subsidence and sets the upper limit on the quantity that can be pumped based on expert analysis of available data. Stoppage or reduction of pumping can be implemented when the groundwater level falls below a critical level, especially under severe drought conditions.

Since the Ministry of the Environment started monitoring in 1935, the cumulative land subsidence in Koshigaya City reached 150 cm. Although pumping is significantly reduced, about 1 to 2 cm subsidence per year is still recorded. When the consumption of groundwater temporarily increased during the drought in 1994, noticeable subsidence was observed.

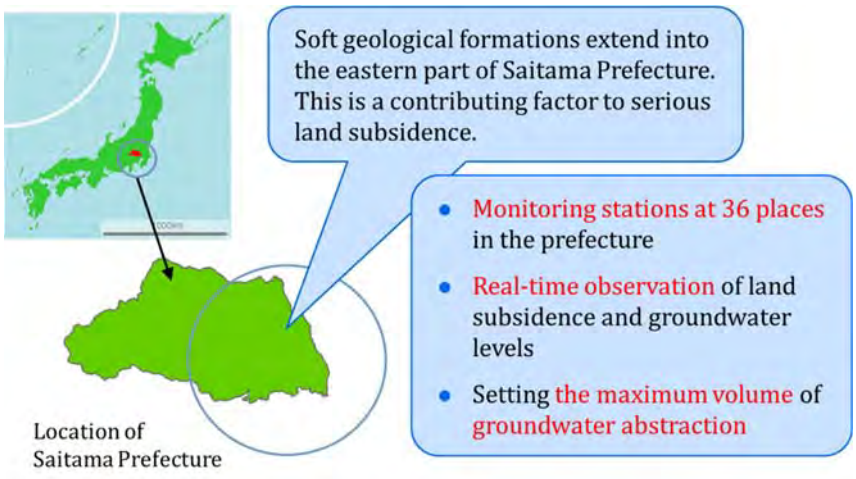


Figure 9. Local condition and monitoring

(2) Industrial Water Supply

Water supply to factories and the provision of alternative water supply to the southern part of Saitama Prefecture prevented further land subsidence.

Many factories were built in the south part of Saitama Prefecture around 1955. The increase in groundwater consumption caused land subsidence. The Enterprise Bureau of Saitama Prefecture started the supply of industrial water to these factories. The Kakinoki water treatment plant began operation in 1964 and Okubo water treatment plant in 1968. Today, they supply about 150 factories in six cities in the area.

Photo 2. Kakinoki Water Treatment Plant (December 22, 2010)

5. Lessons Learned

The following Japanese experiences could be useful for other countries.

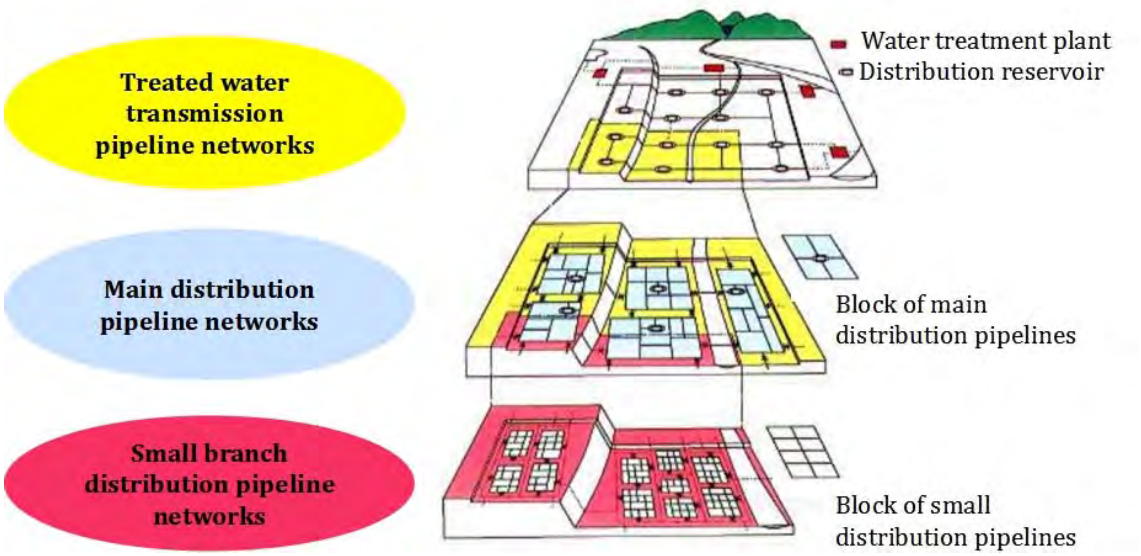
- **(Monitoring)** Land subsidence can occur naturally or can be caused by excessive groundwater pumping. It is essential to monitor ground level and groundwater level continuously in areas where land subsidence occurs. It is also important to understand the relationship between groundwater usage and land subsidence so that the use of groundwater can be regulated.
- **(Alternative Water Sources)** The prevention of land subsidence can be greatly augmented by developing alternative water supplies such as industrial water supply.
- **(Regulations)** The Industrial Water Act, the Act on the Regulation of Pumping-up of Groundwater for Use in Buildings and local ordinances in some prefectures and cities provide the effective legislative framework for controlling groundwater use.
- **(Stakeholder Involvement)** It was effective to arrange the discussions for all the stakeholders including government authorities implicated in the regulation of groundwater usage and work together to find solutions for groundwater depletion and land subsidence.
- **(Prevention in the entire Groundwater Basin)** Preventive measures for land subsidence need to be implemented comprehensively in the entire region which constitutes the groundwater basin. Groundwater monitoring and regulations for groundwater pumping have been implemented in the whole region in order to limit groundwater withdrawal and to prevent further land subsidence.

Case Study 4. Block Distribution System for Equitable, Efficient and Resilient Distribution: Yokohama City and Fukuoka City

Contents

1. Introduction

The block distribution system is commonly used in Japan. This module explains the development and management of the system, with examples of Yokohama and Fukuoka City.



Source: The Bureau of Waterworks, Tokyo Metropolitan Government, https://www.waterworks.metro.tokyo.jp/suidojigyo/torikumi/kadai/step21/05.html

Figure 1. Conceptual Diagram of Treated Water Transmission and Distribution System

2. Block Distribution System (BDS)

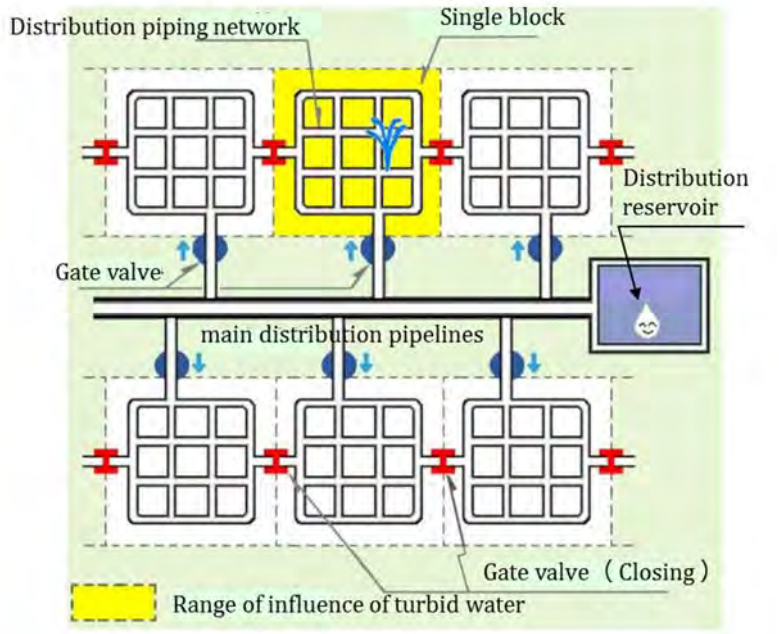
(1) General Features

The advantages of the “block distribution system” include: (1) ability to maintain optimal water pressure in distribution pipelines, (2) ability to measure flow in small areas for early detection of abnormalities, (3) ability to detect broken pipes, and (4) ability to make quick adjustments to the distribution route to provide backup supply.

Wide supply area may present problems such as (1) loss of pressure from friction along the distribution line, (2) uneven pressure and volume caused by elevation differences, and (3) large area can be affected in case of a pipeline accident. There has to be enough pressure to reach the highest elevation. In a supply area where there is big elevation difference, pumping loss will occur. The Block Distribution System (BDS) attempts to deal with these problems by partitioning the distribution network into controllable size.

The distribution network system which is like BDS but has different concept is District Metered Area (DMA). The water supply volume in each DMA is measured and managed using flow meters. Both DMA and BDS deal with partitioned water distribution network. While the aim of DMA is to control and manage leakages, the BDS, water in distribution pipelines can be (1) maintained at optimal pressure, (2) any unusual flow pattern can be detected quickly using flow meter, (3) location of broken pipes can be detected easily and (4) the problem area can be isolated for repair and quick adjustments can be made to the distribution route to provide backup supply.

The block distribution system can be designed according to the purpose it serves. Large blocks deal with water flow between water sources, treatment plants, and other distribution areas. Small blocks can be set up within a large block for switching the distribution route during network maintenance. Utilities can design the block size to match the available budget or the timing of introducing BDS.



Source: Sapporo City

Figure 2. Typical Arrangement of a Block Distribution

(2) Background and History

The block distribution system was initially introduced to reorganize pipeline networks that became difficult to manage because they were installed at various times and not based on well-coordinated plans. The block distribution system improves distribution control and reduces water leakage.

The block distribution system was introduced for various reasons. Yokohama City Waterworks was the first to introduce the system to reorganize the tangled web of pipeline networks that were not distributing water effectively. Fukuoka City adopted the system to improve water source management and supply operation to deal with severe droughts. Niigata City used it to localize water service suspension when liquefaction occurs during earthquakes. Block distribution helped Sendai City and Kobe City equalize water pressure in distribution networks which have to cover supply areas with big differences in elevation.

(3) Design

The block distribution system is designed with consideration of the maximum distribution volume, topographic and geographic characteristics of the area, and locations of distribution mains and reservoirs.

A block distribution system can have different size blocks. There is no standard definition for large, medium or small blocks. Each utility defines the sizes based on its own operations and not all utilities separate their networks into three sizes. The large block usually consists of a reservoir with a distribution main. Medium or small blocks are segmented large blocks, which consist of branch distribution pipelines.

The system is designed to accommodate the maximum distribution volume. Demarcation of blocks takes into consideration of topographic and geographic features, and where distribution mains and reservoirs are located. Medium or small blocks are designed to modulate the distribution pressure and volume according to the elevation of the area. It is important to improve reliability of service by developing connection pipes of distribution main for large blocks to secure backup function of the system and making 2 to 3 inlets from distribution main for medium and small blocks.

As prices of sensors and communications infrastructure become cheaper with further innovations, the block distribution system will become more universal. It will become easier to introduce advanced systems with distribution control and leakage detection, used in Fukuoka City.

3. Case 1: Block Distribution System in Yokohama City

Yokohama City was the first to introduce the block distribution system in Japan. The city had to drastically improve the poorly organized network when it began to receive bulk water supply. Its system is programmed to localize service suspensions and manage backup supply.

(1) Background and Purpose

The block distribution system in Yokohama City was built to reorganize the old patchwork of pipelines to receive Bulk Water Supply from Kanagawa Water Supply Authority.

The catalyst for the introduction of block distribution system in Yokohama City was the establishment of Kanagawa Water Supply Authority in 1968. At that time, water supply facilities in Yokohama City only had funds for the expansion of raw water transmission facilities and water treatment facilities. Without adequate budget, maintenance and improvement of water distribution pipelines and pumping stations were implemented in an ad hoc manner. The network was poorly organized. Apart from experienced senior staff, no one was familiar with how far or how much water was distributed from each reservoir, or the location of pipelines and connections.

When the city planned to increase the water supply volume by taking water from the Kanagawa Water Supply Authority, it had to know the distribution capacity and routes of the pipeline network. City-wide surveys to determine the volume of water used and distributed revealed that water distribution condition such as water pressure, water flow and pipe size varied and inconsistent with water consumption.

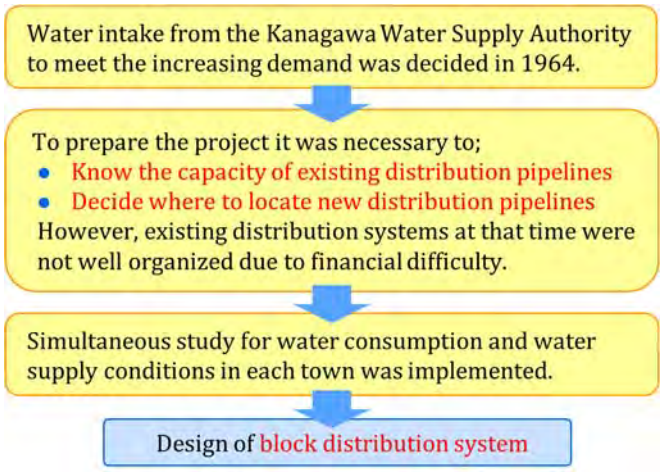
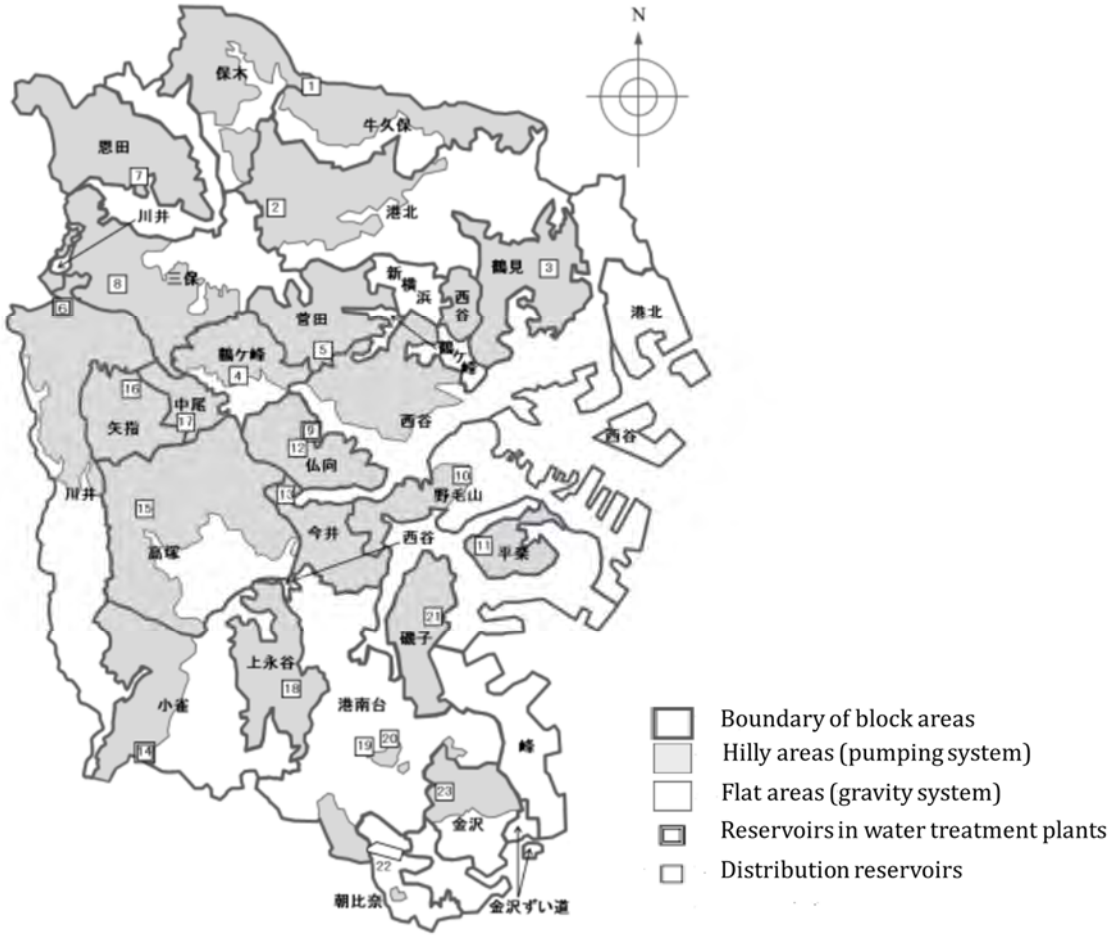


Figure 3. History of Introduction of Block Distribution System in Yokohama City

The block distribution system was introduced to improve these conditions. The area supplied by one distribution reservoir was set as one distribution block. A medium size block consisted of a pumping station. A small block was defined by a certain range of pressure and number of households served, with consideration of the elevation of the area. The system was designed

with computer control. The goals were to (1) expand the distribution network to distribute water from the Kanagawa Water Supply Authority; (2) prepare for the construction of distribution reservoirs to meet rapidly increasing demand, (3) systematize distribution flow by integration of existing pump stations and establishment of pressurized blocks and natural gravity flow blocks, and (4) introduce intensive remote control system with computers at a newly-constructed water distribution management center

The proposal to introduce the block distribution system was met with concerns for high construction cost and the need to raise tariffs. The initial reservation disappeared when the benefits (of better water pressure control and demand allocation, ease of pipeline repairs after accidental damage, and cross connections) became clear.



Source: Yokohama Waterworks Bureau,

http://www.city.yokohama.lg.jp/suidou/os/suidou-suishitsu/suidou/haisui.html

Figure 4. Block Distribution System in Yokohama City

(2) Benefits

The block distribution system improved management of the distribution network and significantly reduced water service interruption in the event of an accident.

The block distribution system is designed with consideration of elevation to achieve proper pressure control. The control valves adjust the distribution volume and easily isolate the problem area when an accident occurs. The advanced mapping system organizes pipeline information and enables appropriate management response to each incidence within the small block.

Block distribution together with advanced mapping provides a clear picture of the network and its operation. This makes daily operation and maintenance, response to accidents, and implementation of system upgrades much easier to manage. Damage to the water source or distribution pipelines can be repaired quickly, dramatically shortening service down time. In 1986, heavy snow damaged a high-voltage cable, causing power outage and water service suspension. Water services were quickly restored thanks to the block distribution system.

Installing a large number of instruments such as flow meters on numerous pipelines and at distribution reservoirs is complicated and expensive. The block distribution system requires fewer instruments to capture the status of the entire water distribution system.

4. Case 2: Block Distribution System in Fukuoka City

Fukuoka City is a regional hub with a population of around 1.5 million and has a network of water distribution pipeline of about 4,000 km. The block system was formed with mutual back up among distribution systems connected to different treatment plants by bridging distribution mains and remote controlling adjustable valves, which enables alternation of supply route. In addition, leakage detection in each block was enabled by isolating distribution networks. Fukuoka City experiences severe droughts and must minimize water leakage. The block distribution system in Fukuoka City contributes to efficient water supply operation and leakage reduction through water pressure control.

(1) Background and Purpose

After the severe drought in 1978, Fukuoka City was determined to improve water distribution so that all households at any elevation could receive water supply under steady pressure. The distribution system would manage the water supply from different water sources and treatment plants efficiently. The Water Management Center was established in 1986.

Fukuoka City has poor water resources and is vulnerable to drought. During the 287 day water restriction caused by severe drought in 1978, the City dedicated a workforce of 34,200 for valve exercising and other tasks to maintain distribution control. There were many areas where tap water ran slow or stopped. The experience prompted the City to make efforts in not only water resource development but also effective water distribution management, water conservation, and in developing a labor-saving distribution network. The new water distribution control system was constructed during FY 1979 to 1980 and started to operate in 1981 when the Water Management Center was established.

Photo 1. Water Trucks Dispatched during the Severe Drought in 1978

Photo 2. Parched Dam during Period of Abnormally Low Rainfall in 1978

The Fukuoka City Waterworks Bureau recognized that block distribution system was essential for effective distribution control. The city added connecting and branching pipes to the existing networks. The supply area was divided into 20 blocks with 6 distribution reservoirs. The division is based on location of distribution mains, main roads, rivers, and railways,

elevation of terrain, and segmentation under city planning. The initial plan to divide the area into 50 blocks according to the number of households, was changed to a layout of 21 blocks according to topography and elevation.

123 electronic control valves were installed on distribution mains and connecting points of each block. The system was equipped with 99 pressure gauges and 47 flow meters for remote monitoring and control from the Water Management Center.

Purposes of Water Management Center are: (1) adjust flow rate and determine allocation from different water treatment plants, (2) control water pressure to reduce leakage, (3) exercise valves during drought to minimize valve operations, (4) monitor for abnormal conditions 24 hours a day and take immediate corrective actions by remote control, and (5) collect and analyze data to improve operation efficiency. The Center's achievements include: (1) effective use of water sources by matching the output from different treatment plants to each water source's situation, (2) stable water supply for the entire city regardless of topographic elevation especially during droughts, no water stoppages at high elevations and end-of-pipe areas, and (3) significant reduction of serious leakages by being able to detect large scale leakages rapidly with continuous monitoring of water pressure and flow. More equipment was installed as the network was expanded in response to increasing water demand: 180 electronic control valves, 124 pressure gauges, and 83 flow meters as of 2016.

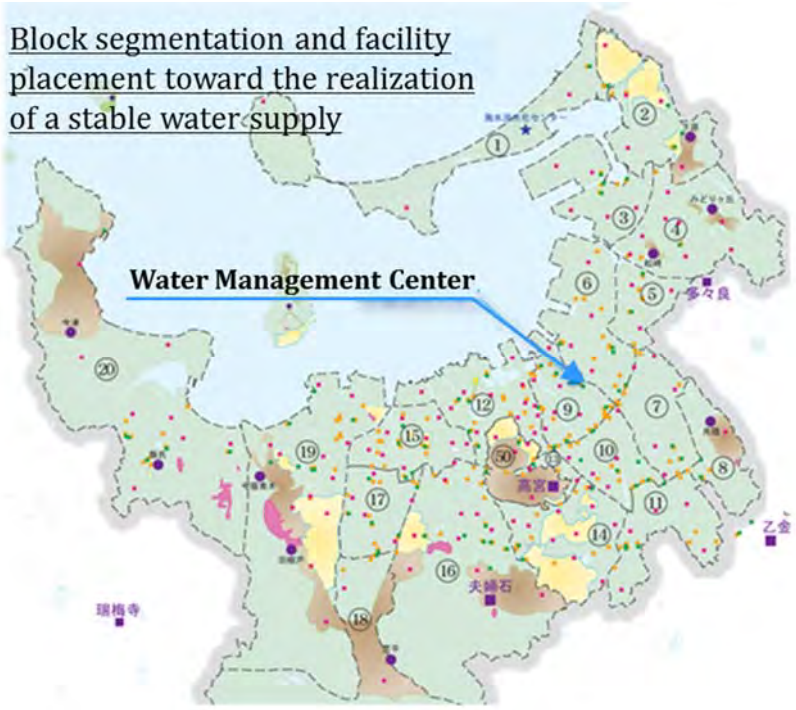


Figure 5. Division of 21 Blocks in Fukuoka City

The electronic control valves are operated manually from the Water Management Center. An alert system notifies staff of troubles of pressure and volume as well as breakdown of valves. Distribution can be adjusted instantaneously by adjusting the valves in response to water demand. The control valves are tested annually to ensure that they operate reliably with rare breaking downs. The valves are controlled electronically by skilled and experienced operators. It is important to develop and maintain this expertise for the long term to ensure continuous successful distribution control.

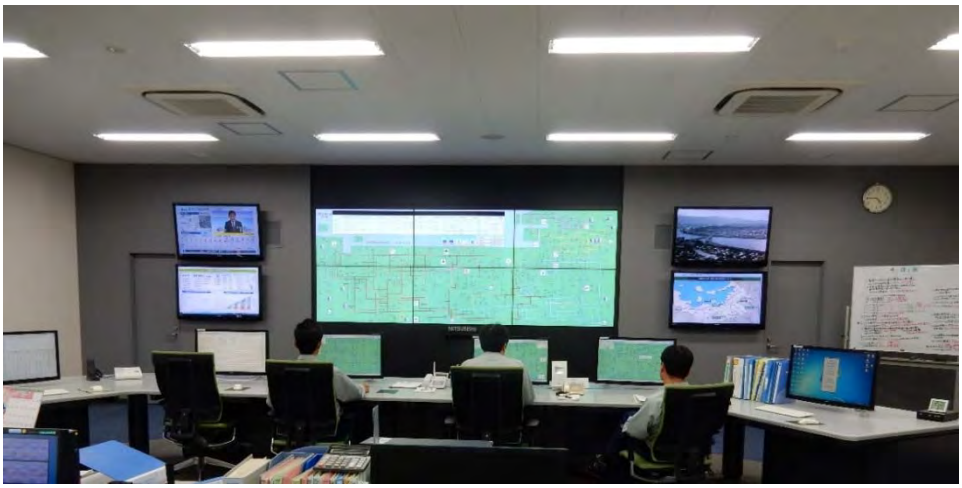


Photo 3. Fukuoka City Water Management Center, taken on April 19, 2016

(2) Benefits

In Fukuoka City, block distribution system is effective in controlling water pressure, reducing leakage and saving precious water resources.

The block distribution system contributes to an estimated saving of 4,000 to 5,000 m^3/day. The precise pressure control minimizes excess water pressure at each block unit, controls water volume distributed daily according to each treatment plant output. The system reduced leakage accidents by 30% and brought the leakage rate from 13% (in 1980) to 2.3% (in 2014). The reduced leakage is also a result of replacement of aged distribution pipes.

The efficient regulation of distribution with mutual backup between treatment plants is credited with no water shutdown or pressure loss during the 1994 drought. Manual control of valves can be handled by half number of operators. Similarly when heavy rainfall causes

distribution stoppage at one treatment plant, water shutdown can be avoided by backup supply from another plant. The backup feature is also useful when accidents occur and during construction and maintenance of distribution mains.

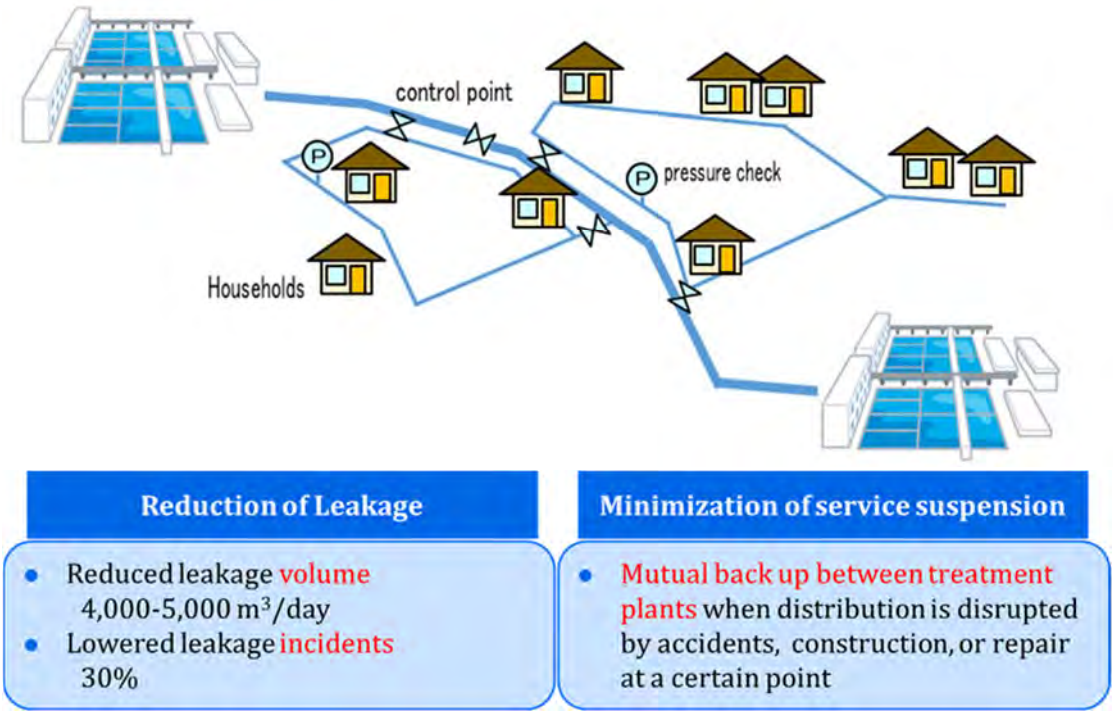


Figure 6. Impacts of the Block Distribution System in Fukuoka

5. Lessons Learned

The following Japanese experience could be useful for other countries.

- **(Block Distribution System)** The system is used by most Japanese water utilities. It is very effective in reducing leakage and maintaining stable supply by: (1) optimizing water pressure in distribution pipelines, (2) measuring flows in small areas to allow early detection of abnormal conditions, (3) identifying the location of broken pipes quickly, and (4) allowing operators to make immediate adjustments to the distribution route and switch to a backup supply.

- **(Large and Small Blocks)** Large blocks allow switching between water sources and water treatment plants. Small blocks are discrete areas within a large block for switching distribution route during maintenance of the network.

- **(Yokohama System)** The block distribution system in Yokohama City drastically modified the disorganized water supply network and improved operation and maintenance by introducing a computerized system. The system makes it easier to identify broken distribution mains and provide a backup supply to minimize suspension of service.

- **(Fukuoka System)** The block distribution system in Fukuoka City established to deal with severe droughts is characterized by the advanced linkage between water sources and distribution reservoirs, switching of water sources by remote control of valve operation, and reduction of leakage in block units. The block system together with the Water Management Center and advanced mapping system is very effective in leakage reduction.

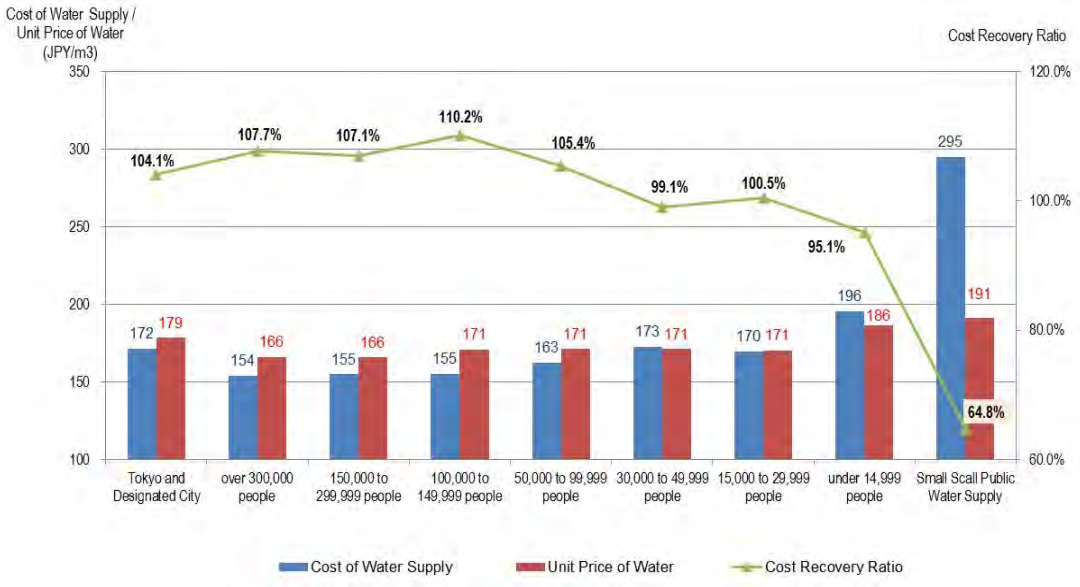
- **(Topographic Considerations)** The implementation of block distribution systems based on topographical characteristics (including the location of water sources and treatment plants) contributes to efficient water supply operations.

Case Study 5. Water Tariff Design with Understanding of Customers: Kyoto City

Contents

1. Introduction

The cost of providing water supply services in Japan for populations of 30,000 to 50,000 slightly exceeds the unit price charged to the customer, and the cost recovery declines to 95.1% for populations of less than 15,000 (see Figure 1). For larger populations (over 50,000) the cost recovery is better than 100%. Therefore on the whole, it can be said that large-scale utilities generate sufficient revenue to cover proper operation and maintenance, development and perpetuation of the system, while maintaining the utilities' financial integrity. Nevertheless, the ability to recover cost differs significantly with the size of the served population as shown in Figure 1.



Source: Created from the data of The Ministry of Internal Affairs and Communications, "*Survey of Financial Status of Local Public Enterprises, FY 2014,*" http://www.soumu.go.jp/main_sosiki/c-zaisei/kouei26/html/mokuji.html

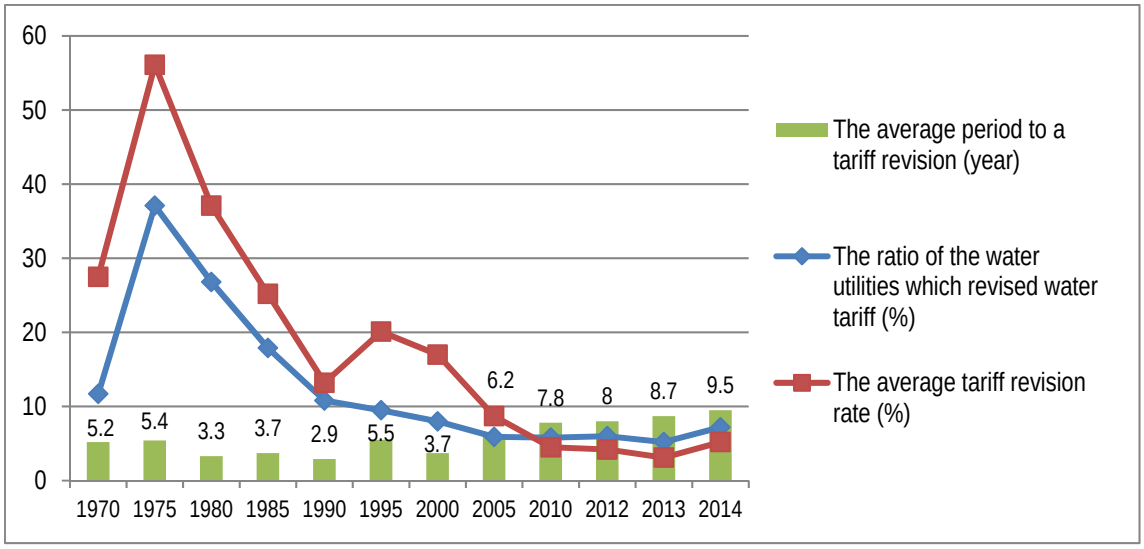
Figure 1. Cost Recovery Ratio by Waterworks of Different Service Capacities (FY2014)

Figure 2 shows that water utilities revised their water tariffs every 3~5 year in the 1970s when they were actively investing in water supply developments. They had to overcome various difficulties to do so.

The national government's policy on price and cost control did not allow tariff increases to keep pace with rapid inflation after World War II (1945). At the same time, construction costs, operation and maintenance costs kept rising and many water utilities faced serious financial

difficulties. The push to increase water tariffs was building. Finally by 1964-1965, 208 water utilities implemented tariff increases of 30-50%.

Water tariffs of most utilities were revised again in 1975, to cope with financial deterioration associated with the 1973 oil crisis and to secure funds for expansion of the water supply facilities (see Figure 2). The average increase was 56.1%. As the Japanese economy stabilized after the 2000s, fewer tariff revisions were implemented and rate increases were kept at low levels. It can be observed that water utilities tended to refrain from revising the water tariff or maintained the revision rates at low levels during recessions. In recent years, only 5-7% of the water utilities made tariff revisions with the average increases at 10% or lower.



Source: Created from the data of Japan Water Works Association, "*The Outline of Water Supply*," 6th ed., 2015.

Figure 2. Water Tariff Revisions from 1970 to 2014

This module explains the water tariff revision process with a specific example of the experience of Kyoto City.

2. Water Tariff Revision Process

Municipalities manage water utilities in Japan under the provisions of the Water Supply Act and Local Public Enterprise Act. Rules for water tariffs are described in detail in the water supply ordinance established by the local assembly. It is necessary to revise the water supply ordinance in order to increase water tariffs. The application to revise water tariffs requires the approval of the municipal assembly and involves discussions on political ramifications, economic conditions, societal and industrial impacts, public welfare, and affordability for low-income households. The proponent (water utility) and the decision maker (local authority) are required to engage the public to inform them of the application for a rate increase and to obtain their input.

The main steps of the water tariff revision process are as follows:

1) Preparation of a fiscal plan (financial analysis/ management analysis, financial projections)
↓
2) Discussions by an advisory committee and public consultations
↓
3) Preparation of the revised water tariffs (draft)
↓
4) Discussion at the local assembly and adoption of the revised water tariffs
↓
5) Public notification of the new rates
↓
6) Report to the Ministry of Health, Labour and Welfare (or Governor of the prefecture)

Figure 3. Steps of Water Tariff Revision Process

When conducting the revision of water tariffs in Japan, the following aspects are functioning effectively: (1) the Local Public Enterprise Act stipulates that public enterprises including water utilities must adopt the self-supporting accounting system and fully distributed cost method in their financial management; (2) appropriate levels for the revised tariffs are calculated following standardized procedures described in the *Water Tariff Setting Manual* prepared by Japan Water Works Association; and (3) public consultations and advisory committees are utilized in order to obtain customers and expert opinions.

(1) Preparation of Fiscal Plan (Financial Analysis/Management Analysis, Financial Projections)

The water utility formulates a fiscal plan, with the projected financial situation showing that revision of water tariffs would be required for sustainable management and provision of adequate water supply services.

The fiscal plan shows the business expenses over the period of time required to realize the targeted level of water supply service and the revenue that can be generated to cover the costs. The plan also includes the financial status to be achieved by the target date and the steps to be taken to do so. A financial plan is required for issuing municipal bonds to secure the financial resources for the construction of the facilities. It is also included in the master plan for water supply facilities to obtain the approval of relevant government authorities when water supply services are being developed. The financial plan is reviewed every 3 to 5 years in order to keep pace with inflation and changes in water demand. The main tasks of water utilities have shifted from construction of new facilities to maintenance and rehabilitation of existing ones. Therefore at the present time, a financial plan is generally prepared in accordance with the targets set in the business plan.

A financial plan is prepared in order to examine whether the current tariff level covers O&M and capital costs within the next 3 to 5 years. Therefore, it is formulated based on the details of other related plans shown in Table 1. Revenue and expenditures are estimated based on these plans and assumptions made on inflation rates.

If the financial outlook is grim, water utilities would review the investment plan and personnel costs, and revise the financial projections. Increasing the water tariffs would be considered after the review. The proposed revision would show how an increase in tariffs would be needed to cover all of the costs.

Prior to the revision of water tariffs, it is necessary to review the historical and future financial status of the water utility. By analyzing the past financial statements and management reports (required to be submitted every year under the Local Public Enterprise Act), changes in management status are evaluated, and compared with the national average and other water utilities of similar scale (benchmarking). Improvements to the management of the utility are also proposed, if necessary.

Table 1. Related Plans to be Considered for Preparation of a Financial Plan

Name of plan	Contents	Criteria for Financial Plan
Demand & Supply Plan	Securing a water source, water demand analysis, etc.	Water service coverage rate, population served, number of connections, etc.
Facility Plan	New construction, expansion, rehabilitation, etc.	Annual amount of water distributed (day maximum & day average) and amount of revenue water.
Funding Plan	Capital income including bond issues, national subsidies and grants, transfers from the general account, contributions for construction, etc.	Amount of bond issued and repayment, amount of grant and subsidy, other income, etc.
Operation Plan	Operation & maintenance of facilities, staff allocation, outsourcing, etc.	Operation & maintenance cost including outsourcing cost, etc.

Source: Created from information of Japan Bank for International Cooperation (JBIC), "*Survey Report on Policy and Case for Water and Sewerage Rates*," 2004., Japan Water Works Association (JWWA), "*Water Tariff Setting Manual*," 2015, http://www.jwwa.or.jp/houkokusyo/pdf/suidou_santei/suidou_santei_02.pdf, etc.

Column: Business Planning

The water supply business in Japan has gone through a period of facility expansion. Now the management environment is becoming increasingly challenging due to revenue and population decline combined with the need for massive rehabilitation and renewal of aging and deteriorating assets. A medium to long-term business plan is required to restore local government financial integrity. In 2016, the Ministry of Internal Affairs and Communications issued guidelines for the formulation of a business strategy and decided to provide subsidies to local governments for three years to carry out this task. Thus, it is essential for all water utilities, especially small ones, to revise the financial plan and business strategy, based on which water tariff revisions can be carried out.

(2) Advisory Committee & Public Consultations

The local government sets up advisory committees to gather advice on various management matters including tariff revisions. Public consultations are also necessary to engage residents and seek their input.

The Local Autonomy Act sets the rules for the establishment of advisory committees. The constitution and the number of members are decided by the ordinance. In general, committees comprise of academic experts, intellectuals, representatives of citizen groups, bulk users and

citizens appointed by the mayor or the executive managing director of the water utility. They review, deliberate, investigate and provide advice on the initiatives and management of the water utility, including policy decisions, financial issues.

The advantages of having an advisory committee are as follows: (1) ensuring accountability and information disclosure by requiring the utility to explain the details of the its business; (2) ensuring objectivity in the decision-making process; (3) ensuring access to experts advice; and (4) ensuring customers to have input through the participation of representatives of user groups.

The committee discusses water tariff revision based on the information provided by the water utility and submits its report to the local assembly for the latter's final deliberation. The members of the committee bring forward diverse perspectives to the decision-making process and their recommendations are usually seriously considered.

The Local Public Enterprise Act stipulates the use of the fully distributed cost method to determine the water tariff schedule. This has the disadvantage that there may not be enough incentive to improve management efficiency because the water tariff schedule is calculated based only on total costs. To promote management efficiency, the advisory committee also discusses personnel assignment, cost reduction through outsourcing, measures for unpaid water tariffs, asset management, etc. In addition, in order for the committee to fully understanding all aspects involved in the revision of water tariffs, it is important that the water utility presents the current and projected financial status including expected renewal expenses, required to provide sustainable services in the medium to long term.

Public consultations and information sessions are held to engage customers and obtain their input on the proposed tariff revision. It is important that the public understand the need for the revision and appreciate the transparency of the process. A draft revision of the water tariffs is then prepared taking their comments into consideration. Information disclosure and public engagement are important at all times and not only when tariffs are being revised. Customers who are engaged would have a good understanding of the water supply business and would readily lend their support to reasonable and necessary initiatives proposed by the water utility.

(3) Preparation of the Revised Water Tariffs (Draft)

The water utility calculates the total cost necessary for the operation using the fully distributed cost method and determines the required water tariff structure according to the *Water Tariff Setting Manual*.

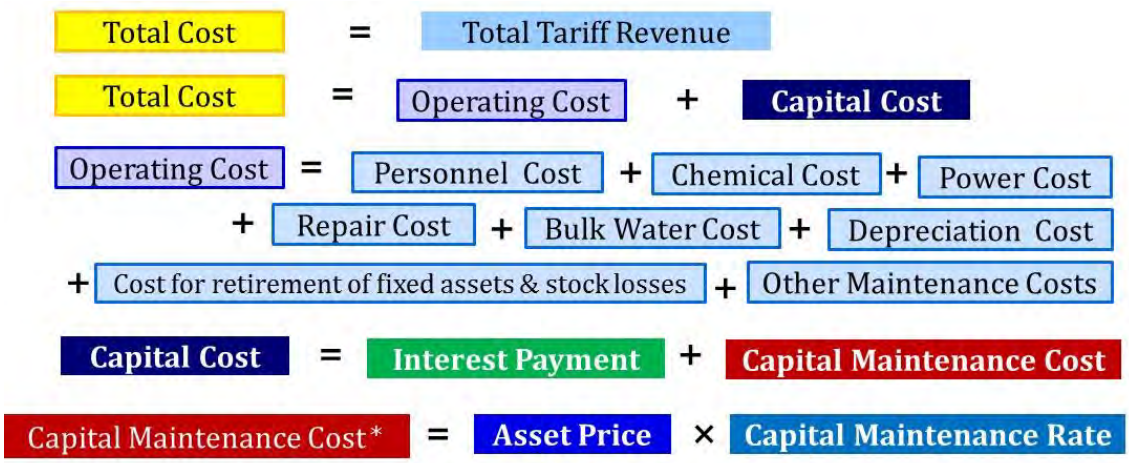
If the advisory committee supports the water tariff revision, a draft revised water tariffs is prepared under the authority of the executive managing director of the water utility. The revised tariffs are calculated based on the Water Tariff Setting Manual and the actual financial conditions of the water utility.

1) Setting the period of water tariff assessment

The *Water Tariff Setting Manual* recommends that the new water tariffs should be set for a period of 3 to 5 years.

2) Assessment of the total cost

The total cost for the period in which the rates are to be effective is the sum of operating expenses and capital costs for the period. This amount should be equal to the total revenue generated from water tariffs. The composition of the operating expenses and capital costs is shown in Figure 4.



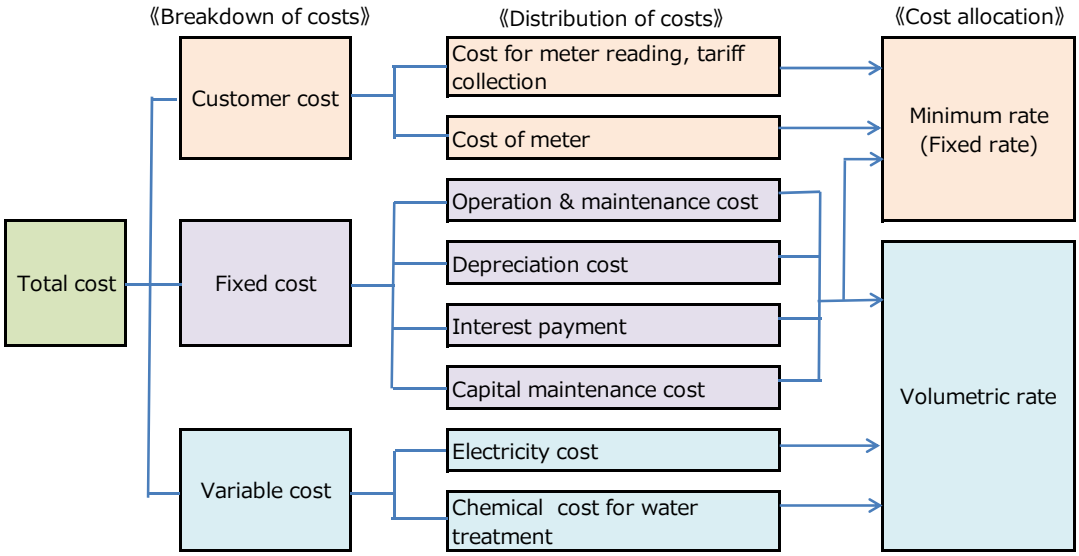
*If the same facility could be constructed again at the same cost as when it was built, the replacement cost could be covered by the retained revenue through depreciation. However, the rising costs of materials and labor makes this approach unattainable. Capital Maintenance Cost will be required to maintain the actual capital required.

Source: Created from information of JBIC, "*Survey Report on Policy and Case for Water and Sewerage Rates*," 2004, JWWA, "*Water Tariff Setting Manual,*" 2015, etc.

Figure 4. Details of the Fully Distributed Cost

3) Calculation for setting water tariffs

Water tariffs are normally designed to fit average conditions for groups of customers having similar service requirements and then the cost of serving each customer group is determined. It is common practice to provide a two-part rate schedule consisting of a minimum rate and a volumetric rate (See Figure 5).



Source: Created from information of JWWA, "*Water Tariff Setting Manual*," 2015, etc.

Figure 5. Breakdown of the Cost and Allocation to the Tariffs

There are two ways to categorize customer groups: purpose-based and pipe size-based. The typical purpose-based categories are residential (domestic), commercial, and industrial (public bath, factory, etc.). The categories differentiate the groups' payment capability, and the nature/type and volume of water consumption, which produces added value. The tariff structure normally assigns a lower rate for domestic use and higher rates for uses beyond basic needs. Water utilities are shifting to classifications based on the size of service pipes or water meter pipe for each customer, or the amount of water used. This method of classification has the advantage of being objective, nondiscriminatory and not perceived to be arbitrary.

Minimum "fixed" rate for each customer group is calculated based on the expense necessary for providing 24/7 water supply services regardless of the amount of water used. The cost allocated per unit of water supply, which is to be collected depending on the actual amount of water used by each customer, is calculated as the volumetric rate.

The minimum rate generally includes a minimum volume of water consumption. To satisfy public health requirements, the minimum volume of 5 - 10 m^3 per month is usually applied to domestic water users. The allocation of capital cost to the minimum volume is reduced to make it more affordable.

The volumetric rate is charged based on the water consumed (per m^3). The rate is the same for all customer groups in principle. However, increasing-block or decreasing-block rates can be adopted to discourage or promote high volume use. Many water utilities adopted decreasing-block rates for industrial developments during the early stages of modern water supply development in Japan. The increasing-block system was introduced by many utilities to counter rapidly increasing water demand during the period of high economic growth.

The unit price decided through the above-mentioned process multiplied by the estimated number of customers and water volume should be the total revenue from water tariffs (and should be equal to the total cost).

(4) Approval by Local Assembly and Adoption of the Revised Water Tariffs

The draft water tariff revision is submitted to the local assembly for discussion and approval.

The water tariff revision proposal is submitted to the local assembly as a draft amendment of the water supply ordinance. The assembly reviews the reasons for the water tariff revision and discusses changes to be made in the original draft. Approval requires a detailed and convincing explanation of the necessity for facility development and renewal to provide sustainable and reliable supply of safe water. In addition, it is important for the utility to explain its efforts in sound management and convince the approval authority of the need for revision even though these efforts are successful. The draft proposal for water tariff revisions may be approved, or approved with additional requirements and amendments, or denied.

(5) Public Notification of New Water Tariffs

When the proposed water tariff revision is approved by the local assembly, the water utility notifies the citizens of the impending rate increases.

The notice of water tariff increases is published in the media, municipal publications and websites or sent out with water bills.

(6) Report to the Supervisory Authority

The water utility reports the revised water tariffs to the supervisory authority.

Based on Paragraph 5, Article 14 of the Water Supply Act, the supervisory authority should be notified of the revised water tariffs; this is usually the Minister of Health, Labour and Welfare or a prefectural governor if the utility is under the jurisdiction of the prefecture (serving design populations is less than 50,000).

3. Case: Kyoto City Water Tariff Revision in 2013

(1) Background

Kyoto City's Water Vision and Medium-Term Management Plan prepared in 2007 forecasted a financial deficit for 2010 and a cumulative deficit reaching 6.4 billion yen by the end of 2012. Kyoto City managed without raising the water and sewerage tariffs until 2012. An advisory committee began a series of meetings in November 2011 to deliberate on the proposal to revise the water tariffs in FY 2013.

Kyoto City is Japan's ancient city and the background information on Kyoto City Waterworks as of the end of FY 2012 is shown in Table 2.

Table 2. Background Information on Kyoto City Waterworks

(As of the end of FY 2012)

Population served	1,455,904 persons
Water service coverage rate	99.90%
Number of connections	750,822
Facility capacity	771,000m³/day
Length of distribution pipeline	3,890km
Maximum daily supply	587,840m³
Average daily supply	539,272m³

Source: Kyoto City Waterworks Bureau's website
http://www.city.kyoto.lg.jp/suido/page/0000008776.html

The water tariffs in Kyoto City had stayed the same for 12 years since 2001. During this period, water demand continued to drop due to economic stagnation and the promotion of water conservation. The amount of water used per household decreased while the number of users increased, resulting in decreasing revenue from water tariffs. "Kyoto City's Water Vision (2008 - 2017)" recognized that the tariff system for water and sewerage services would need to be revised to reflect the new reality. The "Medium-Term Management Plan (2008 - 2012)" projected a cumulative deficit to begin in fiscal 2010, which would increase yearly reaching 6.4 billion yen by the end of FY 2012 (See Table 3).

Table 3. Projected Future Income and Expenditure of the Kyoto Waterworks (As of 2007)

(Million JPY)

Fiscal Year	2007	2008	2009	2010	2011	2012
Net profit or loss	-709	-1,575	-1,830	-2,116	-2,360	-2,502
Accumulated profit or loss	4,018	2,443	613	-1,503	-3,863	-6,365

Source: Kyoto City Waterworks Bureau, *Kyoto City Waterworks' Medium-Term Management Plan (2008 - 2012)*, 2007.

(2) Advisory Committee on Water and Sewerage Tariff System

The Kyoto City Waterworks Bureau decided to maintain the existing water and sewerage tariff level until FY 2012, while managing its finances through other measures. In November 2011, the Advisory Committee on Water and Sewerage tariff System of Kyoto City was established. The eight member advisory committee was comprised of academic experts, a tax accountant, representatives from a women's group, chamber of commerce, social welfare workers' group, and the Japan Water Works Association, and a citizen selected through public recruiting.

(3) Public Survey

A survey of the public showed that while more than half of the citizens were satisfied with the water tariff system, some felt that it should be reviewed in terms of fairness.

The Advisory Committee on Water and Sewerage tariff System carried out a survey of residents, companies and industries to obtain their opinions on the water and sewerage tariff system. The survey was conducted over a one month period from April to May 2012.

Of the 1200 responses more than half indicated that they were satisfied with the existing water tariff system. 20% thought that "it is better to reduce the gap of fixed rate among users' categories," "it is better to reduce or eliminate the volume of minimum water," and "it is better to narrow the gap in unit prices in the increasing block rates." 25% demanded a new bill payment method. 50% of citizens would like measures taken on groundwater use. (As Kyoto City has abundant groundwater resources; there are no regulations on groundwater use. Land owners can freely use groundwater at their premises. Although they are connected to the water supply system, they use groundwater as the main water source; and do not contribute to the costs for maintaining the water supply facilities and do not share equitably the financial burden of water supply system.)

The city had conducted public outreach to improve the citizens' understanding of water supply services previously. Therefore customers were cooperative in responding to the survey.

(4) Advisory Committee Recommendations on Water and Sewerage Tariff System

The Advisory Committee met seven times in one year. They discussed the issues of the existing water and sewerage tariff system and submitted a set of recommendations.

Table 4 summarizes the issues the Advisory Committee discussed and the recommendations for their resolution. The records of the committee meetings and all related information are available on the website of the Kyoto City Waterworks Bureau. The Advisory Committee played a role in demonstrating transparency and achieving accountability to the citizens.

The Kyoto City Waterworks Bureau explained the situation and issues of water and sewage services before the draft water tariff revision was presented to the local assembly. Public outreach was carried out to promote the understanding of citizens, through media outlets such as TV and city bulletins. These activities generated an atmosphere of acceptance among citizens, and contributed to the approval of the proposed revision by the assembly.

Table 4. Water Tariff Issues and Recommendations of the Advisory Committee

Issues		Recommendation
Minimum volume of water	More than 1/3 of households use less than 10 m³/month (monthly water volume covered by the fixed rates).	Reduce the minimal volume by half. Abolish the minimal volume for customers with small diameter of service pipe in future.
Block tariff system	The number of blocks and the range of water volume in each block do not correspond to the water consumption patterns.	Sub-divide small volumetric blocks into more narrow bands and consolidate large volumetric blocks into larger bands.
Fixed cost	Along with the reduced water demand, the revenue from volumetric rate is expected to continue to decline, and it would be difficult to recover the fixed cost in future.	Increase the amount of fixed costs allocated to the fixed rate.
Rate increment	Difference between the highest and the lowest unit price of the volumetric rate is bigger than other major cities, while the rate difference in sewerage tariff is extremely small compared to other cities.	Reduce the rate difference within the water tariff structure and widen it in the sewerage tariff structure, bringing the rate levels closer to those of other cities.
Groundwater use	Groundwater users, who connect to large diameter pipes, pay much less for piped water and are not sharing the financial burden fairly with other users.	Raise the fixed rate and increase the amount of fixed water for customers with large pipe diameter and reduce unit price of volumetric rate. Introduce user fee and/or discount system for customers with large diameter pipe in the future.
Credit card payment	Customers are interested in using credit card to make payments. The commission charge to the utility for credit card payment is more expensive than bank transfer fees.	Introduce credit card payment. Split the difference with the customers by giving them a discount as an incentive for payment using bank transfer.
Connection charge (Membership Fee)	Income generated by the connection charge could decrease in the future because it is influenced by a decline in the number of new customers.	Continue the connection charge system and introduce capital maintenance costs.
Capital maintenance costs	Capital maintenance costs, which are required to renew, replace, or rehabilitate assets, are not included in the calculation of water tariffs. They shall be included in the operating costs according to the *Water Tariff Setting Manual*.	Include capital maintenance costs when setting water tariffs. Propose acceptable portion of the costs based on the necessity for facilities renewal and the calculation formulas. It is necessary to be accepted by citizens.

Source: Created from information of Kyoto City Advisory Committee on Water and Sewerage tariff System "*Recommendations on Kyoto City Water and Sewerage tariff System,*" 2012.

(5) Preparation of the Draft Revision of Water Tariffs and Approval by the Local Assembly

Kyoto City Waterworks Bureau proposed a 9.6% increase in water tariffs, a 3% reduction in sewerage tariffs, with the combined tariff increase of 3.7%. The tariff revision was approved by the assembly.

The proposed water tariff revision submitted by Kyoto City Waterworks Bureau in February 2013 based on the opinions of the Advisory Committee on Water and Sewerage Tariff System and input from public consultation, was approved by the local assembly. Water tariffs were raised by 9.6% and the sewage surcharge was reduced by 3%, resulting in a combined increase of 3.7% in water and sewerage rates.

Table 5 shows the old and revised water tariffs. The minimum volume of water included in the fixed rate was reduced to 5 m^3 per month from 10 m^3 for small pipe sizes (13 and 20 mm) and no change for medium pipe sizes (25 and 40 mm). For large pipe sizes (50 - 200 mm) the minimum volume was decided in accordance with each pipe size (from 50 m^3 to 1000 m^3). With this revision, the percentage of general households using less than minimum water decreased from 37% to 11%.

Small consumption volumetric rate blocks (11 - 30 m^3) were sub-divided into smaller bands (11-20 m^3 and 21-30 m^3) and large consumption volumetric rate blocks (more than 5,001 m^3) were consolidated to promote water saving (See “volumetric rate” in Table 5).

By increasing the fixed rate significantly, setting minimum volume based on the pipe size, and decreasing the maximum unit price of volumetric rate, the utility tried to promote the use of supplied water and to control the increasing use of groundwater. Setting fixed rates based on the minimum water by pipe size resulted in an increase in the percentage of fixed rate water tariff revenue from 35.8% to 36.3%.

The difference between highest and lowest unit price (per m^3) was reduced from 3.9 to 3.36 as shown in Table 5. (Before 339/87＝3.90 : The highest unit price was 339 JPY when more than 10,001 m^3 was used and the lowest was 87 JPY for 13/20 mm pipe when 10m^3 was used. After 326/97＝3.36: The highest is 326 JPY when more than 5,001 m^3 was used and the lowest is 97 JPY for 13/20 mm pipe when 10m^3 is used: 920JPY+50JPY/10 m^3.)

Table 5. Water Tariffs Before and After the Revision

(Unit: JPY)

	Diameter /Block	Old Tariffs		Revised Tariffs	
		Price (JPY)	(Minimum volume)	Price (JPY)	(Minimum volume)
Fixed Rate	13/20 mm	870	10 m³	920	5 m³
	25 mm	1,690		1,900	10 m³
				2,780	
	40 mm	2,470		18,300	50 m³
	50 mm	9,250		35,910	100 m³
	75 mm	15,470		71,600	250 m³
	100 mm				
	150 mm			134,260	500 m³
	200 mm			281,520	1000 m³
Volumetric Rate (/m³)	6 m³	0		10	
	11 m³~20 m³	162		177	
	21 m³~30 m³			180	
	31 m³~100 m³	189		208	
	101 m³~200 m³	206		226	
	201 m³~500 m³	223		243	
	501 m³~5,000 m³	262		284	
	5,001 m³~10,000 m³	301		326	
	10,000 m³~	339			

Source: Kyoto City Waterworks Bureau, *"Reference material for Revision of the Water and Sewerage tariffs,"* 2013.

Table 6 shows the revenue and expenditures of the utility after the revision. Reduction of expenses through the streamlining of operations and strengthening of financial practices reduced the total cumulative deficits from 8,391 million JPY to 2,528 million JPY. After the tariff revision, the city balanced the revenue with expenditures and the capital maintenance cost by eliminating the cumulative deficits.

The city introduced the credit card payment system as requested by the customers. Credit card payment adds another expense to the water supply service because of the commission charges. Therefore, a discount of 40 yen (excluding consumption tax) per month was granted for those who do not use credit card and pay by bank transfer.

Table 6. Projected Fiscal Revenue and Expenditures of Kyoto City Waterworks Bureau (FY2013 -- FY2017)

(Unit: Million JPY)

	Before cost-saving	After cost-saving		After water tariff revision	
			Effect		Effect
Revenue	142,043	142,165	122	152,982	10,817
Water tariff	129,594	129,594	0	140,804	11,210
Others	12,449	12,571	122	12,178	-393
Expenditure	150,136	144,395	-5,741	144,550	155
Personnel cost	33,991	30,191	-3,800	30,191	0
Salary	28,656	26,501	-2,155	26,501	0
Retirement allowance	5,335	3,690	-1,645	3,690	0
Maintenance costs	38,788	36,600	-2,188	36,587	-13
Depreciation	55,725	55,725	0	55,725	0
Interest payment, etc.	16,703	16,703	0	16,335	-368
Consumption tax, etc.	4,929	5,176	247	5,712	536
Net profit or loss	-8,093	-2,230	5,863	8,432	10,662
Appropriation of earned surplus*	0	0	0	-8,134	-8,134
Accumulated profit or loss in the end of FY2017	-8,391	-2,528	5,863	0	2,528

* The amount, which can be utilized or reserved for a specific use, such as capital maintenance, etc.

Source: Kyoto City Waterworks Bureau, *"Reference material for Revision of the Water and Sewerage tariffs,"* 2013.

(6) Customer Notification of Water Tariff Revision

Following the approval of the water tariff revision, the Kyoto City Waterworks Bureau used city bulletins, posts on website, and posters, to inform the public of the revised rates.

The details of the water tariff changes were published in newspapers, on city bulletins, brochures and flyers. Announcements were made on television, radio, and social media, and websites. Posters were put up in public places (See "Photo 1"). In addition, the city held individual meetings with various affected groups and businesses.

Source: Kyoto City Waterworks Bureau, *Concerning Revision of Water and Sewerage tariff System*, the 4th Regional Meeting for Promotion of the New Water Supply Vision (Kansai Region) by the Ministry of Health, Labour and Welfare
http://www.mhlw.go.jp/seisakunitsuite/bunya/topics/bukyoku/kenkou/suido/newvision/chiikikondan/04/suishin_kondan_04-4.pdf

Photo 1. Sticker Announcing the Revision of Water Tariffs

Kyoto City Waterworks Bureau also circulated advance notices of the new tariff schedule shown in Table 7.

Table 8 shows the public engagement activities conducted along the tariff revision process, from the preparation of the Medium-Term Management Plan, the decision to seek tariff revision, to the work of the advisory committee. Securing public understanding and support along every step of the process ensured that the revised water tariffs were acceptable to the customers.

The Kyoto City example shows how water utilities in Japan revised water tariffs by effectively using the advisory committee made up of external experts and representatives of citizens. In the process they also reduced expenses by streamlining the system through management efforts, improved affordability for low income groups and met customer demands for a fairer tariff structure. A wide range of opinions were gathered during the public hearings and these were duly reflected in the revised tariff schedule. The process promoted the citizens' understanding of the need for tariff revision and proved that regular public engagement is necessary to gain their continued understanding and support.

Table 7. New Tariff Schedule（13 mm and 20 mm）for Circulation

京都市上下水道局　料金早見表（2カ月料金・税込）

WATERWORKS BUREAU, CITY OF KYOTO

Water and Sewage Service Charges

per 2 months, 8% consumption tax incl.

diameter of water supply pipe 13&20 mm

2014年6月1日検針分から適用

Effective from 1st June 2014

水量 amount of water used (m³)	水道料金 (円) water charge (yen)	下水道使用料 (円) sewage charge (yen)	合計 (円) total (yen)	水量 amount of water used (m³)	水道料金 (円) water charge (yen)	下水道使用料 (円) sewage charge (yen)	合計 (円) total (yen)
0-10	1,987	1,404	3,391				
11	1,998	1,414	3,412	56	9,028	5,957	14,985
12	2,008	1,425	3,433	57	9,223	6,082	15,305
13	2,019	1,436	3,455	58	9,417	6,207	15,624
14	2,030	1,447	3,477	59	9,612	6,333	15,945
15	2,041	1,458	3,499	60	9,806	6,458	16,264
16	2,052	1,468	3,520	61	10,031	6,633	16,664
17	2,062	1,479	3,541	62	10,255	6,808	17,063
18	2,073	1,490	3,563	63	10,480	6,983	17,463
19	2,084	1,501	3,585	64	10,704	7,158	17,862
20	2,095	1,512	3,607	65	10,929	7,333	18,262
21	2,286	1,634	3,920	66	11,154	7,508	18,662
22	2,477	1,756	4,233	67	11,378	7,683	19,061
23	2,668	1,878	4,546	68	11,603	7,858	19,461
24	2,859	2,000	4,859	69	11,828	8,033	19,861
25	3,051	2,122	5,173	70	12,052	8,208	20,260
26	3,242	2,244	5,486	71	12,277	8,382	20,659
27	3,433	2,366	5,799	72	12,502	8,557	21,059
28	3,624	2,488	6,112	73	12,726	8,732	21,458
29	3,815	2,610	6,425	74	12,951	8,907	21,858
30	4,006	2,732	6,738	75	13,176	9,082	22,258
31	4,197	2,854	7,051	76	13,400	9,257	22,657
32	4,389	2,976	7,365	77	13,625	9,432	23,057
33	4,580	3,098	7,678	78	13,849	9,607	23,456
34	4,771	3,220	7,991	79	14,074	9,782	23,856
35	4,962	3,342	8,304	80	14,299	9,957	24,256
36	5,153	3,464	8,617	81	14,523	10,132	24,655
37	5,344	3,586	8,930	82	14,748	10,307	25,055
38	5,536	3,708	9,244	83	14,973	10,482	25,455
39	5,727	3,830	9,557	84	15,197	10,657	25,854
40	5,918	3,952	9,870	85	15,422	10,832	26,254
41	6,112	4,078	10,190	86	15,647	11,007	26,654
42	6,307	4,203	10,510	87	15,871	11,182	27,053
43	6,501	4,328	10,829	88	16,096	11,357	27,453
44	6,696	4,453	11,149	89	16,320	11,532	27,852
45	6,890	4,579	11,469	90	16,545	11,707	28,252
46	7,084	4,704	11,788	91	16,770	11,882	28,652
47	7,279	4,829	12,108	92	16,994	12,057	29,051
48	7,473	4,955	12,428	93	17,219	12,232	29,451
49	7,668	5,080	12,748	94	17,444	12,407	29,851
50	7,862	5,205	13,067	95	17,668	12,582	30,250
51	8,056	5,330	13,386	96	17,893	12,756	30,649
52	8,251	5,456	13,707	97	18,118	12,931	31,049
53	8,445	5,581	14,026	98	18,342	13,106	31,448
54	8,640	5,706	14,346	99	18,567	13,281	31,848
55	8,834	5,832	14,666	100	18,792	13,456	32,248

水量101m³以上の料金については、営業所までお問い合わせください（裏面をご覧ください。）。

If you want to know about the charge of 101m³ or more, please inquire our service office (See reverse side).

Source: Website of Kyoto City Waterworks Bureau, http://www.city.kyoto.lg.jp/suido/cmsfiles/contents/0000006/6745/8percent_water_and_sewage_service_charges_chart（13and20mm）2016Apr.pdf

Table 8. Water Tariff Revision Process in Kyoto City Waterworks Bureau

2007.12	Kyoto's Water Vision and Medium-term Business Plan was prepared. It showed a deficit situation beginning in FY 2010, and the amount of the deficit reaching 6,400 million yen at the end of FY 2012. The Kyoto City Waterworks Bureau decided to maintain existing water and sewerage tariff rates till FY 2012 and manage the deficit using other financial options.

