



# ***Megacities in the Indo-Pacific Region***



***Major Caleb Dexter, Captain Jesse Geyer, Captain Jheaniell Moncrieffe***

***Dense Urban Terrain Team***

***Asymmetric Warfare Group***

***“Current and Future Operations in Megacities” Conference***

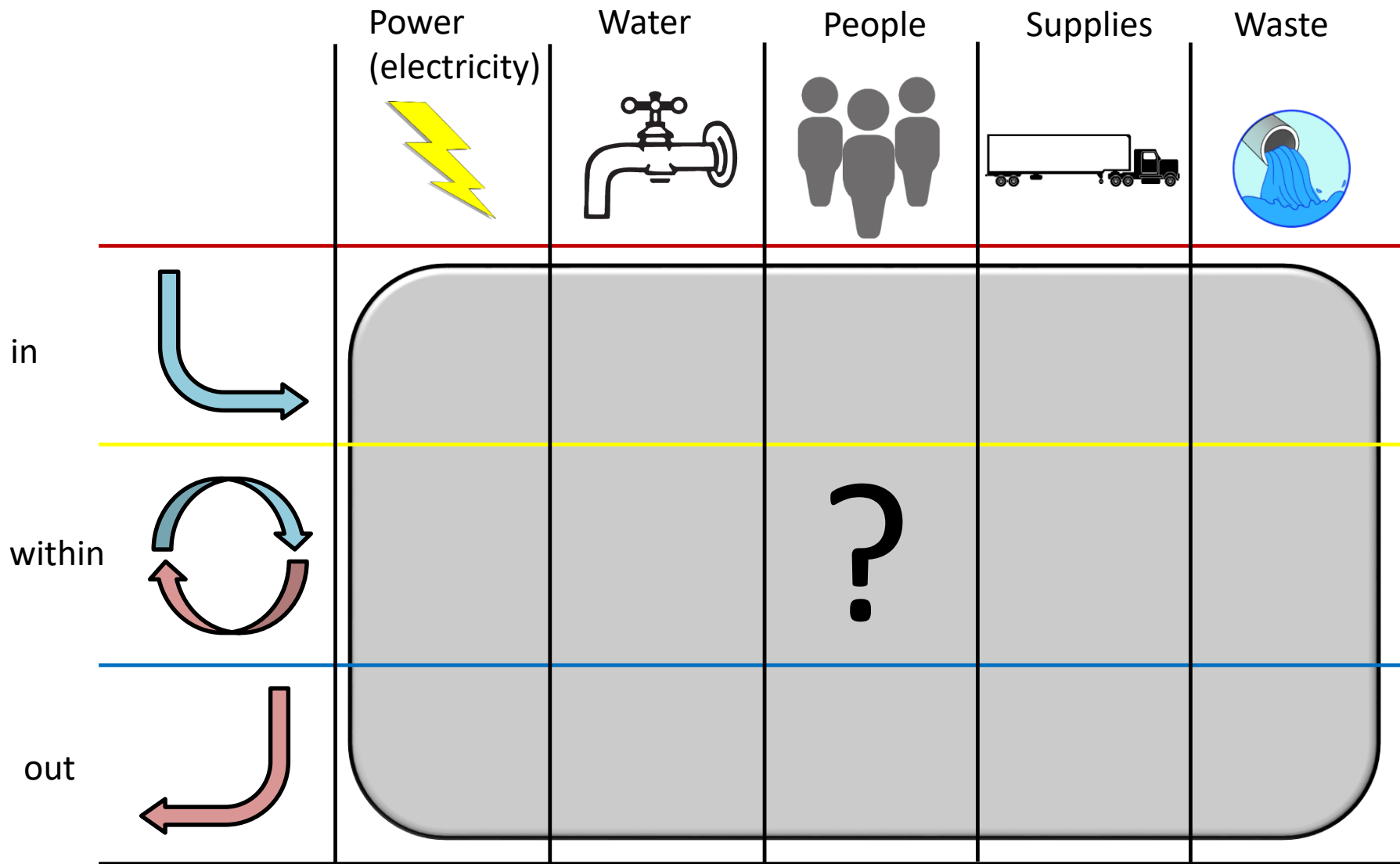
***National Institute for Defense Studies, Tokyo, Japan.***

***July 16, 2019***



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# Flow Analysis for Disaster Relief





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# Power



## The Mainichi

Japan's National Daily Since 1922



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## Huge quake in Hokkaido leaves 7 dead, safety of 31 unknown

September 6, 2018 (Mainichi Japan)

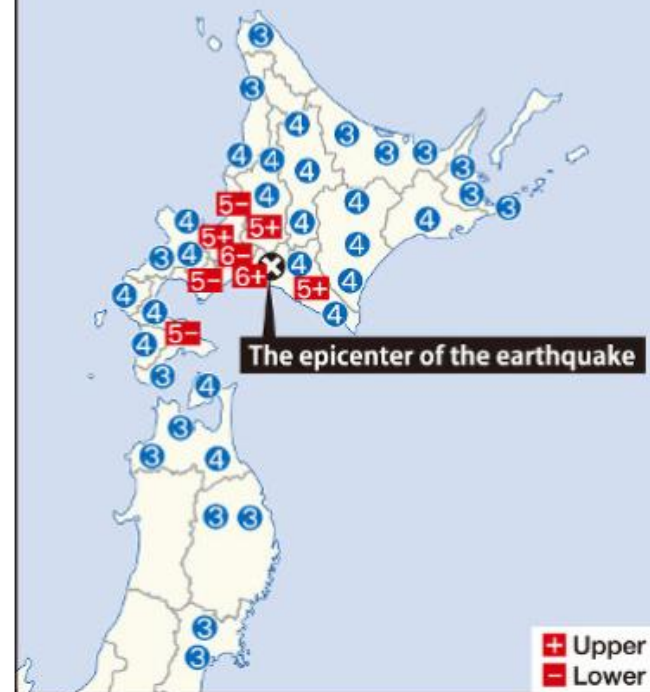


A building in the town of Abira, Hokkaido, is seen damaged by an earthquake with a preliminary magnitude of 6.7 that rocked Japan's northernmost main island of Hokkaido on Sept. 6, 2018. (Kyodo)

<https://mainichi.jp/english/articles/20180906/p2a/00m/0na/009000c>

### Quake intensity by region on Japan's 7-point scale

At around 3:08 a.m. on Sept. 6, 2018



(Mainichi)



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[https://commons.wikimedia.org/wiki/File:2011\\_Sendai\\_earthquake\\_Tokyo.JPG](https://commons.wikimedia.org/wiki/File:2011_Sendai_earthquake_Tokyo.JPG)





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# Power





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# Power

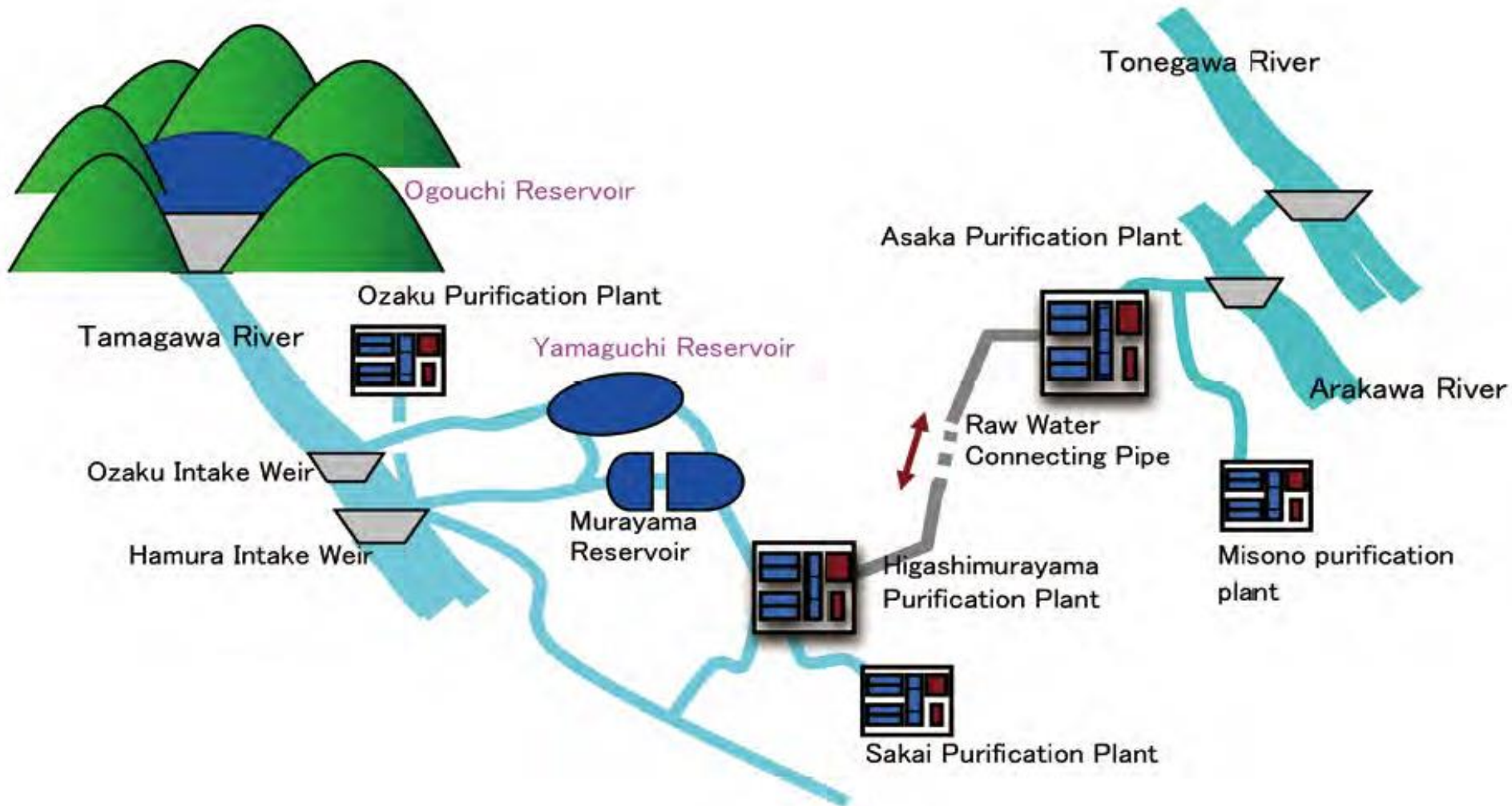


Adobe stock image



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# Water







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# Water





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# People



<https://www.maxpixel.net/Boy-Railway-Station-Sad-Young-People-Melancholy-412041>





