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# Early Warning System

Research Report  
for the Visiting Researcher Program (2011 B)  
Asian Disaster Reduction Centre  
Kobe, Japan

**Phatsita RERNGNIRUNSATHIT**  
Department of Disaster Prevention and Mitigation  
Ministry of Interior, Thailand



Department of Disaster Prevention and Mitigation, Ministry of Interior

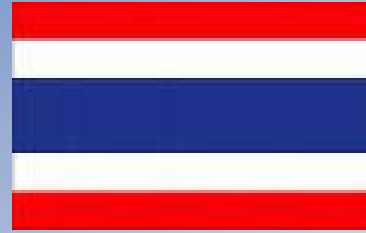


## Scope of Presentation

- I. General Information
  - Thailand
  - Japan
- II. Thailand Disaster Management System
- III. Japan Disaster Management System
- IV. Early warning system in Japan
- V. Early warning system in Thailand
  - Conclusion

# Thailand

## General Information

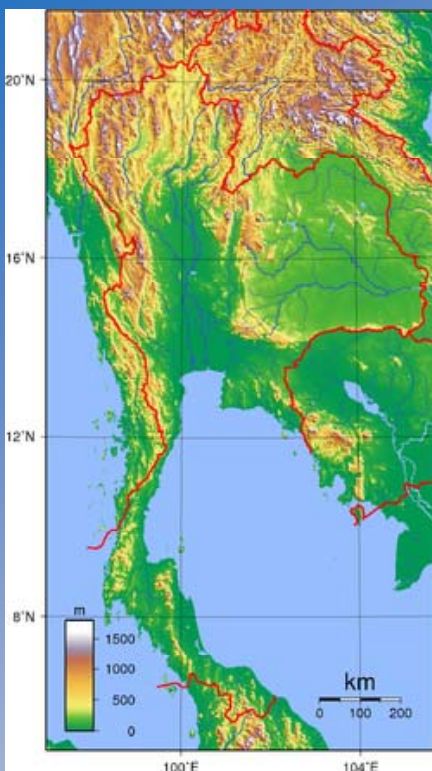


Flag of Thailand

5° and 21° N latitude  
 97° and 106° E longitude,  
 Bordered by Laos, Myanmar, Cambodia,  
 Gulf of Thailand Malaysia, and Andaman  
 513,115 square kilometres.  
 Main 4 regions  
 Average height temperature of 34°C and the  
 low of 23 °C.



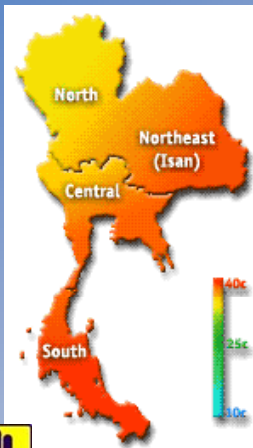
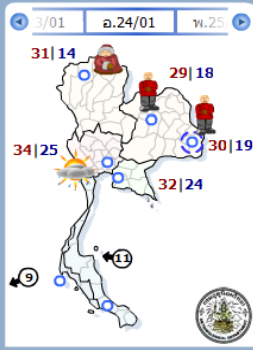
## Geography



Four regions are distinguished:  
**North**; mountainous, forested areas.  
**Central** Plain with the Chao Phraya River Basin  
 and some other, smaller rivers basins;  
 including Eastern, & Western area  
**North-East**, also known as the Khorat Plateau;  
**South** on the northern half of the Malay  
 Peninsula.



# Climate



- A tropical country, Thailand has three distinct seasons. The first is a hot and dry season from February to May, with an average temperature of 34 ° C and 75 percent relative humidity.
- This season is followed by a rainy, cooler season brought by the southwest monsoon from June to September, with an average daily temperature of 29 ° C and 87 percent relative humidity. A cooler, dry season, caused by the northeast monsoon, lasts from November to January, with temperatures ranging from 32 ° C to less than 20 ° C and lower relative humidity.. The lightest rainfall is in the northeast. Temperatures in Bangkok range between 20 ° C and 35 ° C.



# Natural Disaster

The Level of Disaster Intensity, Vulnerability, Managing Competency and Risk Level of Thailand

Disaster	Severity	Vulnerability	Management	Tendency
Flood	High	Medium	Medium	High
Landslide / Mudflow	High	Medium	Poor	High
Windstorm	Medium	Medium	Medium	Medium
Drought	High	Medium	Medium	Medium
Fire	High	Medium	Medium	Medium
Explosive	High	Medium	Medium	Medium
Earthquake	Low	Low	Poor	Medium
Accident	High	Medium	Poor	High
Sunami	High	Medium	Medium	Medium



# Thailand's Disaster Situation Summary in 2010

Disaster type	Frequency	People Killed	Total affected people	Damaged (USD)
Flood	7	266	13,485,963	533,075,769
hailstorm	19	n/a	31,935	184,552
Drought	1	n/a	15,740,824	n/a
Cold Spell	1	n/a	10,609,301	n/a
Fire	1,903	29	8,912	41,885,385
Storm	2,192	30	407,271	6,487,612
Thunderbolt-induced disaster	230	45	817	90,401
Forest Fire	6,763	n/a	n/a	n/a



Department of Disaster Prevention and Mitigation, Ministry of Interior

Source : DDPM

## Recently Major Disasters Flood 2011



- Flood Effects ( July 25,2011 – The arrival of Nock-Ten)
- Effected people : 13.6 million in 4 regions
- Loss of Life 813 (as of JAN. 8 , 2012)
- Economic Damage : 43,253.60 million USD (source : Thai Chamber of Commerce)



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The World Bank has estimated 1,425 billion baht (US\$ 45.7 Bn) in economic damages and losses due to flooding, as of 1 December 2011. Most of this was to the manufacturing industry, as seven major industrial estates were inundated by as much 3 meters (10 feet) during the floods. Disruptions to manufacturing supply chains affected regional automobile production and caused a global shortage of hard disk drives, which is expected to last throughout 2012.



