

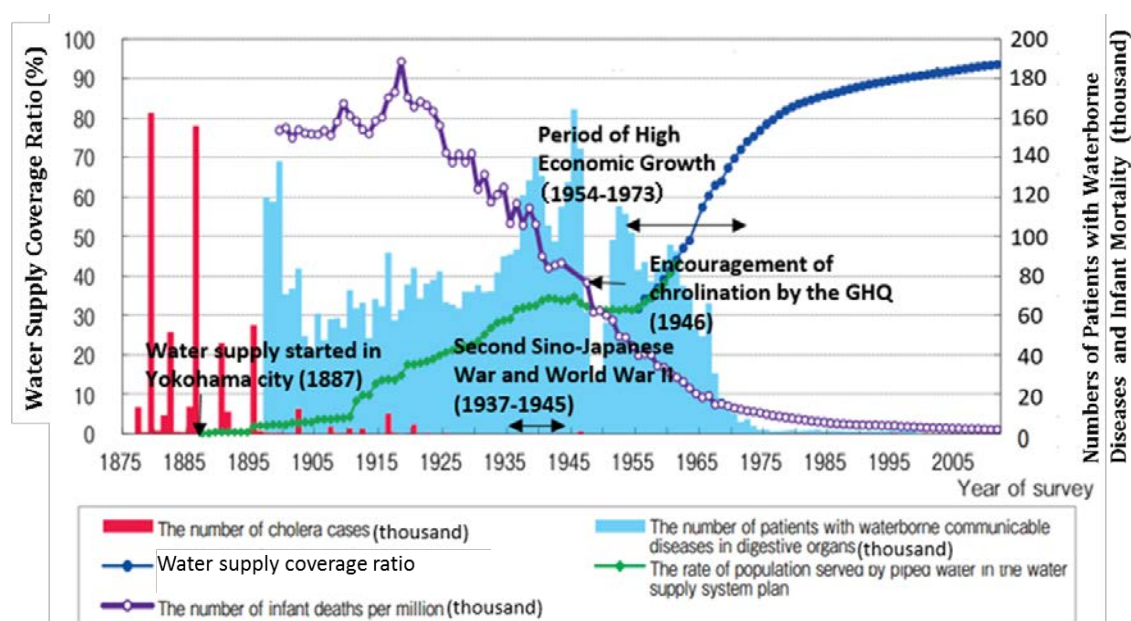
Theme 1. Sector Governance and Regulation for Nationwide Full Coverage of Water Supply Service

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1. Introduction

Japan has achieved 98% of water supply coverage and almost all residents in Japan can enjoy a high level of public health with safe drinking water. This success is a result of many years of effort not only in the building of the physical infrastructures but also in establishing the legislative and administrative frameworks needed to support the developments. This module explains the historical path towards universal coverage and the legislative and regulatory environment for the water supply business as well as the administrative aspects of the system.



Source: 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>

Figure 1. Water Supply Coverage, Number of Patients with Waterborne Diseases and Infant Mortality

This module will answer to the following questions frequently asked by the participants of water supply training courses from developing countries based on Japan's experience in waterworks.

Q1. How did the Japanese water utilities take measure against waterborne diseases such as cholera? How did water utilities in Japan become successful in providing safe drinking water on tap for 24 hours a day?

Q2. How did Japan achieve universal coverage of water supply service including rural areas?

Based on what kind of legislative and regulation frameworks it has been achieved?

Q3. What is the historical path to Japan's development of laws, regulations and standards for water supply? What kinds of factors helped water utilities to comply with them?

Q4. Why can small- and medium-scale water supply utilities, which are insufficient with funding and personnel, comply with the laws, regulations and standards and appropriately maintain their facilities?

The following sections attempt to provide answers to these questions:

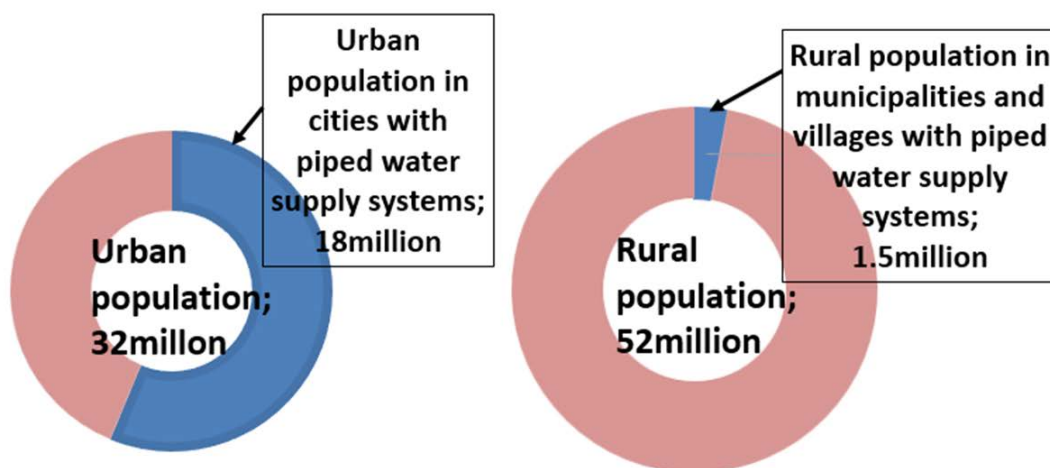
2. The Purpose of Water Supply: Public Health (Q1)
3. Historical Path towards Nationwide Coverage (Q2)
4. Regulatory framework and Administration (1), (2) and (3) (Q3)
4. Regulatory framework and Administration (4) and 5. Challenges in Maintaining Universal Coverage (Q4)

2. Purpose of Water Supply: Public Health

(1) Public Health Objective

The Water Supply Act clearly states that water supply development must be promoted to enhance public health in Japan.

Since Japan began active trading with foreign countries in late 19th century, epidemics of waterborne diseases including cholera, spread from its ports. In 1879, of the 160,000 patients who had cholera, more than 100,000 died¹. People in those days obtained domestic water from wells, open ditches or street vendors, and did not have access to clean water. The installation of modern water supply systems was implemented to prevent waterborne diseases. When the country started to construct safe and stable water supply systems, the foremost objective was to protect human health.