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# Supplies



<https://www.mcasiwakuni.marines.mil/News/Photos/igphoto/256521/>



[https://www.public.navy.mil/surfor/lhd2/Pages/USSEssex\(LHD2\)inSupportofOperationTomodachi.aspx](https://www.public.navy.mil/surfor/lhd2/Pages/USSEssex(LHD2)inSupportofOperationTomodachi.aspx)



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# Waste



[https://commons.wikimedia.org/wiki/File:UNTREATED\\_SEWAGE\\_FROM\\_MANHATTAN,\\_NEW\\_YORK,\\_FLOWING INTO THE HUDSON RIVER.\\_RIVERS\\_WHICH\\_FLOW\\_THROUGH\\_THE\\_REGION\\_CARRY...\\_-\\_NARA\\_-\\_555781.jpg](https://commons.wikimedia.org/wiki/File:UNTREATED_SEWAGE_FROM_MANHATTAN,_NEW_YORK,_FLOWING INTO THE HUDSON RIVER._RIVERS_WHICH_FLOW_THROUGH_THE_REGION_CARRY..._-_NARA_-_555781.jpg)





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# Waste



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# Metropolis of Tokyo Best Practices





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# Best Practices: Power



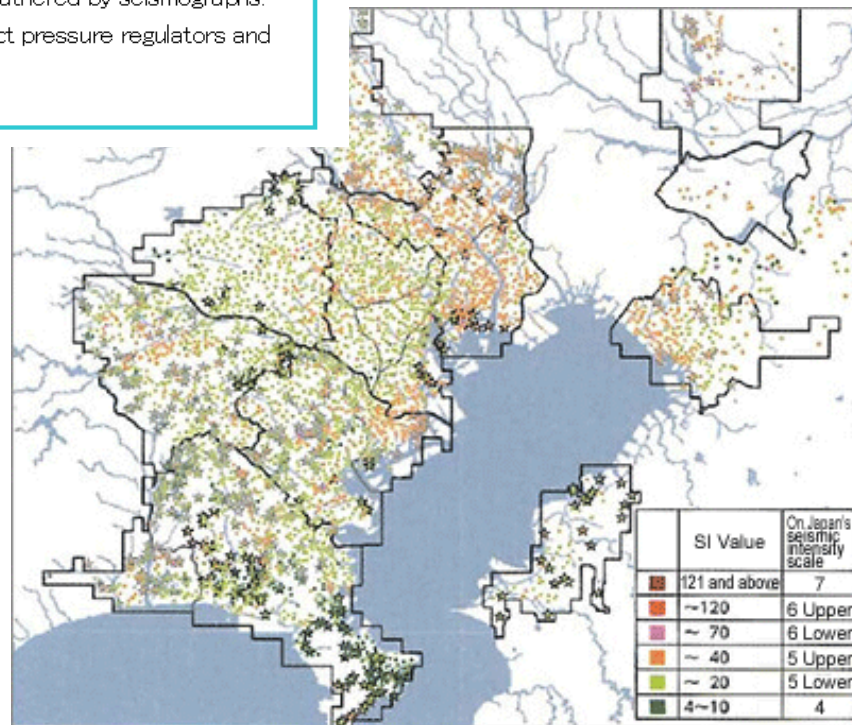
## Topic



**SUPREME**  
Super-dense Real-time Monitoring of Earthquakes

**Ultra-high-density Real-time Earthquake and  
Disaster Preparedness System**

Our SUPREME earthquake and disaster preparedness system uses densely installed seismographs. The system is capable of collecting earthquake data at about 4,000 locations, remotely shutting down district pressure regulators, and estimating damage on gas pipelines in order to monitor district safety. Within about five minutes after a major earthquake, the system identifies damage based on data gathered by seismographs. In about ten minutes, the system swiftly ensures safety by remotely operating district pressure regulators and suspending gas supply to areas where major damage is expected.





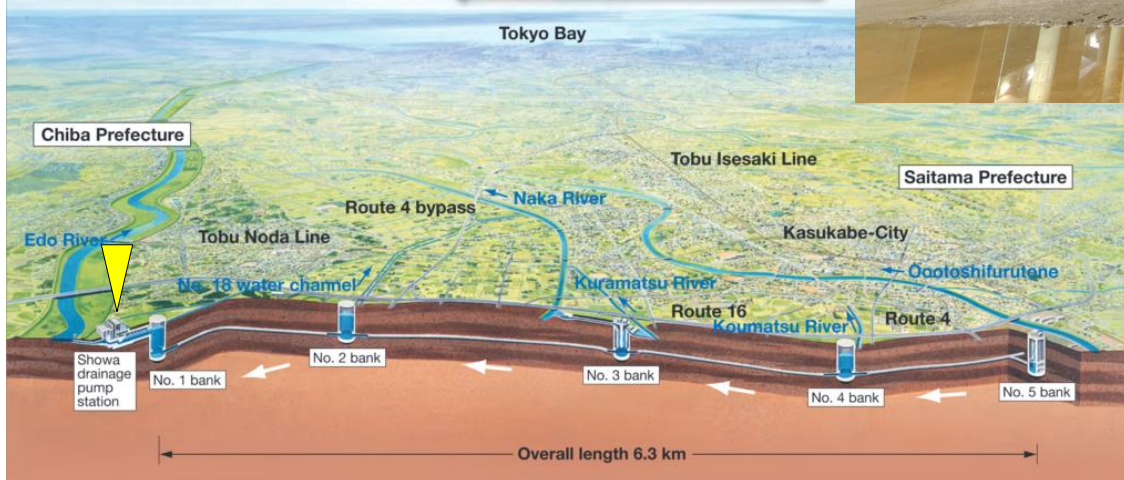
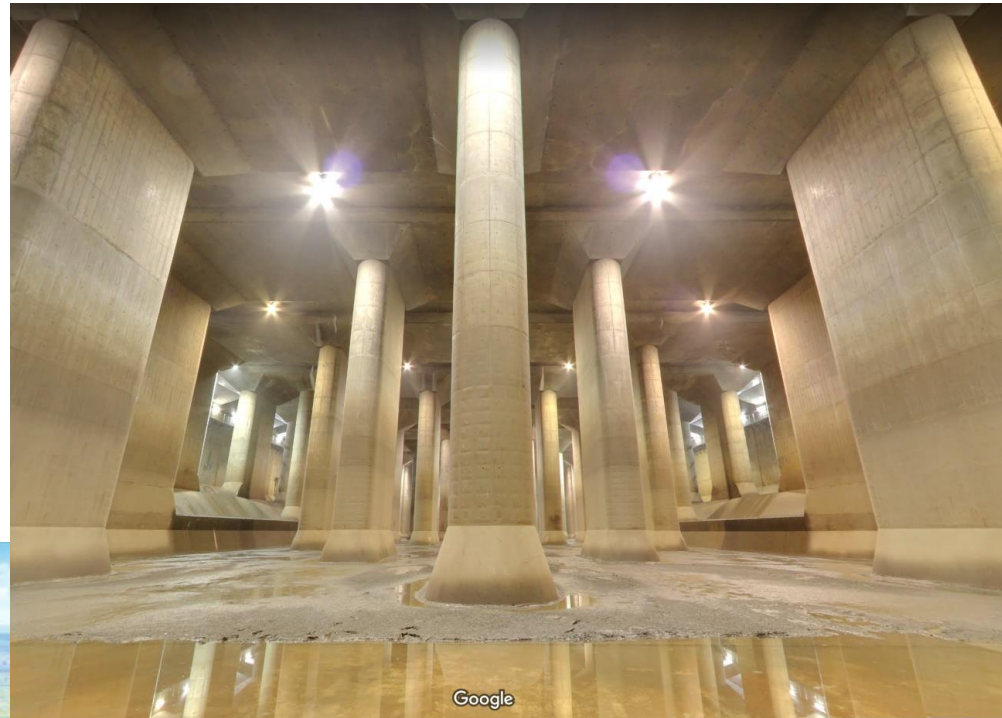
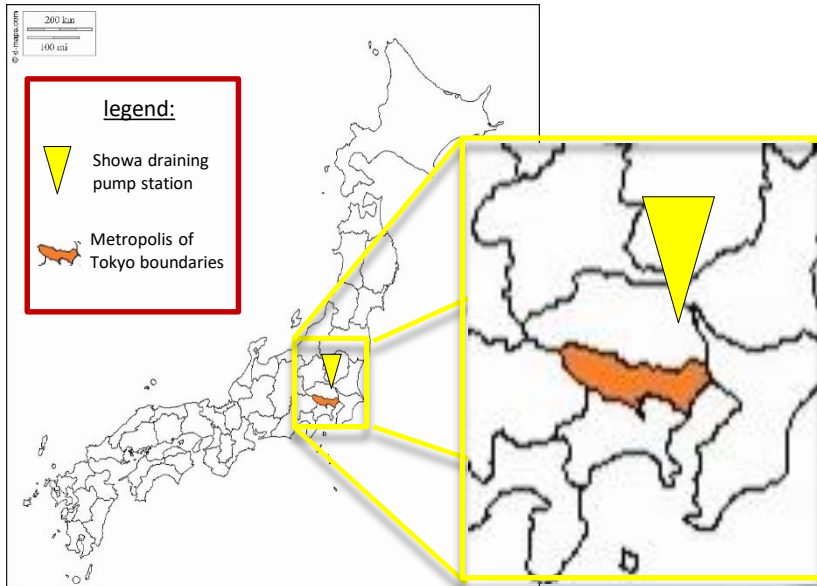


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# Best Practices: Water



## Metropolitan Area Outer Underground Discharge Channel







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# Best Practices: People



TOP page at a Time of Disaster | 1 x



https://www.web171.jp/web171app/topRedirect.do?english

## DisasterMessage Board web171

[日本語](#) [한국어](#) [中文](#)

NTT 東日本 

NTT 西日本 

TOP page

Posting and reading messages is possible with this service.

