

# Emergency Response by Japanese Fire Service Organizations

Tokiyoshi YAMADA

Director, National Research Institute of Fire and Disaster,  
Fire and Disaster Management Agency, Japan

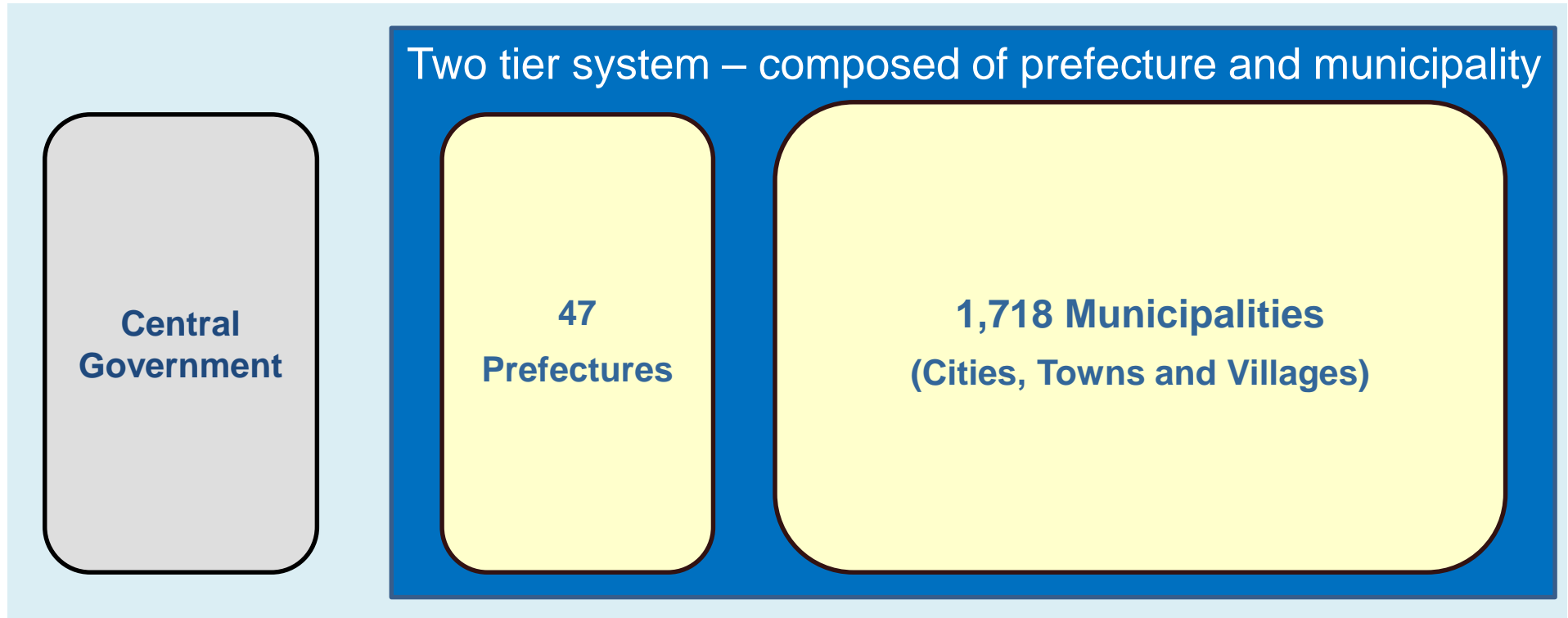
6<sup>th</sup> December, 2017



# I. Institutional Arrangement for Firefighting and Disaster Management in Japan

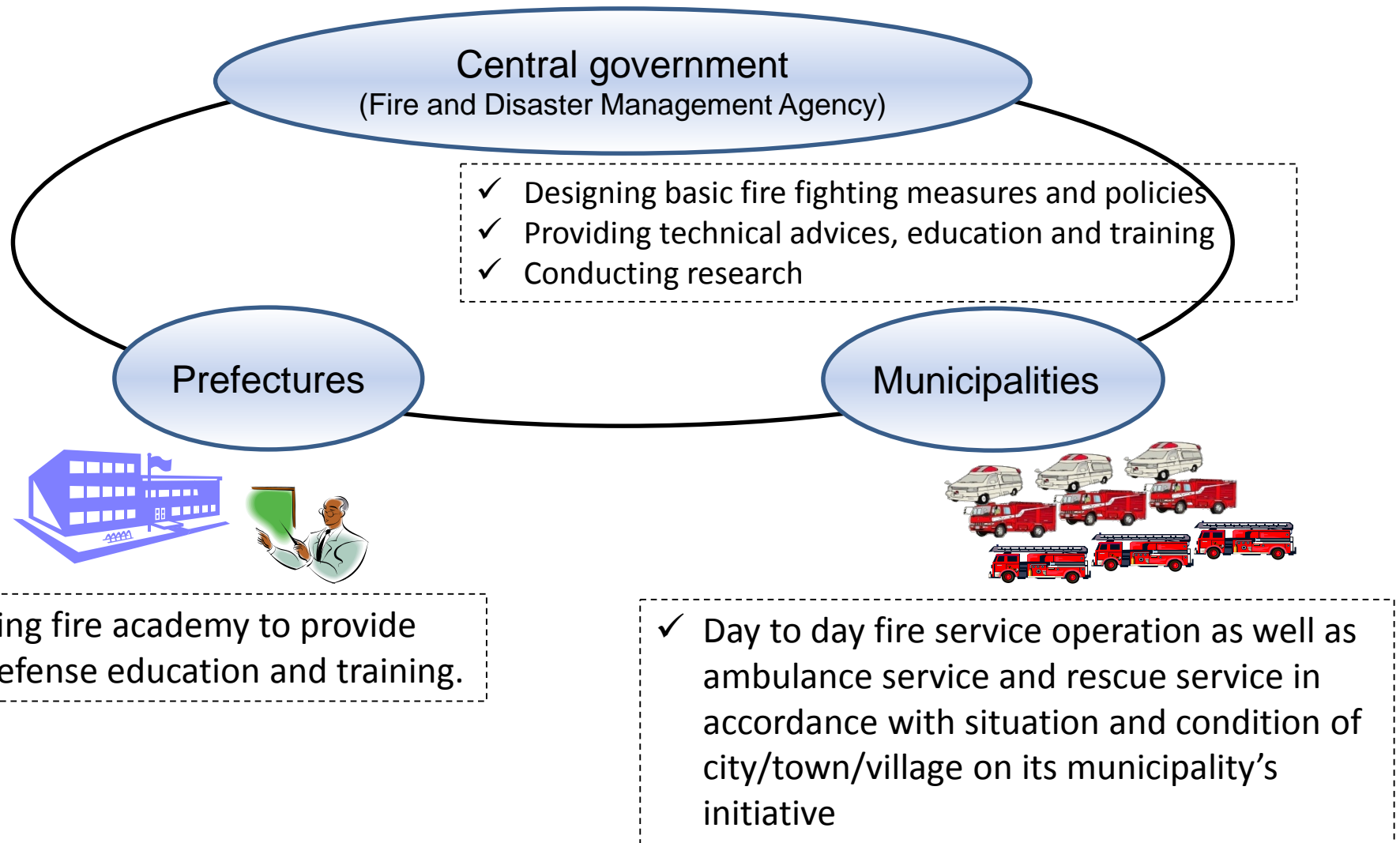


# Local Autonomy in Japan



- ✓ The central government and local governments have equal and co-operative relationships, not hierarchical or superior-subordinate relationships.
- ✓ The fundamental public services are mainly provided by local governments – welfare being, primary education, sanitation, fire service.
- ✓ The central government's "involvement" with local governments' policy and operation is limited in the scope which the laws and the regulations permit.

# Cooperation among the central government, prefectures and municipalities for fire services



# Institutional Arrangement in Fire Services

## Fire and Disaster Management Agency (FDMA)

- ✓ Designing basic fire fighting measures and policies
- ✓ Providing technical advices, education and training
- ✓ Conducting research
- ✓ College and research organization as affiliated organizations
- ✓ Around 170 staff members in total

## Prefectures

- ✓ Running fire service academy for education and training



## Municipalities

### Regular Firefighting



- ✓ Professional first responder units to provide fire service, rescue activity and ambulance service on site
- ✓ 732 fire service organizations, established by municipalities, and 163,814 firefighters across the nation

### Volunteer Firefighting

- ✓ 2,209 volunteer fire corps groups and 850,418 members in the country

