

# Public-private partnerships are an unstoppable global trend moving toward next-generation water systems from a long-term perspective

Waterworks have moved from an era of installation and expansion to one of maintenance and renewal. Pursuing efficient and economical operation and maintenance that can respond to changes in the business environment, and the sustainability of a safe and secure water environment. It is our responsibility to provide that for future generations.

Nowadays, "gratitude" for waterworks is gradually being forgotten, instead being replaced with a sense of them being "a matter of fact"

Our country's waterworks have achieved a high level of coverage of 98%, providing a safe and stable water supply like no other in the world. I believe this is the result of the untiring efforts of water suppliers, forward-looking investments in facilities, and the development and innovation of new technologies. On the other hand, it can also be said that trust and cooperation on the part of citizens and local residents have helped to build the world's highest level of water supply. However, recently when I hear about waterworks, it's that their existence is "a matter of fact", and that if there is even a slight problem, complaints will not stop. For example, in the past it was said that tea would be given out when work on water pipes was being done, but now it seems that with the quake-proofing work for pipelines being performed, it is not tea being served, but complaints. I believe that this is because the world is forgetting about the gratitude they should be having for waterworks in the first place. When I ask students who are just starting school at Tokyo Metropolitan University, they understand the value of tap water, but aren't sure about any of the details behind it, including how it is normally purified and distributed, how used water is collected and purified once more, etc. I think this lack of understanding leads to a "virtual world" where we believe that our present conveniences will last forever, without any effort on our parts. This "matter of fact" thinking is not only showing the indifference residents have regarding waterworks, but is also a dangerous sign that gratitude is disappearing. Technology and research must always be moved forward in a positive way, as it is said that if you stop, you will start moving backwards. I think we are entering an era in which we are not satisfied with the current situation, and are taking new steps

toward the next generation. In other words, the 21st century is the time to rebuild our waterworks. To that end, industry, government, and academia must work together to integrate their superior technologies and ingenuity into a next-generation water system that is "for the benefit of the world and all its people".

## Cooperation among industry, government, and academia is essential for the realization of next-generation waterworks

It is said that waterworks assets amount to about 46 trillion yen, of which close to 70% are pipelines, or so-called water pipes, and which span approximately 680,000 kilometers throughout Japan. This corresponds to a distance of 17 revolutions around the Earth's equator, and these pipelines must be properly renewed. Recent pipelines are manufactured with a lifetime of 100 years, so a renewal rate of at least 1% is necessary. However, at the current renewal rate of 0.75%,

it will take more than 130 years, which is far from acceptable. This will leave a "negative legacy" for the future. Similarly, water treatment and water source facilities must be renewed in a timely manner and need to be robust enough to withstand disasters such as earthquakes and typhoons. Only when these facilities and pipelines come together can safe and delicious tap water be supplied. Five years ago, Tokyo Metropolitan University established the "Research Center for Water System Engineering" with the aim of realizing a "next-generation water system" that could continuously supply safe and delicious water. The three pillars of the Center's research are (1) water operation planning, (2) next-generation pipeline systems, and (3) next-generation water resource management. (1) covers topics such

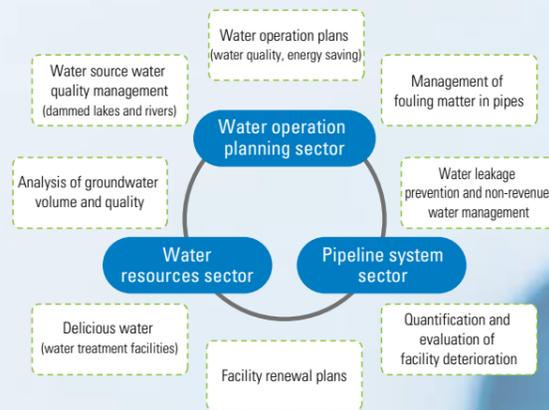
as research on water treatment processes, an appropriate renewal plan for pipeline systems, and an investigation of deterioration factors in waterworks facilities. (2) covers preventive maintenance of water leakage accidents and control of tap water quality. (3) covers management of reservoir water quality and investigation of river catchments. The water supply field is closely related to all faculties in the university (not only engineering but also science, law, economics, sociology, psychology, international studies, etc.), and I believe it is truly a comprehensive academic field. [Fig. 1] It is clear that the cooperation of industry, government, and academia mentioned above is essential to sustain and strengthen our aging and deteriorating water system for the future. [Fig. 2]

### Akira Koizumi

Distinguished Professor, Doctor of Engineering, and Professional Engineer (water supply and sewerage) for the Department of Civil and Environmental Engineering, Tokyo Metropolitan University. Born in Kanagawa Prefecture. After graduating from Tokyo Metropolitan University, he worked as a waterworks consultant for 10 years. He became a Lecturer at the Tokyo Metropolitan University Department of Engineering in 1980, an Assistant Professor in 1983, and a Professor in 1994. He has been a Professor in the Department of Civil and Environmental Engineering since 2005, a Distinguished Professor since 2012, and the Director of the Research Center for Water System Engineering since 2015. His specialty is water system engineering. He has experience serving on the government, the Japan Water Works Association (JWWA), the Japan Water Research Center (JWRC), and a number of water utilities.