Phone number

Post



Read



### Notification

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[Click here for details on how to use.](#)

[Press here to "J-ampi All-Japan Safety Confirmation Portal for Disaster"](#)

※ Transferring to a site provided by NTT Resonant Inc. You can search safety information collected by companies and organizations other than the Disaster Message Board.



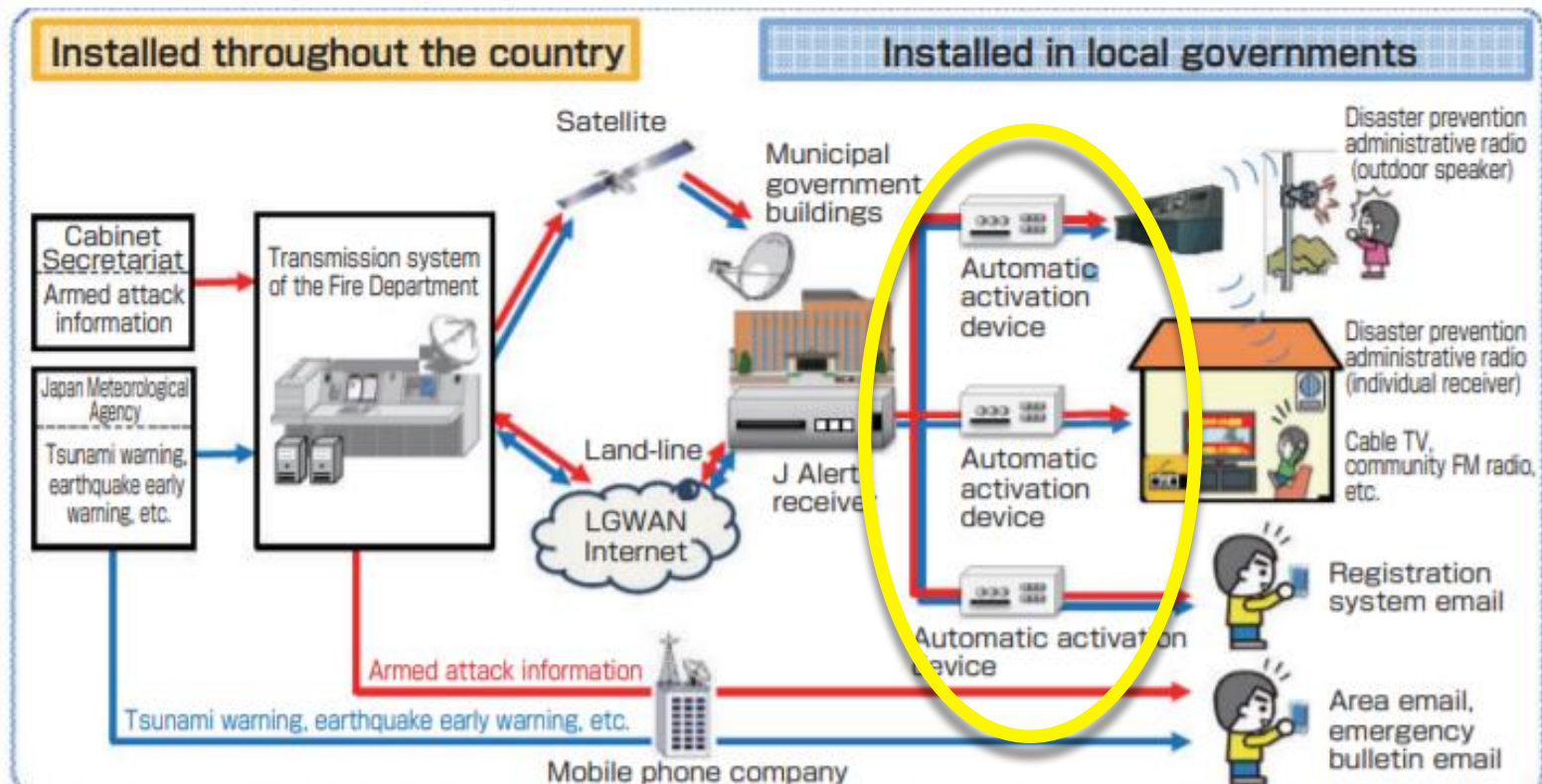
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# Best Practices: People

## J-Alert nationwide instantaneous warning system

If there is a possibility that a ballistic missile may fall within the territory or territorial waters of Japan, or possibly pass through the territory or territorial waters of Japan, the J-Alert nationwide instantaneous warning system will be used to provide you emergency information, in addition to sending messages along with special siren sounds over disaster prevention administrative radio, by emergency emails, and so on.



Source: "Overview of J-Alert," Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications



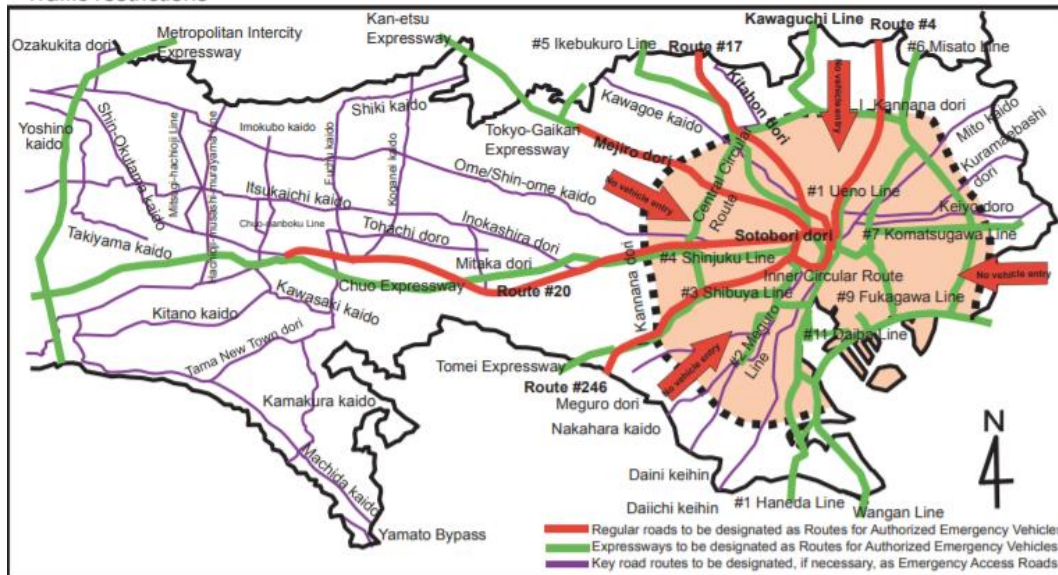


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# Best Practices: People



## Traffic restrictions



## Initial Traffic Restriction

(as stipulated in "the Road Traffic Law")

1. Entry of ordinary vehicles to the area surrounded by the Kannana dori (Tokyo's Loop Road #7) will be banned.

TMG will carry out traffic restrictions along the Kannana dori to cut down on the volume of traffic heading for central Tokyo.

2. Entry of ordinary vehicles to the area surrounded by Kampachi dori (Tokyo's Loop Road #8) will be controlled.

TMG will operate traffic signals to control the volume of vehicles heading for central Tokyo.

3. Routes for Authorized Emergency Vehicles will be designated.

TMG will designate the following seven road routes for authorized emergency vehicles and ban the other traffic.

Route #4 (Nikko kaido, etc.)	Route #17 (Nakasendo, Hakusan dori, etc.)
Route #20 (Koshu kaido, etc.)	Route #246 (Aoyama dori, Tamagawa dori)
Mejiro dori	Sotobori dori
National Expressway, Metropolitan Expressway	

4. In case of an earthquake that has caused an extremely large damage

TMG will evaluate the situation and may restrict the traffic of ordinary vehicles.

## Secondary Traffic Restriction

(as stipulated in "the Basic Act on Disaster Control Measures")

1. "Emergency Access Roads" will be designated.

TMG will prioritize "Routes for Authorized Emergency Vehicles" to be able to function as Emergency Access Roads.

2. The number of "Emergency Access Roads" will be augmented.

Depending on a state of disaster, we'll designate, if necessary, the following road routes to be able to function as Emergency Access Roads.

Daiichi keihin	Daini keihin	Nakahara kaido	Meguro dori
Ome/Shin-ome kaido	Kawagoe kaido	Kitahon dori	Mito kaido
Kuramaebashi dori	Kelyo doro	Inokashira dori	Mitaka dori
Tohachi doro	Koganei kaido	Shiki kaido	Fuchu kaido
Imokubo kaido	Itsukaichi kaido	Chuo-nanboku Line	Hachioji-musashi-murayama Line
Mitsugi-hachioji Line	Shin-Okutama kaido	Ozakukita dori	Yoshino kaido
Takiyama kaido	Kitano kaido	Kawasaki kaido	Tama New Town dori
Kamakura kaido	Machida kaido	Yamato Bypass	

Given that how the National Government of Japan will draw up a traffic control plan in Tokyo and its vicinity or that how the Tokyo Metropolitan Government Offices will revise the Regional Plan for Disaster Prevention and will accordingly review the current designation of Emergency Access Roads.

