Taking advantage of workforce!

~ Tokyo Waterworks Program for Enhancing Crisis-Response Capability ~

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Abstract: Tokyo is faced with a variety of threats including earthquakes and terrorism. Yet there are limitations on how well these threats can be addressed by tangible means alone, and it is important to take more intangible measures as well. The epitome of intangible measures is manpower, but due to management streamlining, total workforce has decreased by more than half. To address this, Tokyo Metropolitan Bureau of Waterworks has instituted the "Tokyo Waterworks Program for Enhancing Crisis-Response Capability" to develop abilities of its staff members, to augment its organizational proficiency to maximize personnel's impact, and to strengthen collaboration with outside partners. We present this program because we believe other water utilities can also apply its key concept of fully utilizing the workforce.

Keywords: Crisis management; crisis-response capability; drill; countermeasures against earthquake; countermeasures against terrorism

1. Introduction

Crisis management is essential to improving the resilience of urban infrastructure.

The Tokyo Waterworks Bureau is tasked with supporting the daily lives of 13 million Tokyo residents, as well as the urban activities and central capital functions of the city. Crisis management is a daily part of waterworks projects.

Meanwhile, Japan remains one of the world's most earthquake-prone countries even after the 2011 Great East Japan Earthquake, with the Kumamoto earthquakes causing serious damage in 2016.

In the Tokyo metropolitan area, experts predict an M7-class Tokyo Inland Earthquake to occur within 30 years at a probability of approximately 70 percent.

In addition, the capital city faces a growing potential threat of terrorism in the run-up to the 2020 Tokyo Olympic and Paralympic Games.

The diverse array of threats includes typhoons, volcanic eruptions, and other natural disasters, as well as emerging infectious diseases that may result in large-scale absences from work.

The Tokyo Waterworks Bureau has worked to systematically implement a variety of tangible measures to address these risks, such as installing earthquake-resistant

joints on the 27,000-km-long water pipe network and improving large-scale purification plants that have a capacity of over one million cubic meters.

However, natural disasters and similar events in recent years have exceeded expectations in terms of scale, and it is important to implement “intangible” measurers in addition to “tangible” ones.

The epitome of intangible measures is manpower, but due to management streamlining, total workforce has at present decreased by more than half.

To address this, Tokyo Metropolitan Bureau of Waterworks has formulated the “Tokyo Waterworks Program for Enhancing Crisis-Response Capability” and is implementing various initiatives to develop abilities of its staff members, to augment its organizational proficiency to maximize personnel’s impact, and to strengthen collaboration with outside partners.

We present this program because we believe other water utilities can also apply its key concept of fully utilizing the workforce.

2. Tokyo Waterworks Program for Enhancing Crisis-Response Capability

The activities of the Tokyo Waterworks Program for Enhancing Crisis-Response Capability can be divided into three major categories: organizational and personnel improvement, collaboration with other water utilities, and anti-terrorism measures.

(1) Enhancing crisis-response capabilities of personnel and the organization through disaster drills and dispatches of aid teams to disaster-hit areas

1) Systematic and comprehensive drill plans

Drills are the most important and the fundamental way to enhance crisis-response capabilities of personnel and the organization. In order for those drills to be more effective, it is necessary to present an annual plan to the organization and personnel implementing the drills at the start of the year to make clear the drills’ objectives.

In this plan, the drill policy is stated as follows: “In an actual disaster, you will be unable to do more than you did in a drill. Without participating in drills, you can do nothing in an actual disaster.”

Further, the annual policy calls for the implementation of the PDCA cycle (Fig. 1), with drill plans (Table 1) designed in a systematic manner to cover natural disasters, terrorist attacks, and emerging infectious diseases.

Drills can be classified into 20 categories, some of which are conducted on a bureau-wide basis and others on an office-by-office basis.