Department of Disaster Prevention and Mitigation, Ministry of Interior

## Disaster Prevention and Mitigation Act 2007

Disaster classified into 3 categories

- 1) Man-made and natural disasters;
- 2) Disaster resulted from air raid during wartime; and
- 3) Disaster resulted from sabotage or terrorist attack



# Disaster Management System

based on

**Disaster Prevention and Mitigation Act 2007**

Come into force on 6 November 2007

## Institutional arrangement

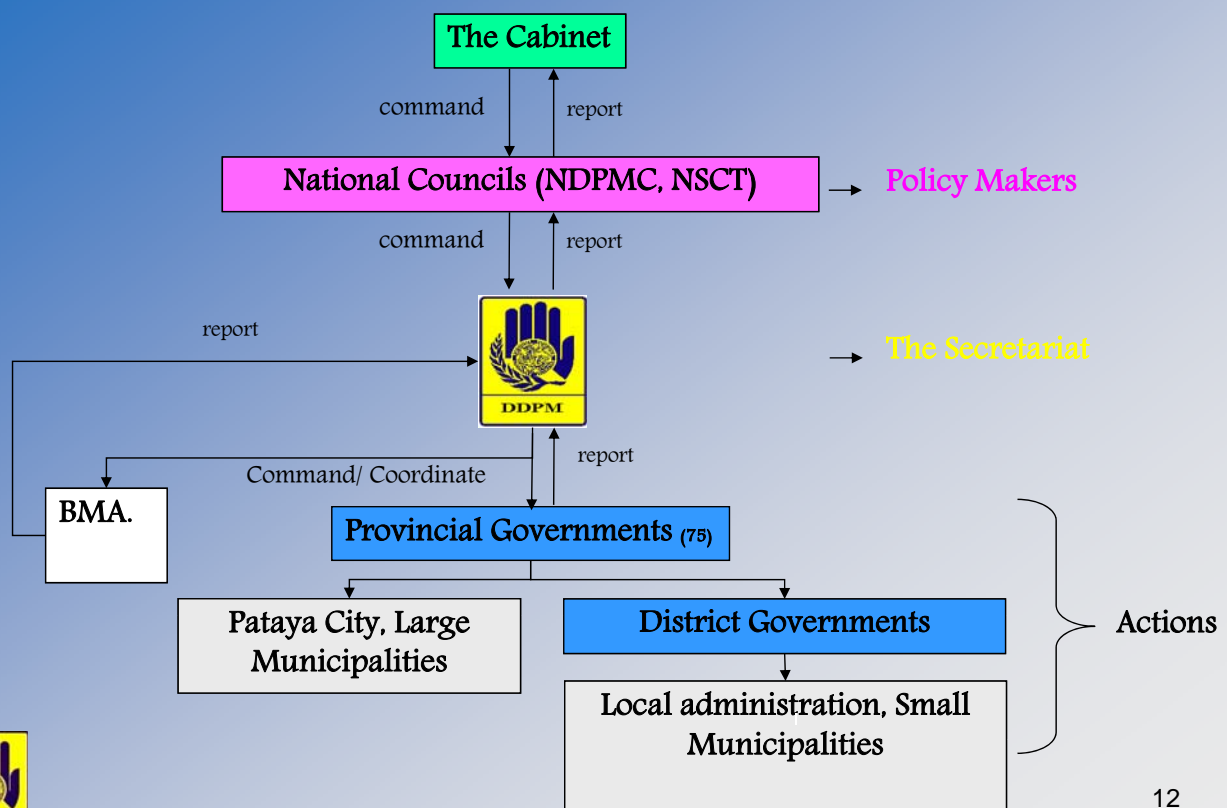
1. National Disaster Prevention and Mitigation Committee (NDPMC)
2. The Commander in chief.
3. The Secretariat of NDPMC.
4. The Directors in the Incident Commander



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## Disaster Management System



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## Structure of Disaster Management System

The structure of disaster prevention and mitigation system in Thailand was divided into 3 levels as follows

### 1. Policy Level:

The **National Disaster Prevention and Mitigation Committee** is the policy maker body. The national disaster prevention and mitigation plan will be the tool to drive the disaster management.

### 2. Command Level:

**Minister of Interior** as Commander in Chief has authority to control and supervise the situation throughout the country. However, in the catastrophe event, Prime Minister or Designate Prime Minister will be Chief of Commander.

### 3. Operation Level:

**DDPM Director General** as Central Director has the duties to prevent and mitigate disaster throughout the country and supervise the Provincial and Local Director, staffs and civil defence volunteers.



## Structure of Disaster Management System

- **3. Operation Level:**
- **Provincial Governor** as Provincial Director has the duties to copes with the disaster prevention and mitigation in the province.
- **Chief of District** as District Director has the duties to carry out the disaster prevention and mitigation in the district. Head of Local Administration Agencies as the Local Director have the duties to carry out the disaster prevention and mitigation in their local areas.
- **Bangkok Metropolitan Administration (BMA) Governor** as BMA Director has the duties to carry out the disaster prevention and mitigation in Bangkok





# National Disaster Prevention and Mitigation Plan

- devised by National Disaster Prevention and Mitigation Committee
- the master plan for establishing provincial and Bangkok Metropolitan plan , and other related government agencies and local administrations' operational plan.
- 3 levels– national, provincial, and Bangkok provinces
- reviewed every 3 years by DDPM

## NDPMC

### National Disaster Prevention and Mitigation Committee

- Based on the DPM Act 2007
- NDPMC is a policy maker, chaired by Prime Minister or designated Deputy Prime Minister and DG. of DDPM is the Secretary  
34 members, and various sub-committee
- Minister of Interior is the Commander in – chef; in large – scale of emergency response.