Source: TMG



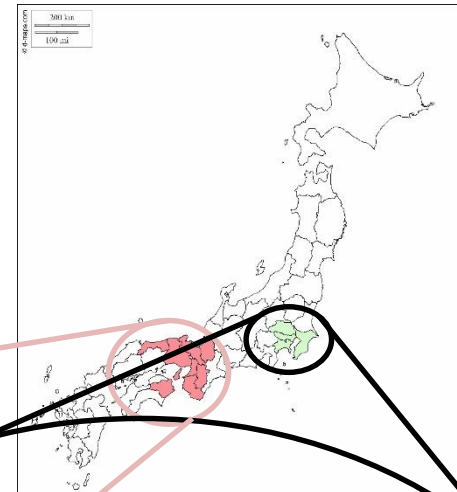
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# Best Practices: People + Supplies



## *Mutual assistance agreements . . .*

Nationwide Agreement on Wide-Area Support in Times of Disaster between Prefectures (signed in July 1996)  
Agreement on mutual support in large-scale urban disasters (concluded in October 1986)  
Agreement on Mutual Support at Times of Disaster between Tokyo and 9 Prefectures (Kanto Region Governors' Association) (signed in June 1977)  
9 Metropolitan Authorities Agreement for Mutual Support During Disasters (Concluded in April 2010)  
Agreement between the Union of Kansai Governments and 9 Metropolitan Authorities for mutual support during disasters (Concluded in March 2014.)



**Union of Kansai Governments**



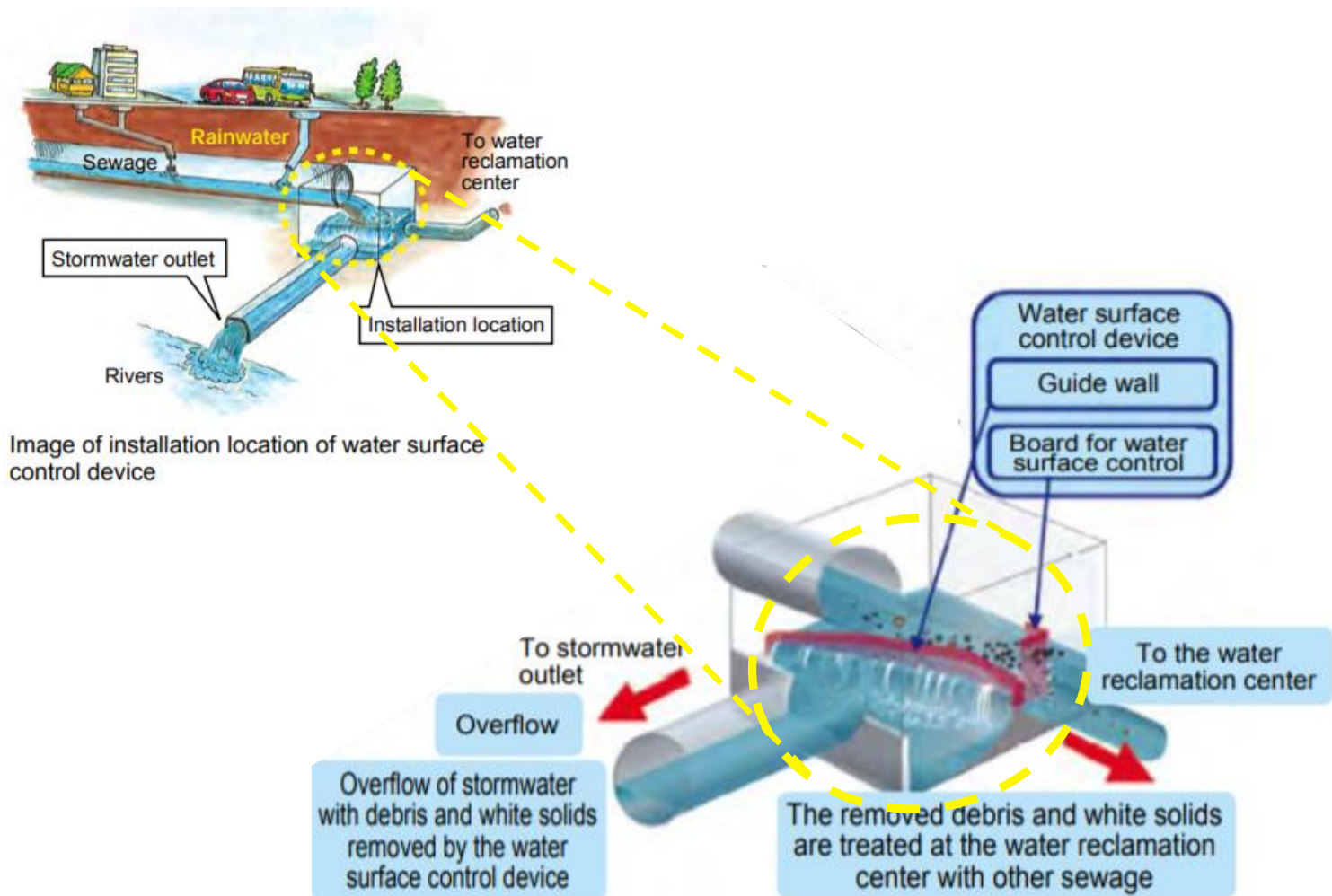
**Nine Metropolitan Authorities Agreement**





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# Best Practices: Waste


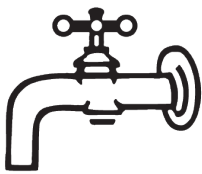

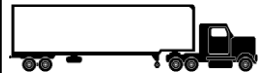

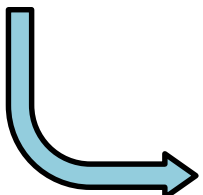





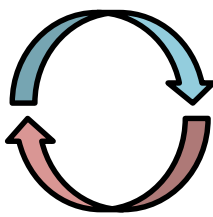




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# Flow Analysis for Disaster Relief



		Power (electricity) 	Water 	People 	Supplies 	Waste 
in 						
within 						





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# Power



Photo Credit: Wikimedia



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# Power



Photo Credit: Wikimedia



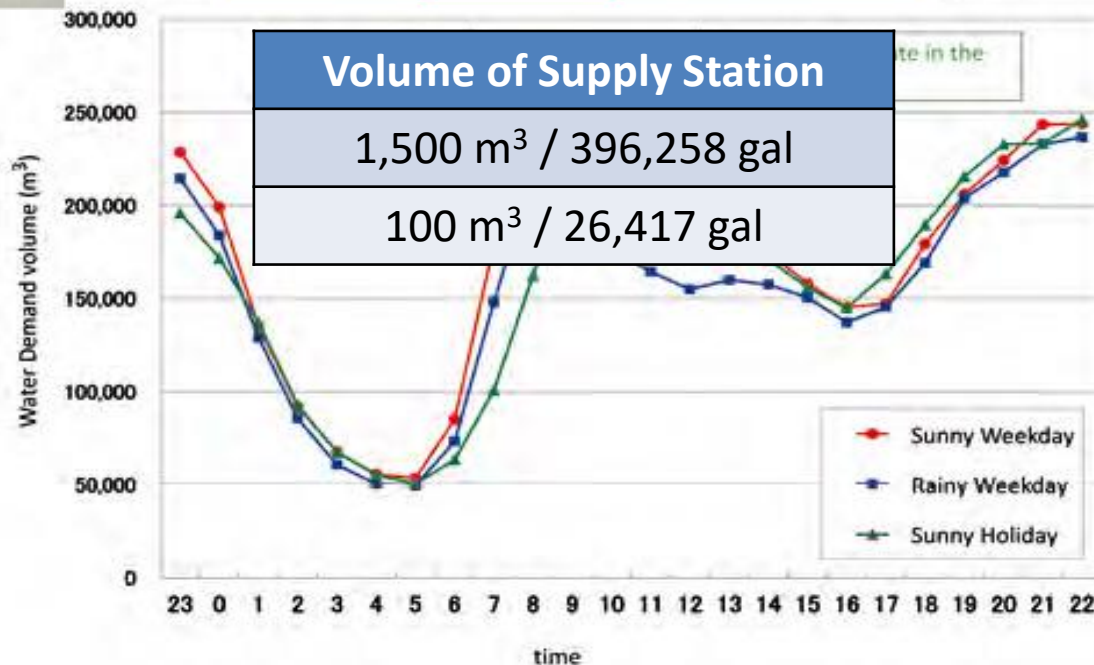
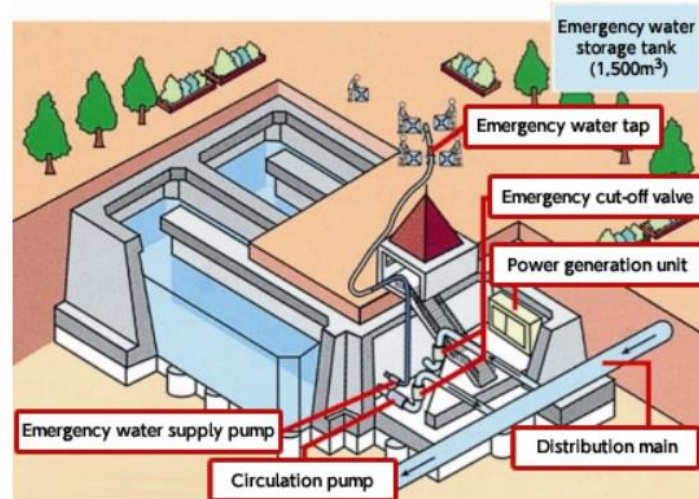


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# Water



## How emergency water storage tanks work





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# Water







VICTORY STARTS HERE!