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

Figure 2. Water Supply Coverage

Public health is “the science and art of promoting health, preventing disease, and prolonging life through the organized efforts of society.”² In Japan, although there are no regulations clarifying the definition of public health, public health in society is enshrined through the regulations under the Community Health Act, aiming to maintain and promote local residents’

¹ Ministry of Health, Labour and Welfare, “*Annual Health, Labour and Welfare Report 2014*,” p.4, <http://www.mhlw.go.jp/wp/hakusyo/kousei/14/dl/1-01.pdf>

² WHO, “Health Promotion Glossary” p.3, <http://www.who.int/healthpromotion/about/HPR%20Glossary%201998.pdf>

health. Public health efforts can be in promotion of basic social security such as healthy lifestyle, infectious disease control, protection from health hazards posed by such things as contaminated water, provision of water supply and sewerage services and food sanitation. Provision of water supply and sewerage services is the most important element in the health protection responsibility to prevent infectious diseases.

Article 1 of the Water Supply Act stipulates that the purpose of the act is to “contribute to improving public health and the living environment.” Article 2 states that waterworks are indispensable for protecting the health of the people.

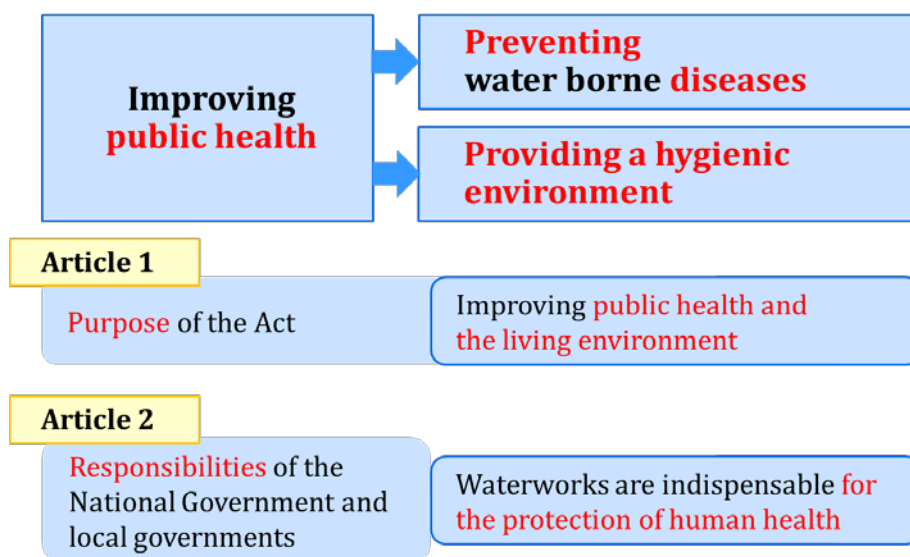


Figure 3. Relation between Public Health and Article 1 and 2 of the Water Supply Act

Water Supply Act – Articles 1 and 2

(Purpose 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. 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.

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

Articles 4 and 5 of the Water Supply Act stipulate the water quality and facility standards required for water utilities to ensure public health.

To ensure drinking water quality, the Water Supply Act stipulates the water quality and facility standards in Articles 4 and 5.

Article 4 stipulates that the water supply must: (1) be absent of contaminants such as pathogens; (2) not contain toxic substances; (3) not contain excessive metal substances like copper and iron; (4) not show abnormal pH level; (5) not include abnormal odors; and (6) be nearly colorless and transparent. As of 2016, 51 parameters for water quality have been stipulated in the Ordinances for Water Quality Standards issued by the Ministry of Health, Labour and Welfare (MHLW).

Water Supply Act - Article 4 Water Quality Standards

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.

Article 5 stipulates the requirements for intake facilities, water storage facilities, raw water transmission facilities, water purification facilities, water conveyance facilities, and water distribution facilities (Paragraph 1). In determining the location and arrangements of water supply facilities, it is necessary to keep their construction, operation, and maintenance as economical and simple as possible, and to give consideration to reliability of water supply (Paragraph 2). These facilities must be able to withstand water pressure, earth load, seismic activities, and there should be no risk of water contamination or leakage (Paragraph 3); and in addition to the standards provided for in Paragraphs 1-3, technical standards required for water supply facilities shall be stipulated by ordinance of the MHLW (Paragraph 4). The “Ordinance for Technical Standards of Water Supply Facilities” is issued by the MHLW.

Water Supply Act - Article 5 Facility Standards

1. Water supply services shall have all or part of intake facilities, water storage facilities, raw water transmission 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:

- 1) Water intake facilities shall be able to take in the necessary volume of raw water whose quality is as excellent as possible.
- 2) Water storage facilities shall have the water storage ability capable of supplying raw water required even at the time of draught.
- 3) Raw water transmission facilities shall have pumps, raw water transmission pipes, and other equipment required to provide the necessary volume of raw water.
- 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 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.
- 5) Water conveyance facilities shall have pumps, water conveyance pipes, and other facilities required to convey the necessary volume of purified water.
 - 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. 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. 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. In addition to the standards provided for in the (3) preceding paragraphs, technological standards required for water supply facilities shall be stipulated under orders of the Ministry of Health, Labor and Welfare.

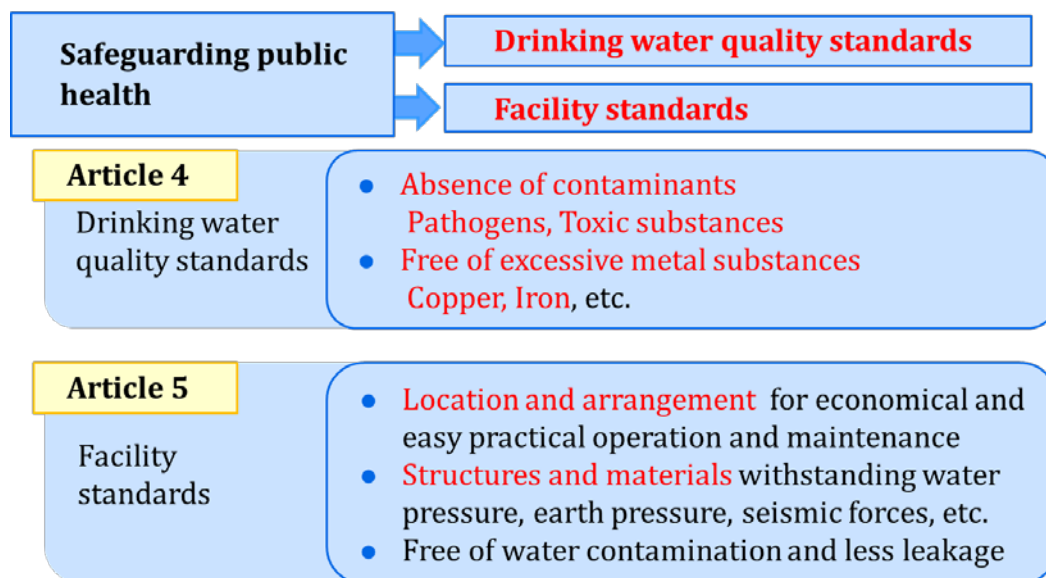


Figure 4. Public Health Protection in the Water Supply Act

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

In Japan, 24-hour chlorinated water supply under sustained pressure contributed to the reduction of waterborne diseases and infant mortality, and the improvement of public health.

