



Disaster Response by Fire Service Organizations in Japan

***- Basic Structure & Preparedness
Based on Past Lessons -***

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What to take away in this presentation:

1. Basic structure and arrangement of fire service organizations - firefighting, ambulance service and rescue activities- in Japan, a top-tier country on this planet in natural disaster experiences.

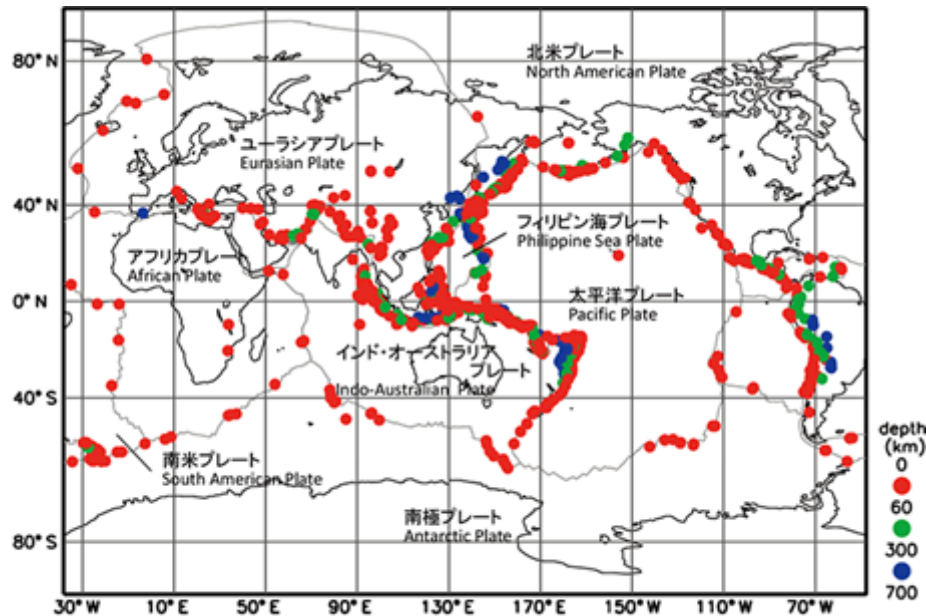
*Although Japan has 0.25 % of land over the world, nearly 20% earthquakes at magnitude ≥ 6.0 occurred in Japan and 7% active volcanos located there.
(See next slide for detail.)

2. What Japanese fire service organizations have currently focused on, based on the lessons learnt from past large scale natural disasters.

Number of Earthquake and Active Volcanoes in Japan

- Japan is located on the Pacific Ring of Fire, where seismic and volcanic activities occur constantly. Although the country covers only 0.25% of the land area on the planet, the number of earthquakes and active volcanoes is extremely high.
- In addition, because of geographical, topographical and meteorological conditions, the country is subject to frequent natural disasters such as typhoons, torrential rains and heavy snowfalls as well as earthquakes and tsunamis.

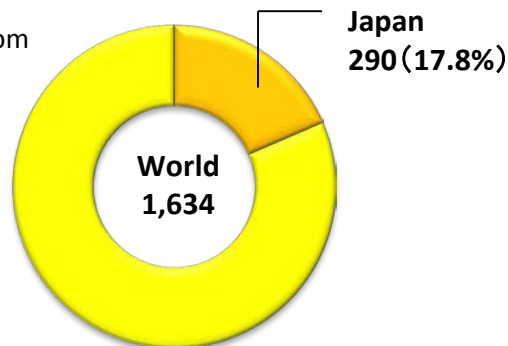
World geographical distribution of hypocentres and plates



Source: Created by Japan Meteorological Agency (JMA) based on hypocentre data from the United States Geological Survey (USGS)

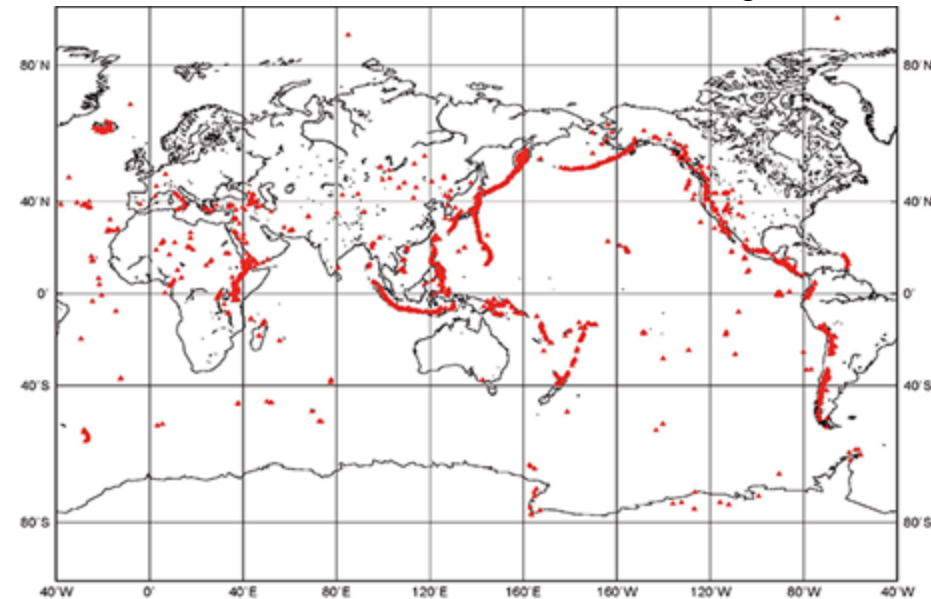
No. of earthquakes of magnitude 6.0 or greater (2006-2015)

JMA and USGS



Principal volcanoes in the world

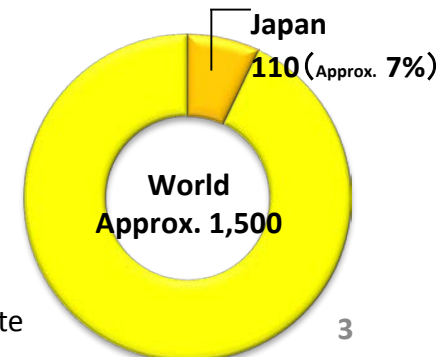
Source: White Paper on Disaster Management 2016



Source: JMA data
Japan / World / approx.