	City Assembly and Revision	Advisory Committee on Water and Sewerage Tariff System	TV・Radio/ Explanatory meeting	City bulletin	Leaflets, etc.
2011.9		Establishing the Advisory Committee			
2011.11		First meeting			
2012.1		Second meeting			
2012.3		Third meeting			
2012.4		Public survey			
2012.5		Public survey			
2012.6		Fourth meeting			
2012.7		Fifth meeting	Staff of Kyoto City Waterworks Bureau explained the status and issues facing the water utility, described the tariff system on KBS (Kyoto Broadcasting System) Kyoto Television.		
2012.8		Sixth meeting			
2012.10					Distributed leaflets on "reduction of water demand, aging facilities, and details on the tariff system review.
2012.11		Seventh meeting ⇒ Submission of the written opinion	A radio personality, an expert, the mayor and a staff of Kyoto City Waterworks Bureau delivered the message on status and issues facing the water utility, and future vision on KBS Kyoto radio. (Total 13 times)	Explained issues related to Kyoto City Waterworks Bureau	
2012.12					
2013.1				Presented the report by the Advisory Committee on Water and Sewerage Tariff System	
2013.2	Submission of the application for water and sewerage tariff revision		Conducted explanatory meetings with various stakeholders.	Presented the outline of the Medium-term Business Plan	Distributed leaflets on "reduction of water demand, aged facilities, and examination of the tariff system" to every house, making them available at ward offices, branch offices of Waterworks Bureau, subway stations, etc.
2013.3	Approval of the application				
2013.4				Explained water and sewerage tariff revision	Distributed leaflets on the tariff revision at meetings, events and at the facilities of Waterworks Bureau. The notice of the tariff revision was included in Waterworks Bureau publications. Posters were also put up in public places.
2013.5					
2013.6					
2013.7					
2013.8				Introduced new discount for bank account transfer users	
2013.9					
2013.10	Application of revised tariff				

Source: Created from information of web sites of Kyoto City Waterworks Bureau, Kyoto City, Kyoto City Assembly, etc.

4. Lessons Learned

The following Japanese experience could be useful for other countries.

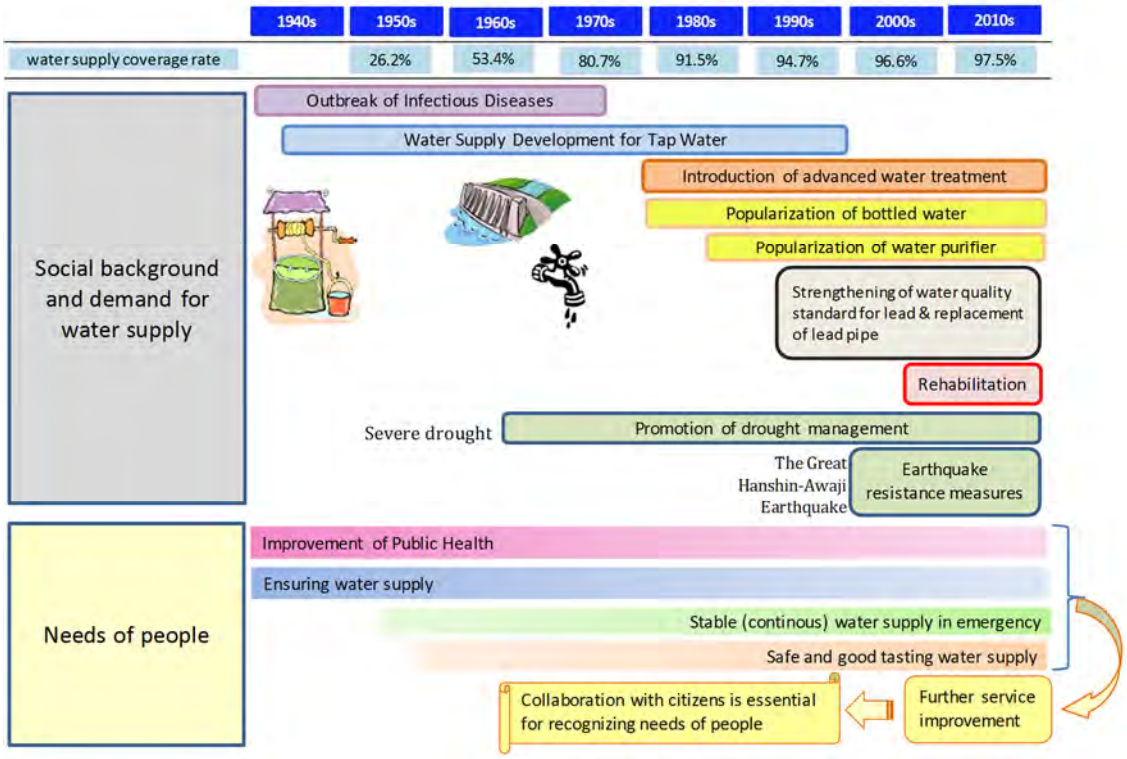
- **(Cost Recovery)** Water tariffs are set based on the principle of the fully distributed cost method as stipulated by acts in Japan. The *Water Tariff Setting Manual* provides guidance on the standardized method for the calculation of water tariffs based on cost recovery.
- **(Bases of Tariff Revision)** The water utility releases financial and operational information, showing the facilities replacement costs and funding sources. This is necessary if it were to continue to provide sustainable, reliable, and safe water supply in the medium and long term.
- **(Utility's Efforts)** It is also necessary to explain the utility's management efforts (control on staff size, cost savings with outsourcing, measures for unpaid water tariffs, asset management, etc.).
- **(Understanding of Customers)** Tariff revision must have the support of the local government and residents. It is important to forecast the financial conditions in a credible manner and explain the need for the rate increase convincingly. The discussions by the advisory committee and public consultations are useful opportunities to engage the public and gather customer input. The utility's business and fiscal plans must be well understood and supported by the customers. It is desirable that tariffs are revised for customers' benefit (improved service and fairness).

Case Study 6. Water Supply Service with Customers' Voices: Osaka City, Tokyo Metropolitan, Chiba Prefecture, Yahaba Town

Contents

1. Introduction

The Japanese government promoted water supply development from the 1940s to 1970s to improve public health and control infectious diseases that cause epidemics. The water supply coverage dramatically improved from 26.2% in the 1950s to 80.7% by the 1970s and 91.5% by 1980s. When the service rate exceeded 95% by the 2000s, customers began to expect other improvements such as “safe and tasty drinking water” and “stable supply during emergencies,” and water utilities heeded and responded to these demands.



Source: Ministry of Health, Labour and Welfare, http://www.mhlw.go.jp/stf/shingi/2r98520000027cq9.html

Figure 1. Changes in the Roles of Waterworks and Needs of Customers

This module explains how the Water Supply Act supports the building of a relationship between the Japanese water utilities and their customers and why the focus is on customer service. It illustrates this by giving examples of daily operations, information disclosure practices, and outreach activities such as publications, customer service centers, public consultations, customer participation and seminars at schools.

2. Customer Relations

(1) Rights and Responsibilities Stipulated in the Water Supply Act

The duty to serve customers and the rights and responsibilities of customers are stipulated in the Water Supply Act in Japan.

The Act stipulates in Article 14 (Rules of Water Supply) that water utilities are required to set and announce the rules under which they enter into the water supply contract with their customers, including tariffs, fees for service connections and other conditions for water supply. The details are specified in the Waterworks Ordinance of each local government. Typically these rules specify that the cost of the service connection is borne by the customer in principle, and the water utility owns the water meters but it is up to the customers to maintain them.

Article 15 (Obligation to Provide Water Supply) states that water utilities cannot refuse application for service from anyone living in their supply areas without justifiable reasons. Water utilities have the obligation to supply water to all citizens at all times.

Article 18 (Request for Inspection) states that customers can request service connection inspection and water quality testing and their requests should be responded to promptly and they be notified of the findings. This article clearly demonstrates the focus on customer service.

Paragraph 2 of Article 24 (Release of Water Supply Information) states that “A water utility shall notify the customers of the results of water quality testing based on the provision of Article 20, Paragraph 1, and other information about the water supply services in accordance with the orders of the Ministry of Health, Labour and Welfare.” This establishes the disclosure requirements for water utilities and rights of customers to relevant and accurate information as one of the fundamental principles in customer service.

The Ordinance for Enforcement of the Water Supply Act which specifies the details for implementing the Act, lists the following types of information water utilities should disclose. Among these, (i) to (vi) should be provided (regularly) at least once a year, while (vii) and (viii) should be provided on a timely basis.

(i) Safety of the water supply, including the results of water quality tests.
(ii) Operation of water supply services.
(iii) Costs for water supply services including the development of facilities.
(iv) Fees and charges for customers including water tariffs.
(v) Management and maintenance plans for service connections and water tanks.

(vi) Seismic performance of water supply facilities and on-going improvements.
(vii) Results of extraordinary water quality tests.
(viii) Emergency response plan for water supply in case of natural disasters or incidents that may compromise water quality.

(2) Relationship between Water Utilities and Customers

Utilities provide water supply services to customers, and customers pay for the services. Water tariffs can be the basis for planning daily operation & maintenance and facilities development.

Under water supply contracts, the utilities provide services to customers who pay water tariffs in return for the services. Water supply contributes to a better living environment by improving public health. Water tariffs are integral to proper management of facilities, essential for daily operation & maintenance and planned developments. Water utilities are obliged to continually improve their services, since the business is a natural monopoly and customers are not normally the ones to initiate improvements.

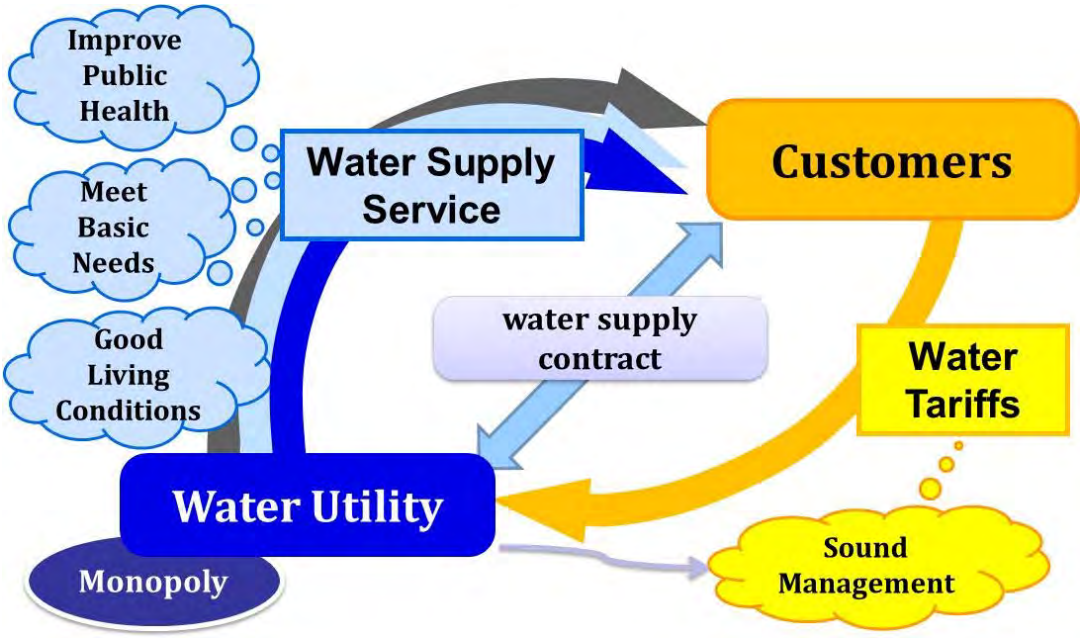


Figure 2. Conceptual Diagram of Relationship between Water Utility and Customers

(3) Need for Two-way Communications

It is important for water utilities to be transparent, accountable and continually engage in public relations activities to build and maintain positive relationships with customers.

The revenue from water tariffs covers all or part of the operational expenses of the water supply system. Therefore, it is essential that customers understand the tariff structure in relation to the services they are getting. This has to be achieved through timely and adequate information dissemination and public outreach. The goal is to clearly demonstrate the water utilities' accountability and build positive relationships with customers.

Good communication is also critical for securing support for future developments. It is important to project future needs, plan developments to meet demands, and engage relevant parties including residents and local authorities in the planning process. Water utilities have to explain the need for the developments, expected outcomes and cost-effectiveness of the proposed projects. Customers are looking for more and better services beyond just basic water delivery. They would like longer supply times, improved water quality, etc. as their economic situation and social environment improves. Water utilities should understand and anticipate customers' needs and provide the services that can accommodate these needs.

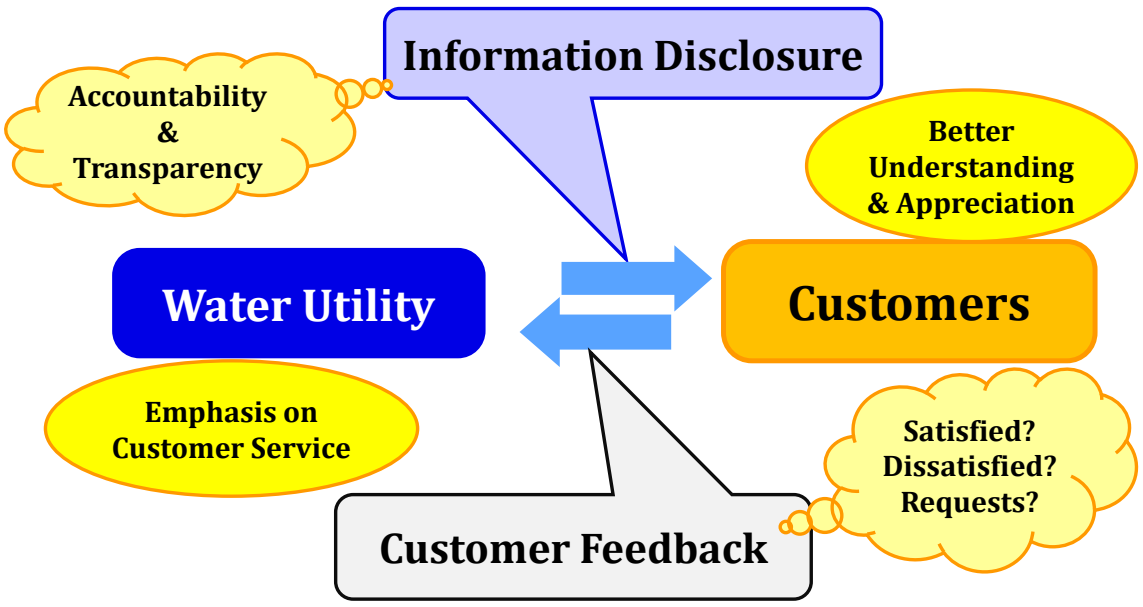


Figure 3. Conceptual Diagram of Two-way Communication

3. Case 1: Customer Service through Daily Operation; Osaka City

Water utilities in Japan strive to increase customer satisfaction and build customers' trust in the water supply business. When customers are familiar with the utilities' daily operations, they would have a clear understanding about tariff revisions and how services can be improved.

Water utilities are bound by law to provide water supply under contract to customers and therefore should have a stronger reason than other local public agencies to be customer-conscious. Nevertheless, there were incidences when staff did not take seriously customers' complaints about water meters, and the improper setup of a water meter was not checked nor fixed for extended periods of time.

Customer service and information disclosure in the water supply sector has improved since the 1980s in Japan. This trend is a result of a number of events happening at that time: local administrative reforms to gain the trust of citizens; new emphasis on information disclosure; and the influence of New Public Management[1] concept developed in the United Kingdom. In addition, the debt-laden Japanese National Railways was divided and privatized in 1987, because of its well-publicized lack of regard for customer service and the distrust of the public due to repeated labour disputes and strikes. As a result, there was a growing demand for customer service in Japanese society in general as well as in the water supply business.

Water utilities in Japan aim to increase customer satisfaction and gain customers' trust by providing better services, including problem-free water tariff collection and improving customers' understanding about tariff revisions. For example, most water utilities pay attention to unusual water use registered by a meter, and notify the customer to avoid unnecessary water consumption and expenses.

Before the World War II (WW II), the Osaka Municipal Waterworks Bureau already had customer service manuals for service connection technicians, meter readers and tariff collectors to improve their service delivery. After the war in 1949, the Bureau started vehicle patrols around the city offering services such as the repair of water supply devices or broken lead pipes.

Progress was also made in changing the organization's attitude towards the customer by operating as a business enterprise rather than a local government service center since the late

[1] New Public Management is management techniques and practices drawn mainly from the private sector. They are seen as effective tools such as performance or output based evaluation in customer service delivery for improving standards of public service under the financial restriction of the government, diversified needs and increasing demands towards public services. The New Public Management reforms initiated by the first Thatcher ministry of the United Kingdom in the 1980s and have been adopted in many countries around the world.

1980s.

In 1988 the Bureau started training programs to improve the business attitude of managers and develop their ability to train workers in customer service skills. This effort produced many in-house instructors and the task force on customer service improvement was established in 1989, to raise the level of customer satisfaction.

Table 1. Customer Service Improvements in Osaka Municipal Waterworks

Period	Customer Service Initiatives in Osaka
Before World War II	Customer service manuals for service connection technicians, meter readers and tariff collectors in order to improve their service delivery.
1949	Service vehicles travelling around the city to work sites to conduct repairs on connections or broken pipes.
Late 1980s	Change in operational philosophy: customers are not just residents receiving government services but are valued clients of a business enterprise.
1988	Began with training managers to improve business demeanor. Managers then trained their staff on customer friendly service. Produced many internal instructors as a result.
1989	Founded the task force on customer service improvement, to engage all personnel in customer friendly practices throughout the organization.

Source: Information taken from Osaka Municipal Waterworks Bureau, "*One Hundred Years' History of Osaka Municipal Waterworks*,"1996.

4. Case 2: Public Outreach and Information Disclosure

Water utilities in Japan are enhancing customers' understanding and cooperation as well as achieving accountability by engaging the public and keeping them well-informed.

During the early stage of the modern water supply business in Japan, public outreach consisted mostly of handing out flyers to encourage citizens to connect to the water supply system, or to promote conservation practices in the time of drought, or notify citizens of water stoppages.

After WWII, water supply services were publicized via mass media such as local papers, radios and TV. Water utilities would provide contents to news outlets for reporting and broadcast, distribute brochures and leaflets, put up posters, and produce publicity videos.

In recent years, water utilities are making information and announcements more meaningful by quantifying the expected outcomes of development plans and providing performance indicators (PIs) and sharing the reviews on asset management. Efforts are also made to present information to customers using fewer technical terms, relying more on illustrations and comparison of situations with and without facilities development.

"Make your kitchen better: A household that values water prospers. A household that wastes water suffers."

Source: Nagoya City Waterworks and Sewerage Bureau

Photo 1. A Poster to Promote Water-Conservation (1912 - 1926)

Photo 2. Brochures

イ　経営指標　Management-related indexes

Indexes 項　目			FY2013(Plan) 25年度（計画）	FY2013(Results) 25年度（実績）	FY2014(Plan) 26年度（計画）	FY2015(Plan) 27年度（計画）
経営の効率性 Management efficiency	Number of service connections per employee 職員一人当たりの給水件数	(x1000/employee) (千件／人)	1.8	1.8	1.8	1.9
	Total length of distribution pipes managed per employee 職員一人当たりの配水管管理延長	(km/employee) (km／人)	6.7	6.7	6.8	7.0
	Accounted-for water per employee 職員一人当たりの有収水量	(1000 m³/employee) (千m³／人)	389	372	393	403
	Water supply cost (Note 3) 給水原価注3	(yen/m³) (円／m³)	202.3	203.5	202.2	201.4
経営基盤の強化 Reinforcement of management base	Employee payroll rate 職員給与比率	(%)	6.8	6.6	7.3	6.7
	Balance of enterprise bonds 企業債残高	(100 million yen) (億円)	2,873	2,813	2,605	2,447
	Ratio of principal and interest redemption to revenue on water supply (Note 4) 給水収益に対する元利償還割合注4	(%)	13.6	14.0	12.3	9.7
	Ratio of owned capital to total capital 自己資本構成比率	(%)	81.6 (73.1)	79.5 (73.0)	75.2	76.9
健全性 Soundness	Ordinary balance ratio 経常収支比率	(%)	112.4	111.5	115.5	114.9

(Note 1) All index values are calculated with tax included.
(Note 2) All index values for fiscal 2014 and subsequent years are calculated on the basis of the new accounting regime.
The figures in parentheses have been calculated for reference purposes on the basis of the new accounting regime under the assumption of its application from fiscal 2014.
(Note 3) Water supply cost is calculated on the bases of the fund, with capital expenditure included in the total expenditure.
(Note 4) The rate of redemption of principal and interest against the revenue on water supply is calculated by exempting the loan.
(注1) 指標値は、全て税込みの額により算出している。
(注2) 平成26年度以降の指標値は、全て新会計制度に基づき算出した数値である。なお、カッコ内は、参考のため平成26年度から適用となる新会計制度に基づき算出した数値である。
(注3) 給水原価は、総支出額の中に資本的支出額を含めた資金ベースで算出している。
(注4) 給水収益に対する元利償還割合は、借換分を除いたもので算出している。

Source: The Bureau of Waterworks, Tokyo Metropolitan Government
http://www.waterworks.metro.tokyo.jp/eng/supply/

Figure 4. Explanation with PI

Message – A homeowner is responsible for fixing the service pipe from the meter to the tap.

Source: The Bureau of Waterworks, Tokyo Metropolitan Government
https://www.waterworks.metro.tokyo.jp/kouhou/manga/pdf/st02.pdf

Photo 3. Explanation in Cartoon

5. Case 3: Customer Service Center - Tokyo Metropolitan

Most water utilities in Japan have a customer service section to respond to enquiries or complaints from customers and organize customer information to facilitate a timely response.

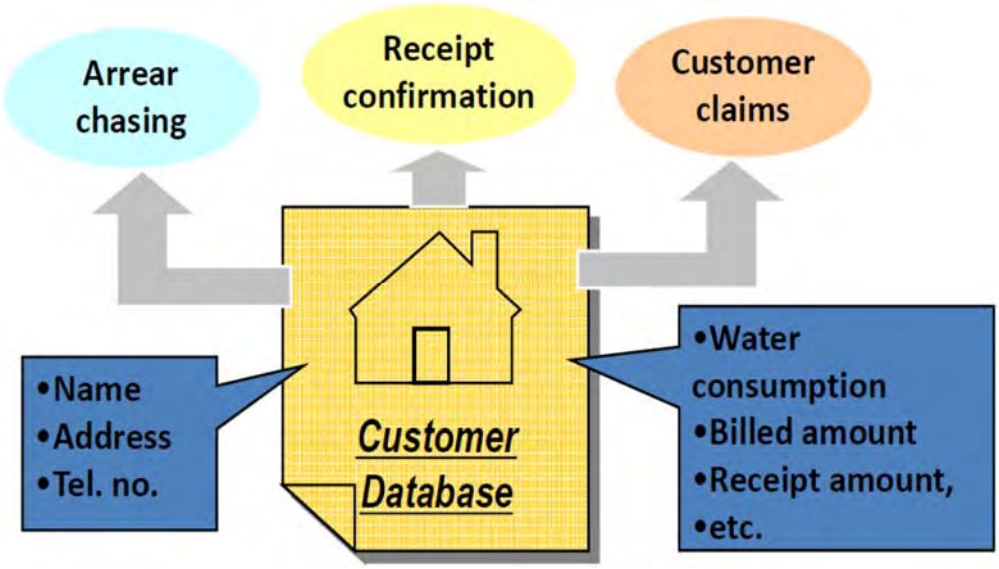
A customer service centers deals with interactions with the customers including letters, faxes, emails, or telephone calls. Most utilities have call centers which is a centralized office for receiving and transmitting customer requests by telephone. Almost all the utilities are ready to deal with incidents such as water leakage 24 hours a day.

The Bureau of Waterworks of Tokyo Metropolitan Government has two customer service centers. They serve as first point of contact where customers can notify commencement/ cancellation of water service and enquire about charges and repairs. They handle enquiries via the internet and telephones. They also accept and process applications from customers, process payment by account transfers or credit card. For convenience the customer service centers open at 8:30 am and closes at 8:00 pm (except on Sundays and national holidays), two hours later than the usual 6:00 pm close of business. The customer service centers respond to emergency events such as water leakage incidents 24 hours a day, 365 days a year.

Source: The Bureau of Waterworks, Tokyo Metropolitan Government
http://www.waterprofessionals.metro.tokyo.jp/pdf/wst_06.pdf

Photo 4. Inside of the Customer Service Center

Information on the contents of the contract with customers concerning water tariffs, meter readings and charges is managed online by the Bureau's independently- established system so that the centers are always ready to respond quickly to enquiries from customers. The Bureau ensures the privacy and security of customers' personal information by using dedicated communications network. Keeping customer data up to date and secure would speed up response time, gain customer satisfaction and trust.



Source: Training material of Nihon Suido Consultants., Co. Ltd.

Figure 5. Concept of Customer Database

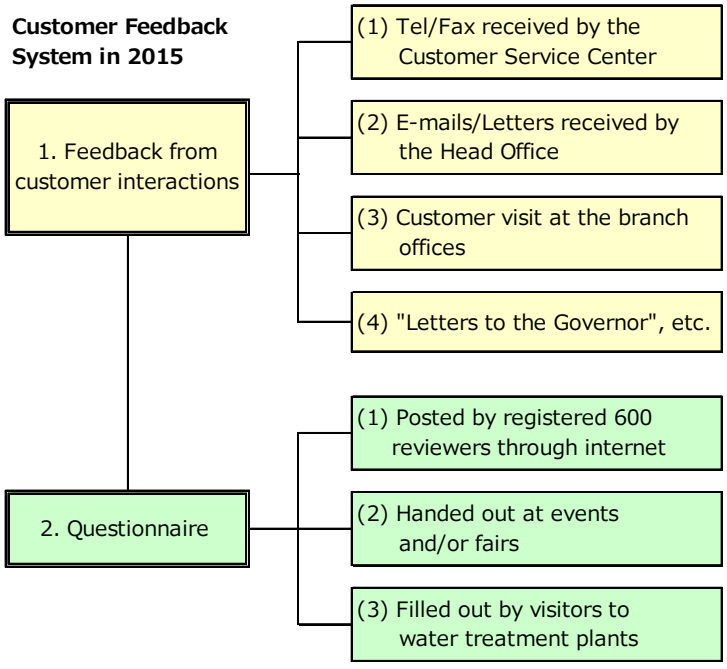
6. Case 4: Customer Feedback / Questionnaire Survey - Chiba Prefecture

Water utilities in Japan conduct public consultations and questionnaire surveys to obtain customers' opinions in order to improve their water supply services.

Public consultations and customer satisfaction questionnaires help the utilities understand customers' concerns so that issues can be identified and action taken to address them. They are a critical component of the public relations effort to improve the delivery of water supply services.

The Waterworks Bureau of Chiba Prefecture uses various means to gather customer feedback and to promote the understanding of the business to a large number of citizens. The Bureau responds to customer opinions and demands, and reflects their diverse needs in the services it delivers.

The means for information gathering can be divided into two types: the "direct interaction with an individual customer" and the "questionnaire survey." The public can access the analysis of the information gathered and the Bureau's responses to customers on the website. For example, an online questionnaire in 2015 showed that more than 90% of the customers were satisfied with the current water supply service.



Source: Waterworks Bureau of Chiba Prefecture, *"Result of PR Activities in FY 2015,"* 2016

Figure 6. Information Gathering from the Customers at the Waterworks Bureau of Chiba Prefecture

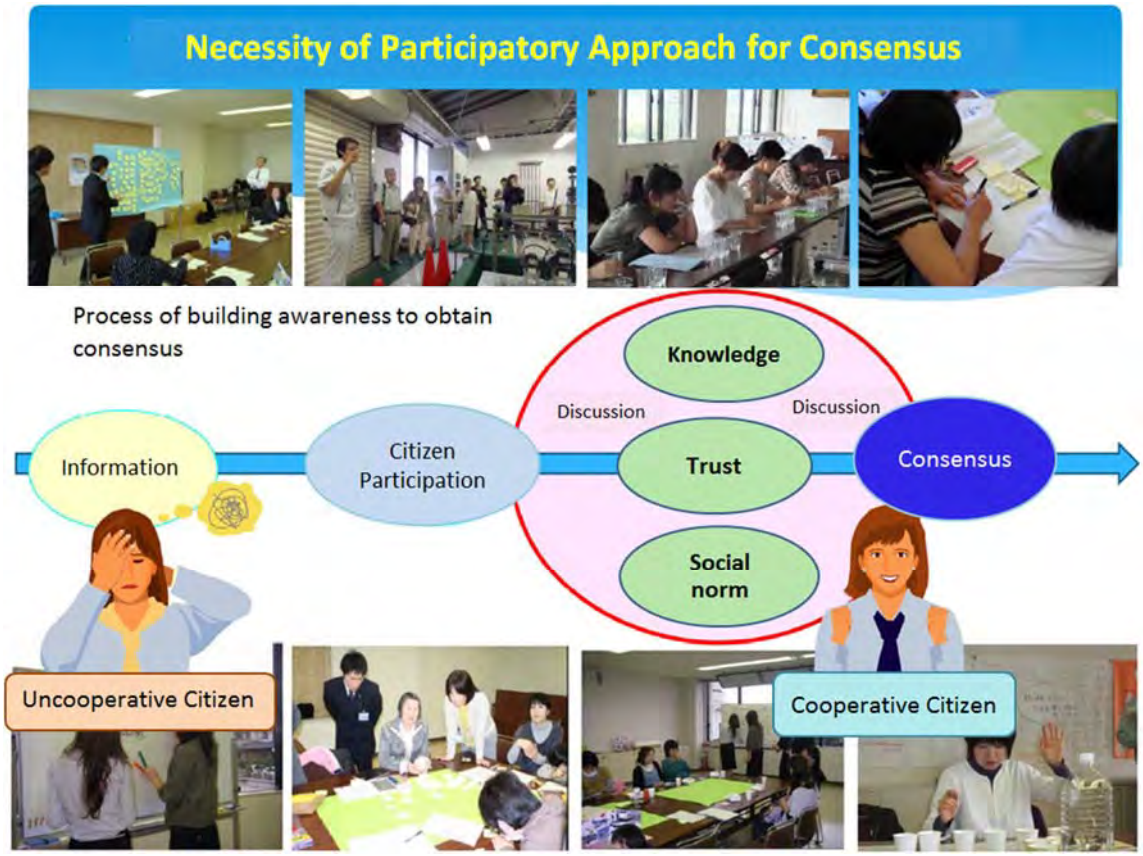
7. Case 5: Customer Participation - Yahaba Town

In recent years, more utilities in Japan are reflecting customers' views in their business plans. This type of customer participation is not limited to tariff revisions.

Customer participation involves customers offering constructive feedback and suggestions based on their sound understanding and knowledge of the business. They can share not only their concerns and appreciation but also their ideas for new services to meet their needs. This is beneficial to building consensus, gaining mutual trust and social acceptance for future developments. In Japan, more efforts have been made by water utilities in recent years to actively engage the customers and reflect their views not only on water tariff revision but also on business plan preparation.

Yahaba Town cites 4 main reasons why they want to work with local residents: (1) residents tend to take the water supply service for granted as a part of the basic infrastructure, and are not always aware of its importance; (2) seismic retrofitting or rebuilding of facilities are not exciting projects that are highly valued by the residents because they do not generate readily visible outcomes; (3) residents do not always understand the necessity to raise water tariffs; and (4) the town office needs the buy-in of the community to achieve the development goals.

The town office concluded that the residents' understanding of the water supply business was indispensable in realizing water supply initiatives. It organized interested residents into the "Yahaba Waterworks Supporters," and held monthly workshops to improve their understanding of the water supply business and the need to operate the services effectively. Initially, the Supporters only focused on lower water tariffs. As they gained a better understanding of and trust in the business, they began to appreciate the need to raise water tariffs and worked with the town in developing the water supply vision and the new business plan.



Source: http://www.hit-u.ac.jp/kenkyu/file/27forum3/YOSHIOKA.pdf

Figure 7. Change of Perception through Resident Participation in Yahaba Town

8. Case 6: Seminars at Schools - Chiba Prefecture

Water utilities offer seminars to schools to enhance children's understanding of the water supply business.

The elementary school curriculum in Japan teaches fourth-grade students (9 or 10 year olds) the important role water and sewerage services play in public health and in improving living conditions. The children go on facility tours and attend seminars delivered by staff from water utilities. The children would share their learning experience with their families as well as become supportive citizens in the future. This is intended to foster a more informed and responsible community.

The Waterworks Bureau of Chiba Prefecture has been offering special seminars on water supply at schools as part of its "Good Tasting Water Project" since 2007. These seminars teach children about the good taste of tap water, and the processes that deliver safe and tasty water to the public. The seminars have been held at schools and other institutions in the region, introducing the system of water supply with demonstrations and lectures.

The contents of the seminars are as follows:

1. How is safe and good tasting water produced? (picture-story show)
2. Let's produce safe and good tasting water! (water treatment experiment)
3. Let's measure the chlorine level of tap water! (experiment)
4. Let's learn about the Good Tasting Water Project!
5. Let's taste chilled tap water! (experience)
6. Let's try the quiz about good tasting water!
7. Q&A
8. Closing: Questionnaire and memento for participation!

In 2013, the Bureau held 36 seminars, 27 of which were for elementary school children and 9 for adults, with approximately 2,700 participants.

Source: Waterworks Bureau of Chiba Prefecture
Reference: http://www.pref.chiba.lg.jp/suidou/keikaku/oishii2/campaign/documents/25demae_kaisai_houkoku.pdf

Photo 5. Seminars at Schools by the Waterworks Bureau of Chiba Prefecture

9. Lessons Learned

The following Japanese experience in customer service could be useful for other countries.

- **(The Water Supply Act and Relationships between a Utility and Customers)** Water utilities are required by the Water Supply Act to supply safe drinking water and provide information to their customers. It is the base of customer services of utilities. The water supply contract between the utility and its customers sets out the relationship between the two parties. Customers pay for services and the revenue generated covers the expenses. Improving customer service can lead to sound and effective management of the water supply business.

- **(Customer Database)** As waterworks are natural monopolies, customers have the right to hold the utilities accountable and continually challenge them to deliver better service. It is essential for utilities to organize and keep their customer databases up to date. A well-run database with reliable and accurate customer information allows utilities to respond to requests and enquiries in a timely manner, thus fostering customers' trust in the business.

- **(Information Disclosure and Public Involvement)** Water utilities are obliged to provide business and financial information on a regular basis and make such information easily accessible. Well-informed customers tend to understand and support proposed initiatives and contribute to sustainable management of the business. Water utilities must continue to improve their services by listening to public opinions and respond to the needs of their customers.

- **(Management Centered on Customer Service)** Japanese water utilities are well-regarded for high service standards, advanced technical capabilities and well-organized operations. The most critical take-away lesson from these successes is the basic premise of good customer service in providing safe and stable drinking water. Emphasizing customer satisfaction is an effective way for water utilities to continue to improve the management of the water supply business.

Japan's Experiences on Water Supply Development: Overview

Nishiya Water Treatment Plant in Yokohama

No. I1 Ver. 1

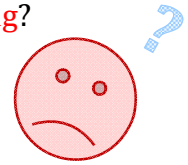
Contents

1. Introduction

Frequently asked questions from participants of the water supply training courses

Q1. How has Japan achieved almost 100% water supply coverage?

Q2. How can Japanese waterworks provide around the clock supply of safe affordable drinking?



2. Goal 6 of SDGs and Japan's Experiences

SUSTAINABLE DEVELOPMENT GOALS

Goal 6: Ensure availability and sustainable management of water and sanitation for all.

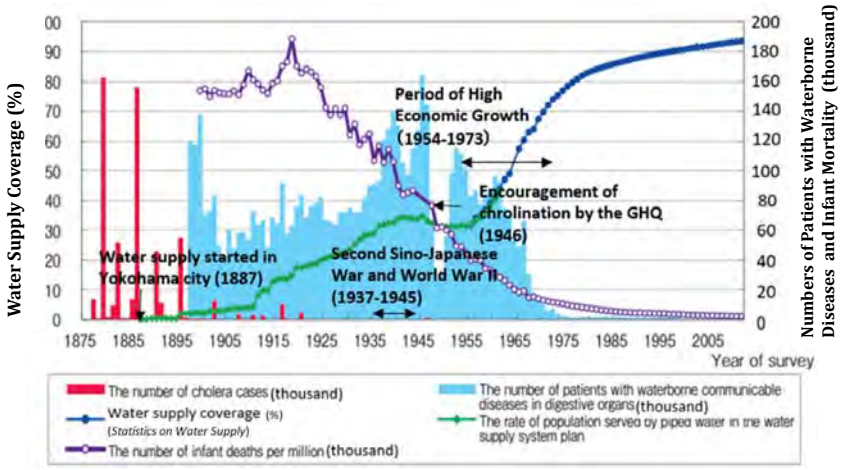
Water Supply Targets

- Universal and equitable access
- Affordable
- Safe
- Efficient water-use
- Integrated resource management
- Public engagement

Japanese Achievements

- Almost 100% water supply coverage
- Water tariff system structured with consideration for low income groups as well as ensures full cost recovery
- High-quality tap water to all customers
- Low leakage rate (4.69% in 2013)
- Securing water resources in collaboration and coordination with all stakeholders
- Always moving forward with full support of local communities

3. Universal and Equitable Access



Source: Added to the figure from Water Resources Department, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism, "*Water in Japan*," http://www.mlit.go.jp/common/001044443.pdf

3. Universal and Equitable Access

(1) Reducing Incidence of Waterborne Diseases

- Water supply system was developed as a measure to improve public health and to prevent the spread of waterborne diseases.
- Water supply distributes filtered and disinfected water through pressured iron pipes.
- Cholera outbreaks were eliminated in Yokohama in 1887 .
- The Waterworks Ordinance was enacted in 1890 .

Establishment of Yokohama water in 1887

Sekiguchi weir of Kanda Josui (Waterworks) in 1919

Tokyo Waterworks Historical Museum
http://www.suidorekishi.jp/minitenji2015.html

3. Universal and Equitable Access

(2) Development of Nationwide Water Supply System

The following measures were implemented:

- **Funding for urban water supply:** from municipal bonds purchased by public funds (public financial institutions, pension funds, etc.)
- **Funding for rural water supply:** subsidies for small-scale utilities (1952)
- **Enactment of the Water Supply Act** (1957)
- **Approval (License) system requiring master plans**
- **Human resources development**
- **Enactment of "*Guidelines for Water Supply Facilities Standards*"** (1966)

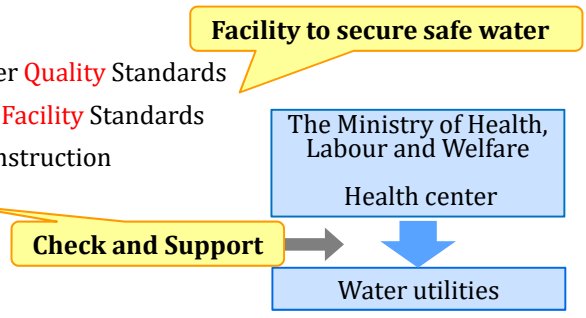
4. Safe Drinking Water

(1) Water Quality Standards and Facilities Standards under the Water Supply Act

Standards are revised periodically as new knowledge emerges on toxic substances and the public concerns, and the technical level of water quality testing.

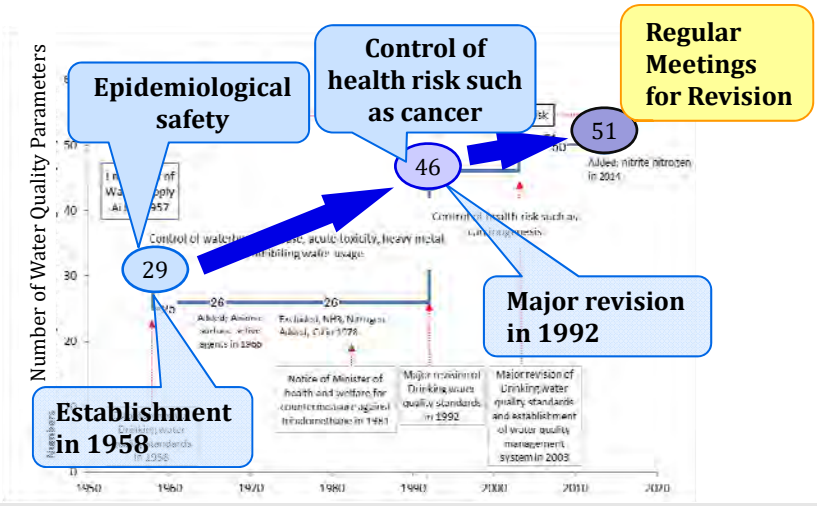
Water Supply Act

- Article 4 Drinking Water Quality Standards
- Article 5 Water Supply Facility Standards
- Quality assurance in Construction → Article 12,13,16, etc.
- Appropriate Operation → Article 19-23, etc.



4. Safe Drinking Water

Water quality standards have been reviewed periodically.



4. Safe Drinking Water

(2) Chlorination

Chlorination after WWII contributed considerably to safe water supply.

Advantages

- Prevented waterborne diseases
- Reliable process
- Easy and simple
- Low cost

Disadvantages

- Toxicity
- Generation of disinfection by-products
- Corrosion of equipment

Chlorination system

Source: Kyoto City
http://www.city.kyoto.lg.jp/suido/page/0000092339.html

4. Safe Drinking Water

(3) Quality Management of Materials and Equipment

Standards and certification system that ensure materials and equipment quality:

- Japanese Industrial Standards (JIS)
- JWWA (Japan Water Works Association) standards
- Examinations and certification by JWWA

Sticker attached to standards conforming products

Sticker attached to basic standards conforming products

This mark is allowed to be affixed to those products that are certified as conforming to the seven (7) items of performance-based standards specified by the Ministerial Ordinance of the Ministry of Health and Welfare.

JWWA

In the case of seal (in recommended color)

In the case of stamping

Sticker attached to special standards-conforming products

This mark is allowed to be affixed to those products that are certified as satisfying the ease-of-use, comfort, and other performance features in addition to the seven (7) items of performance-based standards (basic standards) specified by the Ministerial Ordinance of the Ministry of Health and Welfare.

JWWA

In the case of seal (in recommended color)

In the case of stamping

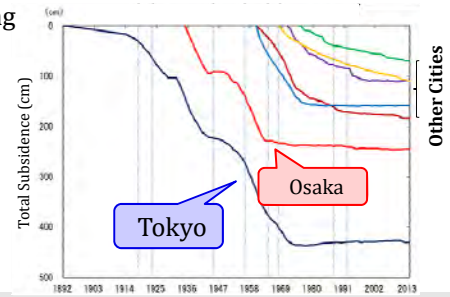
5. Sustainable Water Resources Management

(1) Securing Water Resources

To meet increasing demand - must conserve water quality and work with other users.

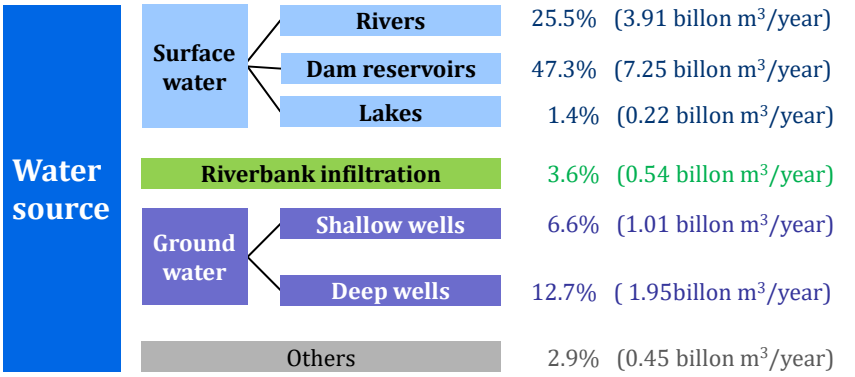
- Development of multipurpose dams for efficient investment, and for bulk water supply system
- Control pollution of water resources
- Control depletion of groundwater sources and prevention of land subsidence caused by over pumping

Multi purpose dam



Land subsidence controlled since 1970s.

5. Sustainable Water Resources Management



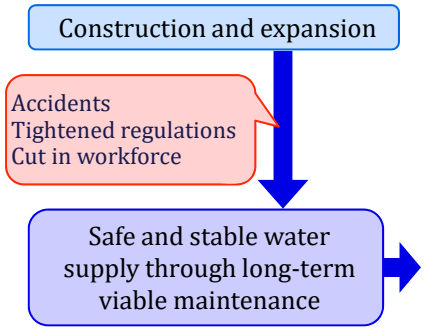
Rivers	25.5%	(3.91 billon m^3/year)
Dam reservoirs	47.3%	(7.25 billon m^3/year)
Lakes	1.4%	(0.22 billon m^3/year)
Riverbank infiltration	3.6%	(0.54 billon m^3/year)
Shallow wells	6.6%	(1.01 billon m^3/year)
Deep wells	12.7%	(1.95billon m^3/year)
Others	2.9%	(0.45 billon m^3/year)
Total	100.0%	(15.33 billon m^3/year)

Source: JWWA, *Water Sources in Japan (2014)*,
http://www.jwwa.or.jp/shiryou/water/water02.html

6. Ensuring Availability

(1) Operation and Maintenance of Facilities

The national government and water utilities worked closely to enhance management of facilities through investigation and by sharing lessons. Preventive maintenance through Time Based Maintenance (TBM) and Condition Based Maintenance (CBM) is essential, and is implemented by keeping record and sharing information.



- Increased oversight
- Sharing knowledge
- Keeping records of operations and construction
- Development of guidelines and minimum level of expertise
- Outsourcing to private sector
- Securing sustainability through asset management

6. Ensuring Availability

(2) Water Supply Operation by Efficient Water Distribution Systems

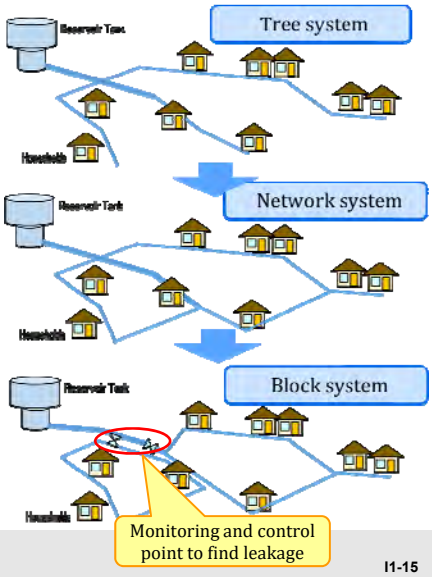
Equalizing water pressure and shortening downtime by using block distribution system.

- 1st stage: Tree (dendritic) system for simple distribution
- 2nd stage: Network system to minimize the negative impact of accidents and ensure operational flexibility
- 3rd stage: Block system for

(1) optimizing water pressure,

(2) understanding distribution condition and optimizing operation

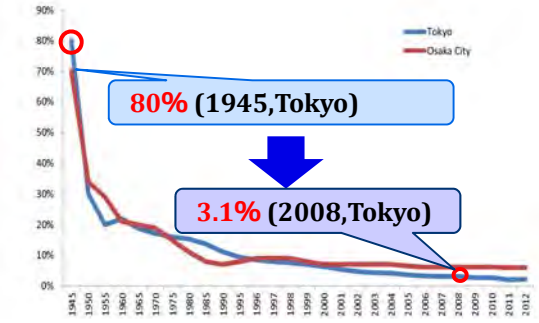
(3) identifying and minimize accidental damage and providing of backup water supply



7. Efficient Water-Use

(1) Water Leakage Prevention

Average leakage rate dropped to 4.7% (2013) from 70-80% in 1945. Efforts prompted by serious droughts and accidents involving the suspension of service.



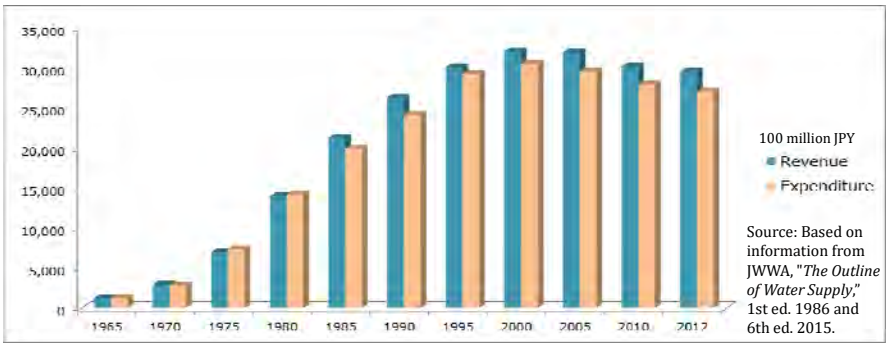
Drop in leakage rate in large cities

- Improved quality of pipe materials and active leakage control.
- Ensuring meter accuracy and scheduled replacement as required by the Measurement Act.
- Reduction of measurment errors, rare unauthorized/ illegal connections.

8. Sustainable Management

(1) Self-Supporting Accounting System and Cost Recovery

Total Revenue (water tariff, etc.) ≥ **Total Expenditure** (repayment of the long-term loans, interest payments, operation and maintenance costs, administrative expenses, etc.)



Source: Based on information from JWWA, "*The Outline of Water Supply*," 1st ed. 1986 and 6th ed. 2015.

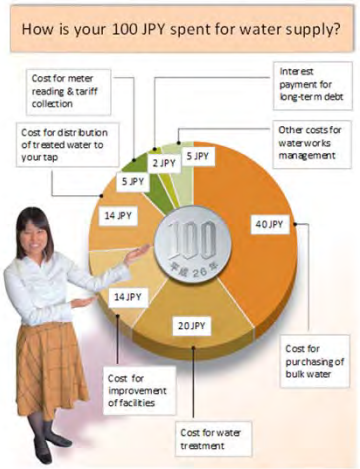
Change in Total Revenue and Expenditure of Water Utilities in Japan

8. Sustainable Management

(1) Self-Supporting Accounting System and Cost Recovery

Setting tariff systems based on:

- Fairness (beneficiary pays principal)
- Affordability
- Clarity in the pricing of water tariff
- Transparency & accountability
- Understanding of customers
- Efficient management



Source: Kawanishi Water and Sewerage Authority
http://www.kawanishi-water.jp/ikkrwebBrowse/material/files/group/2/h27-12-1.pdf

8. Sustainable Management

(2) Customer Relations

Starts with understanding the fundamental importance of water tariffs.

The Water Supply Act stipulates that :

- A water utility shall specify " Water Supply Rule" including water tariff calculation, cost of service connection, and condition of water supply.
- A water utility has the obligation to supply safe drinking water.
- A water utility shall notify customers of the results of water quality testing, and other information about water supply services.

Staff repairing a tap

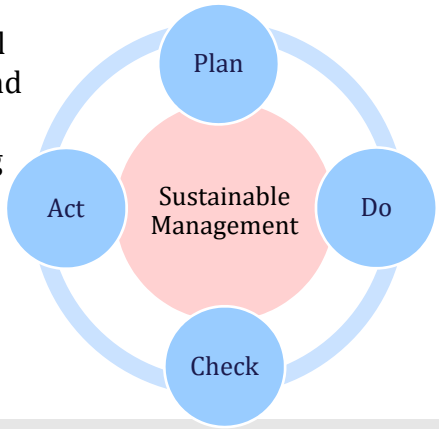
Source: Osaka Municipal Waterworks Bureau, "One Hundred Year History of Water Supply in Osaka City," Osaka Municipal Waterworks Bureau, 1996.

8. Sustainable Management

(3) Master Plan, Business Plan and PDCA Cycle

Master plans and business plans are essential. They are guideposts for sound day to day management, while visualizing the path toward future directions.

- In the preparation of plans, all staff members are engaged and share objectives. It is a good opportunity for team building
- PDCA ensures the continuous improvement of sustainable business operations.



8. Sustainable Management

(4) Public-Private Partnerships (PPP)

Involvement of private companies in the water supply business is increasing.

- Private companies must be qualified and are inspected to ensure that their performance meet national standards.
- PPPs are promoted under legal frameworks with clearly defined allocation of the risks among the parties.

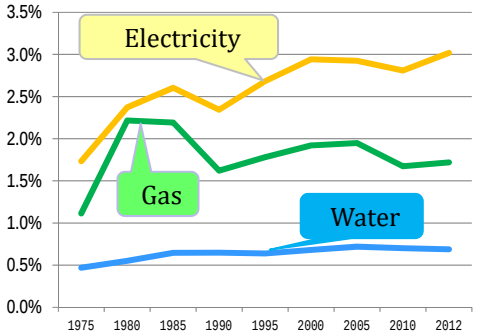
Inside of water purification plant "CERAROKKA"; built by PFI scheme in Yokohama

9. Affordable Drinking Water

(1) Consideration for the Low-Income Group

Affordability

- "Minimum volume" with minimum rate, a cross-subsidy.
- Reduction and exemption as a welfare policy of the local government.
- Installment plan and funds for subsidizing connection charge in the past.



Percentages of water, gas and electricity tariffs in average monthly living expenses

10. Engaging Local Communities

(1) Participation of Residents

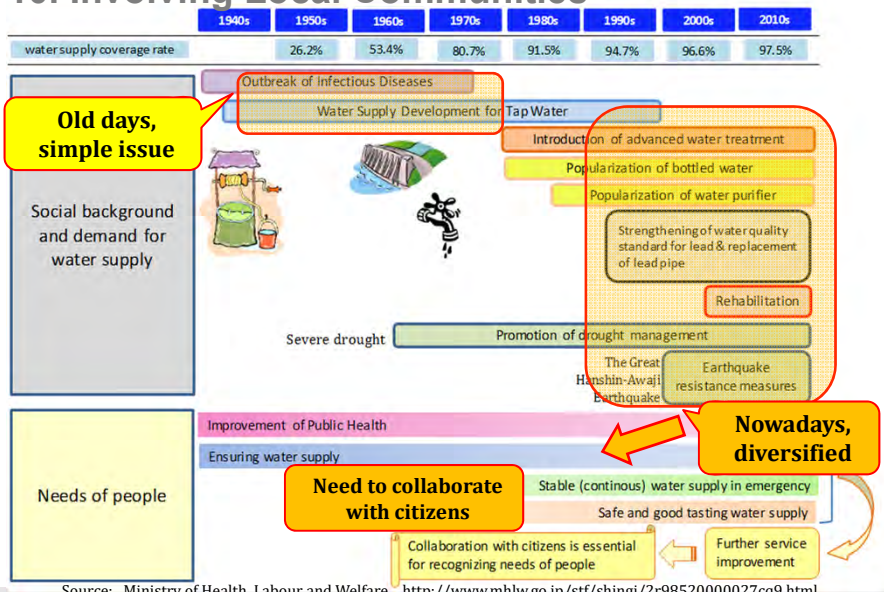
Local residents contributed funds and labor, in developing rural water supply systems.

Public consultations, customer satisfaction surveys, supporters system (monitoring system by customers), etc.

Villagers working in rural water supply development.

Source: Susumu Hani, the film "*Water in Our Life*," 1952

10. Involving Local Communities



Source: Ministry of Health, Labour and Welfare, http://www.mhlw.go.jp/stf/shingi/2r98520000027cq9.html

11. Lessons Learned (1)

- **(Legal Framework for Universal Access)** The national government established the legal frameworks to support utilities in securing funds and in standardizing technical requirements in developing water supply system. Utilities could issue public enterprise bonds for long-term financing. Small utilities in rural areas could not recover the cost with their operation and utilized national subsidies for facility construction.

- **(Water Resources Development)** The national government established an organization responsible for multi-purpose dam constructions and coordination of dam users. By sharing both the costs and benefits of dam construction, the financial burden for each water utility was reduced. Measures and new laws to improve and protect raw water quality, have helped to restore water quality.

11. Lessons Learned (1)

- **(Safe water supply)** To operate a stable supply of good quality water for 24 hours a day, the national government established water quality standards. Water utilities are responsible for implementing water quality analysis, and made efforts to secure quality pipe materials and equipment. The JIS and other standards, and JWWA inspection played key roles to guarantee the quality of pipe materials and equipment.

- **(Maintenance for Stable Water Supply)** Preventive maintenance is very important for a stable water supply. Accidents can be prevented by analyzing data and information of daily inspections, operation, and repairs. Information and knowledge sharing by manual and OJT, regulations and guidance by the national government played an important role for the prevention of accidents and problems.

11. Lessons Learned (2)

- **(Leakage Control)** The average leakage rate in Japan is 4.7%. The dramatic drop from 70-80% after the war was the result of corrective and preventive measures implemented after experiencing severe droughts and water scarcity. These include detection and repair of leaking pipes, replacement of aging pipes and installation of new pipes with better materials and improvement of pipe connections and construction methods. Pipe networks organized in distribution blocks facilitates the leakage reduction activities.
- **(Sustainable Management)** Self-supporting accounting system and cost recovery have been essential for sustainable management. Utilities are required to prepare a financial plan, clearly describe future conditions demonstrate efforts for cost reduction. Master plans, business plans and PDCA cycle are important tools for sustainable management.
- **(Affordable Tariff)** Minimum rates including minimum water are set relatively low making it affordable for low-income group. The progressive rates allocate more financial liabilities to high-volume users (a cross subsidy). Low-income group can apply for tariff reductions or exemptions.

11. Lessons Learned (3)

- **(Training of Utilities' Staffs)** The National Institute of Public Health developed the human resources required to establish the nationwide water supply system. Utility workers were trained through OJT and attended training programs conducted internally. JWWA organizes seminars and committees for knowledge sharing and professional development.
- **(Public Relations)** Public relations activities and mechanisms for public participation are important to building mutually supportive relationship between the utility and its customers. Staff of each utility understand that customers' willingness to pay is directly related to their level of satisfaction with the quality of service. Maintaining trusting relationships with customers is a very important component of the water supply service.

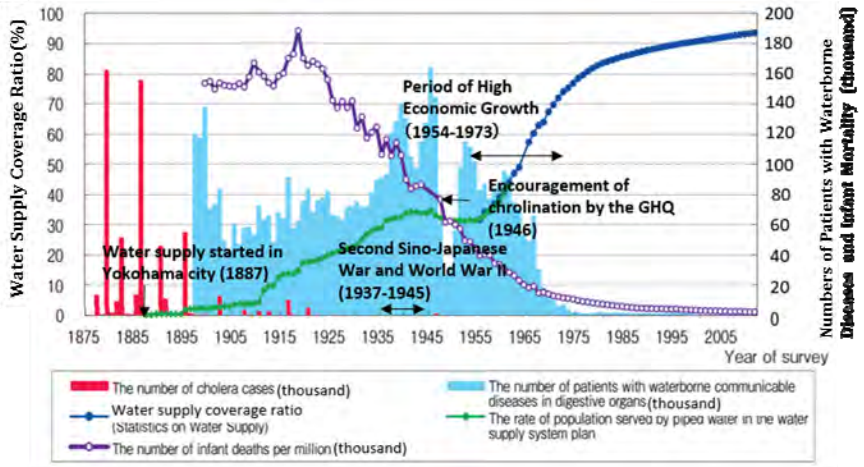
Sector Governance and Regulation for Nationwide Full Coverage of Water Supply Service

The Ministry of Health, Labour and Welfare; regulatory agency of water supply (August 12, 2016)

No. T1 Ver. 1

Contents

1. Introduction



Water Resources Department, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism, "*Water in Japan*," http://www.mlit.go.jp/common/001044443.pdf

1. Introduction

Frequently asked questions from the participants of water supply training courses

Q1. Why have Japan's water utilities been providing safe drinking water to the customer's tap on a continuous 24 hours a day basis?

Q2. What laws and regulations did Japan implement to achieve nationwide full coverage of water supply service?

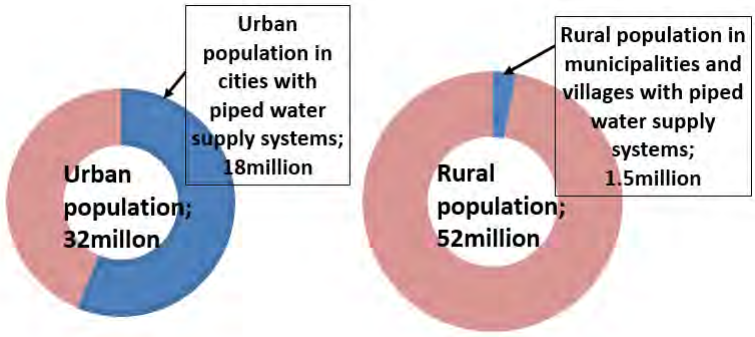
Q3. How did Japan develop laws, regulations and standards for water supply? What kinds of factors helped water utilities to comply with them?

Q4. How do small and medium scale water utilities in Japan comply with the laws, regulations and standards? How do they supply safe water for 24 hours a day?

2. Purpose of Water Supply: Public Health

(1) Public Health Objective

- Water supply in rural areas was the problem.



Population served by piped water supply systems in 1952

Source: Susumu Hani, the film "Water in Our Life," 1952

2. Purpose of Water Supply: Public Health

(1) Public Health Objective

Improving public health

- **Preventing water borne diseases**
- **Providing a hygienic environment**

Article 1

Purpose of the Act — Improving public health and the living environment

Article 2

Responsibilities of the National Government and local governments — Waterworks are indispensable for the protection of human health

2. Purpose of Water Supply: Public Health

(2) Water Quality and Facility Standards to Secure Public Health

Safeguarding public health

- **Drinking water quality standards**
- **Facility standards**

Article 4

Drinking water quality standards

- Absence of contaminants
  Pathogens, Toxic substances
- Free of excessive metal substances
  Copper, Iron, etc.

Article 5

Facility standards

- Location and arrangement for economical and easy practical operation and maintenance
- Structures and materials withstanding water pressure, earth pressure, seismic forces, etc.
- Free of water contamination and less leakage

2. Purpose of Water Supply: Public Health

(3) Modern Water Utilities and Their Contribution to Public Health

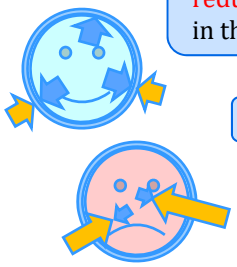
In Japan, public health has improved, as indicated by a reduction of waterborne diseases and infant mortality. This is direct result of increasing the coverage of modern water supply systems (continuous water supply by pressured pipes) and disinfection with chlorine.

2. Purpose of Water Supply: Public Health

Column: Contamination of Drinking Water

If the pressure is maintained in the water pipe, a slight crack in the pipe may lead to leakage but pressure would not allow contaminants to enter.

Water outage would generally reduce pressure or create negative pressure in the pipe.



Contaminants may seep through the cracks.

This poses a risk to the safety of tap water and to public health.

3. Historical Path towards Nationwide Coverage

(1) Public Ownership

- 1890 Waterworks Ordinance
  → Water supply service by public ownership and responsibility
- 1946 The Constitution of Japan
  → Article 25 right to life clause → water supply for all
- 1957 Water Supply Act
  → Water supply for all including rural population
  → Large investment for Small Scale Public Water Supply in all municipalities

Article 25 of *the Constitution of Japan*	**Goal 6 of SDGs; Sustainable Development Goals**
All people shall have the right to maintain the minimum standards of wholesome and cultured living. In all spheres of life, the State shall use its endeavors for the promotion and extension of social welfare and security, and of public health.	Ensure availability and sustainable management of water and sanitation for all.

3. Historical Path towards Nationwide Coverage

Carrying water before promotion of water supply systems,
Source: Susumu Hani, the film "Water in Our Life," 1952

3. Historical Path towards Nationwide Coverage

(2) Water Supply Development in Urban Areas

Period	Characteristics of waterworks
Early stage of construction (1887 – 1945)	● Mainly funded by bond floatation and own funds, financed by tariffs ● Small portion of subsidy by the national government
After World War II (1945 – 1954)	● Technical support from GHQ (widespread introduction of chlorination) ● Subsidy for reconstruction following the war until 1954
Early period of high economic growth (1954 – 1967)	● Rapid population growth and water demand ● Massive water resources development and expansion of water supply service areas by bond floatation ● No subsidy from the state government
Late period of high economic growth to the present (1967 –)	● Targeted subsidy for water resources development, advanced water treatment, replacement of aging pipes, disaster risk reduction, etc. ● Debt repayment ● Asset management for rehabilitation

3. Historical Path towards Nationwide Coverage

(3) Development of Small Waterworks in Rural Areas

Small scale water supply by residents in communities → Small Scale Public Water Supply (population served 101-5000) by municipal governments

Type	planned service population	Accounting system	Funding source	Location
Municipal Water Supply	≧5001	Public enterprise accounting system	(mainly) Bond floatation	Urban area
Small Scale Public Water Supply	101-5000	General account	National subsidy and Bond floatation	Rural area
Facility for Drinking Water Supply	≦100	Self-financing by local residents	Joint investment by users and communities	Rural area

3. Historical Path towards Nationwide Coverage

(3) Development of Small Waterworks in Rural Areas

Enforcement of the Water Supply Act

- Nationwide full coverage of water supply service
- National subsidy for small scale public water supply systems

Human resource development

- Education for staff of prefectural governments
- They support planning and design of small scale public water supply

Leadership by mayors

- Promotion of water supply for improvement of living conditions in their villages
- Effective utilization of national subsidy

3. Historical Path towards Nationwide Coverage

Consultation with engineers of prefectural government and health center,
Source: Susumu Hani, the film "*Water in Our Life*," 1952

4. Regulatory Framework and Administration

(1) Legal System

Constitution	The supreme law of the nation
Law	Codified law enacted by the Diet
Order for enforcement of law	Collective rules necessary for enforcing certain laws
Ordinance	Administrative rules for conducting the order for enforcement of law
Ministerial order	Order of ministry enacted by its minister
Public notice	Notice to provide legally binding information for the public
Notice	Notice to provide certain information between government organizations

The examples concerning the Water Supply Act

- Water Supply Act
- Order for Enforcement of Water Supply Act
- Ordinance for Enforcement of the Water Supply Act
- Ministerial Ordinance on Drinking Water Quality Standards
- Public notice; Method as Specified by the Ministerial Ordinance on Water Quality Standards
- Notice concerning partial revisions of the water quality standards

4. Regulatory Framework and Administration

(2) Approval (License) System of the Waterworks

1890 Waterworks Ordinance
- Public ownership principle
- Approval(License)
- Safe water supply

1957 Water Supply Act
- Public ownership principle
- Approval(License)
- Safe water supply
- Water quality standards
- Water supply facility standards
- Technical administrator of waterworks

Approval(License) for waterworks
- Special license for waterworks issued by the national government (or the prefectural governor). Licensing aims to make sure operators are able to deliver a continuous, stable, safe and clean supply of water.
- Application for Approval (License) requires the following;
  - Water volume and water quality of source
  - Maps and drawings of water supply facilities
  - Total amount of construction expenses and their planned funding source ,
  - Construction period
  - Water tariff and management plan

4. Regulatory Framework and Administration

Information provided in the application for Approval(License) is basis for a master plan

(Project plan)
- Service area, population and water supply volume
- Outline of planned water supply facilities
- Planned date for start of water supply
- Construction expenses and finance
- Balance of income and expense
- Water tariff

(Construction design plan)
- Volumes of daily water supply
- Type of water sources and water intake points
- Capacity and quality of water resource
- Location of water supply facilities
- Water purification process
- Pressure of water distribution pipes
- Scheduled dates of commencement and completion for construction works

Attached documents;
- Evidence to explain reliability of raw water intake
- Location of water supply facilities
- Water source
- Layout plan, elevation, section and structural drawing for main water supply facilities
- Layout plan and longitudinal section for transmission and distribution pipelines

4. Regulatory Framework and Administration

Criteria for license
Article 8 of the Water Supply Act

Licensing of water supply services can be rejected, unless the application meets the following requirements:

- The commencement of water supply services is in accordance with the general demand of the community.
- The plan for the water supply services is certain and reasonable.
- Designs for construction of water supply facilities meet the Water Supply Facility Standard.
- The water supply service area does not overlap the service area of any other water suppliers.
- Water supply conditions meet requirements of articles of the Water Supply Act.
- In the case of water supply services applied by entities other than local public entities, there exists a certain financial foundation capable of performing the water supply services.
- The commencement of water supply services is required from a viewpoint of public interest.

4. Regulatory Framework and Administration

Waterworks Ordinance (1890)

- The first modern water supply system in Japan began supplying water in Yokohama city in 1887 and shortly thereafter in several other cities. Among these, some systems were installed privately and fell short of the facility standard or were poorly managed. Under these circumstances, the *Waterworks Ordinance* was promulgated in 1890.
- "Public ownership principle" and "Approval(License)" had been already defined in the *Waterworks Ordinance* and these concepts were further elaborated by the *Water Supply Act*.

Article 2: Municipalities may not install a water supply facility without public funds.