# National Disaster Prevention and Mitigation Committee

## Members

Chairperson – PM  
V Chairperson 1 – Minister of Interior  
V Chairperson 2 – Permanent Sec of Min. of Interior

Permanent sec. of Min of Defense  
Permanent sec. of Min of Social Dev.  
Permanent sec. of Min of Agriculture etc.  
Experts & Military Commanders

Member & Secretary – DDPM's DG



To set up Sub-Committee (s)

## Duties

- Formulate the National Disaster Prevention and Mitigation Plan
- Approve the National Plan before submitting to the cabinet
- Integrated the development of Disaster Prevention and Mitigation System among all concerned sectors
- give recommendations, consultation, and support to concerned agencies
- propose regulation on remuneration, recompense and so on.

# Provincial Disaster Prevention and Mitigation Committee

## Members

Chairperson – Governor  
Vice Chairperson – Deputy Governor/  
Military Commander/  
Chairman of Provincial  
Administration  
Organization

– Representatives from Provincial  
Government Services, Local  
Administration Organization,  
Private Sector/NGO's

Member & Secretary –  
DDPM's Provincial Chief

## Duties

- Formulate the Provincial Disaster Prevention and Mitigation Plan
- Oversee and provide training for volunteer
- Oversee & investigate local admins. of preparing equipment
- Operate as government service unit at local admins. level to assist the disaster affected and other activities



## Provincial Disaster Prevention and Mitigation Committee

### Members

Chairperson – Governor  
Vice Chairperson – Deputy Governor/  
Military Commander/  
Chairman of Provincial  
Administration  
Organization  
–Representatives from Provincial  
Government Services, Local  
Administration Organization,  
Private Sector/NGO's  
**Member & Secretary –  
DDPM's Provincial Chief**



Department of Disaster Prevention and Mitigation, Ministry of Interior

### Duties

- Formulate the Provincial Disaster Prevention and Mitigation Plan
- Oversee and provide training for volunteer
- Oversee & investigate local admins. of preparing equipment
- Operate as government service unit at local admins. level to assist the disaster affected and other activities

## BMA's Disaster Prevention and Mitigation Committee

### Members

Chairperson – BMA Governor  
Vice Chairperson–BMA Permanent  
Secretary  
  
Government Agencies Reps.  
DDPM's Reps. Private sector/  
NGO's Reps. Community Reps.  
Military Reps.  
Education Institution  
Reps.



Department of Disaster Prevention and Mitigation, Ministry of Interior

### Duties

- Formulate the Disaster Prevention and Mitigation Plan for Bangkok
- Oversee and train volunteer in BK
- Procure material, equipment, tools, vehicles and others
- Support and assist local admins. and the neighboring in disaster prevention

## Substantial Part of 3-level Plan

National plan	Provincial Plan	Bangkok Plan
(1) Guide lines, measures and budget to support disaster prevention and mitigation operations	(1) The setting up of Special Command Center when ever disasters strike	(1) establish command center where disaster occurred
(2) Guide lines and methods for providing aids and mitigate the impacts of disasters	(2) Plan and procedures for local administrations for procuring tools, equipments, materials, hardware and vehicles in disaster prevention and mitigation operations	(2) plan and process to procure materials , tools , equipment, and vehicle for disaster prevention and mitigation



Department of Disaster Prevention and Mitigation, Ministry of Interior

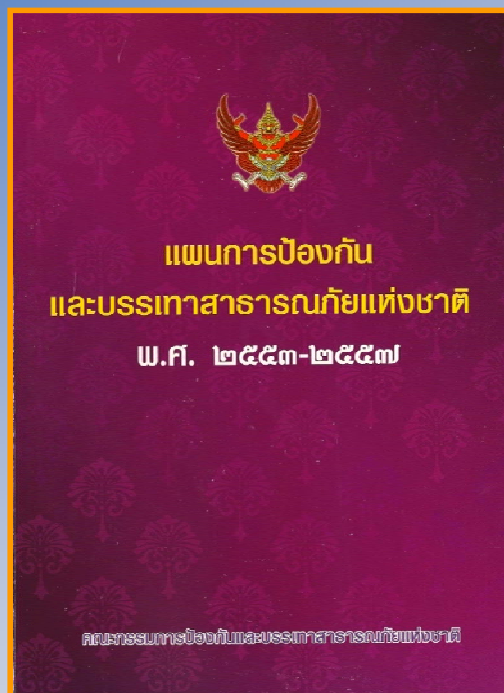
## National Disaster Prevention and Mitigation Plan (cont.)

National plan	Provincial Plan	Bangkok Plan
(3) Relevant government agencies and local administrations shall proceed operations under (1) and (2), and shall seek for availability and mobility of fund	(3) Plan and procedures for local administrations for procuring an early warning system and other equipments	(3) plan and process to procure signaling devices for notifying the occurrence of a disaster
(4) Preparedness perspectives on support personnel, equipments and other materials	(4) Operation plan for disaster prevention and mitigation at local administrations	(4) Bangkok Disaster Prevention and Mitigation Action Operation Plan
(5) Guide line on fixing, recovery and restoration to community right after disaster	(5) Cooperation plan to other relevant public charities.	(5) Coordination Plan with Public Charity Organizations in Bangkok