Public Health in Japan improved with the installation of the modern water supply systems. As the contact with overseas countries increased through trading in the late 19th century, the spread of cholera caused many deaths. The awareness of the necessity to enhance public health increased and the development of water supply systems began.

Initially, there were arguments on whether to invest limited budgets on other infrastructures rather than in improving water supply systems. As a leading trading port, Yokohama City was the first to modernize its waterworks in order to present a good image to visitors from overseas. Other cities followed suit. However, this was not enough to fully achieve public health. Diseases caused by untreated water such as diarrhea had still been serious problems until the wide coverage of water supply systems and thorough chlorination were achieved.

As shown in Figure 1, cholera outbreaks significantly diminished with the increase in water supply coverage. However incidences of waterborne diseases and infant deaths remained high until after Tokyo City Waterworks (later became Bureau of Waterworks, Tokyo Metropolitan Government) started chlorination in 1921. Even though no adequate statistics are available, it is believed that waterborne diseases were prevalent during the WWII period. After the war, the GHQ³ enforced disinfection practice. Increased water supply coverage along with chlorination significantly diminished incidences of waterborne diseases, clearly proving that clean water supply contributed to public health.

What is potable water? In Japan, modern water supply systems are designed to distribute potable water under pressure to the consumers. Treated water can be contaminated in the distribution pipelines. Interruption in the distribution system poses a risk to public health. Around the clock water supply can greatly minimize this risk.

MHLW, not the Ministry of Construction⁴, is responsible for waterworks under the Water Supply Act, showing that public health is the over-riding concern and that public health and waterworks are intricately linked. This principle is the basis for the service standards of present

³ General Headquarters, 1945 – 1952, an organization established by the Allies led by the US government to implement and manage the occupation policies

⁴ The Ministry of Construction was merged with the Ministry of Transport and two Agencies to form the Ministry of Land, Infrastructure, Transport in 2001.

day waterworks in Japan.

Column: Contamination of Drinking Water

Water supply must not have stoppages or interruptions in the modern water supply systems.

Fukuoka City could only distribute water for 9 hours in a day during the severe drought in 1978. More than 1600 complaints from residents about contamination and no water supply were received every day. After this experience, Fukuoka city was determined to develop enough water resources to overcome these adversities.

In Japan, modern water supply systems are expected to distribute treated water under sustained pressure. The key is to sustain the pressure. A slight crack on the distribution pipeline may lead to leakage but not infiltration of contaminants if appropriate pressure can be maintained. Water stoppage for any period of time would create negative pressure in the pipe, allowing underground water with contaminants to seep in, posing a risk to the safety of the drinking water and to public health.

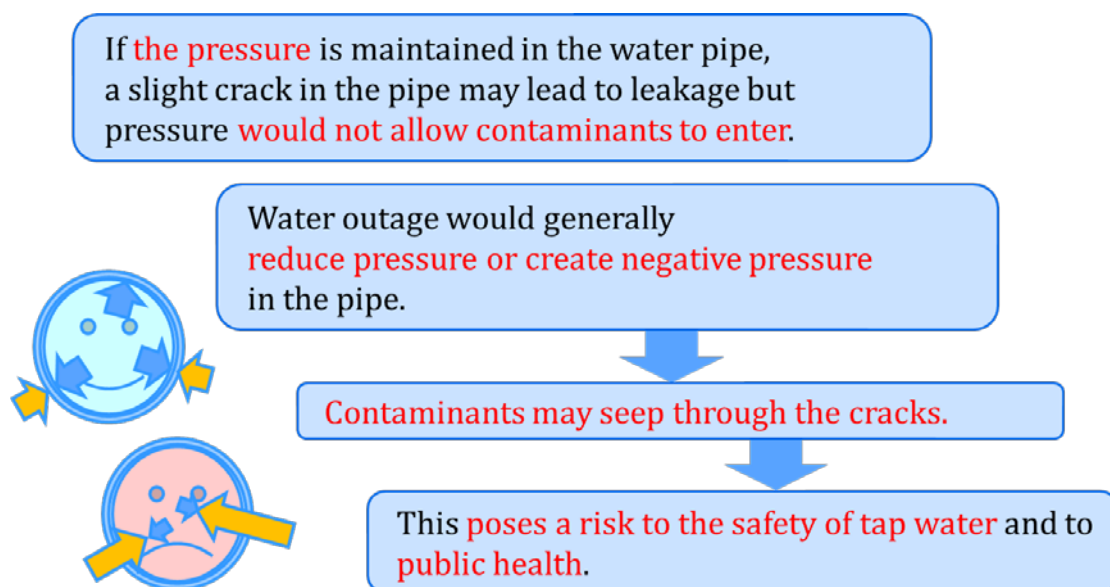


Figure 5. Importance of Uninterrupted Water Supply

3. Historical Path towards Nationwide Coverage

(1) Public Ownership

The Waterworks Ordinance was the first national regulation on waterworks in Japan. Promulgated in 1890, it stipulates that utilities must be managed by municipal governments. Municipalities are therefore responsible for the construction and operation of utilities and for providing water supply across the country. The Japanese Constitution guarantees the right to life for all persons in Article 25. This concept of right to life is relevant to the nation's responsibility for public health and is the primary "raison d'être" for the drive toward nationwide water supply coverage.

Privately-managed waterworks in Japan in the early days did not provide good service and were partly responsible for the spread of infectious diseases. They would even cease operation due to lack of funding. The Waterworks Ordinance promulgated in 1890 placed water supply under the municipal governments making them responsible for funding the construction of waterworks.

Article 25 of the Constitution (1946) stipulates that every person shall have the right to maintain the minimum standards of wholesome and cultured living (right to life) (Paragraph 1); and that the State shall promote and improve public health, (Paragraph 2) as a responsibility towards its citizens. The government is mandated to promote nationwide water supply coverage. The Waterworks Ordinance was not adequate for the launch of new waterworks. The Water Supply Act was established in 1957, making the creation of new water supply projects possible.

The right to life, guaranteed under the Constitution, applies to everyone and thus calls for access to water by all citizens (i.e. universal water supply). Therefore, the government must extend water supply systems and sanitation services to rural areas, leading to the construction of many small-scale public water supply systems.