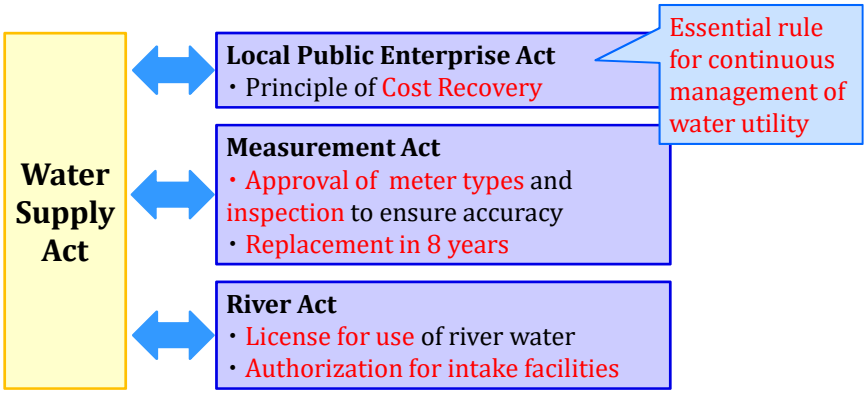
Article 3: Municipalities must provide a prospectus containing the following details through a prefectural governor to the Home Minister for Approval (License) to install a waterworks system.

Article 10: Anyone who has access to water supply services may request the mayor to test water quality and to check the volume.

4. Regulatory Framework and Administration

(3) Other Relevant Laws

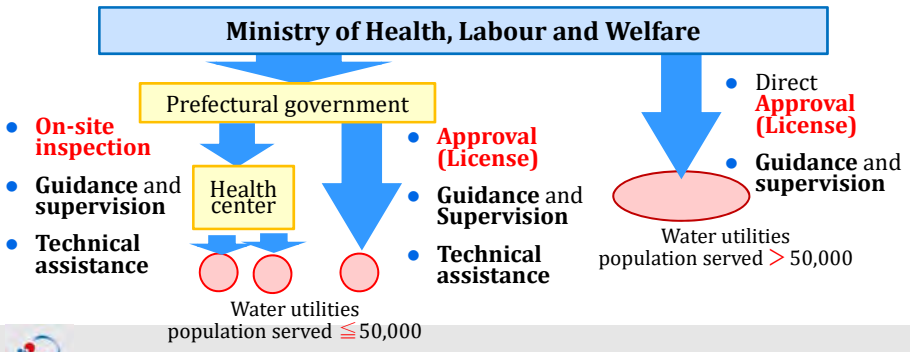
In addition to the Water Supply Act, some related acts supporting waterworks play an important role in operating waterworks and constructing facilities.



4. Regulatory Framework and Administration

(4) Administrative Framework

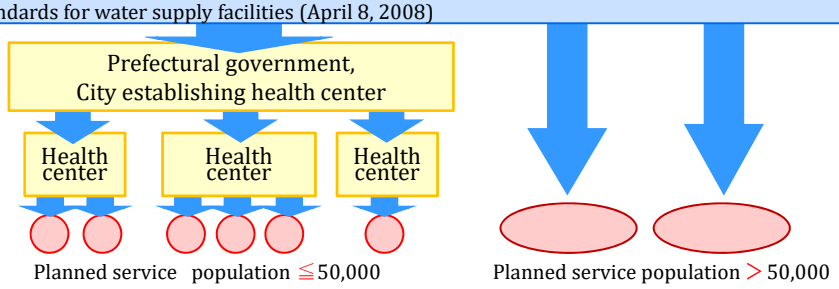
- Detailed rules of the Water Supply Act
  → Order for Enforcement of Water Supply Act,
  Ordinance for Enforcement of the Water Supply Act
- Administrative guidance for rational execution of law is conducted as necessary based upon ministerial order, public notice and public notice of the Ministry of Health, Labour and Welfare, etc.



4. Regulatory Framework and Administration

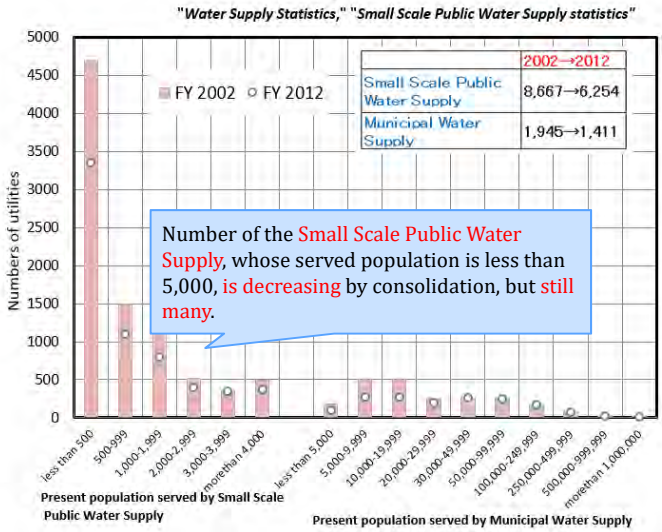
Japanese Administrative System for Water Supply

National Government:
the Water Supply Division of the Ministry of Health, Labour & Welfare
Ministerial order：Ministerial ordinance on Drinking Water Quality Standards (Order of the Ministry of Health, Labour and Welfare No. 101 of May 30, 2003)
Public notice：Concerning partial amendment of the ministerial order which specifies technical standards for water supply facilities (April 8, 2008)



Health center: An organization established based upon the Community Health Act
Ensures comprehensive promotion of regional public health measures

5.Challenges in Maintaining Universal Coverage



Numbers of water utilities according to population served (FY2002→FY2012)

5.Challenges in Maintaining Universal Coverage

Challenges Specific to Smaller Utilities

Water Supply Development with slogan "Nationwide full coverage of water supply service" in Japan.

Small and medium scale public water supply utilities contributed to progress of water supply coverage.

Small and medium scale public water supply utilities have problems concerning renewal, maintenance and management, etc.

Measures for solving problems

Planning of Water Supply Vision	Planning of Water Safety Plan	Asset management	Promotion of consolidation of water utilities
Making of a master plan	Ensuring continuity of safe water supply	Correct recognition of current situation	Consolidation with water supply utilities in adjacent areas

6. Lessons Learned (1)

- **(Continuous Pressurized Water Supply)** Japan introduced the modern water supply systems to reduce the incidence of waterborne diseases including cholera. Water supply facilities were built to treat and deliver a continuous supply of safe drinking water through pressurized distribution networks to customers around the clock. The modern water supply is one of the important determinants of public health and healthy living environment in Japan.
- **(The Water Supply Act)** Japanese government established the Waterworks Ordinance in 1890, and the Water Supply Act in 1957 to promote the establishment of water supply systems. These laws emphasize the technical aspects of the operations and focus on improving public health and the running of the water supply business for public good. The Water Supply Act defines water quality standards and facilities standards.
- **(Approval (License) of Water Utilities)** The Waterworks Ordinance instructed municipalities to construct water supply systems using public financing and requires waterworks to be approved by the national government (or the prefectural governor). The Approval(License) system ensures that all utilities have a certain level of technical competence.

6. Lessons Learned (2)

- **(Universal Access)** Based on Article 25 of the Japanese Constitution, all citizens shall have the right to maintain the minimum standards of wholesome and cultured living. The national government has provided universal access to water, including in rural areas.
- **(Financing of Urban Utilities)** Urban waterworks cover their expenses for facility construction with income generated from tariffs and with funds from bond issues and equity capital. Some national subsidies were also used.
- **(Government Assistance for Rural Areas)** Utilities in rural areas required extra government assistance in terms of training and financial support. The active role played by local politicians made it possible to set up the Small Scale Public Water Supply in these areas as a high priority.
- **(Enforcement of the Act)** Japanese legal system has many detailed stipulations spelled out in government ordinances and public notices to show how to abide by the relevant Acts including the Water Supply Act. The Act defines the administrative process for the development of water supply with different levels of government working together.

6. Lessons Learned (3)

- **(Acts Relevant to the Water Supply Act)** The Measurement Act, which stipulates accurate metering and billing. The Local Public Enterprise Act, which requires utilites to use specific business accounting systems, contributes to their sustainable financial operations.
- **(Challenges of Rural Water Supply)** Waterworks in rural areas were developed using national subsidies. They maintain their technical capabilities with the help of the Water Supply Facilities Maintenance Manual, and obtain staff training conducted by local governments. Other issues such as the cost bearing for facility renewal, succession of techniques, and maintaining staff capability in a shrinking work force, are serious challenges for their long term sustainable operation.

Water Supply System:
from Water Sources to Distribution

Amagasaki Water Treatment Plant,
Hanshin Water Supply Authority

No. T2 Ver. 1

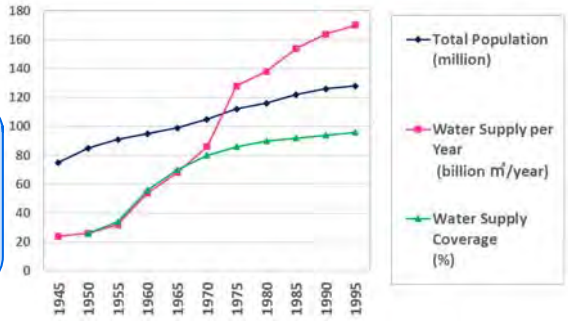
Contents

1. Introduction

What is the water supply system?

- Securement of water sources
- Water treatment facilities suitable for different water sources
- Water transmission and distribution system
- Engineering Design

Development of water supply systems raised the amount of drinking water supply in Japan sharply since the 1950s.



Annual water supply volume in Japan
JWWA, *Water Supply Services Overview*, 6th edition (2015) p.21

1. Introduction

Frequently asked questions from participants of the water supply training courses

Q1. How did Japanese water utilities choose water sources and maintain facilities for stable and economical safe water supply?

Q2. How did they develop water sources to meet increasing demand? How did they manage the conflicts with other water use? How do they share the cost with other stakeholders in water resource development?

Q3. How water source developed for water supply in wide areas? How the Bulk Water Supply is managed?

Q4. How did Japan control pollution of water sources?

Q5. How did Japan overcome land subsidence?

Q6. How did Japanese utilities develop water distribution pipelines? What are characteristics of them?

Q7. Why does Japan emphasize planed facility constructions? How do Japanese water utilities steadily develop water supply facilities in required level? How master plans are made and utilized?

2. Water Sources and Treatment System

It is better to select clean and safe water sources without microbial contamination.

Water source from mountain stream

Quantity

- Meteorological water (rain water)
- Spring water, stream water, groundwater
  - Need to prevent microbial contamination.
- Surface water from dam reservoirs and rivers
  - Plentiful but contaminated
  - River water has been used in response to increased water demand.

3. Development of Surface Water

(1) Water Rights

In Japan, water rights has been established pursuant to state law for the orderly allocation of water and to manage conflicts among stakeholders, with due considerations to customary water rights.

- 1896 Former River Act included the concept of water rights system.
- 1961 Current water rights system was established.

- Multi-purpose dam for cost efficiency
- Coordination of the interests of stakeholders
- Watershed conservation

The Shiroyama Dam and Lake Tsukui

3. Development of Surface Water

(2) Comprehensive River Development

In Japan, in order to meet increasing water demand, water sources were developed mainly by multipurpose dams planned under the Comprehensive River Development Projects, which covered and coordinated water use, flood control and environmental conservation.

- 1951 Comprehensive River Development Project started.
- 1961 Act on Advancement of Water Resources Development enacted.
- For financial efficiency, multipurpose dams are constructed by sharing the burden with other water users and river administrators.

Water saving and leakage reduction were proactively promoted in order to reduce the cost of water resources development.

Ogouchi Dam

3. Development of Surface Water

Example: Coordination of Water Use through Comprehensive Development: Kagawa Canal in Shikoku Region

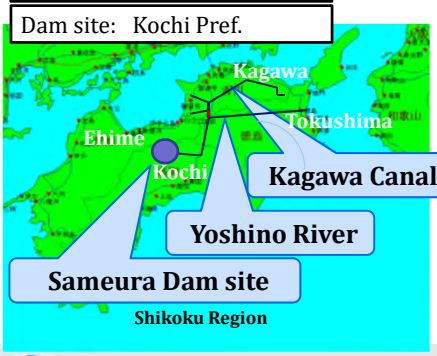
New user: Kagawa Pref.

Flood: Tokushima Pref.

Historic user: Tokushima Pref., Ehime Pref.

Dam site: Kochi Pref.

Conflict management



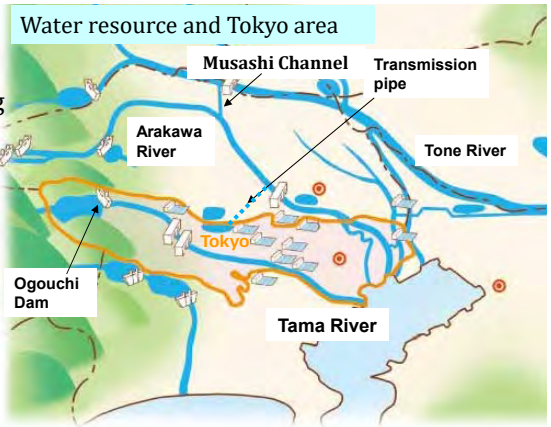
National government steps in by:

- Bringing together key stakeholders in planning how to develop the entire Shikoku Region
- Making a special act for the plan
- Transparent and fair sharing of hydrological data set by the initiative of the national government
- Discussing comprehensive river basin management, covering not only water use by Kagawa Pref., but also flood control needs of Tokushima Pref.
- Providing compensation for negatively-affected Kochi Pref., where dam site is located, from the beneficiary, Kagawa Pref., such as subsidy for forestry

3. Development of Surface Water

Example: Water source development by the Tokyo Metropolitan Government Bureau of Waterworks

- 1957 Commissioning of the Ogouchi Dam in Tokyo
- 1964 Serious drought during Tokyo Olympics
- 1965 Commissioning of the raw water transmission pipe connecting the Tone River (outside of Tokyo) and the Tama River (in Tokyo)
- 1965 Commissioning of the Musashi Channel to bring more water from other prefectures to Tokyo



Source: Bureau of Waterworks Tokyo Metropolitan Government
https://www.waterworks.metro.tokyo.jp/kids/study/images/study_13-14-15-16.pdf

3. Development of Surface Water

(3) Watershed Conservation

In Japan, steady and long-term efforts were made not only for the purpose of water supply, but also for the improvement of water quality in the entire watersheds.

Wastewater Treatment Plant

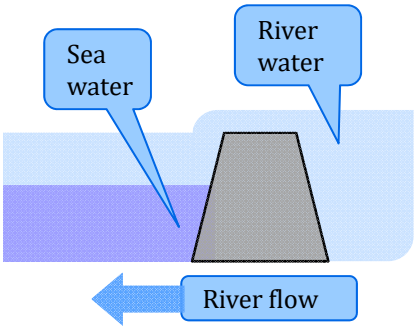
River cleaning campaign

- Effluent regulation
- Wastewater treatment plants
- Conservation of forests in water source areas

3. Development of Surface Water

(4) Salt Water Intrusion

Intake of water in the downstream of rivers can aggravate salt water intrusion. Japan dealt with this issue by installing estuary barrages.



Simple estuary barrage in Okayama city

3. Development of Surface Water

(5) Bulk Water Supply

Bulk Water Supply

↓

Large-scale water sources for the project in a wide region

↓

Securing of water sources

↓

Reduction of investment costs

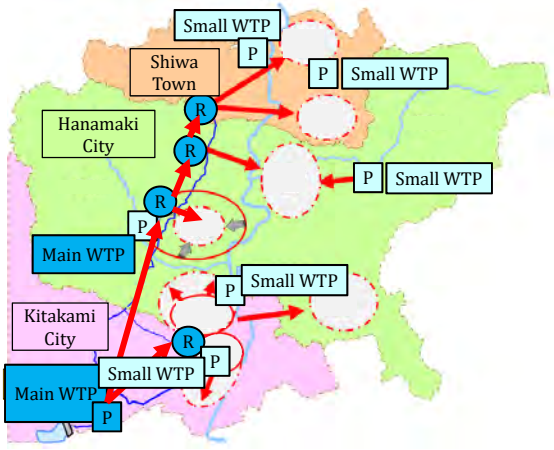
Note: Bulk Water Supply in Japan are operated by public institutions, and different from the private bulk water supplies often seen in developing countries.

3. Development of Surface Water

(5) Bulk Water Supply

Main water treatment plant is connected to other small water treatment plant

Stable water supply.



An example of water supply integration (Iwate Chubu Water Supply Authority)

4. Treatment Process

(1)Chlorination

Chlorination is the most effective disinfection method for the drinking water supply.

The effectiveness of chlorination was recognized as countermeasure against deteriorated public health in Japan after World War II .

Chlorination has prevented waterborne diseases, which were caused by contamination of water sources.

Advantages

- Very effective against waterborne diseases
- Reliable disinfection
- Easy to operate
- Simple injection device
- Low cost

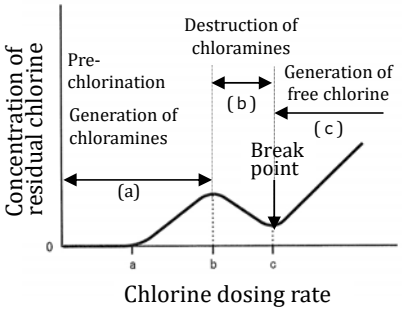
Disadvantages

- Toxicity
- Generation of disinfection by-products
- Corrosion of equipment
- Over-reliance on chlorination may lead to neglect of water purification technology

4. Treatment Process

Water Treatment Using Chlorine

Ammonia Removal (Break point chlorination)



Source: Ministry of the Environment, Government of Japan, http://www.env.go.jp/hourei/05/000188.html

Pre-chlorination to remove algae and ammonia(a)

Generation of chloramines (a)

Destruction of chloramines (b)

Break point chlorination
High injection rate to reduce the chloramine generate free chlorine (c)

Manganese Removal

Oxidation of manganese by chlorine

Rapid and certain removal by filtration of manganese sand, which has manganese dioxide coating.

4. Treatment Process

The Standards of Chloride Concentration

After the World War II, GHQ prescribed the chlorine dosing rate based on their experiences in a developing country.

Residual chlorine at tap; 2.0 mg/l

It was too high in Japan, where hygiene conditions were rather well-maintained.

Bringing in the precedents without considering local situation

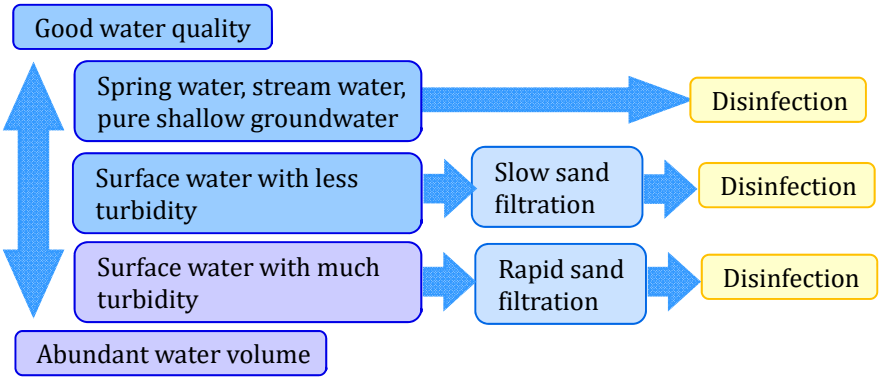
After independence, the Japanese government reduced the chlorine dosing rate.

Free residual chlorine at tap; 0.1 mg/l
Combined residual chlorine ; 0.4 mg/l

4. Treatment Process

(2) Selection of Treatment Process

Water treatment facilities play a central role in water supply systems and its performance has a direct impact on the quality of the water supplied.



4. Treatment Process

(3) Slow Sand Filtration

Slow sand filtration is suitable for relatively clean raw water.

It provides biological treatment when water passes through a gelatinous layer (or biofilm) which consists of algae and bacteria, etc.

Gravity settling in sedimentation tank

↓

sand filtration with filtration velocity 4 – 5 m/day (Japanese standards)

↓

chlorination

Advantages
- Simple facilities
- Less chemicals and electricity
- Removal of odor

Yanagasaki water treatment plant, Otsu City Public Enterprise Bureau

Source: Otsu city Public Enterprise Bureau, *Main water supply facilities*
http://www.city.otsu.lg.jp/kigyo/about/wate
/1454032216393.html

4. Treatment Process

(4) Rapid Sand Filtration

In the early days of construction of water supply systems in Japan, slow sand filtration was selected for treatment of small volumes of relatively clean raw water. In response to the increasing demand, coagulation, sedimentation, and rapid sand filtration became the mainstream treatment technology.

Economic growth caused a huge water demand

↓

Intake points were moved downstream to get larger water volumes

↓

High in contaminants and high turbidity

Advantages of RS filtration
- Adjusts to changes in turbidity
- Less space for facility
- Removal of highly concentrated ammonia

The first plant using rapid sand filtration in Japan(Keage WTP, Kyoto City)

4. Treatment Process

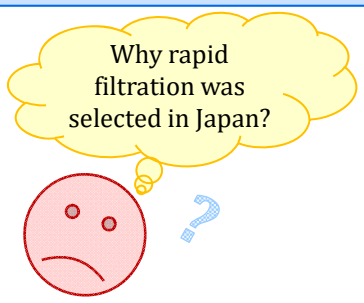
The Background of Widespread Application of Rapid Filtration

Smaller footprint than slow sand filters, making it possible to built in a small plots.

Disruption of river bed caused by digging for construction materials.

Increased levels of ammonia in source waters due to contamination beyond the ability of slow sand filtration.

It may be only a trend; it was the most advanced technology at that time.



4. Treatment Process

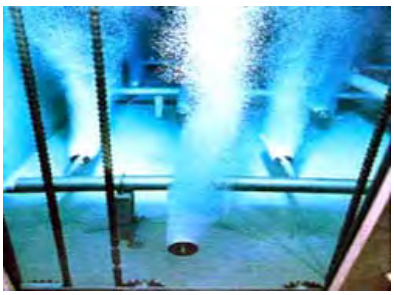
(5) Advanced Water Treatment

Exacerbating pollution of source waters has reached to the levels that made it difficult to treat source waters by conventional water treatment processes designed for the removal of turbidity and disinfection. Japan has carried out a series of studies for the combination of various water treatment technologies to develop advanced water treatment technologies.

Ozonation
=Oxidize organic matter

Activated carbon adsorption
=Biological reactor

Removal of odor and organic substances improves drinking water quality.



Ozone contact basin

Tokyo Metropolitan Government Bureau of Waterworks：
https://www.waterworks.metro.tokyo.jp/suigen/topic/13.html

4. Treatment Process

(6) Membrane Filtration

Advantages of membrane filtration technology requires less land areas, low maintenance and minimal manpower because it is easy to control automatically.

The use of membrane filtration is expected to increase around the world in the future.

1994-1996　MAC 21 research project; Industry-government-academia collaboration

Membrane filtration technology continues to be developed.

Membrane filtration facilities, Water supply system for Kuroda area in Kyoto city, Waterworks Bureau, City of Kyoto

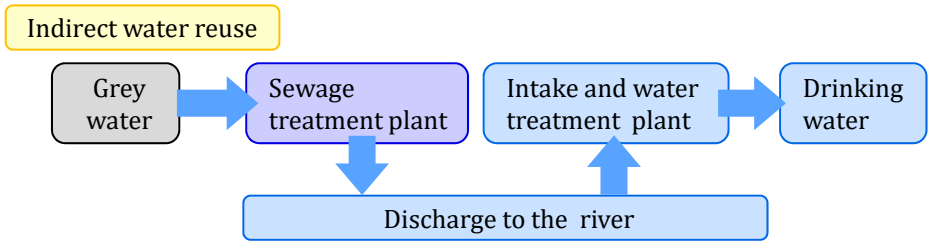
http://www.city.kyoto.lg.jp/suido/page/0000160981.html

4. Treatment Process

(7) Water Reuse

Water reuse can be an option even in developing countries, when water resources become too scarce or degraded to be handled with ordinary water supply systems.

In Japan, reused water is not used directly for potable use. It is used mainly for industrial process water and toilet flushing in regions where the use of groundwater is strictly regulated (ex. Tokyo) or in regions where water resources frequently run short.



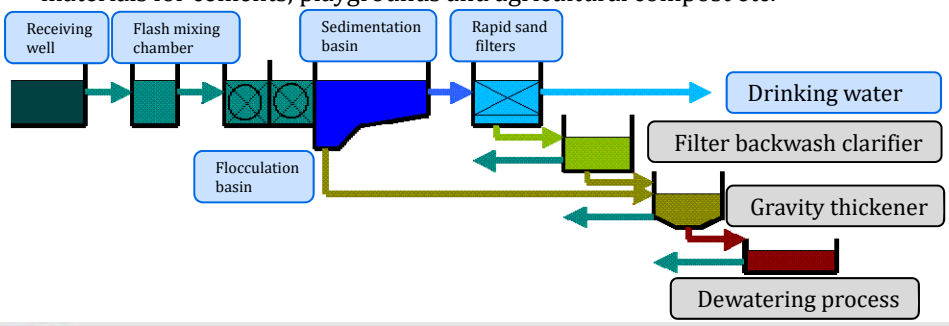
4. Treatment Process

(8) Wastes from Treatment Plants

The sludge from the sedimentation system is sent to gravity thickener and condensed by gravity thickener.

The filter backwash water is sent to filter backwash clarifier then it is sent to gravity thickener.

The dewatered sludge is often disposed but it is sometimes utilized for materials for cements, playgrounds and agricultural compost etc.



5. Groundwater Use and Prevention of Land Subsidence

(1) Groundwater Withdrawal

In general, groundwater is clear and suitable as a drinking water source.
But in some cases, it requires treatment to meet water quality guidelines.

Check water quality carefully because some groundwater is not good for drinking water.

Contaminated by Fe, Mg, As…or *E. Coli.*

Maintain and monitor the well regularly.

Groundwater source
(Takizawa Village, Iwate Prefecture)

5. Groundwater Use and Prevention of Land Subsidence

(2) Land Subsidence

Japan experienced serious land subsidence in some regions, but has brought it under control by introducing strict regulations for use by industries and large buildings, and supplying alternative sources such as surface water and reclaimed wastewater.

Monitoring of the levels of ground and groundwater tables

Preventing overuse of groundwater to avoid negative effect of land subsidence

Introduce regulations for pumping groundwater to restrict water withdrawal

Provide other water sources instead of groundwater

Monitor groundwater levels, land subsidence and groundwater withdrawal regularly

5. Groundwater Use and Prevention of Land Subsidence

The Background of Land Subsidence in Japan

1930s-40s The cause of land subsidence was found to be excessive groundwater pumping.

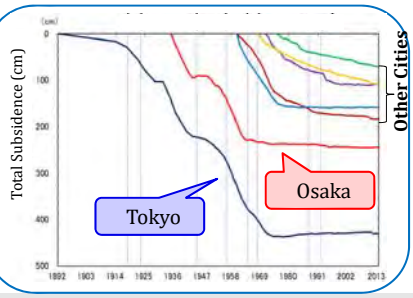
No countermeasures, economic recovery was priority

1950s Land subsidence became recognized as a serious social problem causing flooding and lifting of buildings.

Various countermeasures

Today Japan has almost stopped land subsidence.

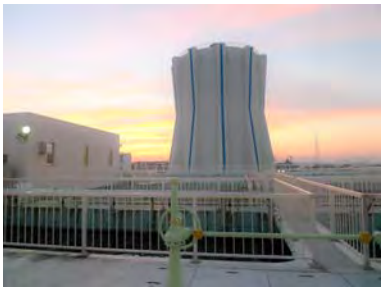
Lifting phenomena at pumping facility



6. Distribution Systems

(1) Distribution Systems

The investment in distribution infrastructure such as service reservoirs, pump stations and pipelines is very costly and it accounts for 2/3 of the total capital cost of all the water supply facilities. Therefore, good planning of the distribution system based on the long-term perspective is very important.



Elevated tank,
Hachinohe Region Water Supply Authority

For good planning,

- Construct service reservoirs in high places
- Use elevated tanks when there is no suitable high place
- Plan the capacity of service reservoirs and distribution network based on the long-term water demand projection
- Understand pump technology and water hammer pressure to prevent critical damages to the system

6. Distribution Systems

(2) Pipeline Configuration

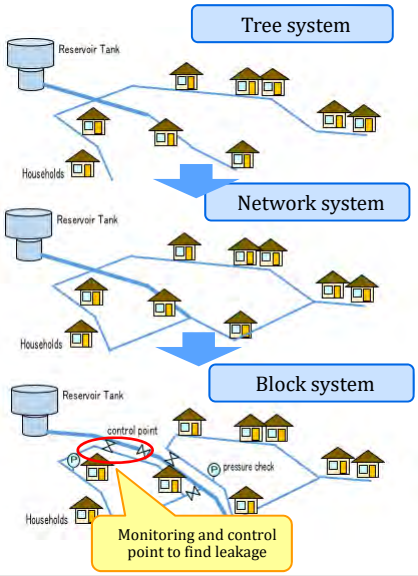
The planning policy for distribution pipelines has been changing gradually in Japan, from simple distribution to more sophisticated control of water distributio

- 1st stage: Tree (dendritic) system for simple distribution
- 2nd stage: Network system to minimize the negative impact of accidents and ensure operational flexibility
- 3rd stage: Block system for

(1) optimizing water pressure

(2) clear picture of water supply operation

(3) identification of accidental damage and provision of backup water supply



7. Engineering Design and Master Plans

(1) Importance of Facility Standards

The most important concept for water supply is to secure the safe supply of water through well-designed water facilities. The design standards to define the function and capacity of water facilities are specified in *the Water Supply Act*.

Need to acquire design methods and accumulate technical knowledge

Share know-how among senior engineers of major water utilities

Coordinated by Japan Water Works Association

Build up the *Design Criteria for Water Supply Facilities*

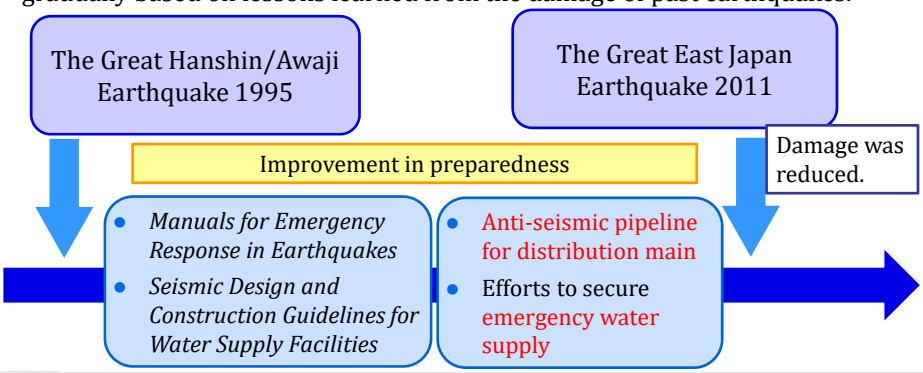
Update the *Design Criteria* on a regular basis

It has been complementing the design standards of *the* Water Supply Act.

7. Engineering Design and Master Plans

(2)Updating the Design Concepts

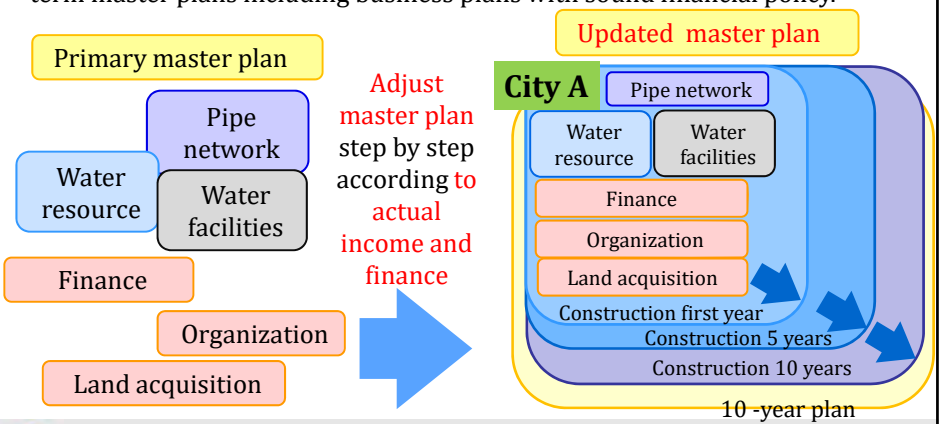
The design concepts for water supply facilities need to be improved, reflecting the situations of each country. For example, since Japan is an earthquake prone country, the design of water supply facilities has been improved gradually based on lessons learned from the damage of past earthquakes.



7. Engineering Design and Master Plans

(3) Step by Step Expansion

Water supply systems require large amounts of funding for construction, and therefore, must be expanded step by step, based on medium to long-term master plans including business plans with sound financial policy.



7. Engineering Design and Master Plans

(4) System to Validate Proper Operation and Management

Approval (License), stipulated in the Water Supply Act, requires a master plan. It was effective in the early stage of expansion when water utilities were not yet technically sophisticated.

- A master plan

  Prepared with technical assistance by prefectural governments and health centers.

As Japan has shifted from the expansion stage to the maintenance stage, Approval(License) is now supplemented by the following plans and systems:

- Waterworks Vision
- Water Safety Plan
- Asset Management

Annual business plan and budget to be approved by local councils

Application for License

- ・Demand prediction
- ・Facility plan
- ・Financial plan (Tariff setting)

Used for screening to obtain subsidy

8. Lessons Learned (1)

- **(Selection of Water Source)** It is ideal if pristine water sources can be used for drinking water supply. This is especially important for small- and medium-scale utilities that are in short of human resources and technical capabilities.
- **(Surface Water Development)** The water rights system and Comprehensive River Development were effective for developing water resources. It requires cooperation of stakeholders, negotiations and sometimes conflict management. Dam construction is expensive, so that municipalities needed to get together and work with other users and river authorities on multipurpose dam construction. They also organized to secure Bulk Water Supply.
- **(Chlorination)** Chlorination contributed a lot to the supply of safe tap water. However, it has some disadvantages including; production of disinfection by-products, formation and corrosion of equipment.
- **(Rapid Sand Filtration)** The coagulation, flocculation, sedimentation and rapid sand filtration process is often used to treat highly polluted raw water. The choice depends on quality of the raw water and water demand. Many utilities use this method to treat large volume of polluted water especially in urban area, which usually located at downstream.

8. Lessons Learned (2)

- **(Dealing with Source Water Deterioration)** Japan developed technologies and new approaches to deal with challenges of water source pollution and drought. These include advanced water treatment, membrane filtration and wastewater reuse. Although new technology development requires larger investment, it can produce high quality waters to win the public support for the water supply.
- **(Prevention of Land Subsidence)** Japan faced serious land subsidence due to over-pumping of groundwater in some regions. This problem is under control by strictly regulating groundwater abstraction, providing alternative water sources and monitoring ground levels and groundwater levels.
- **(Transmission and Distribution Systems)** The investment for transmission and distribution systems accounts for two thirds of the total investment cost of the water supply system, so that it is important to plan and construct distribution reservoir, pumps and pipelines efficiently based on the long-term plans. Japan has taken advantage of its hilly terrain to build gravity flow systems to save money and energy for easy control of water distribution.

8. Lessons Learned (3)

- **(Block Distribution Systems)** Distribution pipelines have evolved from dendritic systems, to network and block distribution systems as cities expand. The advanced designs provide better control of water distribution and minimize supply disruptions.
- **(Master Plan)** Japan expanded its water supply systems by well-planned and stepwise expansion to keep pace with population growth and water demand. This approach is effective for sound financial management of the utilities. Formulation of a master plan, which includes long-term projection of demographic and social changes is effective in developing water supply system and expanding water supply coverage.
- **(Approval(License) System)** The Water Supply Act stipulates the requirements for Approval(License), facility standards and qualification of technical administrators. These set the high standard for water supply quality and sound business management. The national government is encouraging the preparation of Water Vision and Water Safety Plan to ensure technical stability of utilities. Preparation of annual business plan, which includes budget plan based on the Local Public Enterprise Act, and the approval by the local assembly ensures sound business management.

Water Quality Management

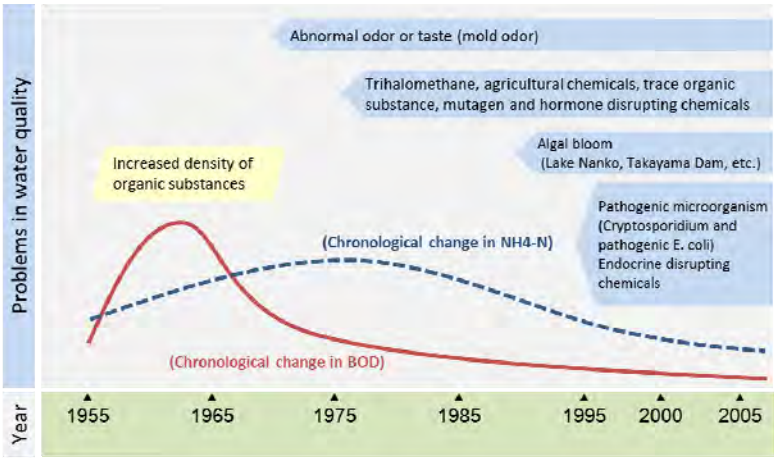
Water quality laboratory at Kitachiba Water Supply Authority (September 21, 2011)

No. T3 Ver. 1

Contents

1. Introduction

Historical change in Yodo River water quality; water source for Osaka



Yodogawa river office, Ministry of Land, Infrastructure, Transport and Tourism, "*Historical transition of water quality problem*," [Online] Available: https://www.yodogawa.kkr.mlit.go.jp/know/data/problem/02/a.html [Accessed 8 July 2016]

1. Introduction

Frequently asked questions from participants of the water supply training courses

Q1. What measures were implemented to reduce the incidence of waterborne diseases such as cholera, which affected Japanese society in the past?

Q2. Why Japan could implement long-lasting water quality management?

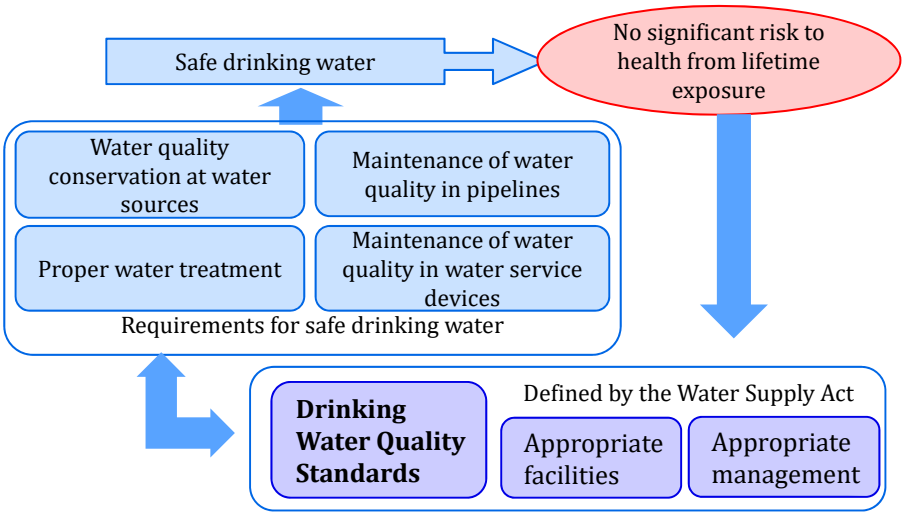
Q3. What are the requirements for compliance with water quality standards for water utilities in Japan?

Q4. How has the good quality equipment required for water quality management been procured in Japan?

Q5. How has Japan dealt with the serious problems caused by deterioration of source water quality?

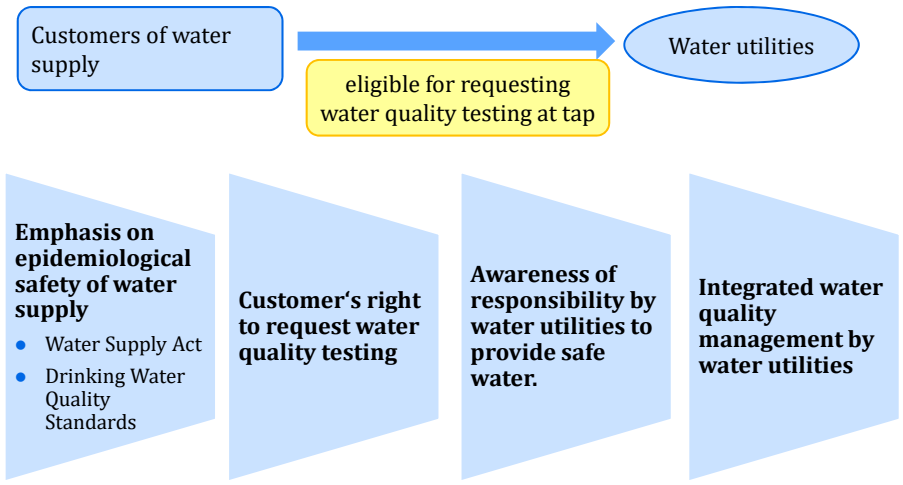
2. Importance of Water Quality Management

(1) History and Background of Water Quality Management



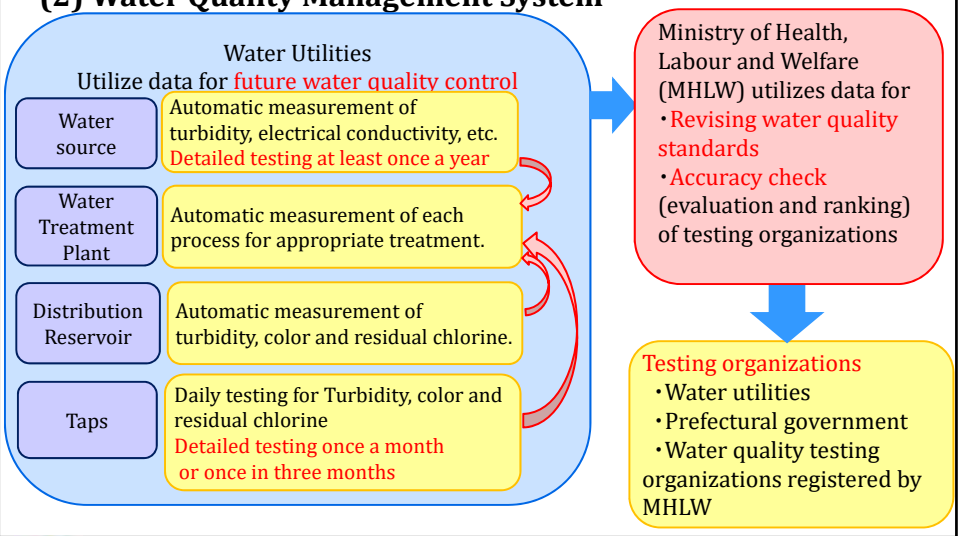
2. Importance of Water Quality Management

Column: Article 18 of the Water Supply Act



2. Importance of Water Quality Management

(2) Water Quality Management System



2. Importance of Water Quality Management

(3) Cost of Water Quality Management

Water quality management requires ...

- **Skilled staff** to conduct water quality management activities
- **Water treatment chemicals**
- **Energy** for water treatment plant
- **Management** and **operation** of appropriate organization

Water quality management costs

Estimation of cost in drafting business plan

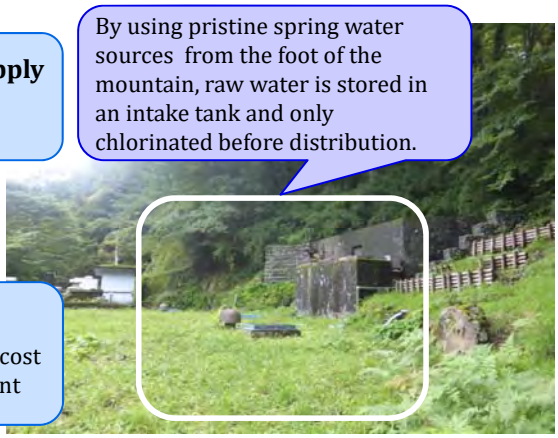
2. Importance of Water Quality Management

Small Scale Public Water Supply Using Good Quality Water Sources

Small Scale Public Water Supply
- Limited financial capacity
- Understaffing

Pristine water source
- Reduction of water treatment cost
- Easy water quality management

By using pristine spring water sources from the foot of the mountain, raw water is stored in an intake tank and only chlorinated before distribution.



2. Importance of Water Quality Management

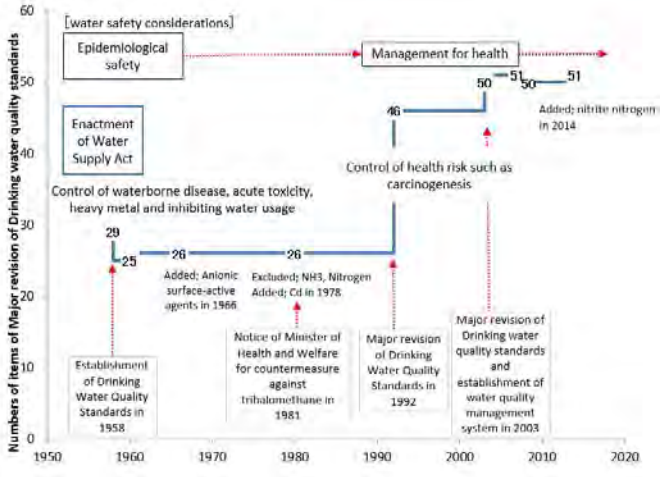
(4) Clear Responsibility for Water Quality Management

Appoint responsible person for water quality management	**Water Supply Services Technical Administrator (Article 19)** Responsibilities • Inspection of water supply facilities to meet technical standards • Water quality examination • Sanitary measures such as disinfection • Water supply suspension
Establish administrative checking system	**On-site inspection, guidance and supervision by a supervising authority (Article 36, Article 39 of the Water Supply Act)** On-site inspection, instruction for improvement and water supply suspension order by the national government or prefectural government
Assist small and medium scale water utilities whose capacity is limited	**Support by health center** • Assessment of result of water quality examination • Providing technical information

3. Drinking Water Quality Standards

(1) Formulation of Drinking Water Quality Standards

Drinking Water Quality Standards in Japan have been developed and modified based on the new knowledge on toxic substances and the technical level of water quality testing.



3. Drinking Water Quality Standards

(2) Notifications about Drinking Water Quality

National Government
(Water Supply Division of the Ministry of Health, Labour and Welfare)
Article 39 of the Water Supply Act; Collection of reports and on-site inspection
Article 36 of the Water Supply Act; Instruction for improvement, etc.
Article 14 of the Order for Enforcement of Water Supply Act; Delegation of authority to the prefectural governors

Prefectural government, City with health centers

Health center | Health center | Health center | Health center

Water utilities
Planned service population ≦50,000

Water utilities
Planned service population ＞50,000

Health center; Organization established based upon Community Health Act
Ensures comprehensive promotion of regional public health measures

4. Drinking Water Quality Testing

(1) Water Quality Parameters and Testing Methods

	Evolution of Drinking Water Quality Standards	Measurement technology
1958	Control of waterborne disease and acute toxicity	Bacterial culture, gravimetric method, titration and calorimetric method
1978	Control of heavy metal and soil contamination	Absorption spectrophotometer Atomic absorption spectrophotometer
1992	Control of health concerns related to carcinogens and disinfection by-products	Flameless atomic absorption spectrophotometer Ion chromatography ICP/MS GC/MS LC/MS
2015	Revision of threshold value based on improved measurement technology	

4. Drinking Water Quality Testing

(2) Responsibility for Water Quality Testing

How can Small-Scale Utilities manage water quality testing?

Water utilities must make their own arrangements for water quality testing

1. Establish a shared testing facility
2. Utilize external service such as health centers, etc.

Water quality testing by health centers became difficult as parameters stipulated in Drinking Water Quality Standards increased.

Increasing outsourcing to private testing facility registered by the Minister of Health, Labour and Welfare

Water utilities prepare a water quality monitoring plan, conduct daily tests (residual chlorine, color and turbidity) by themselves, judge the safety of water and guarantee water quality.

4. Drinking Water Quality Testing

(3) Administrative Framework for Water Quality Testing

Contents of water quality monitoring plan

1. Specific water quality issues that require attention in the water quality monitoring plan
2. Items, sampling points and frequency for regular water quality testing
3. Items omitted from regular testing and the reasons
4. Items for extraordinary water quality testing and the reasons
5. Tests that will be outsourced, when water utilities send samples to health centers or private laboratories
6. Other issues to be considered, such as evaluation of the results, revision of the water quality monitoring plan, quality control, and reliability assessment

The national government or the prefectural government checks the water quality monitoring plan and recommends improvements where necessary.

4. Drinking Water Quality Testing

People engaged in Water Quality Management

Manufacturers of material and equipment for water supply

- Maintenance in usual operations
- Measures in an emergency

Water utilities

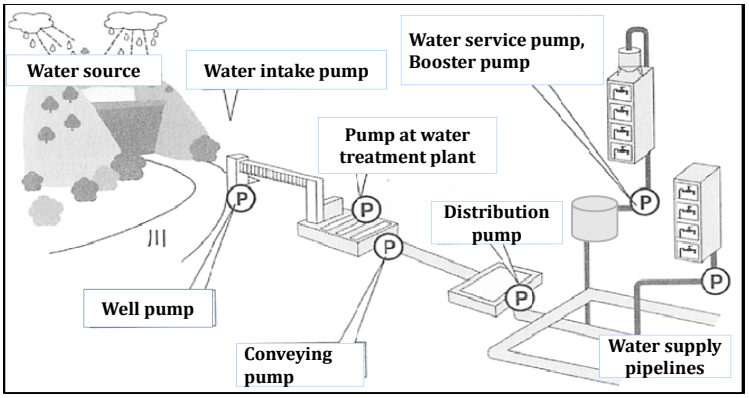
- Technical administrator
- Sanitary engineers, mechanics, electricians, etc.
- Technicians of the laboratory
- Staff who monitor water quality at tap

Administrative staff in government

- Providing new information about water quality
- Check for compliance of water quality management

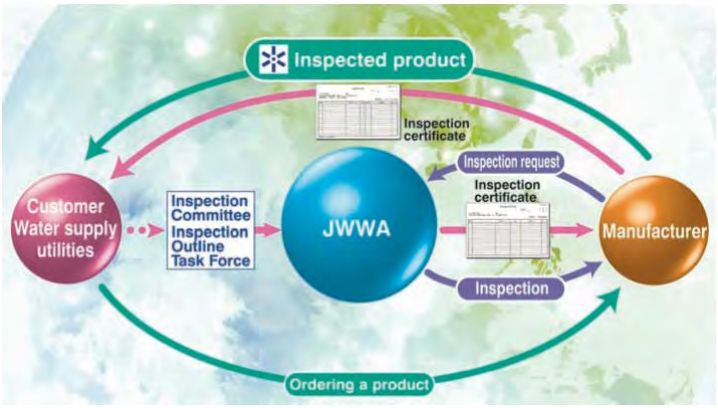
5. Standards for Materials and Equipment for Water Supply

Water quality management from water source to each tap → **Need to ensure quality of material and equipment for water supply**



5. Standards for Materials and Equipment for Water Supply

Japan Water Works Association (JWWA) conducts inspection of material and equipment for water supply facilities



Japan Water Works Association, "*Profile Public Interest Incorporated Association Japan Water Works Association*," [Online] Available: http://www.jwwa.or.jp/jigyou/kaigai_file/JwwaProfile2015.pdf [Accessed 11 July 2016]

6. Preventing Deterioration of Source Water Quality

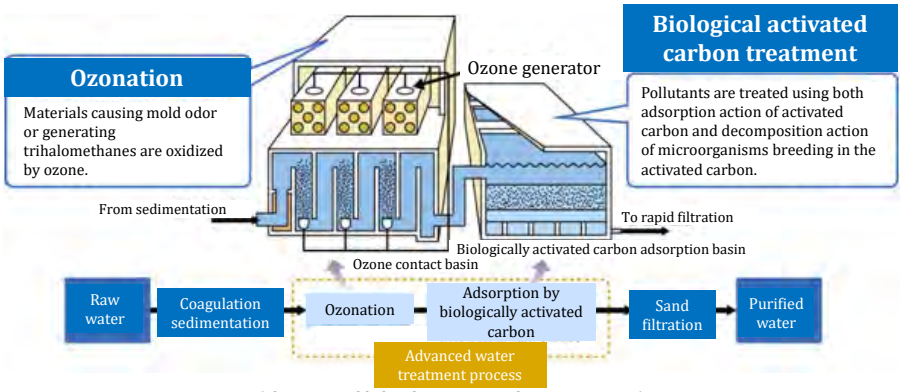
(1) Action taken in response to Changes in Source Water Quality

Year	Laws and systems	Issues of water quality management	Water supply coverage*
1954		Period of High Economic Growth	33%
1964	The River Act was enacted.		69%
1967		Water pollution by industrial wastewater,	72%
1970	The Water Pollution Control Act was enacted.		81%
1973		Contamination by household wastewater with the rise of water supply coverage	84%
1979		Trihalomethane problem Toxicity of water-bloom, odor of purified water	91%
1988	National subsidy for advanced water treatment started.		94%
1994	The Law concerning the Promotion of Projects	Countermeasure against disinfection by-products is required.	95%
2001	The Johkasou(decentralized treatment system) Law was amended.	Dissemination of combined Johkasou(decentralized treatment system)	97%
2014	The Basic Act on the Water Cycle was enacted.		98%

*Water supply coverage is according to estimation until 1955 and "Water Supply Statistics" since 1956.

6. Preventing Deterioration of Source Water Quality

Introduction of Advanced Water Treatment Processes for Deteriorated Raw Waters



(This part is added to the conventional water treatment.)

6. Preventing Deterioration of Source Water Quality

(2) Conservation of Water Catchment Forests

Under the Forest Act water utilities have made efforts to conserve the forests in the catchment area, to improve source water quality and quantity.

In order to protect water sources proactively, water utilities
- Procure forests in the upstream area
- Call for volunteers to take care of trees

Example of Catchment Forest Conservation by Some Utilities

Water utility	Location	Area
Tokyo Metropolis	Upstream of Tama River (Okutama machi and part of Yamanashi Prefecture), started in 1910 as the first attempt	23,000ha
Yokohama City (Kanagawa pref.)	Upstream of Doshi River (Yamanashi Prefecture), located outside Kanagawa pref.	2,873ha
Kagawa Prefecture	Upstream of Yoshino River (Kochi Prefecture) Subsidy for improvement cutting and tree thinning for water source forest.	–

6. Preventing Deterioration of Source Water Quality

Example: Watershed Forest in Doshi

The Doshi River is an important water source for Yokohama City, and its upstream areas belonged to neighboring Yamanashi Prefecture. Yokohama City procured publicly-owned forest lands from Yamanashi Pref. in 1916 and started conservation activities of those lands.

Proactive support of conservation activities by the citizens;
- Organize a volunteer group
- Establish the Doshi Forest Fund and collect contributions
- Use the sales of bottled water "Hamakko Doshi", this name means "we are citizens of Yokohama city together."

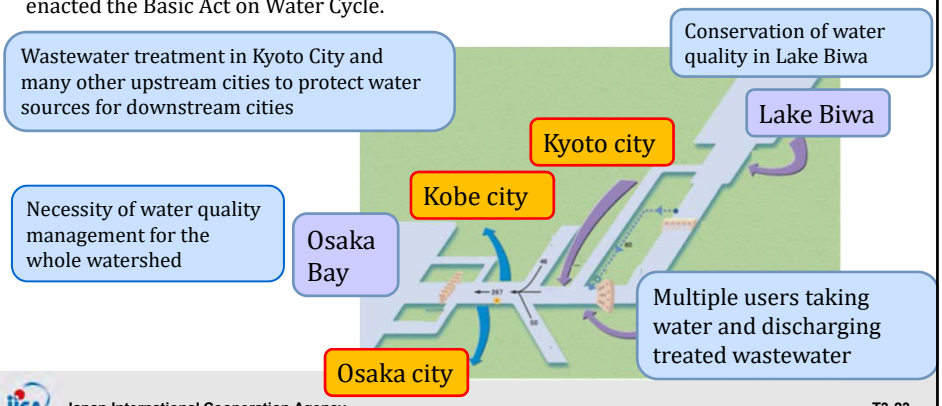
The forest is very wide, and account for 36% of the area of Doshi Village.

Yokohama Waterworks Bureau
http://www.city.yokohama.lg.jp/suidou/kyoku/torikumi/suigen-hozen/doshivolunteer.html

6. Preventing Deterioration of Source Water Quality

(3) Legislative Framework for Protection of Water Source Quality

Promoting water quality management over the whole river basin was rather difficult in Japan, due to fragmentation of the competent authorities and laws. However, improvement of basin-wide water quality management is expected by better coordination among water utilities and local governments, as well as the enforcement of the newly-enacted the Basic Act on Water Cycle.



6. Source Water Quality

Formaldehyde Contamination at Tone River

In 2012 a factory located upstream accidentally discharged hexamethylenetetramine. The chemical reacted with chlorine at several downstream water treatment plants to produce formaldehyde. Consequently, the concentration of formaldehyde in treated water increased significantly, almost reaching the limit set by the water quality standard. The following actions were taken to manage the incident;

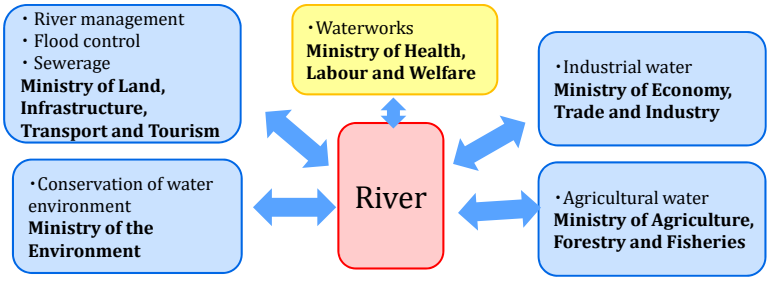
To find the cause
- Increase the frequency of water quality testing of purified water
- Strengthen the water quality monitoring system
- Communicate closely with other water utilities

To avoid distribution of contaminated water
- limit or suspend the intake of contaminated water
- Use other water sources including groundwater
- Supply from stock and not-affected treatment plants
- Urgently release water from the upstream reservoirs to dilute and flush the contaminated water

In such a large basin, a single incident can affect many downstream water utilities. Therefore, the networking system among utilities and local governments has been built to share the information and provide rapid emergency response.

6. Source Water Quality

(4) Practical countermeasures against water source pollution



Two Laws concerning drinking water resources (enacted in 1994)

Ministry of Health, Labour and Welfare	Act on Advancement of Project for Quality Management of Raw Water
Ministry of the Environment	Act on Special Measures concerning Water Quality Conservation at Water Resources Area in Order to Prevent the Specified Difficulties in Water Utilization

6. Source Water Quality

Background of the Basic Act on Water Cycle

Bottom-up movement for legislation from scholars, citizens, and politicians

・Scholars ・Citizens
・Diet members

- Fragmented regulation on water
- Insufficient legal framework to control groundwater
- Necessity for sound basin-wide water management

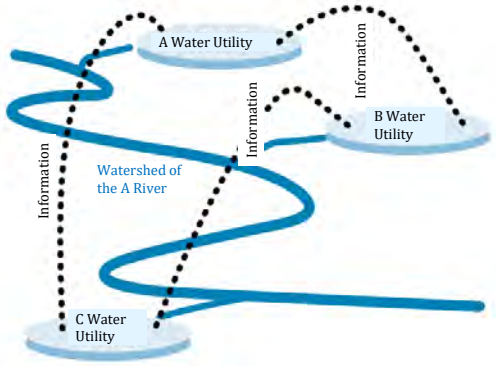
legislation by Diet members

Enactment of the bill in 2014

- Leadership by prime minister to coordinate line ministries
- Decision of "Water Cycle Basic Plan" each five years

6. Source Water Quality

Necessity of cooperation between upstream and downstream users	Councils of stakeholders for information sharing and dialogue, assembled in each watershed	Cooperation between environmental administration and water supply administration in Prefecture	Water Safety Plan based on information of watershed



7. Lessons Learned (1)

- **(From Source to Taps)** Water quality management is considered as a whole of management procedures to meet the water quality standards of tap water throughout from the water source. The national government and water utilities have been actively involved in periodical review of water quality standards, improvement of water quality testing methods, monitoring by administrative organizations, quality control of materials and equipment, and human resource development.
- **(Public Health)** Japan has been focusing on epidemiological safety of modern water supply because it experienced outbreak on waterborne diseases. Water quality management is critical to the utilities' ability to supply safe drinking water; it is very important to public health.
- **(Monitoring)** Water quality is monitored at the water source, treatment plant, distribution reservoir up to the customers' tap. Automated systems has been introduced in place of manual tests for daily testing of residual chlorine, color and turbidity. It is important to utilize the data accumulated for water resource conservation, water treatment and emergency response to accidental contamination of source water quality.

7. Lessons Learned (2)

- **(Cost of Water Quality Management)** Utilities have made sustained efforts in water quality management by securing necessary budget in their business plan. This is based on the recognition that water quality management requires certain costs for chemicals, electricity and many other expenses.
- **(Starting with a Good Quality Water Source)** Small-scale utilities with limited technical capacity and funding have utilized a good quality water source and have installed facilities to simplify and economize the treatment process.
- **(Designing Water Quality Management)** In designing water quality management system, it should comply with the legal requirements prescribed by the relevant Acts and regulations. These include: (1)designating a responsible officer for water quality management; (2)having national nor government oversight; and (3)supporting small and medium scale utilities with limited capacity.

7. Lessons Learned (3)

- **(Setting of Water Quality Standards)** The aim of setting drinking water quality standards is the protection of public health from toxic substances and bacteria, and the parameters of our health concern. Water quality standards for contaminants suspected to cause long term health risk (such as cancer), are revised as a result of new knowledge, public concerns, and availability of measurement instruments. It was important to establish the standards considering qualities of water resources and drinking water, the technical levels of water quality testing and measurement instruments in the country.
- **(Standards for Materials and Equipment)** It is important that utilities use certified materials and equipment. The inspection and certification services of Japan Water Works Association for materials and equipment play an important role in maintaining the high quality of such products. It is essential that water supply system utilize standardized materials and equipment.

7. Lessons Learned (4)

- **(Protecting Water Source)** Utilities use advanced water treatment processes to deal with odor caused by quality deterioration of water sources, but those are expensive. Therefore, water resource conservation such as construction of sewage facilities, regulation of industrial wastewater, enhancement of information sharing among surface water users, awareness-raising activities and conservation of water catchment forests. As the water demand saturated and stabled, it became important to conduct water resource conservation with stakeholders around watershed while seeking for cleaner water source, for example moving intake facilities to upstream.
- **(Cooperation in Watershed)** Utilities in the same watershed cooperate, share information and take prompt action together in case of incidents of pollution. The formal mechanisms for cooperation and coordination greatly facilitate information sharing and water quality management. In this regard, the development of water safety plan is promoted by the national government in Japan.

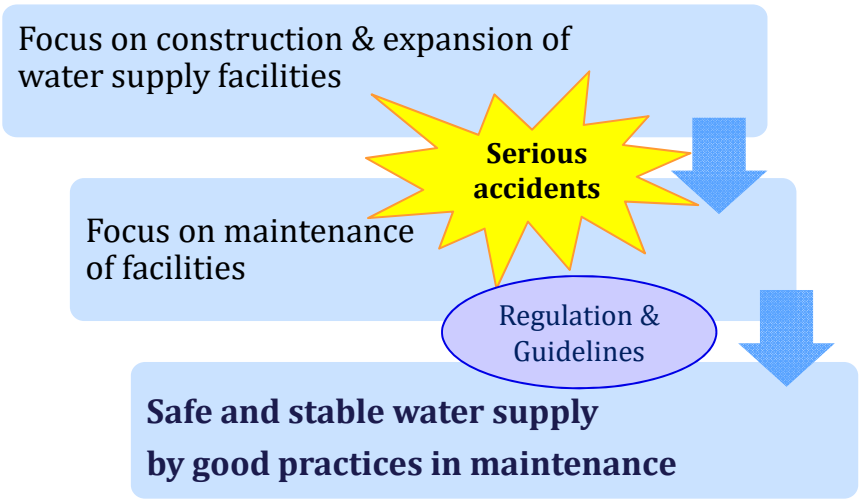
Operation and Maintenance of Facilities

Source: JICA Training Course Material prepared by Sapporo City Waterworks Bureau (JICA Sapporo, 2015)

No. T4 Ver. 1

Contents

1. Introduction



1. Introduction

Frequently asked questions from participants of the water supply training courses

Q1. How did Japanese utilities achieve good practices in maintenance?

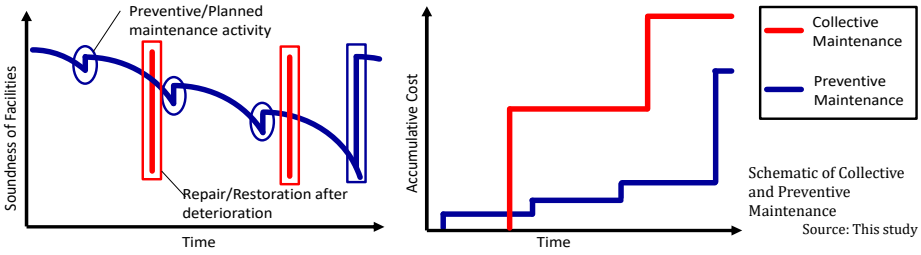
Q2. How do Japanese utilities manage to share the knowledge on maintenance and benefit from each other's experience?

Q3. How can best practices be retained in spite of staff turnover? What is Japan's approach to sharing best practices within a utility and across the water supply sector?

2. Importance of Maintenance

Why maintenance is important?

- Inadequate maintenance can cause operation fault and service deterioration
- Secondary disaster (e.g. road collapse by pipe burst, chlorine leakage)
- Service breakdown: poor water quality, reduced pressure, perception of reduced reliability, claims from customers.
- Higher life cycle cost: early deterioration of facilities



Schematic of Collective and Preventive Maintenance
Source: This study

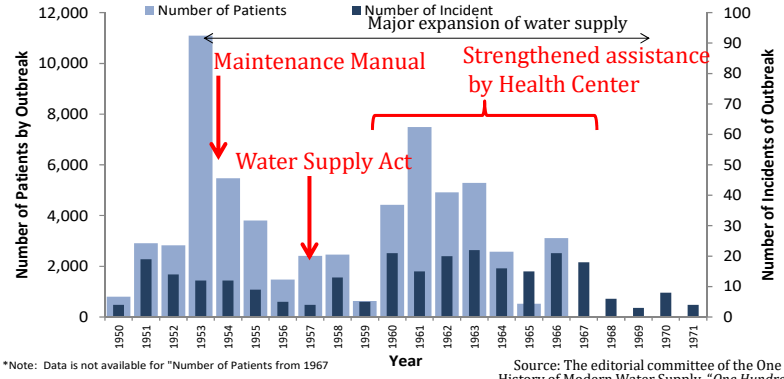
2. Importance of Maintenance

Item	Triggering events	Issues and causes
Water Treatment Facility	Poor disinfection (waterborne diseases spread by water supply)	No standard manuals nor operational procedures for O&M
	Malfunction of facility and failure of water treatment	
Pipelines	Contamination due to negative pressure (waterborne diseases spread by water supply)	No precise information nor drawings on aged pipelines
	Secondary disaster due to burst pipes	
	Public complaint of rusty/turbid water	
	Dysentery caused by cross connection	Quality control for installation of water service connections

2. Importance of Maintenance

(1) Disease Outbreaks

- Outbreaks increased when water supply coverage was expanded to rural areas where many small utilities were built (since the 1950s).
- Cases were dramatically decreased by intensive O&M measures promoted by *Water Supply Facilities Maintenance Manual* in 1953.



*Note: Data is not available for "Number of Patients from 1967

Source: The editorial committee of the One Hundred Year History of Modern Water Supply, "*One Hundred Year History of Modern Water Supply*," Nihon Suido Shimbunsha, 1988.

2. Importance of Maintenance

Causes of Outbreaks of Waterborne Diseases

42%: Lack or failure of disinfection facilities

27%: Contamination in pipelines *

1950s~1960s: Focus on Operation and Maintenance
- Laws and Regulations
- Guidelines
- Best practices and dissemination throughout the country

1970s: Outbreaks of waterborne diseases caused by water supply system were suppressed.

* caused by water supply interruption, cross contamination etc.

2. Importance of Maintenance

(2) Cross Connection

Serious Accident of Cross Connection in1969
It was found that a water distribution pipe had been connected to an industrial water pipe by mistake of pipe installation work. People had been drunk industrial water for one year.

