

Fire Rescue Training Techniques

Exchange with Bangkok, Hanoi, Jakarta, Kuala Lumpur, and Taipei

Objective: To develop rescue technique trainers

To systematically develop emergency responders' abilities to cope with a range of challenging, complex disasters by passing on fire rescue training techniques.

Overview: Two-phased program

Domestic training: Fire/rescue members in leadership positions are accepted from participating cities as trainees.

Overseas training: After completion of the domestic training session, participants return home to become trainers. TFD instructors are then sent to the training sessions held by these new trainers to confirm their skills and provide support.

<Past Achievements>

YEAR & CITY	Foreign Trainees Accepted	TFD Members Sent Out	Local Training Session Participants
2008: Bangkok	6	5	60
2009: Kuala Lumpur	2	3	21
2010: Bangkok	6	3	75
2011: Jakarta	2	5	34
2012: Bangkok	6	5	40
2013: Hanoi	6	3	48
2014: Hanoi	6	3	51
2015: Jakarta	5	—	—
2016: Taipei	6	3	80

Details: Examples of basic fire rescue skills instruction

- Ropework (for equipment & people)
- One rope bridge crossing/Rappelling
- High angle rescue
- Confined space rescue
- NBC (nuclear, biological and chemical) disaster management
- Victim transportation
- Safety management awareness



Session for rope rescue anchor creation



Session for a ladder rescue (with a victim trapped below)



Session for horizontal stretcher rescue from a single suspension point



Session for rappeling

Response Technology for Special Incidents (e.g. NBC*)

(*nuclear, biological, and chemical)

Exchange with France, Korea, Taiwan, the United States, Vietnam, etc.

Objective: To respond to special disasters

To handle hazmat/NBC disasters.

Overview: Fire Rescue Task Forces for NBC disasters and Hazmat Units

The 3rd and 9th Fire Rescue Task Forces are in service as “high-performance” units to specially deal with hazmat/NBC disasters. In addition, there are nine Hazmat Units that are specially equipped for chemical disasters.

TFD Service Area



Details: Special vehicles & equipment

Special vehicles and equipment are deployed to the 3rd and 9th Fire District HQ Fire Rescue Task Forces.



Special Incident Trucks

Special incident trucks carry advanced equipment, such as analyzing equipment, to respond to NBC disasters. The TFD is the only organization in Japan to have special incident trucks with enhanced radiation protection features such as barriers of lead and water to shield the vehicle, as well as positive air pressure inside the vehicle.



Detection Robot

The remote-controlled cameras of the robot are used for fact-finding at disaster scenes that cannot be entered by rescue personnel. Its instruments also detect and measure radiation, flammable gases, chemicals, and other substances.



Rescue Robot

The remote-controlled arms of the robot remove debris. The robot's conveyor belt is used to rescue victims by drawing them inside.

Fire Department Earthquake Preparedness Systems

Exchange with China, France, Israel, Portugal, Romania, and the United States

Objective: To mitigate earthquake damage

To mitigate earthquake damage by putting together and systemizing necessary information in data systems to help emergency responders take appropriate action immediately after a devastating earthquake.

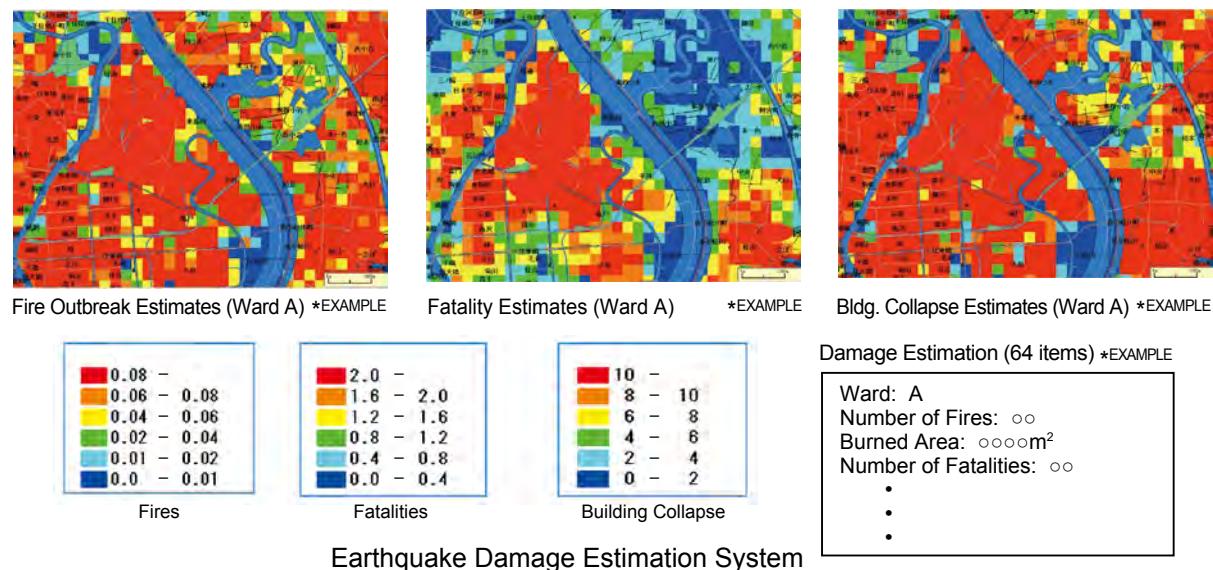
Overview: Temporal and spatial understanding of the disaster situation and firefighting capabilities