Department of Disaster Prevention and Mitigation, Ministry of Interior

## National Disaster Prevention and Mitigation Plan (2010-2014)



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## NSCT

### National Safety Council of Thailand

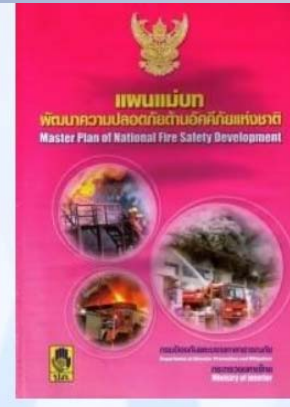
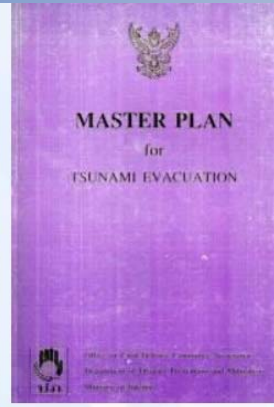
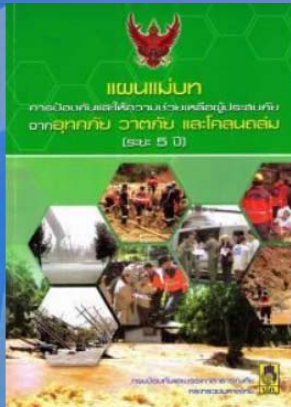
- NSCT is a policy maker body in **technological disaster management**
- NSCT is chaired by **Prime Minister** or designated Deputy Prime Minister
- NSCT comprises 34 members from a wide range of sectors



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# Master Plan



## Budget Size 2003 - 2011

Year	THB	USD	JPN
2003	1,066,412,900	34.7	2775
2004	1,312,578,500	42.8	3416
2005	1,685,362,700	54.9	4386
2006	2,437,850,700	79.5	6345
2007	1,948,805,800	63.6	5072
2008	2,184,972,800	71.3	5687
2009	2,315,783,900	75.5	6027
2010	2,541,163,000	82.9	6614
2011	2,541,163,300	82.9	6614



# Department of Disaster Prevention and Mitigation (DDPM)



- Established in 2002, under Ministry of Interior.
- Performs the Secretariat Tasks for NDPMC and NSCT
- Has over 4,000 Staffs, with 18 branch in regional offices
- And having staffs in 75 provinces throughout the country



Department of Disaster Prevention and Mitigation, Ministry of Interior

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## DDPM responsibilities :

- 1) formulates the National Disaster Prevention and Mitigation Plan for the committee
- 2) Organizes and researches on procedures and measures
- 3) Operates, cooperates, supports and assists all relevant agencies
- 4) Guides, and provides consultancy, and train all concerned sectors
- 5) Follow-up, assesses and evaluates all activities

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## DDPM's Preparedness

DDPM has supported the provinces to carry out preparedness related activities as follow;

- Formulating disaster prevention plan.
- Training the officials and Civil Defense Volunteer.
- Educating the public.
- Procuring equipments, vehicles and other amenities for safety
- Providing temporary shelters.
- Conducting annual exercise & drills.



## DDPM in Preparedness' s activity



Equipment practice



Community Drill



Official training



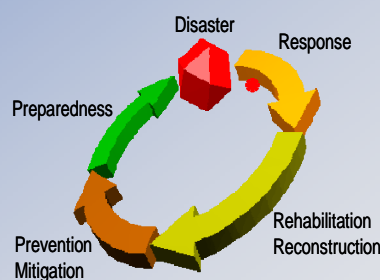
Search & Rescue training



Civil Defense Volunteer



Drill in school





## Projects on disaster reduction

1. The One Tambon–One–Search and Rescue Team (OTOS)
2. Disaster Management Training for Managers, Practitioners, Local Government Officers and Others .The Prevention and Mitigation Academy (DPMA) established by Ministry of Interior, DPMA is now a principle educational institution in disaster management field.
3. Education for Disaster–Preparedness in Primary School
4. Community–Based Disaster Risk Management (CBDRM) Program
5. "Mr. Warning" Training Program
6. Emergency Response Team Development project (ERT)



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## When a disaster strikes.....

National/Provincial/local Plans shall be activated

- Local government shall react first
- Neighboring local governments shall assist
- Provincial government to support
- DDPM shall support and coordinate with other national agencies



Department of Disaster Prevention and Mitigation, Ministry of Interior



# JAPAN

Government Seal of Japan



五七桐 (Go-Shichi no Kin)



ESTIMATED POPULATION : 127.77 MILLION

CAPITAL: TOKYO

CLIMATE: Clear-cut temperature changes between the four seasons

RELIGIONS: BUDDHISM  
SHINTOISM  
CHRISTIANS

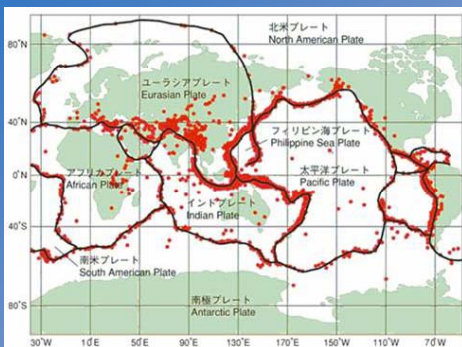
LAND AREA: 378,000 sq.kms.