# Fundamental Arrangement for Activities by Fire Service Organization

## Ordinary Fire, Accident & Disaster

Managed by local fire service organization, which is established by municipalities

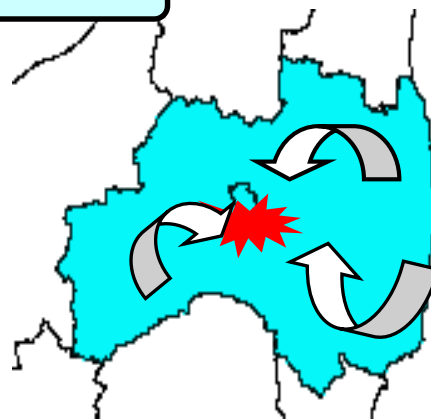


732 fire service organizations across the nation with 163,814 professional firefighters and 850,418 volunteer fire corps



## Large Scale Fire, Accident & Disaster

Prefecture to lead the fire service organizations within its location to support the local fire service organization in disaster hit area

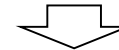


## Extraordinary Disaster

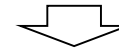
FDMA to function as the control tower with dispatching the Emergency Fire Response Team to the disaster hit area

### Coordination to dispatch the Emergency Fire Response Team

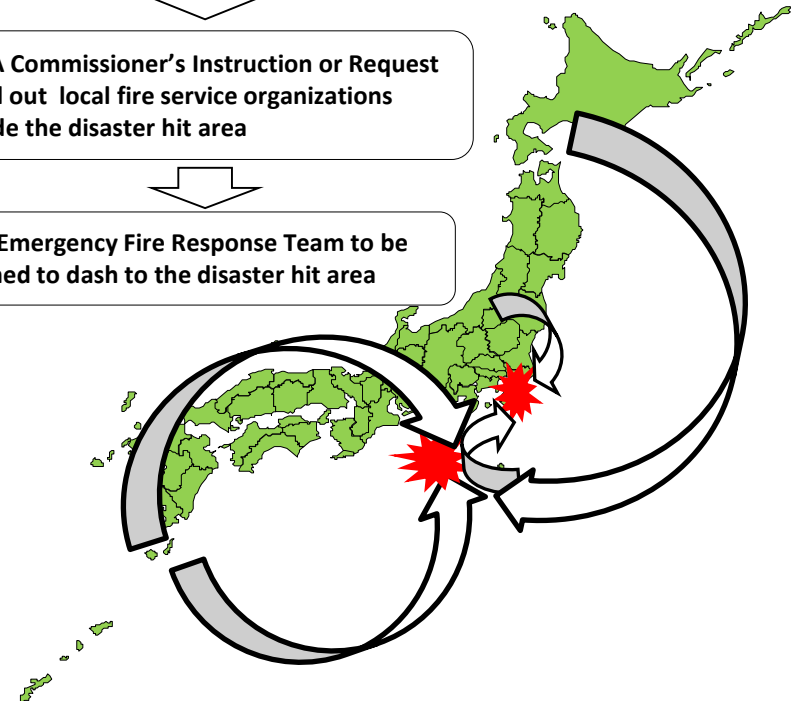
Request from Prefectural Governor of Disaster Hit Area



FDMA Commissioner's Instruction or Request to call out local fire service organizations outside the disaster hit area



The Emergency Fire Response Team to be formed to dash to the disaster hit area



# Emergency Fire Response Team

- the elite units that rush for rescue from various regions across the country

- ✓ Established in 1995
- ✓ Having been dispatched to disaster hit areas in the event of large scale or extraordinary disasters 34 times ever, such as earthquake, landslide, flood, volcano eruption that put huge damages on people
- ✓ Composed of 5,658 units (Firefighting: 2,088, Rescue: 476, Ambulance: 1,310 Air: 75 and so forth) at the beginning of April 2017

## Fire and Disaster Management Agency

Figures out disaster information immediately, puts Emergency Fire Response Teams in action, and performs other operations.