A set of 10 unique systems was developed to support the TFD's firefighting activities for earthquake damage mitigation. The systems allow temporal and spatial understanding of the disaster situation such as fire and building collapse (outbreaks and spread estimates), and response capabilities such as the number of firefighters and vehicles that can be mobilized.

Details: Examples of systems

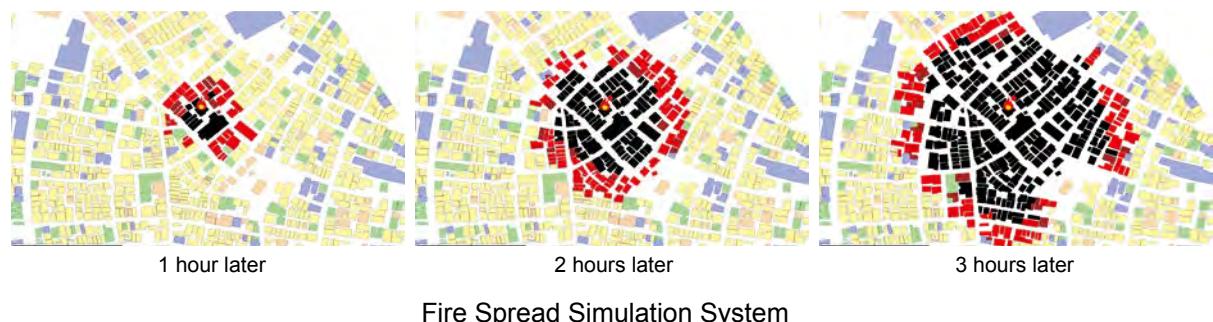
- Earthquake Damage Estimation System

This system estimates the risk of fire outbreaks, fatalities, building/ground damage, road obstructions and other kinds of damage immediately after an earthquake.



- Fire Spread Simulation System

This system estimates both the spread of fire and the number of necessary firefighting units based on weather conditions (e.g. wind direction/velocity), city composition, expected building collapse, and other factors, and depicts this on maps where necessary information such as building shape, structure, and number of floors have been entered beforehand.



Improvement of Districts with Close-Set Wooden Houses

Objective: To turn areas with close-set wooden houses into communities that do not burn or spread fire

Of areas with close-set wooden houses, which contain a high concentration of aging wooden structures, those expected to sustain particularly serious damage when a major earthquake occurs have been designated as development districts*. In order to eliminate this danger, Tokyo is promoting the fireproofing of these neighborhoods and development of firebreak belts in an integrated manner.

*Districts covering an area totaling approx.