These principles correspond to Goal 6 of the Sustainable Development Goals (SDGs): "ensure availability and sustainable management of water and sanitation for all," which was adopted in 2015.



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

Photo 1. Carrying Water Before the Development of Water Supply

Constitution of Japan - Article 25

1. All people shall have the right to maintain the minimum standards of wholesome and cultured living.
2. In all spheres of life, the State shall use its endeavor for the promotion and extension of social welfare and security and public health.

(2) Water Supply Development in Urban Areas

Water utilities in urban centers were developed using tariff revenue as the main source of funding, with the rest from bond issues and equity capital, and a certain amount of government subsidy. The dense population in urban areas guarantees sizable revenue from tariff income. Large operations provide greater efficiency and opportunity to improve the facilities. During the period of high economic growth (1954 – 1973), water utility expansions were financed through bond issues, and made possible by securing engineering expertise and serious efforts in water resources development.

Water supply facilities in high density urban areas and sparsely populated rural areas are very different in size and their ability to recover costs. The development of urban and rural utilities followed different routes. Urban utilities were developed since around 1900. Construction of efficient facilities were financed by bond issues, equity capital and government subsidies. Independent accounting was adopted as required by the Local Public Enterprise Act in 1952. When government subsidies were discontinued in 1954, the procuring of funds for new facilities turned to more bond issues.

After WW II, the availability of technical expertise from GHQ, repatriation of engineers, and elimination of debt by inflation, benefited the rapid expansion of water supply facilities.

During the period of high economic growth and rapid increase in urban population, it became extremely urgent to continue improving water resources and expanding distribution networks. Water utilities used bond issues to procure the funds by relying on their sound financial condition. The bonds were underwritten by public funds and procured by the national government. Furthermore, the government re-established the subsidies for improvement of water supply facilities and water resources and for dam construction in 1967. Water supply systems in urban areas were dramatically expanded as a result of active water resources development and human resources development.

Table 1. Development of Water Supply in Urban Areas

Period	Characteristics of waterworks
Early stage of construction (1887 – 1945)	<ul style="list-style-type: none"> ● Mainly funded by bond floatation and own funds, financed by tariffs ● Small portion of subsidy by the state government
After World War II (1945 – 1954)	<ul style="list-style-type: none"> ● Technical support from GHQ (widespread introduction of chlorination) ● Subsidy for reconstruction following the war until 1954
Early period of high economic growth (1954 – 1967)	<ul style="list-style-type: none"> ● 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 –)	<ul style="list-style-type: none"> ● Targeted subsidy for water resources development, advanced water treatment, replacement of aging pipes, disaster risk reduction, etc. ● Debt repayment ● Asset management for rehabilitation

(3) Development of Small Waterworks in Rural Areas

The development of water supply in rural areas started relatively slowly as it was managed by local communities. The momentum came with the Water Supply Act in 1957. The national government promoted human resources development and provided subsidies. These together with active campaigning by provincial politicians and financing by local residents, small utilities in rural areas began to fill the gaps in the nationwide coverage.

Water supply in rural areas started as simple water sources for communal use, built by residents in local communities. Facilities supplying 100 or less people are not covered under the Water Supply Act. Those supplying 100 or more people were transferred to municipalities for management as the Small Scale Public Water Supply.

Very few people in rural areas had access to piped water until 1973. Under the movement to improve quality of life, residents gathered money by selling what they had such as wood and eggs and began to construct and manage waterworks by themselves. This situation is similar to residents participation projects in some developing countries. Water supply in rural areas was more fully developed only after the national government aggressively injected funds for Small Scale Public Water Supply.

The Water Supply Act defines “waterworks” as facilities supplying domestic water for more than 100 people. The Act defines Small Scale Public Water Supply as a system that supplies water to a population of less than 5,000 and Water Supply as a system that serves a population of more than 5,000. They all have to comply with water quality and facility standards.

Small Scale Public Water Supply does not imply that the operation is technologically simple, only that the utility supplies water to a small population. As shown in Table 2, utilities serving a population of 5,001 or more are subject to the Local Public Enterprise Act, and to corporate accounting rules based on cost recovery. The Small Scale Public Water Supply is not regarded as a public corporation under the Local Public Enterprise Act and is often managed using municipal general accounting.

Table 2. Difference between Water Supply and Small Scale Public Water Supply

Type	Population served	Accounting system	Funding source	Location
Water supply	$\geq 5,001$	Public enterprise accounting system	(mainly) Bond issues	Urban area
Small Scale Public Water Supply	101-5,000	General account	National subsidy and bond issues	Rural area
Facility for drinking water supply	≤ 100	financed by local residents	Residents and community	Rural area

The funding for the development of rural utilities came from subsidies and bond issues. Development of waterworks in rural area was boosted by government subsidies provided after the Water Supply Act was promulgated in 1957. The bond issue system was developed around this time and has been used widely since as the incomes of municipalities were expected to grow during the high economic growth period.

Government subsidies for the Small Scale Public Water Supply are for facility improvement only. Operation and maintenance of these facilities is the responsibility of the utilities, on a financially self-sustaining basis. However since the tariff revenue from low population bases cannot cover the operation and maintenance costs, many utilities have to transfer funds from general accounting.

Skilled workers are needed in the development of the Small Scale Public Water Supply. It is very difficult to providing the training for a small number of workers spread across many small utilities. After World War II, the National Institute of Public Health of MHLW trained a core group of personnel from prefectural or local government agencies. These trained personnel in turn provided technical support to the municipalities during the construction of the water supply facilities. They also supported the development of master plans to apply for subsidies, facilities design and technical management. The water supply coverage to the rural areas increased thanks to government subsidies, technical support from trained personnel, politician pushing for these improvements and financing by local residents.