The commissioner of the Fire and Disaster Management Agency requests, or instructs the dispatch of Emergency Fire Response Teams at the time of large-scale or extraordinary disasters.



## II. Fire Service Organization's Response to Extraordinary Disasters





# Damage in Great East Japan Earthquake

On 14:46, March 11<sup>th</sup> 2011, a great earthquake at the magnitude of 9.0 hit northern east Japan, causing huge tsunami to strike the wide coastal area with leaving around 20 thousands people dead and 2.6 thousands people missing.

## Character of the Disaster

- ✓ The largest scale earthquake on record in Japan.
- ✓ Shaking a lot of areas in northern part of Japan for six minutes on and off.
- ✓ Causing the huge tsunami - the main cause of the casualty and the damage in the disaster hit areas
- ✓ At most, around 450 thousands people were forced to be evacuated – 140 thousands of whom still cannot return to the original place to live in.
- ✓ The aftershocks at the magnitude of more than 5.0 have occurred around a thousand times.

## Outline of Damage as of September 1<sup>st</sup>

Casualty	Iwate pref.	Miyagi pref.	Fukushima pref.
Dead : 19,575	5,136	10,563	3,762
Missing : 2,577	1,121	1,227	225
(Dead and Missing in total : 22,062)			
Injured : 6,230	211	4,148	182

Damage to Buildings	Iwate pref.	Miyagi pref.	Fukushima pref.
Fully destroyed : 121,776	19,507	83,002	15,224
Half destroyed : 280,326	6,571	155,129	80,793
Partially destroyed : 744,269	18,979	224,202	141,040

Cases of Fire	Iwate pref.	Miyagi pref.	Fukushima pref.
330	33	137	38

# Damage in Great East Japan Earthquake and Activities of Fire Service Organization

## Outline of Damage on Fire Service Organizations

### Regular Fire Service

Firefighters	Dead and Missing : 27
Damage on Buildings (fully, half or partially destroyed)	Headquarters and Fire stations: 143, Branch stations: 161
Damage on Vehicles etc.	Vehicles: 86, Fire boat: 2, Helicopter: 1

### Volunteer Fire Service

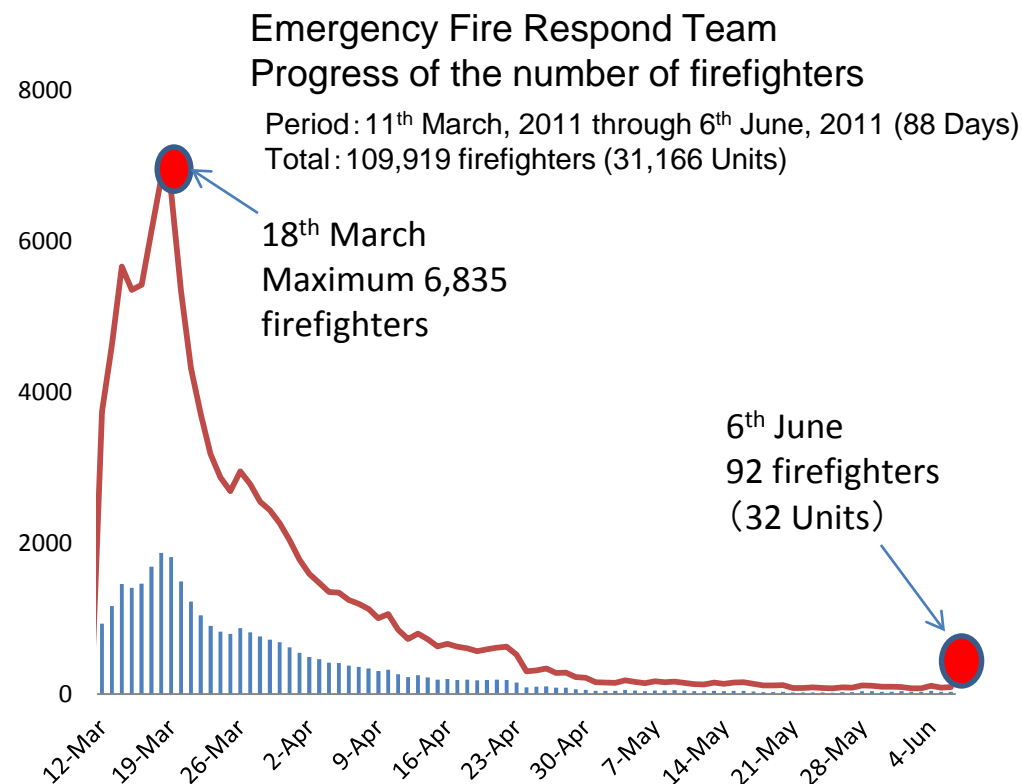
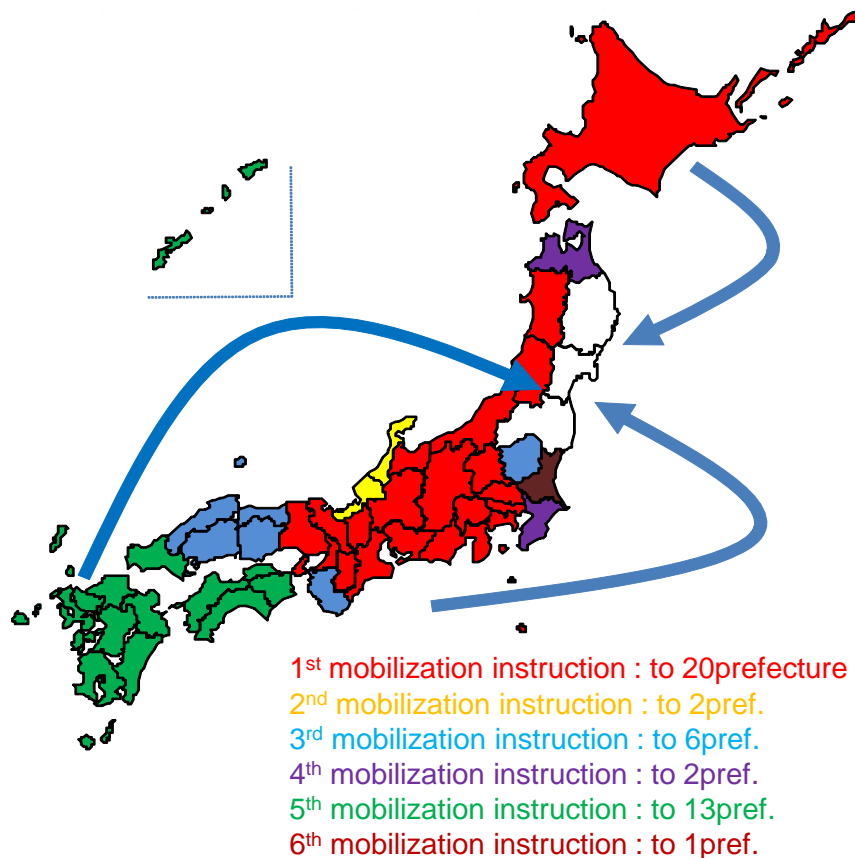
Volunteer Firefighters	Dead and Missing : 254
Damage on Buildings (out of use)	Depot of volunteer fire corps : 450
Damage on Vehicles etc.	Vehicles: 251