# People



Photo Credit: Wikimedia



VICTORY STARTS HERE!

# People



Photo Credit: Wikimedia





VICTORY STARTS HERE!

# People



Photo Credit: TMG



World Health Organization

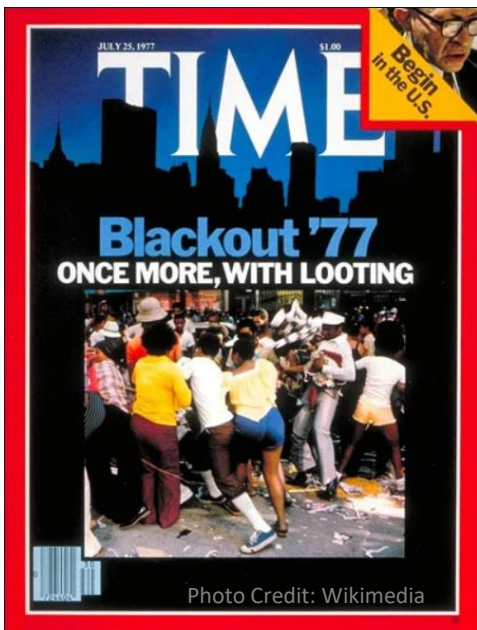


Photo Credit: Wikimedia



Photo Credit: TMG





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# People





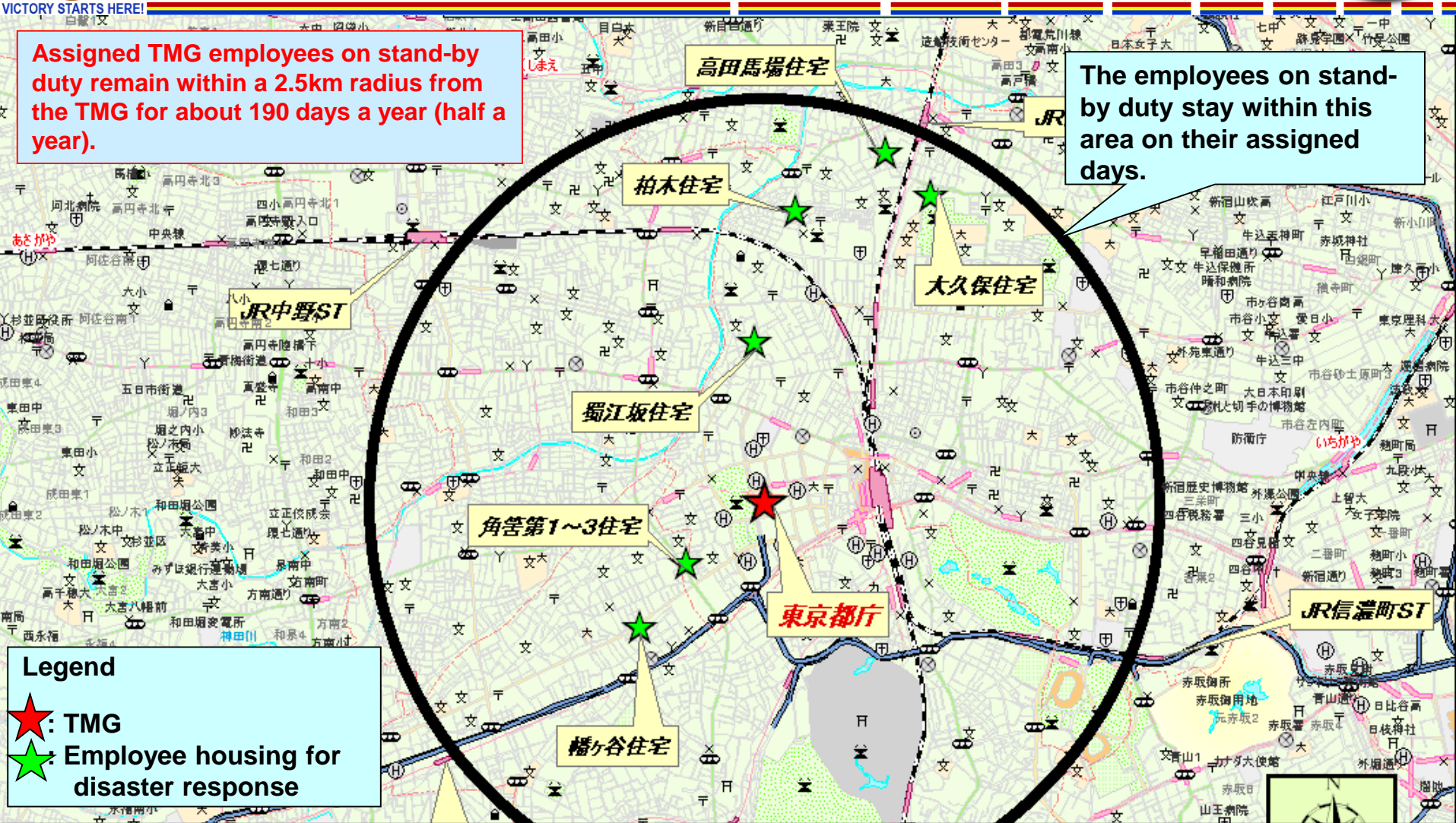


# People



Assigned TMG employees on stand-by duty remain within a 2.5km radius from the TMG for about 190 days a year (half a year).

The employees on stand-by duty stay within this area on their assigned days.



About 50 designated disaster response staff from the Disaster Prevention Division at the TMG who are on call for one-half of a year, and some 100 support staff from various bureaus within the TMG who reside in employee housing for disaster response, located within a 30-minute walking distance from the TMG.



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# Supplies



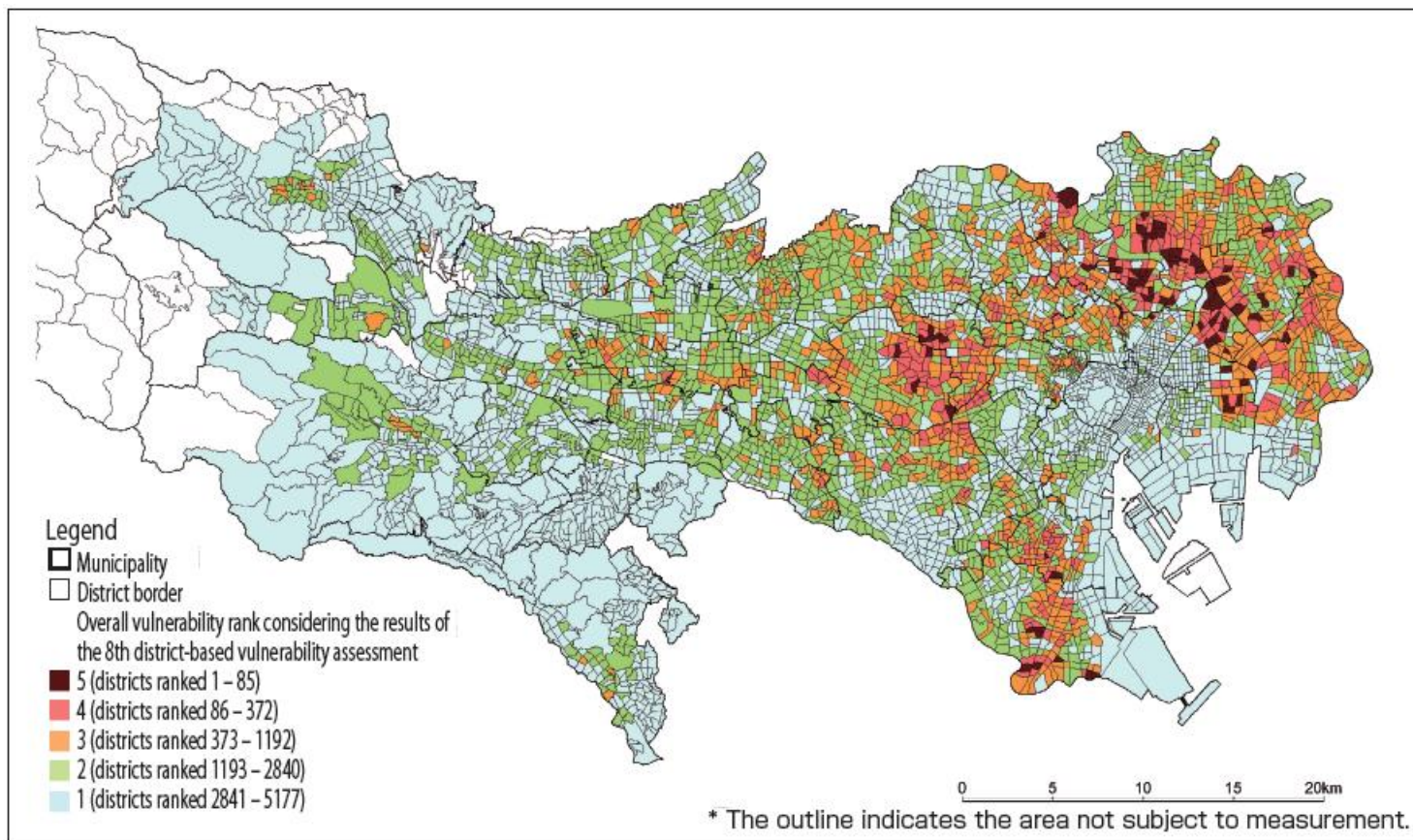
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# Supplies