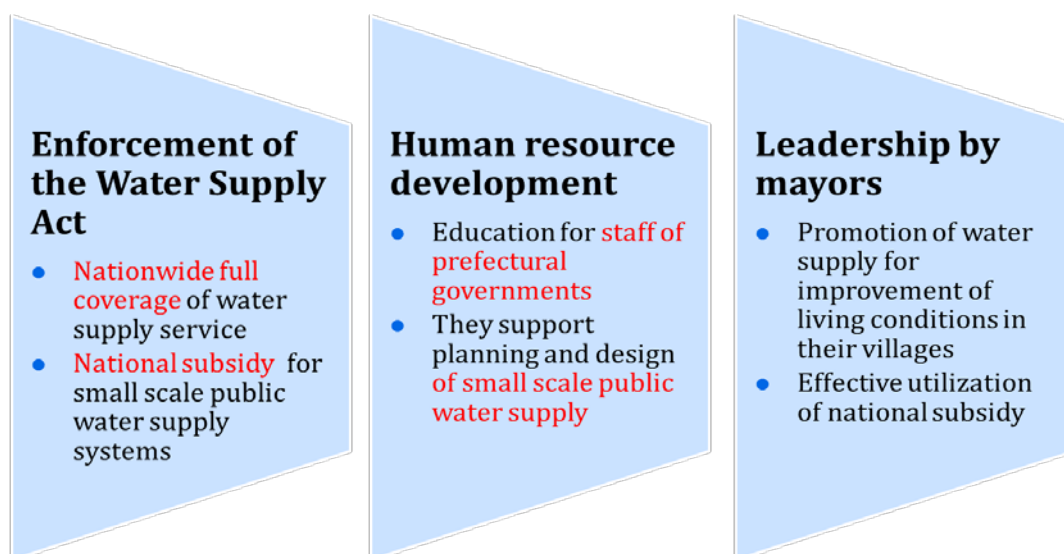


Figure 6. Development of the Small Scale Public Water Supply

The development of the Small Scale Public Water Supply is generally difficult in small municipalities, but Japan achieved this during the high economic growth period. This was because self-financing and reimbursement of bond issues were relatively easy for municipalities after deducting government subsidies for facility development.



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

Photo 2. Consultation with Engineers from the Prefectural Government and Health Center

4. Regulatory Framework and Administration

(1) Legal System

The Japanese legal system is based on the country's Constitution. Various laws, ministerial orders, and public notices made up the legal framework for water supply. Details are stipulated in the order for enforcement of law and ordinances.

The Japanese legal framework for water supply is shown in Figure 7

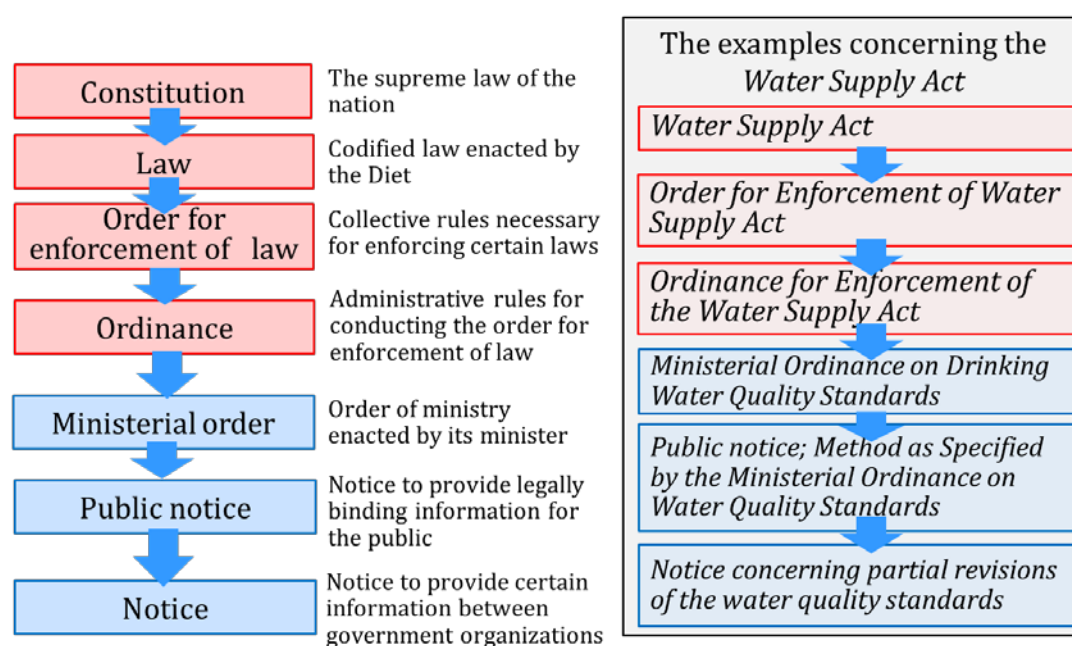


Figure 7. Legislative Framework for Water Supply in Japan

The details of the Water Supply Act are stipulated in the order for enforcement of the Act and ordinances. Ministerial orders and public notices and if necessary, guidance from MHLW can also be stipulated. In this way the Acts stipulate the principle concepts and related ordinance/notices define detailed operations. These all together support operation of legal system and make it possible to comply with laws.

(2) Approval (License) System of the Waterworks

According to the Water Supply Act, utilities must obtain government permission to operate water supply services. The Approval (License) process requires the development of a master plan and the criteria for approval are clearly defined. This ensures the quality of the water supply and the efficient operation of utilities.

The Waterworks Ordinance was established in 1890 when the construction of modern water supply facilities started and new technologies were sought. Some of the existing water supply facilities were privately owned and did not supply water of uniform quality. The Ordinance stipulated that facilities must supply water not harmful to health, be managed as public entities, be approved by the government, provide around the clock service and conduct water quality testing. In 1957, the Water Supply Act added other stipulations, including provisions for water quality and facility standards, and the management by qualified technical managers.

The requirement of Approval (License) in Article 6 is one of the important implications of the Act. A special license must be obtained from the Minister of Health, Labour and Welfare (or in some cases from the prefectural governor), according to the application procedures stipulated in Article 7. In the process, the government scrutinizes the master plan, construction design and determines if the proposed business would improve public health. Article 52 stipulates the penalties for those who manage waterworks without Approval (License).

The following list stipulates further points to be included in the master plan and design drawings.

Water Supply Act - Article 6. Project Approval (License) and Managing Agent; Article 7. Application for Approval (License)

2. The application for Approval (License) in Clause 1 must include the following information:

(1) Name and address of the applicant (details omitted)

(2) Address of the water utility office

3. (details omitted)

4. The master plan must include the following information:

(1) Water supply zone, population size for water supply and supply capacity

(2) Water supply facility summary

(3) Expected water supply start date

(4) Estimated total construction cost and expected sources of financing

(5) Basis for calculating water supply population size and capacity

(6) Current balance estimate

(7) Water supply conditions including water tariffs, shared responsibilities for water supply facility construction expenses

(8) Other matters determined by the ordinances of the Ministry of Health, Labour and Welfare

5. The design drawings in Clause 1 must include the following information:

(1) Daily maximum and daily average water supply capacity

(2) Type of water source and water intake location

(3) Estimated water source capacity and results of water quality testing

(4) Water supply facility location (including altitude and water level), size and structure

(5) Method of water purification

(6) Maximum hydrostatic pressure and minimum hydrodynamic pressure in distribution pipelines

(7) Expected construction start and completion dates

(8) Other matters determined by the ordinances of the Ministry of Health, Labour and Welfare.