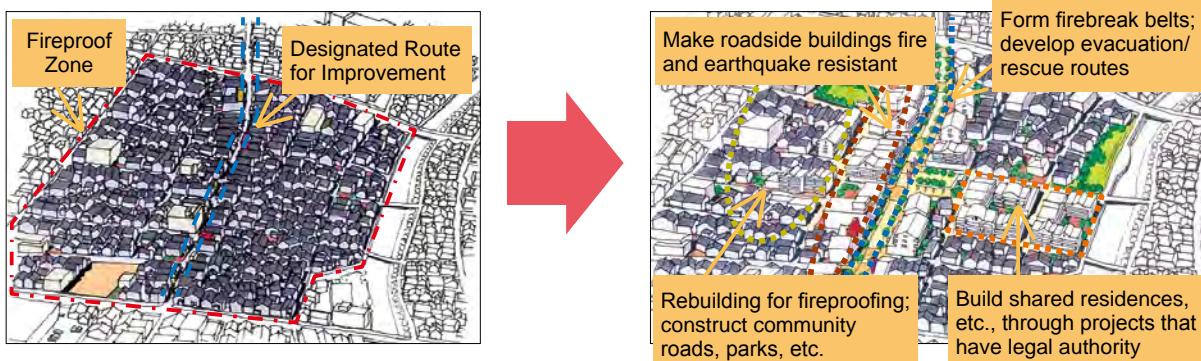
6,900 ha

(About 11% of the land area of the wards, containing about 300,000 wooden houses and a population of about 1.8 million people)



Overview: Prompt resolution of issues through two initiatives

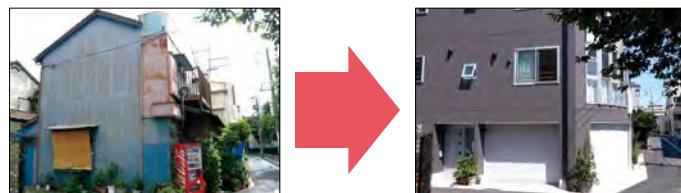
Tokyo designates areas in particular need of improvement as fireproof zones, and is promoting the fireproofing of buildings through tax incentives and subsidies for the cost of rebuilding. In addition, Tokyo designates roads that will be effective in blocking the spread of fire and facilitating evacuation as designated routes for improvement. While extending support to property rights holders to assist them in rebuilding their lives, Tokyo works for early completion of these roads.



Details: Examples of initiatives

1) Fireproof zones

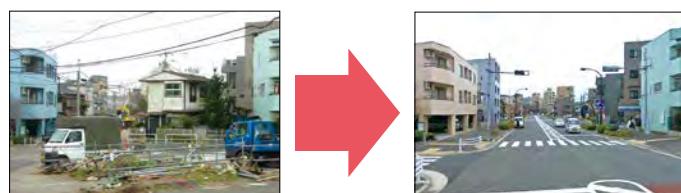
- Provision of subsidies to cover demolition costs and design costs to rebuild houses
- Reduction/exemption of Tokyo Metropolitan tax
- Provision of plans by experts to support displaced residents
- House-to-house surveys of local residents' needs



Replacement of an old wooden building with a fireproof one

2) Designated routes for improvement

- Conducting surveys on residents/businesses in the area regarding their wishes; establishment of consultation desks using private sector businesses
- Assistance with relocation expenses, finding replacement land for relocation or introducing metropolitan housing



Development of a city-planned road

Seismic Resistance of Buildings along Disaster Response Routes

Objective: To prevent the blockage of disaster response routes following a major earthquake

Road blockage could greatly hinder wide area evacuation, as well as emergency and firefighting activities, leading to huge damages.



Road blocked by a collapsed building following the 1995 Great Hanshin-Awaji Earthquake

In preparation for a major earthquake, the TMG designates roads that should not be blocked after an earthquake strikes, and places priority on promoting the seismic resistance of buildings along these roads.



A disaster response route, which will serve as a major artery for the transport of relief, etc. in the event of a disaster

Overview: Carrying out seismic inspections and retrofitting

- It is mandatory for owners of buildings located alongside designated routes to carry out seismic inspections
- The TMG subsidizes building owners for the cost of seismic retrofitting.

Details: Map of designated disaster response routes

Designated Disaster Response Routes (about 1,000km in total length) are emergency transportation roads in particular need of the promotion of seismic retrofitting of buildings along the route.

- | |
|---|
| Designated disaster response routes |
| Expressway |
| Road other than expressway |
| Emergency transportation road other than designated emergency transportation road |



Details: Mandatory seismic-resistance inspections, enlightening the public about seismic-resistance inspection and retrofitting, and subsidizing retrofitting costs

- Seismic inspections are mandatory for owners of buildings along designated disaster response routes.
- Advisors are sent to buildings situated along designated disaster response routes to help formulate retrofitting plans. In addition, metropolitan and municipal staff members visit areas along routes that have a low rate of seismic-resistant buildings to actively enlighten the public.
- When the inspection reveals lack of seismic resistance, the TMG urges the owner to carry out seismic retrofitting, and supports efforts by subsidizing a portion of the costs.