As an example, this section will describe Waterworks Bureau-wide drills that assume an earthquake occurring directly under Tokyo (i.e. a

"Tokyo Inland Earthquake"). One drill is conducted for earthquakes occurring on weekdays and one for holidays. Each drill features the participation of around half of all personnel, and the drills are conducted through the collaboration of the Waterworks Bureau (within the Tokyo government) in a command and coordination role, and emergency response departments (each office). Drill participants are kept blind to the estimated scale of disaster damage until the drill begins. At the Waterworks Bureau's simulated drills, a "roleplaying" method is adopted wherein participants take on roles such as resident or journalist, making inquiries by phone to drill participants and practicing such methods of response. Additionally, the operating drills conducted by emergency response departments include drill activities such as emergency water provision, emergency restoration, and other such training. In this way, more realistic drills are achieved that are in line with activities that will be conducted during an actual earthquake. (Fig. 2-3).

In FY 2017, there were over 300 drills conducted, and the number of participating personnel totaled over 10,000, including both local staff and the staff of supervising organizations.

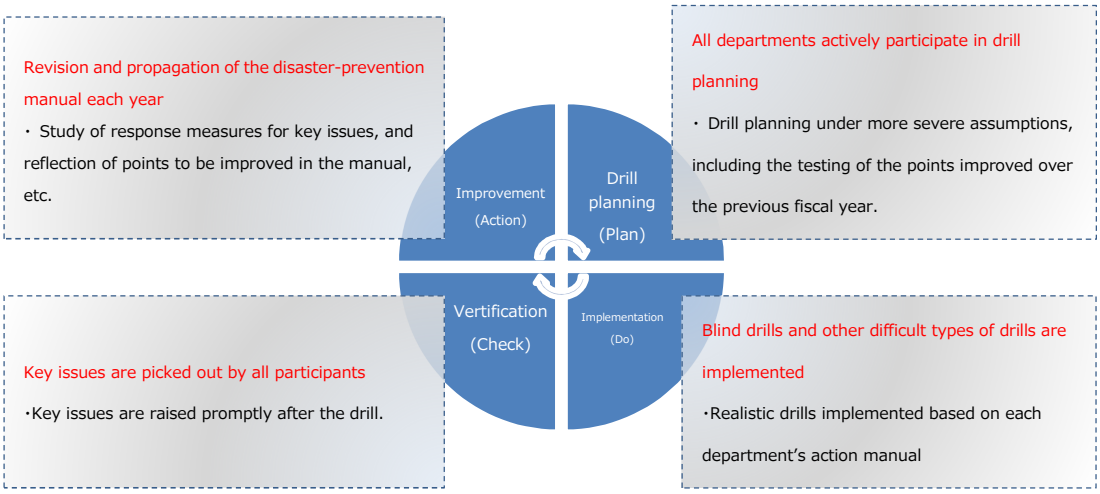

Fig. 1: Annual policy (Executing the PDCA cycle)

Fig. 2: Emergency restoration of water pipes

Fig. 3: Emergency water supply activities at a water station, a collaboration of local residents, city office personnel, etc.

Table 1: Drill Plan

Drill scenario		Implementation scale	Description of drill
Natural disasters	Tokyo Inland Earthquake	All workplaces	Bureau-wide activity drill assuming disasters occurring both during work hours and outside of work hours
		Individual workplaces	Drills in collaboration with residents and students; drills involving dispatching to core Tokyo organizations; etc.
			Drills securing supply routes to core Tokyo organizations, etc.
		Drill in collaboration with other cities	Drills for receiving rescue teams from major urban waterworks departments throughout Japan
			Drill for mutual lending of pipelines connecting with neighboring utilities
	Disasters in other regions	Rescue teams dispatches	Drill for dispatching to waterworks departments in the Kanto region (east Japan)
			Drill for dispatching to faraway major cities for a hypothetical Nankai megathrust earthquake
Terrorism	Terrorism at facilities	All workplaces	Waterworks Bureau-wide activity drill in collaboration with police, etc.
		Individual workplaces	Anti-terrorism drills at water purification plants in collaboration with police and fire departments
	Cyberterrorism	All workplaces	Response drill for targeted email attacks
		Hosted by the national government	Drill exercises hosted by the Cabinet Secretariat
		Individual workplaces	Drill exercises for cyberterrorism directed at control systems at water purification plants, etc.
Spread of emerging infectious diseases		All workplaces	Drill for a massive pandemic of a new strain of influenza (40% of staff catch the flu and take leave from work)
Unforeseen accident or incident		Drills at individual locations	Response drill for a sudden outbreak such as a water-quality accident, water leakage, etc.