## Emergency Responses by Fire Service Organizations

- ✓ Local fire service organization based in the disaster hit areas carried out firefighting, rescue, ambulance service as well as instructed people to evacuation in coordination with other fire departments in the same prefecture which dashed there for support.
- ✓ Volunteer Fire Corps based in local area, in addition to the above mentioned activities, did flood control such as closing water gates, etc..
- ✓ In deeply damaged three prefectures, firefighters were dispatched from inland area to coast side for supporting activities.
- ✓ Also, volunteer firefighters based in the inland were dispatched to coast side, and the total number of volunteer firefighters mobilized to the disaster-hit areas were over 1,400.
- ✓ Examples of rescue activities enforced by fire service organization, etc.  
Rescued 200 people isolated at Funakoshi elementary school in Iwate pref, 630 people isolated at Onagawa town in Miyagi pref and 600 people isolated at Kesenuma city in Miyagi pref.

# Emergency Fire Response Team activities in deeply damaged areas due to Great East Japan Earthquake

- ✓ Just after the Great East Japan Earthquake occurred, Emergency Fire Response Teams were dispatched to the three prefectures - Iwate, Miyagi and Fukushima, with an instruction of the Commissioner of FDMA.
- ✓ The firefighters mobilized in the great earthquake amounts to about 30,000, accounting of around 20% of all the firefighters in Japan.
- ✓ The ground units made firefighting, rescue and ambulance service while the aviation units carried out rescue, aerial firefighting and information collection, having saved 5,064 people.



# Kumamoto Earthquake 2016

## Outline of Damages

- ✓ A series of earthquakes, which started with the magnitude – 6.5 quake on 14<sup>th</sup> April 2016, hit a wider area in Kyushu region with Kumamoto prefecture, the center of Kyushu, significantly damaged.
- ✓ The magnitude – 7.3 quake, which occurred on 16<sup>th</sup> April, is the biggest one in the series, causing the huge damages in Kumamoto prefecture and Oita prefecture, east of Kumamoto.
- ✓ Many of the quakes occurred at a depth of 10 km – so shallow that the buildings around the epicenter were badly damaged.
- ✓ Causality; 50 and Injured; 2,790
- ✓ Completely damaged buildings; 8,674, Half damaged; 34,563 and Partially damaged ; 162,312

## Search and Rescue by Fire Service Organization

- ✓ 376 people were rescued by the rescuers from the fire service organizations – around 3,700 firefighters and about 9,200 volunteer fire corps, who made the efforts on site together with other emergency responders including the Self Defense Force, police and medical team.
- ✓ The ambulance service teams took 2,285 people to hospital.

## Emergency Fire Response Team

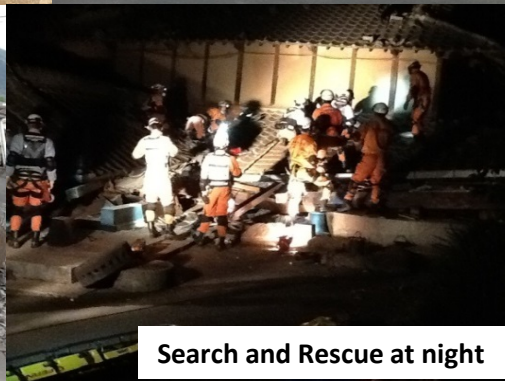
- ✓ The Emergency Fire Response Team started its search and rescue activity just after the first earthquake hit mainly Kumamoto and the activity lasted for 14 days.
- ✓ Additional units joined in the search and rescue activities after another great impact happened due to the magnitude 7.3 quake on 16th April. The following day saw the largest number of the rescuers from fire service organizations including around 2,000 Emergency Fire Response Team members.
- ✓ The land units worked for the search and rescue in city centers and landslides in cooperation with other first responders, while the aerial units did the information collection on the disaster affected areas.
- ✓ In Kumamoto, 86 people were saved and 388 people taken to hospital by the Emergency Fire Response Team.



# Kumamoto Earthquake 2016



Search and Rescue at landslide



Search and Rescue at night





# Water Damages in Northern Kyushu due to Record-Hit Torrential Shower

## Outline of Damages

- ✓ The record-hit torrential shower has stricken northern part of Kyushu region – Asakura City and Hita City most affected with the huge rainfall, the one day amount of which was equivalent to the one month.
- ✓ The heavy rain caused flood in various areas, creating the damages on the residents and the communities - 37 people died, 4 missing and 16 injured, and around 1,500 houses fully or partially destroyed.

## Search and Rescue by Fire Service Organization

- ✓ Neighboring local fire service organizations dashed to the affected areas based on the mutual assistance agreement, joined by Emergency Fire Response Team, to carry out the search and rescue at the communities isolated by landslides, flooded road and drifted timbers.