Measures to Suppress the Surfacing of Manholes Due to Liquefaction

Exchange with New Zealand

Objective: To mitigate the uplift of manholes and ensure transportation functions

Liquefaction from the strong shaking of an earthquake could result in buoyant forces lifting the manholes. As this would have a large impact on sewer functions and passage of emergency vehicles, manholes are being fitted with mechanisms to prevent uplifting during an earthquake.



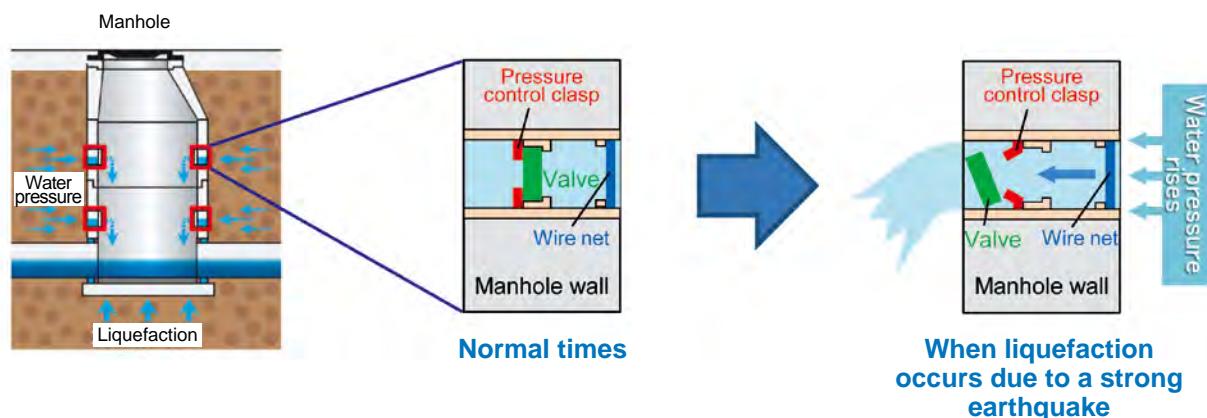
Manhole uplift due to liquefaction
(Great East Japan Earthquake (March 11, 2011))

Overview: Releasing excess pressure into the manholes

This technology installs pressure control devices on the wall of the manhole, and by releasing the excess pressure generated from liquefaction into the manhole, the uplift of the manhole is suppressed.

Details: Mechanism of mitigating floatation

Valves are installed on the inner wall of manholes. When liquefaction occurs from the strong shakings of an earthquake, and water pressure rises, the valves automatically fall off and ground water flows into the manholes. This lowers the water pressure and mitigates the uplift of manholes.



Valve placed inside the manhole



Collection and Provision of Ground Survey Results

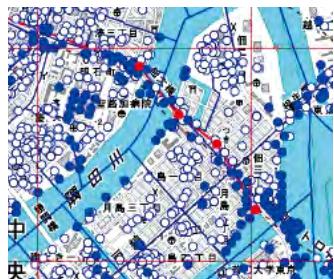
Objective: To broadly use ground survey data to implement measures for disaster preparedness, construction, and the environment

Tokyo has created a database of ground survey results to be used as a basic reference source for earthquake measures, including liquefaction measures, and the construction of urban infrastructure. The database is also available online for broad use of the information by the residents of Tokyo.

Overview: Collection, sharing and usage of boring data

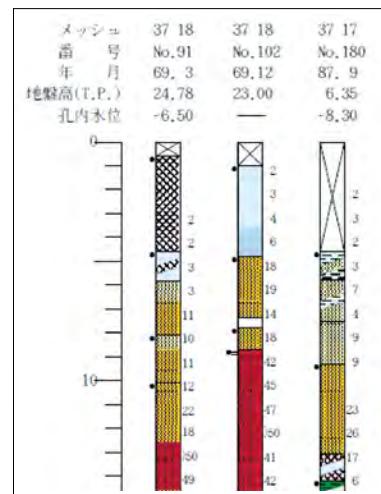
Data from ground surveys conducted by various organizations, including data on ground firmness and soil properties, is collected and compiled to form a database.

In addition to being used for disaster preparedness, this data has been used in the construction of the Toei Oedo Subway Line and plans for the Chuo Shinkansen line. Tokyo is making this information accessible to the public through the Internet and pamphlets.