Articles 1 and 2 of the Ordinance for Enforcement of the Water Supply Act stipulate that the following information (documents and drawings) are required by MHLW.

Ordinance for Enforcement of the Water Supply Act

Article 1-2. Documents to Be Attached to Applications for Approval (License)

- (1) For applicants other than local public agencies, provide a document stating reasons for managing waterworks.
- (2) For corporations or associations other than local public agencies, provide a document to certify the decision on managing waterworks.
- (3) For applicants other than municipalities, provide a document to certify the agreement obtained under Article 6-2 of the Act.
- (4) A document to state the conditions which ensure water intake.
- (5) For corporations or associations other than local public agencies, provide the articles of incorporation or agreement.
- (6) A document to certify that the water supply zone is not overlapping with other waterworks' water supply, a document to certify the existing waterworks in the water supply zone, and a map to clarify the above.
- (7) A map to clarify the location of the water supply facility.
- (8) A map to clarify the general situation around the water source.
- (9) Plans, elevations, sections and structural drawings to clarify the structure of the main water supply facilities (not including the following facilities).
- (10) Plans and longitudinal sections to clarify raw and treated water transmission and distribution pipelines.

The legal requirements serve to ascertain the following details:

- Water supply zone, population size for water supply and supply capacity
- Expected water supply start date
- Water source location, quality and quantity
- Sites/drawings of water intake, treatment plant and distribution reservoir
- Estimated construction cost and source of financing, construction period
- Water tariff and management plan

Applications for Approval (License) should contain the information on (1) water source capable of providing continuous supply, (2) facilities plan, (3) source of financing for construction, (3) construction schedule, (4) proof of cost recovery, and (5) management plan for sustainable water supply after commissioning.

Article 8 stipulates that Approval (License) should not be granted unless the applications are

deemed to meet all the conditions. The application is judged on the project's ability to meet public demand; effective and reasonable plans; and construction designs in compliance with facility standards.

Water Supply Act - Article 8. Approval (License) should not be granted unless the application meets the following conditions:

- (1) The utility is implemented to meet the public demand.
- (2) The waterworks plan is effective and reasonable.
- (3) The water supply facility construction designs are in compliance with the facility standards under the provision of Article 5.
- (4) The water supply zone is not overlapping with water supply zones of other waterworks.
- (5) The supply conditions meet all the requirements under Article 14-2.
- (6) Waterworks applicants other than local public agencies must have a sufficient business foundation for conducting the project.
- (7) Starting such waterworks will serve the public interest.

These strict procedures for Approval (License) emphasize the utilities' responsibility in protecting public health and to supplying clean, safe, reliable drinking water to the citizens. It clearly shows that the Water Supply Act is a legislation aiming to enhance public health in Japan.

Column: Waterworks Ordinance

As shown in Figure 1, waterborne diseases such as cholera were common in Japan until modern water supply systems were installed. At that time, residents obtained drinking water from wells, open channels, and street vendors who drew river water. These water sources were often contaminated.

The government issued drinking water warnings in 1878 and encouraged proper management of wells and wastewater storage. At the same time, there was a growing trend to use steel for distribution pipes. The Yokohama City water supply system was installed in 1887, followed by ones in Sasebo, Hakodate and other cities. Some were run privately, and fell short of meeting facility standards and lacked proper management.

Under these circumstances, there was a need to develop basic principles for operating waterworks, preparing development plans and supervising facilities construction and management of the system. The Waterworks Ordinance was proclaimed in 1890 after two years of negotiation between the Hygiene Bureau of the Ministry of Home Affairs and Legislation Bureau.

Although the Waterworks Ordinance is simple compared to the Water Supply Act, it advocates the basic principle of public management and government approval of utilities. It played an important role in the implementation of nationwide coverage of water supply systems targeted in the Water Supply Act.

Waterworks Ordinance

Article 2 Municipalities may not install a waterworks facility without public funds.

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

Articles 1 – 10 (encompass almost all of Article 7 “Application for Approval (License)” of the current Water Supply Act)

Article 10. Anyone who has access to water supply services may request testing of water quality and quantity at tap. (Adopted by Article 18 of the Water Supply Act).

(3) Other Relevant Laws

In addition to the Water Supply Act, there are other laws relevant to water intake, water resource development, collection of adequate water tariffs and business accounting based on the principle of cost recovery.

There are other laws that are relevant to the management and facility construction of utilities in Japan.

The Local Public Enterprise Act applies to utilities serving populations of 5,001 or more. This Act stipulates conditions for financial management, staffing requirements, basic corporate governance and other measures for corporate financial restructuring. It stipulates the duty of local public enterprises to provide separate accounting for each enterprise and the principle of cost recovery.

Cost recovery mandates incomes to be applied to the costs other than those paid within

general accounting and other special accounting of local public agencies. This is an absolute requirement for the continuous operation of the water supply business.

The Measurement Act stipulates measurement standards for ensuring proper execution of measurements, and key provisions for water meters, including definition of meters, accuracy requirements, types of meters and replacement period (every 8 years). The Act ensures accuracy of meters and appropriate billing.

The River Act stipulates that utilities must obtain a license for the use of water from a river from the River Administrator. It also stipulates the legislative requirements for building new intake facilities and dams, or removing old facilities in the river and surrounding area. It defines the coordination required of organizations having jurisdiction in the area.



Figure 8. Water Supply Act and Other Relevant Laws

(4) Administrative Framework

The Japanese central government directly supervises large utilities and oversees prefectural governments that supervise small utilities and requires them to report on the operation and facilities, and conduct on-site inspections. This ensures the compliance with the Water Supply Act and appropriate operation of the utilities.

The Water Supply Act falls under the jurisdiction of the Water Supply Division of MHLW, which approves utilities serving populations of more than 50,000. Prefectural authorities

approve those serving populations of not exceeding 50,000. In the prefectural water supply administration, the public health center plays many crucial roles.

The Water Supply Act stipulates that the agency which deals with Approval (License) may give instruction, oversee report submission and conduct on-site inspection of facilities to verify compliance with specifications and management standards. Waterworks approved by prefectural governments are of small to medium sizes. They tend to lack human and technical resources. Engineers from the Health Center in each area can make regular visits and give instruction and supervision to ensure compliance. They also explain the technical information in the notifications issued by MHLW.

