

Construction of a management system of “Customer Center” for responding to large-scale earthquake disaster

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Abstract: The Great East Japan Earthquake in 2011 disrupted not only traffic and infrastructure network but also information network. Regarding waterworks, information on restoration of water supply and radioactive contamination due to nuclear accident were conflicted. While the water suspension rate will exceed 30% by a large earthquake, which is projected to occur in Tokyo with a probability of 70% in the next 30 years, this turmoil of information will threaten 13 million citizens' lives and urban activities, and the dysfunction of the center of Tokyo will significantly affect the world. The Bureau of Waterworks Tokyo Metropolitan Government (hereinafter referred to as the Tokyo Waterworks) set a customer center for comprehensive reception service in normal time. We will utilize the center to establish a firm information inquiry system responding to inquiries such as emergency water supply and recovery situation at the time of disaster to maintain the lives of the citizens and central functions of Tokyo.

Keywords: Customer center; response to information inquiries at the time of disaster; improvement of crisis management response

1. Background

Since the beginning of the 21st century, there have been major earthquakes in various parts of the world, including Asia, South America and others and in Japan, the magnitude-9 Great East Japan Earthquake occurred in 2011 (**Figure 1**). This large earthquake caused not only disruption of traffic and infrastructure but also disruption of information network. Regarding waterworks, 2.3 million households with water suspension were unable to get accurate information regarding the outlook for when water would be restored, and information on radioactive contamination due to nuclear accident is complicated. Concerns for contamination of tap water and announcement on planned power outage caused confusion such as cornering of water in various places in all over East Japan (**Photo 1**).

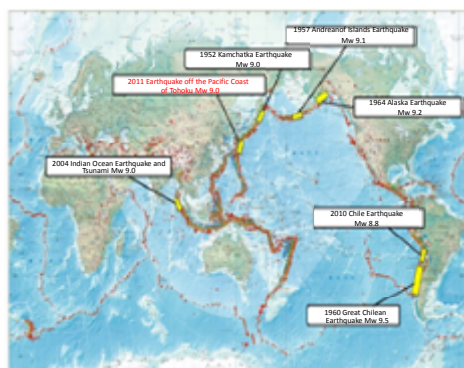
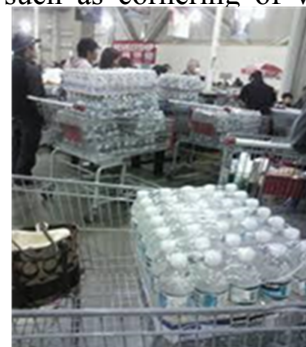


Figure 1: Earthquakes in the World



Picture 1: Confusion occurred, such as residents buying out all bottled water after the announcement of contamination or planned power outages by the waterworks.

An epicentral earthquake in Tokyo is projected to occur with a probability of 70% in the next 30 years. Although the Tokyo Waterworks has proceeded with earthquake resistance of pipes and facilities, it is still assumed that the water suspension rate will exceed 30% at the time of a disaster. The Tokyo Waterworks has also developed emergency water supply facilities in Tokyo; however, the facilities will not be fully utilized, affecting the citizens' lives and urban activities of 13 million people if the information network is confused. The Tokyo Waterworks is responsible for building a rapid and accurate information inquiry system for responding to large-scale earthquake disasters in order to maintain the lives of the citizens and central functions of Tokyo.

2. The role of the Customer Center

Every day, water utilities take many applications from customers to start or stop water supply when they move, as well as inquiries about bills and renovations. In particular, approximately 1,236,000 applications to start service and 1,064,000 applications to stop service are received every year (results for FY2016). In order to respond to these applications and inquiries efficiently, the Tokyo Waterworks opened a “Customer Center” as a call center for comprehensive reception service, where applications by telephone and internet are centrally received.