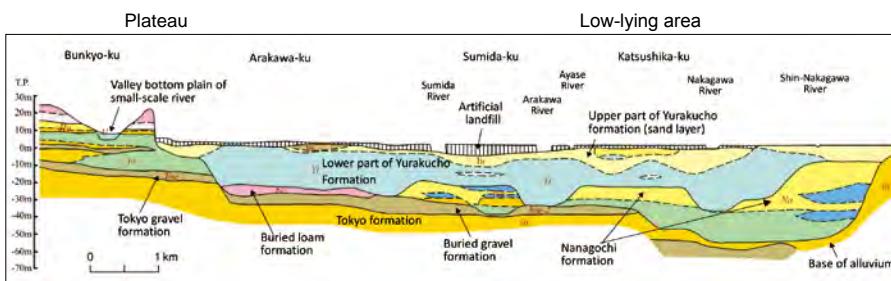
Screen display for boring data search results

- * Data available for approx. 20,000 points throughout Tokyo
- * The highly concentrated data for the 23 special wards is provided in an average 200-meter mesh
(No data available for the mountainous areas and the Tokyo islands)



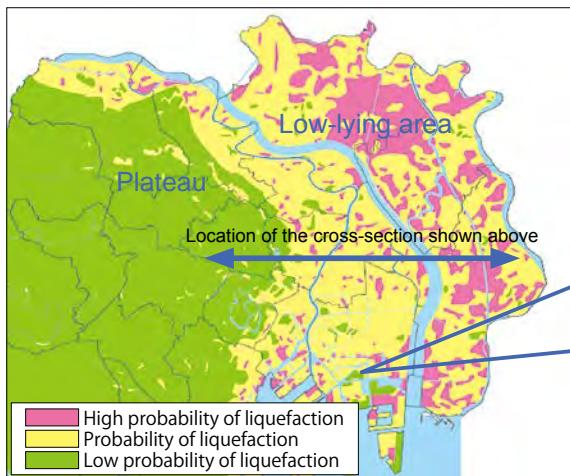
Borehole Log
*Soil data by depth

Details: Examples of use of ground survey results



Cross-sectional soil profile map created from boring data

- * You can see that in comparison to the plateau, bearing layers (hard soil that supports building piles, such as the Tokyo gravel formation) are located more deeply below the surface in the low-lying area.



Liquefaction potential map created from boring data

- * You can see that low-lying areas with silty sand deposits are prone to liquefaction.



Liquefaction caused by the Great East Japan Earthquake (March 11, 2011)
• Sand and groundwater is gushing out of the crack in the road.

Development and Management of Shoreline Protection Facilities

Objective: To prevent flood damage caused by storm surges and tsunamis

Facilities protect the lowland waterfront area of Tokyo, which makes up approximately 40% of the land of the ward area and has a population of about 3.0 million, from flood damage caused by storm surges and tsunamis.

Overview: Structural and non-structural measures

- Technology related to the construction of shoreline protection facilities such as floodgates, seawalls, and interior embankment structures

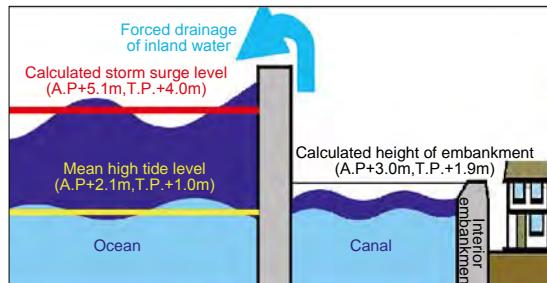
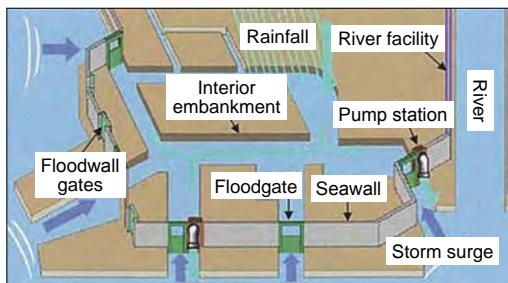
The TMG builds a line of protective structures approx. 5-8 meters in height to prevent seawater from flooding inland due to storm surges or tsunamis occurring from an earthquake of the largest scale.

- Technology related to the operation of floodgates, floodwall gates
Normally, floodgates (on canals and rivers) and floodwall gates (on roads) are kept open for the passage of ships, people, and cars. When a typhoon or earthquake strikes, the floodgates and floodwall gates are closed, allowing them to serve as part of the embankment to protect inland areas from flooding.