MAJOR ISLANDS: Honshu Shikoku  
Hokkaido Kyushu

CONSISTING OF: Prefectures: 47 ,  
Municipalities: 1,800

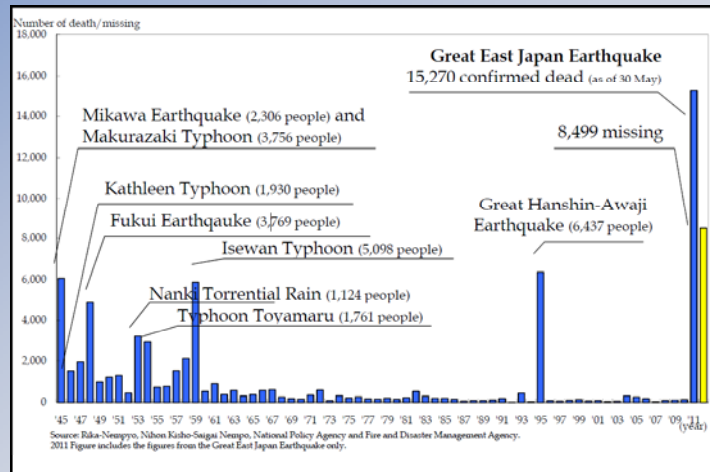


## National Disasters in Japan



JAPAN IS LOCATED WITHIN THE BOUNDARIES OF RING OF FIRE AND AT THE JUNCTION OF 4 TECTONIC PLATES – EURASIAN PLATE, NORTH AMERICAN PLATE, PACIFIC PLATE AND PHILIPPINES SEA.

A Highly Developed country and a Country vulnerable to Disaster



## Natural Disasters in Japan

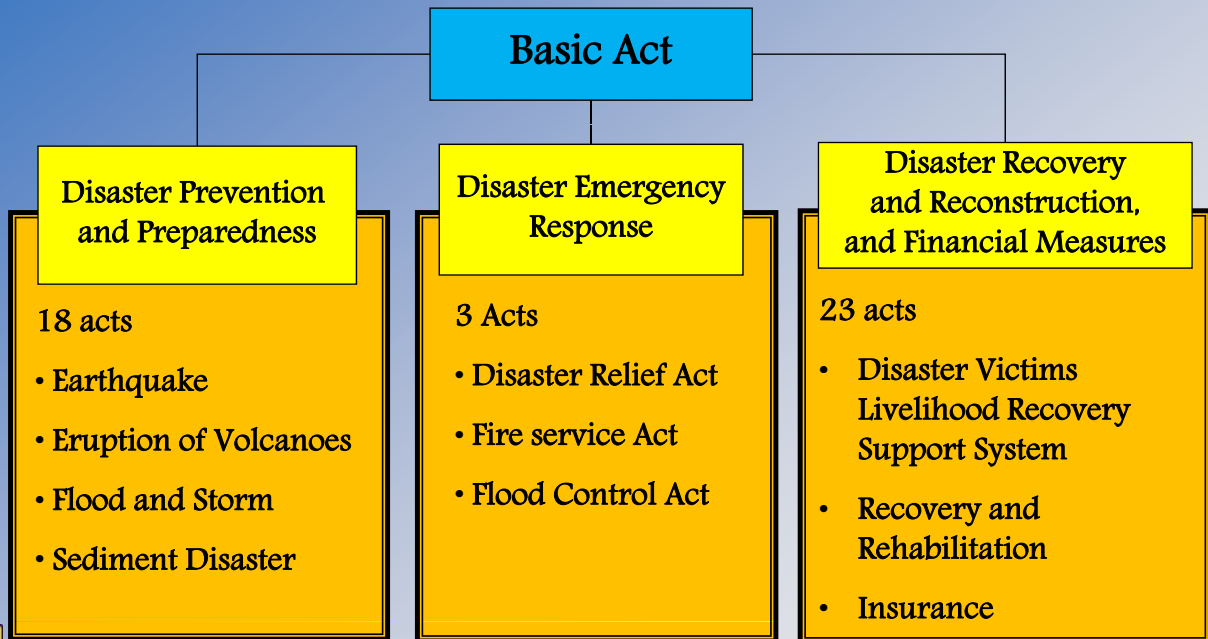


- Earthquake
- Tsunami
- Volcanic Eruption
- Typhoon
- Flood
- Landslide
- Snow Fall (Avalanche)