No. of active volcanoes (2016)

Source: Cabinet Office website



1. Basic Arrangement in Fire Service

2. How to Combat Large Scale Disasters

3. Utilizing Lessons through Disaster Experiences

3-1. Emergency Fire Response Team

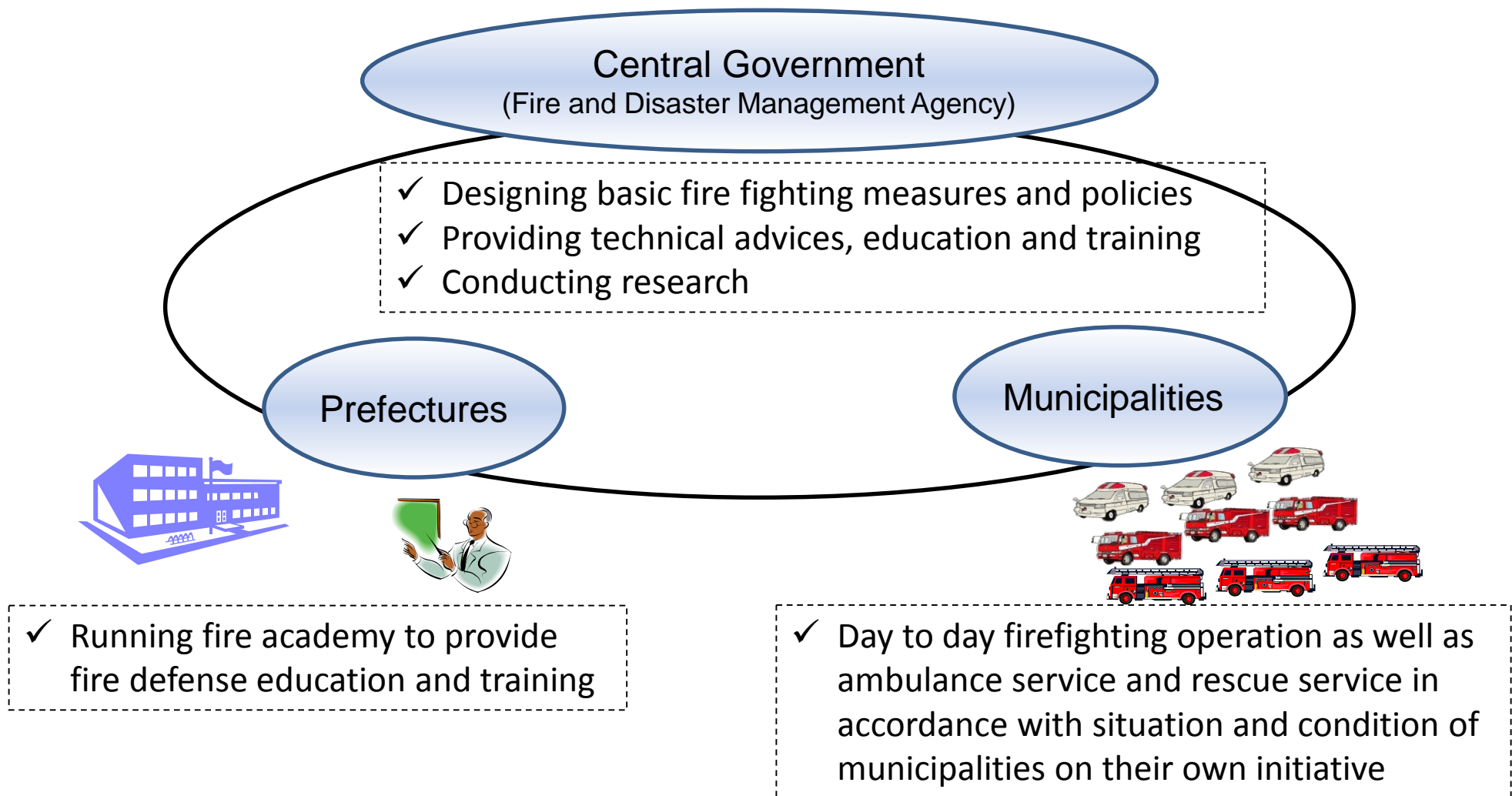
3-2. Volunteer Fire Corps

3-3. Early Warning Systems

1-1. Institutional Arrangement in Fire Services

- Central Government, Prefectures and Municipalities -

Mission: Firefighting, Ambulance Service and Rescue Activity



1-2. Institutional Arrangement in Fire Services – with figures

Fire and Disaster Management Agency (FDMA)

- ✓ Designing basic fire fighting measures and policies
- ✓ Providing technical advices, education and training
- ✓ Conducting research
- ✓ Running 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
- ✓ 11,690 fire engines, 6,271 ambulance cars and 1,248 rescue cars

Volunteer Firefighting

- ✓ 2,209 volunteer fire corps groups and 850,331 members in the country

annual expense to firefighting; approx. 2.1 trillion JPY (3.8% of the total)

* Figures above are as of 1st April, 2017.