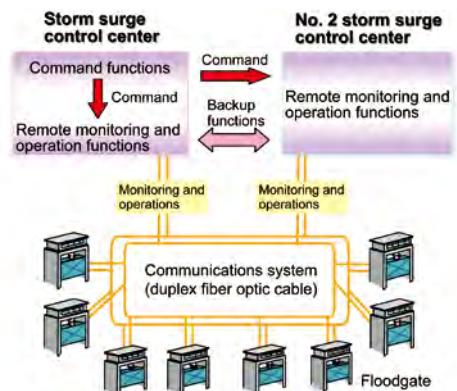
Details: Mechanism of shoreline protection facilities and their management by remote control

- Mechanism of shoreline protection



- Remote control of floodgates and backup functions

Storm surge control centers are prepared for sudden, unexpected situations by constantly monitoring images from onsite surveillance cameras and information signals. The two storm surge control centers and floodgates are connected by duplex fiber optic cable, allowing the floodgates to be closed by remote control. Backup functions are also in place. If one of the centers should fail to function, the other center will be able to open and close all the floodgates.



Reduction of Flood Damage through River Basin Measures

Objective: To reduce flood damage

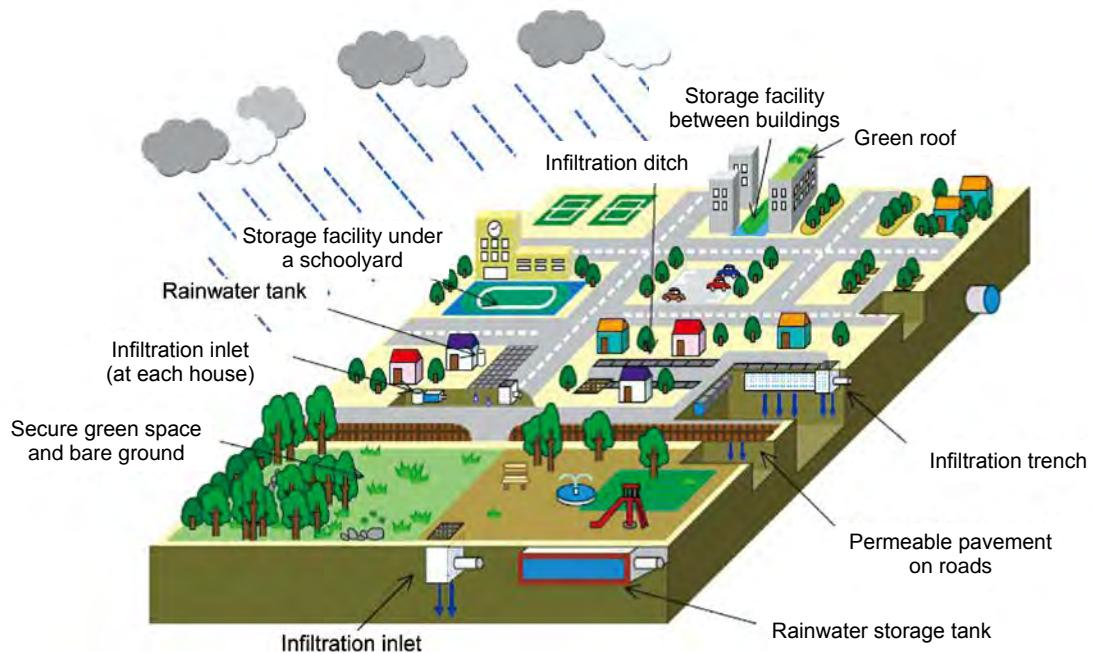
- We aim to reduce urban flood damage by inhibiting the direct flow of rainwater into rivers and the sewer system during a torrential downpour through maximum use of rainwater retention and rainwater infiltration.

Overview: Implementation of river basin measures

- Installation of rainwater storage and infiltration facilities at public facilities such as schoolyards and parks
- Promotion of the installation of rainwater runoff control facilities through efforts such as subsidizing programs conducted by the municipalities for installation of infiltration inlets at private residences

Details: Types of rainwater runoff control facilities and installation examples

- Types of rainwater runoff control facilities



- Installation examples



Rainwater storage facility under a schoolyard



Infiltration inlet



Infiltration trench

Flood Control through Regulating Reservoirs

Exchanges with Seoul and Beijing, etc.

Objective: To prevent flood damage caused by typhoons and torrential rains

With torrential rains occurring more frequently in recent years, the TMG is promoting the improvement of small and medium-sized rivers to protect the lives and livelihoods of Tokyo citizens from floods resulting from typhoons and heavy rains.