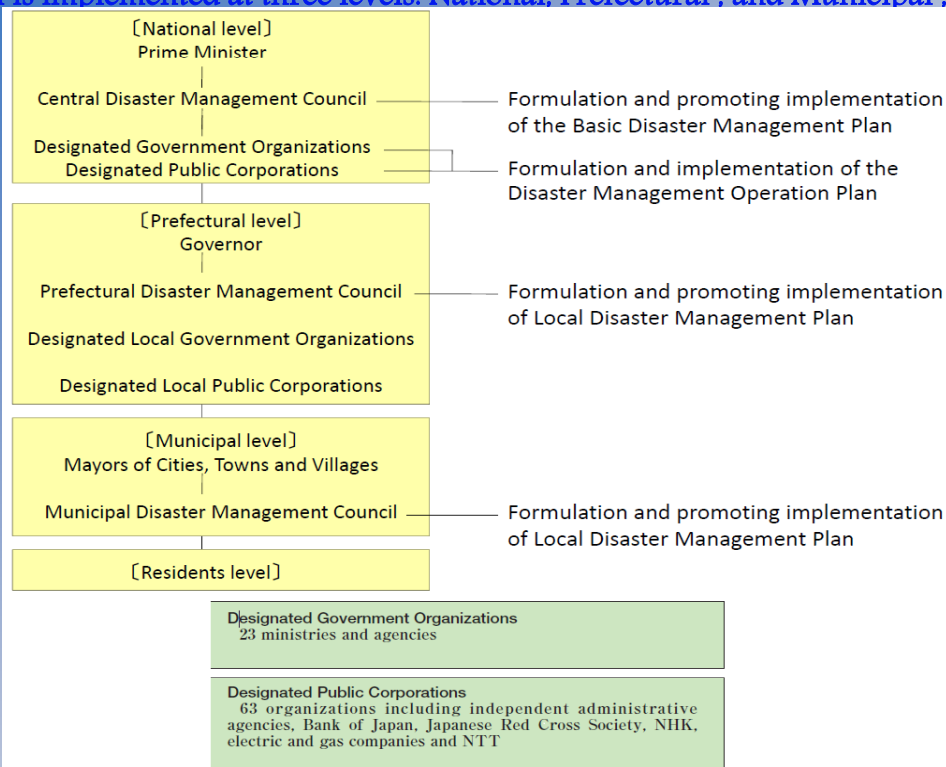
## JAPAN'S DISASTER MANAGEMENT SYSTEM

# Disaster Management Related Laws

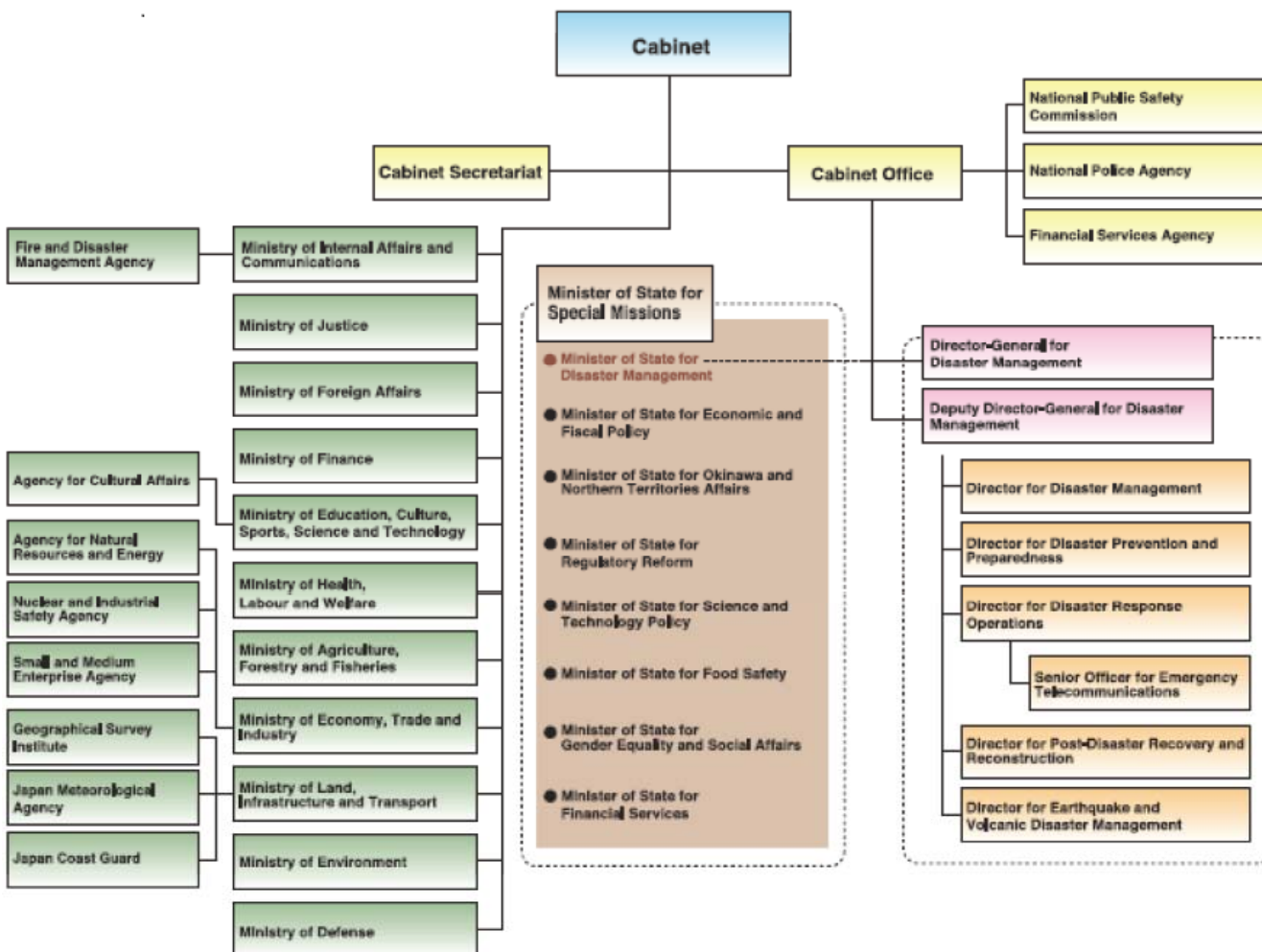
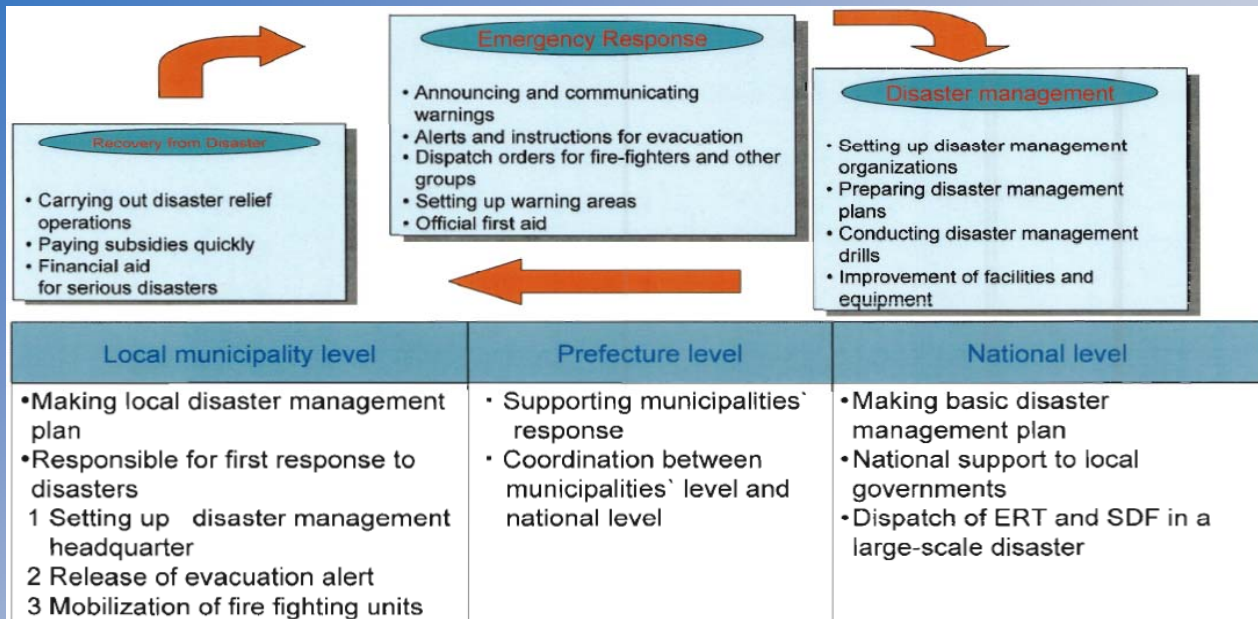