1-3. Preparation for International Disaster Relief

Japan Disaster Relief (JDR) Rescue Team

- ✓ INSARAG – Heavy
- ✓ Dispatched to disaster hit areas overseas 19 times since establishment in 1987
- ✓ Composed of five public organizations and volunteer professionals – doctor & nurse and architect
 - Ministry of Foreign Affairs
 - FDMA & Fire Service Organizations
 - National Police Agency
 - Japan Coast Guard
 - JICA for logistics
- ✓ Exercises and trainings regularly carried out to keep the rescue ability and skill suitable to the IEC/R Heavy.

} Rescuer



(JDR team members on site)



(Joint rescue exercise for fire fighters)

1-3. Preparation for International Disaster Relief

JDR Rescue Team Dispatched Places



1	1990	Iran – earthquake
2	1990	Philippine – earthquake
3	1991	Bangladesh – cyclone
4	1993	Malaysia – building collapse
5	1996	Egypt – building collapse
6	1997	Indonesia – forest fire
7	1999	Colombia – earthquake
8	1999	Turley – earthquake
9	1999	Taiwan – earthquake
10	2003	Algeria – earthquake
11	2004	Morocco – earthquake
12	2004	Thailand – earthquake
13	2005	Pakistan – earthquake
14	2008	China – earthquake
15	2009	Indonesia – earthquake
16	2011	New Zealand – earthquake
17	2015	Nepal – earthquake
18	2017	Mexico – earthquake
19	2018	Taiwan – earthquake

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2-1. Structure of Fire and Disaster Management

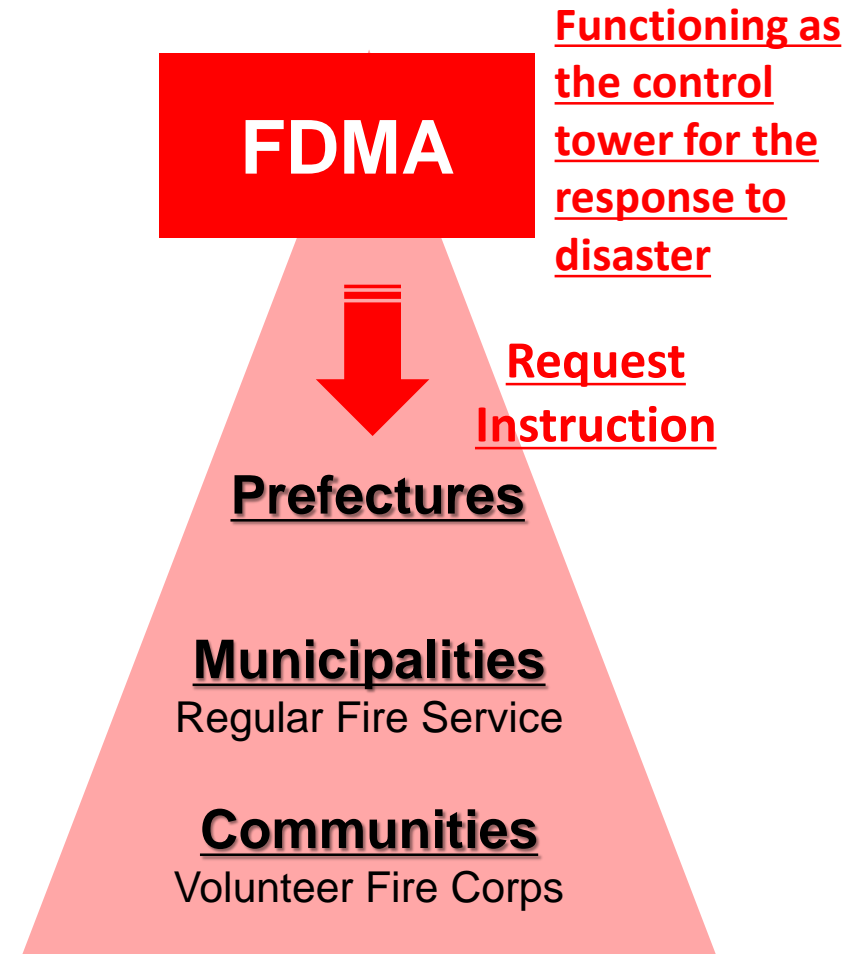
The Basic Structure of Fire and Disaster Management

Municipalities and communities playing the main role in fire and disaster response



- Designing and drafting umbrella rules on fire service and disaster management
- Providing technical advices, education and training
- Conducting researches etc.

For Large Scale Disasters

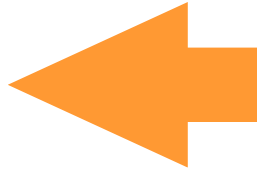


2-2. FDMA Operation in Large-Scale Disasters

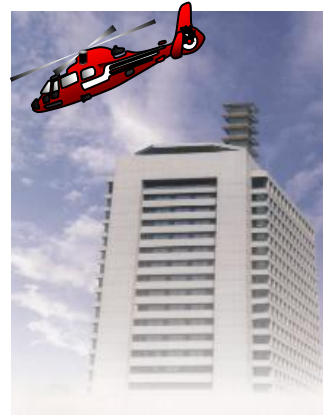
Crisis Management Center
at Prime Minister's Office



Reporting and sharing
of disaster information



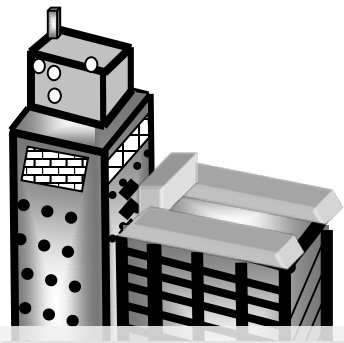
FDMA Disaster Task Force



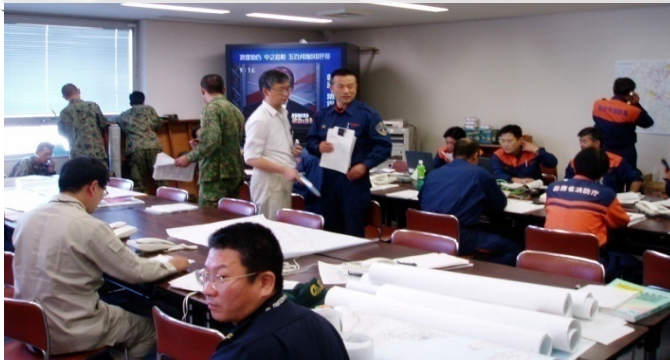
Information collection
from disaster hit areas