Column: Ministry of Health, Labour and Welfare, Prefectural Governments and Health Centers

MHLW issues public notices to large utilities and prefectural governments or mayor of the municipality (city designated by ordinance or core city). Prefectural governments or mayor of the municipality delivers the notices to the prefectural Health Center, to be passed on to every Small Scale Public Water Supply.

Health Centers support local residents in their health and sanitation matters. They are established under the Community Health Act by the prefecture.

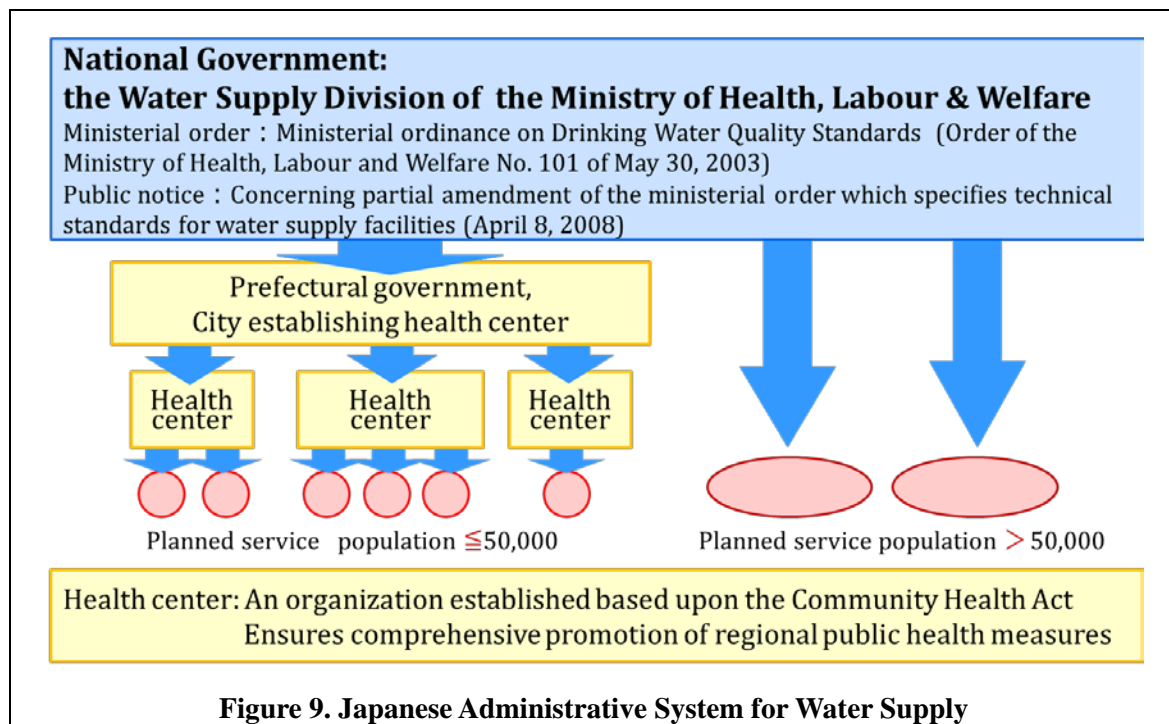
The Community Health Act stipulates the roles of a Health Center as follows:

Article 6. Health Centers shall plan, coordinate and instruct in the following matters as well as conduct related activities:

- (1) Matters concerning promotion of ideas on and improvement of community health;
- (2) Matters concerning demographic statistics and other community health statistics;
- (3) Matters concerning nutritional improvement and food hygiene;
- (4) Matters concerning home, water, sewer and waste disposal, cleanup, and other environmental sanitation;

Health Centers provide services on matters concerning environmental sanitation (Paragraph 4), including acceptance of applications for waterworks, onsite inspections and instruction. The participation of the Health Centers in instructing utilities reflects the alignment of community health with water supply, as intended by the legal system.

The following chart shows the administration system for water supply in Japan:



5. Challenges in Maintaining Universal Coverage

By actively promoting the water supply systems in rural areas, Japan achieved almost 100% coverage. However, small utilities have poor financial conditions and inadequate human resources and technical capabilities. For them to operate sustainably and replace aging facilities in the future, they must find ways to consolidate their operations.

During the high economic growth period, mayors of municipalities in rural areas promoted the development of the Small Scale Public Water Supply, as they were committed to water supply coverage as a priority and believed that it would be a great benefit to the residents. Establishing Small Scale Public Water Supply in rural areas was very effective in expanding the nationwide water supply coverage. However, this resulted in many small utilities scattered in remote mountainous areas. As shown in Figure 10, there were 8,667 utilities each serving populations of 500 or less in 2002.

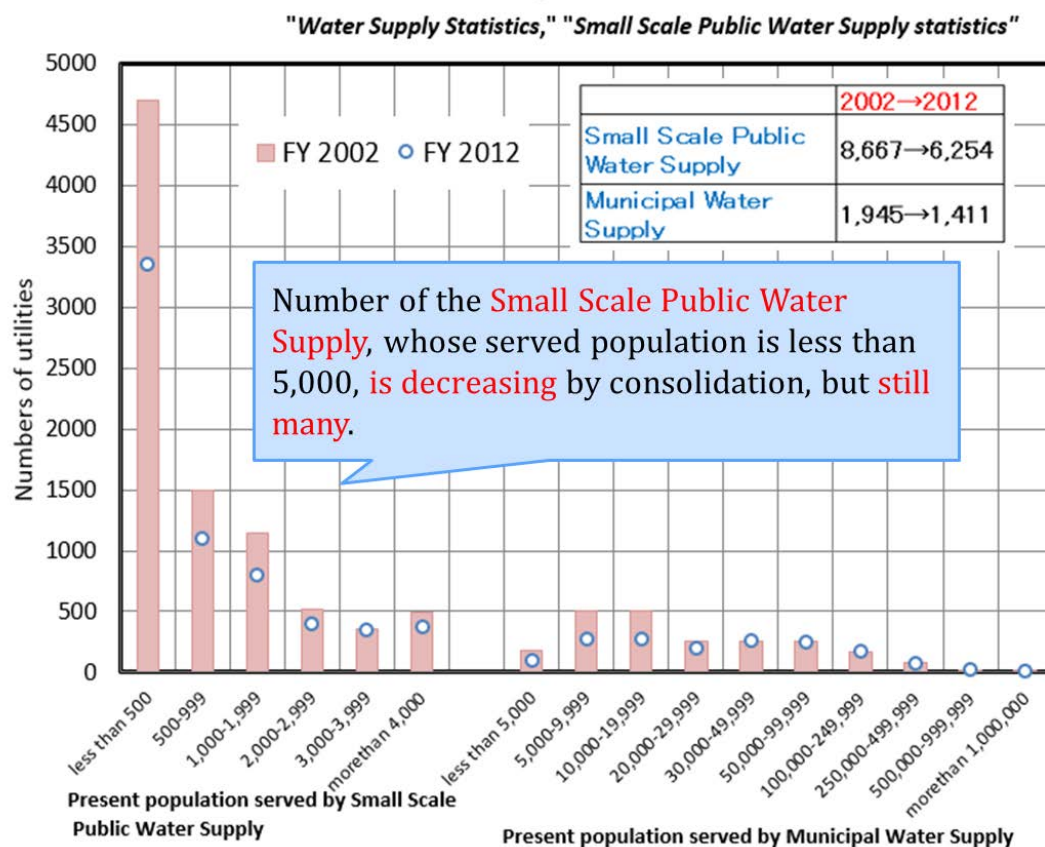
It is very difficult for small utilities to maintain or renew aged facilities. Unlike urban utilities, their accounting system does not include depreciation costs and water tariff is not enough to pay depreciation costs. Their facilities age more rapidly due to the use of low-cost materials such as asbestos cement pipes. They also have difficulty raising funds. They face enormous challenges.