## OVERVIEW OF THE DISASTER MANAGEMENT SYSTEM

According to the Disaster Countermeasures Basic Act, Disaster management in Japan is implemented at three levels, National, Prefectural, and Municipal.



# DISASTER MANAGEMENT ORGANIZATION



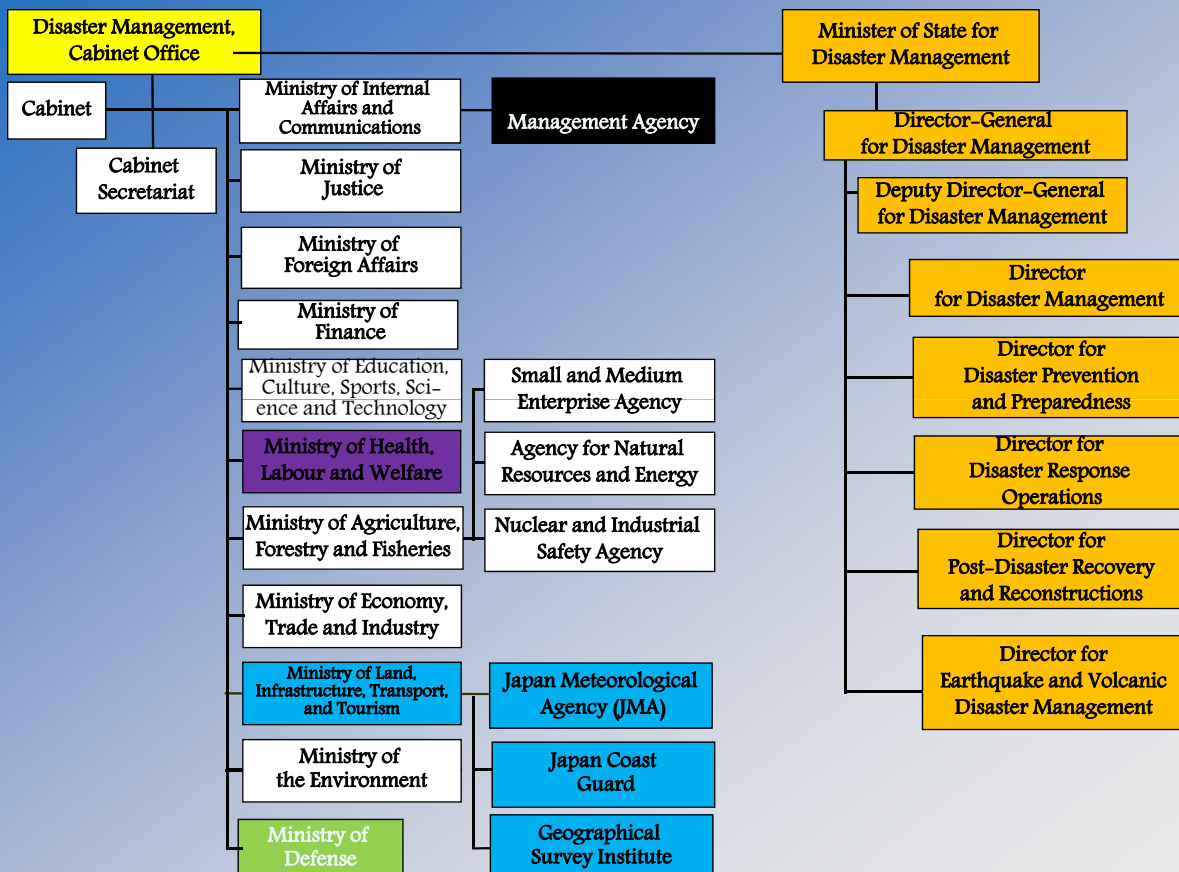
# OVERVIEW OF THE DISASTER MANAGEMENT SYSTEM