Causes
- Drawings and documentation not properly archived
- No appropriate construction supervision
- No water quality testing after construction

Corrective measures
- Strengthening of construction supervision
- Records of construction
- Registration of drawings
- Strengthening of completion inspection
- Testing for residual chlorine

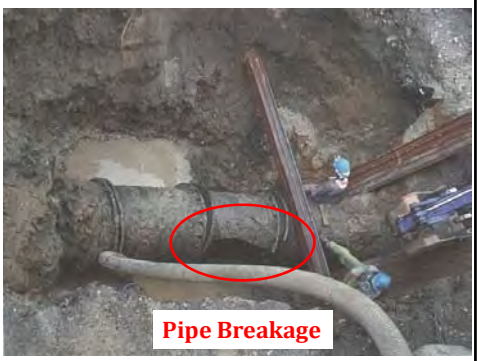
Great impact on both the citizens and utilities

2. Importance of Maintenance

(3) Pipe Bursts

Pipe materials deteriorate with age

Causes	**●Corrosion ●Deterioration of materials ●Old lining method**
Effect	**●Water supply interruption ●Road caving ●Flooding of homes and roads**
Measures	**●Accelerate scheduled replacement of aging pipes ●Emergency management**



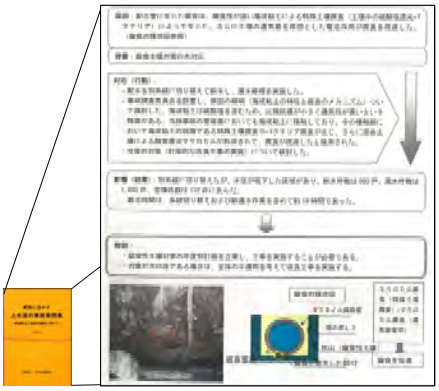
Source: JWWA, "*Casebook of Water Supply Accidents for Practical Use*," 2008.
Note: Photo is modified from original (indicated in red)

2. Importance of Maintenance

Information sharing among utilities across Japan

- Annual academic conference held in Japan Water Works Association General Assembly
- *Casebook of Water Supply Accidents for Practical Use*

Japan Water Works Association General Assembly Meeting



JWWA, "*Casebook of Water Supply Accidents for Practical Use*," 2008.

2. Importance of Maintenance

Improved Management of Pipelines

Laws and regulations were enforced in response to the accident.

Year	Events Related Leakage Control in Japan
1945	**End of World War II** (pipeline damage by war)
1946	***Water Leakage Prevention Guidelines*** (Ministry of Health and Welfare, Japan Water Works Association)
1950s	**Aged pipelines installed before the war and deterioration of pipes of poor material manufactured during the war.**
1960	***Revision of the Water Leakage Prevention Guideline*** (Bureau of Waterworks, Tokyo Metropolitan Government water leakage prevention committee)
1960	Notice of the Ministry of Health and Welfare: **on water leakage prevention measures**
Around 1970	Media reports on rusty water causing public concern.
1970	Notice of the Ministry of Health and Welfare: **on pipeline repair and replacement to prevent leakage and removal of rusting pipes**
1977	***Guidelines for Water Leakage Preventive Measures***

3. Laws and Institutional Framework

Legal Basis on Maintenance

- The Water Supply Act clearly stipulates the importance of abiding by the maintenance and facility standards.
- Japan Water Works Association published *Design Criteria for Water Supply Facilities* and *Water Supply Facilities Maintenance Manual*.

Water Supply Act

"Article 5, 2 ... In determining the location and arrangements of water supply facilities, it is necessary to make their construction, ***operation and maintenance*** *as economically and easily as possible, and to give consideration to assurance of water supply...*

Based on the Act, technical standards are developed & regularly updated.

Technical standards

3. Laws and Institutional Framework

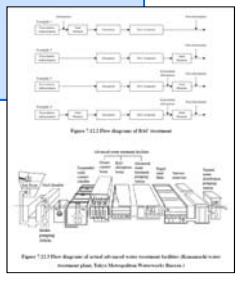
Chronology of Laws and Regulations

1953: *Water Supply Facilities Maintenance Manual*

1955: *Water Supply Facilities Standards*

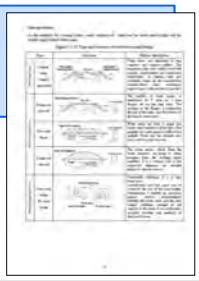
1957: Water Supply Act was enacted

1964: Revision
1970: Revision
1982: Revision
1998: Revision
2006: Revision



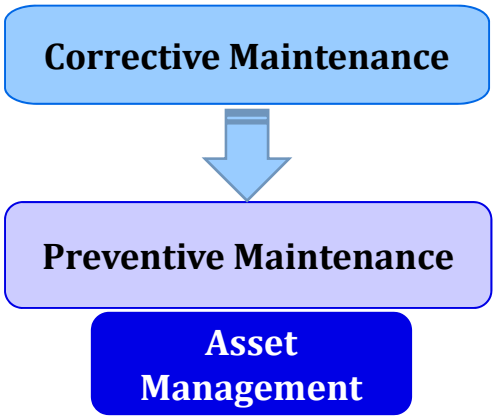
1966: *The Design Criteria for Water Supply Facilities*

1977: Revision
1990: Revision
2012: Revision



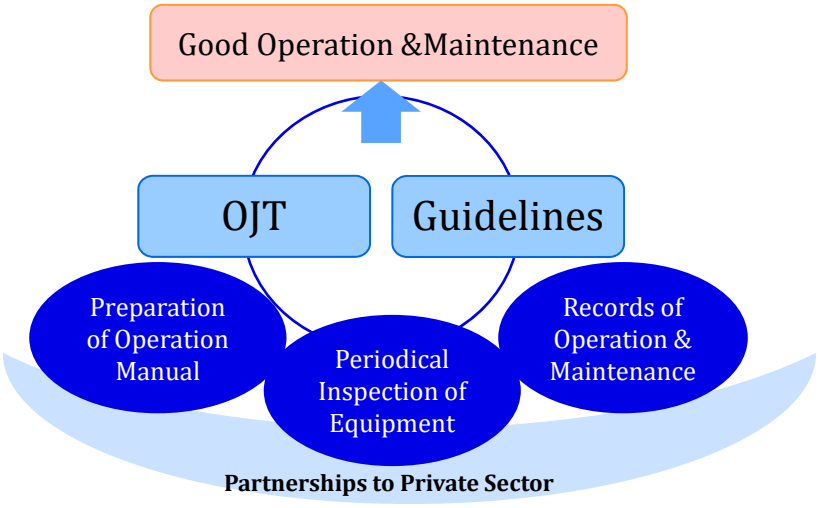
4. Best Practices in Japan

(1) Corrective and Preventive Maintenance



4. Best Practices in Japan

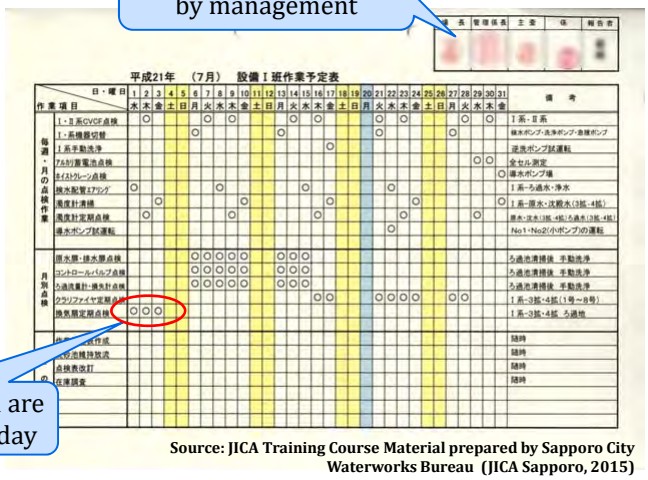
(2) Maintenance in Water Treatment Plants



4. Best Practices in Japan

Example of Checklist

Check list of periodical inspection (Sapporo City)

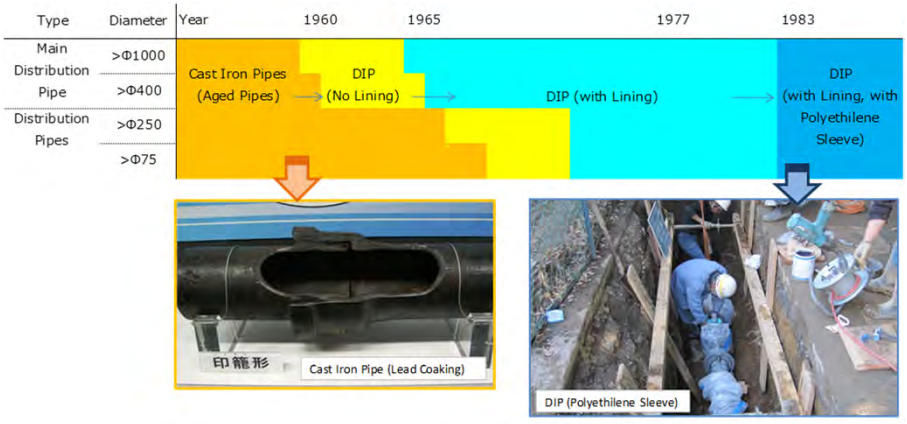


Source: JICA Training Course Material prepared by Sapporo City Waterworks Bureau (JICA Sapporo, 2015)

4. Best Practices in Japan

(3) Pipeline Maintenance

Materials for distribution pipelines change as new materials and technologies become available .



4. Best Practices in Japan

(4) Construction Quality Management

Standardization and Replacement of Lead Pipes

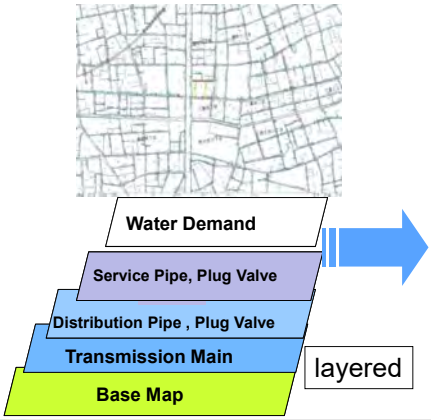
- Lead pipes were historically widely used but are now intensively replaced because of negative health effect and leakage problems.
- Intensive replacement and standardization will prevent future problems.

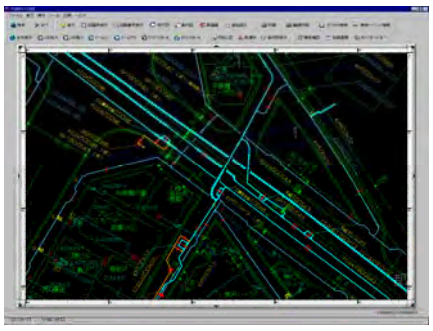
Year	Change in standards for lead pipes
1928	Standards were set for lead pipes for water supply in Japan.
1990	Lining of lead pipes with zero elution were added to the standards.
1993	Based on the revision of the Water Quality Standards, the traditional unlined lead pipes were removed from the standards.

4. Best Practices in Japan

3) Mapping of Distribution Networks

Summarized knowledge and information on pipelines are incorporated into a mapping system to share the information internally and with other utilities.





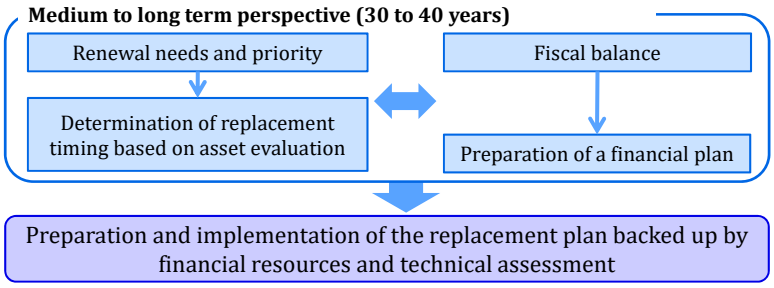
Source: Created from training course material for JICA Project prepared by Tokyo Metropolitan Government Waterworks Bureau

4. Best Practices in Japan

Asset Management

Leakage management and pipe replacement are dealt with cohesively under "Asset Management."

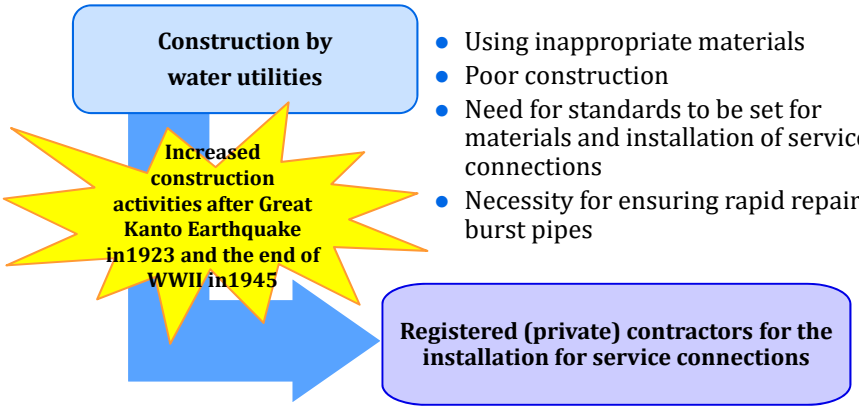
Key features of asset management:
(1) Consolidated information on facilities, (2)Facility assessment and evaluation, (3)Understanding of replacement needs and priorities, and (4) Clear outlook on fiscal balance



Source: MHLW, *Guidelines for the Asset Management for Waterworks*, http://www.mhlw.go.jp/za/0826/d11/d11-01.pdf

4. Best Practices in Japan

Designated Prequalified Contractors and the Registration System for the Contractors for Service Connection



- Using inappropriate materials
- Poor construction
- Need for standards to be set for materials and installation of service connections
- Necessity for ensuring rapid repair of burst pipes

5. Lessons Learned (1)

- **(Preventive Maintenance)** Inadequate operation and maintenance practices lead to serious disease outbreaks and compromise the reliability, safety and quality of the water supply. Preventive maintenance is important both in terms of quality management and reducing life cycle cost.
- **(Guidelines and Standards)** Utilities are strongly supported by national guidelines and standards, enhanced regulations and inspection services by health centers. Water Supply Act, *Water Supply Facility Standards* and *Water Supply Facility Maintenance Manuals* were developed which explicitly state maintenance responsibility.
- **(Concepts and Tools)** (1) Preventive maintenance, (2) Standardization of materials, (3) National design criteria, (4) Information sharing have played key roles in maintenance. Introduction of new management tools such as digital mapping and asset management are great opportunities for utilities to work collaboratively.

5. Lessons Learned (2)

- **(Maintenance of Water Treatment Plant)** Each utility or facility has its own manuals in operation and maintenance of water treatment plants, checklists, and handover procedures, all passed on to workers through OJT. Meetings organized by Japan Water Works Association facilitate information sharing across the country .
- **(Quality Control)** Quality of materials and appropriate construction were the keys for maintenance of pipelines. Various kinds of cooperation with private sector was also essential.

Reducing Non-Revenue Water

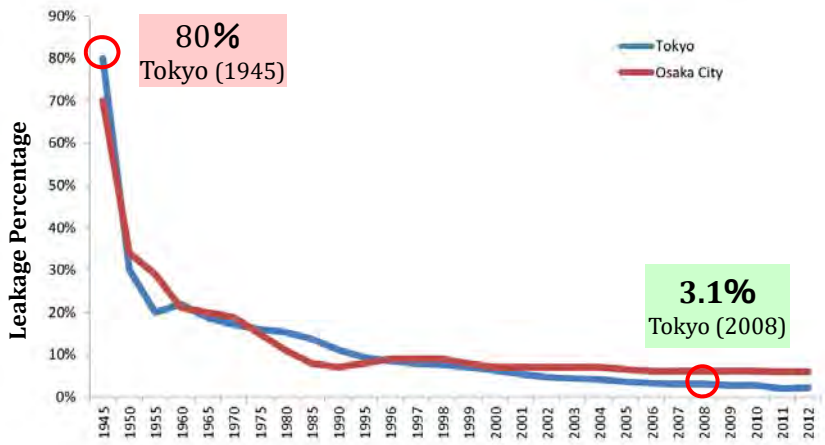
Leakage Survey after World War II
Source: Nagoya City Waterworks and Sewerage Bureau

No. T5 Ver. 1

Contents

1. Introduction

Drastic reduction in leakage in Japan



Source: Created from the data of Tokyo Metropolitan Government Waterworks Bureau and Osaka Municipal Waterworks Bureau

1. Introduction

Definition of Non-Revenue Water

Water Balance Table of IWA				
System Input Volume	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption	Revenue Water
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	**Non-Revenue Water (NRW)**
			Unbilled Unmetered Consumption	
	Water Losses	Apparent Losses	Unauthorized Consumption	
			Customer Metering Inaccuracies	
			Systematic Data Handling Errors	
		Real Losses	Leakage on Transmission and Distribution Mains	
			Leakage and Overflows at Utility's Storage Tanks	
			Leakage on Service Connections up to point of Customer metering	

1. Introduction

Frequently asked questions from participants of the water supply training courses

Q1. How did Japan reduce leakage from 80% to 3% in some large cities?

Q2. What are the effective measures for reducing NRW?

2. Non-Revenue Water in Japan

(1) Low NRW across the Country

NRW is particularly low in Tokyo (≤4%*), Okinawa, Aichi, Osaka, and Fukuoka Prefectures (≤9%*).

* **NRW** percentage, average in the prefecture

Areas achieving low NRW are...

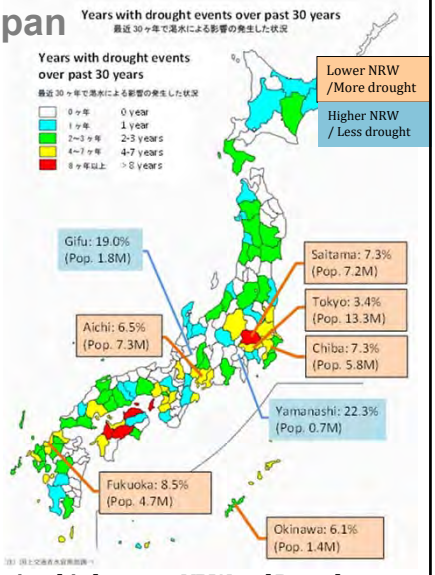
(1) Major metropolitan areas:

High population density and water demand

(2) Water-scarce areas

(Islands, no major reservoirs etc.)

Source: Statistics on Water Supply (2014) and the Ministry of Land, Infrastructure, Transport and Tourism website (the impact of drought in the past 30 years



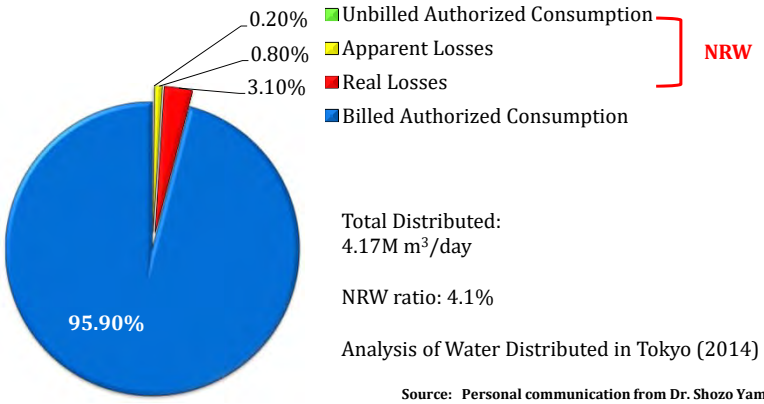
Relationship between NRW and Draught events

Legend: Name of Prefecture: NRW %(Served Population. Million)

2. Non-Revenue Water in Japan

(2) Components of NRW

- Illegal connections are rare.
- Apparent/meter loss is at the lowest possible level.
- Focus is on reducing "**leakage**."



Total Distributed:
4.17M m^3/day

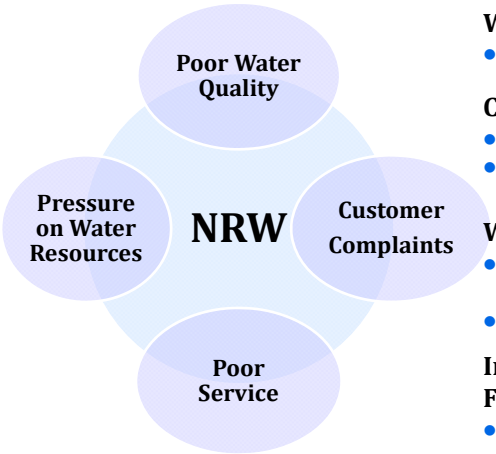
NRW ratio: 4.1%

Analysis of Water Distributed in Tokyo (2014)

Source: Personal communication from Dr. Shozo Yamazaki

3. Causes and Control Measures

(1) Importance of Reducing Non-Revenue Water



Water Quality
- Contamination at leakage point

Customer Complaints
- Complaints of low water pressure
- Low reliability and willingness-to-pay

Water Resources
- Public complaints about water shortage caused by drought
- High cost for water resource development

Impact on Service Efficiency and Financial Management
- Poor service and lost revenue

3. Causes and Control Measures

(2) Causes and Preventive Measures for Leakage

Steps and Categories of the countermeasures for leakage control

Basic measures

- Secure adequate financial sources
- Establish leakage control team
- Conduct surveys, collect & analyze data
- Develop better pipe materials and technology

Corrective measures

- Establish mobile team for prompt repair of burst pipes and other visible leakages
- Schedule for leakage detection and repair

Preventive measures

- Include leakage control as a distinct part of the management plan
- Plan for replacement of old pipes
- Analyze and evaluate pipeline networks
- Implement water pressure control

3. Causes and Control Measures

Quality Control of House Connections

Regulations under the Water Supply Act

Structure and materials for house connections must meet standards. Registration system for the contractors installing service connections.

Quality certification & inspection by third party

Equipment and materials for water supply facilities must meet Japanese Industrial Standards (JIS) and Japan Water Works Association (JWWA) Standards.

Better pipe materials

Changed from lead and galvanized steel to stainless steel, PVC lined steel, 2-layer polyethylene pipes.

3. Causes and Control Measures

Metering error (apparent loss)

Better meter management

Measurement Act requires certain water meter accuracy and replacement every 8 years.

Water meter is protected in a box on loan to the customer from the water utility. It cannot be tampered with, removed or intentionally destroyed.

Meters

Accurate measurement
Less apparent loss

Old Meter Box

Source: (Photo) Nagoya City Waterworks and Sewerage Bureau

4. Importance of Leakage Control

(1) Metering Practices

- **Water shortages due to increasing demands** were common problems for utilities.
- Example in Nagoya
  - **Flat-rate tariff was the main cause of water wastage** because there was no incentive to save water.
  - Started to install meters at all households.
  - Started to manufacture **domestic meters .**

- Importance of metering was fully recognized.
- Supply of quality meter was established before the period of major expansion.
- **"Measurement Act"** (1951) requires appropriate management of meters.
- **Resulted in low apparent losses**

Public Awareness Poster
"Make your kitchen better: A household that values water prospers. A household that wastes water suffers."

Source: Nagoya City Waterworks and Sewerage Bureau

4. Importance of Leakage Control

(2) WW II Destruction of Infrastructure

- "Leaking like a sieve": 80% leakage in Tokyo water supply networks.
- 90 cities were damaged by air raids, and 1.67 million of 3.13 million km of service pipes were destroyed.

Source : Ministry of Internal Affairs and Communications

Ichinomiya City, Aichi Prefecture After WWII

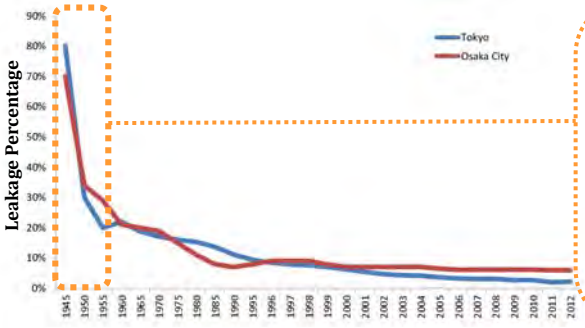
Importance of leakage control was recognized by all water utilities in Japan.

4. Importance of Leakage Control

(2) WW II Destruction of Infrastructure

Post war reconstruction

- Immediate efforts by utilities
- National subsidies (1/3 of expenditures)



Repair work by utilities (partly subsided by national fund)

Source: Photo from "100 years history of modern water supply"

4. Importance of Leakage Control

(3) Water Demand Increase and Water Shortage

- Rapid growth of population and economy from 1950's to late 1970's.
- Severe droughts occurred during the course of demand growth. Strict water supply restrictions were imposed.

Year	Drought Events
1961~65	Tokyo endured close to 5 years of water supply restrictions
1964	Over 8 months of water supply restrictions in Nagasaki
1967	278 utilities rationed water supply due to wide spread drought

Utilities and customers are well aware of the scarcity of water. **Importance of leakage control is clearly recognized.**

Emergency water supply during severe drought in 1964 (Tokyo Olympic year)

Source: Bureau of Waterworks, Tokyo Metropolitan Government

4. Importance of Leakage Control

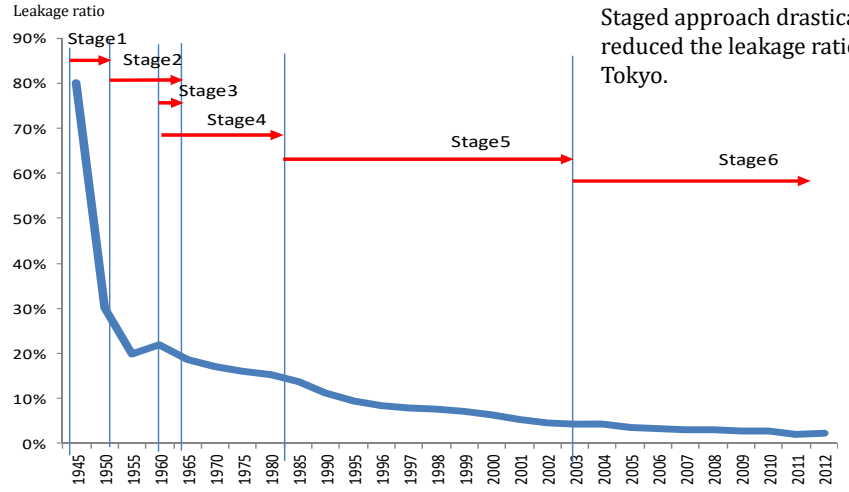
(4) National Policy for Leakage Control

Year	Major Event	Average NRW % (Year)
1960s – 1970s	● Guideline for Leakage Control (JWWA) (1960) ● "Leakage Prevention for Water Supply" (1960) Notice by Ministry of Health	22.4% (1970)
1970s –	● Leakage Prevention Guideline (1977) by JWWA	16.4% (1980)
1980s –	● Enforcement of Leakage Prevention (1990) (Enforce 90% – 95% of effective water ratio)	11.0% (1990)

Guidelines and Notices from National Government promoted leakage prevention

5. Best Practices: Tokyo

(1) Staged Approach to Leakage Management



Staged approach drastically reduced the leakage ratio in Tokyo.

Source: Mr. Shozo Yamazaki

5. Best Practices: Tokyo

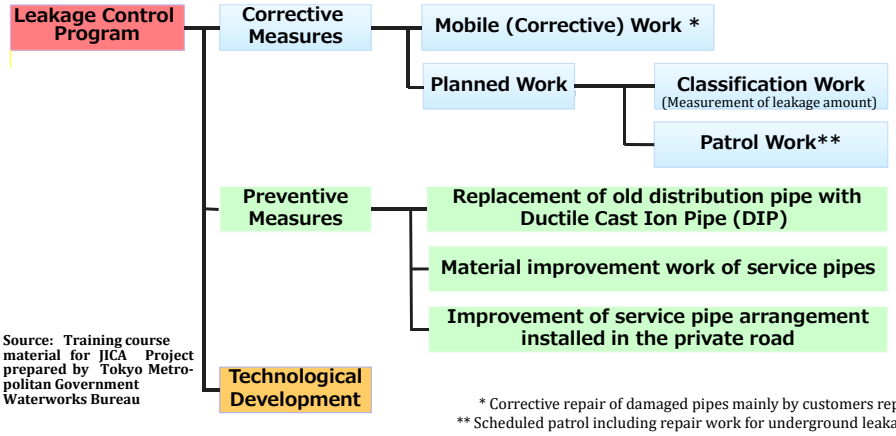
(1) Staged Approach to Leakage Management

Stage	Leakage ratio	Leakage control work	Method
1	>30%	Decrease aboveground visible leakage	Intensive repair activities
2	30%-20%	Decrease underground leakage	Zoning, accurate piping maps, training & utilizing good quality equipment for detection
3	25%-20%	Prevent recurrence of leakage	Increase in leakage control work, starting replacement of deteriorated pipes, use of DCIP
4	20%-12%	Carry out thorough leakage control work	Revision of working method & acceleration of pipe replacement work
5	12%-5%	Improve service pipes	Introduction of stainless steel service pipes which are strong and durable
6	<5%	Maintain low NRW	Systematic pipe replacement and leakage control work based on cost and benefit analysis

Source: Personal communication from Dr. Shozo Yamazaki

5. Best Practices: Tokyo

(2) Early Detection and Repair: Planned and Corrective Work



Source: Training course material for JICA Project prepared by Tokyo Metropolitan Government Waterworks Bureau

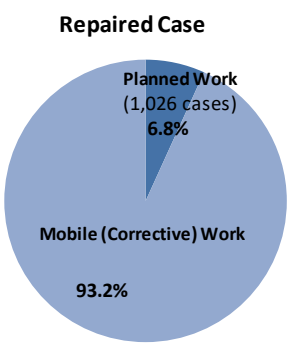
* Corrective repair of damaged pipes mainly by customers report
** Scheduled patrol including repair work for underground leakages

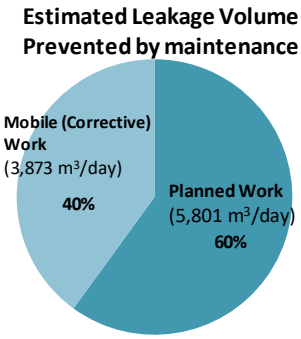
***Corrective* and *preventive* measures - pillars of leakage control**

5. Best Practices: Tokyo

(2) Planned Work for Leakage Prevention

Planned work consists of 6.8% of total repairs but fixes 60% of the leakage.





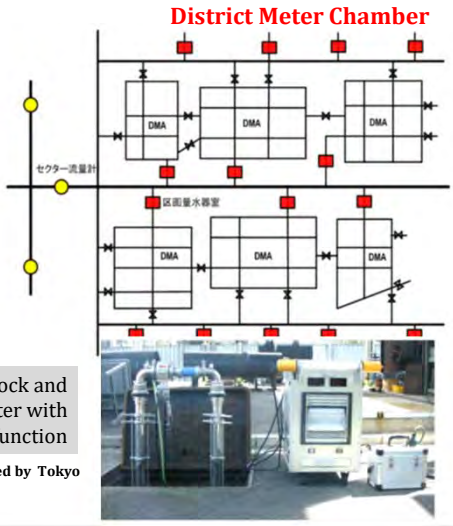
Source: Training course material for JICA Project prepared by Tokyo Metropolitan Government Waterworks Bureau

Planned work is an efficient measure for leakage prevention

5. Best Practices: Tokyo

(3) Selective Measurement by Distribution Block

- Distribution area is divided into blocks with 1,100 households in each block.
- Each block is remotely monitored by district flow meter.
- Minimum Night Flow (MNF) is recorded.



Schematic of distribution block and picture of district meter with telemetering function

Source: Based on training course material for JICA Project prepared by Tokyo Metropolitan Government Waterworks Bureau

5. Best Practices: Tokyo

(4) Planned Pipeline Replacement and Improved Pipe Materials

More than 95% leakage occurred at service pipes

Planned pipe replacement and improved pipe materials

Ferrule with stainless steel saddle

Flexible service connection

Source: Based on training course material for JICA Project prepared by Tokyo Metropolitan Government Waterworks Bureau

6. Lessons Learned (1)

- **(Need for Leakage Prevention)** Japanese water utilities recognize the importance of leakage control and prevention because of their experience with infrastructure destruction during the war, severe droughts, and water restrictions.
- **(Leakage Control for Reducing NRW)** The major cause of NRW in Japan is leakage. Utilities have dramatically improved NRW by reducing leakages. It is important to install meters and analyze water flow, locate leaks and develop control measures. This requires a coordinated effort among various work units within the utility.
- **(Accuracy of Meters)** The Measurement Act requires replacement of water meters every 8 years and utilities are obliged to keep them in good working order under the Water Supply Act. Metering errors can be kept to a minimum with a strong legislative framework.

6. Lessons Learned (2)

- **(Progressive Leakage Control)** An active leakage control program can start with improved response to repairing visible leaks. Then the activities can shift to early detection of leaks not yet visible above ground, and eventually to systematic planned replacement of aging pipes. Planned pipeline replacement and improved pipe materials is effective for NRW reduction.

Financial Management:
Finance and Tariffs

No. T6 Ver. 1

Municipal Bond issued by Kyoto City in 1909
Source: Kyoto City Waterworks Bureau

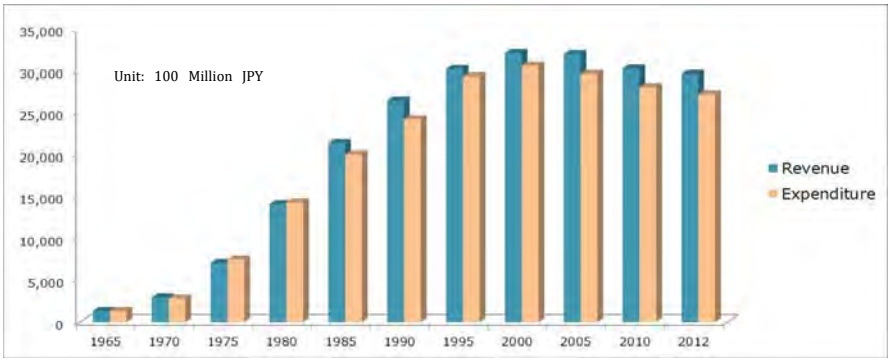
Contents

1. Introduction

Total Revenue
(water tariffs, etc.)

≧

Total Expenditures
(repayment of long-term loans, payment of interest, operation and maintenance costs, administrative expenses, etc.)



Source: Based on information from JWWA, "*The Outline of Water Supply*," 1st ed. 1986, and 6th ed. 2015.

Change in Total Revenue and Expenditure of Water Utilities in Japan

1. Introduction

Frequently asked questions from participants of the water supply training courses

Q1. How did Japanese water utilities finance water supply development during the period of high economic growth?

Q2. Have Japanese water utilities been able to achieve full cost recovery?

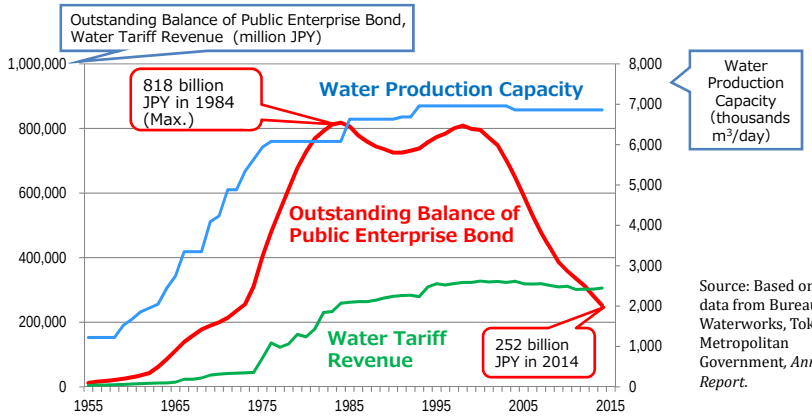
Q3. How do Japanese water utilities determine water tariffs?

Q4. How do Japanese water utilities serve low-income group?

Q5. How do Japanese water utilities achieve almost 100% bill collection?

2. Financing Water Supply Development

The balance of the bonds and water tariff revenue increases during the expansion of facilities because the population served increases. The balance of the bonds gradually levels off after the expansion of facilities.



Source: Based on data from Bureau of Waterworks, Tokyo Metropolitan Government, *Annual Report*.

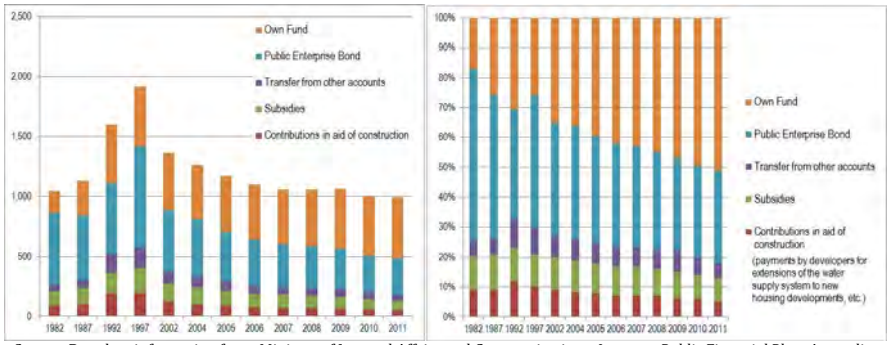
Changes of the Balance of Public Enterprise Bonds, Water Tariff Revenue and Water Production Capacity of Bureau of Waterworks, Tokyo Metropolitan Government

2. Financing Water Supply Development

Main funds : Municipal Bonds (Public Enterprise Bonds) and Subsidies

⇒ **Japanese water supply coverage rate* increased from 26.2% in 1950 to 80% in the 1970s and 90% in the 1980s.** (*served population / total population)

(Billion JPY) (composition ratio)



Source: Based on information from Ministry of Internal Affairs and Communications, *Issues on Public Financial Plan: Appendix*, 2013, http://www.soumu.go.jp/main_content/000266902.pdf

Financial Sources for Construction of Water Supply Facilities

2. Financing Water Supply Development

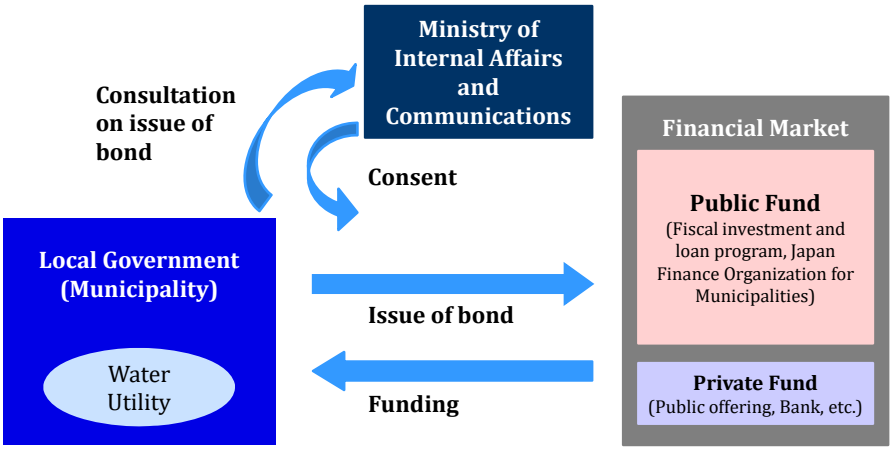
(1) Municipal Bonds (Public Enterprise Bonds)

- Long-term debt obligations issued by local governments for public projects including water supply development.
- The principal and interest payments are covered by revenues generated by water tariff.
- Based on the user-pay principle it is reasonable to **share the liability of facility construction with future beneficiaries** by long-term repayment of the bond over the life of the facilities.

Source: Nagoya City, "*Nagoya City History in Taisho and Showa Period*," 1955.

2. Financing Water Supply Development

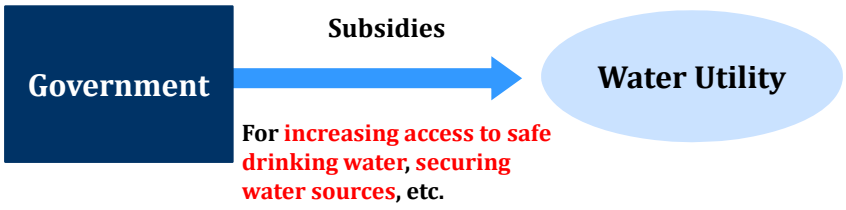
Scheme of Municipal Bonds (Public Enterprise Bonds)



2. Financing Water Supply Development

(2) Subsidies for Urban Water Supply Developments

- Water utilities generally strive for cost recovery by setting appropriate tariffs, however it has proven difficult to develop new facilities without some subsidies.
- The government has set subsidies with clear targets and invested in accordance with well defined policy goals. Subsidies are not normally used to cover operational costs which should be fully covered by revenue from water tariffs.



2. Financing Water Supply Development

(2) Subsidies for Urban Water Supply Developments

Period	Target	Rate of grant	Purpose
1888- 1900-	Three prefectures, and five port cities, Others	1/3 1/4	Improve public health and reduce incidents of infectious diseases in major cities and port cities.
1907-	All major cities	1/4	Increase access to piped water.
After World War II (1945) - 1954			Post war reconstruction.
1954 -1966	Abolishment of subsidies for urban water supply	-	When the urban water supply coverage reached 50%, subsidies were abolished. Government subsidies were shifted to Small-Scale Public Water Supply System development in rural areas.
1967	Restoration of subsidy system for water resources development, facility development, and for consolidation of water utilities	1/2 or 1/3, 1/4	The subsidy system was restored based on the decision that it was not appropriate to have water utilities alone shoulder the increased costs.
1978-2009	Development of laboratories	1/4	Improve water quality testing in small and medium scale waterworks.

＊Other subsidies : Development of advanced water treatment facilities, rehabilitation of old deteriorated pipelines, reinforcement of earthquake preparedness, development of automatic monitoring system for water source, etc.

2. Financing Water Supply Development

(3) Subsidies for Small Scale Public Water Supply

The Water Supply Division of the Ministry of Health and Welfare (MHW) persuaded the Finance Division of MHW to establish the subsidy by stating that **"the costs of improving water supply would be offset by economic benefits such as a reduction in health care costs."**

Subsidies for Small Scale Public Water Supply System in rural areas started in 1952.

180 Small Scale Public Water Supply System were developed in1952. After that, 500 Small Scale Public Water Supply System were developed every year.

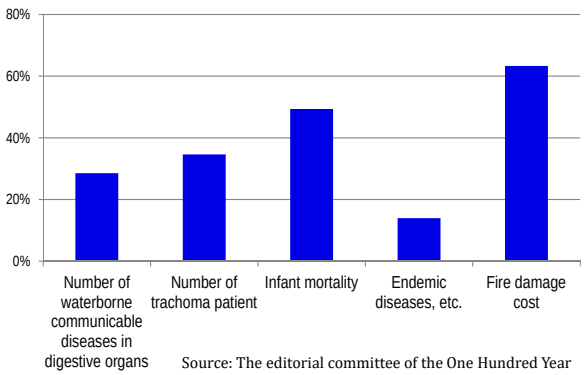
2. Financing Water Supply Development

Benefit of Rural Water Supply Development

Benefit of installing water supply facilities after 5 years of operation:

- **Decrease of waterborne diseases**
- **Decrease of infant mortality rate**
- **Decrease of damages from fires**

etc.



Source: The editorial committee of the One Hundred Year History of Modern Water Supply, "*One Hundred Year History of Modern Water Supply*," Nihon Suido Shimbunsha, 1988.

Reduced Incidence of Diseases and Infant Mortality, etc.
(Information presented by the Water Supply Division of MHW in 1957. 100% represents the level that existed before construction.)

2. Financing Water Supply Development

Villagers paid their share of the costs by selling their trees

Volunteer work by villagers for Small Scale Public Water Supply Development

Source: Susumu Hani, the film "*Water in Our Life*," 1952

2. Financing Water Supply Development

(4) Private Sector Finance

Stagnating economic environment and the critical financial deficits of national and local governments

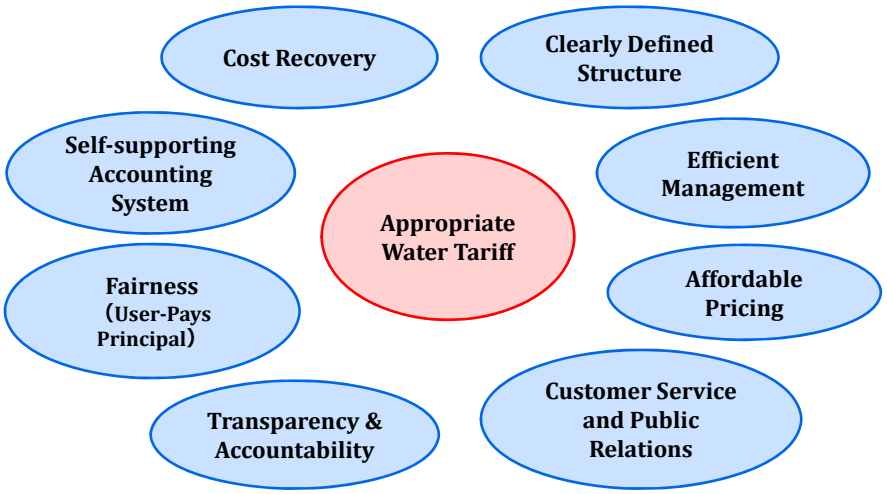
Act on Promotion of Private Finance Initiative (PFI Act) in 1999

Development of public facilities through the utilization of private finance, management abilities and technical capabilities by the law and guidelines

Kawai Water Treatment Plant by PFI Scheme, Yokohama City

3. Water Tariff Setting

Main Components for Water Tariff Setting in Japan



3. Water Tariff Setting

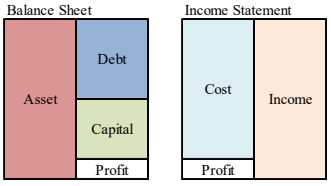
(1) Self-Supporting Accounting System and Fully Distributed Cost Method

Focusing on revenue & expenditure
Cash based accounting,
Not accounting for depreciation of fixed assets

1952 : Local Public Enterprise Act
(Public Enterprise Accounting System)

Double-entry book-keeping
Accrual accounting,
Recording depreciation of fixed assets

Image of double-entry book-keeping



3. Water Tariff Setting

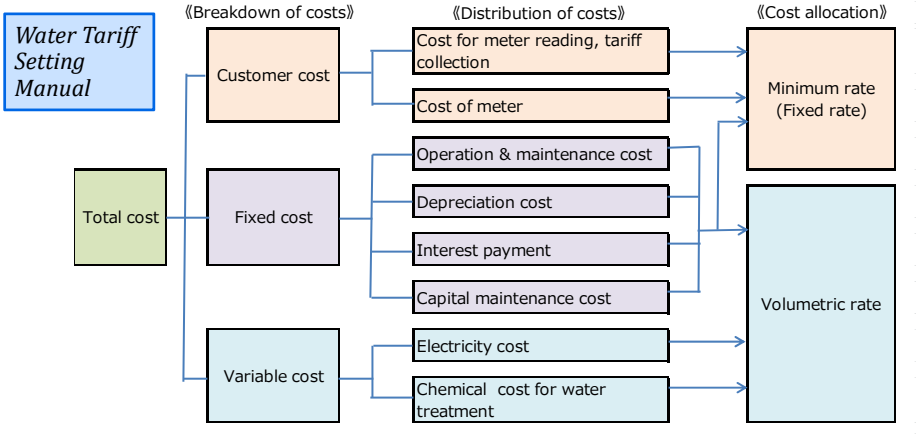
Local Public Enterprise Act

Article 17 Special Account	• The accounting of local public enterprises shall be implemented by instituting a special account.
Article 17-2 Principle of Expenses Sharing	• The expenses must be covered with the operating income. • Expenses not suitable to be borne by operating income shall be covered by the general account or other special accounts (e.g. Fire fighting use).
Article 17-3 Subsidy	• The local government may give support to the local public enterprise by the general account or the separate special account, when it is necessary for restoration after natural disasters or for some other special reasons.

3. Water Tariff Setting

(2) *Water Tariff Setting Manual*

Total Expenditure < **Total Revenue of Water Tariff**



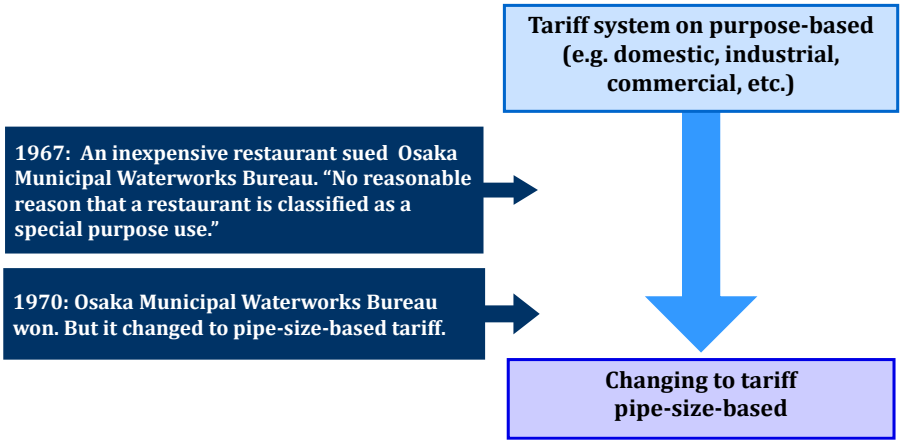
3. Water Tariff Setting

(3) Fairness and Clear Definition

Time of founding	• Tariff level commensurate with ability to pay • Flat rate and metered rate (decreasing-block system) were mixed
1920s-1930s	• Cost recovery • Increasing number of water utilities adopted metered rate (decreasing-block system)
1960s-	• Water-saving • Changing from decreasing-block tariff to increasing-block tariff
1970s-	• Clear definition and fairness • Changing from purpose based tariff to pipe-size based tariff
Present	• Clear definition and fairness • Revision of water tariff structure (a minimum amount of free water consumption included in the minimum charge, difference between the highest rate and the lowest rate by the increasing-block system)

3. Water Tariff Setting

Lawsuit in Osaka Challenged the Fairness of the Purpose-Based Tariff System Contributed to the Shift to the Pipe Size Based Classification

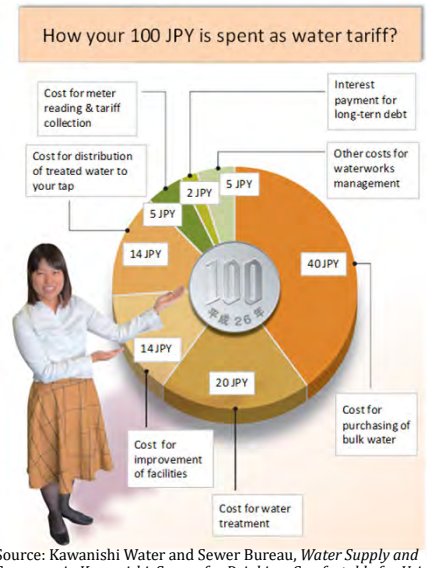


3. Water Tariff Setting

(4) Transparency & Accountability, Public Relations

Water Utility
Disclosure of financial information

Customer
Understanding of financial condition



Source: Kawanishi Water and Sewer Bureau, *Water Supply and Sewerage in Kawanishi: Secure for Drinking, Comfortable for Using*, 2015, http://www.kawanishi-water.jp/ikkrwebBrowse/material/files/group/2/h27-12-1.pdf

3. Water Tariff Setting

(5) Efficient Management

"Water Supply Act" and "Local Public Enterprise Act"
Water tariffs must be fair and reasonable, commensurate with costs of an efficient operation.

Water Utility
Continuous efforts for optimize and streamline operations.

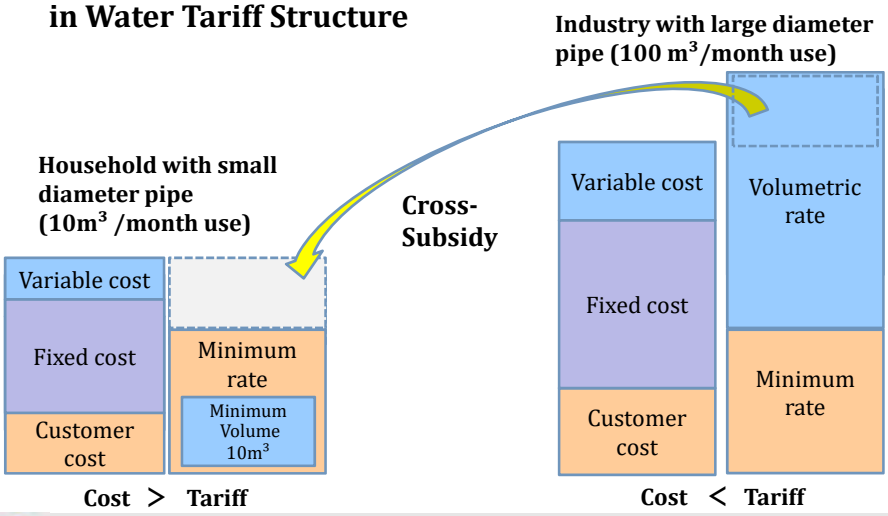
Example: Osaka City

- Not replacing retired engineers and technical staff
- Reduction in staff requirements by improving equipment and control systems at water treatment plants
- Reduction in staff requirements by introducing on-line systems in service stations and data processing of inspection book , etc.

Source: Osaka Municipal Waterworks Bureau, "*One Hundred Year History of Water Supply in Osaka City,*" Osaka Municipal Waterworks Bureau, 1996.

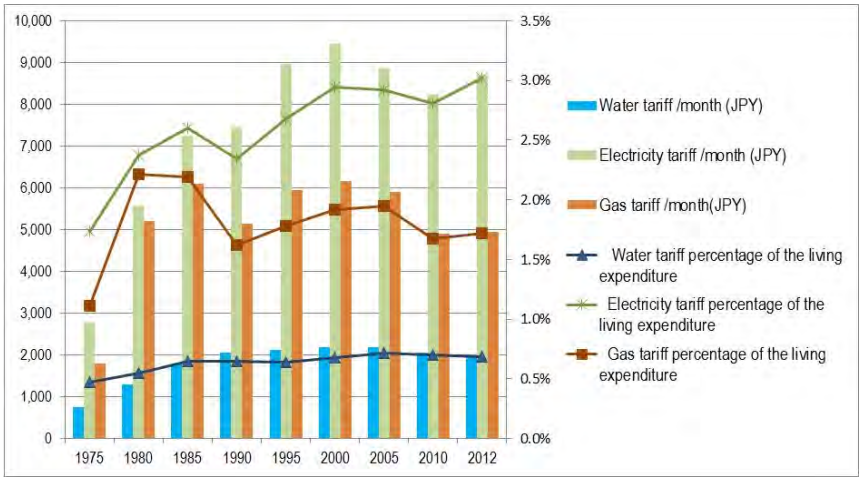
4. Consideration for the Low-Income Group

(1) Minimum Rate and Cross Subsidy in Water Tariff Structure



4. Consideration for the Low-Income Group

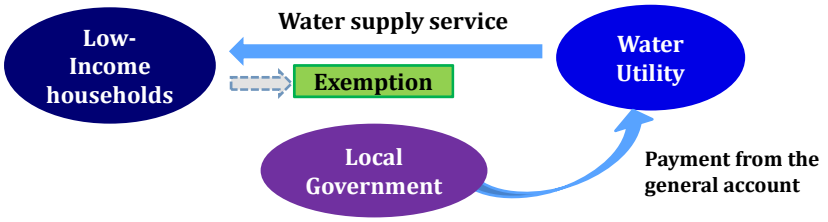
Water tariffs are affordable compared with electricity and gas



Source: Created from the data of JWWA, "*The Outline of Water Supply*," 6th ed. 2015.

4. Consideration for the Low-Income Group

(2) Water Tariff Exemption

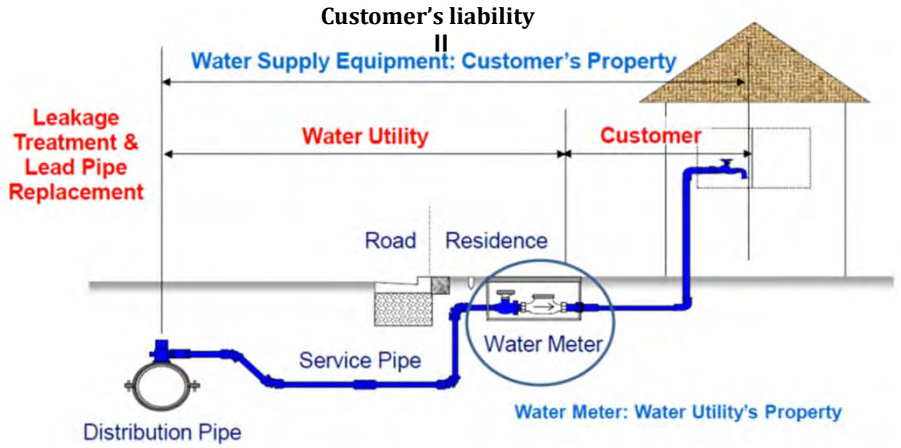


Example: Rules for Exemption from Minimum Charge in Water Tariffs in Tokyo

Recipient qualification	A household that receives public assistance, such as livelihood assistance, education allowance, home allowance, medical allowance, or nursing-care allowance.
Amount of exemption	Minimum charge and metered rate charge up to 10m^3/month.

4. Consideration for the Low-Income Group

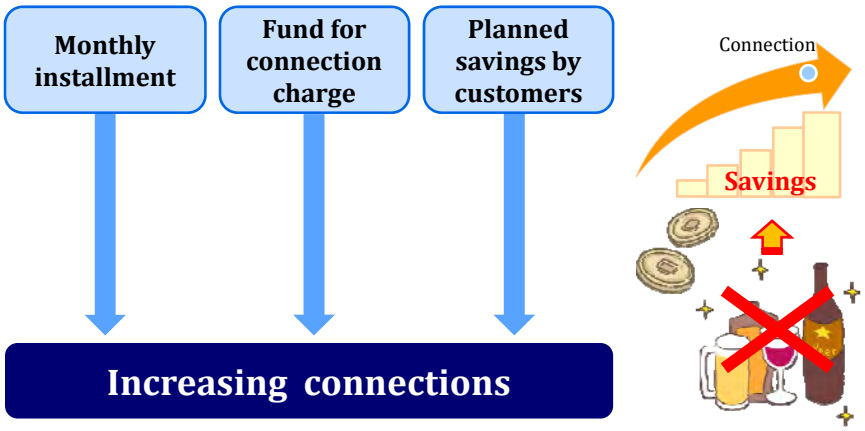
(3) Water Meter Policy & Connection Charge



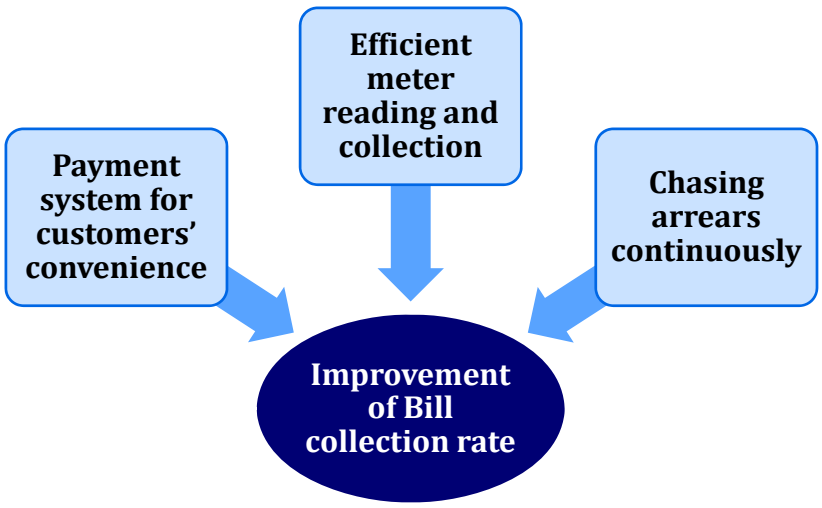
Source: JWWA

4. Consideration for the Low-Income Group

Financial Arrangement for Connection Charge



5. Billing and Collection



5. Billing and Collection

Example: Changes in Water Bill Collection and Handling of Unpaid Tariffs in Osaka Municipal Waterworks Bureau

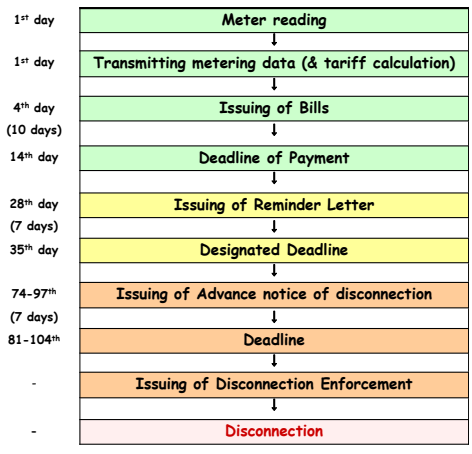
Period	Collection system	Remarks
1910 - 1930	Quarterly payment by customers	(Issue) Only 30% of customers paid water bills by due date. The office could lose track of customers if change of address was not reported.
1931	Introduction of monthly door to door collection	(Result) 99.9% collection rate was achieved in four years after the introduction, and 100% in nine years.
1966	Introduction of bank account transfers	(Result) More customers shifted to account transfers every year, helping improve the efficiency and reduced the need for cash handling.
		(Issue) Efficiency of door to door collection was lowered. Difficult to collect during daytime because more households had no one home during daytime, and the unpaid amount went up.
1975	Door to door collection system was abolished.	Tariff collectors were replaced by dedicated personnel assigned to receive and manage payments and settle unpaid bills. A manual on settlement of bills was prepared to set standard procedures for resolving overdue accounts.
	Gradual promotion of bank account transfer and expansion of financial institutions handling them	
1993	Start of handling payment in convenience stores (open 24/7) Payments can be made during holidays and at night.	

5. Billing and Collection

Example: Challenges and Solutions Concerning Meter Reading and Door to Door Collection System in the Bureau of Waterworks, Tokyo Metropolitan Government

- Incentives for bill collectors and meter readers
- Introduction of digital meters for accurate reading
- Trainings and standardization of works
- Chasing of arrears continuously (Improve convenience of customer's payment)

collection rate **99.9%**



Source: Training material of Nihon Suido Consultants., Co. Ltd..

6. Lessons Learned (1)

- **(Financial Sources for Water Supply Development)** Water supply facilities were developed by public enterprise bonds and. Utilities borrowed large sums at low interest rates and long repayment periods from public financial sources. Subsidies based on well-defined policy goals were granted. This government financial assistance contributed greatly to achieving universal access to water supply service. Public enterprise bonds are an effective and fair way to share the liability of the construction costs among existing and future customers. It is important to have a financial plan showing that water tariffs can generate enough revenue to cover debt repayment and demonstrate financial soundness .
- **(Subsidies for Nationwide Water Supply Coverage)** Although it is desirable to cover all expenses with the revenue from water tariffs, subsidies were required to achieve nationwide water supply coverage and develop water resources in Japan. Especially, in rural areas with small populations, it has been difficult to cover the construction costs of the facilities with tariffs alone.

6. Lessons Learned (2)

- **(Tariff Setting)** In Japan, water tariffs are set based on the following policies and principles: (1) Utility uses the fully distributed cost method and self-supporting accounting system, (2) financial liability for construction of facilities is shared equitably and there is absolute clarity in how tariffs are set, (3) efficient management of the utilities, (4) affordability, and (5) adequate information disclosure. It is important to have legal frameworks to provide the principles and standardized procedures to guide the tariff setting process. Utilities make continuous efforts towards efficient management and information disclosure so that customers clearly understand and support the water supply business.
- **(Affordability)** To support all households including low-income groups, water tariffs are made affordable by including a minimum volume in the minimum charge and implementing cross-subsidies. Exemption and reduced tariff systems are established as a welfare policy of the local government. Customers could pay by installments for costly new connections and were encouraged to save money systematically for the payments in the early stage of water supply development.

6. Lessons Learned (3)

- **(Increasing Bill Collection Rate)** Japanese water utilities have achieved bill collection rate of nearly 100% by shifting to a payment system that is convenient for customers under the financial services available. There are clear procedures for following up on unpaid bills and applying penalties as required. Training for meter readers and tariff collectors together with performance based incentives could also help raise collection rates. Installation of meters at all customers and keeping meter accuracy, have also contributed to high collection rates.

Institutional Management:

Governance,
Human Resources Development,
Consolidation of water utilities,
Public-Private Partnerships

"Let's drink tap water with the whole family"

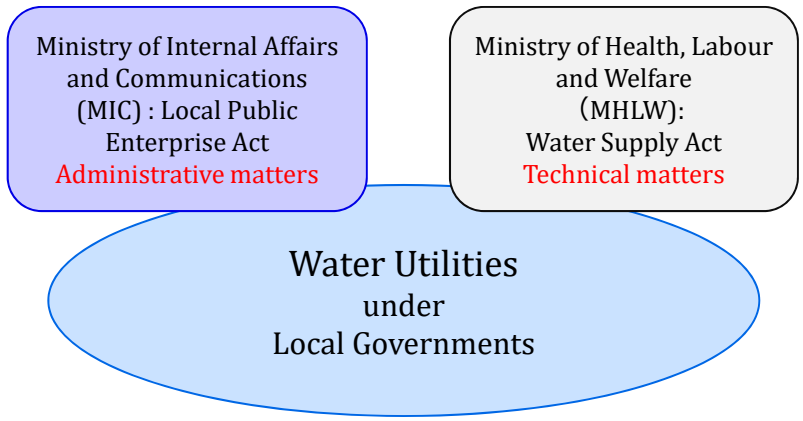
Poster of 58th Water Week in 2016
Source: Japan Water Works Association

No. T7 Ver. 1

Contents

1. Introduction

Water Supply Administration



1. Introduction

Frequently asked questions from participants of the water supply training courses

Q1. What is the governance of Japan's water utilities?

Q2. Why do Japan's water utilities emphasize business planning? What are the contents business plans?

Q3. How do Japan's water utilities develop capacities of human resources?

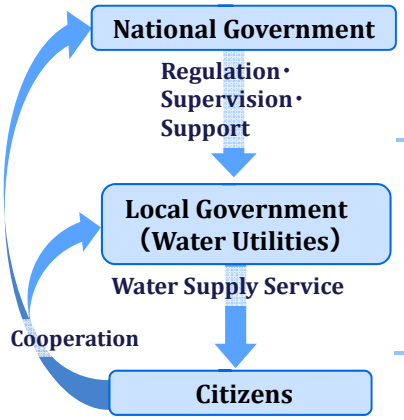
Q4. Do small and medium scale water supply utilities have any problems with finance and human resources? If they have problems, how do they attempt to overcome the problems?

Q5. How does Japan promote public-private partnerships in the field of water supply?