Two Customer Centers have been established: one serving the Wards District (which consists of the 23 municipalities in the eastern part of Tokyo, including the city center) and the Tama District (referring to the rest of Tokyo to the west of the Wards District, which includes plateaus, mountains, and hills). The Customer Center reception time is from 8:30 AM to 8:00 PM on every day except for Sundays and public holidays, with 24/7 service to respond to emergencies such as water leakage accidents (**Figure 2**).

Content of contracts with customers concerning the use of water, as well as information meter readings and bills have been put online by the “Water Bill Network System” in the Wards District and the “Tama Water Bill Network System” in the Tama District, so the Customer Centers can be ready to respond immediately to customer applications and inquiries. These systems are operated under strict management, using a dedicated communication network, and the fullest measures have been taken to protect customer's personal information.

The Tokyo Waterworks aims for efficient operations of its water utilities, and so as much business as possible is commissioned to the private sector. Additionally, an integrated business operation system managed by the Tokyo Waterworks and a supervisory organization has been built for core business. Operation of the Customer Centers is managed by the supervisory body as part of core business.

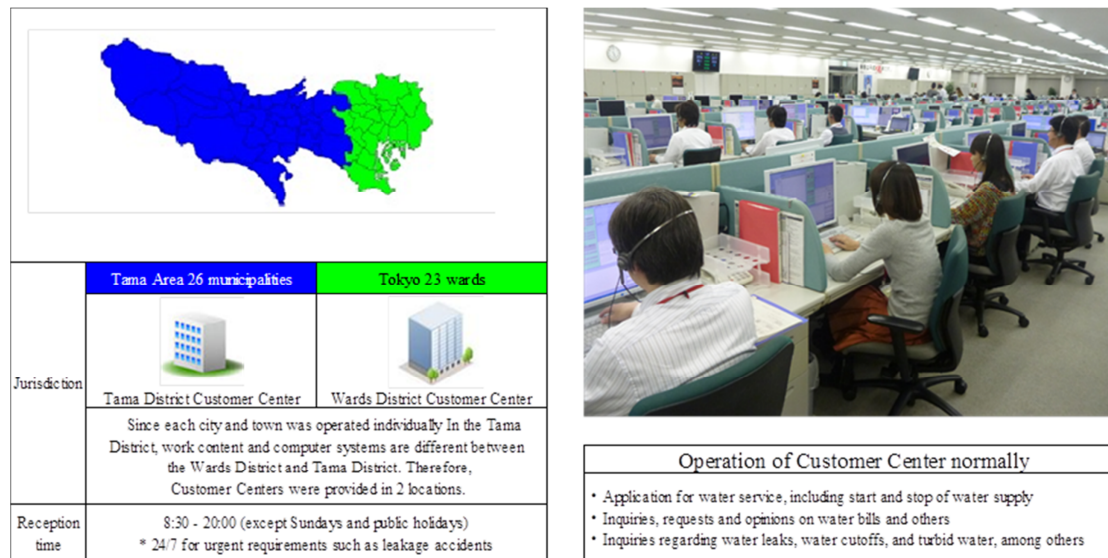


Figure 2. Overview of the Customer Centers

In this manner, the Customer Centers are responsible for efficient business operations by centralizing service counters of the Tokyo Waterworks while responding to the diverse lifestyles of customers. However, the role of the Customer Center is not limited to this.

The Customer Centers have an important mission; to collaborate with the Tokyo Waterworks during disasters such as major earthquakes to respond to inquiries concerning restoration of service and emergency water supply if there is a water cutoff, water turbidity, or water leakage. As the risk of an epicentral earthquake striking Tokyo rises, the Customer Centers must offer high level, high speed, and high accuracy responses.

3. Current status, challenges, and solutions at Customer Centers in the event of disasters

3.1 Conventional emergency response

In order to respond appropriately in the event of a disaster such as a major earthquake, the Tokyo Waterworks has clearly positioned its Customer Centers as bases for responding to inquiries regarding crisis management, and has developed a system for rapidly and accurately supplying necessary information, after producing a disaster recovery manual.

