I·SEOUL·U
너와 나의 서울

SEOUL METROPOLITAN GOVERNMENT

SEOUL TAP WATER

Arisu

MADE BY SEOUL, RECOGNIZED BY THE WORLD.

What is Arisu?

Arisu is the name of Seoul's tap water, which is a compound word of the Korean word 'Ari' meaning big, which was also the old name of the Hangang River, and the Chinese character 'Su (水)' meaning water.

Contents

Arisu!

The world's safest and tastiest water consumed by 10 million Seoul citizens.

01.
General Status of Arisu

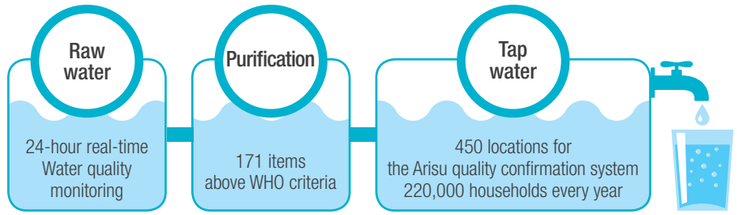
Production and Supply

3.2 million㎥ in average daily production, and 4.8㎥ in production facility capacity! Seoul Arisu takes responsibility for 10 million people in Seoul and the Seoul metropolitan area. Furthermore, with facility maintenance, anti-leakage, and scientific supply management, it maintains the world's highest revenue water ratio (95.1%).

Water Quality

Seoul Arisu pursues the world's safest water. We strictly manage the water quality from raw water to the water tap and disclose water quality information through the Seoul Water-Now System in real time. In addition, with advanced water purification, we are producing healthy and tasty tap water.

Strict water quality management



Arisu is moving beyond safe water to seek tasty water. Arisu selects guidelines for safe and tasty water and strictly reviews and manages nine items.

Guidelines for safe and tasty water

Category	Item	Unit	Drinking water quality standard	Guideline	Background
Health items	Minerals (Ca, Mg, Na, K)	mg/L	-	20~100	Essential for the human body
	Total organic carbon	mg/L	5.0 (monitoring item)	1.0 or less	Good for health by removing disinfection byproducts
	Turbidity	NTU	0.5	0.3 or less	Good for health by removing microorganisms (protozoa, virus, etc.)
Taste items	Residual chlorine	mg/L	4.0	0.1~0.3	Causing disinfection odor
	2-MIB	ng/L	20 (monitoring item)	8.0 or less	Causing moldy odor
	Geosmin	ng/L	20 (monitoring item)	8.0 or less	Causing soil-like odor
	Copper	mg/L	1.0	0.05 or less	Causing green water
	Iron	mg/L	0.3	0.05 or less	Causing red water and metallic odor
	Temperature	°C	-	4~15	Appropriate to drink with fresh taste

It is not that people in Seoul drank this tasty and safe water from the beginning.

Just 50 years ago, waterworks were not properly distributed, which made it difficult to access safe drinking water.

“In the past, there used to be people who fetched water from faraway places and sold it. In Seoul, they were called “Bukcheong water sellers.” Tap water in Seoul was not very clean up until the 1950s when there were still such water sellers.”

Arisu Yesterday and Today

Rapid urbanization and growing population!

The first thing necessary to make Seoul a sustainable city was to provide clean and safe water in a stable manner.

1900

Introduced waterworks technology and overcame difficulties

1908
Provided Seoul's waterworks for the first time

1941
Constructed the Guui Water Purification Plant

1948
Established the Bureau of Waterworks in Seoul

1960

Expanded waterworks facilities

1961
Created 5 offices

1962~ 67
Expanded and increased the Ttukdo, Noryangjin, and Guui Water Purification Plants, and constructed the Bogwang Water Purification Plant

1971
Constructed the Yeongdeungpo Water Purification Plant

1972
Created civil service centers in waterworks offices

1978 ~79
Constructed the Seonyu, Paldang, and Sinwol Water Purification Plants

1980

Stabilized the tap water supply

1981
Launched the Bureau of Waterworks and Sewage

1981~ 89
Expanded the Paldang, Guui, Yeongdeungpo, Amsa, and Ttukdo Water Purification Plants

1986
Constructed the Amsa Water Purification Plant

1989

Launched Seoul Waterworks Authority

1991
Reached 100% in the water penetration rate

1996
Conducted Phase 1 research on advanced water purification

1998
Completed the Gangbuk Water Purification Plant, and conducted water quality control assessment on each water purification plant

1999
Conducted Phase 2 research on advanced water purification

2000

Made tap water high quality

2001
Produced Arisu water bottles

2004
Registered the Arisu trademark

2006
Provided tap water one-stop civil services

2007
Implemented the Arisu quality confirmation system

2008
Automatically measured water quality for 24 hours a day
Disclose in real time on the Internet
Opened the Waterworks Museum

2009
Received UN Public Service Award

2010

Strengthened international competitiveness

2010
Constructed the Yeongdeungpo Advanced Water Purification Center
Received Project Innovation Award from the International Water Association (IWA)

2012
Acquired National Science Foundation (NSF) Quality Assurance as bottled tap water for the first time in the world
Won a consulting project to establish infrastructure in Pulau Muara Besar (PMB), Brunei

2016
Ensured ISO 22000 (food safety management) production and supply
Effectively managed hazards across the process

1990s

Clean water 水

· Established the water supply system that has no outage
· Expanded quantitative supply across the city

2000s

Safe water 水

· Tested water quality in real time by supply stage
· Introduced 60 water quality items + 111 internal monitoring items (171 water quality test items)

2010s

Tasty water 水

· Introduced advanced water purification facilities 100%
· Removed substances creating unpleasant taste and odor

Continued expansion of water purification plants, an expanding waterworks network, systematic revenue water ratio management, and strict water quality management! As a result, Seoul has become a city where its citizens drink the world's best water.

Clean, safe,
and tasty water

Arisu!

What has made it possible?

Know-How 1

Strict Raw Water Management and Cutting-Edge Water Purification Technology

Applicable Acts for the protection of water sources

- Article 38 of the Framework Act on Environmental Policy
  (Paldang Lake designated as a special measure area)
- Article 8 of the Water Supply and Waterworks Installation Act
  (Paldang managed as a water-source protection area)
- Article 4 of the Act on the Improvement of Water Quality and Support for Residents of the Han River Basin (designating and operating riparian zones)
- Article 13 of the Act on the Improvement of Water Quality and Support for Residents of the Han River Basin (projects for improvement of water quality)

01.