[Fig. 1] Main themes of the Research Center for Water System Engineering



Source: Tokyo Metropolitan University Research Center for Water System Engineering pamphlet

[Fig. 2] Prospective image of waterworks in the future



Source: Pipe Stars Project Report, Japan Water Research Center

**Even if wide area waterworks management becomes possible thanks to the evolution of ICT/IoT technology and AI, “human power” remains important**

In the late 1970s, when I was working as a consultant, I was in charge of a number of wide area water supply projects, and while I recognized the need to fully consider the history and climate of the target area, I felt the need for a “greater area that transcended prefectural boundaries” in terms of management and technology. As I encounter the exhausted reality of small- and medium-sized water supply businesses today, I am keenly aware of the need for wider area management. This is just one proposal, but if we focus on the technological capabilities of specific private companies (or JV is also possible), I believe it is possible to technologically monitor numerous small- and medium-sized waterworks.

For example, nearly 10 years ago I was surprised when I visited the waterworks in the suburbs of Melbourne, Australia. Seven water treatment plants scattered across a vast water supply area were being remotely controlled and operated by a single private engineer on an iPad. As ICT and IoT technologies continue to advance along with the evolution of AI, we are entering an era in which a wide range of areas can be managed. With the latest technology from private companies, waterworks management for large areas is no longer just a dream. Needless to say, however, it is necessary to improve the various laws and institutions and make efforts to connect the world of fiction with the world of reality. In this area, you may find management points where private companies can play an active role.

Waterworks are systems with their feet firmly planted to the ground, and we have no choice but to rely on human power in cases of emergency construction, disasters, etc. In the future, this work may be replaced by robots, but ultimately the premise of “human power” cannot be eliminated. I believe that perspective of “human power” will become especially important in Japan. What underlies this is the “human heart”, which sincerely addresses the ideal form of “sustainability” for waterworks in each region. For an advanced example of this, look at the Hachinohe Regional Water Supply Authority in Aomori Prefecture, known for adopting earthquake-resistant

pipes for the first time in Japan. They are searching for a new wide area cooperation that covers not only the Hachinohe area as a wide area water supply, but also the northern area of Iwate Prefecture, crossing prefectural borders. Alternatively, the introduction of private-sector participation in the water supply business in Aizuwakamatsu City, which I assisted with from the planning stage, is centered on collaboration between companies with outstanding water treatment technologies and management capabilities, and local companies that are well-versed in local conditions. This “Aizuwakamatsu method” has attracted nationwide attention and is the new “wisdom” created by human power and the human heart.[Photo 1]



[Photo 1] Takizawa Water Treatment Plant in Aizuwakamatsu City

**It is important to not only sell things, but to train people when providing overseas support**

Many companies are turning their attention to overseas water business, but there are various risks involved in working overseas, and a perfect batting average is just not possible. I think that normally, Japanese companies should be responsible for the ODA budget, but in reality, often times it is foreign companies who are responsible for this.

Two years ago, I had the opportunity to visit the waterworks for the Republic of Rwanda (formerly a Belgian territory), located in East Africa. At a water treatment plant in the capital city of Kigali, an instrumentation facility was installed by a Turkish company and controlled using the latest equipment, known as a SCADA system. However, the water surface of the clarifier

was undulating, and the turbidity of the water treated in the sedimentation tank was high, placing a heavy burden on the subsequent filtration tank. Meanwhile, workers were sweating over low wages due to the staggering labor gap, while highly educated, high-income “high class” operators made decisions based only on inaccurately measured numbers, without ever looking at the site itself. [Photo 2]

This is just one example, but we often see water technologies that took us 100 years to grow being introduced in emerging countries in a sudden leap. In other countries, despite frequent blackouts on a daily basis, I have seen water treatment plants that are “fully automated” yet are unable to fulfill their original functions. Going from 0 to 100 isn’t feasible, as things



[Photo 2] Nzove Water Treatment Plant in Kigali (photo by author)

generally need to develop over time, but those in charge seem to always want the latest cutting-edge technology. For the sake of the community, I believe that it is important to introduce a system appropriate for the actual situation with courage and conviction.

One example of this is the “MaWaSu”, the Project for Improvement of Management Capacity of Water Supply Sector, with the aim of improving the management capabilities of Water Supply Authorities in Laos. “MaWaSu” provides technical assistance in close proximity with local engineers, and I think this is what our country should be doing. In other words, I believe that the most important aspect of technical assistance regarding waterworks is not just selling things, but training people first.

**Expect management and optimal investments from private companies, and opportunities for young people involved in waterworks to play an active role**

The worldwide trend toward public-private partnerships is unstoppable, and will further increase with the passage of time. With this, the work traditionally performed by the public will instead be done privately, but I urge us to place great importance on the feeling that “waterworks are for the benefit of the world and all its people”. I also hope that we will continue to put forth effort to develop technology and implement various ideas. To that end, it is important to work together with a long-term perspective to the greatest extent possible, and I hope that a mentality of cutting corners and providing cheap products driven by a desire for short-term profits will not prevail.

The elements of a water system are diverse and sustained based on multifaceted assessments. The unit of time for this must be considered from a perspective of at least 100 years, or even 1000 years in some cases. Up to now, I’ve been saying that the public side considers water resources and pipelines on a 50- to 100-year-plus basis, while the private side pursues the efficiency and economics of facilities such as water treatment plants on a 10- to 20-year basis, believing that public-private partnerships would combine the best of both worlds.

In the future, expectations will be placed on private companies not only from the perspective of construction, operation and maintenance, but also from the perspective of management and optimal investment based on renewal.

Furthermore, it is important to give opportunities to the next generation of young people who are interested in the field of water supply and carry out public relations activities in which young people want to be involved. Education and research on the waterworks at universities and high schools are of course necessary, but I am looking forward to the arrival of an era in which water supply-related fields grow significantly and young people will be able to play an active role in supporting future water systems.