2. Governance

(1) Roles of the Government, Water Utilities and Citizens

Goal：Water supply for public health and good living environment



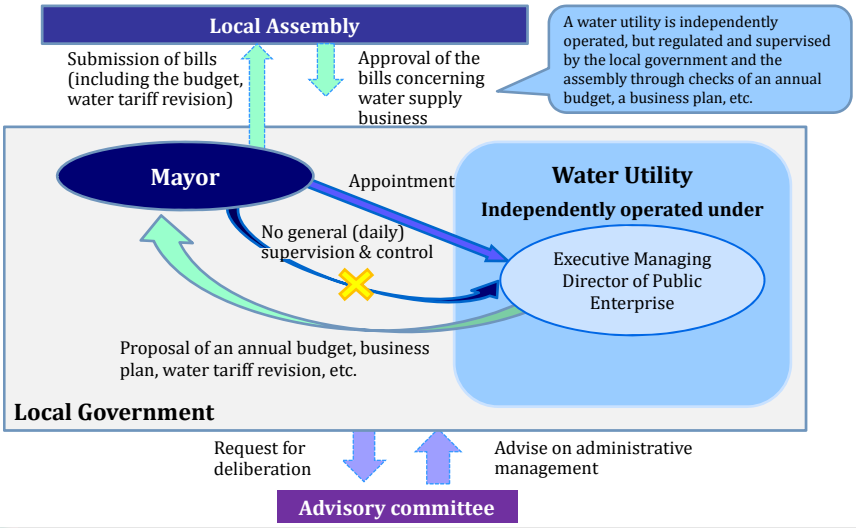
- Basic and comprehensive policies on water resources development and water supply development
- Technical and financial support to water utilities

- Policies/plans on water supply development, proper and reasonable water use, conservation of water sources and maintenance of water supply facilities
- Implementation of those plans
- Appropriate and efficient management of waterworks

- Cooperation with national and local policies
- Proper and reasonable water use

2. Governance

Regulation & Supervision of Water Utilities



2. Governance

(2) Roles of Executive Managing Director & Technical Administrator

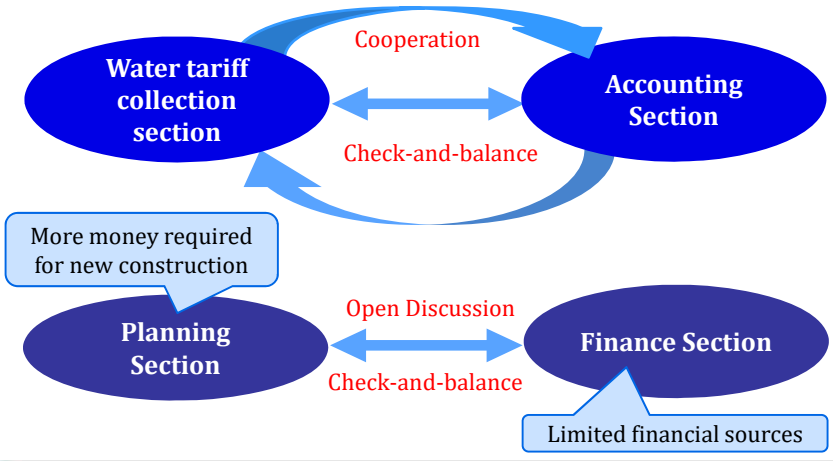
Administrative Management	Technical Management
Executive Managing Director of Public Enterprise	Technical Administrator
• Establishing necessary sections and/or department • Taking charge of employment/dismissal of employees, wages, work hours and other working conditions, punishment, training, etc. • Preparing a draft of the budget and the settlement of accounts • Preparing data for a motion to the local assembly • Acquiring, managing and disposing assets • Concluding agreements/contracts • Collecting tariff, fees other than tariff, contribution, and connection charges, etc. • Carrying out temporary borrowing	• Inspecting water supply facilities based on the standards for facilities • Conducting water quality inspection and facility inspection • Conducting inspection of the structure and material of service connections • Health checkups • Emergency suspension of water supply

Water utilities have been properly managed under the technical administrators and the executive managing directors of public enterprises

2. Governance

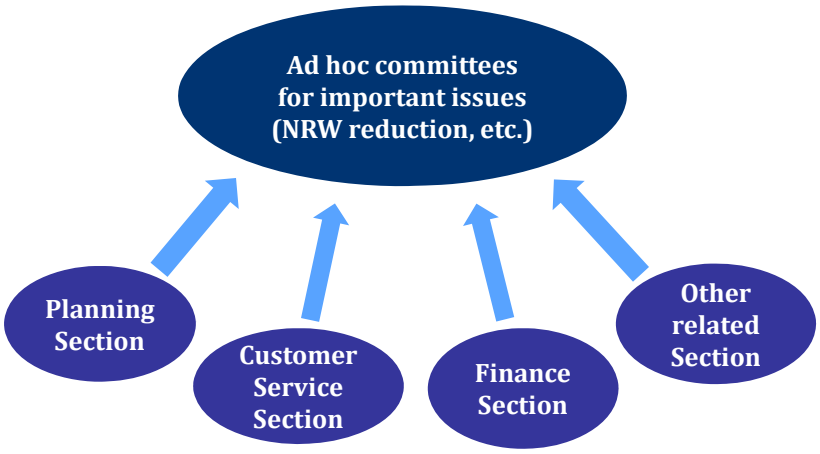
(3) Organizational Management

Example: Tokyo Metropolitan Government



2. Governance

Example: Tokyo Metropolitan Government (Cont'd)



2. Governance

(4) Advisory Committee

An advisory committee is an affiliated organization ruled by the *Local Autonomy Act* and conducts screening, deliberations, investigations, etc. of management of a local government.

Advisory committee ensures:

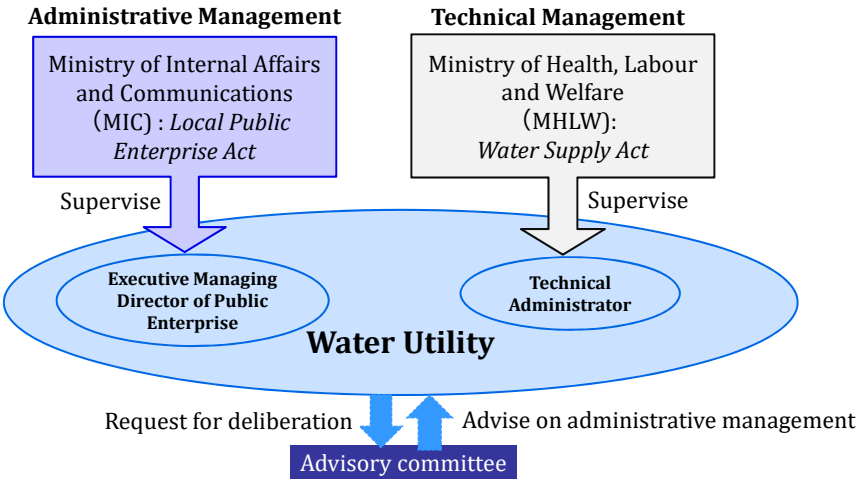
1. accountability and information disclosure (utility has to make the case for revisions);
2. objectivity in the decision-making process;
3. use of expert advice from members;
4. incorporation of customer input from representatives in the committee.

Advisory committee on waterworks management in Koriyama City

https://www.city.koriyama.fukushima.jp/481000/jogesuido/shingikai.html

2. Governance

(5) Concept of Governance for Water Utility



3. Business Plan and PDCA Cycle

Water Supply Development based on Plans

Postwar Recovery

Ongoing repairs of water supply facilities

Expansion

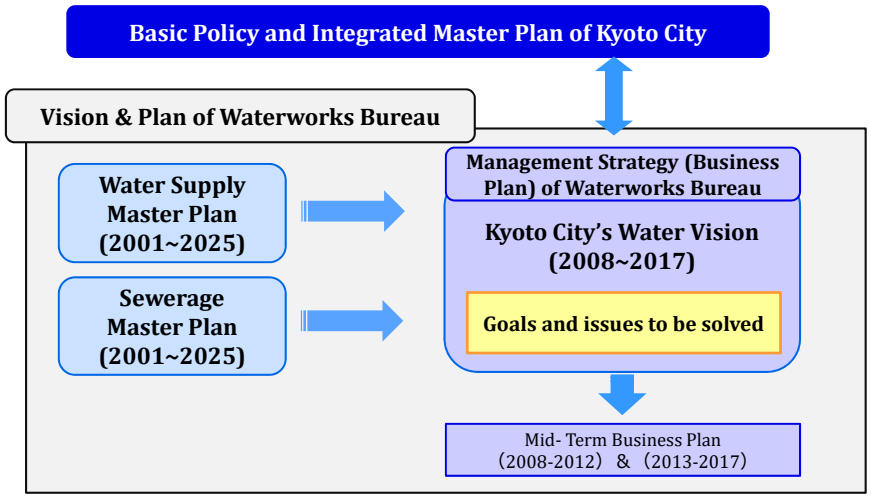
Water supply development based on master plans regulated by *the Water Supply Act*

Maintenance & Rehabilitation

Water supply business plan (including master plan) based on the future vision

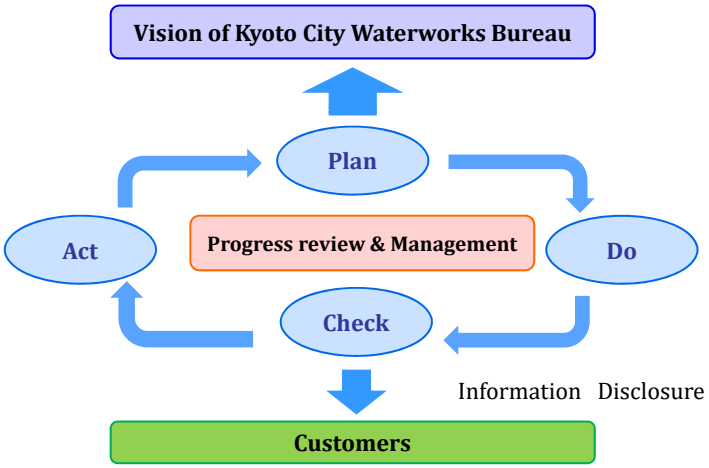
3. Business Plan and PDCA

Example: Kyoto City



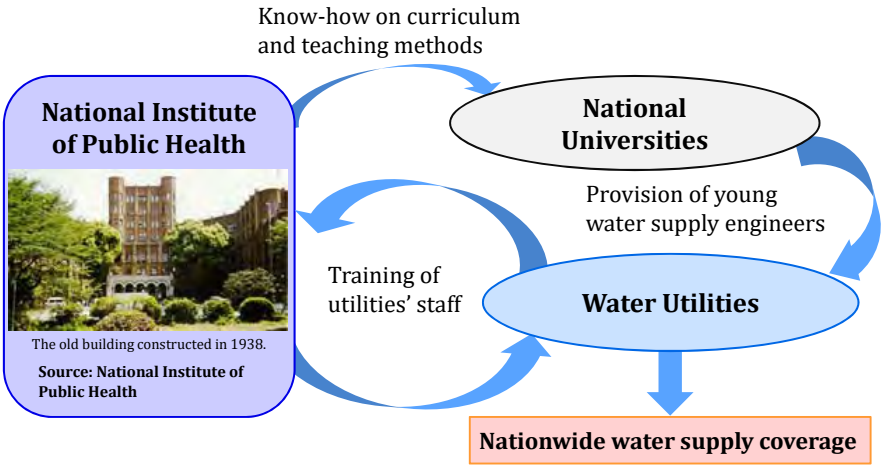
3. Business Plan and PDCA Cycle

Example: Kyoto City (Cont'd)



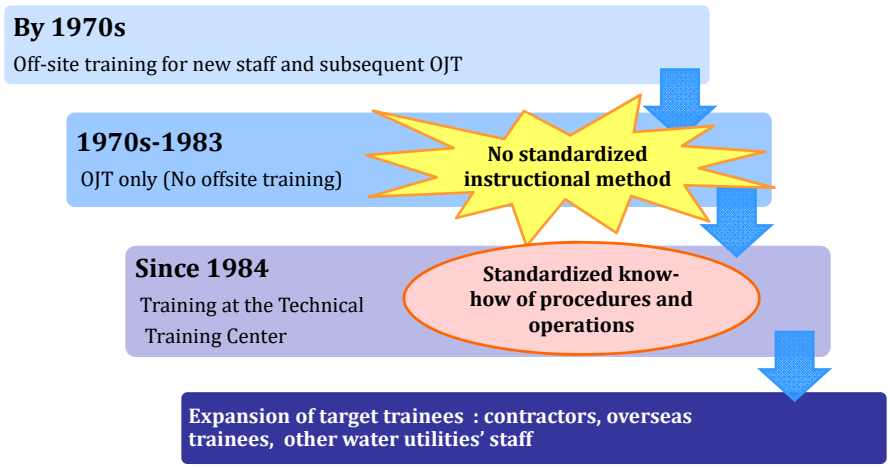
4. Human Resources Development

National Initiatives for Human Resources Development to Achieve Nationwide Water Supply Coverage



4. Human Resources Development

Example : Nagoya City



4. Human Resources Development

Example : Nagoya City (Cont'd)

Leak Detection

Valve Operation

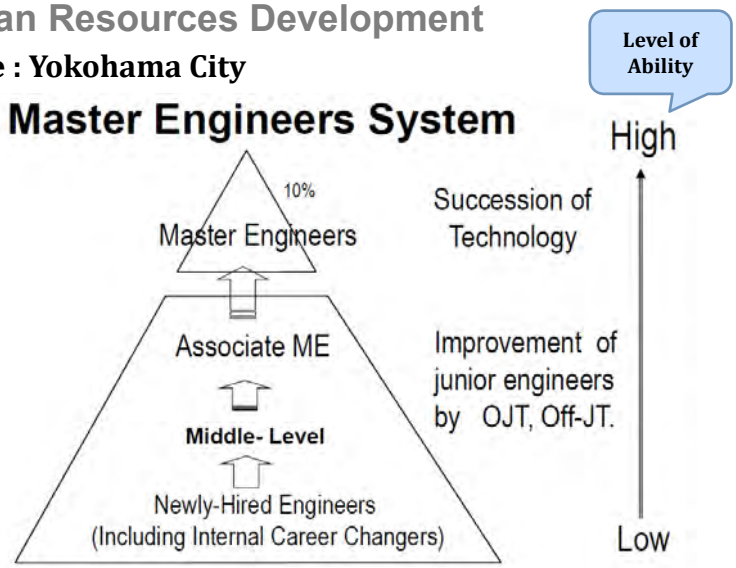
Leakage Repair

Endoscope

Source: Presentation materials by the Nagoya City Waterworks and Sewerage Bureau in the Report of "*The Third Executive Forum for Enhancing Sustainability of Urban Water Service in the Asian Region*", August 2014

4. Human Resources Development

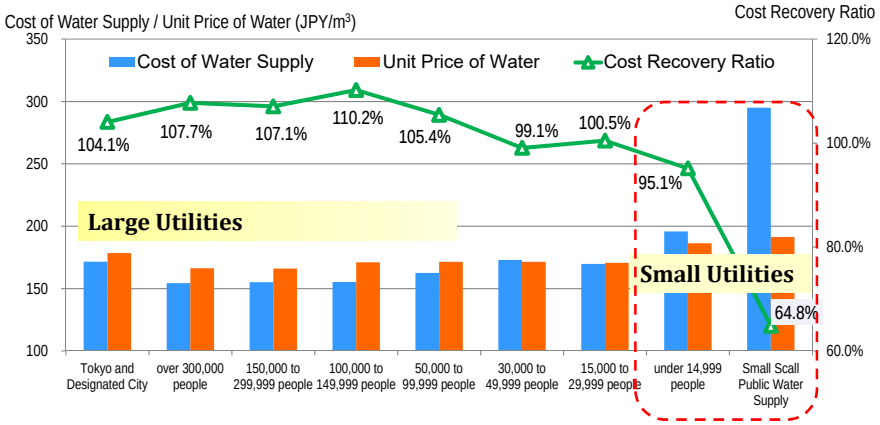
Example : Yokohama City



Source: Presentation materials by the Yokohama Waterworks Bureau for "*The Third Executive Forum for Enhancing Sustainability on Urban Water Service in Asian Region, 2014*"

5. Management of Small and Medium Scale Utilities

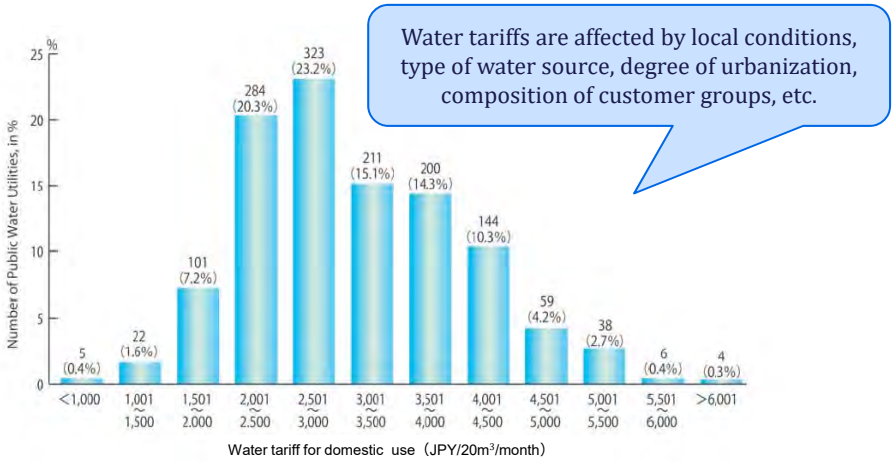
(1) Challenges of Small & Medium Water Supply Management



Source: Created from the data of "*Survey of financial status of local public enterprises, FY 2014*"

Cost recovery in water supply business by size of operation (2014)

5. Management of Small and Medium Scale Utilities



Source: JWWA, *Comfortable Life with Water Supply and Transition of Water Supply Volume*, http://www.jwwa.or.jp/shiryou/water/water.html

Tariff Differential among Water Utilities

5. Management of Small and Medium Scale Utilities

(2) Towards Regional Collaboration

1960s

Rapid increase of water demand, construction costs and water tariffs, deterioration of water sources, inadequate operation and maintenance of small scale water supply

1966

System of "A joint public services authority" was introduced

1977

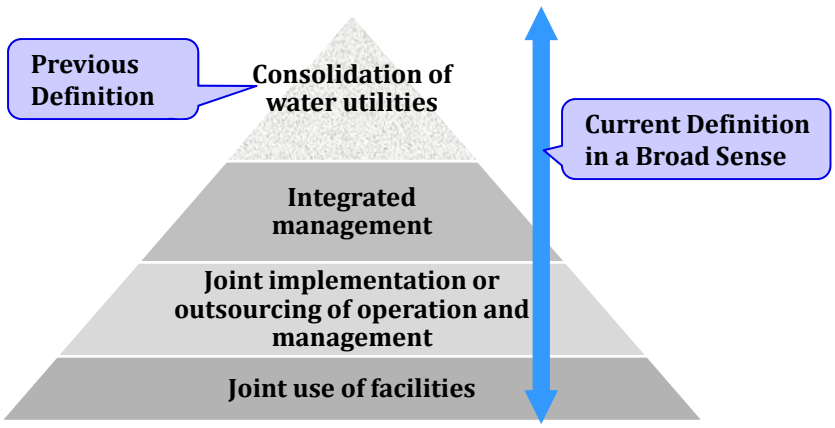
Regional Planning for Water Supply Services was included in Water Supply Act

2000s

Expansion of the concept on regional collaboration

5. Management of Small and Medium Scale Utilities

Previous and New Definition on Regional Collaboration of Water Utilities

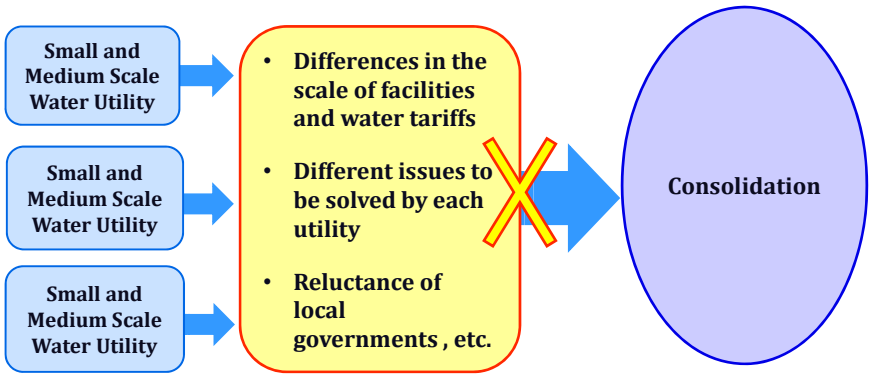


Source: JWWA "*Guidelines for the Consideration of Broadening of Water Supply: For the Promotion of Water Supply Vision*"

5. Management of Small and Medium Scale Utilities

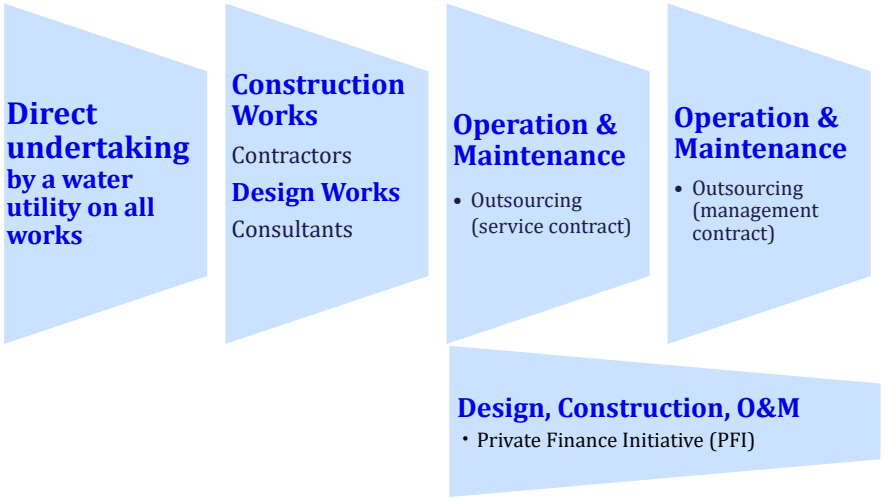
(3) Constraints on Consolidation

There are constrains to be overcome in order to consolidate utilities



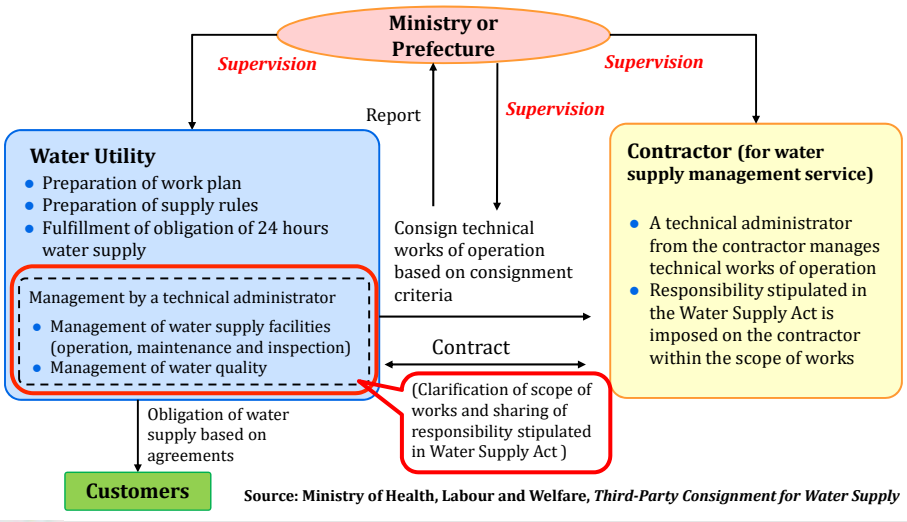
6. Public and Private Partnerships

(1) Increasing Roles of Private Sector



6. Public-Private Partnerships

(2) System for Delegation to a Third Party

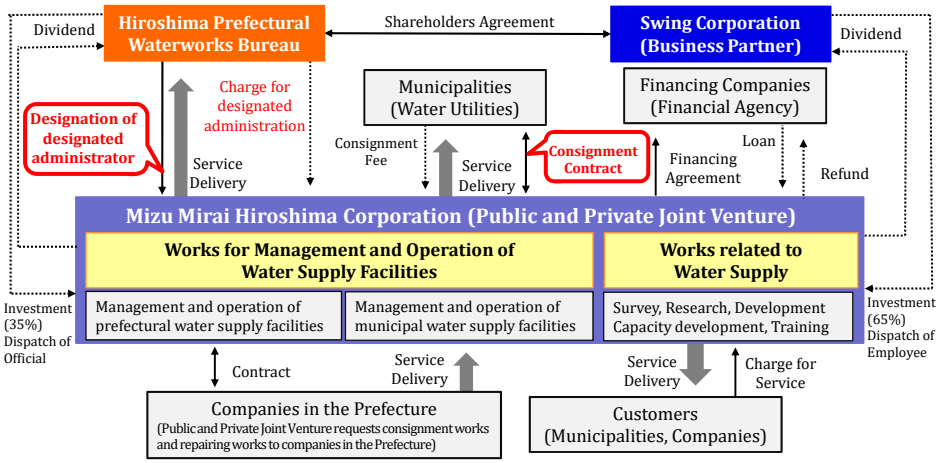


Source: Ministry of Health, Labour and Welfare, *Third-Party Consignment for Water Supply*

6. Public-Private Partnerships

(3) Designated Administrator System

Example : Mizu Mirai Hiroshima



Source: Mizu Mirai Hiroshima Corporation *"Joint efforts of citizens in Mizu Mirai Hiroshima"*, Water Technology Journal, October 2014

6. Public-Private Partnerships

(4) PFI: Private Finance Initiative

Stagnating economic environment and the critical financial deficits of national and local governments

Act on Promotion of Private Finance Initiative (PFI Act) **in 1999**

Development of public facilities through the utilization of private finance, management abilities and technical capabilities within the law and guidelines

Examples of PFI projects:

- BOO (Build Own Operate)project for development of power-generating facilities (cogeneration system) in water treatment plants in Tokyo
- BTO (Build Transfer Operate) project for development of sludge treatment facilities in water treatment plants in Aichi prefecture

Kawai Purification Plant by PFI Scheme, (BTO) Yokohama City

7. Lessons Learned (1)

- **(Governance of Water Utilities)** Water utilities are managed as independent public enterprises. They are responsible for their own human resources management, having the ability to improve staff competence. The job and qualification of the technical administrator is clearly defined and the utilities take the responsibility for all technical matters and for managing the operations effectively.
- **(Supervision by the Local Government)** While the water utility is independent in its operations, the local assembly maintain the oversight responsibility through the approval of annual budgets and business plans. An advisory committee supports the utility's management by providing opinions and recommendations.
- **(Business Planning and PDCA Cycle)** The business plan guides the utility's staff towards a goal to promote more effective operation. By following the PDCA cycle from a plan to check, the utility also reinforces the operational system.

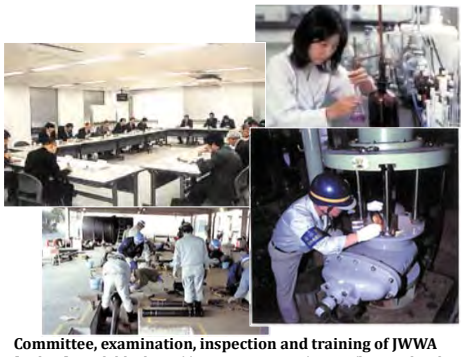
7. Lessons Learned (2)

- **(Training)** In addition to subsidies and the development of technical guidelines/ standards, human resources development has been essential to the establishment and operation of water supply systems across the country. Research institutions and universities provide formal training to develop the required expertise. It is necessary for utilities to establish internal training systems and utilize external training programs for sustainable human resources management.
- **(Regional Collaboration)** When constructing water supply systems, sustainability of operation and management after construction needs to be considered. Small-scale utilities built during the implementation of nationwide water supply coverage generally face difficulties with cost recovery and staff shortage. Consolidation and collaboration of operations across a region are the ways to improve the economies of scale and are promoted utilizing the national subsidies.

7. Lessons Learned (3)

- **(Private Sector Involvement)** The municipalities maintain the ownership of the utilities because of the importance of ensuring that the public health objectives such as water quality are achieved water utilities of municipalities implemented all works by themselves at first. After that, the private sector began to be involved first in the construction of facilities, then gradually in design, meter reading and operation of water treatment plants.
- **(Regulatory Framework)** As the private sector is getting more involved in the water supply business, qualification system, standards and regulations are established to maintain the quality of products and services without compromising competitiveness. A transparent system for supervision is also needed to ensure compliance to regulations on quality of service in the delivery of safe, affordable drinking water. The roles and responsibilities of public and private partners (risk sharing) must be always clearly stated in the contract.

Collaboration among Water Utilities:
Japan Water Works Association



Committee, examination, inspection and training of JWWA
[Online] Available: http://www.jwwa.or.jp/jigyou/kensyu.html

No. C1 Ver. 1

Contents

1. Introduction

History of Japan Water Works Association (JWWA)

Year	Activities of Japan Water Works Association
1904	1st meeting of Federation of Water Authorities held under the theme of "Standardization of water testing methods"
1914	"*Specifications for Cast Iron Pipe for Water Supply*" (prior to JWWA standards) was established.
1932	Water Works Association founded, held 1st board meeting and general assembly. The first issue of *Journal of Japan Water Works Association* was published.
1933	Standing committees were formed.
1934	Quality inspection service for iron pipes started
1953	Printed and distributed "*Water Supply Facilities Maintenance Manual*" developed by the Ministry of Health and Welfare. Published "*Seismic Design and Construction of Water Supply Facilities*"
1955	Joined International Water Supply Association (IWSA, current IWA) as a corporate
1958	Started training programs. Published "*Guidelines for Water Supply Facilities Standards*"
1997	Launched Quality Certification Center, started qualification certification service.
2006	Revision of "*Water Supply Facilities Maintenance Manual*" (5th edition)

2. Establishment of Japan Water Works Association

(1) History of JWWA Activities

Water supply started;
1887 Yokohama City
1891 Nagasaki City
1895 Osaka City
1898 Hiroshima City
1898 Tokyo City
:

Construction of water supply systems is promoted.

Construction of modern water supply systems started.

Facilities were designed by foreign engineers.

Little know-how about operation and management

No advice from the national government

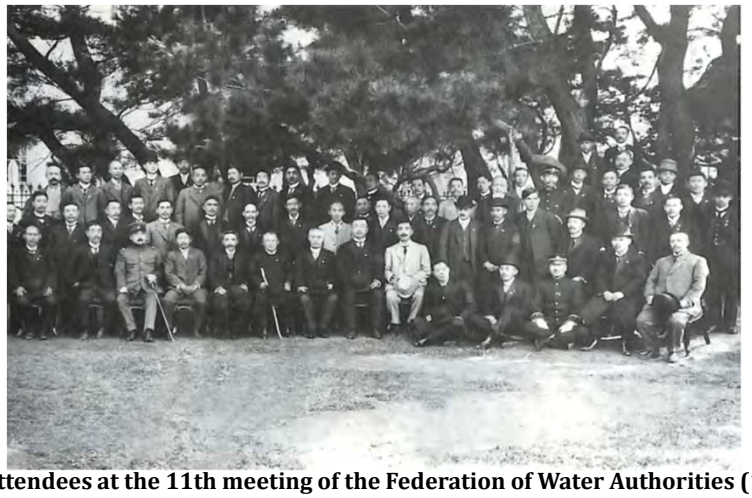
Discussion among water utilities

In 1904, the 1st Federation of Water Authorities (on standard methods for the examination of water quality)

Annual meetings were held to discuss about topics on operation and engineering.

In 1932, Incorporated Association "Water Works Association" approved by Minister of Interior

2. Establishment of the Japan Water Works Association



Attendees at the 11th meeting of the Federation of Water Authorities (1913)

JWWA, Federation of Water Authorities, *One Hundred Years' History of Japan Water Works Association* (2004).

2. Establishment of Japan Water Works Association

(1) History of JWWA Activities

1914 Standard for cast iron pipe in waterworks	Predecessor of JWWA standard
1932 Incorporated Association "Water Works Association" approved by Minister of Interior	Renamed as Japan Water Works Association later
1932 Publication of *Journal of Japan Water Works Association*	Mainly academic research, case reports and information exchange
1934 Inspection Service started	Turned into main income resource later
1954-1971 Petition for national subsidy	Petitions for national subsidy, reform of system and bond floatation, etc.
1958 Training Programs started	Training for technical administrators of waterworks and other programs are added later
1997 Quality Certification Service started	Based on deregulation measures introduced by the state government

3. Activities of Japan Water Works Association

(2) Committees

Management Standing Committee	Research and development concerning waterworks management
Engineering Standing Committee	Research and development concerning waterworks technology
Water Quality Standing Committee	Research and development concerning water quality management
Special task forces	Established as necessary
Other committees such as publication and inspection	

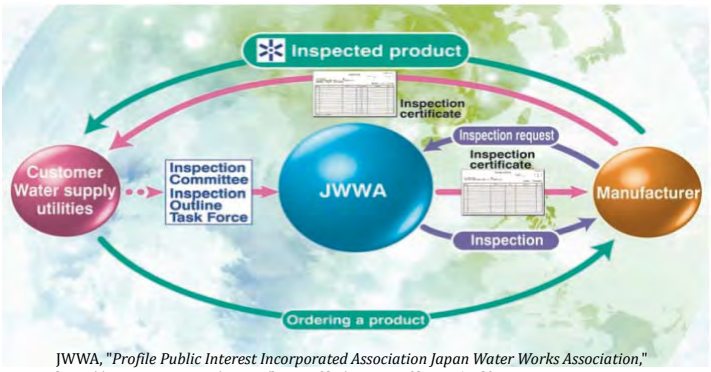
- Committees are the foundation of JWWA's expertise.
- Members are assigned mainly from large water utilities.

3. Activities of Japan Water Works Association

(3) Product Inspection Service

Inspection by each water utility

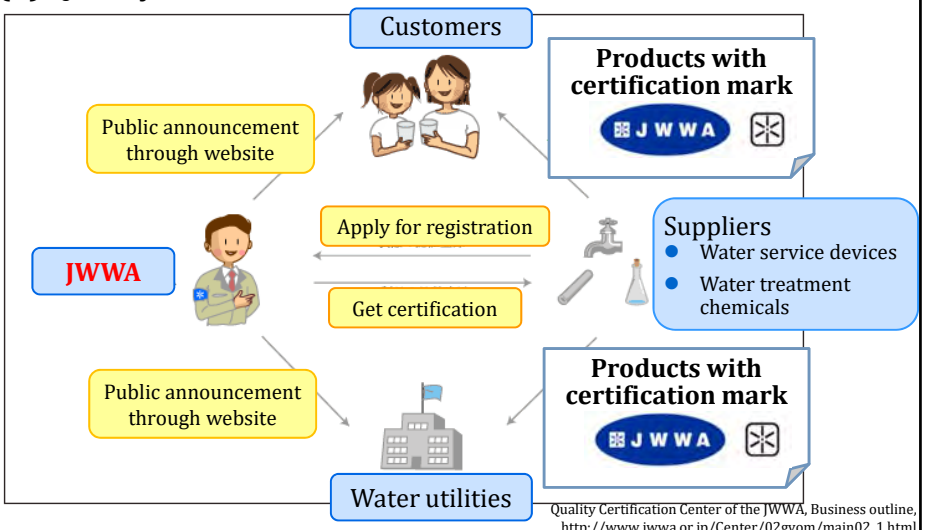
Inspection by JWWA
- Standards for materials and equipment
- Improving efficiency of inspection



JWWA, "*Profile Public Interest Incorporated Association Japan Water Works Association*," http://www.jwwa.or.jp/jigyou/kaigai_file/JwwaProfile2015.pdf

3. Activities of Japan Water Works Association

(4) Quality Certification Service



Quality Certification Center of the JWWA, Business outline, http://www.jwwa.or.jp/Center/02gyom/main02_1.html

3. Activities of Japan Water Works Association

(5) Training programs

Management courses	Training for director generals (Executive Managing Director)
	Water utility management
	Practical training for collection of unpaid water bills
Technical courses	Training for technical administrators of waterworks
	Training for water supply engineers
	Training for water leak prevention
	Practical training for water purification plant operation

3. Activities of Japan Water Works Association

(6) International Activities

1955	Joined International Water Supply Association (IWSA)
1978	Established the agency office of the 12th World Congress of IWSA
1987	・Established JWWA's International Committee ・Joined the Asia-Pacific Group (ASPAC) of IWSA ・Cooperative research with American Water Works Association (AWWA)
1999	Represents the International Water Association (IWA) in Japan since the establishment of the IWA
	・JICA's training programs ・Overseas training and Senior Technical Experts for Developing Countries ・Establishing Waterworks Associations and Friendship Associations

3. Activities of Japan Water Works Association

(7) *Design Criteria for Water Supply Facilities*

- *Guidelines for Water Supply Facilities Standards* 1958
- *Guidelines for Water Supply Facilities Standards* 1966
- *Design Criteria and Guidelines for Water Supply Facilities* 1977
- *Design Criteria and Guidelines for Water Supply Facilities* 1990
- *Design Criteria for Water Supply Facilities* 2000
- *Design Criteria for Water Supply Facilities* 2012

Revised every decade

The latest information at the time of publication

Easy access to the latest information for the small and medium scale utilities

Nationwide standardization of water supply facilities

3. Activities of Japan Water Works Association

(8) *Water Supply Facilities Maintenance Manual*

- *Water Supply Facilities Maintenance Manual* 1953; the first edition
- Revised five times
- *Water Supply Facilities Maintenance Manual* 2006; the latest edition (undergoing it's sixth revision)

Standardization of maintenance

Accordance with :
- Introduction of outsourcing to a third party
- Reinforcement of water quality management
- Diversity of water treatment

(9) *Seismic Design and Construction Guidelines*

- *Seismic Design and Construction of Water Supply Facilities* 1953 ; the first edition
- Revised four times
- *Seismic Design and Construction Guidelines for Water Supply Facilities* 1997; the latest edition (undergoing revision after the 2011 Great East Japan Earthquake and 2016 Kumamoto earthquakes)

Standardization of seismic design and construction

Incorporating lessons learned from the Great Hanshin/Awaji Earthquake in 1995

3. Activities of Japan Water Works Association

(10) Disaster Response

Supporting activities by water utilities in various places

The Great Hanshin/Awaji Earthquake in 1995 → *Report on emergency response in earthquake and disasters* 1996

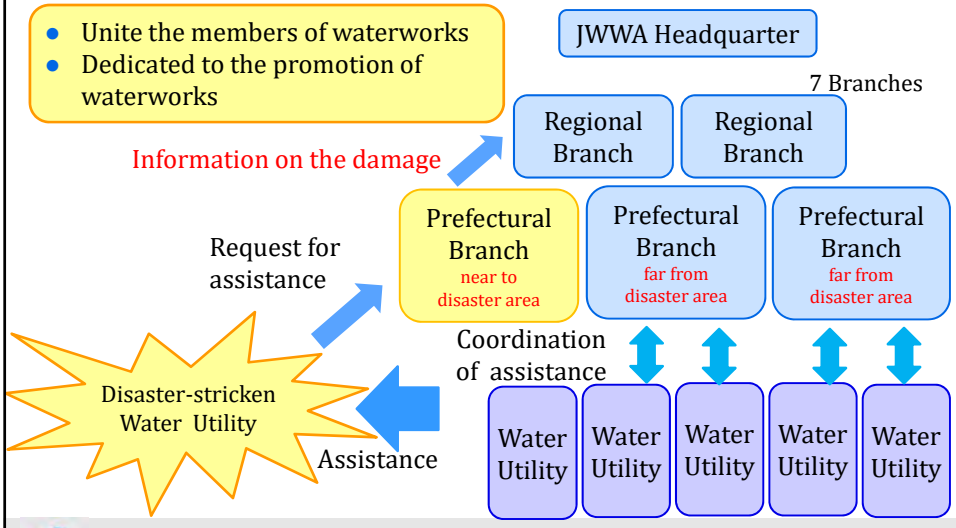
Chuetsu Earthquake in 2004
Noto Earthquake in 2007
Chuetsu Offshore earthquake in 2007
→ *Manuals of emergency response in earthquake and disasters* 2008

The Great East Japan Earthquake in 2011
Kumamoto Earthquake in 2016
→ Being revised based on experience from the recent earthquakes

3. Activities of Japan Water Works Association

"Suido Ikka" (Waterworks Family)

- Unite the members of waterworks
- Dedicated to the promotion of waterworks



3. Activities of Japan Water Works Association

Emergency Response for the Great East Japan Earthquake by JWWA(1)

The Great East Japan Earthquake

- March 11, 2011 at 14:46
- Magnitude 9.0 centered around the Iwate, Miyagi and Fukushima
- Tsunami in large area
- Suspension of water supply ; 2.56million households

Water tanker in Iwate prefecture

Set up of Relief headquarters at JWWA
↓
Reorganized as the Great East Japan Earthquake Reconstruction Support Headquarters

Information

Arrangement

Assistance in emergency
- Water utilities; 550
- Water tankers; 13,500
- Total supporters; 41,000

Restoration support
- Total supporters; 3,500
- Repair of breaks and leaks

3. Activities of Japan Water Works Association

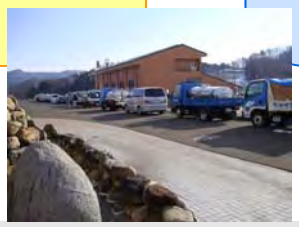
Emergency Response for the Great East Japan Earthquake by JWWA(2)

The Relief Headquarters

- Arrangements for dispatching water tankers
- Collection of information on extent of damage
- Communication and coordination with Ministry of Health, Labour and Welfare and water-related organizations

Reconstruction Support Headquarters

- Collection of information on extent of damage
- Communication and coordination with Ministry of Health, Labour and Welfare and water-related organizations



Vehicles gathered from various regions in front of the Iwate Prefectural Branch

4. Financial Structure of Japan Water Works Association

(1) Membership Fees

Amount of annual membership fee depends on scale of water utility.

・Fixed fee 43,000 JPY
・Variable annual membership fee depends on annual revenue water. (diminishing system)

- Annual revenue water 1 million m^3 (10,000 in population); 73,000 JPY
- Annual revenue water 30 million m^3 (300,000 in population); 420,000 JPY
- The largest utility (Tokyo) ; 5,500,000 JPY

Total number of utilities; 1,482
Water supply utilities; 1,388
Utilities for bulk water supply; 94

The number of JWWA members; 1,361
=92% of the total utilities

4. Financial Structure of Japan Water Works Association

(2) Changes in Revenue Sources

Founded in 1932.
2-4 million JPY in present value

Inspection Services started in 1935.
Approximately 9million JPY

Deregulation of inspection services was decided in 1996.
5.7 billion JPY

Decrease in inspection services caused by revision of the rules for inspections.
In 2014,
3 billion JPY

5. Other Organizations in the Water Supply Sector

Japan Small Scale Water Works Association	Support for Small Scale Public Water Works; Publishing handbook for national subsidy
Japan Water Research Center	Information collection, research and development activities, public promotion and others about the waterworks technology
Federation of Japan Water Industries, Inc.	Technical collaboration among private companies
Japan Water Plumbing Engineering Promotion Foundation	Promotion of water plumbing engineering
Japan Finance Organization for Municipalities	Joint financing for bond floatation
Nihon Suido Shimbun Suidou Sangyou Shimbun	Specialized newspaper concerning water supply, semi-weekly

6. Lessons Learned (1)

- **(Cooperation among Water Utilities)** JWWA was founded through discussions among water utilities on water quality, and operation and management of water supply. Cooperation among members plays a critical role in sharing knowledge and experience and mutual support in case of disaster response.
- **(Communication between Government and Utilities)** JWWA plays an important role in facilitating communication between the national government and water utilities, e.g. it disseminates and draws its members' attention to national policies and lobbies for government support on behalf of the utilities.
- **(International Activities)** JWWA participates at the International Water Association (IWA) board meetings in coordination with the Japan Society on Water Environment. JWWA contributes to overseas training, dispatches experts and supports establishment of waterworks associations in developing countries.

6. Lessons Learned (2)

- **(Materials and Equipment Quality)** JWWA develops standards for materials and equipment, and guarantees their high quality level with its inspection and quality certification services.
- **(Publication of Guidelines)** JWWA publishes the "*Design Criteria for Water Supply Facilities*," "*Water Supply Facilities Maintenance Manual*," and "*Seismic Design and Construction Guidelines for Water Supply Facilities*" to provide the latest information to water utilities. These publications have contributed to stable operation of water supply nationwide even in rural areas.
- **(Disaster Response)** Natural disasters occur frequently in Japan. JWWA organizes disaster response activities and makes valuable and significant contribution to effective emergency response and restoration of damaged utilities.

6. Lessons Learned (3)

- **(Financial Structure)** JWWA's revenue comes from membership fees and revenue generating services such as inspection and certification, which contribute substantially to its sound financial foundation. The income generating services contribute to the improvement of the water supply industry. However, the income from these services is declining because of recent regulatory changes. The revenue sources of the association need to be diversified in order to mitigate the risk caused by changes of regulations and business environment.

Water Resources Development:
Yodo River System, Okinawa Prefecture and Fukuoka City

Water tanker for the drought of 1978

Source: Fukuoka City Waterworks Bureau, "Waterworks Technologies of Fukuoka City; Overcoming Water Shortages"
http://www.city.fukuoka.lg.jp/data/open/cnt/3/1796/1/English.pdf

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Contents

1. Introduction

Water source	Surface water	Rivers	25.5% (3.91 billon m^3/year)
		Dam reservoirs	47.3% (7.25 billon m^3/year)
		Lakes	1.4% (0.22 billon m^3/year)
	Riverbank infiltration		3.6% (0.54 billon m^3/year)
	Ground water	Shallow wells	6.6% (1.01 billon m^3/year)
		Deep wells	12.7% (1.95billon m^3/year)
	Others		2.9% (0.45 billon m^3/year)
Total			100.0% (15.33 billon m^3/year)

Breakdown of water sources in Japan(2014)
Source : Japan Water Works Association
http://www.jwwa.or.jp/shiryou/water/water02.html

2. Background of Water Resources Development

(1) Water Rights

Cylindrical Siphon to allocate water equally, built in 1938 at Rokugou town, Akita Prefecture
http://www.pref.akita.jp/fpd/tuchi/nanataki.htm

Early Japanese society depended on rice crops so it was a serious problem to allocate water resources to drinking water use

↓

Conflict with agricultural water use

↓

Early understanding of the importance of well-ordered water allocation

↓

1896 Former River Act →The concept of licenses for water use

↓

1961 Maturity of water rights with enactment of Act on Advancement of Water Resources Development

2. Background of Water Resources Development

(2) Comprehensive River Development

In Japan, in order to increase the capacity for water supply to meet increasing demand, water resources development was implemented centering on multipurpose dams under the Comprehensive River Development Project, which took a holistic approach to water use and flood control.

1930s
River Water Control Plan
Flood control, Irrigation and Power generation

1937
River Water Control Project
Target the seven rivers

1951
Comprehensive River Development Project
Develop the relevant laws

1962
Japan Water Agency inaugurated
Basic Plan for Water Resources Development created

2. Background of Water Resources Development

(3) High Economic Growth and Drought in Urban Areas

1950-1970s Rapid increase in the demand for municipal water supply because of the rapid growth of population and economy

↓

Frequent water shortages

↓

- Water resource development (multipurpose dams etc.)
- Water saving
- Smooth adjustment of water allocation during drought
- Support for upstream reservoir areas from downstream users

2. Background of Water Resources Development

(4) Act on Advancement of Water Resources Development and Water Resources Development Public Corporation

1961 Act on Advancement of Water Resources Development

【Purpose】
- Comprehensive water resources development
- Rationalization of water use

【Role】
- Designation of priority river basins
- Determination of the Basic Plan for Water Resources Development
- Installation of the advisory committee
- Designation of responsible organizations to implement the basic plans

1962 The establishment of Water Resources Development Public Corporation (later renamed to the Japan Water Agency)

2. Background of Water Resources Development

(5) Bulk Water Supply

In Japan, the bulk water supply project provided the large-scale development of water resources for bulk treated water supply to large regional areas. The project contributed to securing water sources and reducing investment costs.

It was difficult for **small** water utilities to **secure water sources**.
- High cost
- Unstable sources
- Disparity of water sources among utilities

Consolidation of the whole utilities was **difficult**.
- Long process
- Conflict of interests
- Principle of municipal management

Prioritize the securement of water sources

→ The start of Bulk Water Supply Utilities

2. Background of Water Resources Development

The advantage of Bulk Water Supply Utilities

- Sharing of cost for securing water resources
- Reduction in maintenance costs
- Stabilization of water resources

The disadvantage of Bulk Water Supply Utilities

- Bulk water purchase contracts are for long-term fixed amounts which limits the ability to pass on any cost benefits for water saving to end users.
- Scaling-down of end user utilities → Decrease in technical capabilities and shortfall in human resources

2. Background of Water Resources Development

(6) "New" Water Sources

Water resources development in Japan

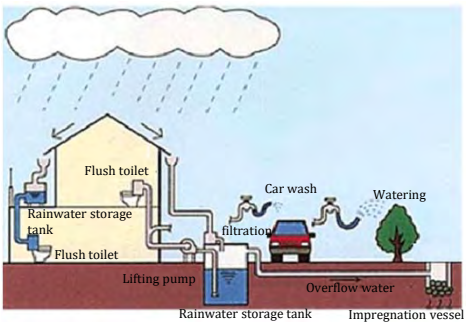
- Promotion of efficient use of water
- Improving efficiency of waterworks by reducing water leakage etc.
- Raising awareness for using water wise

Efforts in areas where drought occurs frequently:

- Rainwater harvesting for non-potable water
- Water recycling for non-potable water
- Seawater desalination

2. Background of Water Resources Development

Rainwater Harvesting in Sumida City, Tokyo



1981 Start rainwater harvesting in "Ryogoku Kokugikan" the Sumo Stadium

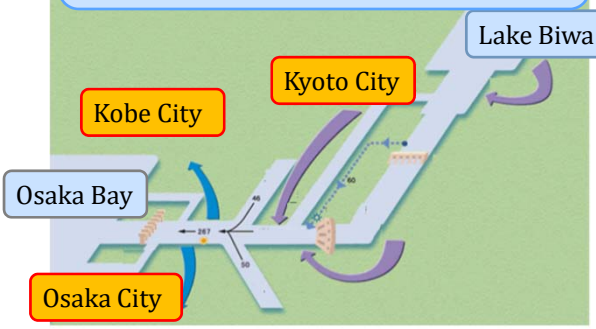
【 Purpose 】

- Effective use of rainwater
- Water supply in the event of a disaster
- Urban flood control measures

3. Case 1: Yodo River System Water Resources Development

(1) Background on Development of Yodo River System

The majority of water used upstream is discharged back to the Yodo River and used again by multiple downstream users.



Catchment area 8,240km^2
Population in the basin about 12 million

Kyoto city and many regional cities

High-density water use for various purposes

Pioneering role in comprehensive development for flood control and water use

Water use in the Yodo River Basin

Ministry of Land, Infrastructure and Transport Yodogawa River Office, "*Water use of the Yodo River*," http://www.yodogawa.kkr.mlit.go.jp/know/data/use/index.html

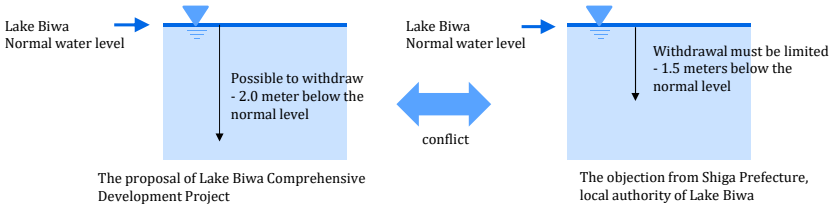
3. Case 1: Yodo River System Water Resources Development

(2) Securing Water Resources for Downstream Water Utilities

1942	Yodo Basin Flood Control Basic Plan Yodo Basin Water Resource Development Basic Plan	• Flood control and water use were considered separately
1952	Yodo Basin Consolidated Master Plan 1st stage (1943～1952)	• Reallocate flood control capacity to water resources
	Rapid demand growth	
1962	Yodo Basin Water Resource Development Basic Plan (full plan) (1962)	• Using amount required for maintaining normal river function • Construction of dams
	Still demand exceeds resource	
1972	Lake Biwa Comprehensive Development Plan (1972)	• Not only water use and flood control but also water quality management and conservation of aquatic environment

3. Case 1: Yodo River System Water Resources Development

To secure water sources to meet water demands and control floods, Act on Special Measures concerning Development of Lake Biwa was enacted in 1972. Under the law stakeholders made a compromise deal.



- - 2.0 m below normal level: Estimated water level for water control and utilization
- Water intake below - 1.5 m : Requires the approval of the Ministry of Construction

Such efforts successfully secured water resources to meet the demand in the large cities located downstream such as Osaka and Kobe. In the 1990s, the water demand reached a peak, and since then, water demand in those cities has been stable.

4. Case 2: Securing Water Resource in Okinawa Prefecture

(1) History of Okinawa Prefecture and its Water Shortage

Per capita water resources potential is only 60% of the national average.

Steep short rivers

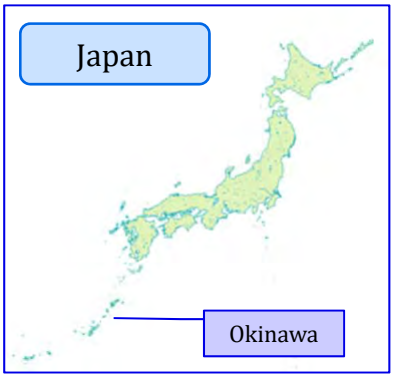
Small watersheds

Scarce water resources

Frequent water service suspension until 1994

Various activities

There has been no water service suspension related to water resource shortage since March 1994.



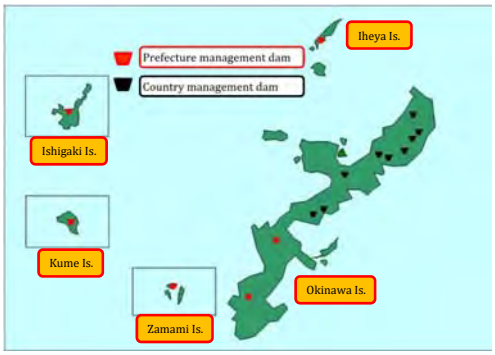
4. Case 2: Securing Water Resource in Okinawa Prefecture

(2) Dam Development

The River Act, enacted in 1964, stipulated that the rivers in Okinawa should be governed by the prefecture.

In 1971, Act on Special Measures for the Promotion and Development of Okinawa was enforced and it included a special provision of the River Act to allow the state government to construct dams, in order to promote water resources development in Okinawa.

1974 Completion of Fukuchi Dam; Construction of another nine dams in the north



Dams in Okinawa Prefecture

Okinawa Prefectural government, http://www.pref.okinawa.jp/site/doboku/damu/kanri/ken-damu.html

4. Case 2: Securing Water Resource in Okinawa Prefecture

(3) Rainwater Utilization

Rooftop tank in Okinawa Prefecture

Countermeasure against frequent droughts

- Residents installed rainwater reservoirs on the rooftop
- Rooftop tanks were used to store tap water and rainwater until stable water resources were developed.

The custom of installing a storage tank still remains even now.

4. Case 2: Securing Water Resource in Okinawa Prefecture

(4) Seawater Desalination

The development of a seawater desalination system, which was planned in the time when Okinawa suffered from repeated drought, was completed in 1996.

1980 – 1990s Repeated drought

Seawater desalination plant Completed in 1996

Today, dam construction has been completed and demand has stabilized. The desalination plant does not run at its full capacity. But this system ensures stable water supply even in an emergency situation such as serious drought.

40,000m^3/day

Seawater Desalination Facility in Chatan Water Treatment Plant

4. Case 2: Securing Water Resource in Okinawa Prefecture

(5) Promoting Water Conservation in Times of Drought

Repeated drought → High awareness of the people to prepare for interruptions in water service

【 Methods of calling for water conservation in times of drought 】

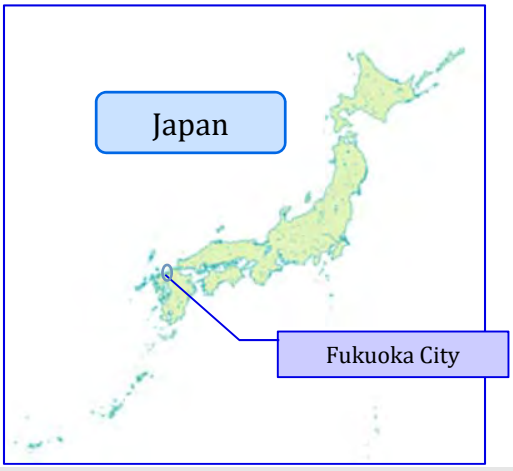
- The message of water saving on sign boards along the roads
- Daily announcement of water levels of dams in the newspaper
- Call for water saving by radio and television

5. Case 3: Water Resources Development and Water Conservation-Conscious City; Fukuoka

(1) History of Various Water Resources Development

Fukuoka City was chronically suffering from shortage of water source. Water restriction continued 287 days under severe drought in 1978.

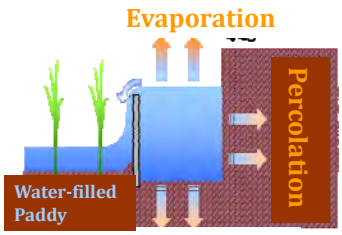
- Only small rivers in the area
- Population growth and increased water demand



5. Case 3: Water Resources Development and Water Conservation-Conscious City; Fukuoka

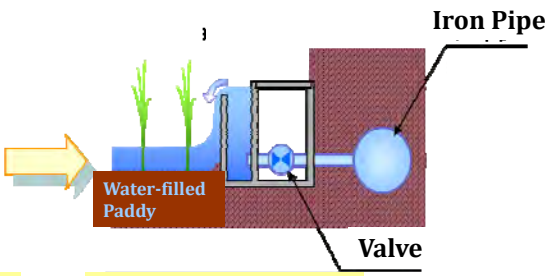
(1) History of Various Water Resources Development

Open-channel Type
(cross section)



Much Water Loss

Iron Pipeline Type
(cross section)



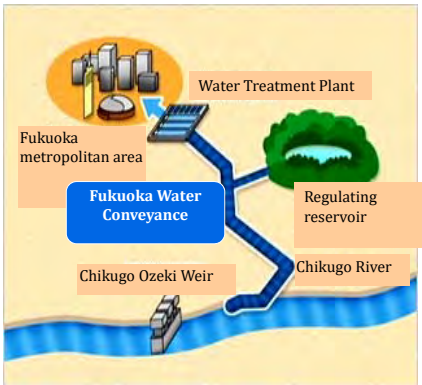
Less Water Loss

Efficient Use of Agricultural Water

5. Case 3: Water Resources Development and Water Conservation-Conscious City; Fukuoka

(1) History of Various Water Resources Development

Conveyance from Chikugo River, which flows outside of Fukuoka City, to mitigate the shortage of water resources was realized by understanding and corporation with residents and related entities in watershed.



Conveyance from outside of the watershed

Fukuoka District Waterworks Agency, http://www.f-suiki.or.jp/facility/ushikubi-placement/placement-shikumi/

5. Case 3: Water Resources Development and Water Conservation-Conscious City; Fukuoka

(1) History of Various Water Resources Development

Uminonakamichi Nata Sea Water Desalination Center

- 2005 in service
- Capacity of facility is 50,000 m^3/day.
- Fukuoka City receives 16,400 m^3/ day.

Uminonakamichi Nata Sea Water Desalination Center

5. Case 3: Water Resources Development and Water Conservation-Conscious City; Fukuoka

(2) Water Conservation-Conscious City

Water-Wise City

- Non-revenue water rate: 3.9% in 2015
- Water Consumption: 194 L/person/day (the lowest among large cities in Japan)

Promotion of Water Reuse

Introduce of Water Distribution Control System

Proactive Promotion of Leakage Reduction

Improvement of Water Distribution System

Public Relation Activities, etc.

Diffusion of Water Saving Device

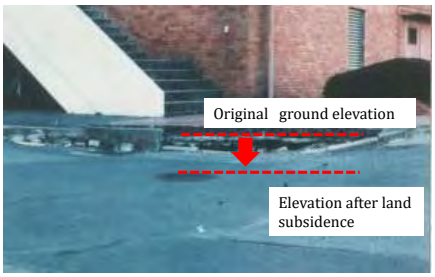
6. Lessons Learned (1)

- **(Comprehensive River Development)** While securing water resources is a top priority for utilities, the use of river water must be well planned and controlled in a fair and equitable manner. The Japanese system takes great efforts in this regard, by allocating water rights and implementing comprehensive river development. The Water Resources Development Public Corporation (now Japan Water Agency) balances the needs for flood control and water utilization.
- **(Multipurpose Dam)** Dam development is expensive and must be carried out with a multi-purpose concept to be cost effective. This requires cost sharing and coordination among government organizations and dam reservoir users.
- **(Bulk Water Supply)** Water utilities can cooperate to utilize Bulk Water Supply as their water source. They also benefit from integrated management by joining efforts from resource development to water distribution to end users.

6. Lessons Learned (2)

- **(Other Means to Secure Water Resource)** Dam construction takes a long time to complete; therefore, other means to secure water resource must be implemented at the same time. The combined efforts in rainwater utilization, leakage reduction, reuse and water saving campaign have all helped to make lower water consumption in Fukuoka City to than the national average. Seawater desalination is much more expensive than the use of surface water, so it is still only a supplemental method to obtain additional water resources.

Sustainable Groundwater Use and Prevention of Land Subsidence:
Osaka City and Saitama Prefecture



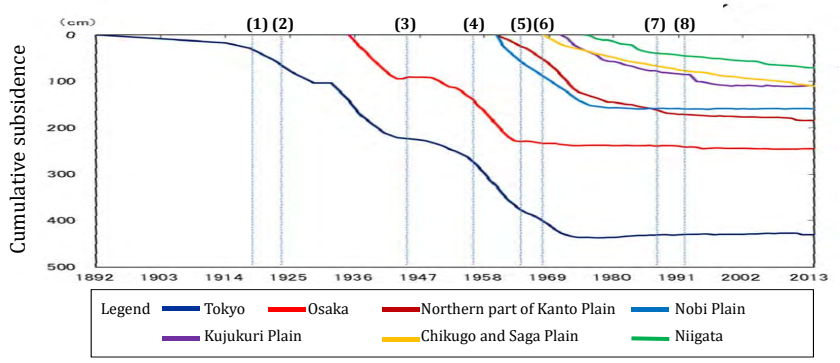
Depression caused by land subsidence
https://www.pref.saitama.lg.jp/a0505/901-20091202-17.html

No. C3 Ver. 1

Contents

1. Introduction

(1) Beginning of borehole drilling in various regions
(2) Great Kanto Earthquake
(3) World War II
(4) Enactment of "Industrial Water Act"
(5) Enactment of "Building Water Act"
(6) Enactment of "Basic Law for Environmental Pollution Control"
(7) Guideline on Countermeasures for Prevention of Land Subsidence (Chikugo Saga plain and Nobi Plain)
(8) Guideline on Countermeasures for Prevention of Land Subsidence (Northern part of Kanto Plain)



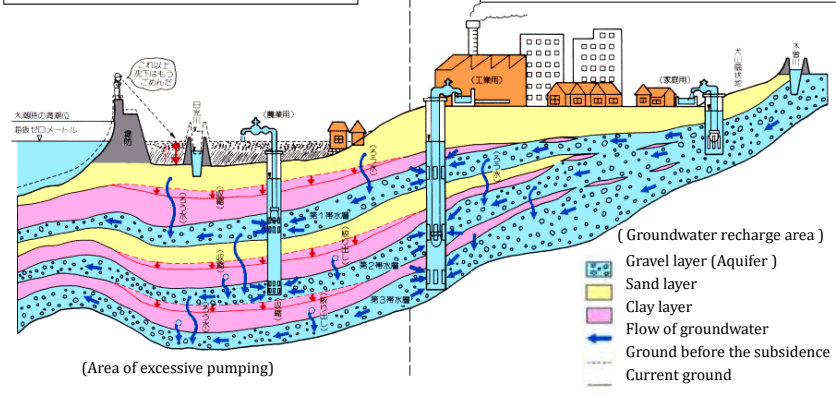
Changes in land subsidence in Japan 1892-2013

Ministry of the Environment, http://www.env.go.jp/water/jiban/gaikyo/gaikyo26.pdf

2. Land Subsidence and Preventive Measures

Land subsidence in this area is likely to occur because the clay layer is thick.

Land subsidence in this area is not likely to occur because the clay layer is thin.



How excessive pumping of groundwater can cause land subsidence

Aichi prefectural government, "*Outlines of land subsidence*,"
http://www.pref.aichi.jp/soshiki/mizu/0000035197.html

2. Land Subsidence and Preventive Measures

(1) Causes of Land Subsidence

Land subsidence may be accelerated by increased water demand and excessive groundwater pumping.

- Increase of industrial water demand
- Development of pump technology
- Advances in borehole drilling technology

1923 The first recognition of land subsidence
(Surveying after the Great Kanto Earthquake)

- Increasing use of groundwater
- Lowering of groundwater level
- Shrinkage of clay layer

1950s Recognized as a social problem

Land subsidence

2. Land Subsidence and Preventive Measures

(2) Industrial Water Act and Building Water Act

In Japan, the key countermeasures against land subsidence are regulations to control groundwater pumping. Two laws to control groundwater withdrawal targeting factories and buildings have been effective in stopping land subsidence.

【Countermeasures against land subsidence】

• **1956**	Industrial Water Act	Regulation for controlling groundwater withdrawal for industrial water use in designated areas
• **1962**	Act on the Regulation of Pumping-up of Groundwater for Use in Buildings (Building Water Act)	Regulation for controlling groundwater withdrawal for buildings

2. Land Subsidence and Preventive Measures

The Industrial Water Act is designed to ensure a reliable supply of water for industry, conserve groundwater and contribute to the prevention of land subsidence. When the Act was drafted there was a debate about how to regulate wells and it was decided as follows:

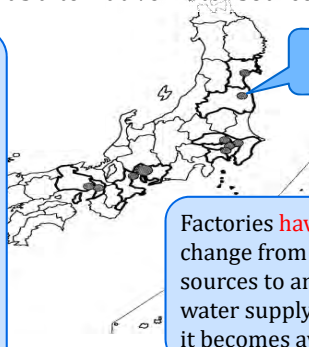
- Regulate newly drilled wells only
- Exempt small household wells (smaller than 21 cm^2 in cross-sectional area of a discharge outlet of a pump)
- Do not regulate the distance between wells
- Supply alternative sources from publicly owned water supply systems

- The prefectural governor has the authority to order additional restrictions on groundwater withdrawal to protect the groundwater source in the case of emergencies.
- Officials designated by ministers in charge or prefectural governors have the authority to conduct on-site inspections.

2. Land Subsidence and Preventive Measures

The Industrial Water Act regulates the groundwater pumping in the region where the excessive pumping had caused land subsidence and industrial water systems are/will be constructed as alternative water sources.

- Criteria for designated regions
  - i) Occurrence of subsidence, etc.
  - ii) Large demand for industrial water
  - iii) Industrial water supply systems are/will be constructed as an alternative water source.
- 17 regions in 10 prefectures
- Position of a strainer of a well and a cross-sectional area of a discharge outlet of a pump



Factories have one year to change from groundwater sources to an industrial water supply system once it becomes available.

Designated regions targeted by the Industrial Water Act

Ministry of Economy, Trade and Industry, "Overview of groundwater protection," 2009, http://www.meti.go.jp/policy/local_economy/kougyouyousui/chikasuitaisakunogaikyo21fy.pdf

2. Land Subsidence and Preventive Measures

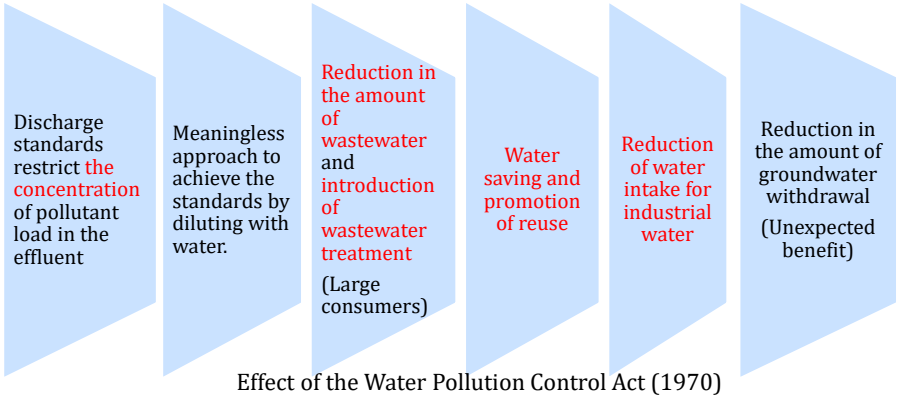
The Act on the Regulation of Pumping-up of Groundwater for Use in Buildings(Building Water Act) is designed to prevent land subsidence. Withdrawal of groundwater to supply a building in a designated region (some parts of Osaka, Tokyo, Saitama and Chiba prefectures) requires approval from a prefectural governor if the well is above a certain scale.

Other ordinances by many local governments (311 cities, towns or villages of 27 prefectures out of 47, as of March 2015) have also been enacted to regulate groundwater withdrawal, reflecting local conditions. These local ordinances complement the broader national laws that target the significant large-scale land subsidence that has occurred in some regions of Japan.

2. Land Subsidence and Preventive Measures

Prevention of Land Subsidence through the Industrial Wastewater Regulation

The Water Pollution Control Act enacted in 1970 inadvertently contributed to decreasing the volume of groundwater withdrawn.



Effect of the Water Pollution Control Act (1970)

2. Land Subsidence and Preventive Measures

(4) Comprehensive Preventive Measures: *Guidelines for Prevention of Land Subsidence*

Especially intense land subsidence; 3 regions

- *Guidelines for Prevention of Land Subsidence*
- Establishment of coordination mechanism among the relevant ministries and agencies

【The comprehensive countermeasures】

- Regulation to prevent over pumping
- Ensure alternative water source

→ Conservation of groundwater

- Prevention of disasters
- Restoration after damage

→ Comprehensive measures in response to actual situation of the region

2. Land Subsidence and Preventive Measures

(4) Comprehensive Preventive Measures: *Guidelines for Prevention of Land Subsidence*

The monitoring of land subsidence and ground water levels is important to formulate appropriate regulations and analyze their impact.