1982 typhoon (Kanda River)



2005 torrential rain (Myoshoji River)

Overview: Improvement of small and medium-sized rivers

The Bureau of Construction is working to quickly enhance safety from flood damages. Along with river channel improvements, including widening, in urban areas where there are many buildings and houses along a river, the Bureau constructs regulating reservoirs to hold flood waters and diversion channels to divert some of the flood water.



River channel improvement



Before

After



Regulating reservoir



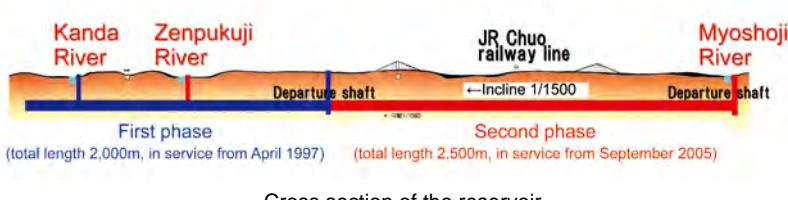
Diversion channel

Details: Kanda River / Ring Road No. 7 Underground Regulating Reservoir

The Kanda River / Ring Road No. 7 Underground Regulating Reservoir was constructed with the aim of quickly enhancing safety from flooding in the Kanda River middle basin that is prone to flooding. Located about 40 meters beneath this arterial road, it is a 4.5km long tunnel with an inner diameter of 12.5 meters, which can store 540,000 cubic meters of water. As of August 2016, the facility has taken in water from the river 39 times since it went into service in April 1997, demonstrating high effects in reducing flood damages in the downstream area.



Location of the reservoir



Cross section of the reservoir



Shield machine



Tunnel interior



Water flowing into the intake facility



Typical cross-section

Flood Control through Sewerage Storage Facilities

Objective: Mitigation of flood damage

To make Tokyo a safe and sound place for its residents by securing urban functions through the advancement of measures to control flooding in the event of localized intense rainfall, which has been occurring frequently in recent years. One way to mitigate flood damage is to temporarily store stormwater in sewer system storage facilities.



Flood damage

Overview: Storage of stormwater exceeding the capacity of sewers

Flood damage can be mitigated by temporarily storing stormwater in storage facilities when sewer water levels rise due to a rapid increase in the volume of rainfall from typhoons or concentrated, intensive rain.

Details: Example of storage facility construction

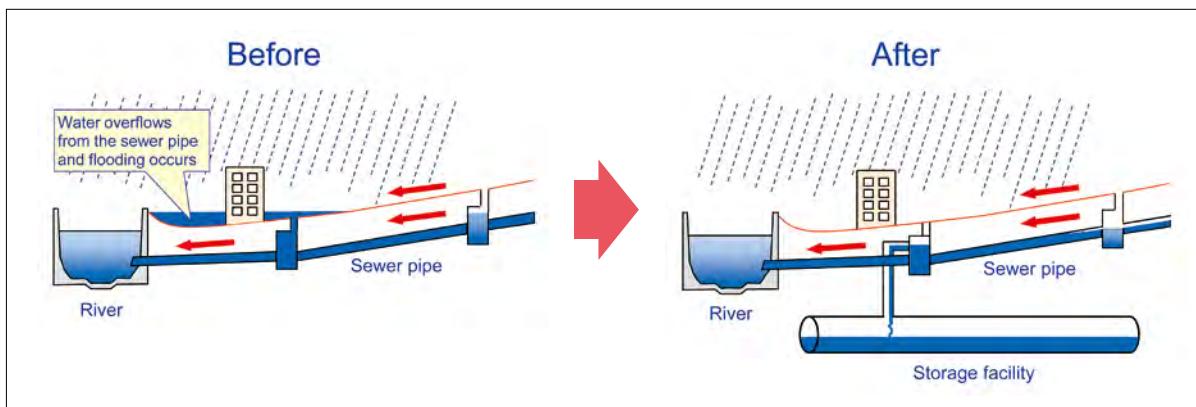


Image of reducing flood damages by constructing storage facilities

The Wada-Yayoi Trunk Sewer is a storage facility with an inner diameter of 8.5 meters and length of about 2.2 kilometers. This trunk sewer and the collecting pipes can collect stormwater from an area as wide as 573 hectares and store up to about 150,000 cubic meters of water.