Coordination for dispatch of
Emergency Fire Response Team



Local government office
in disaster hit area



2-3. Emergency Fire Response Team

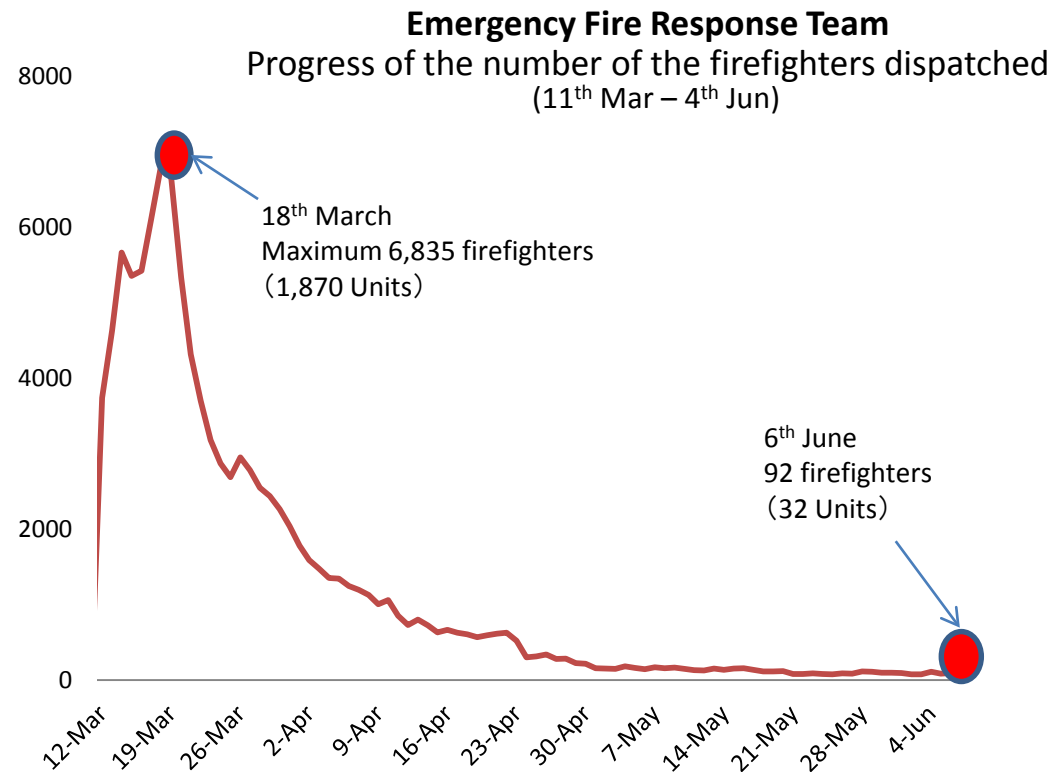
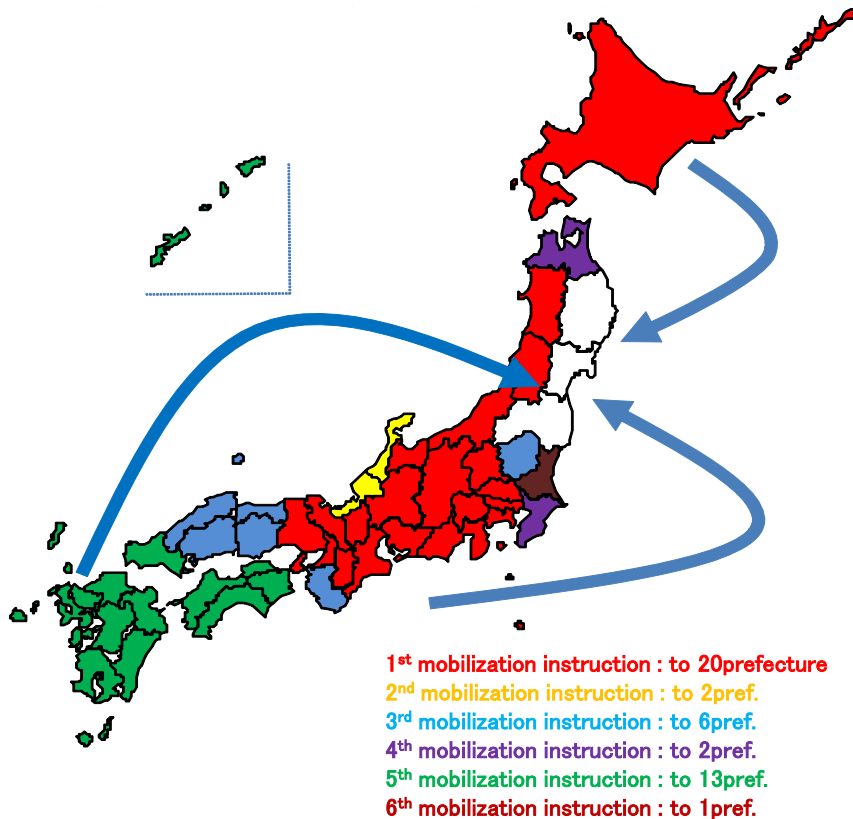
The Elite Units that Rush for Rescue from Various Regions across the Country