Construction of nationwide broad-based observation network

- Regular monitoring of the effects of regulation and alternative water supply

- Hydrogeology
- Land subsidence
- Quantity of groundwater usage
- Groundwater level
- Groundwater quality

Information disclosure on the Ministry of the Environment website

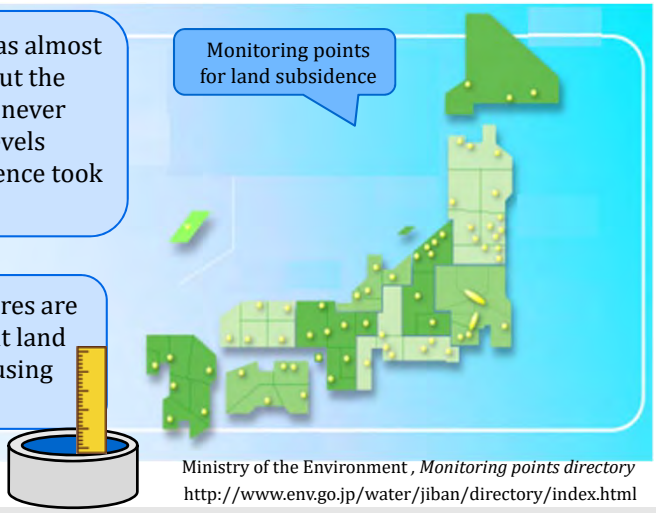
- Usage of groundwater
- Land subsidence situation

2. Land Subsidence and Preventive Measures

(5) Monitoring of Groundwater Level and Land Subsidence

Land subsidence has almost stopped in Japan, but the ground levels shall never come back to the levels before land subsidence took place.

Early countermeasures are important to prevent land subsidence from causing serious problems.



Ministry of the Environment , *Monitoring points directory*
http://www.env.go.jp/water/jiban/directory/index.html

2. Land Subsidence and Preventive Measures

In Japan, the land owner has right to use groundwater defined by the Civil Code. This caused difficulties for implementing groundwater regulation.

Establishment of the Basic Act on Water Cycle in 2014

Groundwater is regarded as a precious public commodity.

3. Case 1 : Osaka City

(1) History of Groundwater Use and Land Subsidence

1930 - 1940s	Land subsidence became a serious social issue. ● Damage to buildings by uneven settlement ● Inundation by storm surge
ca. 1945	Decrease in economic activity due to war. Land subsidence temporarily halted.
ca. 1950	Resumption of land subsidence

The first recorded occurrence of land subsidence in Konohana Ward, Osaka City
The cumulative amount of land subsidence
= More than 270cm (by 1964)

3. Case 1 : Osaka City

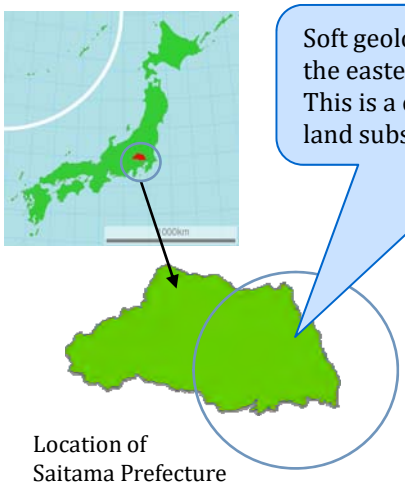
(2) Industrial Water Supply

1954	Start of industrial water supply system, before legislation is enacted
1956	Enactment of the *Industrial Water Act*
1959	Establishment of the Osaka Coastal Industrial Water Supply Authority to accelerate the supply of water distribution system for Industry.
1968	A ban on groundwater withdrawal

Land subsidence has been almost stopped today.

4. Case 2 : Saitama Prefecture

(1) History of Groundwater Use and Land Subsidence



Location of
Saitama Prefecture

Soft geological formations extend into the eastern part of Saitama Prefecture. This is a contributing factor to serious land subsidence.

- Monitoring stations at 36 places in the prefecture
- Real-time observation of land subsidence and groundwater levels
- Setting the maximum volume of groundwater abstraction

4. Case 2 : Saitama Prefecture

1935

Monitoring of land subsidence started by Ministry of the Environment.

→ Cumulative subsidence in Saitama Prefecture
Koshigaya City = About 150 cm
(Since 1935)

Pumping of groundwater has been drastically reduced.

BUT

Still, land subsidence proceeds at 1 – 2 cm/year even now.

4. Case 2 : Saitama Prefecture

(2) Industrial Water Supply

ca. 1955

Factories increased in the southern area of Saitama Prefecture.

↓

Increased use of groundwater

↓

Problem of land subsidence

↓

Saitama Prefecture Bureau of Public Enterprise started supplying industries with water in 1964.

Kakinoki purification plant

Supply area: 6 cities,
153 business sites
Supply amount: 195,280 m^3/day
Tariff: 22.53 yen/m^3

5. Lessons Learned (1)

- **(Monitoring)** Land subsidence can occur naturally or can be caused by excessive groundwater pumping. It is essential to monitor ground level and groundwater level continuously in areas where land subsidence occurs. It is also important to understand the relationship between groundwater usage and land subsidence so that the use of groundwater can be regulated.
- **(Alternative Water Sources)** The prevention of land subsidence can be greatly augmented by developing alternative water supplies such as industrial water supply.
- **(Regulations)** The Industrial Water Act, the Act on the Regulation of Pumping-up of Groundwater for Use in Buildings and local ordinances in some prefectures and cities provide the effective legislative framework for controlling groundwater use.

5. Lessons Learned (2)

- **(Stakeholder Involvement)** It was effective to arrange the discussions for all the stakeholders including government authorities implicated in the regulation of groundwater usage and work together to find solutions for groundwater depletion and land subsidence.
- **(Prevention in the entire Groundwater Basin)** Preventive measures for land subsidence need to be implemented comprehensively in the entire region which constitutes the groundwater basin. Groundwater monitoring and regulations for groundwater pumping have been implemented in the whole region in order to limit groundwater withdrawal and to prevent further land subsidence.

Block Distribution System for Equitable, Efficient and Resilient Distribution:

Yokohama City and Fukuoka City

Model of block distribution system
(Fukuoka City Waterworks Bureau)

No. C4 Ver. 1

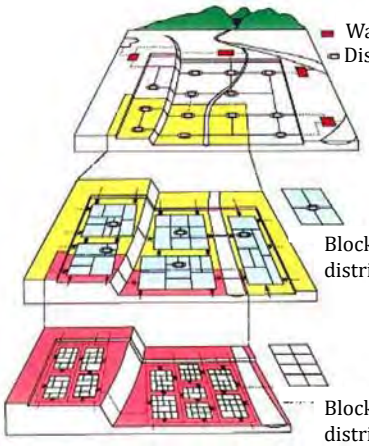
Contents

1. Introduction

Treated water transmission pipeline networks

Main distribution pipeline networks

Small branch distribution pipeline networks



Concept of treated water transmission and distribution system

Source: Bureau of Waterworks Tokyo Metropolitan Government, https://www.waterworks.metro.tokyo.jp/suidojigyo/torikumi/kadai/step21/05.html

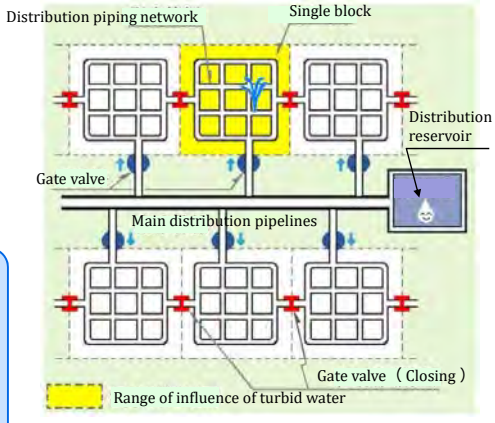
2. Block Distribution System in Japan

(1) General Features

Both District Metered Area (DMA) and Block Distribution System (BDS) can be defined as a discrete area of a water distribution network.

While the aim of DMA is to reduce and control leakage, BDS has been developed and utilized in Japan for the following purposes :

- Optimization of water pressure
- Flow measurement in smaller blocks and quick adjustment of supply route
- Isolation of water mains and alternation of supply route
- Early detection of leakage



Overview of block distribution system

Source : Sapporo City

2. Block Distribution System in Japan

(2) Background and History

Yokohama The first water utility to use a block distribution system

Unorganized & intricate piping → Failure to manage distribution → Organize pipelines and make block a distribution system

Fukuoka

Prolonged serious drought
→ Advanced water resource management and water supply operation

Source : Fukuoka City Waterworks Bureau
http://www.city.fukuoka.lg.jp/mizu/keikaku/machi/0060_3_2_3.html

Niigata

Liquefaction caused by earthquakes
→ Localized suspension of the water service

Source : Niigata City
http://www.city.niigata.lg.jp/shisei/koho/kohoshi/shiho/backnumber/h26/shiho140511/1_01.html

Sendai

Large difference in height in water supply districts
→ Equalization of water pressure

Source : Sendai City Waterworks Bureau
,https://www.suidou.city.sendai.jp/03_suisitu/16.html

3. Case 1 : Yokohama City

(1) Background and Purpose

Water intake from the Kanagawa Water Supply Authority to meet the increasing demand was decided in 1964.

To prepare the project it was necessary to;
- Know the capacity of existing distribution pipelines
- Decide where to locate new distribution pipelines

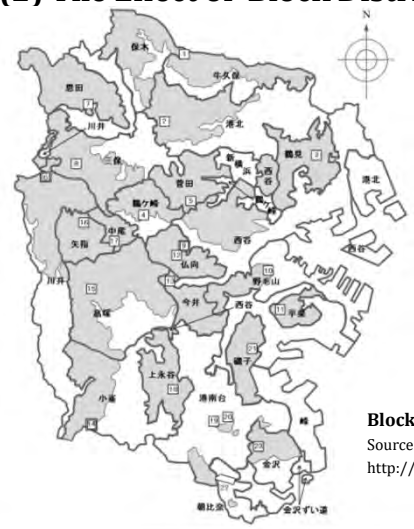
However, existing distribution systems at that time were not well organized due to financial difficulty.

Simultaneous study for water consumption and water supply conditions in each town was implemented.

Design of block distribution system

3. Case 1 : Block Distribution System in Yokohama

(2) The Effect of Block Distribution System



Boundary of block areas
Hilly areas (pumping system)
Flat areas (gravity system)
Reservoirs in water treatment plants
Distribution reservoirs

Block distribution system in Yokohama City
Source : Yokohama Waterworks Bureau,
http://www.city.yokohama.lg.jp/suidou/kyoku/suidoujigyo/jigyogaiyou.html

3. Case 1 : Block Distribution System in Yokohama

(2) The Effect of Block Distribution System (Cont'd)

- Introduction of the block distribution system
- Pipeline information database
- Network information using computerized system and advanced mapping system

- Easy pressure control by utilization of elevation
- Easy distribution volume control by valves in the network
- Reduction of water service suspension time for repairs and maintenance
- Improvement of pipeline system
- Easy maintenance in daily operation

4. Case 2 : Fukuoka City

(1) Background and Purpose

【Drought in1978】
- Water restrictions up to 287 days
- Drought was so severe that emergency water was brought from a distance using ships and trains.

Water-saving urban development

Parched Dam during Period of Abnormally Low Rainfall in 1978

Water Trucks Dispatched during the Severe Drought

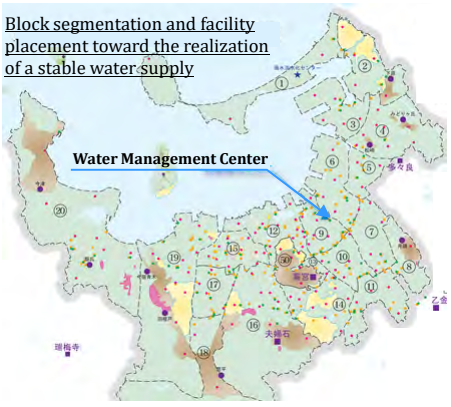
4. Case 2 : Fukuoka City

1978 Serious drought

- Reduction of downtime in daily water supply
- Reduction of supply restrictions during drought by multiple water sources
- Uniform distribution throughout the city
- Detection of water leakage through advanced monitoring

1981 Establishment of the Water Management Center and 21 distribution blocks

Block segmentation and facility placement toward the realization of a stable water supply



21 distribution blocks in Fukuoka City

4. Case 2 : Fukuoka City

Function of the Water Management Center

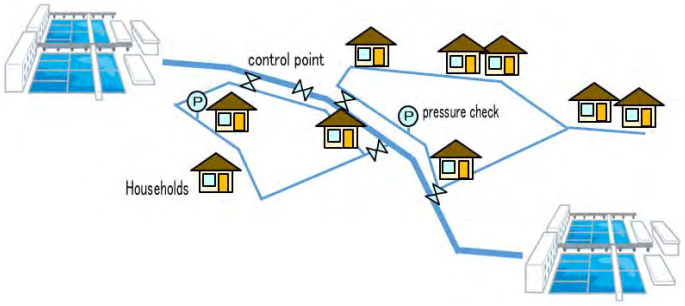
- Adjustment of flow rate and allocation from different water treatment plants
- Leakage reduction by controlling water pressure
- Reduction of labor for valve exercising during droughts
- Early detection of abnormal conditions and quick measures by remote control
- Efficient operation based on information collection and analysis

The Water Management Center, Fukuoka City Waterworks Bureau

- Opening and closing of 180 electric valves
- Manual remote operation from the Water Management Center

4. Case 2 : Fukuoka City

(2) The Effect of Block Distribution System



Reduction of Leakage

- Reduced leakage volume 4,000-5,000 m^3/day
- Lowered leakage incidents 30%

Minimization of service suspension

- Mutual back up between treatment plants when distribution is disrupted by accidents, construction, or repair at a certain point

5. Lessons Learned (1)

- **(Block Distribution System)** The system is used by most Japanese water utilities. It is very effective in reducing leakage and maintaining stable supply by: (1) optimizing water pressure in distribution pipelines, (2) measuring flows in small areas to allow early detection of abnormal conditions, (3) identifying the location of broken pipes quickly, and (4) allowing operators to make immediate adjustments to the distribution route and switch to a backup supply.
- **(Large and Small Blocks)** Large blocks allow switching between water sources and water treatment plants. Small blocks are discrete areas within a large block for switching distribution route during maintenance of the network.
- **(Yokohama System)** The block distribution system in Yokohama City drastically modified the disorganized water supply network and improved operation and maintenance by introducing a computerized system. The system makes it easier to identify broken distribution mains and provide a backup supply to minimize suspension of service.

5. Lessons Learned (2)

- **(Fukuoka System)** The block distribution system in Fukuoka City established to deal with severe droughts is characterized by the advanced linkage between water sources and distribution reservoirs, switching of water sources by remote control of valve operation, and reduction of leakage in block units. The block system together with the Water Management Center and advanced mapping system is very effective in leakage reduction.
- **(Topographic Considerations)** The implementation of block distribution systems based on topographical characteristics (including the location of water sources and treatment plants) contributes to efficient water supply operations.

Water Tariff Design with Understanding of Customers:
Kyoto City

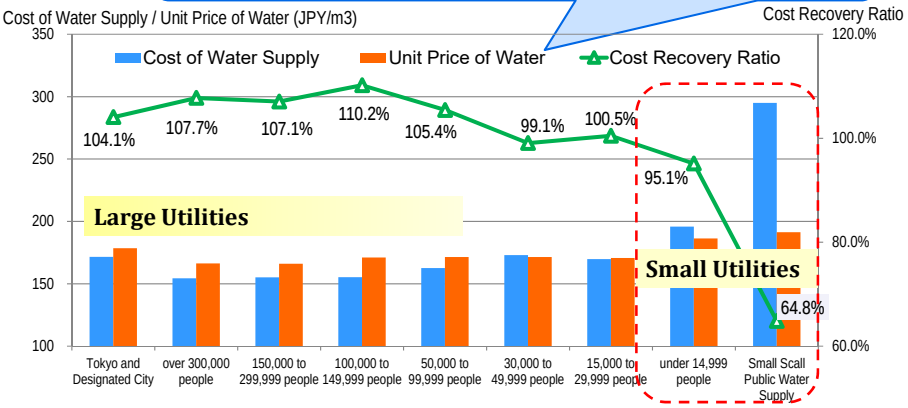
Public meeting to explain water tariff revision in Source: Ikusaka Village in Nagano Prefecture
http://blog.village.ikusaka.nagano.jp/sontyo/index.php?blogid=254&archive=2013-01

No. C5 Ver. 1

Contents

1. Introduction

In Japan, tariff revenue can cover all the costs at large utilities but not at small-scale utilities.

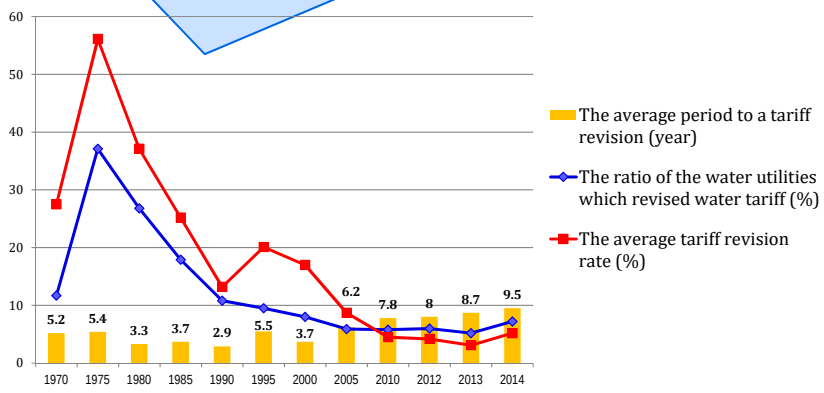


Source: Created from the data of The Ministry of Internal Affairs and Communications "*Survey of Financial Status of Local Public Enterprises, FY 2014*"

Cost recovery in water supply business by size of operation (2014)

1. Introduction

Water tariffs are revised periodically to reflect changing conditions.



Source: Created from the data of Japan Water Works Association "The Outline of Water Supply (6th ed.)"2015

Water Tariff Revisions from 1970 to 2014

1. Introduction

Self-supporting accounting system and **fully distributed cost method** as defined by Local Public Enterprise Act

Water Tariff Setting Manual guides the calculation of appropriate tariff level

Advisory committee and **public consultation** allow external input

Periodic revision of water tariffs

2. Water Tariff Revision Process

(1) Preparation of a fiscal plan

(2) Discussion by an advisory committee & public consultations

(3) Preparation of revised water tariffs

(4) Discussion at the local assembly and adoption

(5) Public notification

(6) Report to the Ministry of Health, Labour and Welfare (or Governor of the prefecture)

2. Water Tariff Revision Process

(1) Preparation of fiscal plan

The **Fiscal plan** should indicate whether the existing tariffs would cover the O&M and capital costs (OPEX and CAPEX) for the next 3 to 5 years.

Components	Contents	Criteria
Demand & Supply Plan	Securing water source, water demand analysis, etc.	Water service coverage ratio, population served, number of connections, etc.
Facility Plan	New construction, expansion, rehabilitation, etc.	Annual amount of water distributed (daily maximum & average) and amount of revenue water..
Funding Plan	Capital income including bond issues, national subsidies and grants, transfers from the general account, contributions for construction, etc.	Amount of bond issued and repayment, amount of grant and subsidy, other income, etc.
Operation Plan	Operation & maintenance of facilities, staff allocation, outsourcing, etc.	Operation & maintenance cost including outsourcing cost, etc.

2. Water Tariff Revision Process

(2) Discussion by advisory committee & public consultations

An advisory committee is established to examine the tariff system and public consultations are held to seek customers input.

Advisory committee ensures:

1. accountability and information disclosure (utility has to make the case for revision);
2. objectivity in the decision-making process;
3. use of expert advice from members;
4. incorporation of customers' inputs from representatives in the committee.

Advisory committee on waterworks management in Koriyama City

Source:https://www.city.koriyama.fukushima.jp/481000/jogesuido/shingikai.html

2. Water Tariff Revision Process

(3) Preparation of revised water tariffs

Water Tariff is revised based on Fully Distributed Cost Method.

- **Calculation period : 3 – 5 years**
- **Calculation of total cost:**

Total Cost = Total Tariff Revenue

Total Cost = Operating Cost + Capital Cost

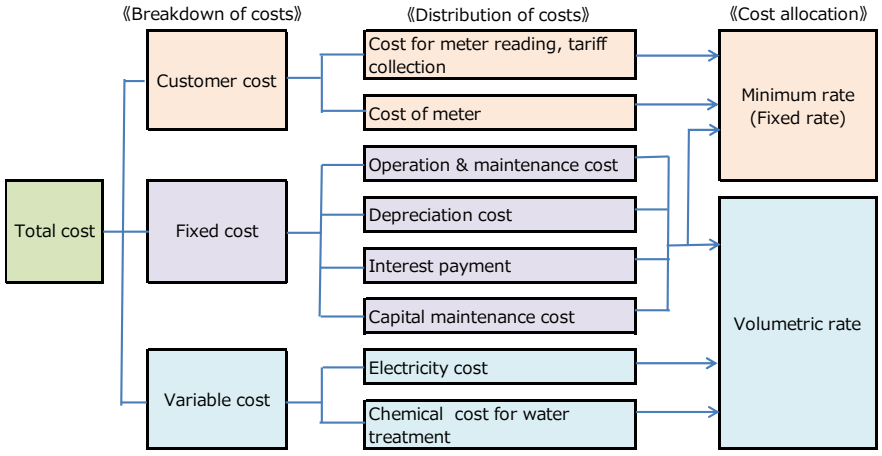
Operating Cost = Personnel Cost + Chemical Cost + Power Cost + Repair Cost + Bulk Water Cost + Depreciation Cost + Cost for retirement of fixed assets & stock losses + Other Maintenance Costs

Capital Cost = Interest Payment + Capital Maintenance Cost

Capital Maintenance Cost = Asset Price × Capital Maintenance Rate

2. Water Tariff Revision Process

(3) Preparation of revised water tariffs (Cont'd)



Calculation steps based on *the Water Tariff Setting Manual*

2. Water Tariff Revision Process

(4) Discussion at local assembly

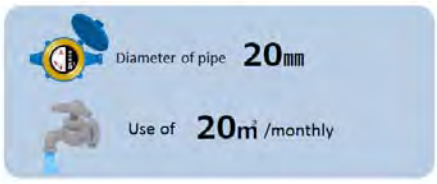
Makinohara City bulletin announcing submission of proposed tariff revision to the local assembly for approval.

Source:http://www.city.makinohara.shizuoka.jp/ftp/01gt01/koho/201202/201202_04_05.pdf

2. Water Tariff Revision Process

(5) Public notification

The public is informed of the new tariffs.



Monthly water tariff (excluding consumption tax, etc.)

(Present) April, 2015	(Revised) April, 2016	(Revised) April, 2017
1,915 JPY	2,060 JPY	2,140 JPY
	+145 JPY	+80 JPY

Source: Suita City, http://www.city.suita.osaka.jp/var/rev0/0096/0282/11641310928.pdf

2. Water Tariff Revision Process

(6) Report to supervising authority

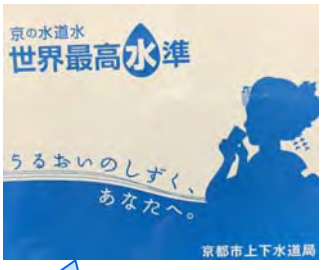
The water utility reports the change in tariffs to the Ministry of Health, Labour and Welfare (or the Governor of the prefecture).

3. Case Study : Kyoto City

(1) Background

	FY2012
Population served	1,455,904 persons
Water service coverage ratio	99.90%
Number of connection	750,822
Facility capacity	771,000m^3/day
Length of distributed pipeline	3,890km
Maximum daily supply	587,840m^3
Average daily supply	539,272m^3

Source: Kyoto City Waterworks Bureau's website
http://www.city.kyoto.lg.jp/suido/page/0000008776.html



Poster commending the superior water quality of Kyoto City

3. Case Study : Kyoto City

(1) Background (Cont'd)

Preparation of Water Vision and medium-term business plan

Cumulative deficit forecasted to occur

Maintain existing tariffs and rely on other means to balance budget until FY 2012

(Million JPY)

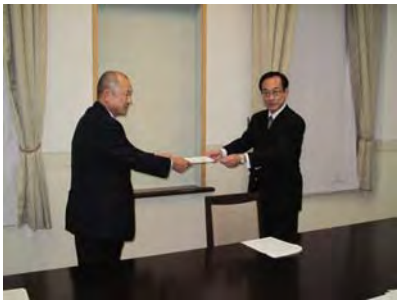
Fiscal Year	2007	2008	2009	2010	2011	2012
Net profit or loss	-709	-1,575	-1,830	-2,116	-2,360	-2,502
Accumulated profit or loss	4,018	2,443	613	-1,503	-3,863	-6,365

Source: Kyoto City Waterworks Bureau "Kyoto City Waterworks' Medium-Term Management Plan (2008 – 2012)," December, 2007

3. Case Study : Kyoto City

(2) Advisory committee on water tariff revision

- Period: 2011.11– 2012.11
- Members:
  - Academic experts
  - Tax accountant
  - Representative from women's group
  - Representative from chamber of commerce
  - Representative from social welfare workers' group
  - Representative from Japan Water Works Association
  - Representative from public



Submission of the recommendations from the Advisory committee
Source:http://www.city.kyoto.lg.jp/suido/page/0000132114.html

3. Case Study : Kyoto City

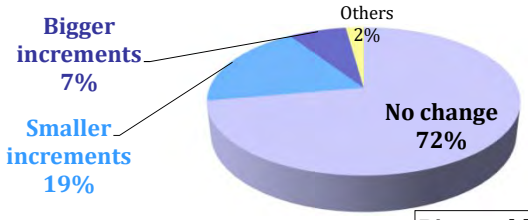
(3) Public Survey

- Objective: To input citizen's opinions into discussions of the Advisory Committee
- Period: April to May, 2012 (1 month)
- Questionnaire: Asked following 6 points
  - **Differences among fixed rates** based on diameters of pipes
  - **Minimum volume water** (20m^3/two months) included in the fixed rates
  - **Increasing-block system and the rates**
  - **Number of blocks** in the increasing-block system
  - **Measures against groundwater users** who connect to large diameter pipes and pay much less for piped water
  - **Payment methods**
- Collected: **1,200 answers**

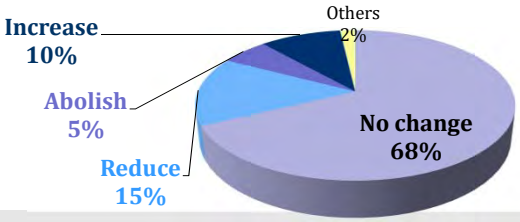
3. Case Study : Kyoto City

(3) Public Survey - Results

Difference among fixed rates based on diameters of pipes

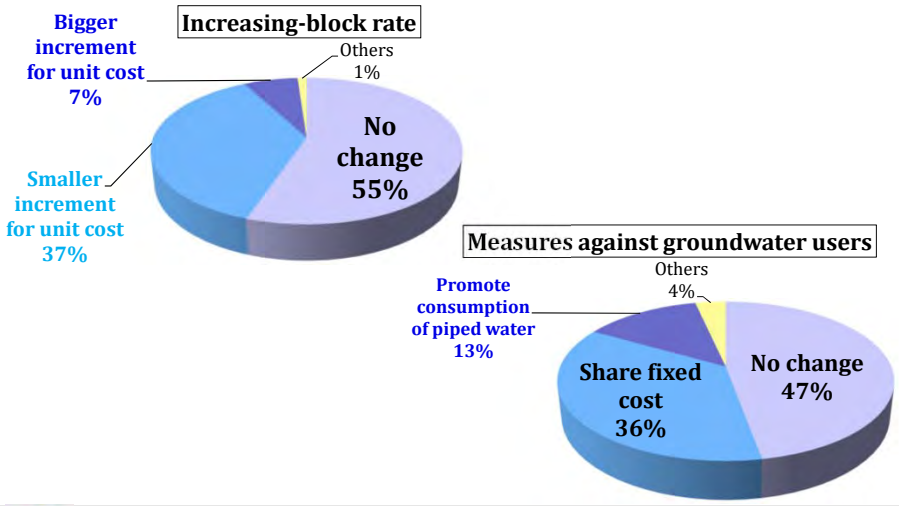


Bi-monthly minimum volume covered by the fixed rate (20 m^3)



3. Case Study : Kyoto City

(3) Public Survey - Results (Cont'd)



3. Case Study : Kyoto City

(4) Issues Identified & Recommendations by the Committee

	Issues	Recommendations
Minimum volume of water	More than 1/3 of households use less than 10m^3/month (monthly water volume covered by the fixed rates).	Reduce the minimum volume by half.
Block tariff system	The number of blocks and the volume in each block do not correspond to the water consumption pattern.	Sub-divide small volumetric blocks into more narrow bands and consolidate large volumetric blocks into larger bands.
Fixed cost	Along with the reduced water demand, it would be difficult to cover the fixed cost in future.	Increase the amount of fixed costs allocated to the fixed rate.
Rate increment	Difference between the highest and the lowest unit price of the volumetric rate is bigger than other major cities	Reduce the rate difference within the water tariff structure, bringing the rate levels closer to those of other cities.

3. Case Study : Kyoto City

(4) Issues Identified & Recommendations by the Committee (Cont'd)

	Issues	Recommendations
Groundwater use	Groundwater users pay much less for water and are not sharing the financial burden equitably with other users.	Raise the fixed rate and increase the amount of fixed water for customers with large pipe diameter and reduce unit price of volumetric rate.
Credit card payment	Customers are interested in using credit card to make payments. The commission charge to the utility for credit card payment is more expensive than bank transfer fees.	Introduce credit card payment. Split the difference with the customers by giving them a discount as an incentive for payment using bank transfer.
Connection charge	Income generated by the connection charges would decrease.	Introduce capital maintenance cost.
Capital maintenance cost	Capital maintenance costs are not included in the calculation of water tariffs.	Include capital maintenance costs when setting water tariffs.

3. Case Study : Kyoto City

(4) Comparison of Old and New Tariff s Schedule

	Diameter /Block	Old Tariffs		Revised Tariffs	
		Price (JPY)	(Minimum volume)	Price (JPY)	(Minimum volume)
Fixed Rate (Minimum Charge)	13/20mm	870	10m³	920	5m³
	25mm	1,690		1,900	10m³
				2,780	
	40mm	2,470		18,300	50m³
	50mm	9,250		35,910	100m³
	75mm	15,470		71,600	250m³
	100mm				
	150mm			134,260	500m³
	200mm			281,520	1000m³
Volumetric Rate (Volumetric Charge) (/m³)	6m³	0		10	
	11m³~20m³	162		177	
	21m³~30m³			180	
	31m³~100m³	189		208	
	101m³~200m³	206		226	
	201m³~500m³	223		243	
	501m³~5,000m³	262		284	
	5001m³~10,000m³	301		326	
	10,000m³~	339			

Source: Kyoto City Waterworks Bureau

3. Case Study : Kyoto City

(5) Effect of Tariff Revision (FY2013-FY2017)

Unit: Million JPY

	Before cost-saving	After cost-saving		After water tariff revision	
			Effect		Effect
Revenue	142,043	142,165	122	152,982	10,817
Water tariff	129,594	129,594	0	140,804	11,210
Others	12,449	12,571	122	12,178	-393
Expenditure	150,136	144,395	-5,741	144,550	155
Personnel cost	33,991	30,191	-3,800	30,191	0
Salary	28,656	26,501	-2,155	26,501	0
Retirement allowance	5,335	3,690	-1,645	3,690	0
Maintenance costs	38,788	36,600	-2,188	36,587	-13
Depreciation	55,725	55,725	0	55,725	0
Interest payment, etc.	16,703	16,703	0	16,335	-368
Consumption tax, etc.	4,929	5,176	247	5,712	536
Net profit or loss	-8,093	-2,230	5,863	8,432	10,662
Earned surplus	0	0	0	-8,134	-8,134
Accumulated profit or loss in the end of FY2017	-8,391	-2,528	5,863	0	2,528

No accumulated loss

Source: Kyoto City Waterworks Bureau

3. Case Study : Kyoto City

(6) Public Notification

"Revised Water and Sewerage Tariffs to Start October, 2013."

Source:
http://www.mhlw.go.jp/seisakunitsuite/bunya/topics/bukyoku/kenkou/suido/newvision/chiikikondan/04/suishin_kondan_04-4.pdf

3. Case Study : Kyoto City

(6) Public Notification (Cont'd)

New Tariff Table - Effective from 1st June 2014

京都市上下水道局　料金早見表（2カ月料金・税込）

WATERWORKS BUREAU, CITY OF KYOTO

Water and Sewage Service Charges

per 2 months, 8% consumption tax incl.

diameter of water supply pipe: 13&20 mm

2014年6月1日検針分から適用

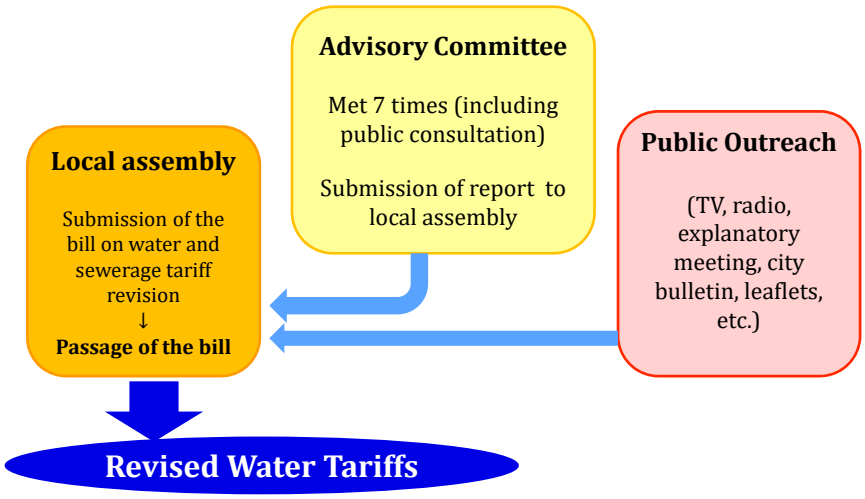
Effective from 1st June 2014

水量 amount of water used (m³)	水道料金 (円) water charge (yen)	下水道使用料 (円) sewage charge (yen)	合計 (円) total (yen)	水量 amount of water used (m³)	水道料金 (円) water charge (yen)	下水道使用料 (円) sewage charge (yen)	合計 (円) total (yen)
0-10	1,987	1,404	3,391				
11	1,998	1,414	3,412	56	9,028	5,957	14,985
12	2,008	1,425	3,433	57	9,223	6,082	15,305
13	2,019	1,436	3,455	58	9,417	6,207	15,624
14	2,030	1,447	3,477	59	9,612	6,333	15,945
15	2,041	1,458	3,499	60	9,806	6,458	16,264
16	2,052	1,468	3,520	61	10,031	6,633	16,664
17	2,062	1,479	3,541	62	10,255	6,808	17,063
18	2,073	1,490	3,563	63	10,480	6,983	17,463
19	2,084	1,501	3,585	64	10,704	7,158	17,862
20	2,095	1,512	3,607	65	10,929	7,333	18,262

Source: Kyoto City Waterworks Bureau

3. Case Study : Kyoto City

Water Tariff Revision Process



4. Lessons Learned (1)

- **(Cost Recovery)** Water tariffs are set based on the principle of the fully distributed cost method as stipulated by acts in Japan. The *Water Tariff Setting Manual* provides guidance on the standardized method for the calculation of water tariffs based cost recovery.
- **(Bases of Tariff Revision)** The water utility releases financial and operational information, showing the facilities replacement costs and funding sources. This is necessary if it were to continue to provide sustainable, reliable, and safe water supply in the medium and long term.
- **(Utility's Efforts)** It is also necessary to explain the utility's management efforts (control on staff size, cost savings with outsourcing, measures for unpaid water tariffs, asset management, etc.).

4. Lessons Learned (2)

- **(Understanding of Customers)** Tariff revision must have the support of the local government and residents. It is important to forecast the financial conditions in a credible manner and explain the need for the rate increase convincingly. The discussions by the advisory committee and public consultations are useful opportunities to engage the public and gather customer input. The utility's business and fiscal plans must be well understood and supported by the customers. It is desirable that tariffs are revised for customers' benefit (improved service and fairness).

Water Supply Service with Customers' Voices:

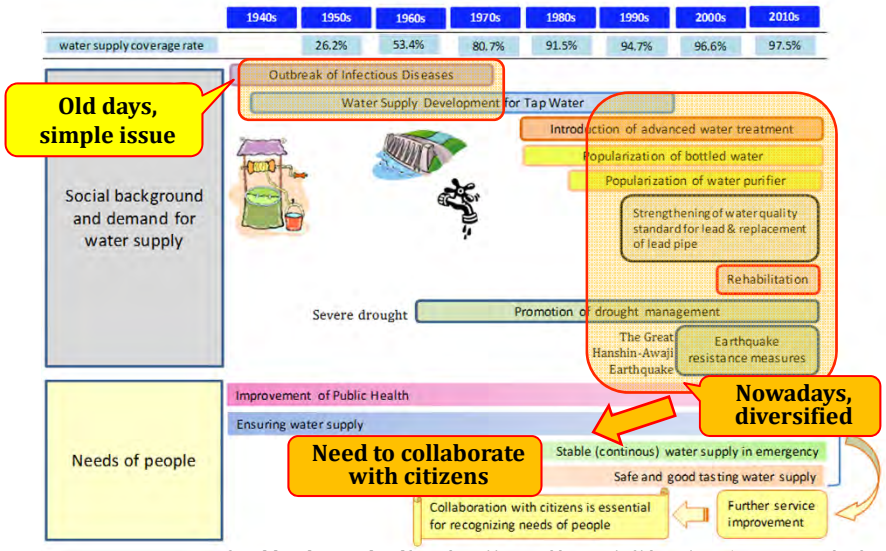
Osaka City, Tokyo Metropolitan, Chiba Prefecture, Yahaba Town

Water tasting challenge by Bureau of Waterworks, Tokyo Metropolitan Government
Source: http://www.metro.tokyo.jp/INET/CHOUSA/2015/07/60p76400.htm

No. C6 Ver. 1

Contents

1. Introduction



Source: Ministry of Health, Labour and Welfare, http://www.mhlw.go.jp/stf/shingi/2r98520000027cq9.html

2. Customer Relations

(1) Rights and Responsibilities of Water Utilities and Customers Stipulated in the Water Supply Act

- Article 14 (Rules of Water Supply) : A water utility shall develop regulations and share details of water supply contract with its customers including water tariff, customer's cost burden of service connection installment (construction cost), and condition of water supply.
- Article 15 (Obligation to Provide Water Supply): A water utility cannot reject any application for service without a valid reason and is obliged to provide safe reliable water supply service.
- Article 18 (Request for Inspection): A customer has the right to ask the water utility for water quality testing and inspection of water supply equipment. The water utility shall respond to such requests in a timely manner and inform the customer of the results.
- Article 24-2 (Information Disclosure): A water utility shall notify customers of the results of water quality tests, and other information about the water supply services in accordance with the orders of the Ministry of Health, Labor and Welfare.

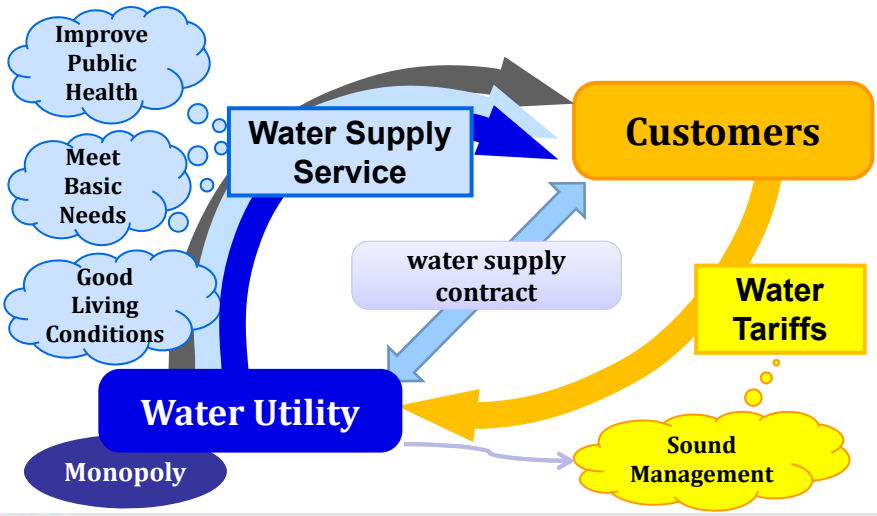
2. Customer Relations

"Ordinance for Enforcement of the Water Supply Act" gives customers the right to know:

1. Safety of the water supply, including the results of water quality tests.
2. Operation of water supply services.
3. Costs for water supply services including the construction and maintenance of facilities.
4. Fees and charges for customers including water tariff.
5. Management and maintenance plans for service connections and water tanks.
6. Earthquake resistance of water supply facilities and on-going improvements.
7. Results of additional temporary water quality tests.
8. Emergency response plan for water supply in case of natural disasters or incidents that may compromise water quality.

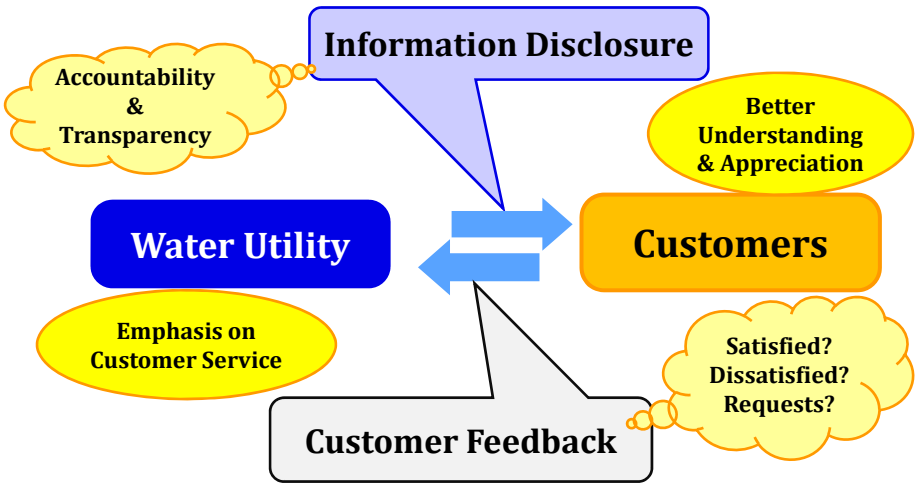
2. Customer Relations

(2) Relationship between a Water Utility and Customers



2. Customer Relations

(3) Need for Two Way Communications



3. Case 1: Customer Service through Daily Operation

Customer Service Improvement in Osaka City

Period	Customer Service Initiatives
Before World War II	Customer service manuals for service connection technicians, meter readers and tariff collectors in order to improve their service delivery.
1949	Start of service vehicles travelling around the city to work sites to conduct repairs on connections or broken pipes.
Late 1980s	Change in operational philosophy: customers are not just residents receiving government services but are valued clients of a business enterprise.
1988	Began with training managers to improve business demeanor. Managers then trained their staff on customer friendly service. Produced many internal instructors as a result.
1989	Founded the task force on customer service improvement, to engage all personnel in customer friendly practices throughout the organization.

3. Customer Service through Daily Operation

Customer Service Improvements in Osaka City (Cont'd)

Service vehicle conducting repairs around the city

Staff repairing a tap

Source: Osaka Municipal Waterworks Bureau "One Hundred Years' History of Osaka Municipal Waterworks" 1996

4. Case 2: Public Outreach and Information Disclosure

Example of a Poster

A poster for water-saving (1912～1926, Nagoya City)

"Make your kitchen better:
A household that values water prospers.
A household that wastes water suffers."

Source: Nagoya City Waterworks and Sewerage Bureau

4. Case 2: Public Outreach and Information Disclosure

Example of Brochures

Easily to understand with pictures and data.

4. Case 2: Public Outreach and Information Disclosure

Example of Brochures (Cont'd)

Easily to understand with performance indicators

イ 経営指標 Management-related indexes

	Indexes 項目		FY2013(Plan) 25年度（計画）	FY2013(Results) 25年度（実績）	FY2014(Plan) 26年度（計画）	FY2015(Plan) 27年度（計画）
Management efficiency 経営の効率性	Number of service connections per employee 職員一人当たりの給水件数	(x1000/employee) (千件／人)	1.8	1.8	1.8	1.9
	Total length of distribution pipes managed per employee 職員一人当たりの配水管管理延長	(km/employee) (km／人)	6.7	6.7	6.8	7.0
	Accounted-for water per employee 職員一人当たりの有収水量	(1000 m³/employee) (千m³／人)	389	372	393	403
	Water supply cost (Note 3) 給水原価[注3]	(yen/m³) (円／m³)	202.3	203.5	202.2	201.4
Reinforcement of management base 経営基盤の強化	Employee payroll rate 職員給与比率	(%)	6.8	6.6	7.3	6.7
	Balance of enterprise bonds 企業債残高	(100 million yen) (億円)	2,873	2,813	2,605	2,447
	Ratio of principal and interest redemption to revenue on water supply (Note 4) 給水収益に対する元利償還金割合[注4]	(%)	13.6	14.0	12.3	9.7
	Ratio of owned capital to total capital 自己資本構成比率	(%)	81.6 (73.1)	79.5 (73.0)	75.2	76.9
Soundness 健全性	Ordinary balance ratio 経常収支比率	(%)	112.4	111.5	115.5	114.9

(Note 1) All index values are calculated with tax included.
(Note 2) All index values for fiscal 2014 and subsequent years are calculated on the basis of the new accounting regime.
The figures in parentheses have been calculated for reference purposes on the basis of the new accounting regime under the assumption of its application from fiscal 2014.
(Note 3) Water supply cost is calculated on the bases of the fund, with capital expenditure included in the total expenditure.
(Note 4) The rate of redemption of principal and interest against the revenue on water supply is calculated by exempting the loan.

Source: Bureau of Waterworks, Tokyo Metropolitan Government
http://www.waterworks.metro.tokyo.jp/eng/supply/

4. Case 2: Public Outreach and Information Disclosure

Example of Brochures (Cont'd)

Message – A homeowner is responsible for fixing the service pipe from the meter to the tap.

Getting customers' attention in water supply matters by cartoon (*manga*).

Source: Bureau of Waterworks, Tokyo Metropolitan Government
https://www.waterworks.metro.tokyo.jp/kouhou/manga/pdf/st02.pdf

5. Case 3: Customer Service Center

Customer Service Centers of Tokyo Metropolitan Government

- Deal with complaints, enquiries, applications and disconnection requests.
- Organize customer information to facilitate a timely response.
- Respond to reports of leakage and broken water mains 24/7.

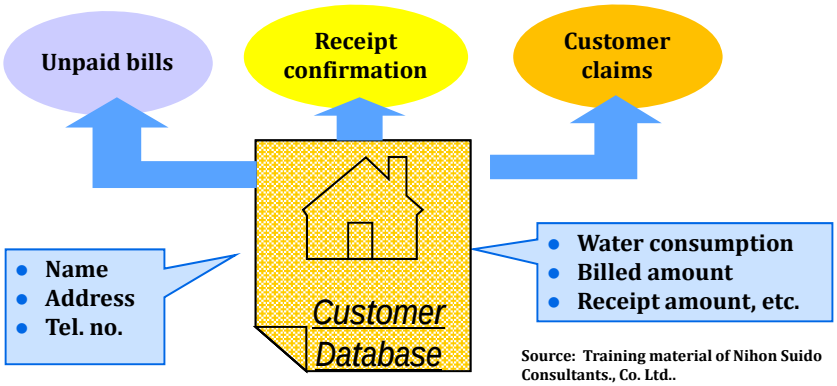
Inside of the Customer Service Center

Source: Bureau of Waterworks, Tokyo Metropolitan Government
http://www.waterprofessionals.metro.tokyo.jp/pdf/wst_06.pdf

5. Case 3: Customer Service Center

Customer database;

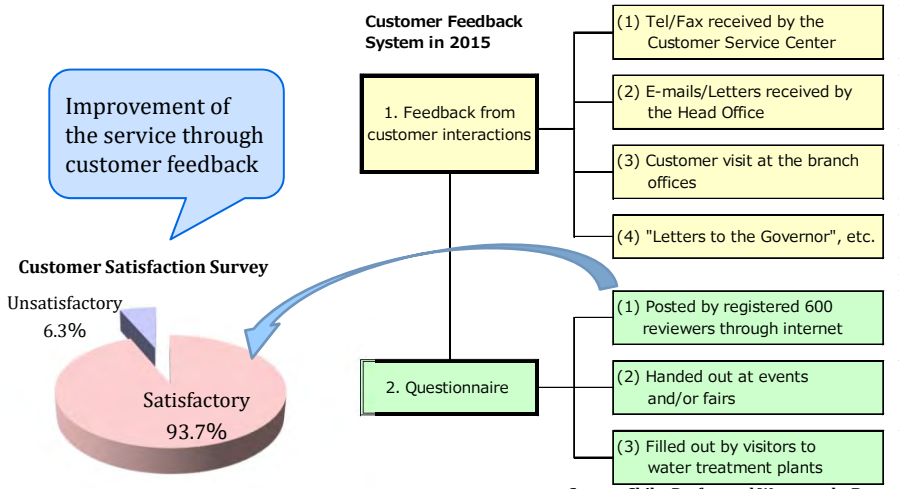
Key to quick response to enquires, customer's satisfaction and reliability of a water utility.



Source: Training material of Nihon Suido Consultants., Co. Ltd..

6. Case 4: Customer Feedback / Questionnaire Survey

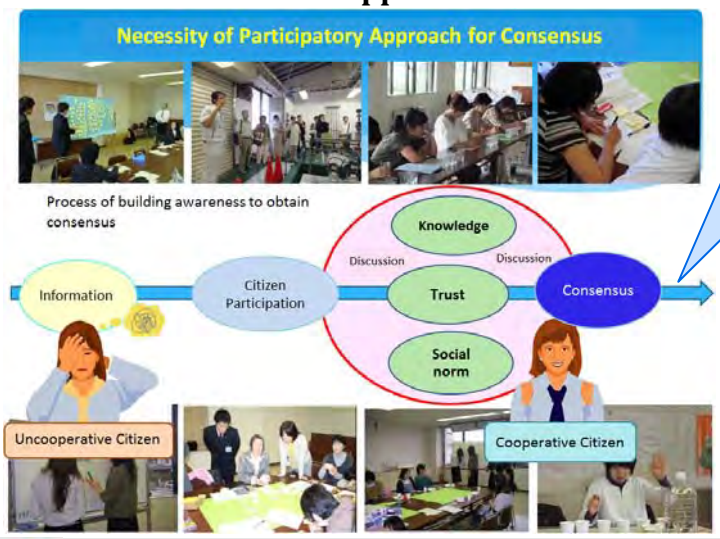
Customer Satisfaction Survey & Feedback by Chiba Prefecture



Source: Chiba Prefectural Waterworks Bureau

7. Case 5: Customer Participation

Yahaba Waterworks Supporters in Yahaba Town



Well-informed customers ⇒ knowledgeable supporters who will understand the need for future waterworks.

Source: http://www.hit-u.ac.jp/kenkyu/file/27forum3/YOSHIOKA.pdf

8. Case 6: Seminars at Schools

Seminars by Chiba Prefecture

Utility staff teach students about water supply and sewerage systems and how these contribute to their health and living conditions. Students also visit a water treatment plant.

Picture story shows, water purification experiments, quiz, etc.

Source: Chiba Prefectural Waterworks Bureau

9. Lessons Learned (1)

- **(The Water Supply Act and Relationships between a Utility and Customers)** Water utilities are required by the Water Supply Act to supply safe drinking water and provide information to their customers. The water supply contract between the utility and its customers sets out the relationship between the two parties. Customers pay for services and the revenue generated covers the expenses. Improving customer service can lead to sound and effective management of the water supply business.
- **(Customer Database)** As waterworks are natural monopolies, customers have the right to hold the utilities accountable and continually challenge them to deliver better service. It is essential for utilities to organize and keep their customer databases up to date. A well-run database with reliable and accurate customer information allows utilities to respond to requests and enquiries in a timely manner, thus fostering customers' trust in the business.

9. Lessons Learned (2)

- **(Information Disclosure and Public Involvement)** Water utilities are obliged to provide business and financial information on a regular basis and make such information easily accessible. Well-informed customers tend to understand and support proposed initiatives and contribute to sustainable management of the business. Water utilities must continue to improve their services by listening to public opinions and respond to the needs of their customers.
- **(Management Centered on Customer Service)** Japanese water utilities are well-regarded for high service standards, advanced technical capabilities and well-organized operations. The most critical take-away lesson from these successes is the basic premise of good customer service in providing safe drinking water. Emphasizing customer satisfaction is an effective way for water utilities to continue to improve the management of the water supply business.

Appendices

Contents

List of Terminology

Approval (License)	Special license issued by the government which makes a certain private activity legally effective. Water supply business is not legally effective unless the water utility gets approved by the government (there are some exemptions by prefectural governor). Once a water utility is approved, it has obligation to supply water for public health.
Basic Act on Water Cycle	Basic law aims to maintain and restore the water cycle. The law stipulates that the national government shall make a Water Cycle Basic Plan with comprehensive measures. The Act promotes the coordination of water-related administrative organizations.
Bulk Water Supply	A water supply system that provides raw water to individual water supply utilities. The Bulk Water Supply Utilities should be publicly owned in principle; there are no private bulk water suppliers in Japan.
Business plan	A plan for water business management. It includes management policies, institutional management, financial plans, operation plans, etc. for some years. Most large-scale utilities formulate it as a mid-term plan every five years.
Consolidation of Water Utilities / Regional Collaboration of Water Utilities	Providing water supply for a wider area by merger or joint operation of neighboring water utilities. Water utilities in Japan have been managed by municipal government and their businesses have been limited in their jurisdictions. However, consolidation or collaboration of water utilities is required for scale of economy in Japan.
Construction design plan	A plan which gives comprehensive instruction for water supply construction. The application for the Approval (License) for water supply operations requires a construction design plan including (1) maximum and average volumes of daily water supply, (2) type of water sources and water intake points, (3) water purification process, etc. When changes occur in these matters water utilities have to notify the Minister of Health, Labor and Welfare.
Fully Distributed Cost Method	A pricing method for allocating total costs to the services.
Health Center	Administrative organization which promotes community health. The Health Center is established by Prefecture and large city where is designated by the Community Health Act. The Health Center supervises water utilities in its jurisdiction.
high economic growth period	The period from 1954 to 1973 when Japan rapidly became the world's second largest economy. After the World War II recovery period of 1945-49 and the Korean War in 1950-53, the Japanese economy entered into a period of high growth. From the mid-1950s to the early 1970s, the average real growth was roughly 10%. This very high and sustained growth transformed the Japanese economy and society significantly. By around 1970, Japan overtook West Germany and became the second largest economy in the capitalist world measured by GNP size.
Local Public Enterprise Act	The Act is designed to establish special provisions for structures of an enterprise managed by a local public entity, finances of such enterprise, status and treatment of employees serving in the enterprise, and other basic standards for the operation of the enterprise.
Master plan	A plan which gives comprehensive instruction for water supply utilities. The application for the Approval (License) of water supply requires a master plan including (1) Service area, water supply population and water supply volume, (2) Outline of planned water supply facilities, (3) Total amount of construction expenses and their planned fund source, etc. When changes occur in these matters water utilities have to notify the Minister of Health, Labor and Welfare.
Minister of Health, Labour and Welfare	Minister of State who is the head of the Ministry of Health, Labour and Welfare. The Cabinet of Japan consists of approximately 14 Ministers of State and the Prime Minister.
Ministerial Ordinance about Water Quality Standard	Order of the Ministry of Health, Labour and Welfare enacted by its minister concerning water quality standards. It stipulates the parameters in detail.

Ministry of Economy, Trade and Industry	National administrative organization which promotes economy and industry in Japan. Its name was changed from Ministry of International Trade and Industry in 2001. The Ministry deals with industrial water for promotion of infrastructure for regional economy and industry.
Ministry of Health, Labour and Welfare (MHLW)	Administrative organization which provides regulations on health, medical care, employment, etc. The Ministry was formed with the merger of the former Ministry of Health and Welfare and the Ministry of Labour in 2001. The Water Supply Division is part of the Department of Environmental Health and Food Safety.
Ministry of Internal Affairs and Communications	National administrative organization which is responsible for fundamental framework of Japan, such as the various organizations relating to the economic and social activities of the nation. The Ministry was created in 2001 by the merger of the Ministry of Home Affairs, the Ministry of Posts and Telecommunications and the Management and Coordination Agency.
Ministry of Land, Infrastructure, Transport and Tourism (MLIT)	Administrative organization which provides development and conservation of country land and construction of infrastructures, etc. The Ministry was formed with the merger of Ministry of Construction, Ministry of Transport and two Agencies in 2001. The Water and Disaster Management Bureau is in charge of river and sewerage facilities.
Ministry of the Environment	National administrative organization which promotes global environmental conservation, pollution control, and nature conservation. The Ministry was formed at the cabinet level in 2001 from the sub-cabinet level Environmental Agency established in 1971.
Non-Revenue Water (NRW)	It consists of unbilled authorized consumption, apparent/commercial losses (unauthorized consumption, customer metering inaccuracies and systematic data handling errors) and real losses (leakage).
Order for the Water Supply Act	Rules by the state government which are necessary for enforcing the Water Supply Act. It stipulates qualifications of the Technical Administrator for Waterworks and so on.
Ordinance for Enforcement of the Water Supply Act	Rules by the Ministry of Health, Labour and Welfare which are necessary for enforcing the Water Supply Act. It stipulates documents to be attached to applications for Approval (License) and so on.
Prefecture	The first level of administrative division of Japan. Each Prefecture has a Governor and an Assembly. The Assembly is able to issue ordinances.
River Act	Basic law of river management in Japan, including flood control and water resources development. It stipulates the classification of river, river administrator and so on.
Self-Supporting Accounting System	Management system that aims to make a business unit manage itself with its own financial means. In this text, self-supporting accounting system means that a water utility is managed by tariff revenue.
Small Scale Public Water Supply	Waterworks served a population of 101to 5,000. Small Scale Public Water Supply does not mean a technically simple system just a system that supplies a small population.
Volumetric Rate	The water rates charged according to water volume consumed. Two-part tariffs consisting of the minimum rates and volumetric rates are generally used in Japan.
Water Rights	Special license by the river administrator. The river administrator is able to approve an exclusive use of a designated amount of water for certain purpose; electric power, irrigation and water supply etc. "Water Rights" is a customary name and it is not the legal word used in the River Act.
Water Supply Act	A basic law of waterworks in Japan since 1957. It stipulates fundamental concepts of water supply in Japan such as water quality standards, facilities standards and Approval (License).
Water Supply Vision	A long-term plan (vision) to indicate the future direction the water supply should consider the major changes in the business environment. Each water utility makes their Water Vision according to their own situation. The Ministry of Health, Labour and Welfare has recommended that since 2005.

Chronological Table

Fiscal year	Events conserning water supply: Legal Framework, Social System	Events conserning water supply: Finance, Tariff	Events conserning water supply: Technology	Events conserning water supply: Others	Social situation	Water supply coverage*1	Consumer price index*2	GDP (nominal) per capita*3 (US$)
					1859 The Port of Yokohama was opened to foreign countries			
					1868 Government of Meiji			
1870								
				1877 Cholera epidemics from Yokohama and Nagasaki				
	1879 Drinking Water Warning Act (Notification)							
1880								
		1888 Subsidy for waterworks	1887 The first modern water supply in Japan started at Yokohama City			0～1%		
	1889 New local government structure put into effect							The early period of modern water supply development
1890		1890 The Waterworks Ordinance						
					1894 First Sino-Japanese War	1～2%		
	1896 Prior River Act		1896 Water supply at Osaka City			2～3%		
			1899 Water supply at Tokyo City					
1900								
			1904 Federation of Water Authorities (Japan Water Works Association)		1904 Russo-Japanese War			
						4～5%		
1910								
						12%		
					1914-18 World War I			
						18%		
1920								
					1923 Great Kanto earthquake	19%		Spreading of modern water supply system
1930								
			1934 Quality inspection service by JWWA					
	1937 Health Center Act prior to Community Health Act				1937 Second Sino-Japanese War	28%		
						30%		
1940			1945 Governmental order to enhance chlorination		1941- 45 World War II			
						30%		
	1946 The Constitution promulgated in Japan			1948 Lectures on sanitary engineering started at the Institute of Public Health		28%	2.8%	
					1950-53 Korean War			
1950		1951 Measurement Act		1951 Comprehensive River Development		26%	12.5%	
	1952 Local Public Enterprise Act	1952 Subsidy for the Small Scale Waterworks				27%		
					1952 US-Japan Status Treaty, end of occupation	29%		
			1953 *Water Supply Facilities Maintenance Manual* by JWWA			31%		
						33%		High economic growth period
			1955 *Water Supply Facilities Standards* by JWWA					
						36%		
	1957 Water Supply Act							
		1957 Promotion of human resoourced development for the Small Scale Waterworks through training by prefectural government under the Water Supply Act						
			1958 *Guidelines for Water Supply Facilities Standards* by JWWA					
	1958 Drinking Water Quality Standards							
1960							18.4%	478
	1964 River Act					69%		
	1967 National subsidy for water source development and facilities construction	1967 *Water Tariff Setting Manual* by JWWA				72%		
					ca.1970 Pollution became tangible			
1970	1970 Water Pollution Control Act					81%	32.4%	1,967
					1973 Oil Crisis (“Oil Shock”)	84%		
						91%		
			1979 Trihalomethane problems became tangible		1979 Second Oil Crisis			
1980							76.7%	9,099
	1981 Notice of Minister of Health and Welfare about measures against trihalomethane							
1990	1992 Major revision of Drinking Water Quality Standards						89.8%	24,629
	1994 Act for Preservation of Drinking Water Sources		1994 Measures against disinfection by-product became common		1995 Great Hanshin earthquake	95%		
		1999 The Act on Promotion of Private Finance Initiative						
2000	2003 Major revision of Drinking Water Quality Standards and establishment of Water Quality Management System						98.5%	37,423
	2004 Water Supply Vision							37,976
					2011 The Great East Japan earthquake			
2010	2013 New Water Supply Vision					97%	96.3%	38,552
	2014 The Basic Act on Water Cycle					98%	99.7%	36,156
							100.0%	

*1. Water supply coverages until 1955 are according to estimation, others are according to JWWA's "Statistics on Water Supply in Japan."

*2. Consumer price index is estimated according to statistics of the Japanese government （http://www.e-stat.go.jp/SG1/estat/List.do?bid=000001074278&cycode=0）

*3. GDP (nominal) per capita is estimated according to the below.

Untill 2000: statistics of the Japanese Cabinet Office （http://www5.cao.go.jp/j-j/sekai_chouryuu/sa07-02/pdf/sa07-si-02.pdf）

After 2008: http://ecodb.net/country/JP/imf_gdp2.html

Water Supply Act
Local Public Enterprise Act

Abridged Translation

There is no official translation of the Water Supply Act and the Local Public Enterprise Act. These are personal translations from Mr. Hiroyasu Saito, who was a senior expert for JICA's water supply projects.

Thanks to Mr. Saito for kindly allowing us to use them in promoting a better understanding of Japan's waterworks management. He hopes that we utilize them in various JICA projects.

水道法対訳 (English version)（抄訳）

水道法（昭和 32 年 6 月 15 日法律第 177 号）	Water Supply Service Act　(Act No.177 of June 15, 1957)
第 1 章　総則（第 1 条―第 5 条） 第 1 章の 2　広域的水道整備計画（第 5 条の 2） 第 2 章　水道事業 　第 1 節　事業の認可等（第 6 条―第 13 条） 　第 2 節　業務（第 14 条―第 25 条） 　第 3 節　指定給水装置工事事業者（第 25 条の 2―第 25 条の 11） 　第 4 節　指定試験機関（第 25 条の 12―第 25 条の 27） 第 3 章　水道用水供給事業（第 26 条―第 31 条） 第 4 章　専用水道（第 32 条―第 34 条） 第 4 章の 2　簡易専用水道（第 34 条の 2―第 34 条の 4） 第 5 章　監督（第 35 条―第 39 条） 第 6 章　雑則（第 40 条―第 50 条の 3） 第 7 章　罰則（第 51 条―第 57 条） 附則	Chapter 1　General Provisions Chapter 1-2 Regional Planning of Construction/Improvement for Water Supply Services Chapter 2　Water Supply Services 　Section 1　Licensing of Services 　Section 2　Services 　Section 3　Designated Service Connection Facility Work Contractor 　(Section 4　Designated Examination Institute) Chapter 3　Wholesale water Supply services Chapter 4　Private Water Supply Systems Chapter 4-2 Small Private Water Supply System Chapter 5　Supervision Chapter 6　Miscellaneous Provisions Chapter 7　Penal Regulations Supplementary Provision
第一章　総則 **（この法律の目的）** **第一条**　この法律は、水道の布設及び管理を適正かつ合理的ならしめるとともに、水道を計画的に整備し、及び水道事業を保護育成することによって、清浄にして豊富低廉な水の供給を図り、もつて公衆衛生の向上と生活環境の改善とに寄与することを目的とする。 **（責務）** **第二条**　国及び地方公共団体は、水道が国民の日常生活に直結し、その健康を守るために欠くことのできないものであり、かつ、水が貴重な資源であることにかんがみ、 水源及び水道施設並びにこれらの周辺の清潔保持並びに水の適正かつ合理的な使用に関し必要な施策を講じなければならない。	**Chapter 1　General Provisions** **(Purposes of the Act)** **Article 1**　This Act is designed to make the construction and operation of water supply services appropriate and reasonable, to improve water supply networks systematically, to strive for the supply of wholesome, plenty and affordable water by protecting and developing water supply service, and thereby to contribute to the enhancement of public health and improvement of living environment for residents of community. **(Responsibilities)** **Article 2**　1. In view of the facts that water supply services are directly connected with the daily life of the people of this nation, that they are indispensable to protect the health of the people, and that water is valuable resources, the state and local public entities must take necessary measures for the maintenance of the cleanness of water sources, facilities for water supply, and their surroundings, as well as the appropriate and reasonable use of water.

2　国民は、前項の国及び地方公共団体の施策に協力するとともに、自らも、水源及び水道施設並びにこれらの周辺の清潔保持並びに水の適正かつ合理的な使用に努めなければならない。	2. The people of this nation must cooperate with the measures of the state and local public entities, provided for in the preceding paragraph, and personally strive for the maintenance of the cleanness of water sources, facilities of water supply services, and their surroundings, as well as for appropriate and reasonable use of water.
第二条の二　地方公共団体は、当該地域の自然的社会的諸条件に応じて、水道の計画的整備に関する施策を策定し、及びこれを実施するとともに、水道事業及び水道用水供給事業を経営するに当たっては、その適正かつ能率的な運営に努めなければならない。 **２**　国は、水源の開発その他の水道の整備に関する基本的かつ総合的な施策を策定し、及びこれを推進するとともに、地方公共団体並びに水道事業者及び水道用水供給事業者に対し、必要な技術的及び財政的援助を行うよう努めなければならない。	**Article 2-2**　1. Local public entities shall formulate measures for the systematic construction and improvement of water supply services in accordance with the natural/social conditions of the said area, to implement such measures, and to strive for the appropriate and efficient operations in managing water supply services and running water supply services. 2. The state must formulate basic and overall plans for the development of water sources and improvement of other aspects of water supply services, to promote such plans, and strive to provide local public services, water suppliers, and wholesale water suppliers with necessary technical and financial assistance.
（用語の定義） **第三条**　この法律において「水道」とは、導管及びその他の工作物により、水を人の飲用に適する水として供給する施設の総体をいう。ただし、臨時に施設されたものを除く。 **２**　この法律において「水道事業」とは、一般の需要に応じて、水道により水を供給する事業をいう。ただし、給水人口が百人以下である水道によるものを除く。 **３**　この法律において「簡易水道事業」とは、給水人口が五千人以下である水道により、水を供給する水道事業をいう。 **４**　この法律において「水道用水供給事業」とは、水道により、水道事業者に対してその用水を供給する事業をいう。ただし、水道事業者又は専用水道の設置者が他の水道事業者に分水する場合を除く。	**(Terminology Definition)** **Article 3**　1. In this Act, “water supply systems” shall mean entire facilities designed to supply water as potable for human beings through pipes or other products. However, tentatively manufactured facilities shall be excluded from this category. 2. “Water supply services” in this Act shall mean public services to provide water through water supply systems in response to general demand of the community. However, water supply services through water supply systems for the population of 100 persons or less shall be excluded from this category. 3. “Small scale water supply services” in this Act shall mean the water supply services for providing water through water supply systems whose population of service is 5,000 people or less. 4. “Wholesale water supply services” in this Act shall mean the public services to provide the water suppliers with water to be used for their water supply service through water supply systems. However, the case in which a water supply services or private water supply services divide its water to other water supply services shall be excluded from this category.