• Disaster recovery manual

The Customer Centers will establish an emergency response system for taking calls quickly in the aftermath of a disaster, and check or restore the system environment while simultaneously centralizing management of information and consolidating various chains of command. After that, within about 24 hours, the Customer Centers will secure a system for the second day from the disaster onwards, and collaborate with the Tokyo Waterworks to do business from then on, expanding its call center service gradually after that. Examples of specific matters that require consideration when expanding call center service include the content and scope of information

given by the Customer Centers, how information will be provided by the Customer Centers to the Tokyo Waterworks (content, destination, timing, means of information provided), and how information will be provided by the Tokyo Waterworks to the Customer Centers (content, destination, timing, means of information provided).

- Information on operating status of emergency water supply bases

As mentioned in the beginning, it is expected that the water cutoff rate in the event of a disaster will exceed 30% in Tokyo. When water cutoffs on this level occur, the Tokyo Waterworks has decided to conduct emergency water supply activities with a rapid and accurate grasp of necessary information, including the status of water supply and the status of resident evacuations. Emergency water supply activities consist of three methods: supplying water at emergency water supply bases, delivering water with water supply trucks from the Tokyo Waterworks to facilities and locations that need water, and installing temporary water faucets on fire hydrants on the roads. Of these, water supply at emergency water supply bases is the emergency water supply activity most available to citizens of Tokyo.

Emergency water supply bases are spaced so there is always one within a 2 km radius, for a total of 213 water purification plants, water supply stations, and emergency water supply tanks (installed under parks, etc.) installed in Tokyo (**Figure 3**). When water is cutoff during a disaster, residents living in various parts of Tokyo can rely on these facilities for their water supply. It is essential that citizens properly understand the locations and roles of emergency water supply bases in order to achieve a smooth water supply in the event of a disaster. Therefore, even in day to day public relations, the Tokyo Waterworks is making an effort to inform citizens of the symbol mark used for disaster water supply stations, as well as the locations and roles of emergency water supply bases. However, there are still many residents who are not aware of their nearest emergency water supply base or who are simply not interested. Because of this situation, when a major earthquake actually does occur, and there are large scale water cutoffs, there is expected to a huge number of inquiries regarding the location and operating status of emergency water supply bases.

Therefore, when a disaster does occur, the Customer Centers will collect information on emergency water supply bases throughout Tokyo and supply this information to citizens. Specifically, the Customer Centers will work closely with the Tokyo Waterworks to quickly acquire information on the operating status of water supply bases grasped by the Tokyo Waterworks using a system that handles information on the operating status of water supply bases which operate even during disasters, and take a stance to respond quickly to inquiries.

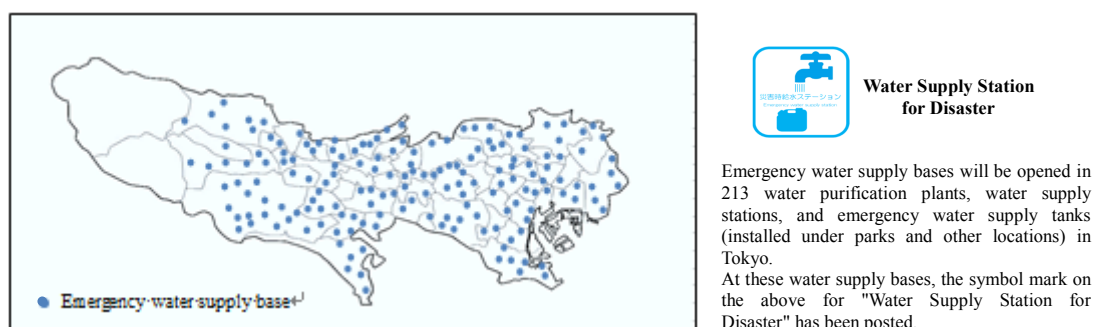


Figure 3. Distribution of emergency water supply bases

- Disaster drills

The Tokyo Waterworks conducts systematic and comprehensive drills year round with the purpose of strengthening its crisis response for various threats. Even training for the entire Tokyo Waterworks assuming an epicentral earthquake strikes Tokyo includes weekday disaster response training, holiday disaster response training, and holiday disaster assembly training, and training on safety check and assembly check systems.