## Emergency Fire Response Team

- ✓ The Emergency Fire Response Team was organized based on the prefectural governor's request with around 1,000 rescuers of 262 units dispatched.
- ✓ The ground units worked for the search and rescue with shovel cars and amphibious baggies in cooperation with other first responders, while the aerial units proved its usefulness through its activities to rescue the people stranded in the isolated place
- ✓ All-terrain vehicle, named Red Salamander, took action to carry rescuers to the isolated areas, getting over tough road conditions – too bad for normal rescue truck to approach.



### III. Enhancing Disaster Management Capability against Possible Large Scale Disasters



# Major Large Scale Earthquakes Forecasted to Occur in the Future

Japan is surrounded by 4 plates. 20% of earthquake (more than M6) in the world have occurred in Japan.

And, it is said that about 2,000 active faults exist in Japan.

Source of the description here from long term research about trench type earthquake made by Earthquake Research Committee, Headquarters for Promotion of Earthquake Research

**Trench type earthquakes in the vicinity of the Japan and the Chishima Trenches**  
(along with Chishima Trench, offshore of Sanriku to Boso)

The aftermath of Great East Japan Earthquake, over M7 may occur in the future.

**Tokyo Inland Earthquake**

(other earthquake in southern area of Kanto)

M7 class earthquake may occur with around 70% of probability in the next 30 years.

**Nankai Trough Earthquake**

M8 to M9 class earthquake may occur with around 70% of probability in the next 30 years.

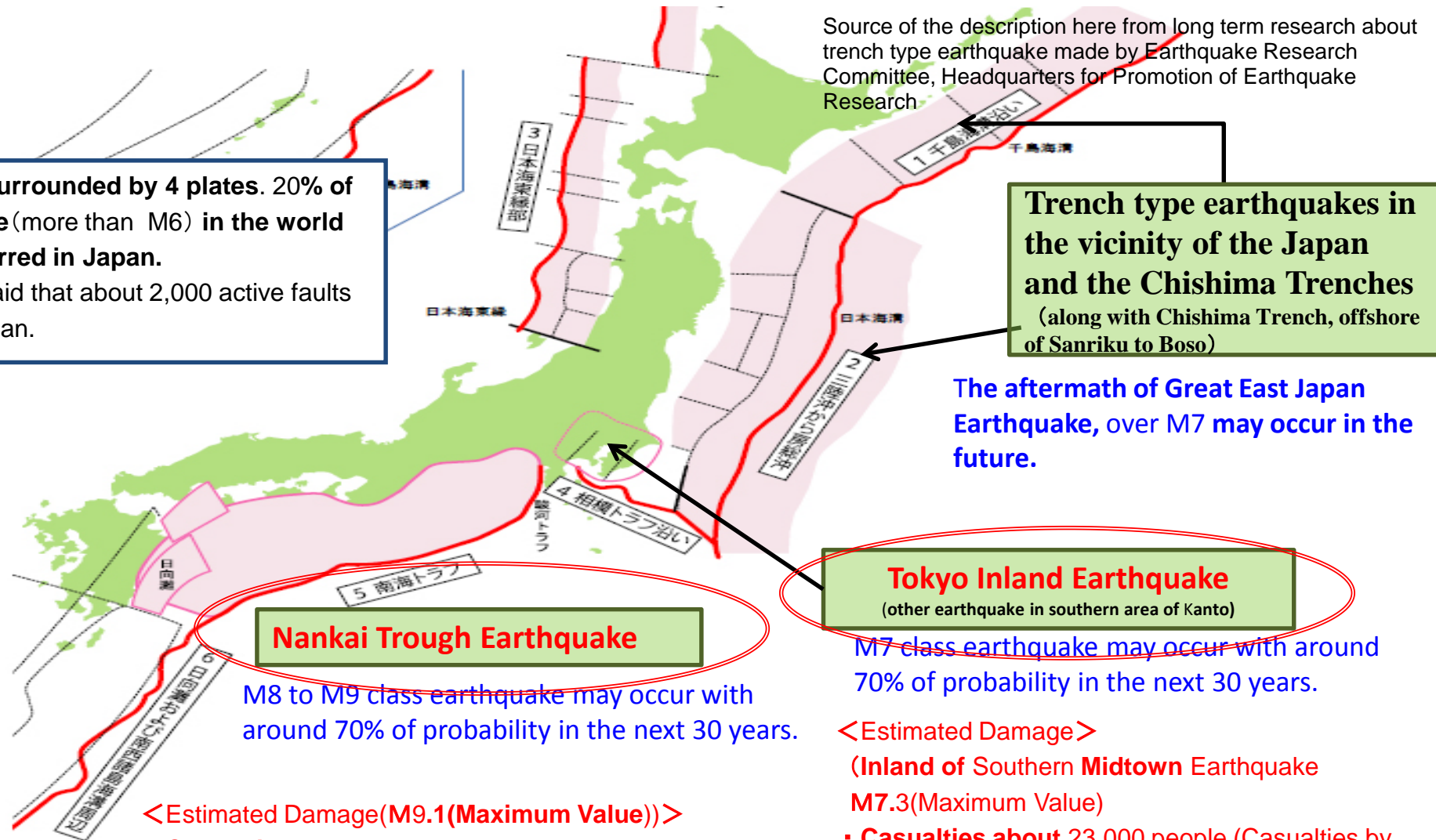
<Estimated Damage(M9.1(Maximum Value))>

- Casualties about 320,000 people
- Economic Loss : Approx. 220 trillion JPY, equivalent to 1.8 trillion USD (JPY/USD=120 applied)

<Estimated Damage>

(Inland of Southern **Midtown** Earthquake  
M7.3(Maximum Value)