Raw Water Management

To get clean, safe, and tasty tap water, it is crucial to manage raw water from the beginning. In particular, Seoul with four distinctive seasons has large variability in the quality of raw water due to different levels of precipitation according to the season, and the river closest to the large city of Seoul has many potential pollution sources. In this regard, by scientifically managing and measuring the water quality, we manage raw water strictly from the beginning.

Pursue projects to protect Hangang River water sources and improve the water quality

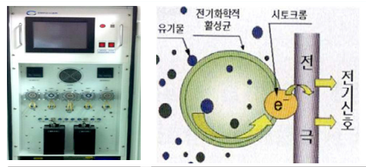
- Operate the Hangang River Environment Monitoring Group to manage water sources
- Limit pollutant littering and development projects by law
- Fund projects to improve the water quality in water sources

Operate the scientific raw water condition measurement system

- Operate the biological early warning system that uses microorganisms and closteriaceae (algae) in water intake plants
- Install oil barriers around water intake plants
- Reinforce the response system for the deterioration of raw water including odorous substances
  - Operate the 'algae warning system' to prevent harm from green algae
  - Use Seoul's internal 'taste and odor substance management standards' due to limitations in managing odorous substances

Management level	Attention		Alert	
	2-MIB	Geosmin	2-MIB	Geosmin
Odorous substance (ng/L)	20	100	100	300

Operate biological early warning systems in water intake plants
- Number of biological early warning systems: 4

Gangbuk, Jayang, and Pungnap Water Intake Stations (closteriaceae)	Amsa Water Intake Station (electrochemically active microorganism)
	
Heavy metals, pesticides, etc.	Household wastewater, etc.

※Gwangam Water Purification Plant: Use monitoring data (water flea, closteriaceae) from K-water at Paldang Dam

Continuously check the water quality and install automatic water quality meters

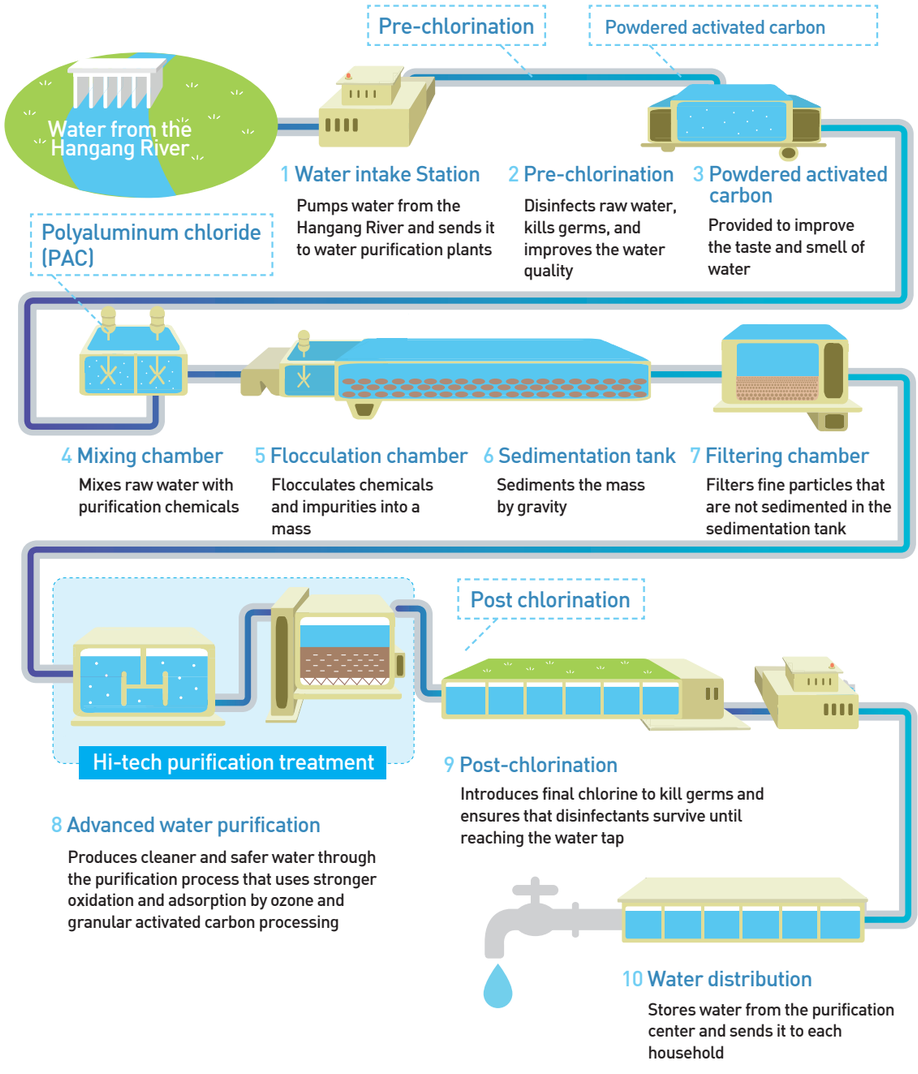
- Regularly conduct water quality tests on 29 items at 32 water sources and 158 items at five water intake locations
- Install automatic water quality meters that can monitor eight items including algae (Chlorophyll a) and phenol at water sources 24 hours a day

Strengthen water purification in response to raw water changes by season

- Reinforce water purification in each process when there are multiple algae and odorous substances in the dry season
- Obtain water purification chemicals in preparation for high turbidity in the monsoon season and inspect chemical injectors

02.
Purification Technology

Arisu does not have any odor.
There is no chemical odor, which usually comes from tap water, no soil-like taste, and no environmental hormones such as antibiotics. Arisu's own advanced water purification system, re-chlorination injection system, and membrane filtration system remove odor and hormones and produce the word's tastiest water.



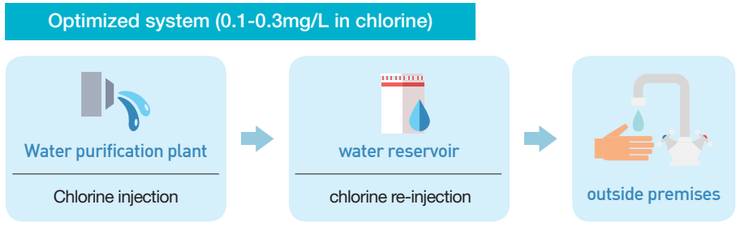
Advanced Water Purification System

- Advanced water purification is a technology that removes unpleasant taste and odor, existing tap water's biggest drawbacks, and gets rid of environmental pollutants.
- This system adds ozone and granular activated carbon processing to the existing standard water purification, completely removes 2-MIB and geosmin, and gets rid of environmental pollutants like antibiotics.
- This system is recognized as one of the world's best systems as it does not greatly increase the cost by the introduction of ozone processing and can quickly respond to a sudden quality change in raw water by simply controlling the ozone concentration.