The supervisory body that has built an integrate business operation system with the Tokyo Waterworks participates in this training every time. Training includes training in accordance with the manuals as well as training for responses in blind, unexpected settings. By participating in this training, the Customer Centers have deepened their collaboration with the Tokyo Waterworks and improved their ability to respond to earthquakes.

3.2. Issues facing Customer Centers regarding emergency response

On average, the Customer Centers take around 8,000 inquiries per day (2,372,000 calls, for an average of 8,200 calls per day in FY2015). However, there will be large scale water cutoffs, turbid water, and water leakage during a disaster, as well as inquiries regarding matters that could not be expected normally. Looking at the Sendai Waterworks Call Center during the Great East Japan Earthquake that struck on March 11th, 2011 as an example, for the rest of the month of March after the earthquake, 3.5 times the number of calls were taken day after day compared to the same time the previous year. At that time in Tokyo, there were over 1,000 water leakages in the Wards District (27 distribution pipe leaks, 74 equipment leaks, and 1,010 water supply pipe leaks) and repeated water cutoffs due to emergency shutoff valve closures and power outages in the Tama District, leading to a sudden increase of inquiries regarding these damages. Especially in the Wards district which has a large water supply population, the number of inquiries for the month of March (334,000) was 2.5 the average, and responses to inquiries were inadequate. This is made abundantly clear looking at the response rate (= calls that operators could answer ÷ incoming calls to the Customer Centers × 100) falling from the normal rate of over 95% to just 59.8% in March (**Figure 4**).

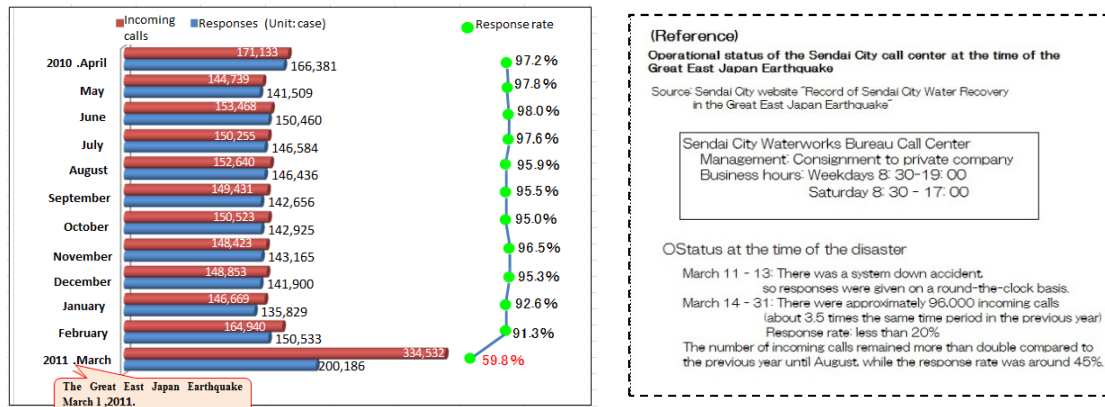


Figure 4. The number of incoming calls, responses, and response rate (Ward District) from April 2010 to March 2011

Based on assumptions by the Tokyo Disaster Management Council in 2012, the Tokyo Waterworks expects that in its 26,900 km of water distribution pipes and 6,859,500 m³/day of facility capacity, there will be at least 13,000 cases of damages suffered due to an epicentral earthquake in Tokyo. Water leakages and water cutoffs, as well as inquiries into these matters will increase beyond comparison to the when the Great East Japan Earthquake struck, and in case of emergency, the Customer Center response rate will deteriorate even further.