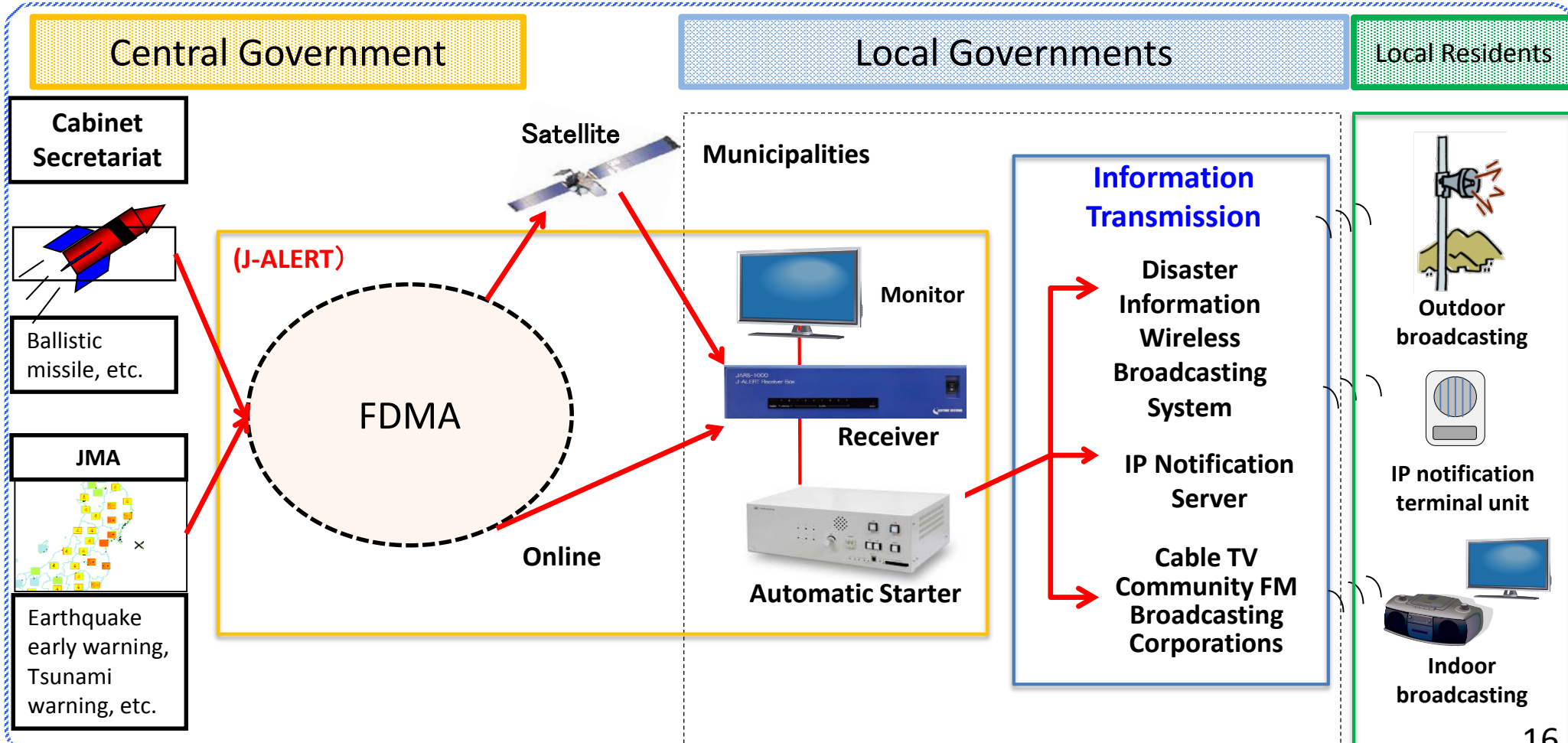
- Casualties about 23,000 people (Casualties by fire about 16,000 people)
- Economic Loss : Approx. 95 trillion JPY, equivalent to 0.8 trillion USD (JPY/USD=120 applied)





# Overview of “J-ALEART”

The national early warning system “J-ALEART” can instantly transmit emergency information, such as ballistic missile and earthquake early warning, both via a satellite and online from the central government to local governments. The information the local governments receive is automatically delivered to local residents through various devices like outdoor/indoor broadcasting systems.



# Stepping up Emergency Fire Response Team

## The 3<sup>rd</sup> fundamental Plan of Emergency Fire Response team

Increase the units to 6,000 by March 2019, as a main measure to combat the possible large scale disasters including the Nankai Trough Earthquake, based on the lessons learned through the Great East Japan Earthquake

The previous targets; 1st plan - 4,000 by March 2009, 2nd plan 4,500 - by March 2014

- ✓ Put the primary focus on the three core units – firefighting, ambulance and rescue, to be increased.
- ✓ Establish a special unit dedicated to firefighting at industrial complexes – 12 units by 2018
- ✓ Create a new kind of unit with the high mobility to dash to the disaster hit area - strengthen the initial response, such as the fact finding on site.
- ✓ Make the back up system more robust to prepare for a long-period search and rescue.
- ✓ Ensure the communication among the units and the headquarter on site, through forming 50 new units equipped with the telecommunication devices and the equipment against communication blackout

# Stepping up Emergency Fire Response Team

- ✓ Operation Base Forming Vehicle and Large Air Tent to strengthen the logistic and back-up teams so that Emergency Fire Response Team can keep on their activities in a long period and also in wider areas.
- ✓ Operation Base Forming Vehicle is equipped with large air tents, lavatories, shower facilities and information and communication devices.



Operation Base Forming Vehicle



Large Air Tent

# Stepping up Emergency Fire Response Team

- ✓ Small Amphibious Buggy and Tsunami/Large-Scale Water Disaster Countermeasure Vehicle enable the rescue teams to keep the high mobility in the flood, the tsunami-hit and the rubble area.



Small Amphibious Buggy



Tsunami/Large-Scale Water Disaster Countermeasure Vehicle



Specialize in the rescue activities at flood areas, loading devices and tools such as boat, buggy, life jacket and dry suit

# Stepping up Emergency Fire Response Team

## “Dragon Hyper Command Unit” - The Special Unit Dedicated to Firefighting at Petro Complex -



Water Cannon  
Vehicle

Mega Volume  
Pumper



- ✓ Dedicated to extraordinary disaster response activities at energy and industrial infrastructures
- ✓ Can discharge the larger volume of water to farther and higher point than ordinary fire engine  
pumping 8,000l/min, 1km distance from water resource and discharge 8,000l/min to fire point
- ✓ At present, six units formed in Ichihara, Yokkaichi, Shizuoka, Kobe, Kurashiki and Kagoshima, which have mega-sized industrial complexes in their city
- ✓ By 2018 to deploy 12 units in total to the areas close to large petrochemical complexes across the nation



# Collaboration among Disaster Response Forces (in Emergency Fire Response Team Disaster Exercise)

## Joint Rescue Activity



Rescue teams both of fire service and police are jointly in operation.