Source: TMG



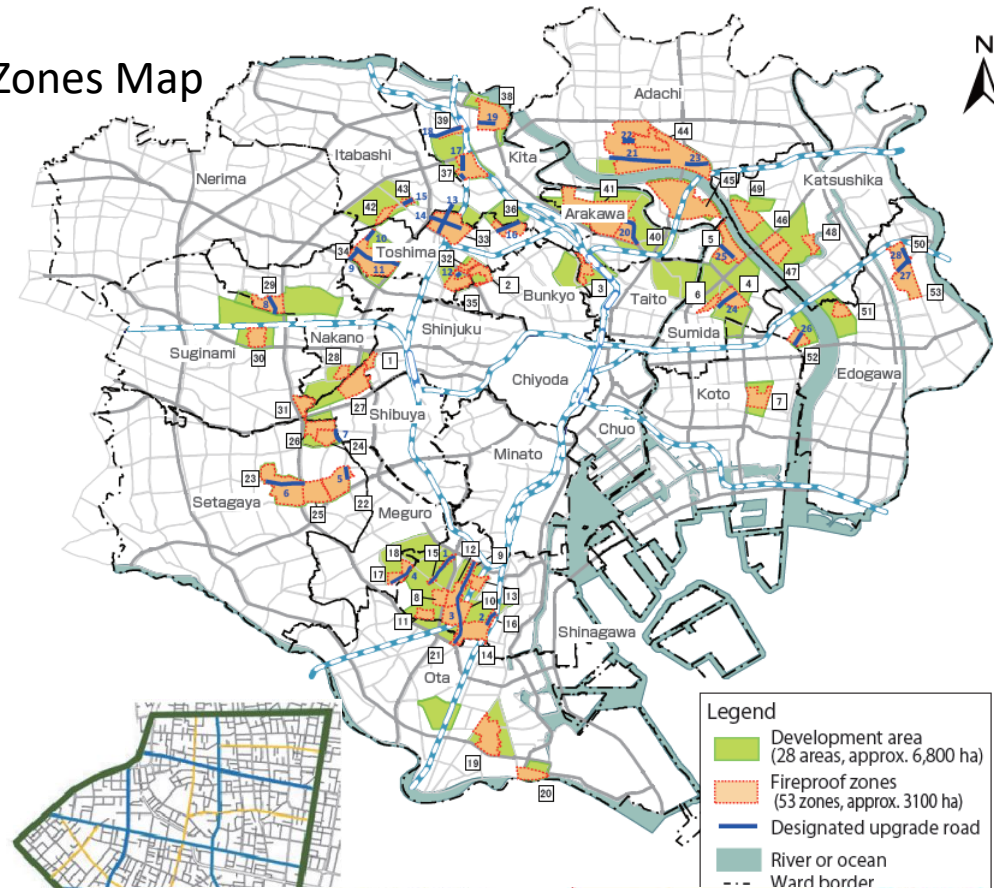
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# Supplies



Example of upgrade by elimination of utility poles  
(top: before upgrade, bottom: after upgrade)

## Fireproof Zones Map



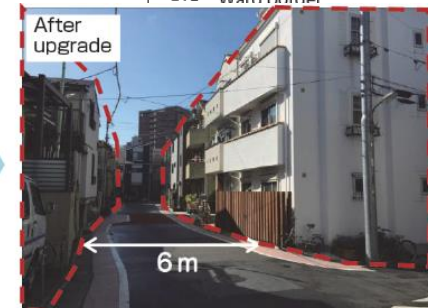
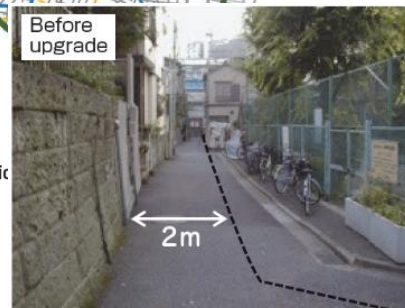
Fireproofing zone

Prevention roads

Width 6 m or more  
(Mainly for smooth fire-fighting and relief activities)

Width 4 m or more and less than 6 m  
(Mainly for smooth evacuation)

Illustration of disaster prevention



Examples of disaster prevention road upgrades





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# Supplies



What's necessary?

## Key Items

(Model family: A family of four—husband, wife, infant and elderly woman)  
Estimates for about 3 days to 1 week

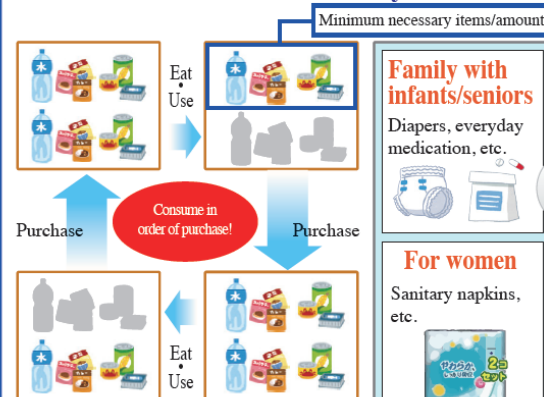
	Supplies for everyday use (to always be stocked)	Supplies for a disaster
Items that disaster survivors have found valuable	<input type="checkbox"/> Water (3 liters a day per person) <input type="checkbox"/> Portable gas cooking stove: 1; canisters: 6 <input type="checkbox"/> Medicine, non-prescription drugs: 1 box each	<input type="checkbox"/> Emergency toilet: 5 units a day per person <input type="checkbox"/> Flashlight: 2 <input type="checkbox"/> Batteries <input type="checkbox"/> Hand-rechargeable or other type of radio
Food	<input type="checkbox"/> Staples Pre-washed rice: 5 kg; heat-and-eat rice: 6; dried noodles: 1; instant noodles: 3 <input type="checkbox"/> Main dish Canned food (e.g. miso-stewed mackerel, vegetables): 6 each <input type="checkbox"/> Heat-and-eat food: 9 <input type="checkbox"/> Canned food (fruit, etc.): 1 <input type="checkbox"/> Vegetable juice: 9 <input type="checkbox"/> Drinks: 6 500 ml bottles <input type="checkbox"/> Cheese, "kamaboko" steamed fish paste, etc.: 1 pack each <input type="checkbox"/> Snacks: 3 <input type="checkbox"/> Nutrition bars 3 boxes; powdered health drink: 1 bag <input type="checkbox"/> Seasonings: 1 set	<p>Save gas by preparing items that heat quickly.</p> <p>Can be eaten without heating.</p> <p>Provides vitamins and minerals lost from the lack of vegetables.</p> <p>Can be eaten without heating.</p>
Daily items	<input type="checkbox"/> Large plastic bag, garbage bag: 30 each <input type="checkbox"/> Plastic bag <input type="checkbox"/> First-aid kit <input type="checkbox"/> Plastic wrap: 1 <input type="checkbox"/> Tissue paper: 5 boxes <input type="checkbox"/> Toilet paper: 12 rolls <input type="checkbox"/> Disinfecting wet wipes: 1 box (about 100) <input type="checkbox"/> Disposable contact lenses: 1-month supply <input type="checkbox"/> Disposable body warmer: 10 <input type="checkbox"/> Ignition stick: 1	<p>Can be used to carry water from a water supply point, or for an emergency toilet.</p> <input type="checkbox"/> Spare battery for mobile phone: 3 (the number of mobile phones) <input type="checkbox"/> Latex gloves: 1 box (about 100) <p>Can keep your hands clean during cooking.</p> <p>Can be used in place of a triangular cloth bandage. Can also be used to cover plates, and by just changing the wrap, dishes need not be washed.</p>
For women	<input type="checkbox"/> Sanitary napkins: about 60	
For infants	<input type="checkbox"/> Powdered infant formula: about 20 single packets (allergen-free) <input type="checkbox"/> Baby food: at least 1-week supply (allergen-free) <input type="checkbox"/> Baby wipes: 1 pack <input type="checkbox"/> Diapers: about 70	
For the elderly	<input type="checkbox"/> Rice gruel or other soft food, food for the elderly: at least 1 week supply <input type="checkbox"/> Medicine (prescription drugs): 1 month supply <input type="checkbox"/> Battery for hearing aid: 6 <input type="checkbox"/> Denture cleaner: about 30	

Based on the above list, prepare your own set of items that meet the needs of your household. First try to prepare a stock for 3 days, then a week or more!



## Image of daily stockpiling at home

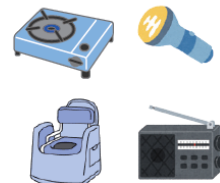
Buy a little extra food and daily essentials and consume these items in daily life



Always keep a little more

Items especially necessary when disaster strikes

- Portable gas cooking stove and canisters
- Flashlight
- Emergency toilet
- Rechargeable radio
- Etc.



Family with infants/seniors

Diapers, everyday medication, etc.

For women

Sanitary napkins, etc.