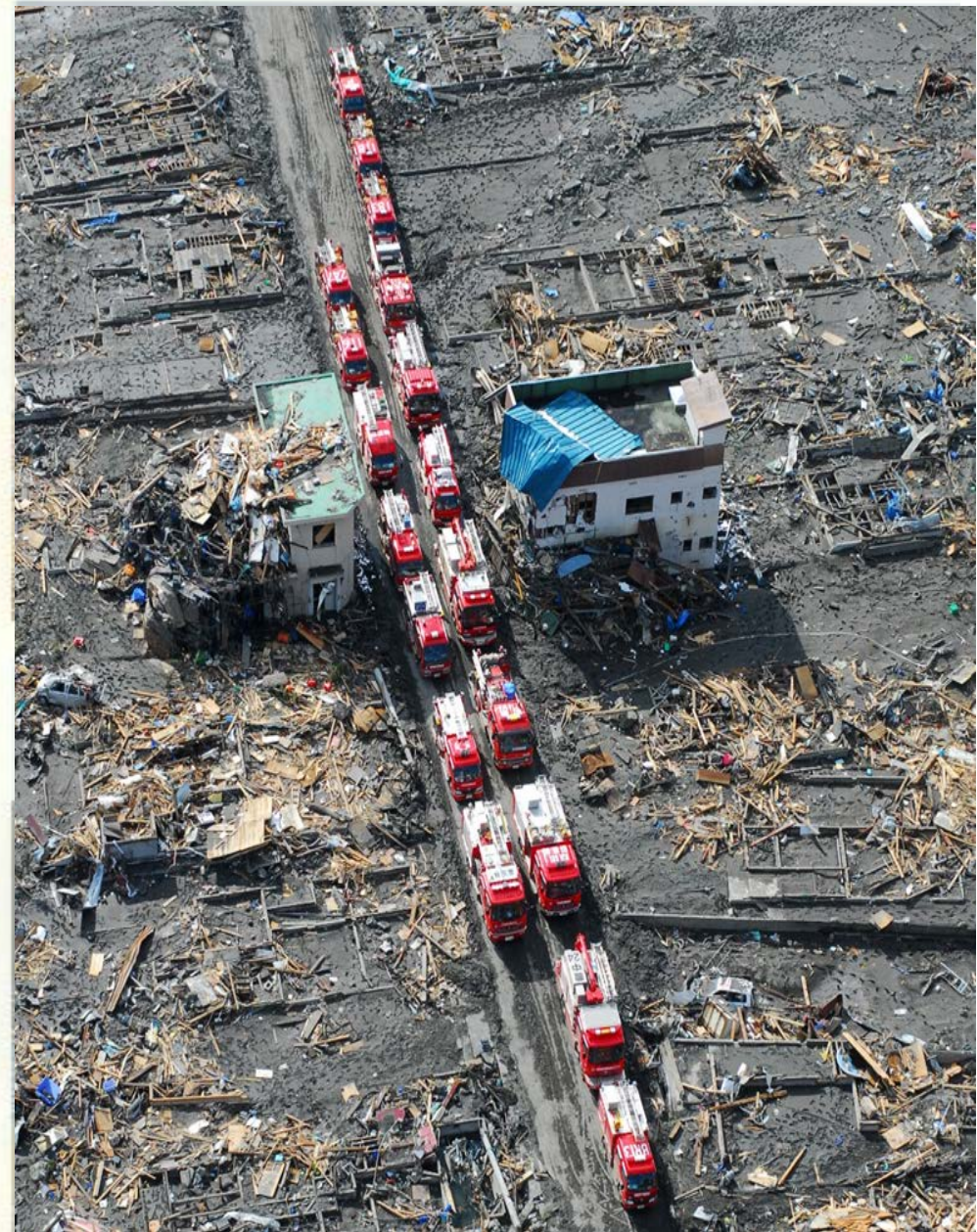
- Established in 1995
- Having been dispatched to disaster hit areas in the event of large scale disasters 38 times ever, such as earthquake, landslide, flood, and volcano eruption that put huge damages on people
- Composed of 5,978 units (Firefighting: 2,260, Rescue: 487, Ambulance: 1,361 Air: 75 and so forth) as of April 2018

2-4. Emergency Fire Response Team in Great East Japan Earthquake

- Just after the Great East Japan Earthquake occurred, Emergency Fire Response Team was formed and dispatched to the disaster hit areas in three prefectures - Iwate, Miyagi and Fukushima, with an instruction of the FDMA Commissioner.
- 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.



2-4. Emergency Fire Response Team in Great East Japan Earthquake



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(Appendix) Outline of Damages in Great East Japan Earthquake

(As of September 1st, 2018)

1. Total Damages

Damage to Human	Iwate pref.	Miyagi pref.	Fukushima pref.
Dead : 19,667	5,140	10,566	3,846
Missing : 2,566	1,115	1,223	224
(Dead and Missing in total : 22,233)			
Casualty : 6,231	211	4,148	183

Damage to House	Iwate pref.	Miyagi pref.	Fukushima pref.
Fully destroyed : 121,783	19,508	83,004	15,224
Half destroyed : 280,965	6,571	155,130	80,803
Partially destroyed : 745,162	19,061	224,202	141,044

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

2. Damages on Fire Services

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

Volunteer Firefighters	Dead/Missing : 254
Damage on Buildings (out of use)	Depot of Volunteer Fire Corps : 463
Damage on Vehicles etc.	Vehicles : 255

(Appendix) Major Large Scale Earthquakes Forecasted to Occur in the Future

Japan is surrounded by four plates. Nearly 20% of earthquakes (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.

Nankai Trough Earthquake

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

(About "the earthquake of the greatest class which is generated in the Nankai trough", the quantitative evaluation is difficult, but it is said that the outbreak frequency is considerably low.