Dispersed chlorine injection system

- This system is designed to reduce chlorine odor, which has been pointed out as the biggest barrier to drinking tap water.
- It conducts chlorination, which is performed traditionally only once, at the minimum amount in the water purification plant for the 1st time and disperses and injects chlorine for the 2nd time in the water reservoir or pressure chamber at the minimum amount, which dramatically reduces odor.

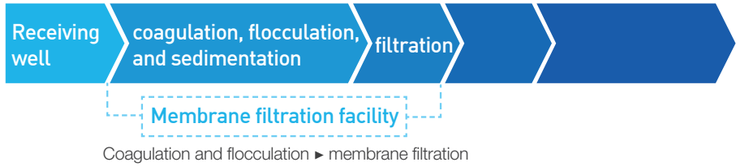
Ensure residual chlorine uniformity in tap water across Seoul



Membrane filtration facilities

- Membrane filtration is a method that purifies water more precisely than existing sand filtration by using the membrane as a filter and separating and removing impurities in raw water through the filter.
- Its biggest advantage is that it can reduce the use of chemicals such as polyaluminum chloride by more than 50%, simplify maintenance, and greatly reduce the required budget.
- Seoul is recognized to have world-class water purification technology as the city has commercialized membrane filtration and acquired five patents for this technology and three patents as novel environmental technology.

Membrane filtration process



Coagulation and flocculation ▸ membrane filtration

Arisu,

Which can be always enjoyed by 10 million citizens!
What has made it possible?

Know-How 2

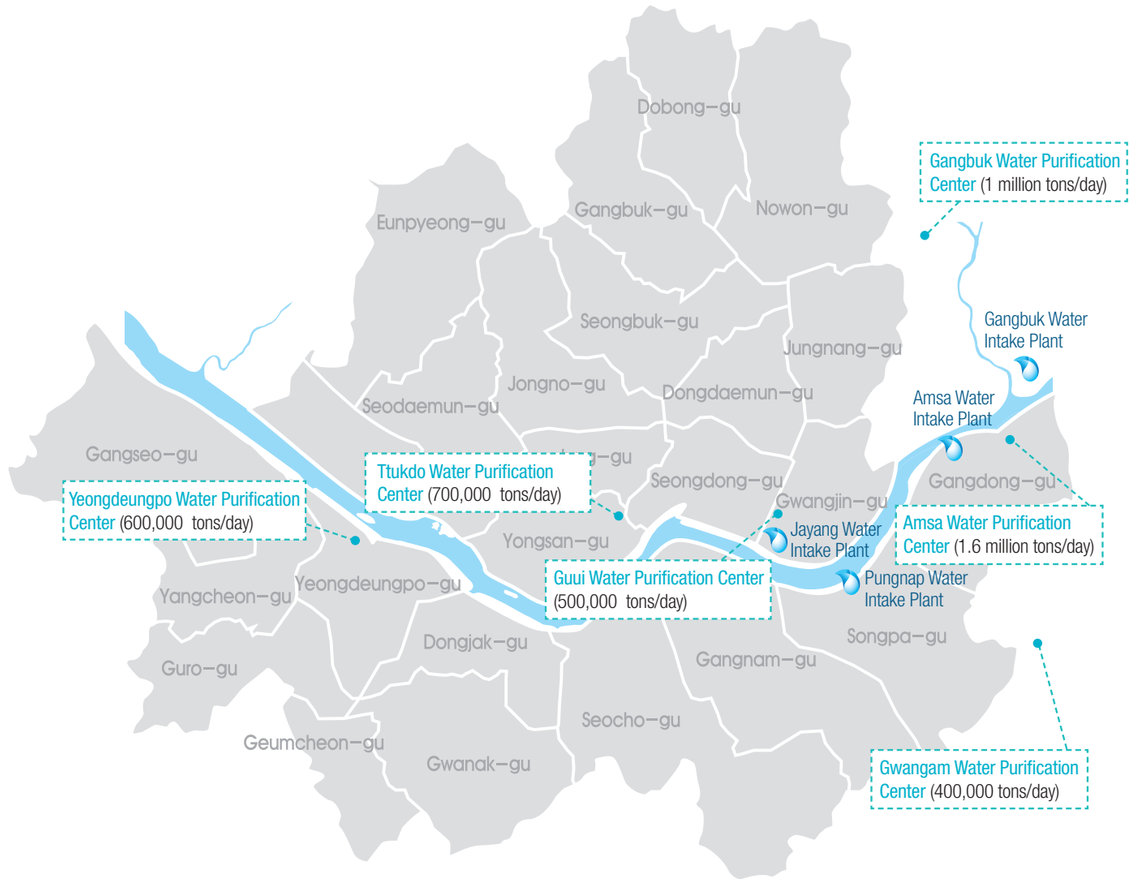
Stable Water Supply by Optimized Waterworks Network

01.

Establishment and Operation of Water Purification Plants

Seoul Metropolitan Government is building an expansive metropolitan rail network that offers easy access to public transportation for citizens throughout the entire city. By 2020, Seoul plans to build 10 light rail transit (LRT) lines and extend existing lines in order to create a broad transportation network covering the Seoul metropolitan area.