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# Supplies







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# Waste


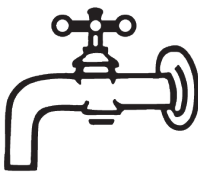

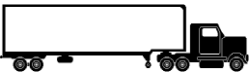

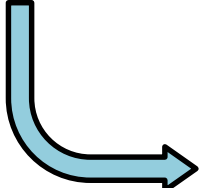
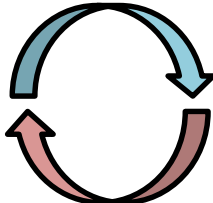
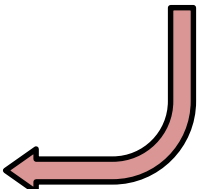




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# Flow Analysis for Disaster Relief



		Power (electricity) 	Water 	People 	Supplies 	Waste 
in 		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
within 		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
out 						





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# *Security Implications*



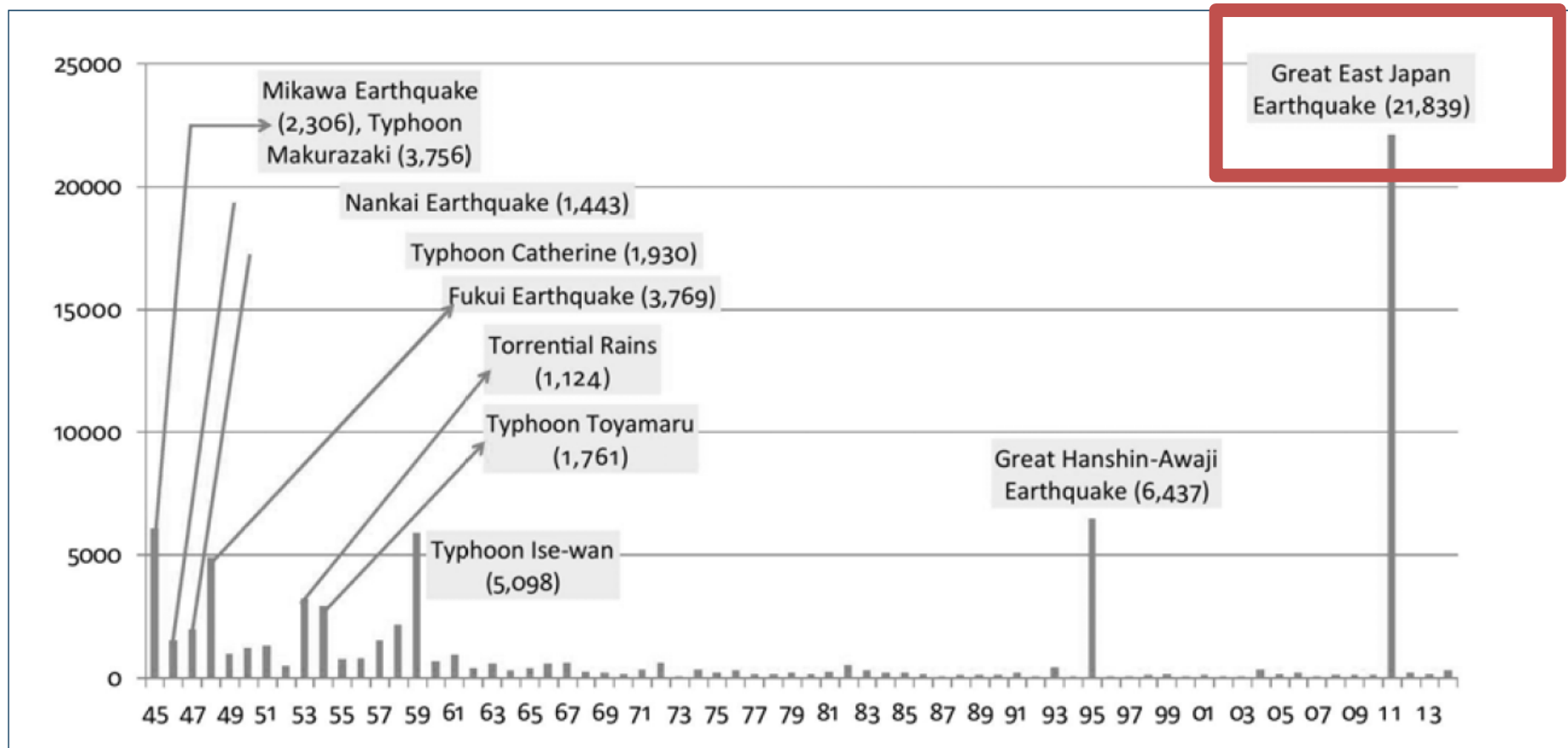
*CPT Moncrieffe*



# 3/11, Great East Japan Earthquake (東日本大震災 *Higashi nihon daishinsai*)

Figure 1: Number of Dead and Missing Persons Caused by Natural Disasters in Japan

\*Source: data from “Disaster Management in Japan (2015), Cabinet Office, Government of Japan”







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# Disaster Scenario



## 7.3 Richter Scale earthquake strikes Tokyo during 2020 Summer Olympics

### Damage Estimates for Direct-Hit Earthquakes

	Damage estimates by the TMG (released in 2012)	Great East Japan Earthquake (March 11, 2011)	Great Hanshin-Awaji Earthquake (January 17, 1995)
Epicenter / Magnitude	Northern part of Tokyo Bay / M7.3	Off the Sanriku coast / M9.0	Northern part of Awajishima Island / M7.3
Time of occurrence, etc.	6 p.m. in winter, with the wind blowing at 8m/s	2:46 p.m.	5:46 a.m.
Number dead, missing	approx. 9,700*	approx. 19,500	approx. 6,400
Number injured	approx. 147,600*	approx. 5,900	approx. 43,800
Totally destroyed structures	approx. 304,000 (incl. 190,000 totally burned)	approx. 120,000	approx. 105,000
Economic loss	—	17 trillion yen	10 trillion yen

\*Breakdown

	Collapse of structure	Fire	Concrete wall collapse, etc.	Other	Total
Number dead	approx. 5,400	approx. 4,100	approx. 100	approx. 100	approx. 9,700
Number injured	approx. 126,000	approx. 17,700	approx. 3,500	approx. 400	approx. 147,600



TOKYO 2020  
PARALYMPIC GAMES



In addition to the above, about 5.17 million people are estimated to be stranded, unable to go home.