<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)

Tokyo Inland Earthquake

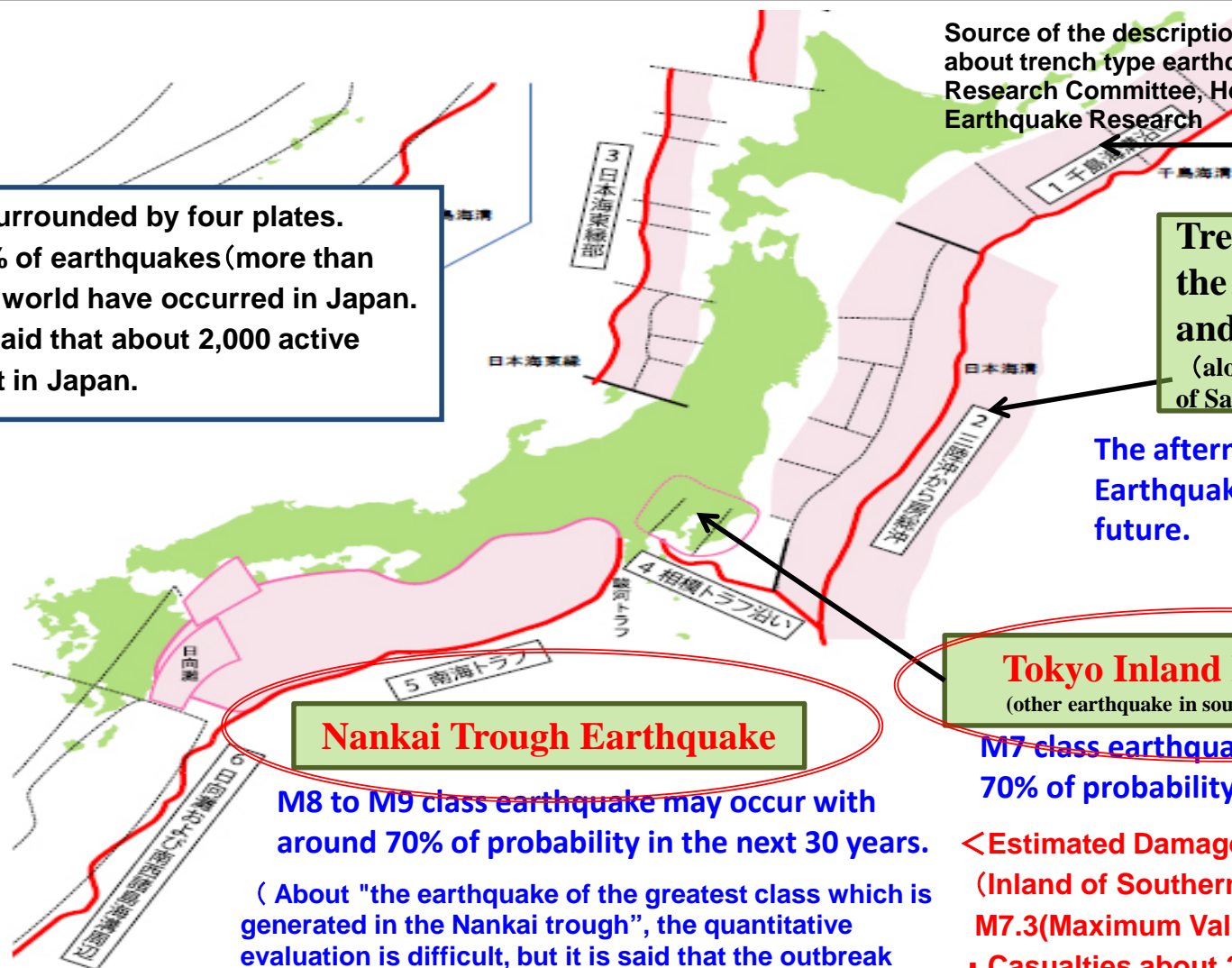
(other earthquake in southern area of Kanto)

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

<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)



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3-2. Volunteer Fire Corps

3-3. Early Warning Systems

3-1-1. Stepping Up Emergency Fire Response Team through Experience of Great East Japan Earthquake

1. Need 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

➡ Introducing Operation Base Forming Vehicle and Large Air Tent



Operation Base Forming Vehicle



Large Air Tent

2. Need to make sure of alternative ways that the rescue teams can arrive at disaster hit areas swiftly even in the case that the roads are closed due to damages caused by disaster

➡ Increasing the helicopter bases across the nation so that the rescue teams can dash to disaster hit areas with helicopters, no matter how the road conditions are



75 helicopters on active, for firefighting and disaster response throughout Japan



Rescue activity base with rescue tools storage and oil depot

3-1-1. Stepping Up Emergency Fire Response Team through Experience of Great East Japan Earthquake

3. Need to enable the rescue teams to keep the high mobility in the flood, the tsunami-hit and the rubble area

➔ Introducing Small Amphibious Buggy and Tsunami/Large-Scale Water Disaster Countermeasure Vehicle