## Field Emergency Command Post

(jointly operated by fire service, police, Self Defense Force, DMAT (medical team), Coast Guard etc)



## Medical Treatment immediately after rescue

The rescue teams save people, followed by DMAT medical treatment on site.



Fire Service Organizations and Japan Coast Guard jointly search and rescue castaways.

SDF clears stuff on roads to enable firefighters to rush to disaster hit areas.



## Joint Search and Rescue Activities

## Firefighting by Fire Service Organization and industrial Firefighters

Dragon Hyper Command Unit in collaboration with industrial firefighters makes firefighting at petrochemical complex.



Coordination

## SDF clearing roads for firefighting

## Transportation of firefighters by SDF Carrier

SDF Carrier Aircrafts transports firefighters and fire engines to frontline.



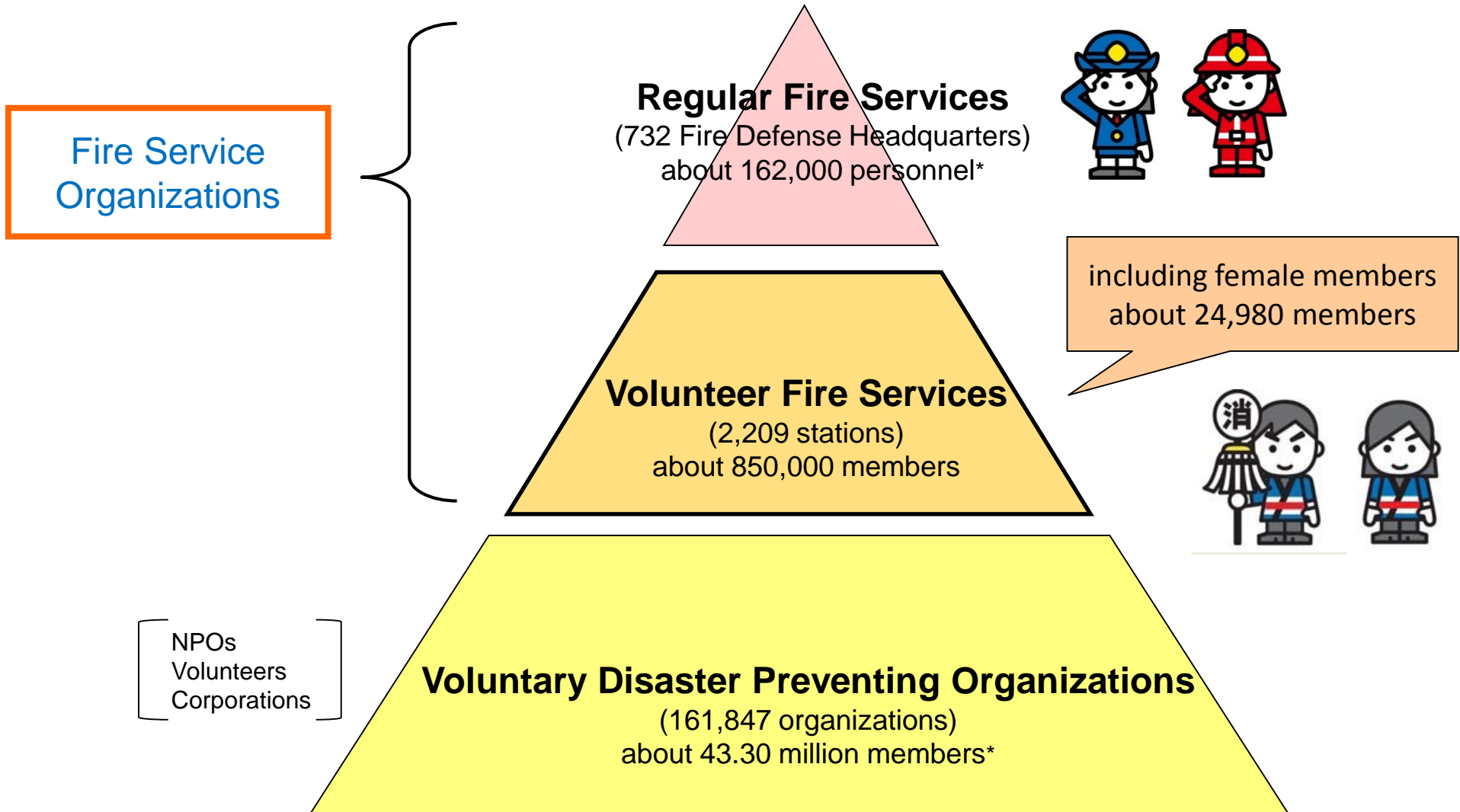
Disaster Management Headquarter at local governments

Coordination and Support

Disaster Management Headquarter at the central governments

# Regional Fire Management and Disaster Prevention Structure

(as of April 1, 2017)



\* as of April 1, 2016

# Volunteer Fire Fighter

## Summary of Volunteer Fire Fighter

- Part-time local civil servants, acting under the slogan “Protection of our community by ourselves”
- Having authority and duty to carry out fire defense activity in community
- The initial response to disasters on the front line
- The number of volunteer firefighters used to be over one million, but is currently falling to below 0.9 million.