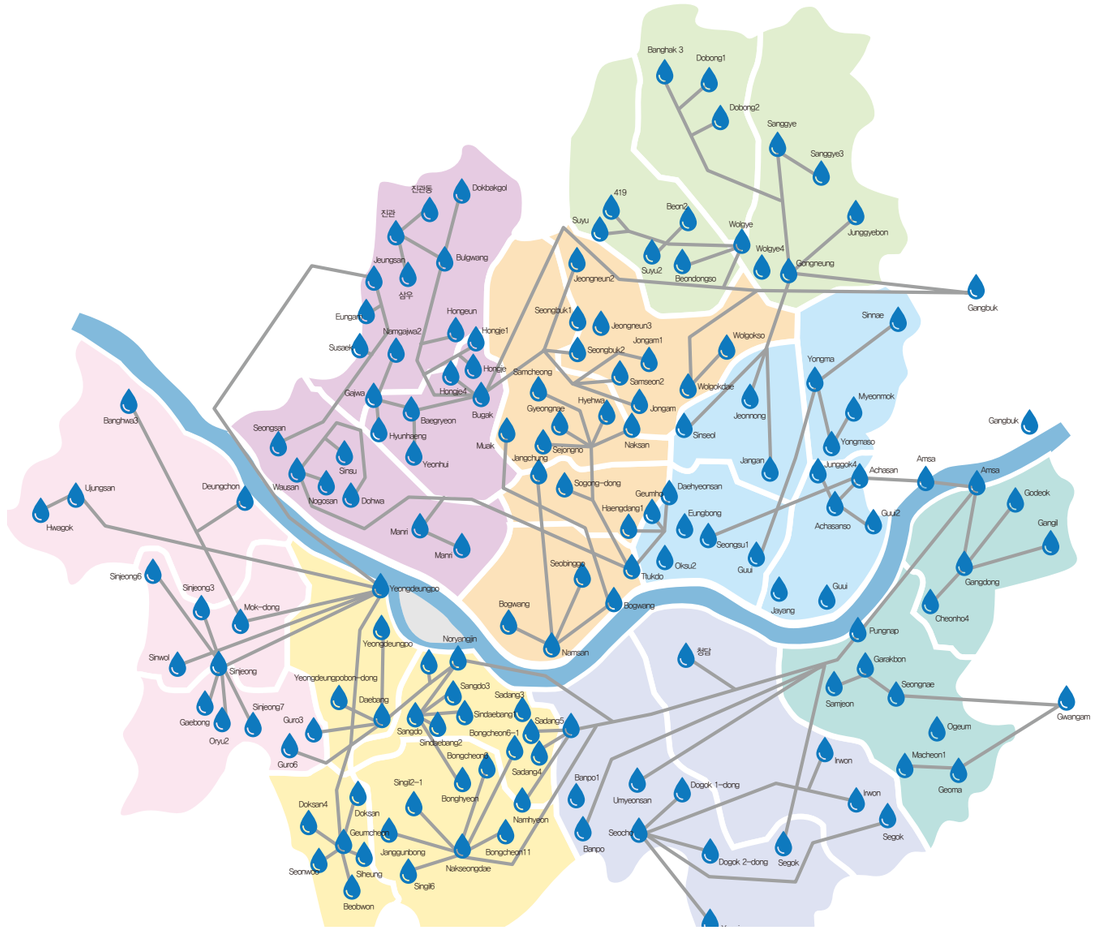
Purification Center	Guui Water Purification Center	Ttukdo Water Purification Center	Yeongdeungpo Water Purification Center	Amsa Water Purification Center	Gangbuk Water Purification Center
400,000 tons/day	500,000 tons/day	700,000 tons/day	600,000 tons/day	1.6 million tons/day	1 million tons/day



02.

Expansion of the Network of Water Pipes and Taps

What matters is to supply water. Arisu has provided 13,571 km of water pipes and 2 million water taps, reached the water supply penetration rate of 100%, and ensured people can use safe and tasty water (3A: anytime, anywhere, and anyone).



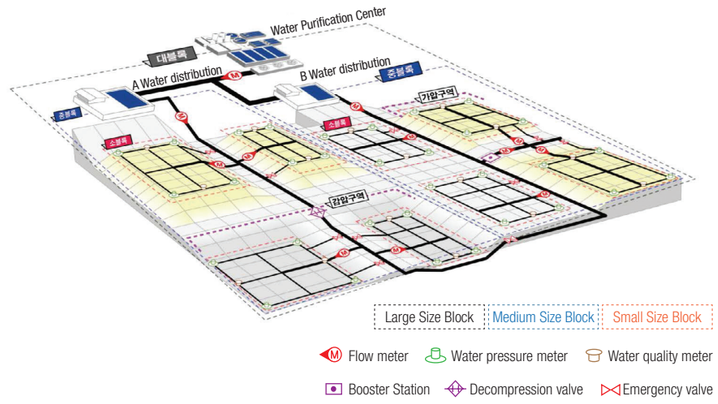
03.

Strict Water Revenue Ratio Management

What is as important as producing and supplying water is to ensure that water is delivered to citizens by preventing water leaks. Managing the water revenue ratio is crucial in Seoul, which is quite mountainous and has huge temperature variations across four seasons. Arisu is systematically managing the water revenue ratio by continuously repairing water pipes, conducting waterworks network block projects, and introducing the indirect water supply system.

Waterworks network block project

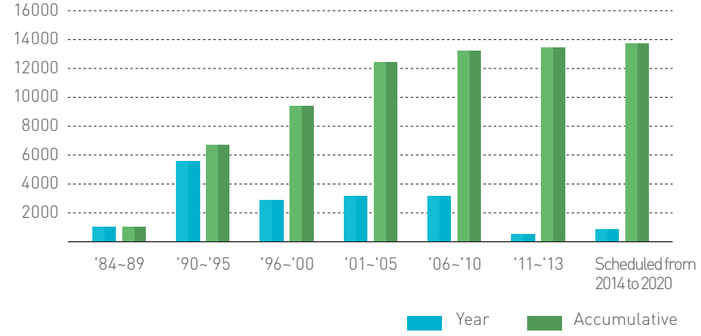
- Divide the waterworks network into 100 large, medium, and small blocks to make it easier to detect leaks and analyze water consumption



Water pipe repair project

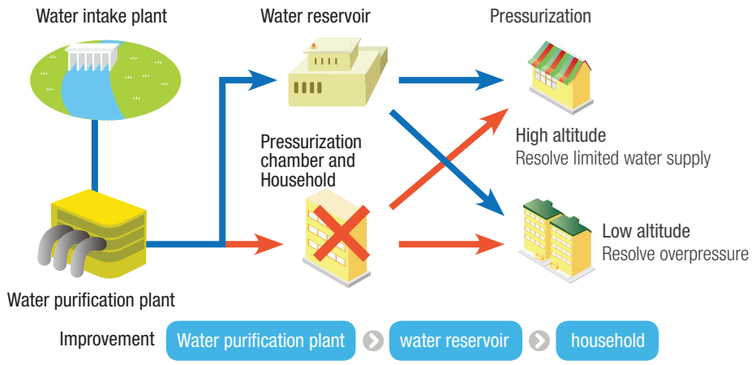
- Replace galvanized, steel, and PVD pipes, which are old and often cause leaks, with stainless and ductile iron pipes, which have strong endurance and rust resistance

Repair of old water pipes



Indirect water supply system based on water reservoirs

- In the past, pressurization was often used to provide tap water to areas in high altitudes or ground, but it burst pipes frequently.
- The city has transitioned into an indirect water supply system based on water reservoirs and prevented water pipe bursts.
- As a result, the water revenue ratio has improved 72% (2000) ▶ 95.1% (2018).