Small Amphibious Buggy



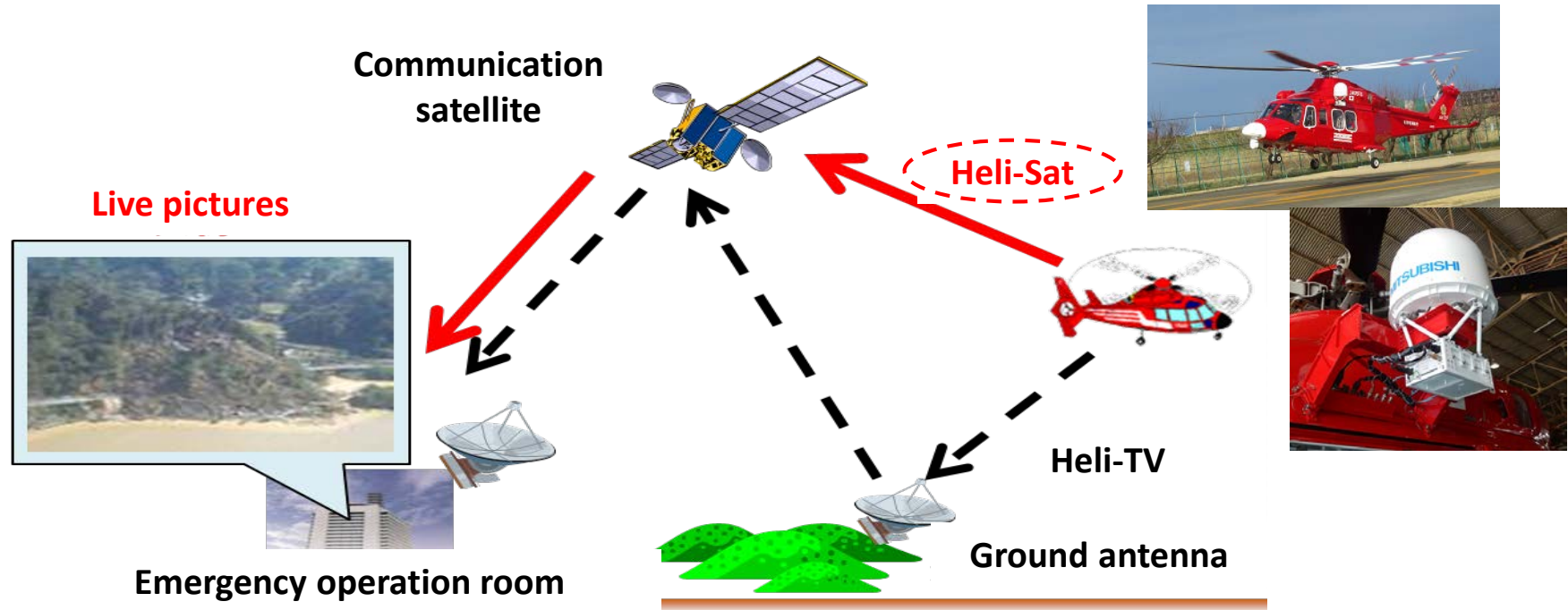
Tsunami/Large-Scale Water Disaster Countermeasure Vehicle



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

3-1-1. Stepping Up Emergency Fire Response Team through Experience of Great East Japan Earthquake

4. Need to enhance the arrangement to gather and share information on disaster damages ➡ Installation of Heli-Sat system



Advantageous Aspects of Heli Sat, Compared to Heli TV (the conventional system)

- Able to directly transmit images to disaster management institutions - no need to use ground antenna which is fragile to disasters such as earthquake and landslide, as well as to cut the cost to build ground antennas
- Possible to receive radio waves free from constraints of terrain

3-1-1. Stepping Up Emergency Fire Response Team Activity through Experience of Great East Japan Earthquake

5. Need to create a special unit dedicated to firefighting at petro complex

➡ Forming new fire response team, “Dragon Hyper Command Unit”



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 for longer time than ordinary fire engine
- At present, eight units formed in Tomakomai, Yokohama, Ichihara, Yokkaichi, Shizuoka, Kobe, Kurashiki and Kagoshima
- By 2018 to deploy 12 units in total to the areas close to large petrochemical complexes

3-1-2. 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

Coordination

SDF clearing roads for firefighting

Firefighting by Fire Service Organization and Industrial Firefighters

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



Disaster Management Headquarter at local governments

Coordination and Support

Disaster Management Headquarter at the central governments

Transportation of firefighters by SDF Carrier

SDF Carrier Aircrafts transports firefighters and fire engines to frontline.