Searching people in landslide disaster  
(Hiroshima-City)



Supporting firefighter's rescue activity with  
power shovel (Oshima-Cho)

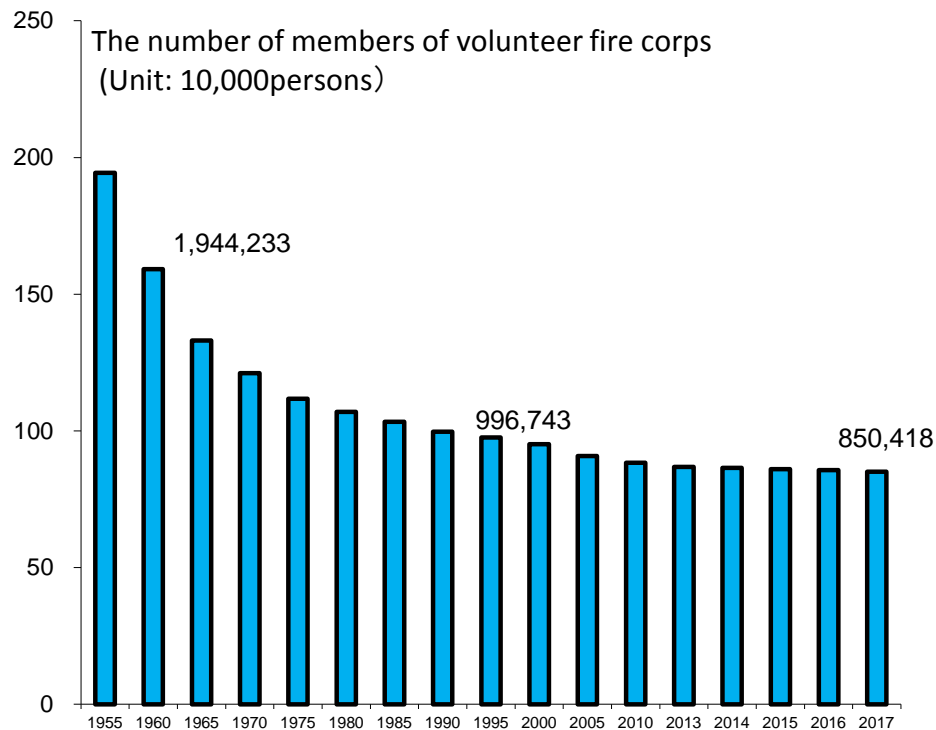


# Current Status of Volunteer Fire Fighters

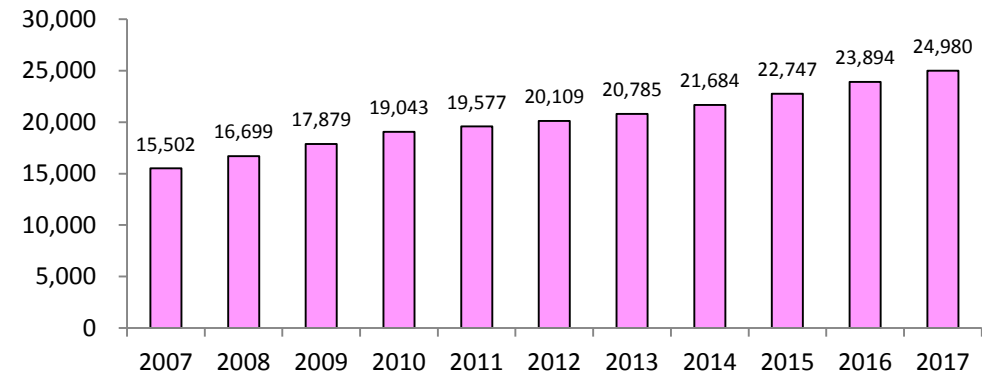
The law concerning step-up of community disaster prevention capability with Volunteer Fire Fighters playing the center role

Aim: for the safety of the residents, upgrading and enhancing the community disaster prevention capability with a focus on Volunteer Fire Fighters

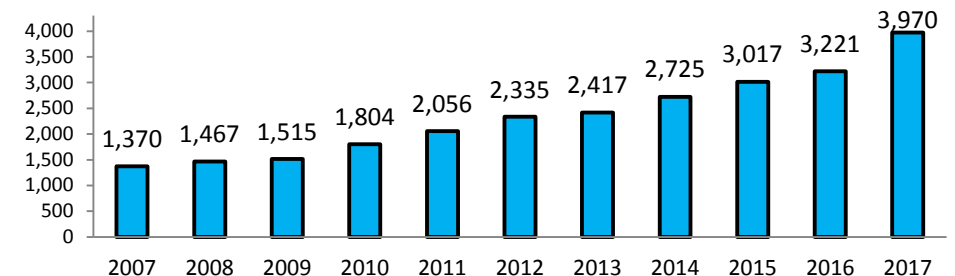
## 1. Number of Volunteer Fire Fighters



## 2. Number of female members



## 3. Number of college student members

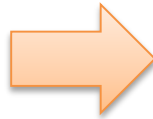


# Enhancement of the Capacity to Handle NBC Disasters

## ◆ To increase Special Disaster Response Unit of Emergency Fire Response Team

The unit to rescue people from NBC disasters with chemical protection suits and specially customized vehicles which contain the detector

**284 units**



**300 units**

by 2018



Chemical Protection Suit

## ◆ Tools and equipment to combat NBC disasters deployed to rescue teams in fire service organizations

### Equipment and Tools

- ✓ Portable biological agent detector
- ✓ Portable chemical agent detector
- ✓ Positive pressure chemical protective suit
- ✓ Decontamination shower



### Vehicle

- ✓ Special disaster response vehicle (NBC disaster response vehicle)



- ✓ Large Decontamination System Vehicle

# FDMA's Effort in Countermeasures to NBC Terrorism

To strengthen the countermeasure by the fire service organization to NBC terrorism, especially to ensure the safety for the 2020 Tokyo Olympic and Paralympic.

- ✓ To establish a special arrangement for fire service organization's preparedness around the venues – calling out the responders based in the cities other than Tokyo
- ✓ Vehicles and equipment to enhance security for the games - decontamination detecting instruments
- ✓ Capacity development for special force in NBC disaster
- ✓ To educate the fire fighters and the staff at the venues in NBC disasters
- ✓ Civil protection exercise jointly by the central government and the local authorities



Firefighter's Preparedness and Exercise for the Japan and S. Korea FIFA world cup 2002





Thank you very much for listening.