５　この法律において「水道事業者」とは、第六条第一項の規定による認可を受けて水道事業を経営する者をいい、「水道用水供給事業者」とは、第二十六条の規定による認可を受けて水道用水供給事業を経営する者をいう。	5. “A water supplier” in this Act shall mean the operator engaged in water supply services after being awarded a license based on the provisions of Article 6, Paragraph 1, while a “a wholesale water supplier” in this Act shall mean a wholesale water supplier engaged in water supply services after being awarded a license based on the provision in Article 26.
６　この法律において「専用水道」とは、寄宿舎、社宅、療養所等における自家用の水道その他水道事業の用に供する水道以外の水道であって、次の各号 のいずれかに該当するものをいう。ただし、他の水道から供給を受ける水のみを水源とし、かつ、その水道施設のうち地中又は地表に施設されている部分の規模 が政令で定める基準以下である水道を除く。	6. “Private water supply systems” in this Act shall mean water supply services falling under any of the following items, excluding cases of water supply services used for in-house water supply systems for dormitories, corporate houses, recuperation facilities, and other water supply services. This category shall not include, however, water supply services whose water sources are exclusively the water supplied from other water supply services, and whose facility size for the portions laid underground or on the ground surface is less than the standard set under a Cabinet order.
一　百人を超える者にその居住に必要な水を供給するもの	1) Water supply systems designed to supply more than 100 persons with water necessary for their living.
二　その水道施設の一日最大給水量（一日に給水することができる最大の水量をいう。以下同じ。）が政令で定める基準を超えるもの	2) Water supply systems whose maximum daily supply volume (referring to the water volume capable of being supplied per day; hereinafter the same) exceeds the standard set under a Cabinet order.
７　この法律において「簡易専用水道」とは、水道事業の用に供する水道及び専用水道以外の水道であって、水道事業の用に供する水道から供給を受ける水のみを水源とするものをいう。ただし、その用に供する施設の規模が政令で定める基準以下のものを除く。	7. “Small, private water supply systems” in this Act shall mean water supply services other than water supply services and private water supply systems supplying water for water supply services whose water source is limited to water supplied exclusively from water for water supply services, excluding, however, water supply services that provide water to water supply facilities whose services is smaller than the standard specified under a Cabinet order.
８　この法律において「水道施設」とは、水道のための取水施設、貯水施設、導水施設、浄水施設、送水施設及び配水施設（専用水道にあっては、給水の 施設を含むものとし、建築物に設けられたものを除く。以下同じ。）であつて、当該水道事業者、水道用水供給事業者又は専用水道の設置者の管理に属するもの をいう。	8. “Water supply facilities” in this Act shall mean water intake facilities, water storage facilities, raw water transmission facilities, water purification facilities, water conveyance facilities, and water distribution facilities for water supply systems (including, in case of private water supply services, water supply facilities, but excluding those facilities installed within buildings/structures; hereinafter the same) that are managed by the said water supply services, a wholesale water services, or a private water supply systems.

９　この法律において「給水装置」とは、需要者に水を供給するために水道事業者の施設した配水管から分岐して設けられた給水管及びこれに直結する給水用具をいう。	9. “Service connection facilities” in this Act shall mean service pipes for branching out of water distribution pipes installed by a water supply services for delivery of water for customers, and water supply devices and fittings directly connected with the said service pipes.
１０　この法律において「水道の布設工事」とは、水道施設の新設又は政令で定めるその増設若しくは改造の工事をいう。	10. “Water services laying work” in this Act shall mean construction work for new installation of water supply services, as well as their expansion or alteration set under a Cabinet order.
１１　この法律において「給水装置工事」とは、給水装置の設置又は変更の工事をいう。	11. “Construction work for service connection facilities“ in this Act shall mean construction work for installation or alteration of service connection facilities.”
１２　この法律において「給水区域」、「給水人口」及び「給水量」とは、それぞれ事業計画において定める給水区域、給水人口及び給水量をいう。	12. “Water supply service area,” “water supply population,” and “water supply volume” in this Act shall mean the water supply service area, water supply population, and water supply volume set individually under a business plan.
（水質基準） **第四条**　水道により供給される水は、次の各号に掲げる要件を備えるものでなければならない。 一　病原生物に汚染され、又は病原生物に汚染されたことを疑わせるような生物若しくは物質を含むものでないこと。 二　シアン、水銀その他の有毒物質を含まないこと。 三　銅、鉄、弗素、フェノールその他の物質をその許容量をこえて含まないこと。 四　異常な酸性又はアルカリ性を呈しないこと。 五　異常な臭味がないこと。ただし、消毒による臭味を除く。 六　外観は、ほとんど無色透明であること。 ２　前項各号の基準に関して必要な事項は、厚生労働省令で定める。	**(Water Quality Standards)** **Article 4**　1. Water to be supplied through water supply services must meet requirements shown in the following items: 1) Not containing organisms or substances that indicate or are suspected to indicate contamination by pathogenic organisms. 2) Not containing cyanogens, mercury, or other poisonous substances. 3) Not containing copper, iron, fluorine, phenol, etc. beyond their permissible volumes. 4) Not showing any abnormal acidity or alkaline nature. 5) Not including any abnormal odor, excluding such an order due to disinfection. 6) External appearance shall be almost colorless and transparent. 2. Matters required for the standards shown in the items of the preceding paragraph shall be determined through orders of the Ministry of Health, Labour and Welfare.
（施設基準） **第五条**　水道は、原水の質及び量、地理的条件、	**(Water Supply Facility Standards)** **Article 5**　1. Water supply services shall have all or part of intake facilities, water storage facilities, raw water transmission

当該水道の形態等に応じ、取水施設、貯水施設、導水施設、浄水施設、送水施設及び配水施設の全部又は一部を有すべきものとし、その各施設は、次の各号に掲げる要件を備えるものでなければならない。	facilities, water purification facilities, water conveyance facilities, and water distribution facilities in accordance with the quality and quantity of raw water, geographical conditions, type of the said water supply services, and the like. These water supply facilities shall meet the requirements shown in items below:
一　取水施設は、できるだけ良質の原水を必要量取り入れることができるものであること。	1) Water intake facilities shall be able to take in the necessary volume of raw water whose quality is as excellent as possible.
二　貯水施設は、渇水時においても必要量の原水を供給するのに必要な貯水能力を有するものであること。	2) Water storage facilities shall have the water storage ability capable of supplying raw water required even at the time of draught.
三　導水施設は、必要量の原水を送るのに必要なポンプ、導水管その他の設備を有すること。	3) Raw water transmission facilities shall have pumps, raw water transmission pipes, and other equipment required to provide the necessary volume of raw water.
四　浄水施設は、原水の質及び量に応じて、前条の規定による水質基準に適合する必要量の浄水を得るのに必要なちんでん池、濾過池その他の設備を有し、かつ、消毒設備を備えていること。	4) Water purification facilities shall have a sedimentation tank, a filter basin, other facilities required to obtain a necessary volume of purified water, meeting the water quality standards, based on the provisions of the previous Article, and disinfection facilities, in accordance with the quality and volume of raw water.
五　送水施設は、必要量の浄水を送るのに必要なポンプ、送水管その他の設備を有すること。	5) Water conveyance facilities shall have pumps, water conveyance pipes, and other facilities required to convey the necessary volume of purified water.
六　配水施設は、必要量の浄水を一定以上の圧力で連続して供給するのに必要な配水池、ポンプ、配水管その他の設備を有すること。	6) Water distribution facilities shall have service reservoirs, pumps, distribution pipes, and other equipment required to continually distribute the necessary volume of purified water at a pressure above a fixed level.
2　水道施設の位置及び配列を定めるにあたっては、その布設及び維持管理ができるだけ経済的で、かつ、容易になるようにするとともに、給水の確実性をも考慮しなければならない。	2. In determining the location and arrangements of water supply facilities, it is necessary to make their laying, operation and maintenance as economically and easily as possible, and to give consideration to assurance of water supply.
3　水道施設の構造及び材質は、水圧、土圧、地震力その他の荷重に対して充分な耐力を有し、かつ、水が汚染され、又は漏れるおそれがないものでなければならない。	3. With regard to the structure and material of water supply facilities, these facilities shall have sufficient durability against water pressure, earth load, earthquake force, and other loads, and there should be no fear of water contamination or leakage.
4　前三項に規定するもののほか、水道施設に関して必要な技術的基準は、厚生労働省令で定める。	4. In addition to the standards provided for in the three (3) preceding paragraphs, technological standards required for water supply facilities shall be stipulated under orders of the Ministry of Health, Labor and Welfare.

第一章の二　広域的水道整備計画	**Chapter 1-2　Regional Planning of Construction/ Improvement for Water Supply Services**
第五条の二　地方公共団体は、この法律の目的を達成するため水道の広域的な整備を図る必要があると認めるときは、関係地方公共団体と共同して、水道の広域的な整備に関する基本計画（以下「広域的水道整備計画」という。）を定めるべきことを都道府県知事に要請することができる。	**Article 5-2**　1. When a local public entity recognizes that it is necessary to seek the regional construction and improvement of water supply services to attain the purposes of this Act, it may, jointly with the local public entities concerned, to ask the governor of the Prefecture concerned to set a regional basic plan of the construction / improvement for water supply services (hereinafter, “Regional Plan of Construction / Improvement for Water Supply Services”).
２　都道府県知事は、前項の規定による要請があつた場合において、この法律の目的を達成するため必要があると認めるときは、関係地方公共団体と協議し、かつ、当該都道府県の議会の同意を得て、広域的水道整備計画を定めるものとする。	2. When the governor of the Prefecture recognizes and the request mentioned in the preceding paragraph is made, the need for adoption of the proposed step to attain the purposes of the Act, he shall consult with the local public entities concerned and, after obtaining the approval of the local assembly of the Prefecture, set the regional plan of construction / improvement for water supply services.
３　広域的水道整備計画においては、次の各号に掲げる事項を定めなければならない。 一　水道の広域的な整備に関する基本方針 二　広域的水道整備計画の区域に関する事項 三　前号の区域に係る根幹的水道施設の配置その他水道の広域的な整備に関する基本的事項	3. In the regional plan of construction / improvement for water supply services, it shall be necessary to set matters provided for in the following items: 1) Basic policy for the regional construction / improvement for water supply services. 2) Matters related to the area for the regional plan of construction / improvement for water supply services. 3) Location of basic water supply facilities related to the service area in the preceding item and other fundamental matters concerned with regional construction / improvement for water supply services.
４　広域的水道整備計画は、当該地域における水系、地形その他の自然的条件及び人口、土地利用その他の社会的条件、水道により供給される水の需要に関する長期的な見通し並びに当該地域における水道の整備の状況を勘案して定めなければならない。	4. The regional plan of construction / improvement for water supply services must be worked out in consideration of water supply services, topography and natural conditions in the area; population, land use, and other social conditions; regional outlook for water demand and supply; and the state of construction and improvement for water supply services in the said area.
５　都道府県知事は、広域的水道整備計画を定めたときは、遅滞なく、これを厚生労働大臣に報告するとともに、関係地方公共団体に通知しなけ	5. When the governor of the Prefecture concerned determines a regional plan of water supply construction / improvement, he must report the plan to the Minister of Health, Labor and Welfare and notify the local public entities concerned of the

ればならない。

６　厚生労働大臣は、都道府県知事に対し、広域的水道整備計画に関し必要な助言又は勧告をすることができる。

第二章　水道事業

第一節　事業の認可等

（事業の認可及び経営主体）

第六条　水道事業を経営しようとする者は、厚生労働大臣の認可を受けなければならない。

２　水道事業は、原則として市町村が経営するものとし、市町村以外の者は、給水しようとする区域をその区域に含む市町村の同意を得た場合に限り、水道事業を経営することができるものとする。

(認可の申請)

第七条　水道事業経営の認可の申請をするには、申請書に、事業計画書、工事設計書その他厚生労働省令で定める書類（図面を含む。）を添えて、これを厚生労働大臣に提出しなければならない。

２　前項の申請書には、次に掲げる事項を記載しなければならない。

一　申請者の住所及び氏名（法人又は組合にあっては、主たる事務所の所在地及び名称並びに代表者の氏名）

二　水道事務所の所在地

３　水道事業者は、前項に規定する申請書の記載事項に変更を生じたときは、速やかに、その旨を厚生労働大臣に届け出なければならない。

４　第一項の事業計画書には、次に掲げる事項を記載しなければならない。

plan.

6. The Minister of Health, Labor and Welfare may give necessary recommendations or advice to the governor concerned regarding the said regional plan of construction / improvement for water supply services.

Chapter 2　Water Supply Services

Section 1　Licensing of Services

(Licensing of the Services and the Entity of Operation)

Article 6　1. The entity who is planning to operate water supply services must be awarded the license of the Minister of Health, Labor and Welfare.

2. Water supply services shall be operated by a city/town/village (herein after referred to as “municipal authority”) in principle, and other organization may operate water supply services only when the consent of a municipal authority containing the area for planned water supply services in its region is obtained.

(Application for License)

Article 7　1. For seeking a license of the operation of water supply services, the entity concerned shall submit an application, accompanied by a business plan, construction / design plan, and other documents including drawings specified under an order of the Ministry of Health, Labor and Welfare, to the Minister of Health, Labor and Welfare.

2. In the application provided for in the preceding paragraph, the following matters must be stated:

1) The address and name of the applicant (in the case of an enterprise or organization, the address of the main office, name, and the name of its representative)

2) Location of the water supply services office

3. When changes occur in the matters stated in the application, stipulated in the preceding paragraph, a water supplier shall promptly notify the Minister of Health, Labor and Welfare of the changes.

4. The business plan, mentioned in Paragraph 1, must state the following matters:

一　給水区域、給水人口及び給水量	1) Service area, water supply population, and waster supply volume
二　水道施設の概要	2) Outline of planned water supply facilities
三　給水開始の予定年月日	3) Planned date for commencement of said water supply
四　工事費の予定総額及びその予定財源	4) Total amount of construction expenses and their planned fund source
五　給水人口及び給水量の算出根拠	5) Grounds for the calculation of water supply population and water supply volume
六　経常収支の概算	6) Balance of current account (income and expense)
七　料金、給水装置工事の費用の負担区分その他の供給条件	7) Water rates and allocation for construction expenses of service connection facilities between water supplier and customers, as well as other supply conditions
八　その他厚生労働省令で定める事項	8) Other matters determined under orders of the Ministry of Health, Labor and Welfare
5　第一項の工事設計書には、次に掲げる事項を記載しなければならない。	5. The construction design plan, mentioned in Paragraph 1, must state the following matters:
一　一日最大給水量及び一日平均給水量	1) Maximum and average volumes of daily water supply
二　水源の種別及び取水地点	2) Type of water sources and water intake points
三　水源の水量の概算及び水質試験の結果	3) Rough estimate of water volume at water sources and results of water quality examination
四　水道施設の位置（標高及び水位を含む。）、規模及び構造	4) Location of water supply facilities (including altitude and water levels), their scales and structure
五　浄水方法	5) Water purification process
六　配水管における最大静水圧及び最小動水圧	6) Maximum hydrostatic pressure and minimum hydrodynamic pressure in water distribution pipes
七　工事の着手及び完了の予定年月日	7) Scheduled dates of commencement and completion for construction works
八　その他厚生労働省令で定める事項	8) Other matters set under orders of the Ministry of Health, Labor and Welfare
（認可基準）	**(Standards of License)**
第八条　水道事業経営の認可は、その申請が次の各号に適合していると認められるときでなければ、与えてはならない。	**Article 8** 1. License of water supply services may not be given, unless the related application meets the requirements in the following items:
一　当該水道事業の開始が一般の需要に適合すること。	1) The commencement of said water supply services is in accord with general demand of the community.
二　当該水道事業の計画が確実かつ合理的であること。	2) The plan for the said water supply services is certain and reasonable.
三　水道施設の工事の設計が第五条の規定によ	3) Designs for construction of water supply facilities meet the facility standards based on the provisions of Article 5.

る施設基準に適合すること。 **四**　給水区域が他の水道事業の給水区域と重複しないこと。 **五**　供給条件が第十四条第二項各号に掲げる要件に適合すること。 **六**　地方公共団体以外の者の申請に係る水道事業にあっては、当該事業を遂行するに足りる経理的基礎があること。 **七**　その他当該水道事業の開始が公益上必要であること。 **２**　前項各号に規定する基準を適用するについて必要な技術的細目は、厚生労働省令で定める。	4) The water supply service area does not overlap the service area of any other water suppliers. 5) Water supply conditions meet requirements stated in Article 14, Paragraph 2, individual items. 6) In the case of water supply services applied for by entities other than local public entities, there exists a certain financial foundation capable of performing said water supply services. 7) In addition, the commencement of said water supply services is required from a viewpoint of public interest. 2. Technological details required for the application of standards, provided for in items of the preceding paragraph, shall be determined under orders of the Ministry of Health, Labor and Welfare.
（附款） **第九条**　厚生労働大臣は、地方公共団体以外の者に対して水道事業経営の認可を与える場合には、これに必要な期限又は条件を附することができる。 **２**　前項の期限又は条件は、公共の利益を増進し、又は当該水道事業の確実な遂行を図るために必要な最少限度のものに限り、かつ、当該水道事業者に不当な義務を課することとなるものであつてはならない。	**(Reservation of Provisions)** **Article 9**　1. In the case that the Minister of Health, Labor and Welfare gives license for the operation of water supply services to entities other than local public entities, he may specify a required time period or additional conditions for the operation. 2. The time period or additional conditions provided for in the preceding paragraph shall be limited to those of minimum requirements to enhance public interests or ensure enforcement of the water supply services, and may not be such as to impose unreasonable duties on the said water supply services.
（事業の変更） **第十条**　水道事業者は、給水区域を拡張し、給水人口若しくは給水量を増加させ、又は水源の種別、取水地点若しくは浄水方法を変更しようとするとき（次の各号のいずれかに該当するときを除く。）は、厚生労働大臣の認可を受けなければならない。この場合において、給水区域の拡張により新たに他の市町村の区域が給水区 域に含まれることとなるときは、当該他の市町村の同意を得なければ、当該認可を受けることができない。 **一**　その変更が厚生労働省令で定める軽微なも	**(Modification in water supply services)** **Article 10**　1. A water supplier shall be awarded the license by the Minister of Health, Labor and Welfare, when it is about to expand the service area, increase water supply population or water supply volume, or change the types of water sources, water intake points, or water purification processes (excluding cases shown in the following items). When, in this case, some service areas of other municipal authorities are to be included in the planned service area because of the projected expansion, the said water supply services cannot be awarded said license unless it obtains the consent of the other municipal authorities concerned. 1) When the modification falls under a slight one classified by an order of the Ministry of Health, Labor and Welfare.

のであるとき。 二　その変更が他の水道事業の全部を譲り受けることに伴うものであるとき。 ２　第七条から前条までの規定は、前項の認可について準用する。 ３　水道事業者は、第一項各号のいずれかに該当する変更を行うときは、あらかじめ、厚生労働省令で定めるところにより、その旨を厚生労働大臣に届け出なければならない。	2) When the modification is incidental to acquire of an entire water supply services from other entity. 2. Provisions of Article 7 to the preceding article shall be applied to procedure to the license in the preceding paragraph. 3. When a water supply services plans to implement a modification falling under any item of Paragraph 1, it shall report the planned modification to the Minister of Health, Labor and Welfare in advance, in accordance with the order concerned of the Ministry of Health, Labor and Welfare.
（事業の休止及び廃止） **第十一条**　水道事業者は、給水を開始した後においては、厚生労働大臣の許可を受けなければ、その水道事業の全部又は一部を休止し、又は廃止してはならない。ただし、 その水道事業の全部を他の水道事業を行う水道事業者に譲り渡すことにより、その水道事業の全部を廃止することとなるときは、この限りでない。 ２　前項ただし書の場合においては、水道事業者は、あらかじめ、その旨を厚生労働大臣に届け出なければならない。	**(Suspension and Discontinuation of Water Supply Services)** **Article 11** 1. After a water supply services commences water supply, it may not suspend or discontinue all or part of its water supply services unless it obtains permission from the Minister of Health, Labor and Welfare. This shall not apply, however, when it discontinues all of its water supply services by merging all of its water supply services to other water supply services. 2. In the case of the provision in the preceding paragraph, the water supply services must report to that effect to the Minister of Health, Labor and Welfare in advance.
（技術者による布設工事の監督） **第十二条**　水道事業者は、水道の布設工事を自ら施行し、又は他人に施行させる場合においては、その職員を指名し、又は第三者に委嘱して、その工事の施行に関する技術上の監督業務を行わせなければならない。 ２　前項の業務を行う者は、政令で定める資格を有する者でなければならない。	**(Supervision of Construction Work by an Engineer)** **Article 12** 1. When a water supply services engages in water supply construction work by itself or have other entity implement such work, it must designate an engineer or entrusting such work to a third party, to give technological supervision for the enforcement of said construction work. 2. The person who carries out the work provided for in the preceding paragraph must have qualifications specified under a Cabinet order.
（給水開始前の届出及び検査） **第十三条**　水道事業者は、配水施設以外の水道施設又は配水池を新設し、増設し、又は改造した場合において、その新設、増設又は改造に係る施設を使用して給水を開始し ようとするときは、あらかじめ、厚生労働大臣にその旨を届け出で、	**(Reporting and Inspection before Commencement of Water Supply)** **Article 13** 1. When a water supply services newly commences, expands, or alters water supply facilities or distribution reservoirs, other than water distribution facilities, and intends to commence water supply by using the facilities newly installed, expanded, or altered, the said water supply services must report its effects to the Minister of Health, Labor and

かつ、厚生労働省令の定めるところにより、水質検査及び施設検査を行わなければならない。

２　水道事業者は、前項の規定による水質検査及び施設検査を行つたときは、これに関する記録を作成し、その検査を行った日から起算して五年間、これを保存しなければならない。

Welfare in advance and execute inspection of water quality and water supply facilities in accordance with orders of the Ministry of Health, Labor and Welfare.

2. When the water supply services executes inspection of water quality and water supply facilities based on the provision in the preceding paragraph, it must formulate records thereof, and maintain such records for five (5) years from the date of said inspections.

第二節　業務

Section 2 Services

（供給規程）

第十四条　水道事業者は、料金、給水装置工事の費用の負担区分その他の供給条件について、供給規程を定めなければならない。

２　前項の供給規程は、次の各号に掲げる要件に適合するものでなければならない。

一　料金が、能率的な経営の下における適正な原価に照らし公正妥当なものであること。

二　料金が、定率又は定額をもつて明確に定められていること。

三　水道事業者及び水道の需要者の責任に関する事項並びに給水装置工事の費用の負担区分及びその額の算出方法が、適正かつ明確に定められていること。

四　特定の者に対して不当な差別的取扱いをするものでないこと。

五　貯水槽水道（水道事業の用に供する水道及び専用水道以外の水道であって、水道事業の用に供する水道から供給を受ける水のみを水源とするものをいう。以下この号において同じ。）が設置される場合においては、貯水槽水道に関し、水道事業者及び当該貯水槽水道の設置者の責任に関する事項が、適正かつ明 確に定められていること。

(Water Supply Regulations)

Article 14　1. A water supply services shall set water supply regulations regarding water rates, allocation of expense for service connection facilities work between water supplier and customers, and other water supply conditions.

2. The water supply regulations, provided for in the preceding paragraph, shall meet requirements shown in the following items:

1) Water rates must be fair and reasonable in light of appropriate cost under an efficient operation.
2) Water rates must be set based on either fixed rates or fixed sum.
3) Matters related to responsibilities of water supply services and customers, allocation of expense for service connection facilities work between them, and methods for calculating said expenses must be appropriately and clearly set.
4) No unfair and discriminatory measures should have been taken toward any specific persons.
5) In the case of constructing “a tank storage water supply systems” (water supply system other than those designed to provide water to water supply services or private water supply services that receive water only from water supply services providing water to water supply services, as its water source; hereinafter the same in this item), matters related to responsibilities of the water suppliers and the installer of said “a tank storage water supply systems,” with regard to the tank storage water supply systems, shall be appropriately and clearly set.

3　前項各号に規定する基準を適用するについて必要な技術的細目は、厚生労働省令で定める。	3. Technological details required for the application of standards provided for in the items in the preceding paragraph shall be set under orders of the Ministry of Health, Labor and Welfare.
4　水道事業者は、供給規程を、その実施の日までに一般に周知させる措置をとらなければならない。	4. The water supply services must take steps to notify its water supply regulations to the general public by the date of commencing water supply services.
5　水道事業者が地方公共団体である場合にあっては、供給規程に定められた事項のうち料金を変更したときは、厚生労働省令で定めるところにより、その旨を厚生労働大臣に届け出なければならない。	5. In the case of a water supply services is a local public entity, and when the said water supply services changes its water rates, among matters set under its water supply regulations, the said water supply services must report to that effect to the Minister of Health, Labor and Welfare in accordance with the provisions of the Ministry of Health, Labor and Welfare.
6　水道事業者が地方公共団体以外の者である場合にあっては、供給規程に定められた供給条件を変更しようとするときは、厚生労働大臣の認可を受けなければならない。	6. In the case of a water supply services is an entity different from a local public entity, the said water supply services must be awarded a license by the Minister of Health, Labor and Welfare, when it plans to change water supply conditions set in its water supply regulations.
7　厚生労働大臣は、前項の認可の申請が第二項各号に掲げる要件に適合していると認めるときは、その認可を与えなければならない。	7. When the Minister of Health, Labor and Welfare recognizes that application for the license stipulated in the preceding paragraph satisfies the requirements shown in the items of Paragraph 2, the Minister must award the said license.
（給水義務） **第十五条**　水道事業者は、事業計画に定める給水区域内の需要者から給水契約の申込みを受けたときは、正当の理由がなければ、これを拒んではならない。	**(Water Supply Obligations)** **Article 15**　1. When a water supply services receives an application for water supply services from a person living in service area of the said water supply services, set in its business plan, the water supply services may not refuse the application unless it has any justifiable reasons against its acceptance.
2　水道事業者は、当該水道により給水を受ける者に対し、常時水を供給しなければならない。ただし、第四十条第一項の規定による水の供給命令を受け たため、又は災害その他正当な理由があってやむを得ない場合には、給水区域の全部又は一部につきその間給水を停止することができる。この場合には、やむを 得ない事情がある場合を除き、給水を停止しようとする区域及び期間をあらかじめ関係者に周知させる措置をとらなければならない。	2. The water supply services must supply water on a continuous basis to the person receiving water from it. However, the water supply services may suspend water supply for all or part of the service area, when a water supply order, based on the provision of Article 40, Paragraph 1, is received, or when the suspension is unavoidable due to a natural disaster or some other justifiable reasons. In this case, the water supply services must take measures to notify the persons concerned of the service area and period for the said suspension of water supply in advance, unless there are some unavoidable reasons.
3　水道事業者は、当該水道により給水を受け	3. Notwithstanding the provision in the text of the preceding paragraph, when a person receiving water from the water

る者が料金を支払わないとき、正当な理由なしに給水装置の検査を拒んだとき、その他正当な理由があると きは、前項本文の規定にかかわらず、その理由が継続する間、供給規程の定めるところにより、その者に対する給水を停止することができる。	supply services does not pay water rates, when a person refuses inspection of the service connection facilities without any practical reasons, or when there is some other justifiable reason, the water supply services may suspend water supply to such a person in accordance with its water supply regulations, so long as the reason for suspension continues.
（給水装置の構造及び材質） **第十六条**　水道事業者は、当該水道によって水の供給を受ける者の給水装置の構造及び材質が、政令で定める基準に適合していないときは、供給規程の定めるところにより、その者の給水契約の申込を拒み、又はその者が給水装置をその基準に適合させるまでの間その者に対する給水を停止することができる。	**(Structure and Material of Service Connection Facilities)** **Article 16** When the structure and material of service connection facilities of a person receiving water from the related water supply services are not in accordance with standards set by Cabinet orders, the water supply services may refuse an application for water supply from the said person or suspend water supply to the said person based on its supply regulations until that person adapts his/her service connection facilities so as to meet the standards.
（給水装置工事） **第十六条の二**　水道事業者は、当該水道によって水の供給を受ける者の給水装置の構造及び材質が前条の規定に基づく政令で定める基準に適合することを確保するため、当該水道事業者の給水区域において給水装置工事を適正に施行することができると認められる者の指定をすることができる。 **２**　水道事業者は、前項の指定をしたときは、供給規程の定めるところにより、当該水道によって水の供給を受ける者の給水装置が当該水道事業者又は当 該指定を受けた者（以下「指定給水装置工事事業者」という。）の施行した給水装置工事に係るものであることを供給条件とすることができる。 **３**　前項の場合において、水道事業者は、当該水道によって水の供給を受ける者の給水装置が当該水道事業者又は指定給水装置工事事業者の施行した給水装置工事に係るものでないときは、供給規程の定めるところにより、その者の給水契	**(Service Connection Facilities Work)** **Article 16-2** 1. To ensure that the structure and material of service connection facilities of persons receiving water supply from a water supply services satisfy standards fixed by Cabinet orders, based on the provisions of the preceding Article, the water supply services may designate a person recognized to be able to appropriately implement service connection facilities work in the service area of the said water supply services. 2. When a water supply services carries out the designation as stipulated in the preceding paragraph, the said water supply services may make it a supply condition, under its supply regulations, for the service connection facilities of the person receiving water supply from the said water supply services to be related to service connection facilities works, implemented by the said water supply services or said designated person (hereinafter, “designated service connection facility constructor”). 3. When, in the case mentioned in the preceding paragraph, the service connection facility of a person receiving water from the said water supply services is not related to service connection facility works by the said water supply services or designated service connection facility constructor, the said water supply service may reject the application from the said person or

約の申込みを拒み、又はその者に対する給水を停止することができる。ただ し、厚生労働省令で定める給水装置の軽微な変更であるとき、又は当該給水装置の構造及び材質が前条の規定に基づく政令で定める基準に適合していることが確 認されたときは、この限りでない。

suspend water supply to that person, in accordance with its supply regulations. This shall not apply, however, when the case falls under that of light changes in service connection facility, classified in accordance with an order of the Ministry of Health, Labor and Welfare, or when the structure and material of the said service connection facility are confirmed to meet the standards set under a Cabinet order, based on the regulations provided for in the preceding Article.

（給水装置の検査）

第十七条　水道事業者は、日出後日没前に限り、その職員をして、当該水道によって水の供給を受ける者の土地又は建物に立ち入り、給水装置を検査させることができる。 ただし、人の看守し、若しくは人の住居に使用する建物又は閉鎖された門内に立ち入るときは、その看守者、居住者又はこれらに代るべき者の同意を得なければ ならない。

２　前項の規定により給水装置の検査に従事する職員は、その身分を示す証明書を携帯し、関係者の請求があつたときは、これを提示しなければならない。

(Inspection of Service Connection Facilities)

Article 17 1. A water supplier may have its employees enter the premises, where its water supply services provide water, to inspect their service connection facility only during the period after daybreak until sunset. In the event of employees' entry to the premises, watched by caretakers or used for residing, or closed compounds, however, consent by the caretaker, residents, or persons acting on behalf of them must be obtained.

2. The employees engaged in the inspection of services connection facility, based on the provision in the preceding paragraph, must carry their identification certificates with them, and shall show the said certificates, when requested by the persons concerned.

（検査の請求）

第十八条　水道事業によって水の供給を受ける者は、当該水道事業者に対して、給水装置の検査及び供給を受ける水の水質検査を請求することができる。

２　水道事業者は、前項の規定による請求を受けたときは、すみやかに検査を行い、その結果を請求者に通知しなければならない。

(Requesting Inspection)

Article 18 1. A person receiving water supply from the water supply service may request the inspection of its service connection facility and the quality of supplied water by the water supply services concerned.

2. Upon the receipt of the request based on the provision in the preceding paragraph, the water supply services concerned must promptly implement inspection, and notify the requester of inspection results.

（水道技術管理者）

第十九条　水道事業者は、水道の管理について技術上の業務を担当させるため、水道技術管理者一人を置かなければならない。ただし、自ら水道技術管理者となることを妨げない。

(Water Supply Services Technical Administrator)

Article 19 1. A water supplier shall appoint a water supply services technical administrator to take care of technological works relating to the management of water supply services. However, a water supplier shall not be prevented from being installed as the water supply services technical administrator

	himself.
2　水道技術管理者は、次に掲げる事項に関する事務に従事し、及びこれらの事務に従事する他の職員を監督しなければならない。	2. The water supply services technical administrator shall engage in the businesses listed below and must supervise other employees who are executing such works.
一　水道施設が第五条の規定による施設基準に適合しているかどうかの検査	1) Inspecting whether or not water supply facilities meet standards for facilities, based on the provisions of Article 5.
二　第十三条第一項の規定による水質検査及び施設検査	2) Conducting water quality inspection and facility inspection, based on the provisions of Article 13, Paragraph 1.
三　給水装置の構造及び材質が第十六条の規定に基く政令で定める基準に適合しているかどうかの検査	3) Conducting inspection to check if the structure and material of service connection facility satisfy standards based on the provisions of Article 16 under Cabinet orders.
四　次条第一項の規定による水質検査	4) Water quality inspection, based on the provisions of Paragraph 1 of the following article.
五　第二十一条第一項の規定による健康診断	5) Health checkups based on the provisions of Article 21, Paragraph 1.
六　第二十二条の規定による衛生上の措置	6) Sanitary steps in line with the provisions of Article 22.
七　第二十三条第一項の規定による給水の緊急停止	7) Emergency suspension of water supply based on the provisions of Article 23, Paragraph 1.
八　第三十七条前段の規定による給水停止	8) Water supply suspension, based on the provision in the first half of Article 37.
3　水道技術管理者は、政令で定める資格を有する者でなければならない。	3. The water supply services technical administrator must be a person having qualifications specified under a Cabinet order.
（水質検査）	**(Water Quality Inspection)**
第二十条　水道事業者は、厚生労働省令の定めるところにより、定期及び臨時の水質検査を行わなければならない。	**Article 20** 1. A water supplier shall implement regular and extraordinary water quality inspection in accordance with the provisions in orders of the Ministry of Health, Labor and Welfare.
2　水道事業者は、前項の規定による水質検査を行つたときは、これに関する記録を作成し、水質検査を行った日から起算して五年間、これを保存しなければならない。	2. When a water supplier executes water quality inspection in accordance with the provision of the preceding paragraph, it shall record details of the inspection and maintain said records for five (5) years after the date of inspection.
3　水道事業者は、第一項の規定による水質検査を行うため、必要な検査施設を設けなければならない。ただし、当該水質検査を、厚生労働省令の定めるところにより、地方公共団体の機関又は厚生労働大臣の登録を受けた者に委託して行う	3. A water supplier shall establish inspection facilities necessary for the implementation of water quality inspection based on the provision of Paragraph 1. This shall not apply, however, when the water supplier carries out the said water quality inspection by entrusting the work to the organization of a local

ときは、この限りでない。	public entity or a person registered under the registration of the Minister of Health, Labor and Welfare.
（登録） **第二十条の二**　前条第三項の登録は、厚生労働省令で定めるところにより、水質検査を行おうとする者の申請により行う。	**(Registration)** **Article 20-2** The registration in Paragraph 3 of the preceding article shall be carried out at the request of the person planning to implement water quality inspection, in accordance with the provisions of an order of the Ministry of Health, Labor and Welfare.
（登録基準） **第二十条の四**　厚生労働大臣は、第二十条の二の規定により登録を申請した者が次に掲げる要件のすべてに適合しているときは、その登録をしなければならない。 一　第二十条第一項に規定する水質検査を行うために必要な検査施設を有し、これを用いて水質検査を行うものであること。 二　別表第一に掲げるいずれかの条件に適合する知識経験を有する者が水質検査を実施し、その人数が五名以上であること。 三　次に掲げる水質検査の信頼性の確保のための措置がとられていること。 イ　水質検査を行う部門に専任の管理者が置かれていること。 ロ　水質検査の業務の管理及び精度の確保に関する文書が作成されていること。 ハ　ロに掲げる文書に記載されたところに従い、専ら水質検査の業務の管理及び精度の確保を行う部門が置かれていること。	**(Registration Standards)** **Article 20-4** The Minister of Health, Labor and Welfare shall register the entity that applied for registration based on the provisions of Article 20-2, when the applicant meets all requirements stated hereunder. 1) The applicant must have inspection facilities necessary to execute water quality inspection, provided for in Article 20, Paragraph 1, and be actually engaged in water quality inspection through the use of such facilities. 2) Applicants having the knowledge and experience meeting any condition stated in Separate Table No. 1 should be engaged in water quality inspection, and the number of related employees must be five (5) or more. 3) The following steps for enhancing the reliability of water quality inspection must have been taken. a. Appointing a full-time manager in the section for implementing water quality inspection. b. Formulating documents related to business operation and precision maintenance regarding water quality inspection. c. Installing a sector exclusively engaged in the business operation and precision maintenance regarding water quality inspection in accordance with statements in the documents provided for in sub-item b.
２　登録は、水質検査機関登録簿に次に掲げる事項を記載してするものとする。 一　登録年月日及び登録番号 二　登録を受けた者の氏名又は名称及び住所並びに法人にあっては、その代表者の氏名	2. Registration shall be performed by entering information about the following matters in the water quality inspection ledger. 1) Date of registration and registration number. 2) The name of the person allowed to be registered and address; in the case of an organization, the name of its representative.

三　登録を受けた者が水質検査を行う区域及び登録を受けた者が水質検査を行う事業所の所在地	3) The area for implementation of water quality inspection to be carried out by the registered person and the address of the said person's office for conducting water quality inspection.
（登録の更新） **第二十条の五**　第二十条第三項の登録は、三年を下らない政令で定める期間ごとにその更新を受けなければ、その期間の経過によって、その効力を失う。 ２　前三条の規定は、前項の登録の更新について準用する。	**(Renewal of Registration)** **Article 20-5** 1. Registration provided for in Article 20-3 shall lose its effect after the passage of a period not less than three (3) years, which is to be set under a Cabinet order, unless it is renewed during the said period. 2. The provisions in three (3) preceding articles shall be applied with necessary adjustments to renewal of registration in the preceding paragraph.
（受託義務等） **第二十条の六**　第二十条第三項の登録を受けた者（以下「登録水質検査機関」という。）は、同項の水質検査の委託の申込みがあつたときは、正当な理由がある場合を除き、その受託を拒んではならない。 ２　登録水質検査機関は、公正に、かつ、厚生労働省令で定める方法により水質検査を行わなければならない。	**(Obligations to Accept Entrustment)** **Article 20-6** 1. The entity that was registered under Article 20, Paragraph 3 (hereinafter, "registered water quality inspection institution") may not refuse a request for water quality inspection, stipulated in the same paragraph, unless it has a justifiable reason. 2. A registered water quality inspection institution must carry out water quality inspection in a fair manner and under the method set by an order of the Ministry of Health, Labor and Welfare.
（業務規程） **第二十条の八**　登録水質検査機関は、水質検査の業務に関する規程（以下「水質検査業務規程」という。）を定め、水質検査の業務の開始前に、厚生労働大臣に届け出なければならない。これを変更しようとするときも、同様とする。 ２　水質検査業務規程には、水質検査の実施方法、水質検査に関する料金その他の厚生労働省令で定める事項を定めておかなければならない。	**(Business Regulations)** **Article 20-8** 1. A registered water quality inspection organization shall set regulations regarding the work of water quality inspection (hereinafter, "water quality inspection regulations"), and it must submit the regulations to the Minister of Health, Labor and Welfare before the commencement of its water quality inspection activities. Such submission shall be also required when the organization is to change the said regulations. 2. Water quality inspection regulations must set out methods for water quality inspection, charges for water quality inspection, and other matters to be determined under orders of the Ministry of Health, Labor and Welfare.
（改善命令） **第二十条の十二**　厚生労働大臣は、登録水質検	**(Improvement Orders)** **Articled 20-12** When the Minister of Health, Labor and Welfare

査機関が第二十条の六第一項又は第二項の規定に違反していると認めるときは、その登録水質検査機関に対し、水質検査を受託すべきこと又は水質検査の方法その他の業務の方法の改善に関し必要な措置をとるべきことを命ずることができる。	deems that a registered water quality inspection institution violates provisions of Article 20-6, Paragraph 1 or Paragraph 2, the Minister may order the said registered water quality inspection institution to accept a request for water quality inspection work or take necessary steps for the improvement of methods for water quality inspection and other work.
（報告の徴収及び立入検査） **第二十条の十五**　厚生労働大臣は、水質検査の適正な実施を確保するため必要があると認めるときは、登録水質検査機関に対し、業務の状況に関し必要な報告を求め、又は当該職 員に、登録水質検査機関の事務所又は事業所に立ち入り、業務の状況若しくは検査施設、帳簿、書類その他の物件を検査させることができる。	**(Collection of Reports and On-site Inspection)** **Article 20-15** 1. The Minster of Health, Labor and Welfare may instruct a registered water quality inspection institution to submit necessary reports regarding the state of its business or have related employees enter the office or establishment of the said water quality inspection institution and inspect the state of its activities, its account books, documents, etc. when the Minister recognizes that such actions are necessary to ensure appropriate enforcement of water quality inspection.
２　前項の規定により立入検査を行う職員は、その身分を示す証明書を携帯し、関係者の請求があったときは、これを提示しなければならない。	2. An employee, who implements on-site inspection in accordance with the provision of the preceding paragraph, shall carry his identification certificate with him, and show the certificate when so requested by the persons concerned.
３　第一項の規定による権限は、犯罪捜査のために認められたものと解釈してはならない。	3. The power stipulated in Paragraph 1 may not be interpreted to have been established for the purpose of criminal investigation.
（健康診断） **第二十一条**　水道事業者は、水道の取水場、浄水場又は配水池において業務に従事している者及びこれらの施設の設置場所の構内に居住している者について、厚生労働省令の定めるところにより、定期及び臨時の健康診断を行わなければならない。	**(Health Checkups)** **Article 21** 1. A water supplier shall arrange for regular or extraordinary health checkups for persons engaged in work at water intake places, purification facilities, and distribution basins, as well as those living in the locations of these facilities, in accordance with regulations set under an order of the Ministry of Health, Labor and Welfare.
２　水道事業者は、前項の規定による健康診断を行ったときは、これに関する記録を作成し、健康診断を行った日から起算して一年間、これを保存しなければならない。	2. When a water supplier implements health checkups based on the provision of the preceding paragraph, it must prepare records concerning said health checkups, and keep them for one (1) year from the date of the health checkups.
（衛生上の措置） **第二十二条**　水道事業者は、厚生労働省令の定めるところにより、水道施設の管理及び運営に関し、消毒その他衛生上必要な措置を講じなければならない。	**(Sanitary Measures)** **Article 22** With regard to the management and operation of water supply facilities, a water supplier must implement disinfection or other measures required for sanitary purposes in accordance with provisions based on related orders of the Ministry of

	Health, Labor and Welfare.
（給水の緊急停止） **第二十三条**　水道事業者は、その供給する水が人の健康を害するおそれがあることを知ったときは、直ちに給水を停止し、かつ、その水を使用することが危険である旨を関係者に周知させる措置を講じなければならない。 ２　水道事業者の供給する水が人の健康を害するおそれがあることを知った者は、直ちにその旨を当該水道事業者に通報しなければならない。	**(Emergency Suspension of Water Supply)** **Article 23**　1. When a water supplier learns that there is a fear of its water harming the health of people, it must immediately suspend water supply and take steps to notify the persons concerned of the danger resulting from the use of the water. 2. Any person who learns that the water supplied by a water supplier may harm the health of people must immediately report to that effect to the said water supplier.
（消火栓） **第二十四条**　水道事業者は、当該水道に公共の消防のための消火栓を設置しなければならない。 ２　市町村は、その区域内に消火栓を設置した水道事業者に対し、その消火栓の設置及び管理に要する費用その他その水道が消防用に使用されることに伴い増加した水道施設の設置及び管理に要する費用につき、当該水道事業者との協議により、相当額の補償をしなければならない。 ３　水道事業者は、公共の消防用として使用された水の料金を徴収することができない。	**(Fire Hydrants)** **Article 24**　1. A water supplier must install hydrants for public fire fighting in its water supply system. 2. A municipal authority shall pay a suitable amount of compensation to the water supplier which installs hydrants within its administrative areas for expenses required for the installation and management of hydrants, as well as installation and management of water supply facilities increased because of the additional use of the water supply services for fire fighting purposes, based on consultations with the said water supplier. 3. A water supplier may not collect charges for water used for public fire fighting purposes.
（情報提供） **第二十四条の二**　水道事業者は、水道の需要者に対し、厚生労働省令で定めるところにより、第二十条第一項の規定による水質検査の結果その他水道事業に関する情報を提供しなければならない。	**(Release of Water Supply Information)** **Article 24- 2**.　A water supplier shall notify the customers of the results of water quality inspection, based on the provision of Article 20, Paragraph 1, and other information about the water supply services in accordance with the orders of the Ministry of Health, Labor and Welfare.
（業務の委託） **第二十四条の三**　水道事業者は、政令で定めるところにより、水道の管理に関する技術上の業務の全部又は一部を他の水道事業者若しくは水道用水供給事業者又は当該業務を適正かつ確実に実施することができる者として政令で定める要	**(Entrustment of Operation)** **Article 24-3**　1. In accordance with provisions of Cabinet orders, a water supplier may entrust all or part of technical work related to the operation of water supply services to other water supplier, an enterprise supplying water to wholesale water supplier, or other entity which can satisfy requirements set under Cabinet orders as an entity capable of appropriately and surely enforcing the said work.

件に該当するものに委託することができる。 ２　水道事業者は、前項の規定により業務を委託したときは、遅滞なく、厚生労働省令で定める事項を厚生労働大臣に届け出なければならない。委託に係る契約が効力を失ったときも、同様とする。 ３　第一項の規定により業務の委託を受ける者（以下「水道管理業務受託者」という。）は、水道の管理について技術上の業務を担当させるため、受託水道業務技術管理者一人を置かなければならない。 ４　受託水道業務技術管理者は、第一項の規定により委託された業務の範囲内において第十九条第二項各号に掲げる事項に関する事務に従事し、及びこれらの事務に従事する他の職員を監督しなければならない。 ５　受託水道業務技術管理者は、政令で定める資格を有する者でなければならない。 （簡易水道事業に関する特例） **第二十五条**　簡易水道事業については、当該水道が、消毒設備以外の浄水施設を必要とせず、かつ、自然流下のみによって給水することができるものであるときは、第十九条第三項の規定を適用しない。 ２　給水人口が二千人以下である簡易水道事業を経営する水道事業者は、第二十四条第一項の規定にかかわらず、消防組織法（昭和二十二年法律第二百二十六号）第七条に規定する市町村長との協議により、当該水道に消火栓を設置しないことができる。 **第三節　指定給水装置工事事業者**	2. When a water supplier entrusts work to other enterprise, based on the provision of the preceding paragraph, it must promptly report on matters specified under orders of the Ministry of Health, Labor and Welfare to the Minister of Health, Labor and Welfare. The same action shall be required when a contract related to entrustment loses its force. 3. The entity that receives entrustment of business in accordance with the provision of Paragraph 1 (hereinafter, “Water supply operation entrusted enterprise”) shall appoint an “entrusted water supply operation technical administrator” to take care of technical business concerned with water supply services operation. 4. The entrusted water supply operation technical administrator shall engage in the work related to matters mentioned in Article 19, Paragraph 2, individual items, within the range of business entrusted in accordance with the provisions of Paragraph 1, and supervise other employees engaged in these activities. 5. The entrusted water supply operation technical administrator must be a person having qualifications set under a Cabinet order. **(Exceptions in the case of Small Water Supply Services)** **Article 25** 1. Regarding small water supply services, the provision of Article 19, Paragraph 3 shall not be applied when said small water supply services do not require water purification facilities other than disinfection facilities, and when they can supply water only through natural gravity flow of water. 2. Notwithstanding the provision of Article 24, Paragraph 1, a water supplier that operates a small water supply services whose water supply population is 2,000 people or less, may withhold installing hydrants in the said water supply services based on consultations with the mayor/head of the municipal authority, stipulated in the Fire-Fighting Organization Act (Act No. 226 of 1947). **Section 3 Designated Service Connection Facility Work Contractor** **(Application of Designation)** **Article 25-2** 1. The designation provided for in Article 16-2,

（指定の申請）

第二十五条の二　第十六条の二第一項の指定は、給水装置工事の事業を行う者の申請により行う。

2　第十六条の二第一項の指定を受けようとする者は、厚生労働省令で定めるところにより、次に掲げる事項を記載した申請書を水道事業者に提出しなければならない。

一　氏名又は名称及び住所並びに法人にあっては、その代表者の氏名

二　当該水道事業者の給水区域について給水装置工事の事業を行う事業所（以下この節において単に「事業所」という。）の名称及び所在地並びに第二十五条の四第一項の規定によりそれぞれの事業所において選任されることとなる給水装置工事主任技術者の氏名

三　給水装置工事を行うための機械器具の名称、性能及び数

四　その他厚生労働省令で定める事項

（指定の基準）

第二十五条の三　水道事業者は、第十六条の二第一項の指定の申請をした者が次の各号のいずれにも適合していると認めるときは、同項の指定をしなければならない。

一　事業所ごとに、次条第一項の規定により給水装置工事主任技術者として選任されることとなる者を置く者であること。

二　厚生労働省令で定める機械器具を有する者であること。

2. 水道事業者は、第 16 条の 2 第 1 項の指定をしたときは、遅滞なく、その旨を一般に周知させる措置をとらなければならない。

Paragraph 1 shall be implemented in response to the application by an entity engaging in the work of service connection facility.

2. An entity planning to seek designation stipulated in Article 16-2, Paragraph 1, shall submit an application setting out the matters shown below to the water supplier, based on the provisions of related orders of the Ministry of Health, Labor and Welfare.

1) Name and address, and in the case of an enterprise, the name of its representative.
2) The name and address of the office implementing service connection facility works in the service area of the said water supplier (hereinafter in this section simply referred to as “office”), as well as the name of the service connection facility work technician, to be selected for each office under the provisions of Article 25-4, Paragraph 1.
3) Names, performance, and numbers of machinery/ equipment designed for conducting service connection facility works.
4) Other matters set under the orders of the Ministry of Health, Labor and Welfare.

(Designation Standards)

Article 25-3 1. When a water supplier recognizes that entities that applied for designation under Article 16-2, Paragraph 1 meet all of the requirements in any of the following items, the said entity must specify the suitable item among the following items:

1) The entity that has installed a person to be appointed as the service connection facility work technician, based on Paragraph 1 of the following Article, in each office.
2) The entity having the machinery/equipment specified under the orders of the Ministry of Health, Labor and Welfare.

2 When a water supplier carries out specification under Article 16-2, Paragraph 1, it must promptly take steps to let such designation be known to the general public.

(Service Connection Facility Work Technician)

（給水装置工事主任技術者） **第二十五条の四**　指定給水装置工事事業者は、事業所ごとに、第三項各号に掲げる職務をさせるため、厚生労働省令で定めるところにより、給水装置工事主任技術者免状の交付を受けている者のうちから、給水装置工事主任技術者を選任しなければならない。	**Article 25-4**　1. The specified service connection facility work contractor shall appoint a service connection facility work technician from among employees who have awarded licenses of service connection facility work technicians for each office for implementation of work set out in items of Paragraph 3, in accordance with provisions of the orders of the Ministry of Health, Labor and Welfare.
２　指定給水装置工事事業者は、給水装置工事主任技術者を選任したときは、遅滞なく、その旨を水道事業者に届け出なければならない。これを解任したときも、同様とする。	2. When the specified service connection facility work contractor appoints a service connection facility work technician, it shall promptly report to that effect to the water supplier. The similar action shall be followed when the designated service connection facility work contractor dismisses the said technician.
３　給水装置工事主任技術者は、次に掲げる職務を誠実に行わなければならない。 一　給水装置工事に関する技術上の管理 二　給水装置工事に従事する者の技術上の指導監督 三　給水装置工事に係る給水装置の構造及び材質が第十六条の規定に基づく政令で定める基準に適合していることの確認 四　その他厚生労働省令で定める職務	3. A service connection facility work technician shall sincerely implement the following work: 1) Technical management of service connection facility works. 2) Technical guidance for persons engaging in service connection facility works. 3) Confirming that the structure and material of service connection facilities related to water supply facility work meet standards based on Articles 16 set under Cabinet orders. 4) Other duties determined under the orders of the Ministry of Health, Labor and Welfare.
４　給水装置工事に従事する者は、給水装置工事主任技術者がその職務として行う指導に従わなければならない。	4. Persons engaged in service connection facility works shall follow the guidance given by the service connection facility work technician, based on his duties.
（給水装置工事主任技術者試験） **第二十五条の六**　給水装置工事主任技術者試験は、給水装置工事主任技術者として必要な知識及び技能について、厚生労働大臣が行う。	**(Examinations for Service Connection Facility Work Technician)** **Article 25-6**　1. Examinations for service connection facility work technicians are implemented by the Minister of Health, Labor and Welfare regarding knowledge and techniques required for a service connection facility work technician.
２　給水装置工事主任技術者試験は、給水装置工事に関して三年以上の実務の経験を有する者でなければ、受けることができない。	2. Examinations for service connection facility work technician cannot be taken except by persons who have practical experience of three (3) or more years concerning service connection facility works.
	3. Examination subjects, examination procedures, and other details of examinations for service connection facility work

3　給水装置工事主任技術者試験の試験科目、受験手続その他給水装置工事主任技術者試験の実施細目は、厚生労働省令で定める。	technicians shall be determined under the orders of the Ministry of Health, Labor and Welfare.
（事業の基準） **第二十五条の八**　指定給水装置工事事業者は、厚生労働省令で定める給水装置工事の事業の運営に関する基準に従い、適正な給水装置工事の事業の運営に努めなければならない。	**(Business Standards)** **Article 25-8** A specified service connection facility work contractor shall follow the standards for management of business regarding service connection facility work, set under the orders of the Ministry of Health, Labor and Welfare, and strive to implement appropriate business of service connection facility works.
（給水装置工事主任技術者の立会い） **第二十五条の九**　水道事業者は、第十七条第一項の規定による給水装置の検査を行うときは、当該給水装置に係る給水装置工事を施行した指定給水装置工事事業者に対し、当該給水装置工事を施行した事業所に係る給水装置工事主任技術者を検査に立ち会わせることを求めることができる。	**(Presence by the Service Connection Facility Work Technician)** **Article 25-9** When a service connection facility work contractor implements inspection of service connection facility work, based on the provisions of Article 17, Paragraph 1, the water supplier may ask the designated service connection facility work contractor, which implemented service connection facility work related to the said water supply facilities, for the presence of the service connection facility work technician from the office that executed the construction work during the inspection.
（報告又は資料の提出） **第二十五条の十**　水道事業者は、指定給水装置工事事業者に対し、当該指定給水装置工事事業者が給水区域において施行した給水装置工事に関し必要な報告又は資料の提出を求めることができる。	**(Reporting or Submission of Data)** **Article 25-10** A water supplier may demand necessary reporting or submission of data from a specified service connection facility work contractor regarding service connection facility works, implemented by the said specified service connection facility work entity in the service area.
第三章　水道用水供給事業	**Chapter 3　Wholesale water Supply services**
（事業の認可） **第二十六条**　水道用水供給事業を経営しようとする者は、厚生労働大臣の認可を受けなければならない。	**(License of Business Operation)** **Article 26** An entity which intends to operate wholesale water supply services must be awarded a license by the Minister of Health, Labor and Welfare.
（認可の申請） **第二十七条**　水道用水供給事業経営の認可の申	**(Application for License)** **Article 27** 1. To apply for a license of operation for wholesale water supply services, it is necessary to submit a written application, with a business plan, a work design document

請をするには、申請書に、事業計画書、工事設計書その他厚生労働省令で定める書類（図面を含む。）を添えて、これを厚生労働大臣に提出しなければならない。

２　前項の申請書には、次に掲げる事項を記載しなければならない。

一　申請者の住所及び氏名（法人又は組合にあつては、主たる事務所の所在地及び名称並びに代表者の氏名）

二　水道事務所の所在地

３　水道用水供給事業者は、前項に規定する申請書の記載事項に変更を生じたときは、速やかに、その旨を厚生労働大臣に届け出なければならない。

４　第一項の事業計画書には、次に掲げる事項を記載しなければならない。

一　給水対象及び給水量

二　水道施設の概要

三　給水開始の予定年月日

四　工事費の予定総額及びその予定財源

五　経常収支の概算

六　その他厚生労働省令で定める事項

５　第一項の工事設計書には、次に掲げる事項を記載しなければならない。

一　一日最大給水量及び一日平均給水量

二　水源の種別及び取水地点

三　水源の水量の概算及び水質試験の結果

四　水道施設の位置（標高及び水位を含む。）、規模及び構造

五　浄水方法

六　工事の着手及び完了の予定年月日

七　その他厚生労働省令で定める事項

(including related drawings), and other documents required under a related order of the Ministry of Health, Labor and Welfare attached, to the Minister of Health, Labor and Welfare.

2. The written application provided for in the preceding paragraph shall set out the following matters:
   1) The address and name of the applicant (in the case of an enterprise or organization, the location of its principal office, name of the enterprise, and the name of its representative)
   2) Location of the office of wholesale water supply services
3. When changes occur to matters of statement specified in the preceding paragraph, the enterprise operating wholesale water supply services shall promptly report to that effect to the Minister of Health, Labor and Welfare.
4. The business plan, specified in Paragraph 1, must state the following matters:
   1) Object of water supply and water supply volume
   2) Outline of the water supply facilities
   3) Scheduled date of commencing water supply
   4) Planned total expenses for the construction work and planned fund sources
   5) Outline of current account (income and expenses)
   6) Other matters set under related orders of the Ministry of Health, Labor and Welfare
5. The work design document, provided for in Paragraph 1, must state the following matters:
   1) Maximum and average volumes of daily water supply
   2) Types of water sources and water intake points
   3) Rough estimate of water volume at the water sources and results of water quality examination
   4) Locations of water facilities (including altitude and water surface level), their scale, and structure
   5) Water purification processes
   6) Scheduled dates of construction work commencement and completion
   7) Other matters set under orders of the Ministry of Health, Labor and Welfare

（認可基準）

第二十八条　水道用水供給事業経営の認可は、その申請が次の各号に適合していると認められるときでなければ、与えてはならない。

一　当該水道用水供給事業の計画が確実かつ合理的であること。

二　水道施設の工事の設計が第五条の規定による施設基準に適合すること。

三　地方公共団体以外の者の申請に係る水道用水供給事業にあっては、当該事業を遂行するに足りる経理的基礎があること。

四　その他当該水道用水供給事業の開始が公益上必要であること。

２　前項各号に規定する基準を適用するについて必要な技術的細目は、厚生労働省令で定める。

（附款）

第二十九条　厚生労働大臣は、地方公共団体以外の者に対して水道用水供給事業経営の認可を与える場合には、これに必要な条件を附することができる。

２　第九条第二項の規定は、前項の条件について準用する。

第四章　専用水道

（確認）

第三十二条　専用水道の布設工事をしようとする者は、その工事に着手する前に、当該工事の設計が第五条の規定による施設基準に適合するものであることについて、都道府県知事の確認を受けなければならない。

(Standards for License)

Article 28　1. License of wholesale water supply services operation shall not be given unless an application is recognized to meet provisions in the following items:

1) The plan for the said wholesale water supply services is certain and reasonable.
2) The construction work design for water supply facilities meet the facility standards, based on the provisions of Article 5.
3) In the case of wholesale water supply services whose license application is submitted by an entity other than local public entities, the entity has the financial foundation sufficient to implement the said business.
4) In addition, the commencement of the said wholesale water supply services is necessary, when seen from the standpoint of public interests of the community.

2. Technical details necessary for application of standards specified in items of the preceding paragraph shall be determined through orders of the Ministry of Health, Labor and Welfare.

(Reservation of Provisions)

Article 29　1. When the Minister of Health, Labor and Welfare awards a license for operating wholesale water supply services to entities other than local public entities, he may attach necessary conditions to the license.

2. The provision in Article 9, Paragraph 2 shall be applied to the conditions stipulated in the preceding paragraph with necessary adjustments.

Chapter 4　Private Water Supply Systems

(Confirmation)

Article 32　The entity that intends to conduct construction works of the private water supply systems shall, before commencing of actual laying work, being awarded the Prefectural Governor's confirmation that the design for the planned construction work meets the facility standards based on the provisions of Article 5 herein.

（確認の申請） **第三十三条**　前条の確認の申請をするには、申請書に、工事設計書その他厚生労働省令で定める書類（図面を含む。）を添えて、これを都道府県知事に提出しなければならない。 **２**　前項の申請書には、次に掲げる事項を記載しなければならない。 一　申請者の住所及び氏名（法人又は組合にあっては、主たる事務所の所在地及び名称並びに代表者の氏名） 二　水道事務所の所在地 **３**　専用水道の設置者は、前項に規定する申請書の記載事項に変更を生じたときは、速やかに、その旨を都道府県知事に届け出なければならない。 **４**　第一項の工事設計書には、次に掲げる事項を記載しなければならない。 一　一日最大給水量及び一日平均給水量 二　水源の種別及び取水地点 三　水源の水量の概算及び水質試験の結果 四　水道施設の概要 五　水道施設の位置（標高及び水位を含む。）、規模及び構造 六　浄水方法 七　工事の着手及び完了の予定年月日 八　その他厚生労働省令で定める事項 **５**　都道府県知事は、第一項の申請を受理した場合において、当該工事の設計が第五条の規定による施設基準に適合することを確認したときは、申請者に その旨を通知し、適合しないと認めたとき、又は申請書の添附書類によっては適合するかしないかを判断することができないときは、その適合しない点を指摘 し、又はその判断するこ	**(Application for Confirmation)** **Article 33**　1. To apply for confirmation in the preceding Article, the entity concerned shall submit a written application, with a construction work design and other documents specified by an order of the Ministry of Health, Labor and Welfare attached, to the Prefectural Governor concerned. 2. The written application, mentioned in the preceding paragraph, must state the following matters: 1) The address and name of the applicant (in the case of an enterprise or organization, the location of its principal office, the name of the entity, and the name of the representative) 2) Location for the office of the private water supply system 3. When changes occurred in the matters of statement in the written application, specified in the preceding paragraph, the installer of the wholesale water supply services must promptly report to that effect to the Prefectural Governor concerned. 4. The construction design document, provided for in Paragraph 1, must state the following matters: 1) The maximum and average volume of daily water supply 2) Types of water sources and water intake points 3) Rough estimate of water volume in water sources and results of water-quality examinations 4) Outline of water supply facilities 5) Locations (including altitude and water surface level), scale, and structure of water supply facilities 6) Water purification processes 7) Scheduled dates of construction work for commencement and completion 8) Other matters set under orders of the Ministry of Health, Labor and Welfare 5. In the case of the Prefectural Governor's acceptance of the application provided for in Paragraph 1, when he confirmed that the design of the said construction work satisfies the facility standards, based on provisions of Article 5, the governor shall notify the applicant to that effect; when the governor judged that the design does not satisfy the said facility standards, or when he is unable to judge on said satisfaction/non-satisfaction, he shall notify the applicant to that effect while pointing out the points not satisfying the

とができない理由を附して、申請者にその旨を通知しなければならない。

6　前項の通知は、第一項の申請を受理した日から起算して三十日以内に、書面をもつてしなければならない。

第四章の二　簡易専用水道

第三十四条の二　簡易専用水道の設置者は、厚生労働省令で定める基準に従い、その水道を管理しなければならない。

2　簡易専用水道の設置者は、当該簡易専用水道の管理について、厚生労働省令の定めるところにより、定期に、地方公共団体の機関又は厚生労働大臣の登録を受けた者の検査を受けなければならない。

（検査の義務）

第三十四条の三　前条第二項の登録を受けた者は、簡易専用水道の管理の検査を行うことを求められたときは、正当な理由がある場合を除き、遅滞なく、簡易専用水道の管理の検査を行わなければならない。

第五章　監督

（認可の取消し）

第三十五条　厚生労働大臣は、水道事業者又は水道用水供給事業者が、正当な理由がなくて、事業認可の申請書に添附した工事設計書に記載した工事着手の予定年月日の経過 後一年以内に工事に着手せず、若しくは工事完了の予定年月日の経過後一年以内に工事を完了せず、又は事業計画書に記載した給水開始の予定年月日の経過後一年以内に給水を開始しないときは、事業の認可を

standards or stating the reasons for his inability to judge regarding the matter.

6. The Prefectural Governor must make the notification, as provided for in the preceding paragraph, in writing within thirty (30) days after the receipt of the application stipulated in Paragraph 1.

Chapter 4-2　Small Private Water Supply System

Article 34-2　1. The installer of small private water supply system must operate the said water supply system in accordance with standards set under orders of the Ministry of Health, Labor and Welfare.

2. The installer of small private water supply system shall be subject to inspection regularly implemented by the related organization of a local public entity or a person registered by the Minister of Health, Labor and Welfare regarding operation of said small private water supply system, in accordance with an order of the Ministry of Health, Labor and Welfare.

(Obligation to Conduct Inspection)

Article 34-3　The entity that was registered under Paragraph 2 of the preceding Article must promptly inspect the operation of small private water supply system if requested to do so, excluding the case in which there is a justifiable reason.

Chapter 5　Supervision

(Cancellation of License)

Article 35　1. The Minister of Health, Labor and Welfare may cancel the license of a water supplier or a wholesale water supplier when, without a justifiable reason, has not undertaken construction work within one (1) year from the scheduled work commencement date, stated in the construction design document attached to the application for license of business; or has not completed the work within one (1) year after the scheduled completion date; or has not inaugurated water supply within one (1) year from the scheduled commencement date of water supply, stated in the business plan.　In this case,

取り消すことができる。この場合において、工事完了の予定年月日の経過後一年を経過した時に一部の工事を完 了していたときは、その工事を完了していない部分について事業の認可を取り消すこともできる。

2　地方公共団体以外の水道事業者について前項に規定する理由があるときは、当該水道事業の給水区域をその区域に含む市町村は、厚生労働大臣に同項の処分をなすべきことを求めることができる。

3　厚生労働大臣は、地方公共団体である水道事業者又は水道用水供給事業者に対して第一項の処分をするには、当該水道事業者又は水道用水供給事業者 に対して弁明の機会を与えなければならない。この場合においては、あらかじめ、書面をもつて弁明をなすべき日時、場所及び当該処分をなすべき理由を通知し なければならない。

（改善の指示等）

第三十六条　厚生労働大臣は水道事業又は水道用水供給事業について、都道府県知事は専用水道について、当該水道施設が第五条の規定による施設基準に適合しなくなったと 認め、かつ、国民の健康を守るため緊急に必要があると認めるときは、当該水道事業者若しくは水道用水供給事業者又は専用水道の設置者に対して、期間を定めて、当該施設を改善すべき旨を指示することができる。

2　厚生労働大臣は水道事業又は水道用水供給事業について、都道府県知事は専用水道について、水道技術管理者がその職務を怠り、警告を発したにもかかわらずなお継続して職務を怠つたときは、当該水道事業者若しくは水道用水供給事

when part of construction work has been completed after the passage of one (1) year following the scheduled work completion date, the Minister may cancel license for the portion of construction work not yet finished.

2. When there is a reason provided for in the preceding paragraph regarding a water supply services other than a local public entity, the municipal authority, whose administrative area includes the service area of such a water supplier, etc., may ask the Minister of Health, Labor and Welfare to take steps, provided for in the preceding paragraph.

3. When the Minister of Health, Labor and Welfare is to take steps provided for in Paragraph 1 against a water supplier or a wholesale water supplier, which is a local public entity, he must give such a water supplier or wholesale water supplier opportunities for defense of its non-action. In this case, the Minister must notify the entities concerned in writing of the time and place for the oral defense, and the reason for his planned execution of the aforementioned steps.

(Instruction for Improvement, etc.)

Article 36 1. When the Minster of Health, Labor and Welfare recognizes that water supply facilities of a water supplier or wholesale water supplier are no longer meeting the facility standards, based on provisions of Article 5, and that improvement is urgently necessary to protect the health of people; or when a Prefectural Governor recognizes that facilities of private water supplier are no longer meeting he facility standards mentioned above, and that improvement is urgently necessary to protect the health of people, it is possible for the Minister or Prefectural Governor to instruct the said water supplier, or said installer of small water supply system, to improve facilities concerned while setting the time limit for said improvement.