Scientific supply management

- Install meters (460 locations including water collection and transmission, zones, and medium blocks) to accurately manage inbound and outgoing water supply
- Established a flow rate monitoring system (2005) to monitor and analyze the flow rate, pressure, and speed in real time

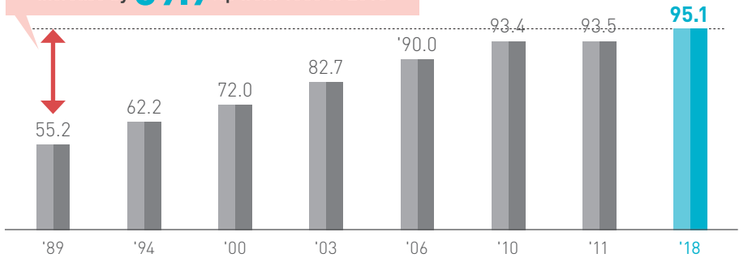
Economic effects of managing the water revenue ratio

Since the opening of Seoul Waterworks Authority (1989), Arisu has continued to manage the water revenue ratio, which has increased the ratio by 39.9% and reduced KRW 6.5 trillion in costs.
Furthermore, we have reduced the number of water purification plants from 10 (7.3 million tons/day) in 1999 to 6 in 2018 (4.8 million tons/day).

Changing trends of the water revenue ratio

Reducing the total water production of **11.5** billion tons

Increase by **39.9**%p from 1989 to 2018



04.

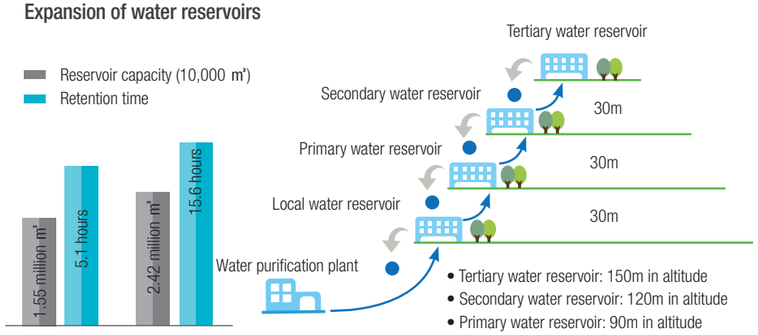
24-hour Stable Water Supply with No Outage

Arisu is operating a cutting-edge no-outage system by expanding water reservoirs and replacing pipes without outage and excavation to make sure that citizens can use water 24/7.

No-outage system by expanding water reservoirs

- Preparation of 100 water reservoirs that can retain 2.42 million tons of water in total
- Provision of stable water supply up to 16 hours even if a water purification plant cannot be operated due to power outage or other accident

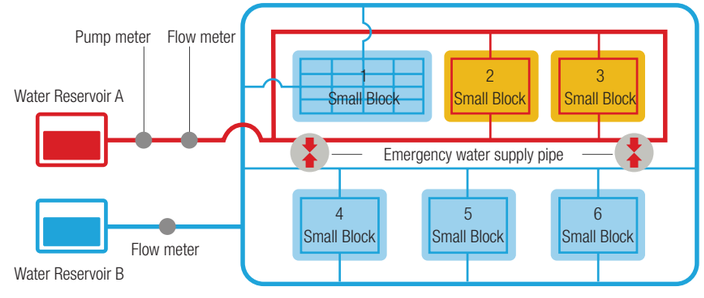
Expansion of water reservoirs



No outage system with redundancy pipes

- Redundancy pipes are placed, connecting water purification plants.
- When one water purification plant cannot function due to power outage or other accident, this system allows for another water purification plant to provide water immediately.
- This system makes it possible to provide a stable water supply throughout the year despite any accident.

Establish emergency pipes between blocks



What has made it possible to manage pipes as well as a large amount of water consumed by more than 10 million citizens?

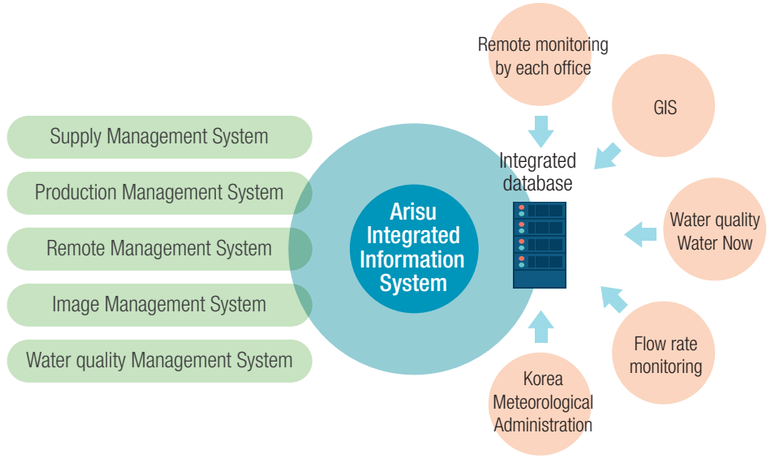
Know-How 3

IT-Based Scientific and Systematic Waterworks Operation

01.

Operating System

The Arisu Integrated Information System is a ‘real-time response and management system’ that monitors major waterworks facilities through CCTVs and allows different offices to discuss a course of action through video conferencing in case of a problem. With the Integrated Information System, we have been able to consolidate operation systems separated across different offices and greatly reduce water production costs.



Integrated Management of Arisu Information

Integrate and manage a database such as monitoring, operational information, and system data, which was previously managed separately by different offices

Production Management System

Scientific demand prediction modeling by using real-time weather and day to day information and past demand and supply patterns

Supply Management System

Improve risk management capabilities in case of a water leak, outage, or water quality accident by monitoring the water amount, quality, and pressure in distribution and supply networks

Remote Management System

- Collect and analyze operational information from facilities in Waterworks Offices (8) and Water Purification Centers (6)
- Provide integrated CCTV monitoring and video conferencing system

Seoul Water-Now System

By testing and managing the water quality in real time across the entire process from raw water to water taps, the system sends a text message to the public servant in charge if there is any problem with the water quality and allows them to take immediate action. This system has greatly improved Arisu's reliability.