As mentioned above, there is one Tokyo Waterworks Customer Center each for the Wards District and Tama District, but if either one of them should become unable to adequately serve its function due to damages suffered, it will still be possible to efficiently collect and provide information at all times if the other can offer backup. However, at present, the Customer Centers in the Wards District and the Tama District are of different sizes, and use different systems, so except for some limited mutual support, they can only respond to inquiries from their respective areas. This is one major challenge facing Customer Centers in relation to emergency response.

(Reference)

Water utilities in the Tama District have been managed individually by the municipalities that constitute the district. Therefore, water utilities in the Tama District are distinguished even now by being based on the infrastructure of municipalities, while mainly carrying out business operation using a supervisory organization, and systems used include many systems unique to the Tama District. Thus, the background of the current difficulty of giving full mutual support between the Wards District and the Tama District is deeply tied to the historical circumstances of water utilities in the Tama District.

3.3. Promoting centralization of the Wards District and Tama District communication systems

In response to these problems, one effective solution has been integrated operations through central management via unification of business processes and systems

between the Wards District and the Tama District.

The Tokyo Waterworks has worked to achieve mutual backup management so as to improve on the inefficient situation in which each center only responds to its own area. Based on the assumption that the Wards District and the Tama District are independent of each other, the operator would be able to provide backup for Tama from Wards or for Wards from Tama only a few contents, and this was limited mutual operations in which each system can be checked at both Customer Centers,

In the future, assuming the event of a major earthquake, the Tokyo Waterworks aims to unify actual differences in business process and systems between the Wards District and the Tama District as much as possible, in order to centrally manage the Customer Centers. **(Figure 5).**

Centralized management is planned in the unification process through virtual business unification, as there will continue to be 2 Customer Centers in operation, with an equal number of operators working at each center, but using a unified system, they will respond to matters in both the Wards District and Tama District **(Figure 6)**. This plan takes into account risks in crisis management based on damage estimates presented by the Tokyo Metropolitan Government, which show that the damage situation will differ in the Wards District and the Tama District depending on whether the northern Tokyo Bay or the Tama area is the epicenter of an epicentral earthquake that strikes Tokyo. By making an integrate response for all of Tokyo from the two Customer Centers while distributing risk, it will be possible to quickly and accurately to find and transmit information, respond on-site, and dramatically improve crisis management response.

At the same time, since it will be easier to for customers to make calls on a regular basis, there are also expected to be benefits to day to day reception work.