Wada-Yayoi Trunk Sewer
(Inspection tour after completion)

Information Provision on Heavy Rainfall and Flooding

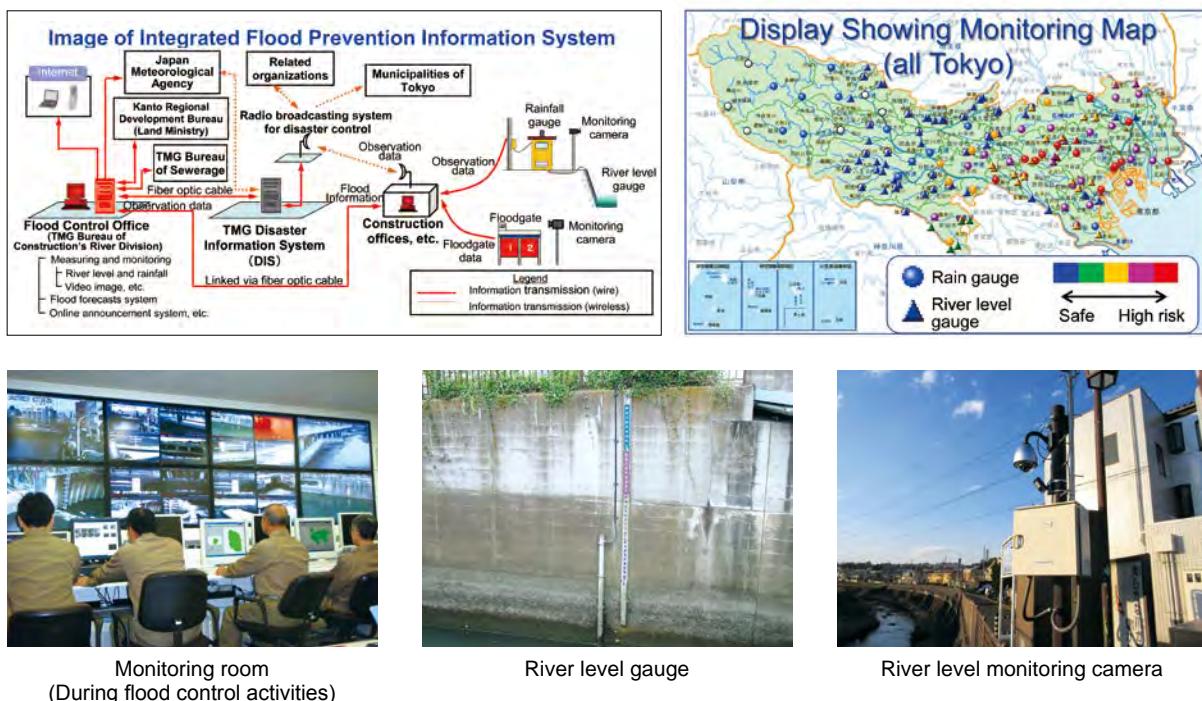
Exchange with Tigre (Argentina) and the United States, etc.

Objective: To quickly provide flood and storm surge information

Flood control activities are very important in preventing and mitigating damages from flooding and storm surges. To ensure smooth flood control activities, the TMG provides its citizens and municipalities with river level and rainfall data, flood warnings and other relevant information utilizing its Integrated Flood Prevention Information System.

Overview: Integrated Flood Prevention Information System

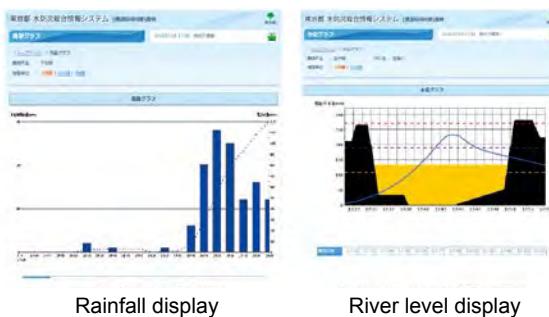
The TMG Integrated Flood Prevention Information System consists of the observation and monitoring system, flood forecast system, online announcement system, and others. It monitors data from 140 rain gauge sites and 164 river level gauge sites in Tokyo every minute, 24 hours a day.



Details: Online announcements and flood forecasts

Monitored rainfall and river levels and other information are made public over the Internet

The system forecasts river levels up to one hour ahead using rainfall and river level information, and announces flood forecasts when there is a risk of flooding.



Rise in river level (Meguro River)