Small utilities have many weaknesses. Without adequate human resources, they depend on the *Water Supply Facilities Maintenance Manual* issued by Japan Water Works Association and training programs provided by local governments (e.g. public health centers). The situation could become worse with the shrinking work force.

It was necessary to strengthen the financial base and the human resources and expand the scale of operation. Ministry of Health, Labour and Welfare revised the Water Supply Act in 2001 to promote the merging of facilities. However, the progress of this initiative was very slow because it encountered a lot of difficulties. Quite a number of consolidations (utilities serving population less than 500) took place in 2005 (big merger of Heisei). Even so, there were still 6,254 of Small Scale Public Water Supply operating in 2012. Although the number of small utilities serving less than 500 customers declined drastically, there are still numerous compared to large utilities serving more than 5,001 customers.

As of 2015, there are 1,388 large to medium size facilities, supplying water to 119,670,000 people, and 5,890 small facilities, supplying water to 4,200,000 people. 96.6% of the population receives piped water from public utilities and 3.4% from their own wells or unregulated small systems, mainly in rural areas. In spite of the success in achieving universal access to water

supply, serious challenges still remain.




Small utilities are considering various measures including outsourcing, seeking help from larger utilities and obtaining subsidies for facility renewal.

MHLW is promoting the following measures for all utilities:

- consolidate facilities in adjacent areas
- develop Water Supply Vision and master plan
- develop water safety plan for reliable and sustainable water supply
- manage assets to properly finance the timely replacement and maintenance of existing equipment and facilities

Table 3. Japanese Social Situations, Legal System and Waterworks Promotion

Year	Japanese social situations	Trends in laws and systems	Trends of water utility industry	Water Supply Coverage
1859	Yokohama Port opened			
1868	Meiji Government established			
1877	Cholera outbreaks in Yokohama/Nagasaki, spreading nationwide			
1879		Drinking Water Warning Act (Notification)		
1886				
1887	↓		Yokohama City waterworks introduced	0~1%
1889		City systems/municipal systems put into effect		0~1%
1890		The Waterworks Ordinance proclaimed		0~1%
1894	Sino-Japanese War			0~1%
1895	↓			1~2%
1896		Former River Act established		2~3%
1899			Tokyo City waterworks completed (Waterworks to spread nationwide thereafter)	2~3%
1904	Russo-Japanese War			
1905	↓		Federation of Water Authorities (later version of Japan Water Works Association) established	2~3%
1914	World War I		Water quality testing methods/management/operation studied	4~5%
1918				12%
1923	Great Kanto Earthquake			18%
1934			Water Supply Equipment inspection system started (Japan Water Works Association)	19%
1937	Sino-Japanese War	Health Center Law (later version of Community Health Act)		28%
1941	World War II			30%
1945	End of war, GHQ occupation		Chlorination ensured	30%
1947	Constitution of Japan proclaimed	Constitution of Japan proclaimed	"Universal Water Supply Policy" targeted	28%
1950	Korean War broke out			26%

Year	Japanese social situations	Trends in laws and systems	Trends of water utility industry	Water Supply Coverage	
1951		Measurement Act established	Water meter accuracy secured	27%	
1952		Local Public Enterprise Act established	Small Scale Public Water Supply subsidy plan started	29%	
1953				31%	
1954				33%	
1957		Water Supply Act established	The water supply is subject to the local municipal enterprise law Development of prefectural human resources/promotion of Small Scale Public Water Supply systems accelerated	36%	
1964		River Act established		69%	
1967			Waterworks water supply source development and facility improvement subsidies started	72%	
1970		Pollution problems became visible	Water Pollution Control Act established	Trihalomethane problems became visible	81%
1973		Oil shock			84%
1979		Second oil shock			91%
1994		Act on Advancement of Raw Water Quality Management Projects established	Response to disinfection byproducts became necessary	95%	
1995	Great Hanshin Earthquake				
2011	Great East Japan Earthquake			97%	
2014		Water Cycle Act established		98%	

* Water supply coverage rates up to 1955 estimated, the rest based on the water statistics

* The red character is a text entry

6. Lessons Learned

The following Japanese experience could be useful for other countries.

- **(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.
- **(Water Supply Act)** Japanese government established the Waterworks Ordinance in 1890, and the Water Supply Act in 1957 (full revision of Waterworks Ordinance) 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 instructs municipalities to construct water supply systems using public financing and requires waterworks to be approved by the national government (some by prefectural governor). The Approval (License) process ensures that all utilities have a certain level of technical competence, that facilities are designed with safety in mind and that the financial plans are sound. The master plan is required in the process of Approval (License).
- **(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. Local residents worked on facilities construction, sometimes on a voluntary basis. All these contributed to achieve universal coverage of water supply including in rural areas.

- **(Enforcement of the Act)** The Japanese legal system has many detailed stipulations clearly spelled out in government ordinances, notices, and procedures, to show the water supply business how to abide by the relevant Acts including the Water Supply Act. The Act defines the administrative process for the development of water supply across the country, with different levels of government working together. Depending on the size of the utility, the national or the prefectural government instructs the utilities on compliance and carry out the required monitoring.
- **(Acts Relevant to the Water Supply Act)** The Measurement Act, which stipulates requirements to ensure the accuracy of water meters, thereby contributes to accurate billing. The Local Public Enterprise Act, which requires utilities 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. Their operational and financial situations tend to be weak. They maintain their technical capabilities with the help of the guidelines such as *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.