Source: TMG



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# Power



## Tokyo's Power Outflow:

- Liquid natural gas (LNG)
- Other fossil fuels

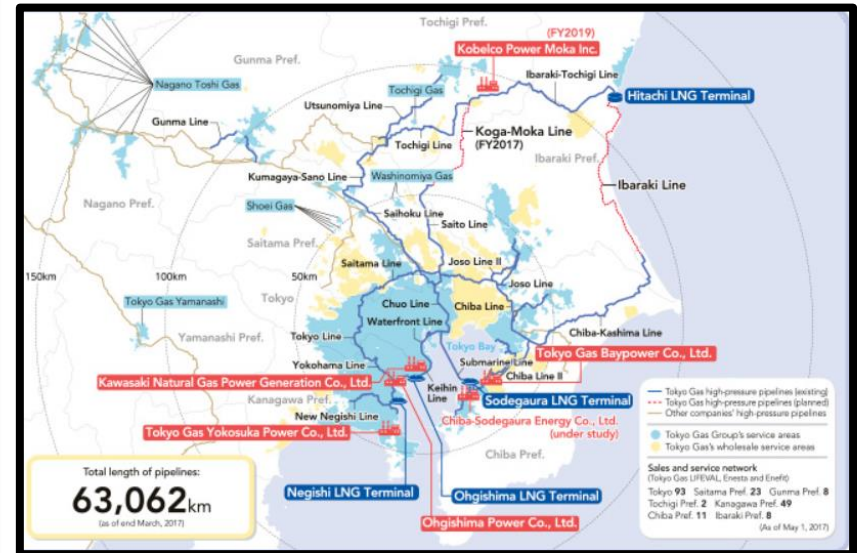


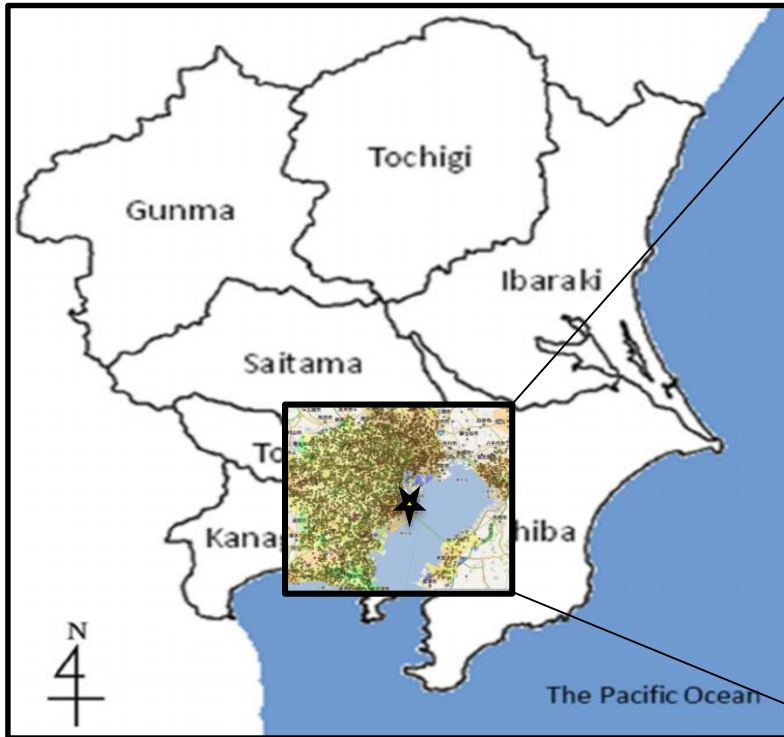
Photo Credit: Wikimedia



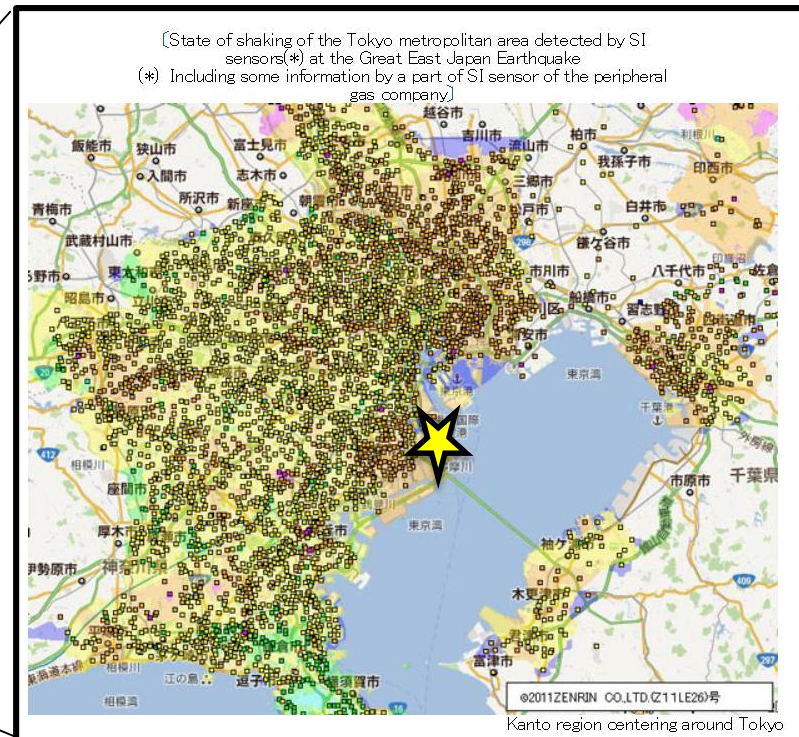


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# Power



Outline of the Kanto region  
northeast of Tokyo



Seismographs record the 3/11  
Earthquake



# Power







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# Water

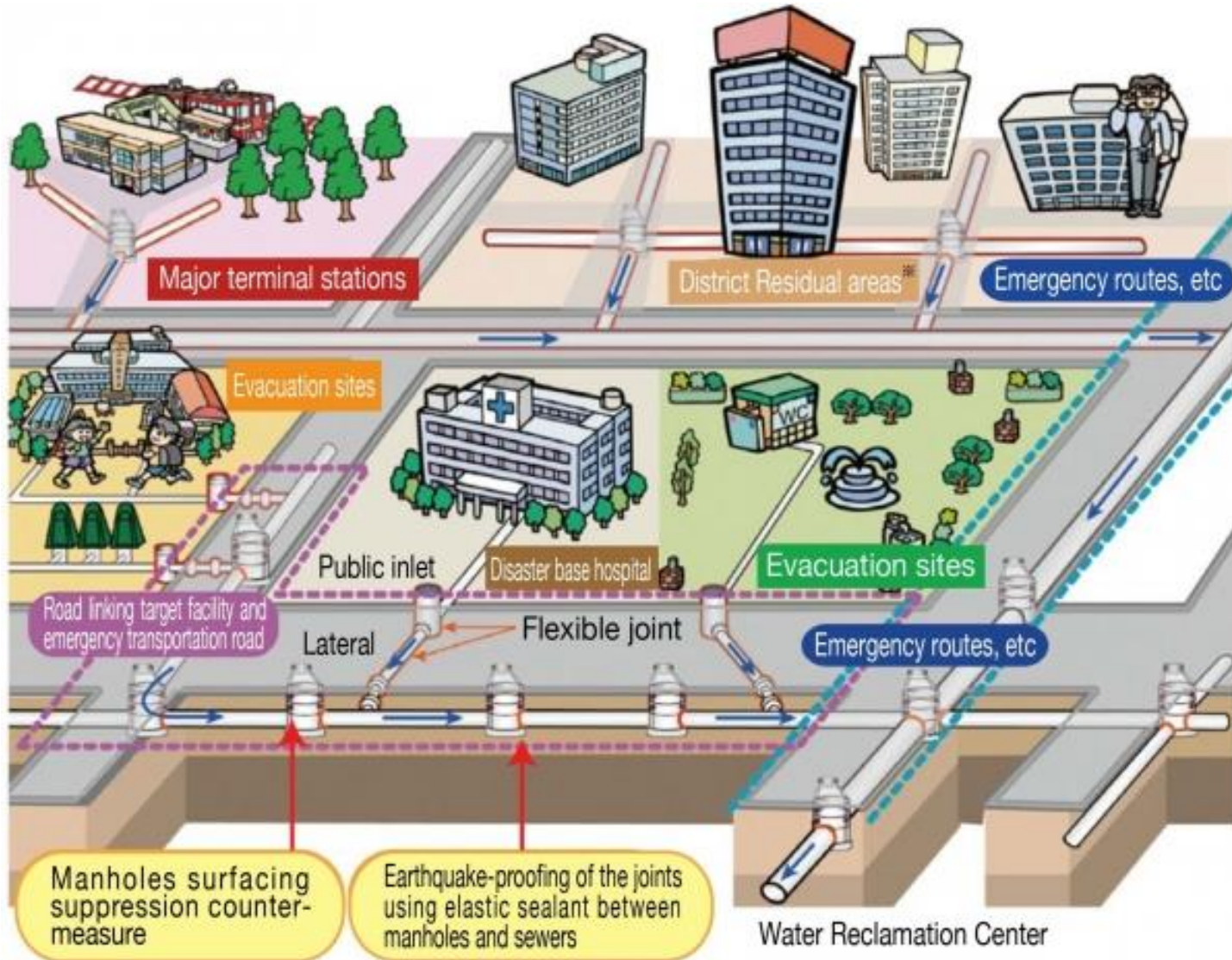


Photo Credit: Wikimedia

Source: TMG





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# Waste Water



Expansion

Shown by a  
blue rubber cap

A manhole that can be  
used as temporary toilets







VICTORY STARTS HERE!

# People



## Scenario

On the  
Richter scale strike of Tokyo  
Summer







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# People







VICTORY STARTS HERE!

# People



## NARITA AIRPORT







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# People



Photo Credit: Wikimedia commons





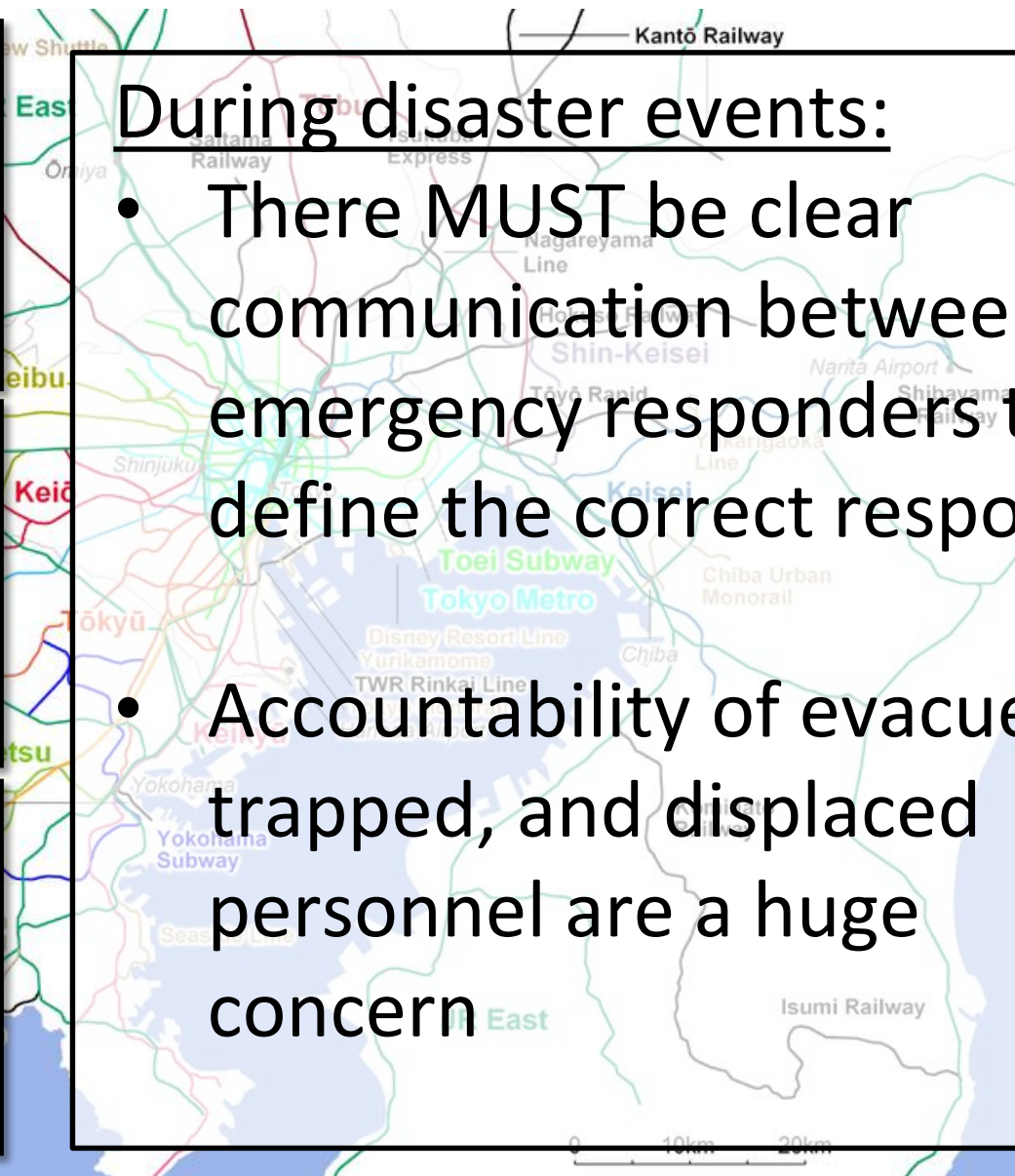
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# People



## During disaster events:

- There **MUST** be clear communication between emergency responders to define the correct response
- Accountability of evacuees, trapped, and displaced personnel are a huge concern





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# Supplies



**FOOD**



**MEDICAL**



**FUEL**





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# Waste




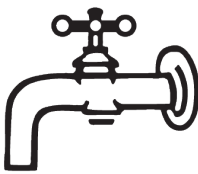

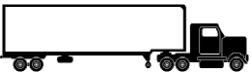

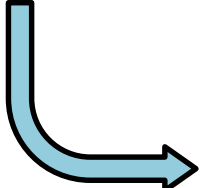





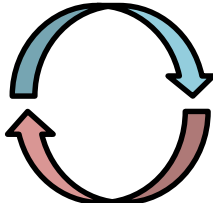





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# Summary



		Power (electricity)	Water	People	Supplies	Waste
						
in						
within						
out	