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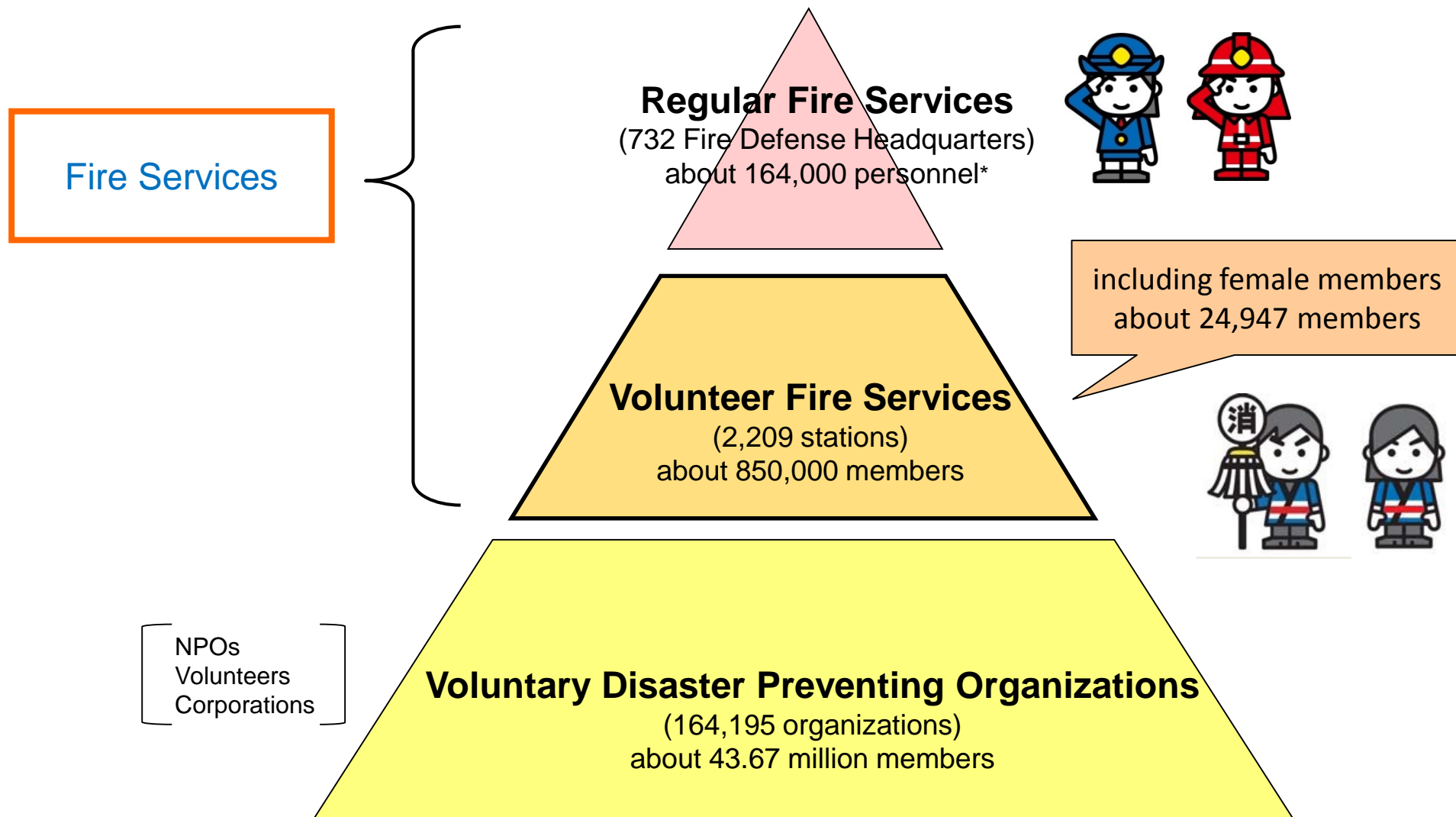
3-1. Emergency Fire Response Team

3-2. Volunteer Fire Corps

3-3. Early Warning Systems

3-2-1. Volunteers for Disaster Response

(as of April 1, 2017)



3-2-2. Volunteer Fire Corps

Volunteer Fire Corps:

- Act under the slogan “Protection of Our Community by Ourselves.”
- Usually work on their own job, but when a disaster occurs in their community, start the emergency response onsite.
- Take initial response to disasters on the front line before the professionals arrival.
- Give people an instruction about disaster response in normal situation.



Searching for victims in landslide disaster
(Hiroshima-City)



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

3-2-3. Volunteer Fire Corps in Great East Japan Earthquake

- In Great East Japan Earthquake, volunteer fire corps dedicated themselves to the following activities although they themselves were also victims, in some cases losing their family.

closing water gates, guiding people for evacuation, firefighting, rescue activities, searching for those missing

- 254 fire corps died or missing while in activities



It was suggested that the current safety measure for volunteer fire corps should be stepped up.

FDMA, with an advisory group, completed a report, encouraging local government, which is responsible for fire corps, to set up a manual book to ensure the safety of fire corps activities. The followings are parts of recommendations to include in their manual book.

To predetermine the activity time and start escaping when the predetermined time is over

To ensure at least two members get to water gates to close it, equipped with transceiver and wearing saving jacket

3-2-4. Significance of Volunteer Fire Corps Proved

- **A village which was stricken by a 15m high tsunami in Great East Japan Earthquake didn't see any casualty.**

Volunteer Fire Corps not only instructed people to dash to high level hills but closed the roads toward lower places so that people couldn't go down before the tsunami warning is lifted. This tactful idea and action were thanks to their regular disaster drill.

- **Even with a magnitude-6.7 earthquake in mid-night winter 2014, all of the residents in a village survived.**

An original map for emergency operation where the location of people in need for evacuation was plotted – quite useful to save and guide the people to evacuation instantly.



These good practices proved the significance of the volunteer fire corps in disaster management.



FDMA has taken measurements to encourage people to join the volunteer fire corps and enhance their capabilities through providing training and equipment.



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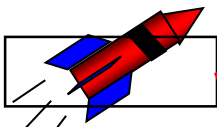
3-3. Early Warning Systems

3-3-1. Overview of “J-ALERT”

The national early warning system “J-ALERT” 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.

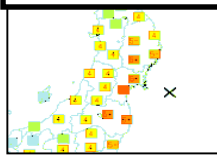
Central Government

Cabinet Secretariat



Ballistic missile, etc.

JMA



Earthquake early warning, Tsunami warning, etc.

(J-ALERT)

FDMA

Satellite



Online

Local Governments

Municipalities



Monitor



Receiver



Automatic Starter

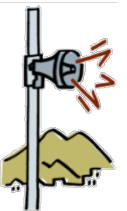
Information Transmission

Disaster Information Wireless Broadcasting System

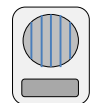
IP Notification Server

Cable TV Community FM Broadcasting Corporations

Local Residents



Outdoor broadcasting



IP notification terminal unit



Indoor broadcasting

3-3-2. Diversification of Disaster Warning Channel

- Prompt disaster warning to people significant to save their lives from disasters
- One-type method to transmit the disaster warnings not sufficient
 - ✓ Loud speakers – the most familiar way of early warning transmission, but fragile to earthquake and tsunami
 - ✓ Warning voices outside buildings difficult to listen to amid heavy rain
 - ✓ Not everyone with mobile phones – especially the elder
- Diversification of disaster information channel necessary to promote



- ✓ No way to control the earth, the natural world or the climate
- ✓ Preparedness is the only measure to minimize the damage
- ✓ Learning the lesson gets the preparedness robust

Thank you very much for listening.



Shota: the mascot of FDMA