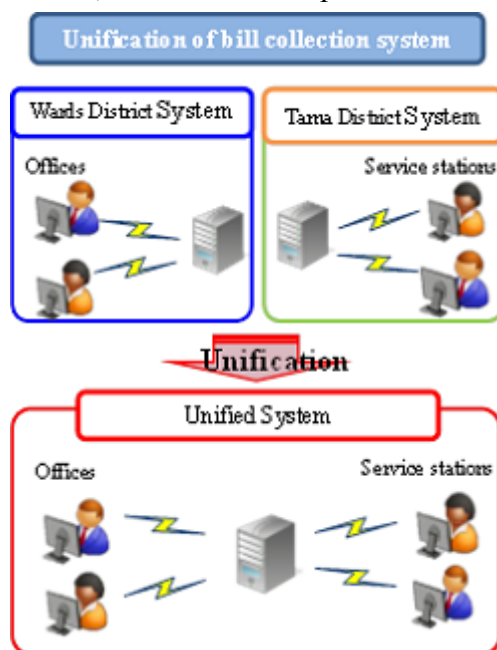


Figure 5. Image of system unification

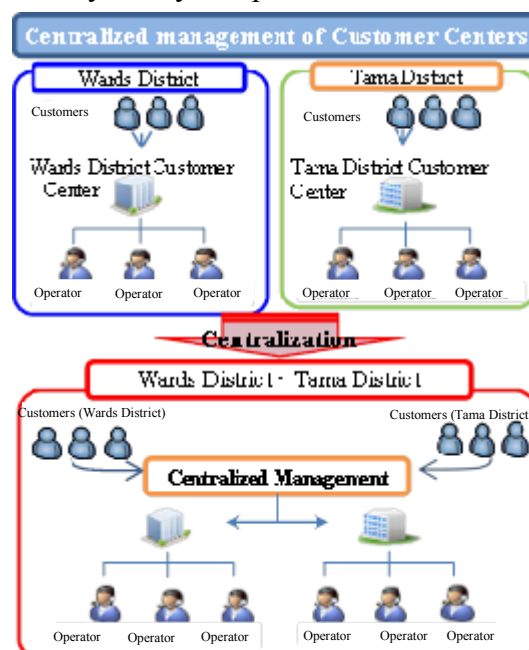


Figure 6. Image of centralized management

4. Conclusion

In preparation for a major earthquake, the Tokyo Waterworks has deliberately advanced hard measures, such as seismic retrofitting of pipes and facilities and developing home power generation facilities to secure a minimum water supply using these facilities. At the same time, the Tokyo Waterworks has also put an emphasis on soft measures, such as emergency systems including restoration and supply of water, development of an internal system for emergencies, and building a collaborative relationship with local municipal governments and private corporations. All of these measures are made to maintain a stable supply of clean water to citizens even in the event of a disaster, but in order for citizens to fully enjoy the benefits of these measures taken by the Tokyo Waterworks, it is an absolute necessity that they be able to quickly obtain accurate information even in the midst of a disaster.

The Tokyo Waterworks has collaborated closely with a supervisory organization with the goal of making a more efficient operation system and service. In the future, the Tokyo Waterworks will collaborate even more closely with recognition of the fact that rapid and accurate communication of information to citizens of Tokyo during a disaster is a challenge of utmost importance (**Figure 7**). The Tokyo Waterworks will also steady restructure its Customer Centers, which act as comprehensive reception service centers, as organizations with operation systems prepared for the event of a major earthquake, with the goal of further earning the trust of residents of Tokyo.

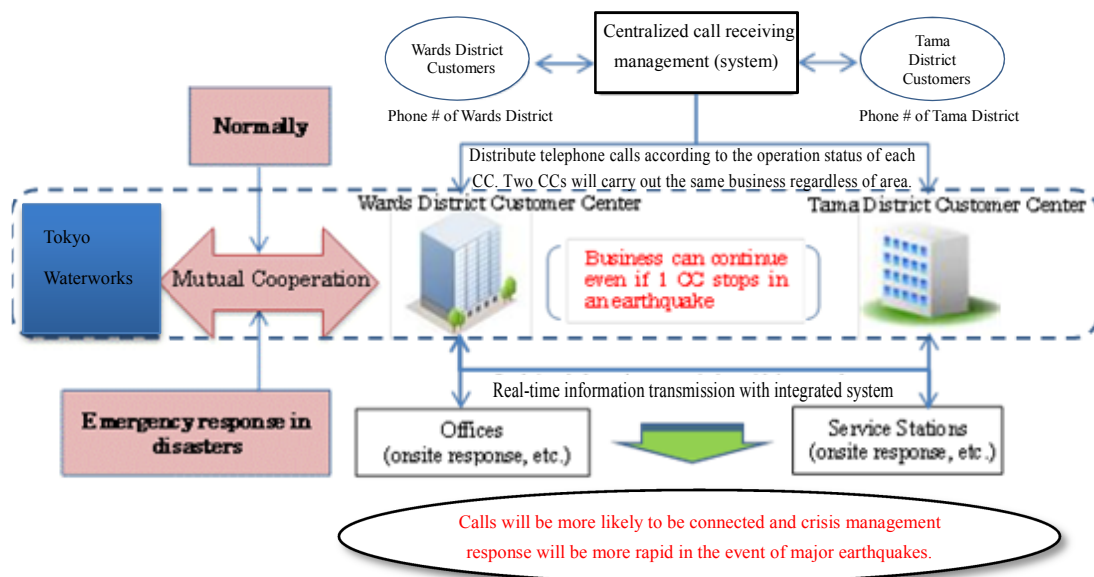


Figure 7. Collaboration between the Tokyo Waterworks and Customer Centers

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