Establish emergency pipes between blocks

Stage		Installed meter locations (241)	Amsa Water Intake Station (electrochemically active microorganism)	
			Integrated water quality management	Online disclosure for citizensOnline disclosure for citizens
Water purification process	Raw water (5)	Water intake plant (5)	Turbidity, water temperature, pH, phenol, cyanide, NH_3-N, TOC, algae, biological monitoring (9)	Turbidity, pH (2)
	Process	Receiving well	Turbidity, alkalinity, pH, residual chlorine, water temperature, electrical conductivity (6)	Not disclosed
		Sedimentation tank	Turbidity, alkalinity, pH, residual chlorine (4)	
		Water transmission (6)	Turbidity (1)	
	Water purification (6)	Water transmission (6)	Turbidity, pH, residual chlorine, electrical conductivity, water temperature (5)	Turbidity, pH, residual chlorine (3)
Supply process (197)		Water reservoir (101)		
		Water tap (102)		

Seoul Water-Now System website

Waterworks Geographic Information System database

Waterworks Geographic Information System database

The Waterworks Geographic Information System predicts water demand and prevents any accidents by accurately collecting and analyzing locations and information for waterworks facilities.

The following describes how the Waterworks Geographic Information System works:

- Data collection scope: Water intake plants, water purification plants, environmental infrastructure, and water source protection areas
- Major functions: Setting the water collection area at the water source, setting the protection area at the water source and managing the water quality, predicting water shortage areas and providing information, planning anti-leakage projects, and predicting water demand

Measuring reference points → Investigating/exploring/measuring → establishing facility database → conducting data check-in → inspecting the database

Mobile Arisu

By providing waterworks information on outages and freezing and receiving civil petitions in real time through mobile devices, we have reinforced communication with citizens and greatly improved Arisu's image.

1. **Arisu (waterworks) information and public relations**
   Post public relations materials including Arisu videos and campaigns
2. **Instructions and application for waterworks civil services**
   Provide water bill checks, water bill calculation for house moving, self-check entries and instructions, instructions for name change, free-of-charge tests, and domestic water supply consultation
3. **Tour guide services for Waterworks Museum and Water Purification Centers**
   Install beacons in visiting locations and provide mobile guide services
4. **Push service (alert services)**
   Provide alerts on water bill, water outage, and freeze prevention

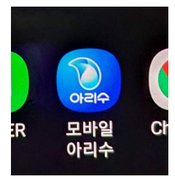
Arisu mobile website (m.arisu.seoul.go.kr)

Consists of major information and popular items from the Arisu website (6 in total)

- Civil services such as water bill checks and water bill calculation for house moving
- Bulletin board for citizens
- Introduction of Arisu and Seoul Waterworks Authority
- Location-based services (water quality information and Arisu Fountain)

Arisu mobile app (App)

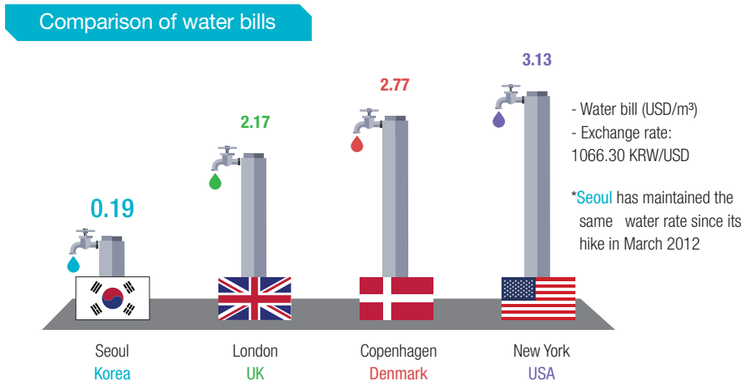
- Go to the mobile website
- Push services
  - Water bill alerts
  - Water outage and freeze prevention alerts



02.
Affordable Water Bill

To minimize the water bill burden of citizens, we have continued to rationalize management by using private contractors, consolidating various organizations under our umbrella, managing the water revenue ratio, reducing production costs, and turning various administrative processes into electronic information, which has resulted in a water bill more affordable than major cities in other countries.

Comparison of water bills (USD/m³)



The water bill in New York and Copenhagen is **6.4** and **5.7** times more expensive than that in Seoul (as of Jan. 2018)

Seoul's water bill

Water bill		
Category / Use category	Use volume (M³)	Cost per M³ (KRW)
Household	0 to 30 or less	360
	More than 30 to 50 or less	550
	More than 50	790
Bath	0 to 500 or less	360
	More than 500 to 2,000 or less	420
	More than 2,000	560
Public	0 to 50 or less	570
	More than 50 to 300 or less	730
	More than 300	830
General	0 to 50 or less	800
	More than 50 to 300 or less	950
	More than 300	1,260

03.
Operator

Seoul Waterworks Authority, the center of waterworks management

Seoul Waterworks Authority has a history of 110 years ever since water was first supplied from the Ttukdo Water Purification Plant in 1908. Seoul Waterworks Authority is Korea's largest waterworks institution, which accounts for 20% of the country's waterworks market. Since its launch in 1989, Seoul Waterworks Authority has streamlined its organization through more efficient business management and system, and now consists of 1,800 employees.

| Organization | 1 Head Office (5 departments), 1 Research Institute, 8 Offices, and 7 Centers (6 for water purification; 1 for materials)

| No. of employees | 2,060 (244 in Head Office, 102 in Research Institute, 1,198 in Offices, 472 in Water Purification Centers, and 44 in Material Management Center

Waterworks Research Institute, a think tank for waterworks management

Waterworks Research Institute, established in 1989 to ensure Arisu's quality control and technology development, has acquired 17 patents in Korea and abroad including membrane filtration technology, eco-friendly ozone processing, and anti-rust pipes and two program copyrights. It is a leading research institute which has been recognized by not just Seoul's raw water and purification tests but also the Korea Laboratory Accreditation Scheme (KOLAS).

Arisu,
recognized by the world!

Arisu,
advancing towards the world!

With continued capital expenditure and technological development, Arisu has been recognized for its excellence by international water quality standards and patents.