2 When a technical administrator of water supply services neglects his work with regard to water supply or wholesale water supply, and continues to be neglectful, even after a warning was issued; or when a technical administrator of water supply services neglects his work with regard to wholesale water supply services, and continues to be neglectful, even after a warning was issued, the Minster of Health, Labor and

業者又は専用水道の設置者に対して、水道技術管理者を変更すべきことを勧告することができる。	Welfare or the Prefectural Governor may recommend that the water supplier, or the wholesale water supplier, change the technical administrator of water supplier.
3　都道府県知事は、簡易専用水道の管理が第三十四条の二第一項の厚生労働省令で定める基準に適合していないと認めるときは、当該簡易専用水道の設置者に対して、期間を定めて、当該簡易専用水道の管理に関し、清掃その他の必要な措置を採るべき旨を指示することができる。	3. When a Prefectural Governor recognizes that the operation of private water supply system is not meeting the standards based on the order of the Ministry of Health, Labor and Welfare, provided for in Article 34-2, Paragraph 1, the Governor may instruct the installer of the said private water supply system to implement cleaning or other necessary measures regarding the operation of the said private water supply system, while setting the time limit for enforcement of such measures.
（給水停止命令） **第三十七条**　厚生労働大臣は水道事業者又は水道用水供給事業者が、都道府県知事は専用水道又は簡易専用水道の設置者が、前条第一項又は第三項の規定に基づく指示に従わ ない場合において、給水を継続させることが当該水道の利用者の利益を阻害すると認めるときは、その指示に係る事項を履行するまでの間、当該水道による給水を停止すべきことを命ずることができる。同条第二項の規定に基づく勧告に従わない場合において、給水を継続させることが当該水道の利用者の利益を阻害する と認めるときも、同様とする。	**(Water Supply Suspension Order)** **Article 37**　When the Minister of Health, Labor and Welfare recognizes that continuation of water supply by a water supplier or a wholesale water supplier after their refusal to follow instructions based on Paragraph 1 or 3 of the preceding Article will damage interest of customers of said water supply services; or when the Prefectural Governor recognizes that continuation of water supply by the installer of either wholesale water suppliers or small, water suppliers, after their refusal to follow aforementioned instructions, will damage the interest of customers of said water suppliers, the Minister or Governor may order suspension of water supply by the related water suppliers until these water suppliers take steps following the said instructions.　This shall also apply if continuation of water supply by the entities that do not follow recommendations in Paragraph 2 of the same Article is recognized to damage interest of customers of their respective water supply services.
（供給条件の変更） **第三十八条**　厚生労働大臣は、地方公共団体以外の水道事業者の料金、給水装置工事の費用の負担区分その他の供給条件が、社会的経済的事情の変動等により著しく不適当と なり、公共の利益の増進に支障があると認めるときは、当該水道事業者に対し、相当の期間を定めて、供給条件の変	**(Change in Supply Conditions)** **Article 38**　1. When the Minister of Health, Labor and Welfare recognizes that water rates, allocation of expenses for service connection works, and other supply conditions of a water supply services other than local public entities have become extremely inappropriate due to changes in the social and economic situations, preventing enhancement of public interest of community, the Minister may instruct the said water supply services to apply for changes in the supply conditions,

更の認可を申請すべきことを命ずることがで きる。	while setting a suitable time limit.
２　厚生労働大臣は、水道事業者が前項の期間内に同項の申請をしないときは、供給条件を変更することができる。	2. The Minister of Health, Labor and Welfare may change the supply conditions when a water supply services does not file an application for the said changes within the period provided for in the preceding paragraph.
（報告の徴収及び立入検査） **第三十九条**　厚生労働大臣は、水道（水道事業及び水道用水供給事業の用に供するものに限る。以下この項において同じ。）の布設若しくは管理又は水道事業若しくは水道用 水供給事業の適正を確保するために必要があると認めるときは、水道事業者若しくは水道用水供給事業者から工事の施行状況若しくは事業の実施状況について必要な報告を徴し、又は当該職員をして水道の工事現場、事務所若しくは水道施設のある場所に立ち入らせ、工事の施行状況、水道施設、水質、水圧、水量若しく は必要な帳簿書類（その作成又は保存に代えて電磁的記録の作成又は保存がされている場合における当該電磁的記録を含む。次項及び次条第八項において同じ。）を検査させることができる。	**(Collection of Reports and On-site Inspection)** **Article 39**　1. When the Minster of Health, Labor and Welfare recognizes it as necessary in connection with laying or operation of water supply services (limited to those for water supply services or wholesale water supply services in this paragraph) or with appropriateness of water supply services or wholesale water supply services, he may collect necessary reports on the state of construction work implementation or business enforcement from water supply services or wholesale water supply services or have related employees enter the place of water supply construction sites, offices, or water supply facilities and check the state of work execution, water supply facilities, water quality, water pressure, water volume, or required documents and books.
２　都道府県知事は、水道（水道事業及び水道用水供給事業の用に供するものを除く。以下この項において同じ。）の布設又は管理の適正を確保するため に必要があると認めるときは、専用水道の設置者から工事の施行状況若しくは専用水道の管理について必要な報告を徴し、又は当該職員をして水道の工事現場、 事務所若しくは水道施設のある場所に立ち入らせ、工事の施行状況、水道施設、水質、水圧、水量若しくは必要な帳簿書類を検査させることができる。	2. When the Prefectural Governor recognizes it as necessary in connection with the laying or operation of water supply services (excluding those for water supply services or wholesale water supply services in this paragraph) or with securing appropriateness of water supply services, he may collect necessary reports on the state of construction work implementation or business enforcement of wholesale water supply services from installers of such water supply services or have related employees enter the place of water supply construction sites, offices, or water supply facilities to examine the state of work execution, water supply facilities, water quality, water pressure, water volume, or required documents and books.
３　都道府県知事は、簡易専用水道の管理の適正を確保するために必要があると認めるときは、	3. When the Prefectural Governor recognizes it as necessary in connection with ensuring appropriateness of operating small water supply systems, he may collect necessary reports on the state of operation of small water supply systems from their

簡易専用水道の設置者から簡易専用水道の管理について必 要な報告を徴し、又は当該職員をして簡易専用水道の用に供する施設の在る場所若しくは設置者の事務所に立ち入らせ、その施設、水質若しくは必要な帳簿書類 を検査させることができる。

4　前三項の規定により立入検査を行う場合には、当該職員は、その身分を示す証明書を携帯し、かつ、関係者の請求があつたときは、これを提示しなければならない。

5　第一項、第二項又は第三項の規定による立入検査の権限は、犯罪捜査のために認められたものと解釈してはならない。

installer or have related employees enter the facilities for the use of small water supply systems or offices of the installer to examine its facilities, water quality, or required documents and books.

4. An employee, who implements on-site inspection in accordance with the provisions in the three (3) preceding items, shall carry his identification certificate with him, and show the certificate if so requested by the persons concerned.

5. The power stipulated in Paragraph 1, 2, or 3 may not be interpreted to have been established for the purpose of criminal investigation.

第六章　雑則

Chapter 6　Miscellaneous Provisions

（水道用水の緊急応援）

第四十条　都道府県知事は、災害その他非常の場合において、緊急に水道用水を補給することが公共の利益を保護するために必要であり、かつ、適切であると認めるとき は、水道事業者又は水道用水供給事業者に対して、期間、水量及び方法を定めて、水道施設内に取り入れた水を他の水道事業者又は水道用水供給事業者に供給すべきことを命ずることができる。

2　厚生労働大臣は、前項に規定する都道府県知事の権限に属する事務について、国民の生命及び健康に重大な影響を与えるおそれがあると認めるときは、都道府県知事に対し同項の事務を行うことを指示することができる。

3　第一項の場合において、都道府県知事が同項に規定する権限に属する事務を行うことができないと厚生労働大臣が認めるときは、同項の規定にかかわらず、当該事務は厚生労働大臣が行う。

4　第一項及び前項の場合において、供給の対価は、当事者間の協議によって定める。協議が調わないとき、又は協議をすることができないとき

(Emergency Assistance through Water Supply)

Article 40　1. When a Prefectural Governor recognizes, in such urgent cases as natural disasters, that emergency water supply is necessary and appropriate to protect public interests of community, he may instruct the water supplier or wholesale water supplier concerned to provide water, taken into its water supply facilities, to other water suppliers or wholesale water supplier, while setting the period, water volume, and method for such water supply.

2. When the Minster of Health, Labor and Welfare recognizes with regard to the work that belongs to the power of a Prefectural Governor, which is provided for in the preceding paragraph, that there is a fear of causing serious effects on the life and health of the people of community, the Minister may instruct the Prefectural Governor concerned to implement the work specified in the said paragraph.

3. In the case of Paragraph 1, when the Minister recognizes that the Prefectural Governor cannot execute the work under the authority stipulated in the said paragraph, the work shall be implemented by the Minister, notwithstanding the provision in the said paragraph.

4. In the case of Paragraph 1 and the preceding paragraph, the consideration for the water supply shall be determined through consultations between the parties concerned. When such consultations do not come to an amicable conclusion, or when such consultations are impossible, the Minister of Health,

は、都道府県知事が供給に要した実費の額を基準として裁定する。	Labor and Welfare shall conduct arbitration, based on the amount of actual expenses required for the water supply.
6　第四項の規定による裁定に不服がある者は、その裁定を受けた日から六箇月以内に、訴えをもつて供給の対価の増減を請求することができる。	6. When either party is dissatisfied with the amount of the arbitration made in accordance with the provision in Paragraph 4, the party may request an increase or decrease of the amount of consideration by submitting a petition within six (6) months from the date of the receipt of the arbitration amount notice.
（合理化の勧告） **第四十一条**　厚生労働大臣は、二以上の水道事業者間若しくは二以上の水道用水供給事業者間又は水道事業者と水道用水供給事業者との間において、その事業を一体として経営し、又はその給水区域の調整を図ることが、給水区域、給水人口、給水量、水源等に照らし合理的であり、かつ、著しく公共の利益を増進すると認めるとき は、関係者に対しその旨の勧告をすることができる。	**(Recommendation for Rationalization)** **Article 41**　When the Minister of Health, Labor and Welfare recognizes that the integration of operations or coordination of service areas among two (2) or more water supply services, among two (2) or more wholesale water suppliers, or between a water suppliers and a wholesale water suppliers will be natural in view of service areas, water supply population, water supply volume, water sources, etc. and will greatly enhance public interests of community, the Minister may make recommendations for such integration or coordination to the parties concerned.
（地方公共団体による買収） **第四十二条**　地方公共団体は、地方公共団体以外の者がその区域内に給水区域を設けて水道事業を経営している場合において、当該水道事業者が第三十六条第一項の規定による施設の改善の指示に従わないとき、又は公益の必要上当該給水区域をその区域に含む市町村から給水区域を拡張すべき旨の要求があつたにもかかわらずこれに 応じないとき、その他その区域内において自ら水道事業を経営することが公益の増進のために適正かつ合理的であると認めるときは、厚生労働大臣の認可を受け て、当該水道事業者から当該水道の水道施設及びこれに付随する土地、建物その他の物件並びに水道事業を経営するために必要な権利を買収することができる。	**(Acquisition by Local Public Entity)** **Article 42**　1. In the case that an entity other than a local public entity sets a service area within a certain local public entity, and manages a water supply operation there, when the said entity does not follow instructions for the improvement of facilities, based on the provision of Article 36, Paragraph 1; or when, although the municipal authority whose administrative area includes the service area of the said entity demands expansion of the said service area because of needs of public interest, the said entity does not accept the request; or when the local public entity recognizes that its own operation of water supply services in its administrative area will be appropriate and reasonable for the enhancement of public interests of community, the local public entity may purchase facilities of said water supply services, related land, buildings, other objects, and rights necessary to operate water supply from the water supplier, after being awarded the license by the Minister of Health, Labor and Welfare. 2. When the local public entity plans to purchase water supply facilities, etc. in accordance with the provision of the preceding

２　地方公共団体は、前項の規定により水道施設等を買収しようとするときは、買収の範囲、価額及びその他の買収条件について、当該水道事業者と協議しなければならない。	paragraph, it must consult with the said water supply services on the scope of purchases, prices, and other purchasing conditions.
３　前項の協議が調わないとき、又は協議をすることができないときは、厚生労働大臣が裁定する。この場合において、買収価額については、時価を基準とするものとする。	3. When the consultations provided for in the preceding paragraph do not come to an amicable settlement, or when the local public entity cannot hold such consultations, the Minister of Health, Labor and Welfare shall implement arbitration. In this case, purchase prices shall be based on market prices.
（水源の汚濁防止のための要請等） **第四十三条**　水道事業者又は水道用水供給事業者は、水源の水質を保全するため必要があると認めるときは、関係行政機関の長又は関係地方公共団体の長に対して、水源の水質の汚濁の防止に関し、意見を述べ、又は適当な措置を講ずべきことを要請することができる。	**(Requests for Prevention of Contamination in Water Sources)** **Article 43**　A water supplier or a wholesale water supplier may state its opinions on preventing contamination of water in water sources to the head of the administrative agency concerned or the local public entity or request adoption of suitable measures for the prevention, when such a water supplier recognizes the aforementioned actions as necessary for securing the quality of water in water sources.
（国庫補助） **第四十四条**　国は、水道事業又は水道用水供給事業を経営する地方公共団体に対し、その事業に要する費用のうち政令で定めるものについて、予算の範囲内において、政令の定めるところにより、その一部を補助することができる。	**(Subsidies from the State Treasury)** **Article 44**　The state may provide a local public entity, operating water supply services or wholesale water supply services, with subsidies for covering part of expenses required for the aforementioned services, among the services specified under a Cabinet order, within the framework of its budget in accordance with a Cabinet order.
（国の特別な助成） **第四十五条**　国は、地方公共団体が水道施設の新設、増設若しくは改造又は災害の復旧を行う場合には、これに必要な資金の融通又はそのあつせんにつとめなければならない。	**(Special Subsidies from the State)** **Article 45**　When a local public entity carries out new construction, expansion, or remodeling of water supply, or restoration of water supply facilities after their damage due to natural disasters, the state must strive to lend funds necessary for such activities or conduct good offices for such lending.
（研究等の推進） **第四十五条の二**　国は、水道に係る施設及び技術の研究、水質の試験及び研究、日常生活の用に供する水の適正かつ合理的な供給及び利用に関する調査及び研究その他水道に関する研究及び	**(Promotion of Research and Development, etc.)** **Article 45-2**　The state shall strive to promote research on facilities and technologies related to water supply works, examination and research on the quality of water, examination and research on appropriate, reasonable supply and use of water consumed in daily life of people, and other research, testing, and examination regarding water supply.

試験並びに調査の推進に努めるものとする。	
（都道府県が処理する事務） **第四十六条**　この法律に規定する厚生労働大臣の権限に属する事務の一部は、政令で定めるところにより、都道府県知事が行うこととすることができる。	**(Business to be Handled by Prefectures)** **Article 46** Part of businesses belonging to the power of the Minister of Health, Labor and Welfare, provided for in this Act, may be executed by Prefectural Governors in accordance with provisions of Cabinet orders.
第七章　罰則	**Chapter 7　Penal Regulations**
第五十一条　水道施設を損壊し、その他水道施設の機能に障害を与えて水の供給を妨害した者は、五年以下の懲役又は百万円以下の罰金に処する。 **２**　みだりに水道施設を操作して水の供給を妨害した者は、二年以下の懲役又は五十万円以下の罰金に処する。 **３**　前二項の規定にあたる行為が、刑法 の罪に触れるときは、その行為者は、同法 の罪と比較して、重きに従って処断する。	**Article 51** 1. A person who damages water supply facilities or otherwise impaired the functions of water supply facilities, thereby preventing the supply of water, shall be punished by the imprisonment of five (5) years or less, or fines of ¥1 million or less. 2. A person who operates water supply facilities without permission, thereby obstructing the supply of water, shall be punished by the imprisonment of two (2) years or less, or fines of ¥500,000 or less. 3. When the actions corresponding to actions mentioned in the two (2) preceding paragraphs are punishable by the Criminal Act, the executor of the actions shall be punished for the heavier of the punitive measures in this and Criminal Act.
第五十二条　次の各号のいずれかに該当する者は、三年以下の懲役又は三百万円以下の罰金に処する。 一　第六条第一項の規定による認可を受けないで水道事業を経営した者 二　第二十三条第一項（第三十一条及び第三十四条第一項において準用する場合を含む。）の規定に違反した者 三　第二十六条の規定による認可を受けないで水道用水供給事業を経営した者	**Article 52**　A person who falls under any of the following items shall be punished by the imprisonment of three (3) years or less, or fines of ¥3 million or less. 1) A person who operates water supply services without being awarded license based on the provision of Article 6, Paragraph 1. 2) A person who violates the provision of Article 23, Paragraph 1 (including cases in which its provision is applied to Article 31 and Article 34, Paragraph 1). 3) A person who operates wholesale water supply services without being awarded license based on the provision of Article 26.
第五十三条　次の各号のいずれかに該当する者は、一年以下の懲役又は百万円以下の罰金に処す	**Article 53**　A person who falls under any of the following items shall be punished by the imprisonment of one (1) year or less, or the fine of ¥1 million or less. 3) A person who violates the provision of Article 15,

る。 **三**　第十五条第一項の規定に違反した者 **四**　第十五条第二項（第三十一条において準用する場合を含む。）の規定に違反して水を供給しなかつた者 **五**　第十九条第一項（第三十一条及び第三十四条第一項において準用する場合を含む。）の規定に違反した者 **六**　第二十四条の三第一項（第三十一条及び第三十四条第一項において準用する場合を含む。）の規定に違反して、業務を委託した者 **附　則　抄** （施行期日） **第一条**　この法律は、公布の日から起算して六箇月をこえない範囲内において政令で定める日から施行する。	Paragraph 1. 4) A person who does not supply water in violation of the provision in Article 15, Paragraph 2 (including the case in which the provision is applied to Article 31). 5) A person who violates the provision of Article 19, Paragraph 1 (including the case in which the provision is applied to Article 31 and Article 34, Paragraph 1). 6) A person who entrusts the business to others in violation of the provision in Article 24-3, Paragraph 1 (including the case in which the provision is applied to Article 31 and Article 34, Paragraph 1). **Supplementary Provision** **(Date of Enforcement)** **Article 1** The date of the enforcement of this Act shall be fixed by Cabinet ordinance within 6 months counting from the day of its promulgation.

地方公営企業法(昭和 27 年 8 月 1 日法律第 292 号)	Local Public Enterprise Act（Act No292, August 1, 1952）
第一章　総則（第一条―第六条） 第二章　組織（第七条―第十六条） 第三章　財務（第十七条―第三十五条） 第四章　職員の身分取扱（第三十六条―第三十九条） 第五章　一部事務組合及び広域連合に関する特例（第三十九条の二・第三十九条の三） 第六章　雑則（第四十条―第四十二条）	Chapter 1　General Provisions Chapter 2　Structure Chapter 3　Financial Affairs Chapter 4　Legal Status and Treatment for Employees Chapter 5　Special Cases of “Joint Public Services Authority” and “Regional Municipal Federations” Chapter 6　Miscellaneous Rules
第一章　総則	**Chapter 1　General Provisions**
（この法律の目的） **第一条**　この法律は、地方公共団体の経営する企業の組織、財務及びこれに従事する職員の身分取扱いその他企業の経営の根本基準、企業の経営に関する事務を処理する地方自治法の規定による一部事務組合及び広域連合に関する特例並びに企業の財政の再建に関する措置を定め、地方自治の発達に資することを目的とする。	**(Purposes of This Act)** **Article 1**　This Act is designed to establish special provisions for structures of an enterprise managed by a local public entity, finances of such enterprise, statuses and treatment of employees serving in the enterprise, and other basic standards for the operation of the enterprise; special cases in the handling of some joint pubic services authorities and regional municipal federations, based on the provisions of the Local Autonomy Act, designed to deal with the public services related to the operation of the enterprise; and steps regarding financial restoration of the enterprise, thereby contributing to the development of local autonomy.
（この法律の適用を受ける企業の範囲） **第二条**　この法律は、地方公共団体の経営する企業のうち次に掲げる事業（これらに附帯する事業を含む。以下「地方公営企業」という。）に適用する。 一　水道事業（簡易水道事業を除く。） 二　工業用水道事業 三　軌道事業	**(Enterprises to Which This Act Is Applied)** **Article 2**　1. This Act shall be applied to the following enterprises among the public services operated by a local public entity (including public services attached to such enterprise; hereinafter referred to as “local public enterprise”). 1) Water supply services (excluding small water supply systems) 2) Industrial water supply services 3) Railroad services

四　自動車運送事業 五　鉄道事業 六　電気事業 七　ガス事業	4) Transportation services 5) Railroad traffic services 6) Electricity services 7) Gas supply services
2　前項に定める場合を除くほか、次条から第六条まで、第十七条から第三十五条まで、第四十条から第四十一条まで並びに附則第二項及び第三項の規定（以下「財務規定等」という。）は、地方公共団体の経営する企業のうち病院事業に適用する。	2. Besides excluding the cases provided for in the preceding paragraph, provisions in the immediately following articles －Article 6, Articles 17－35, Articles 40－41, and Attached Regulations, Paragraphs 2－4 (hereinafter, “financial clauses”) - shall be applied exclusively to hospital services among the operations managed by a local public entity.
3　前二項に定める場合のほか、地方公共団体は、政令で定める基準に従い、条例（地方自治法（昭和二十二年法律第六十七号）第二百八十四条第一項の一部事務組合（以下「一部事務組合」という。）又は広域連合（以下「広域連合」という。）にああっては、規約）で定めるところにより、その経営する企業に、この法律の規定の全部又は一部を適用することができる。	3. In addition to cases provided for in the two preceding paragraphs, a local public entity may apply all or part of provisions of this Act to enterprise managed by itself, based on so-called regulations for part of related joint pubic services authorities and for regional municipal federations, stipulated under ordinances (Local Autonomy Act (Act No. 67 of 1947), Article 284, Paragraph 1), in accordance with standards set by a Cabinet order.
（経営の基本原則） **第三条**　地方公営企業は、常に企業の経済性を発揮するとともに、その本来の目的である公共の福祉を増進するように運営されなければならない。	**(Basic Principles of Management)** **Article 3**　A local public enterprise must be operated so as to continually exercise its economical features, and promote the public welfare, which is its objective by nature.
（地方公営企業の設置） **第四条**　地方公共団体は、地方公営企業の設置及びその経営の基本に関する事項は、条例で定めなければならない。	**(Establishment of a Local Public Enterprise)** **Article 4**　A local public entity must set matters related to the establishment of a local public enterprise and basics of their operation by enacting a local ordinance.
（地方公営企業に関する法令等の制定及び施行） **第五条**　地方公営企業に関する法令並びに条例、規則及びその他の規程は、すべて第三条に規定する基本原則に合致するものでなければならない。	**(Institution and Enforcement of Acts/Ordinances, etc. Regarding Local Public Enterprises)** **Article 5**　Acts/ordinances, rules, and all other regulations regarding a local public enterprise must invariably comply with the basic principles stipulated in Article 3 herein.
（国の配慮） **第五条の二**　国の行政機関の長は、地方公営企業の業務に関する処分その他の事務の執行にあたっては、すみやかに適切な措置を講ずる等地方公営企業の健全な運営が図られるように配慮する	**(Consideration by the State)** **Article 5-2**　The heads of administrative organizations of the state shall give consideration, in the enforcement of execution and other work regarding the services of a local public enterprise, so as to arrange for certain development

ものとする。	of the operation of the enterprise by promptly taking suitable measures.
（地方自治法等の特例） **第六条**　この法律は、地方公営企業の経営に関して、地方自治法 並びに地方財政法（昭和二十三年法律第百九号）及び地方公務員法（昭和二十五年法律第二百六十一号）に対する特例を定めるものとする。	**(Exclusion in the Enforcement of the Local Autonomy Act)** **Article 6**　This Act shall set exclusion for the enforcement of provisions of the Local Autonomy Act, the Local Public Finance Act (Act No. 109 of 1948) and the Local Public Service Act (Act No. 261 of 1950).
第二章　組織	**Chapter 2　Structure**
（管理者の設置） **第七条**　地方公営企業を経営する地方公共団体に、地方公営企業の業務を執行させるため、第二条第一項の事業ごとに管理者を置く。ただし、条例で定めるところにより、政令で定める地方公営企業について管理者を置かず、又は二以上の事業を通じて管理者一人を置くことができる。なお、水道事業（簡易水道事業を除く。）及び工業用水道事業を併せて経営する場合又は軌道事業、自動車運送事業及び鉄道事業のうち二以上の事業を併せて経営する場合においては、それぞれ当該併せて経営する事業を通じて管理者一人を置くことを常例とするものとする。	**(Appointment of an Executive Managing Director)** **Article 7**　To have a local public entity operating a local public enterprise enforce work related to the public services of such a local public enterprise, an executive managing director shall be appointed for each service stated in Article 2, Paragraph 1.　Based on provisions of a local ordinance, however, it is possible not to appoint any executive managing director in relation to local public enterprises specified by a Cabinet order, or it is possible to appoint one executive managing director for two or more public services.　In the case of jointly operating water supply services (excluding small scale water supply systems) and industrial water supply services, or in the case of operating two or more of railroad services, transportation services and railroad traffic services at the same time, it shall be the usual practice to appoint one executive managing director for all of these simultaneously implemented operations.
（管理者の選任及び身分取扱い） **第七条の二**　管理者は、地方公営企業の経営に関し識見を有する者のうちから、地方公共団体の長が任命する。 **2**　次の各号のいずれかに該当する者は、管理者となることができない。 一　成年被後見人若しくは被保佐人又は破産者で復権を得ない者	**(Appointment and Status/Treatment of an Executive Managing Director)** **Article 7-2**　1.　The executive managing director shall be selected from among persons having excellent knowledge and views about operation of a local public enterprise and appointed by the head of the local public entity concerned. 2. Persons falling under any of the following items cannot become the executive managing director. 1) An incompetent person, or quasi-incompetent person, or bankrupt person who has not yet attained restoration of

	his (or her; hereinafter the same) previous rights.
二　禁錮以上の刑に処せられ、その執行を終わるまで又はその執行を受けることがなくなるまでの者	2) A person who was sentenced to imprisonment or more strict penalty, and who has not yet finished the execution of such penalty, or who is no more subject to the execution of such penalty.
3　管理者は、衆議院議員若しくは参議院議員又は地方公共団体の議会の議員若しくは常勤の職員若しくは地方公務員法第二十八条の五第一項に規定する短時間勤務の職を占める職員と兼ねることができない。	3. The executive managing director cannot simultaneously serve as a member of the House of Representatives, or the House of Councilors; or as a member of local assembly or a regular public official of the local public entity.
4　管理者の任期は、四年とする。	4. The tenure of office for the executive managing director shall be four (4) years.
5　管理者は、再任されることができる。	5. The executive managing director may be reappointed to the same post.
6　管理者は、常勤とする。	6. The executive managing director shall serve on a regular basis during his tenure.
7　地方公共団体の長は、管理者が心身の故障のため職務の遂行に堪えないと認める場合又は管理者の業務の執行が適当でないため経営の状況が悪化したと認める場合その他管理者がその職に必要な適格性を欠くと認める場合には、これを罷免することができる。	7. The head of a local public entity may discharge an executive managing director, when the head recognizes that the executive managing director cannot perform his duties due to mental or physical trouble, or when the head recognized that, because the operation of public services by the executive managing director is inappropriate, the state of operation has deteriorated, or when the head recognizes that the executive managing director lacks qualifications for his office.
8　地方公共団体の長は、管理者に職務上の義務違反その他管理者たるに適しない非行があると認める場合には、これに対し懲戒処分として戒告、減給、停職又は免職の処分をすることができる。	8. The head of a local public entity may take such actions as delivering a reprimand to an executive managing director, reducing his salary, suspending his work, or discharging him as punishment when the head recognizes that the executive managing director committed violation of management duties or conducted behavior unsuitable for his managerial position.
9　管理者は、前二項の規定による場合を除くほか、その意に反して罷免され、又は懲戒処分を受けることがない。	9. Excluding cases in which the executive managing director falls under one of the two preceding items, he shall not be discharged or subject to any punitive steps against his will.
10　管理者は、第二項各号の一に該当するに至つたときは、その職を失う。	10. The executive managing director shall lose his position when he falls under Item 1 in Paragraph 2 above.
11　地方自治法第百五十九条 、第百六十五条第二項及び第百八十条の五第六項から第八項まで並びに地方公務員法第三十条 から第三十七条	11. The provisions of the Local Autonomy Act, Article 159; Article 165-2; Article 180-5, Paragraph 6－Paragraph 8, as well as the Local Public Service Act, Articles 30－37; and

まで及び第三十八条第一項 の規定は、管理者について準用する。	Article 38, Paragraph 1, shall be applied to the executive managing director with necessary adjustments.
（管理者の地位及び権限） **第八条**　管理者は、次に掲げる事項を除くほか、地方公営企業の業務を執行し、当該業務の執行に関し当該地方公共団体を代表する。ただし、法令に特別の定めがある場合は、この限りでない。 一　予算を調製すること。 二　地方公共団体の議会の議決を経るべき事件につきその議案を提出すること。 三　決算を監査委員の審査及び議会の認定に付すること。 四　地方自治法第十四条第三項 並びに第二百二十八条第二項 及び第三項 に規定する過料を科すること。 2　第七条ただし書の規定により管理者を置かない地方公共団体においては、管理者の権限は、当該地方公共団体の長が行う。	**(Status and Authorities of an Executive Managing Director)** **Article 8**　1.　Excluding the matters shown hereunder, the executive managing director shall execute business of a local public enterprise or represent the said local public entity with regard to the said business. This shall not apply, however, when there are special provisions concerned in Acts or ordinances. 1) Setting/adjusting a budget. 2) Submitting a motion regarding matters that should be put to a vote at the local assembly of the local public entity concerned. 3) Referring a settlement of accounts document to the auditor for examination and to the local assembly for recognition. 4) Imposing penalty charges, based on the Local Autonomy Act, Article 228, Paragraph 2 and Paragraph 3; and Article 244-2, Paragraph 7. 2.　In the case of a local public enterprise, regarding which no executive managing director is appointed based on the provisions in Article 7, powers of the executive managing director shall be exercised by the head of the said local public entity.
（管理者の担任する事務） **第九条**　管理者は、前条の規定に基いて、地方公営企業の業務の執行に関し、おおむね左に掲げる事務を担任する。 一　その権限に属する事務を分掌させるため必要な分課を設けること。 二　職員の任免、給与、勤務時間その他の勤務条件、懲戒、研修及びその他の身分取扱に関する事項を掌理すること。 三　予算の原案を作成し、地方公共団体の長に	**(Businesses In Charge of an Executive Managing Director)** **Article 9**　The executive managing director shall be generally in charge of the following businesses with regard to the enforcement of business related to a local public enterprise concerned, based on the provisions of the preceding Article. 1)　Establishing necessary sections in charge of businesses under the powers of the executive managing director. 2)　Taking charge of matters concerning the employment/dismissal of employees, wages, work hours and other working conditions, punishment, training, and other treatment of employees. 3)　Preparing the original draft of a budget, and delivering

送付すること。 **四**　予算に関する説明書を作成し、地方公共団体の長に送付すること。 **五**　決算を調製し、地方公共団体の長に提出すること。 **六**　議会の議決を経るべき事件について、その議案の作成に関する資料を作成し、地方公共団体の長に送付すること。 **七**　当該企業の用に供する資産を取得し、管理し、及び処分すること。 **八**　契約を結ぶこと。 **九**　料金又は料金以外の使用料、手数料、分担金若しくは加入金を徴収すること。 **十**　予算内の支出をするため一時の借入をすること。 **十一**　出納その他の会計事務を行うこと。 **十二**　証書及び公文書類を保管すること。 **十三**　労働協約を結ぶこと。 **十四**　当該企業に係る行政庁の許可、認可、免許その他の処分で政令で定めるものを受けること。 **十五**　前各号に掲げるものを除く外、法令又は当該地方公共団体の条例若しくは規則によりその権限に属する事項 （企業管理規程） **第十条**　管理者は、法令又は当該地方公共団体の条例若しくは規則又はその機関の定める規則に違反しない限りにおいて、業務に関し管理規程（以下「企業管理規程」という。）を制定することができる。	it to the head of the local public entity concerned. 4) Preparing explanatory documents regarding the budget, and delivering them to the head of the local public entity. 5) Formulating a document about the settlement of accounts, submitting it to the head of the local public entity. 6) Preparing data about the preparation of a motion with regard to a matter to be referred to the local assembly for voting, and delivering such data to the head of the local public entity. 7) Acquiring assets to be used by the said local public enterprise, managing them, and disposition of them. 8) Concluding agreements/contracts. 9) Collecting charges, fees other than charges, service charges, contribution, and connection charges. 10) Carrying out temporary borrowing for disbursements within the framework of a budget. 11) Implementing accounting work, including disbursements and receipts of cash. 12) Keeping deeds/certificates and other official documents. 13) Concluding labor contracts. 14) Being awarded permissions, recognitions, licenses, and other execution by the government agencies concerned with the said local public enterprise that is specified by a Cabinet order. 15) Matters belonging to the authority of the local public enterprise based on the Acts/orders, or local ordinances or rules of the said local public entity, except for those stipulated in the preceding items. **(Enterprise Operating Regulations)** **Article 10** An executive managing director may enact operating regulations (hereinafter, “Enterprise Operating Regulations”) regarding the local public enterprise’s business, so long as Enterprise Operating Regulations do not violate Acts/orders, or local ordinances or rules of the local public entity concerned, or regulations established by the local public enterprise.

（代理及び委任） **第十三条**　管理者に事故があるとき、又は管理者が欠けたときは、管理者が当該地方公共団体の長の同意を得てあらかじめ指定する上席の職員がその職務を行う。	**(Delegation)** **Article 13**　1. When an accident/problem occurs to an executive managing director, or when the post of an executive managing director is vacant, a high-rank official, designated by the executive n managing director in advance after the consent of the head of the said local public entity is obtained, shall perform the duties of the executive managing director.
2　管理者は、その権限に属する事務の一部を第十五条の職員に委任し、又はこれにその職務の一部を臨時に代理させることができる。	2. The executive managing director may delegate a part of his businesses put under his powers to the official, provided for in Article 15, or have the said official temporarily handle part of his businesses as his proxy.
（事務の委任） **第十三条の二**　管理者は、その権限に属する事務の一部を、当該地方公共団体の経営する他の地方公営企業の管理者に委任することができる。	**(Entrustment of an Executive Managing Director's Businesses)** **Article 13-2**　The executive managing director may entrust part of businesses under his powers to the manager of other local public enterprise operated by the said local public entity.
（事務処理のための組織） **第十四条**　地方公営企業を経営する地方公共団体に、管理者の権限に属する事務を処理させるため、条例で必要な組織を設ける。	**(Organization for the Business Execution)** **Article 14**　To have a local public entity, which operates the local public enterprise, execute business belonging to the powers of the executive managing director, a necessary organization shall be established by enacting local ordinances.
（補助職員） **第十五条**　管理者の権限に属する事務の執行を補助する職員（以下「企業職員」という。）は、管理者が任免する。但し、当該地方公共団体の規則で定める主要な職員を任免する場合においては、あらかじめ、当該地方公共団体の長の同意を得なければならない。	**(Auxiliary Employees)** **Article 15**　1. Staff appointed to support the execution of businesses belonging to the powers of an executive managing director (hereinafter, "an enterprise employee") shall be employed/dismissed by the executive managing director.　In the case of employing/dismissing an important official, specified under the regulations of the said local public entity, as an enterprise employee, however, the consent of the head of the local public entity shall be obtained in advance.
2　企業職員は、管理者が指揮監督する。	2. An enterprise employee shall be commanded or supervised by the executive managing director.

（管理者と地方公共団体の長との関係）

第十六条　地方公共団体の長は、当該地方公共団体の住民の福祉に重大な影響がある地方公営企業の業務の執行に関しその福祉を確保するため必要があるとき、又は当該管 理者以外の地方公共団体の機関の権限に属する事務の執行と当該地方公営企業の業務の執行との間の調整を図るため必要があるときは、当該管理者に対し、当該 地方公営企業の業務の執行について必要な指示をすることができる。

(Relationship between Executive Managing Director and the Head of Local Public Entity)

Article 16　The head of a local public entity may issue instructions to the executive managing director concerned regarding enforcement of the business of the related local public enterprise, when such actions are required to secure welfare in connection with the execution of business of the said local public enterprise that seriously affects the welfare of residents in the said local public entity, or to carry out coordination between execution of the business under the powers of the organization of the local public entity different from that of the said executive managing director and execution of business by the said local public enterprise.

第三章　財務

Chapter 3　Financial Affairs

（特別会計）

第十七条　地方公営企業の経理は、第二条第一項に掲げる事業ごとに特別会計を設けて行なうものとする。但し、同条同項に掲げる事業を二以上経営する地方公共団体においては、政令で定めるところにより条例で二以上の事業を通じて一の特別会計を設けることができる。

(Special Account)

Article 17　The accounting of local public enterprises shall be implemented by instituting a special account for each service specified in Article 2, Paragraph 1. In the case of a local public entity operating two (2) or more of the services specified in the same paragraph of the same Article, it shall be possible to establish a single special account for the said two or more services, based on an ordinance based on a Cabinet order.

（経費の負担の原則）

第十七条の二　次に掲げる地方公営企業の経費で政令で定めるものは、地方公共団体の一般会計又は他の特別会計において、出資、長期の貸付け、負担金の支出その他の方法により負担するものとする。

一　その性質上当該地方公営企業の経営に伴う収入をもつて充てることが適当でない経費

二　当該地方公営企業の性質上能率的な経営を行なつてもなおその経営に伴う収入のみをもつて

(Principle of Expenses Sharing)

Article 17-2　1. The following expenses of a local public enterprise specified by a Cabinet order shall be covered through fund contribution, long-term loans, disbursement of contribution, or other methods for disbursements from the general account or special account of the local public entity concerned:

1) Expenses not suitable to be borne by operating income of the said local public enterprise in consideration of their nature.
2) Expenses recognized to be objectively difficult to be borne only with the operating income of the said

充てることが客観的に困難であると認められる経費	local public enterprise, even if the said local public enterprise is efficiently operated, in view of the character of the said local public enterprise.
2　地方公営企業の特別会計においては、その経費は、前項の規定により地方公共団体の一般会計又は他の特別会計において負担するものを除き、当該地方公営企業の経営に伴う収入をもつて充てなければならない。	2. Concerning the special account of the local public enterprise, its expenses must be covered with the operating income of the said local public enterprise excluding those to be borne by the general account or special account of the local public entity concerned, as stipulated in the provisions of the preceding paragraph.
（補助） **第十七条の三**　地方公共団体は、災害の復旧その他特別の理由により必要がある場合には、一般会計又は他の特別会計から地方公営企業の特別会計に補助をすることができる。	**(Subsidy)** **Article 17-3**　The local public entity may give support to the special account of a local public enterprise based on funds in its general account or the separate special account, when it is necessary for restoration from natural disasters or for some other special reasons.
（出資） **第十八条**　地方公共団体は、第十七条の二第一項の規定によるもののほか、一般会計又は他の特別会計から地方公営企業の特別会計に出資をすることができる。	**(Fund Contribution)** **Article 18**　1. The local public entity may implement fund contribution to the special account of the local public enterprise through disbursements from the general account or a separate special account, in addition to cases under provisions of Article 17-2, Paragraph 1.
2　地方公営企業の特別会計は、前項の規定による出資を受けた場合には、利益の状況に応じ、納付金を一般会計又は当該他の特別会計に納付するものとする。	2. When the special account of the local public enterprise receives fund contribution, provided for in the preceding paragraph, it shall deliver the contributed fund to the general account or the said special account concerned in accordance with its state of profit.
（長期貸付け） **第十八条の二**　地方公共団体は、第十七条の二第一項の規定によるもののほか、一般会計又は他の特別会計から地方公営企業の特別会計に長期の貸付けをすることができる。	**(Long-Term Loans)** **Article 18-2**　1. The local public entity may extend long-term loans to the special account of the local public enterprise through disbursements from its general account or other special account, in addition to cases under provisions of Article 17-2, Paragraph 1.
2　地方公営企業の特別会計は、前項の規定による長期の貸付けを受けた場合には、適正な利息を一般会計又は当該他の特別会計に支払わなければならない。	2. When the special account of the local public enterprise receives long-term loans, provided for in the preceding paragraph, it shall pay appropriate interest to the general account or the other special account concerned.

（事業年度） **第十九条**　地方公営企業の事業年度は、地方公共団体の会計年度による。	**(Business Year)** **Article 19**　The business year for local public enterprises shall be in accordance with the fiscal year of local public entity.
（計理の方法） **第二十条**　地方公営企業においては、その経営成績を明らかにするため、すべての費用及び収益を、その発生の事実に基いて計上し、かつ、その発生した年度に正しく割り当てなければならない。 2　地方公営企業においては、その財政状態を明らかにするため、すべての資産、資本及び負債の増減及び異動を、その発生の事実に基き、かつ、適当な区分及び配列の基準並びに一定の評価基準に従って、整理しなければならない。 3　前項の資産、資本及び負債については、政令で定めるところにより、その内容を明らかにしなければならない。	**(Methods for Accounting)** **Article 20**　1. In the case of a local public enterprise, it must post all of its expenses and revenues, based on the facts of their accrual, and allocate them to the business year in which they were accrued, to clarify its operational performances. 2. When the local public enterprise is to clarify the financial state of itself, the local public enterprise must sort out increases and decreases of all assets, shareholders' equity, liabilities, and their changes in accordance with appropriate classification/ arrangement standards and fixed evaluation criteria, based on the facts of their accrual. 3. As for the assets, shareholders' equity, and liabilities, mentioned in the preceding paragraph, their content must be clarified based on the provisions of a Cabinet order.
（料金） **第二十一条**　地方公共団体は、地方公営企業の給付について料金を徴収することができる。 2　前項の料金は、公正妥当なものでなければならず、かつ、能率的な経営の下における適正な原価を基礎とし、地方公営企業の健全な運営を確保することができるものでなければならない。	**(Charges)** **Article 21**　1. A local public entity may collect charges for the supply of public services by a local public enterprise. 2. Charges provided for in the preceding paragraph shall be fair and reasonable. In addition, they shall be based on the appropriate cost under efficient operation, and shall be able to maintain sound operation of the local public enterprise concerned.
(企業債) 第二十二条　地方公共団体が、地方公営企業の建設、改良等に要する資金に充てるため起こす地方債（以下「企業債」という。）については、行政庁の許可を必要としない。	**(Enterprise Bonds)** **Article 22**　With regard to local bonds (hereinafter, "enterprise bonds") to be floated by a local public entity to apply to funds required for the construction, improvement, etc. of a local public enterprise, no permission by the government agency concerned shall be required.

（企業債についての配慮） **第二十二条の二**　国は、地方公営企業の健全な運営を確保するため必要があると認めるときは、地方公共団体が地方公営企業の建設、改良等に要する資金に充てるため起こす地方 債（以下「企業債」という。）の償還の繰延べ、借換え等につき、法令の範囲内において、資金事情が許す限り、特別の配慮をするものとする。	**(Consideration regarding Income Bonds)** **Article 22-2**　The state shall give special consideration within the range of Acts/ordinances and so long as the fund situation allows, regarding postponement in the redemption for income bonds, refunding, and the like, when it recognizes such steps are necessary to ensure sound operation of the local public enterprise.
（償還期限を定めない企業債） **第二十三条**　地方公共団体は、企業債のうち、地方公営企業の建設に要する資金に充てるものについては、償還期限を定めないことができる。この場合においては、当該地方公営企業の毎事業年度における利益の状況に応じ、特別利息をつけることができる。	**(Permanent Income Bonds)** **Article 23**　Regarding income bonds designed to raise funds for the construction works by a local public enterprise, among various income bonds, the local public entity may withhold setting the time limit for their redemption.　In this case, it shall be possible to arrange for payment of special interest in accordance with the state of profit of the said local public enterprise in each business year.
（予算） **第二十四条**　地方公営企業の予算は、地方公営企業の毎事業年度における業務の予定量並びにこれに関する収入及び支出の大綱を定めるものとする。 **2**　地方公共団体の長は、当該地方公営企業の管理者が作成した予算の原案に基いて毎事業年度地方公営企業の予算を調製し、年度開始前に議会の議決を経なければならない。 **3**　業務量の増加に因り地方公営企業の業務のため直接必要な経費に不足を生じたときは、管理者は、当該業務量の増加に因り増加する収入に相当する金 額を当該企業の業務のため直接必要な経費に使用することができる。この場合においては、遅滞なく、管理者は、当該地方公共団体の長にその旨を報告するもの とし、報告を受けた地方公共団体の長は、次の会議においてその旨を議会に報告しなければならない。	**(Budget)** **Article 24**　1. The budget of a local public enterprise shall set the planned volume of its work for each business year, as well as outline figures of revenues and disbursements related to the said work volume. 2. The head of the local public entity shall adjust the budget of the local public enterprise every business year in accordance with the draft budget formulated by the executive managing director of the said local public enterprise, and he shall arrange for the voting of the local assembly before the commencement of the business year concerned. 3. When the amount of expenses required for the business of the local public enterprise is in short because of an increase in the business volume, the executive managing director may disburse the same amount as the growth of income expected to occur as a result of the work volume increase, for the expenses directly required for the business of the local public enterprise. In this case, the executive managing director shall promptly report to that effect to the head of the local public entity, and the head of

	the local public entity, who received the said report, must report to that effect to the local assembly at its next session.
（予算に関する説明書） **第二十五条**　地方公共団体の長は、地方公営企業の予算を議会に提出する場合においては、当該地方公営企業の管理者が作成した政令で定める予算に関する説明書をあわせて提出しなければならない。	**(Explanatory Document Regarding the Budget)** **Article 25**　When the head of a local public entity submits the budget of a local public enterprise to the local assembly, he must jointly submit an explanatory document prepared by the executive managing director of the said local public enterprise based on Cabinet order.
（予算の繰越） **第二十六条**　予算に定めた地方公営企業の建設又は改良に要する経費のうち、年度内に支払義務が生じなかつたものがある場合においては、管理者は、その額を翌年度に繰り越して使用することができる。	**(Carry-forward of the Budget)** **Article 26**　1. When, among the expenses required for the construction or improvement of a local public enterprise specified in a budget, there are expense items for which there are no obligations of payment within the fiscal year concerned, the executive managing director may carry forward such expenses to the following fiscal year and disburse them in that fiscal year.
2　前項の規定による場合を除くほか、毎事業年度の支出予算の金額は、翌事業年度において使用することができない。ただし、支出予算の金額のうち、 年度内に支出の原因となる契約その他の行為をし、避け難い事故のため年度内に支払義務が生じなかつたものについては、管理者は、その金額を翌事業年度に繰 り越して使用することができる。	2. Excluding the cases provided for in the preceding paragraph, the amounts of budget expenses for each business year cannot be disbursed in the following business year.　When, with regard to expenses, among disbursement budget amounts, regarding which conclusion of contracts that are the cause of disbursements and similar actions are taken within the business year concerned, but because of some unavoidable accidents obligations for their payment do not occur during the year, however, the executive managing director may carry over the said amounts to the next business year and disburse them in that business year.
3　前二項の規定により予算を繰り越した場合においては、管理者は、地方公共団体の長に繰越額の使用に関する計画について報告をするものとし、報告を受けた地方公共団体の長は、次の会議においてその旨を議会に報告しなければならない。	3. In the case of budgetary carry-forward, based on the provisions in the two preceding paragraphs, the executive managing director shall report on the plan for disbursing the carry-forward funds to the head of the local public entity concerned, and the head of the local public entity who received the said report must report to that effect to the local assembly during the next session thereof.

（出納） **第二十七条**　地方公営企業の業務に係る出納は、管理者が行う。ただし、管理者は、地方公営企業の業務の執行上必要がある場合においては、政令で定める金融機関で地方公 共団体の長の同意を得て指定したものに、当該地方公営企業の業務に係る公金の出納事務の一部を取り扱わせることができる。	**(Treasurer)** **Article 27**　Receipts and disbursements related to the business of a local public enterprise shall be implemented by the executive managing director.　When necessary in the execution of business by the local public enterprise concerned, however, the executive managing director may have a financial institution specified under a Cabinet order and designated based on the approval of the head of the local public entity handle part of the receipts/ disbursements of public funds related to the business of the said local public enterprise.
（公金の収納等の監査） **第二十七条の二**　監査委員は、必要があると認めるとき、又は管理者の要求があるときは、前条の規定により指定された金融機関が取り扱う地方公営企業の業務に係る公金の収納又は支払の事務について監査することができる。 ２　監査委員は、前項の規定により監査をしたときは、監査の結果に関する報告を地方公共団体の議会及び長並びに管理者に提出しなければならない。	**(Audit of Receipts, etc. of Public Funds)** **Article 27-2**　1.An auditor may, when he deems the following action necessary, or when such an action is requested by the executive managing director, carry out audit of the work of receipts or payments of public funds related to the business of the local public enterprise by the financial institution designated under the provisions of the preceding Article. 2. When an auditor executes audit based on the provisions in the preceding paragraph, he shall submit a report on the results of the audit to the local assembly and head of the local public entity, as well as to the executive managing director.
（企業出納員及び現金取扱員） **第二十八条**　地方公営企業を経営する地方公共団体に、当該地方公営企業の業務に係る出納その他の会計事務をつかさどらせるため、企業出納員及び現金取扱員を置く。ただし、現金取扱員は、置かないことができる。 ２　企業出納員及び現金取扱員は、企業職員のうちから、管理者が命ずる。 ３　企業出納員は、管理者の命を受けて、出納その他の会計事務をつかさどる。	**(A Financial Officer and Cashiers)** **Article 28**　1. Within the local public entity operating a local public enterprise, an enterprise financial officer and cashiers shall be appointed to take care of receipts/disbursements and other accounting work related to the business of the said local public enterprise.　It shall be possible, however, for the local public entity not to appoint a cashier. 2. A financial officer and cashier shall be selected from among the enterprise employees and appointed as such by the executive managing director. 3. A financial officer shall take care of receipts/disbursements and other accounting work under the instructions of the executive managing director.

4　現金取扱員は、上司の命を受けて、企業管理規程で定めた額を限度として当該地方公営企業の業務に係る現金の出納に関する事務をつかさどる。	4. A cashier shall take care of receipts/disbursements of cash related to the business of the said local public enterprise under the instructions of their superior, with the amount set under the Enterprise Operating Regulations as the upper limit.
（一時借入金） **第二十九条**　管理者は、予算内の支出をするため、一時の借入をすることができる。	**(Temporary Loans Payable)** **Article 29**　1.　The executive managing director may receive temporary loans to implement disbursements within the limits of a budget.
2　前項の規定による借入金は、当該事業年度内に償還しなければならない。但し、資金不足のため償還することができない場合においては、償還することができない金額を限度として、これを借り換えることができる。	2. The loans based on the provisions in the preceding paragraph shall be redeemed within the same business year. In the case of impossibility to redeem the loans due to the shortage of available funds, however, it shall be possible to carry out refunding, with the non-redeemable amount as the upper limit of such refunding.
3　前項但書の規定により借り換えた借入金は、一年以内に償還しなければならない。但し、借入金をもつてこれを償還するようなことをしてはならない。	3. The loans, received as a result of refunding stipulated in the preceding paragraph, must be redeemed within a year. However, the executive managing director may not take such an action as to redeem the loans by means of other loans payable.
（決算） **第三十条**　管理者は、毎事業年度終了後二月以内に当該地方公営企業の決算を調製し、証書類、当該年度の事業報告書及び政令で定めるその他の書類をあわせて当該地方公共団体の長に提出しなければならない。	**(Settlement of Accounts)** **Article 30**　1. The executive managing director shall compile the draft of the settlement of accounts of the said local public enterprise within two (2) months following the end of each business year, and must submit it, together with instruments, the business report for the said business year, and other documents specified by a Cabinet order, to the head of the said local public entity.
2　地方公共団体の長は、決算及び前項の書類を監査委員の審査に付さなければならない。	2. The head of the local public entity must refer the draft of the settlement of accounts and the documents provided for in the preceding paragraph to the auditors for the examination.
3　監査委員は、前項の審査をするにあたっては、地方公営企業の運営が第三条の規定の趣旨に従ってされているかどうかについて、特に意を用いなければならない。	3. In carrying out the examination stipulated in the preceding paragraph, the auditors must pay special attention to the problem of whether or not the operation of the local public enterprise is executed in line with the purport of the provision in Article 3 herein.
4　地方公共団体の長は、第二項の規定により監	4. The head of the local public entity shall refer the draft of

査委員の審査に付した決算を、監査委員の意見を付けて、遅くとも当該事業年度終了後三月を経過した後において最初に招集される定例会である議会の認定に付さなければならない。	the settlement of accounts, which was put to the examination by the auditors, based on the provisions of Paragraph 2, jointly with the opinion of the auditors, to the regular session of the local assembly to be convened for the first time after the passage of three (3) months following the end of the said business year for their recognition.
5　前項の規定による意見の決定は、監査委員の合議によるものとする。	5. The opinion provided for in the preceding paragraph, when the number of auditors is two (2) or more, shall be determined through consultations among the said auditors.
6　地方公共団体の長は、第四項の規定により決算を議会の認定に付するに当たっては、第二項の規定により監査委員の審査に付した当該年度の事業報告書及び政令で定めるその他の書類を併せて提出しなければならない。	6. When the head of the local public entity refers the draft of the settlement of accounts to the local assembly for recognition based on the provisions of Paragraph 4, he must submit the business report for the said business year, which was put to the examination by auditors under the provisions of Paragraph 2, and other documents specified by a Cabinet order, jointly with the draft of the settlement of accounts.
7　第一項の決算について作成すべき書類は、当該年度の予算の区分に従って作成した決算報告書並びに損益計算書、剰余金計算書又は欠損金計算書、剰余金処分計算書又は欠損金処理計算書及び貸借対照表とし、その様式は、総務省令で定める。	7. The documents to be prepared in connection with the settlement of accounts, provided for in Paragraph 1, shall be in the form of a settlement of accounts report, profit and loss statement, surplus calculation sheet or deficit calculation sheet, surplus appropriation sheet or deficit disposal calculation sheet, and balance sheet, prepared in accordance with the classification of the said business year, and their styles shall be set under an order of the Ministry of Home Affairs.
（計理状況の報告） **第三十一条**　管理者は、毎月末日をもつて試算表その他当該企業の計理状況を明らかにするために必要な書類を作成し、翌月二十日までに当該地方公共団体の長に提出しなければならない。	**(Reporting on the State of Accounting)** **Article 31**　The executive managing director shall prepare a trial balance and other documents necessary to reveal the state of accounting of the said local public enterprise by the end of each month and submit them to the head of the said local public entity by the 20th of the following month.
（剰余金） **第三十二条**　地方公営企業は、毎事業年度利益を生じた場合において前事業年度から繰り越した欠損金があるときは、その利益をもつてその欠損金をうめ、なお残額があると きは、政令で定めると	**(Surplus Money)** **Article 32**　1. In the case that a local public enterprise registers profit in each business year, when there is a deficit carried over from the preceding business year, the local public enterprise shall cover the deficit with the

ころにより、その残額の二十分の一を下らない金額を減債積立金又は利益積立金として積み立てなければならない。	surplus, and when the surplus still remains, the local public enterprise must accumulate an amount not less than 1/20 of the remaining sum as the sinking fund or retained earning.
2　毎事業年度生じた利益の処分は、前項の規定による場合を除くほか、議会の議決を経て定めなければならない。	2. The disposal of a profit produced in each business year must be determined through a voting in the local assembly, excluding the case based on the provisions in the preceding paragraph.
3　第一項の減債積立金は、企業債の償還に充てる場合のほか、使用することができない。	3. The sinking fund reserve, stipulated in Paragraph 1, cannot be used except for the case of redeeming enterprise bonds.
4　第一項の利益積立金は、欠損金をうめる場合のほか、使用することができない。	4. The retained earnings, stipulated in Paragraph 1, cannot be used except for the case of covering a deficit.
5　毎事業年度生じた資本剰余金は、その源泉別に当該内容を示す名称を附した科目に積み立てなければならない。	5. Capital surplus, which arises in each business year, must be accumulated under individual items bearing names that show their content in line with profit sources.
6　前項の資本剰余金は、政令で定める場合を除くほか、処分することができない。	6. The capital surplus, provided for in the preceding paragraph, may not be disposed of except for the case in which such disposal is stipulated by a Cabinet order.
（欠損の処理） **第三十二条の二**　地方公営企業は、毎事業年度欠損を生じた場合において前事業年度から繰り越した利益があるときは、その利益をもつてその欠損金をうめ、なお不足があるときは、政令で定めるところにより、これを繰り越すものとする。	**(Disposal of Deficit)** **Article 32-2**　When there is a profit carried forward from the previous business year while the local public enterprise concerned records a deficit in every business year, the local public enterprise shall cover the deficit with its profit.　When there still is shortage of money for the coverage of the deficit after adoption of such an action, the local public enterprise shall repeat the aforementioned action based on the provisions of a Cabinet order.
（資産の取得、管理及び処分） **第三十三条**　地方公営企業の用に供する資産の取得、管理及び処分は、管理者が行う。	**(Acquisition, Management, and Disposal of Assets)** **Article 33**　1.　The acquisition, management, and disposal of assets stipulated to be used by a local public enterprise shall be implemented by the executive managing director.
2　前項の資産のうちその種類及び金額について政令で定める基準に従い条例で定める重要なものの取得及び処分については、予算で定めなければならない。	2. With regard to assets provided for in the preceding paragraph, acquisition and disposal of important assets whose kinds and value are specified through ordinances based on a Cabinet order, shall be determined by means of the budget.
3　地方公営企業の用に供する行政財産を地方	3. In the case of administrative assets, designed for use by a

自治法第二百三十八条の四第四項 の規定により使用させる場合に徴収する使用料に関する事項については、管理者が定める。	local public enterprise, utilized by other entities under the provisions of the Local Autonomy Act, Article 238-4, Paragraph 4, matters regarding the charges to be collected shall be set by the executive managing director.
（公金の徴収又は収納の委託） **第三十三条の二**　管理者は、地方公営企業の業務に係る公金の徴収又は収納の事務については、収入の確保及び住民の便益の増進に寄与すると認める場合に限り、政令で定めるところにより、私人に委託することができる。	**(Entrusting Collection or Receipt of Public Funds)** **Article 33-2**　Regarding the collection or receipt of public funds related to the business of a local public enterprise, the executive managing director may entrust the said business to private persons based on the provisions of a Cabinet order, only when the executive managing director recognizes it as contributing to securing of revenues and enhancement of resident conveniences.
（職員の賠償責任） **第三十四条**　地方自治法第二百四十三条の二の規定は、地方公営企業の業務に従事する職員の賠償責任について準用する。	**(Compensatory Responsibilities of Employees)** **Article 34**　Provisions in the Local Autonomy Act, Article 243-2 shall be applied to compensatory responsibilities of employees engaged in the business of a local public enterprise with necessary adjustments.
（財務規定等が適用される場合の管理者の権限） **第三十四条の二**　第二条第二項又は第三項の規定により地方公共団体の経営する企業に財務規定等が適用される場合においては、管理者の権限は、当該地方公共団体の長が行な う。ただし、管理者の権限のうち当該企業の出納その他の会計事務及び決算に係るものについては、条例で定めるところにより、その全部又は一部を当該地方公共団体の出納長又は収入役に行なわせることができる。	**(Powers of the Executive Managing Director in the Case of Application of Financial Provisions, etc.)** **Article 34-2**　When financial provisions, etc. are applied to enterprises operated by a local public entity, based on provisions of Article 2, Paragraph 2 or Paragraph 3, the powers of the executive managing director shall be exercised by the head of the said local public entity. However, all or part of receipt/disbursement and other accounting work, as well as matters related to the settlement of accounts of the local public enterprise concerned, among the authority of the executive managing director, may be entrusted to the chief financial officer or cashier, based on the clauses of a local ordinance.
（政令への委任） **第三十五条**　この章に定めるものを除く外、地方公営企業の財務に関し必要な事項は、政令で定める。	**(Delegation on Cabinet Orders)** **Article 35**　Excluding provisions contained in this Chapter, matters necessary for the finances of a local public enterprise shall be set through Cabinet orders.
第四章　職員の身分取扱	**Chapter 4　Legal Status and Treatment for Employees**

（職員の労働関係の特例） **第三十六条**　企業職員の労働関係については、地方公営企業等の労働関係に関する法律（昭和二十七年法律第二百八十九号）の定めるところによる。	**(Exception of Labor Relations of Enterprise Employees)** **Article 36**　Labor relations of enterprise employees serving in a local public enterprises shall be based on the provisions of the Local Public Enterprise Labor Relations Act (Act No. 289 of 1952).
（職階制） **第三十七条**　企業職員については、職階制を実施することができる。 **2**　前項の職階制においては、企業職員の職を職務の種類及び複雑と責任の度に応じて分類整理しなければならない。	**(Position Hierarchical System)** **Article 37**　1. Concerning enterprise employees, it shall be possible to adopt a position hierarchical system. 2. With regard to the position hierarchical system, mentioned in the preceding paragraph, positions of enterprise employees shall be classified and sorted out in accordance with the kinds of work, degree of work complexity, and extent of responsibilities.
（給与） **第三十八条**　企業職員の給与は、給料及び手当とする。 **2**　企業職員の給与は、その職務に必要とされる技能、職務遂行の困難度等職務の内容と責任に応ずるものであり、かつ、職員の発揮した能率が充分に考慮されるものでなければならない。 **3**　企業職員の給与は、生計費、同一又は類似の職種の国及び地方公共団体の職員並びに民間事業の従事者の給与、当該地方公営企業の経営の状況その他の事情を考慮して定めなければならない。 **4**　企業職員の給与の種類及び基準は、条例で定める。	**(Wages)** **Article 38**　1. Wages of enterprise employees shall be salaries and allowances. 2. Pays of enterprise employees shall match the content and responsibilities of work duties, such as skills required for work duties and difficulty of work execution, and they shall also be based on sufficient consideration to the efficiency displayed by enterprise employees concerned. 3. Wages of enterprise employees must be fixed in view of their living expenses, wages of public officials of the central government or local public entity or employees of private enterprises in the equivalent or analogous business categories, the state of business of the said local private enterprise, and other matters concerned. 4. Kinds and standards of wages for enterprise employees shall be determined based on ordinances.
第五章　一部事務組合及び広域連合に関する特例	**Chapter 5　Special Cases of “Joint Public Services Authority” and “Regional Municipal Federations”**
（組織に関する特例） **第三十九条の二**　地方公営企業の経営に関する事務を共同処理する一部事務組合（これを企業団	**(Special Cases regarding Structure)** **Article 39-2**　1.　The name of the executive managing director for “a joint public services authority” jointly

という。）の管理者の名称は、企業長とする。	operation related to the public services of local public enterprises shall be referred to as the “head of joint public services authority.”
2　企業団には、第七条の規定にかかわらず、同条の管理者を置かず、当該管理者の権限は、企業長が行なう。	2. Notwithstanding the provisions of Article 7 herein, no executive managing director shall be installed in any joint public services authority, and powers of the said executive managing director shall be exercised by the head of joint public services authority.
3　企業長は、企業団の規約で別段の定めをしない限り、地方公営企業の経営に関し識見を有する者のうちから、企業団を組織する地方公共団体の長が共同して任命するものとする。	3. Unless otherwise provided for in the regulations of the joint public services authority concerned, the head of joint public services authority shall be selected from among persons having knowledge and views regarding the management of local public enterprises and jointly appointed by the heads of local public entities.
5　企業団の監査委員の定数は、企業団の規約で定めるところにより二人又は一人とする。	5. The number of auditors of a joint public services authority shall be two (2) or one (1), as determined by regulations of the said joint public services authority.
6　前項の監査委員は、企業長が企業団の議会の同意を得て、人格が高潔で、事業の経営管理に関し優れた識見を有する者のうちから選任する。	6. The auditors mentioned in the preceding paragraph shall be selected by the head of joint public services authority from among persons who have noble characters and excellent knowledge and views on the management/ operation of the business, with the consent of the local assembly of the joint public services authority obtained.
7　企業団の議会の議員の定数は、十五人をこえることができない。	7. The number of members of the local assembly of a joint public services authority may not surpass fifteen (15).
第六章　雑則	**Chapter 6　Miscellaneous Rules**
（地方自治法の適用除外） **第四十条**　地方公営企業の業務に関する契約の締結並びに財産の取得、管理及び処分については、地方自治法第九十六条第一項第五号 から第八号 まで及び第二百三十七条第二項 及び第三項 の規定にかかわらず、条例又は議会の議決によることを要しない。	**(Exclusion of the Application of the Local Autonomy Act)** **Article 40**　1. With regard to the conclusion of agreements/contracts related to business of a local public enterprise and the acquisition, management, and disposal of assets of the local public enterprise, notwithstanding the provisions of the Local Autonomy Act, Article 96, Paragraph 1, Items 5－8; and Article 237, Paragraphs 2－3, no decisions need to be based on any ordinance or a voting by the local assembly.
2　地方公営企業の業務に関する負担附きの寄附又は贈与の受領、地方公共団体がその当事者である審査請求その他の不服申立て、訴えの提	2. Unless otherwise provided for in ordinances, no application shall be made of the provisions in Local Autonomy Act, Article 96, Paragraph 1, Items 9, 12, and

起、和解、あつせん、調停及び仲裁並びに法律上地方公共団体の義務に属する損害賠償の額の決定については、条例で定めるものを除き、地方自治法第九十六条第一項第九号、第十二号及び第十三号の規定は、適用しない。	13, to the receipt of burden-attached donations or gifts for the business of a local public enterprise; submission of demands for examination or other complaints regarding which the local public enterprise is a party, starting of appeals, composition, good offices, mediation, arbitration, and the setting of an amount of damage compensation demand, which is legally one of the obligations of the local public enterprise.
（業務の状況の公表） **第四十条の二**　管理者は、条例で定めるところにより、毎事業年度少くとも二回以上当該地方公営企業の業務の状況を説明する書類を当該地方公共団体の長に提出しなければならない。この場合においては、地方公共団体の長は、遅滞なく、これを公表しなければならない。 ２　前項の規定による公表は、これをもつて、当該地方公営企業に係る地方自治法第二百四十三条の三第一項 の規定による普通地方公共団体の長の行う公表とみなす。	**(Release of the State of Business)** **Article 40-2**　1. Based on the provisions of an ordinance, the executive managing director shall submit documents explaining the state of business of the said local public enterprise to the head of the local public entity two (2) or more times per business year. In this case, the head of the local public entity must promptly release such documents for public. 2. The public release provided for in the preceding paragraph shall thereby be regarded as the public announcement to be usually executed by the head of the local public entity related to the said local public enterprise under the provisions of the Local Autonomy Act, Article 243-3, Paragraph 1.
（助言等） **第四十条の三**　総務大臣は、地方公営企業が第三条に規定する基本原則に合致して経営されるように、地方公営企業を経営する地方公共団体に対し、助言し、又は勧告することができる。 ２　総務大臣は、前項の助言又は勧告を行うため必要がある場合においては、地方公営企業を経営する地方公共団体に対し、政令で定めるところにより、当該地方公営企業の経営に関する事項について報告を求めることができる。	**(Advices, etc.)** **Article 40-3**　1. The Minister of General Affairs may give advices or recommendations to a local public entity operating a local public enterprise, so that the local public enterprise will be operated in accordance with basic principles, stipulated in the Local Autonomy Act, Article 3. 2. When necessary for giving advices or recommendations as provided for in the preceding paragraph, the Minister of General Affairs may request the submission of a report by the local public entity, which operates the local public enterprise, regarding matters of the operations of the said local public enterprise, as stipulated in the clauses concerned of a Cabinet order.
（国と地方公営企業を経営する地方公共団体等と	**(Relations between the State and the Local Public Entity,**

の関係） **第四十一条**　地方公営企業の経営に関し、地方公共団体相互の間で協議がととのわない場合において、関係地方公共団体の申出があるときは、政令で定めるところにより、総務大臣又は都道府県知事は、必要なあっ旋若しくは調停をし、又は必要な勧告をすることができる。	**etc., Managing Local Public Enterprises)** **Article 41**　When a request is submitted by local public entity concerned in the case that no agreement can be reached among local public entities on the operation of a certain local public enterprise, either the Minister of General Affairs or the governor of the prefectures may arrange for necessary good offices or mediation, or provide necessary recommendations based on provisions of a Cabinet order.
（地方公共企業体） **第四十二条**　地方公共団体は、別に法律で定めるところにより、地方公営企業を経営するための地方公共企業体を設けることができる。	**(Local Public Entity)** Article 42　A local public entity may separately establish a local public enterprise designed to operate other local public enterprise, as provided for under Acts.

Back cover photos

Upper left: Seminar at school in 2016, Waterworks Bureau of Chiba Prefecture.

Upper middle: Construction site of large-diameter transmission pipe in 2001, Fukushima Water Supply Authority.

Upper Right: Environmental conservation activities for watershed forest by volunteers group in 2008,Yokohama Waterworks Bureau.

Bottom left: Inspection of chemical feeders in water treatment plant in 2017, Sapporo City Waterworks Bureau.

Lower middle: Surikamigawa Dam in 2007, Surikamigawa Dam and Reservoir Management Office.

Down right: Customer Service Center in 2016, Bureau of Waterworks, Tokyo Metropolitan Government.