(2) Tokyowater Rescue

Tokyo Waterworks has undertaken emergency water supply and restoration activities in response to requests for support from disaster-stricken areas after major disasters, such as the Great East Japan Earthquake and the Kumamoto earthquakes. (Fig. 4-5.)

In recent years, abnormal weather has resulted in heavy rain-related disasters, resulting in an increasing number of personnel dispatches.

Personnel dispatches to disaster-stricken regions require rapid response time because they are a race against time. For that reason, the Tokyowater Rescue initiative was established in 2017 for the purpose of working with water pipe construction companies on improving the response framework in place.

Through this initiative, relief teams are formed immediately after a large-scale disaster occurs to conduct emergency water supply and restoration activities in the disaster-stricken area.

In normal, non-disaster periods, an opt-in list is created of personnel interested in voluntarily participating in Tokyowater Rescue. By selecting primary dispatched parties each month from this list of registered volunteer

participants, it is possible to dispatch an emergency relief team immediately. As of April 2018, this system features approximately 1,400 individuals.

Registered personnel are provided training and drill exercises every year, and they learn practical on-site emergency aid information from past participants with real experience in addition to learning practical emergency response skills through drill exercises.

The primary objective of emergency disaster aid activities is obviously to provide relief for disaster victims. Personnel with experience performing such relief work in disaster-stricken areas learn actual crisis response skills through real experience that they could never acquire by training alone. That experience will be put to use in the event that there is ever a disaster in Tokyo.

Fig. 4: Emergency water supply activities after the Great East Japan Earthquake

Fig. 5: Emergency restoration activities after the Kumamoto earthquakes

(3) Waterworks Emergency Team

The Waterworks Bureau established this emergency team to restore water supply to the capital's central agencies and emergency medical institutions within three days of water supply interruptions.

The 60-member team works in shifts and operates around the clock to be ready to respond at any time.

In normal, non-disaster times, the team has a regular routine involving a variety of training including drills for securing water supply routes for central agencies in the capital and similar core infrastructure (Fig. 6), emergency water supply drills for emergency medical institutions (Fig. 7) etc. As experts in disaster response, the team also conducts educational instruction for standard staff.

Whenever a Tokyowater Rescue dispatch is conducted to a disaster-stricken area, the team is capable of immediate departure to the area and functions as the main force of response activities.

Fig. 6: Securing a supply route to central capital agencies

Fig. 7: Emergency drill for supplying water to an emergency hospital

(2) Organic, wide-ranging partnerships with other major cities

The aforementioned hypothetical Tokyo Inland Earthquake is predicted to simultaneously affect a quarter of Japan's total population, and the scale of damage will be unprecedented within Japan. In the event of such an earthquake, the Japanese waterworks sector will need to mobilize all available resources to quickly build up a proper support system. To this end, it is effective to develop a role-playing model both for waterworks utilities who provide disaster relief support and those who receive such support, and to conduct exercise drills on the basis of that framework.

The Tokyo Waterworks Bureau has signed a mutual support partnership memorandum with the Sendai Waterworks Bureau, which has the experience of restoration from a major disaster and tsunami due to the Great East Japan Earthquake.

Based on this agreement, the two parties regularly conduct meetings to exchange information, and the Waterworks Bureau has received much valuable advice regarding restoration activities based on experience from the Great East Japan Earthquake, which is put to use in the bureau's earthquake countermeasure policies. The two departments also conduct regular joint drills in alternating cities. In the 2017 joint drill, the Sendai Waterworks Bureau's Emergency Relief HQ was established in the Tokyo government offices, and a practical drill was conducted on initial relief response in the event of a Tokyo Inland Earthquake.