Awards in Korea and abroad

2009. 6

UN Public Service Award

Received UN Winner and recognized for transparency and reliability in water quality control with real-time water quality information disclosure and free water quality tests for all households

2010. 5

Korea Service Quality (SQ) Certification (Public Service)

Certified by the Minister of Knowledge Economy for providing quality public services as the government's only official certification in service quality

2010. 9

2010 Global Project Innovation Award

Received UN Winner and recognized for transparency and reliability in water quality control with real-time water quality information disclosure and free water quality tests for all households

2010. 9

2010 International Business Awards

Evaluated for knowledge efficiency by creative and knowledge management and named Product Development Department of the Year from the Stevie Awards

2012. 8

Quality Assurance by National Sanitation Foundation (NSF) International

Accepted for US drinking water quality standards and proven as internationally outstanding water as a result of a water quality test on 167 items by National Sanitation Foundation (NSF) International, an international analytical institute in the US

2012. 9

Received the Global Honor Award for the research outcome of technology development on an integrated remote inspection system based on the power lines used as a communications line

01.
Patents

Production

1. Device that selects the operational mode by using the water quality grade code in a membrane separation plant, and its operational method
2. Flocculation pre-treatment control device by continuous monitoring on the membrane contamination index by the advanced water purification system, and its method
3. Selective pre-treatment membrane filtration device based on automatic control, and its method
   Selectively apply direct membrane filtration or membrane filtration after flocculation and sedimentation
4. Filtration by the advanced water purification system using the 2-stage submerged membrane filtration tank
   Use the advanced water purification system based on a submerged membrane that repeats air cleaning and backwashing and emits water
5. Device that removes residual ozone by attaching the upstream anthracite facility to the back of the existing upstream ozone contact tank (patented in China)
6. Testing on membrane integrity by reducing surface tension
   Reduce surface tension to increase test detection to better detect membrane damage in the membrane filtration module in a water purification plant
7. Selection of the pre-treatment process by encoding inflow water quality, and membrane separation advanced water purification through automatic polyaluminum chloride control
   Automatically control the amount of polyaluminum chloride to be injected to minimize membrane contamination and effectively remove dissolved organic matter, pathogenic microorganisms, and substances causing unpleasant taste and odor
8. Pressure-driven membrane filtration, which automatically controls pre-treatment, and submerged membrane filtration, which recovers released water
   Use advanced water purification based on pre-treatment, which can automatically operate or stop depending on the quality of the raw water, and hollow fiber membrane filtration
9. Water purification technology by using submerged membrane filtration through automatically controlled aeration
   Ensure stable treatment water quality and a high recovery rate, and reduce electricity costs through automatic control on the level of aeration based on the membrane contamination index

Water quality

1. Baffle that prevents running water from being stagnated in a purification chamber or water reservoir
   Effectively reduce stagnation in a purification chamber or water reservoir

Production

1. Method to prevent corrosion in the pipe by using calcium hydroxide slurry
   Prevent corrosion in the pipe by using liquid calcium hydroxide, not solid calcium hydroxide
2. Method to limit corrosion in the pipe
   Analyze only one item as opposed to 20 items which used to be analyzed to measure corrosion for water quality
3. Method to provide corrosion-controlled tap water
   Completely dissolve insoluble calcium hydroxide by using carbon dioxide and homogenizer to prevent corrosion in the water pipe

02.
Overseas Expansion of Waterworks Projects

Arisu has actively expanded overseas projects based on the technologies and awards that we have accumulated to get ahead in the rapidly growing global water market and enhance international competitiveness.

Overseas achievements

Consulting to establish infrastructure in PMB, Brunei

Contract awarding date I Aug. 2012
Type of participation I Public-private consortium (Pyunghwa Engineering Consultants, Korea Expressway Corporation, Saman Corporation, OMC (local company)
Project overview I Construction of bridges, access roads, waterworks, telecommunications, and electricity for PMB, an island 1.5 km away from the mainland
Contract amount I KRW 13.5 billion in total

Project to improve waterworks in Chanchamayo (San Ramon), Peru

Phase 1	2013 - 2015	water purification plants in San Ramon
		Improve water intake facilities, pipes
Phases 2 and 3	2016 - 2018	Improve water intake facilities, water purification plants, and water pipes in La Merced and Pichanaki

MOU to expand exchanges in waterworks

Signed MOUs with 11 foreign cities and authorities for mutual cooperation in waterworks, including Brazil, Thailand, and Papua New Guinea

Training by inviting waterworks officials in foreign cities

Inviting 30 officials each year from Southeast Asia and Latin America
Introducing waterworks policies and providing site visits

Arisu International Forum

Hosting a forum consisting of experts in the private sector, the government, and academia to research and advise in overseas expansion frameworks and strategies

Seoul-Tokyo Forum

Held by alternating between Seoul and Tokyo every year since 1999 to exchange waterworks information and technologies
Seoul: Seoul Waterworks Authority, University of Seoul, Korea Water and Wastewater Works Association
Tokyo: Tokyo Metropolitan Government Bureau of Waterworks, Tokyo Metropolitan University, Japan Waterworks Association

Future **Arisu!**

Think about people.
Think about the environment

Renewable energy facilities in operation

By introducing renewable energy facilities, we are contributing to the country's energy policies, securing clean and unlimited energy sources, and implementing an eco-friendly green water purification plant environment in connection with renewable energy.

- **Solar power system (17 locations, 12,348kW)**
- **Small hydropower system (1 location, 300kW)**
- **Geothermal heating and cooling system (6 locations, 3,246kW)**

Q1 Many cities are facing various obstacles in establishing and implementing waterworks development poli cies. How did Seoul overcome them, and what were the success factors?

Just 50 years ago, waterworks were not properly provided in Seoul. Not only did the city have a lack of technology, but its population has also grown exponentially 4.3 times in the past 50 years along with rapid economic development (2.45 million in the 1960s → 10 million in 2010). Thus, there were many difficulties in supplying water, but the city has been able to provide the world's highest quality drinking water to its citizens in a short period of time. The following are Seoul's success factors:

Case1 Lack of infrastructure → Greatly expand water purification plants and water reservoir facilities

From 1954 after the end of the Korean War, the city introduced foreign aid loans from the government and the UN to make up for a lack of funding to repair and restore waterworks. In the late 1950s, water purification plants were constructed by Korea's own technology, and facilities have been expanded and renovated since then. In the 1980s, water purification plants, pressurization chambers, and water reservoirs were expanded greatly, which brought demand under stable control and shifted the goal of waterworks administration from quantitative to qualitative. Meanwhile, as environmental problems emerged, citizens were increasingly interested in protecting water sources, which has brought about huge progress in tap water's qualitative growth.

Case2 Nurture Korea's own professionals and obtain original technology

As overseas training was provided to Korean waterworks professionals since 1952, the country's waterworks technology took a step further. Since the launch of Seoul Waterworks Authority in 1989, we have been nurturing professionals through continuous job training, strengthening waterworks researchers' R&D competencies, and making our best efforts to provide quality water and improve civil services by implementing total services, which resolve civil petitions about waterworks all at once.

Case3 Provide the highest quality water at affordable prices by streamlining management and improving the system

By improving the water revenue ratio, consolidating institutions under our umbrella, using electronic information for water fees, materials, and accounting, and streamlining business management and systems, we have reduced the number of employees from 4,300 to 2,000, transformed ourselves into a small but strong organization, and provided the highest quality water at affordable prices.

Q2 What are Seoul's waterworks development model compared to other international cities, and the leading policies or technology cases that can be acknowledged around the world?

To plan waterworks across a city and establish infrastructure accordingly, it is necessary to analyze the city's status (population, urban planning, facilities, obstacles, etc.), consider applicable laws, and apply appropriate policies and technologies.

Case1 "Seoul Water-Now System" combining IT and management know-how

To provide safe and tasty tap water, Seoul has established and operated the Seoul Water-Now System, which tests the water quality in real time from raw water to the water tap, discloses water quality information online in real time, automatically detects any problem with the system, and allows for immediate action. This system is installed with automatic water quality meters at 214 locations across raw water, production, distribution, and supply, manages the water quality, provides an alert from the monitoring device if the water quality exceeds an acceptable level, and sends a text message to the operator. We are disclosing three measured items (pH, turbidity, and residual chlorine) to citizens.

Case2 "Advanced water purification system" recognized for its technology around the world

Seoul's advanced water purification adds ozone and granular activated carbon processing to the standard water purification plant, and advanced water purification is a system that completely removes substances causing unpleasant taste and odor due to deteriorated water quality during the dry season and oxidizes, removes trace organic matter such as residual antibiotics, and is much more improved than existing water purification. Seoul has installed and operated the advanced water purification system in all of its water purification plants.

Q3 How can you provide tap water to citizens in a stable manner?

To maintain a stable Arisu supply system without worrying about any water outages 24/7, Seoul is operating a cutting-edge supply management system such as expanding the water reservoir capacity and introducing the no-outage system by connecting redundancy pipes and zones. In the case of a water leak or outage at water purification and intake plants, this system can supply water without interruption for 16 hours, which is its retention time in the water reservoir. As its retention time is longer than other cities and countries, it can ensure stable water, deliver greater economic effects, and provide satisfaction to citizens.

Know-how 1

Expand water reservoir capacity

Seoul divides water reservoirs into local →primary →secondary →tertiary depending on the topography and tap water supply conditions, operates a locally tailored supply system, and contributes to better energy efficiency. By using reserved water in the case of an emergency such as water outage, we are contributing to establishing a no-outage water supply system

Know-how 2

Connect redundancy pipes and zones to establish a no-outage system

By renovating old pipes, preventing leaks, and cleaning transmission and distribution pipes, we are establishing a no-outage water supply system to provide Arisu in a stable manner during not just water outages but also during maintenance. By establishing a supply system between Arisu Water Purification Centers, implementing redundancy pipes and double lines, and establishing an efficient block system by optimizing the waterworks network, we ensure that tap water is provided under any circumstance.

Q4 How can you manage the world's best water revenue ratio?

As Seoul has high and low grounds and varying temperatures across seasons, its conditions make it difficult to manage the water revenue ratio. Despite such conditions, we replaced old pipes and accessories, established a block system for water pipes, prevented leaks systematically, and managed supply scientifically through the integrated operation system and geography information system. As a result, we have been able to reach 95.1%, a world-class water revenue ratio, in a short period of time.

Know-how 1

Continued repair of water pipes, and blocks for the waterworks network

To replace old water pipes, which may potentially cause leaks or rusty water due to weakened durability, we have replaced old pipes for 13,396 km (98.7%) out of 13,571 km to prevent water quality contamination during water production and establish an optimal water pipe environment.
In addition, we have turned a complex waterworks network into 100 medium blocks and 2,037 small blocks, which makes it easier to identify the water supply status, improve the maintenance level, minimize outage areas in case of a leak, and provide emergency water and recovery in the event of a disaster. In addition, it allows us to check whether there are any leaks in each block and the amount of leak, and consequently improves the water revenue ratio.

Know-how 2

Systematic anti-leak

By implementing scientific and systematic detection such as the multi-point correlation leak detector, which detects any underground leaks in water pipes late at night when there is almost no tap water consumption, and the permanent leak diagnosis system, which always checks whether there are any leaks, we are detecting leaks early and repairing the pipes accordingly.

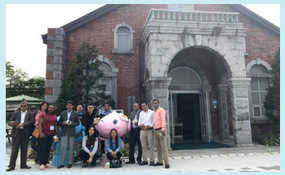
Q5 What are Seoul's waterworks development model compared to other international cities, and the leading policies or technology cases that can be acknowledged around the world?

Seoul is a megacity of over 10 million people and intends to share with overseas cities its policy experience in which the city has reached 100% in providing quality waterworks over the course of rapid population growth and urbanization. To do so, the city is implementing various projects.

Case1

Training by inviting waterworks officials in foreign cities

To share Seoul's waterworks technology with overseas cities, we invite 30 waterworks officials in overseas cities including Southeast Asia for short-term training and supporting policies and technologies tailored to their cities' needs. This training has been provided since 2012, and 262 officials from 87 cities in 37 countries have participated thus far in 21 training sessions.



Case2

Projects to support waterworks in overseas cities

Seoul is supporting private enterprises to advance into overseas projects to reinforce Seoul's waterworks competitiveness based on its accumulated operational experience and extraordinary technology in waterworks. In 2012, Seoul and private enterprises divided roles, participated in a bid for a waterworks project, and were awarded the infrastructure development consulting project for PMB, Brunei from 2016 to 2020. Then, Seoul's international cooperation fund was used to provide help to Peruvians by implementing a waterworks improvement project in Chanchamayo, Peru from 2013 to 2018. In 2016, Seoul Waterworks Authority's own budget was used for a drinking water facility improvement project (installing water quality meters, etc.) in Thua Thien Hue, Vietnam, which is in a sister partnership with Seoul and paved the way for future waterworks projects.

If you contact us as below for any question about Seoul's waterworks, we will kindly respond to you.

ContactInformation

Postal Address 51 Seosomun-ro, Hap-dong, Seodaemun-gu, Seoul (Postal code) 120-030
International Cooperation Division, Management Department, Seoul Waterworks Authority

Phone +82-(0)2-3146-1200, 1201, 1202, 1203, 1207

Fax +82-(0)2-3146-1224

Website http://arisu.seoul.go.kr/sudo_eng/

Made in December 2019


SEOUL METROPOLITAN
GOVERNMENT
english.seoul.go.kr