In 2018, the Tokyo Waterworks Bureaus also signed relief support partnership memoranda with waterworks bureaus in major cities in western Japan: the Osaka City Waterworks Bureau and the Okayama City Waterworks Bureau.

These three major cities serve as hubs for water utilities in the Tohoku, Kansai, and Chugoku-Shikoku regions. Through this, the Tokyo Waterworks Bureau established an organic, wide-ranging collaborative framework spanning

from the Tohoku region in eastern Japan to the Kansai and Chugoku-Shikoku regions in western Japan.

The Tokyo Waterworks Bureau conducts information-sharing meetings and joint preparedness drills with both major urban waterworks bureaus to ensure the effectiveness of joint relief activities in the event of a large-scale disaster.

(3) Countermeasures against terrorism in collaboration with the police, fire department, and local residents

In the run-up to the 2020 Tokyo Olympic and Paralympic games, the Tokyo Waterworks Bureau faces the heighted threat of terrorist activity. However, unlike water purification plants overseas, Japanese plants have not previously had permanent armed guards from the self-defense force or police on site, and core safety measures were taken by the bureau itself.

In this area, it is important to strengthen collaboration between the police, the fire department, and other anti-terrorist organizations.

The Waterworks Bureau conducts anti-terrorism drills in collaboration with the police, fire department, and other related organizations and thereby builds stronger partnerships with such organizations (Fig. 8-9), in addition to conducting external PR regarding its improved anti-terrorism capabilities. This will help to improve terrorism deterrence.

There is a high probability that suspicious persons will trespass into waterworks facilities from outside. It is the residents who live in the area every day who will be able to quickly sense that something is abnormal, such as the presence of a suspicious person or a suspicious vehicle. Thus, the Waterworks Bureau has formed “counterterrorism partnerships” with residents’ organizations located nearby core Tokyo Waterworks water purification plants. Through these partnership initiatives, local residents learn the important roles served by water purification plants and other such information, thereby developing an affinity with their local plant and seeking to watch over it in the future. This will lead local residents to proactively report suspicious individuals, vehicles, or other abnormalities to the appropriate authorities.

Through these measures, in addition to “tangible” security such as surveillance cameras and sensors, a stronger “intangible” precautionary framework was established of vigilance both inside and outside water purification plants by police, fire departments, and other related bodies as well as by local residents.

Moreover, the Waterworks Bureau is also conducting antiterrorism training for all personnel to improve security awareness. Only a small number of personnel and guards are responsible for security within the Waterworks Bureau. If other staff also persistently maintain a security-conscious mindset,

the chance of discovering a suspicious person or object within a waterworks facility is improved.

In anti-terrorism measures, one assigned staff member provides just two eyes, but 100 personnel and local residents total 200 eyes' worth of surveillance. Personnel and local residents thus work together to use the "Community's Eyes" to protect the Waterworks Bureau from terrorism.

Fig. 8: Drill on Handling Bomb-related Terrorism

Fig. 9: Drill on Handling Poison-related Terrorism at Higashimurayama Water Purification Plant

3. Conclusion

The water supply is a core essential utility that is directly connected to our lives. Interruption of water utility services would have an enormous impact on the Tokyo capital area, and the interruption of capital functions is a threat to the nation. If an area experiences a water outage, there is a need to provide the maximum emergency water supply service possible and to restore the water utility to functionality as soon as possible.

To that end, it is necessary to improve the crisis-response capabilities of personnel and organizations, and to prepare to make maximum use of such capabilities in the event of an earthquake disaster.

Regarding anti-terrorism measures, checks for suspicious individuals and objects will be performed by all personnel at water purification plants, as well as by contractors, other affiliated personnel, and even local residents. In this way, terrorism will be stopped by keeping many eyes peeled for terrorist activity.

Crisis management in Tokyo's waterworks system will involve the routine execution of the Tokyo Waterworks Program for Enhancing Crisis-Response Capability, with a focus on achieving maximum results from full utilization of personnel, thereby improving the resilience of the Tokyo waterworks system in the face of threats.

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