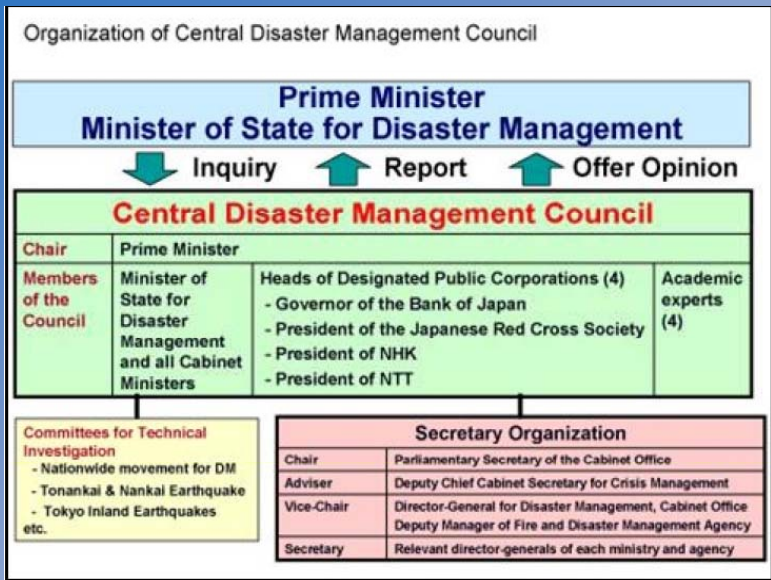
## CENTRAL DISASTER MANAGEMENT COUNCIL

Central Disaster Management Council consists of the prime minister, who is the chairperson, Minister of State for Disaster Management, all ministers, heads of major public institutions and experts. The council promotes comprehensive disaster countermeasures including deliberating important issues on disaster reduction according to requests from the Prime Minister or Minister of State for Disaster Management.



## DM & Organization of the national government of Japan





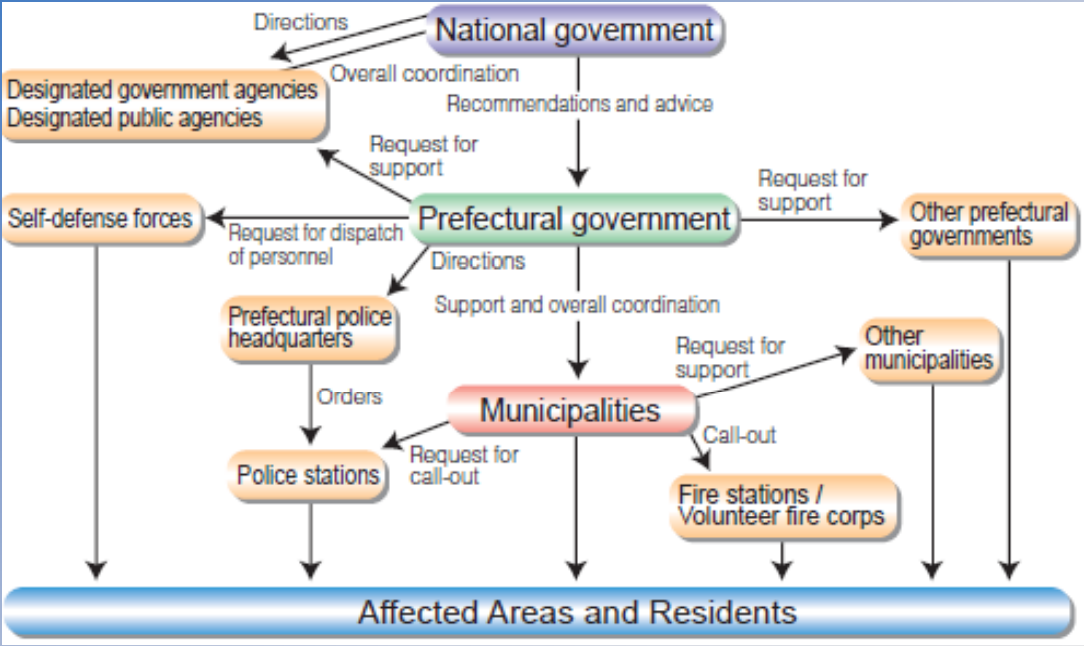
**Central Disaster Management Council**

- Chairperson – Prime Minister
- Members
- 17 Head of all ministers
  - Head of all Designated Public Corporations
  - Governor of the Bank of Japan
  - President of Japanese Red Cross Society
  - President of Nippon Hoso Kyokai (Japan Broadcasting Corporation)
  - NTT
  - President of Nippon Telegraph and Telephone Corporation
  - Experts

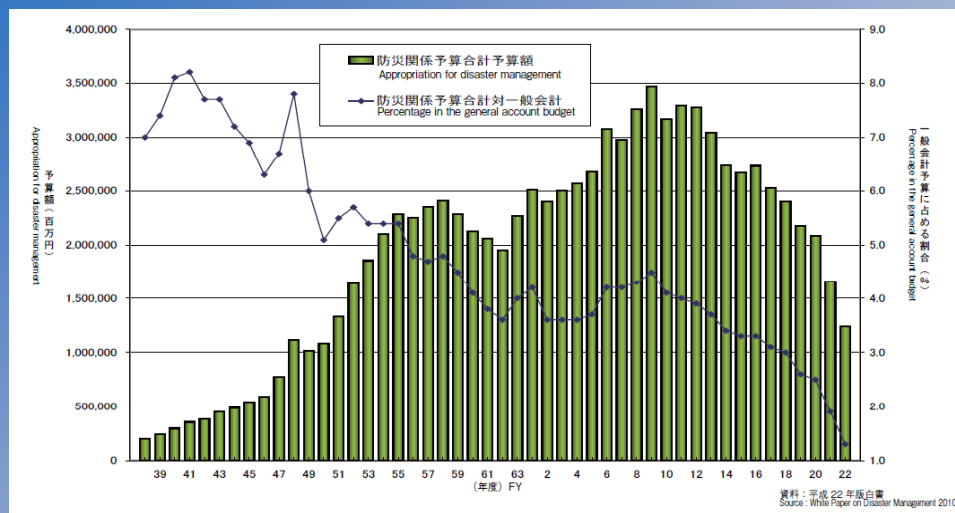
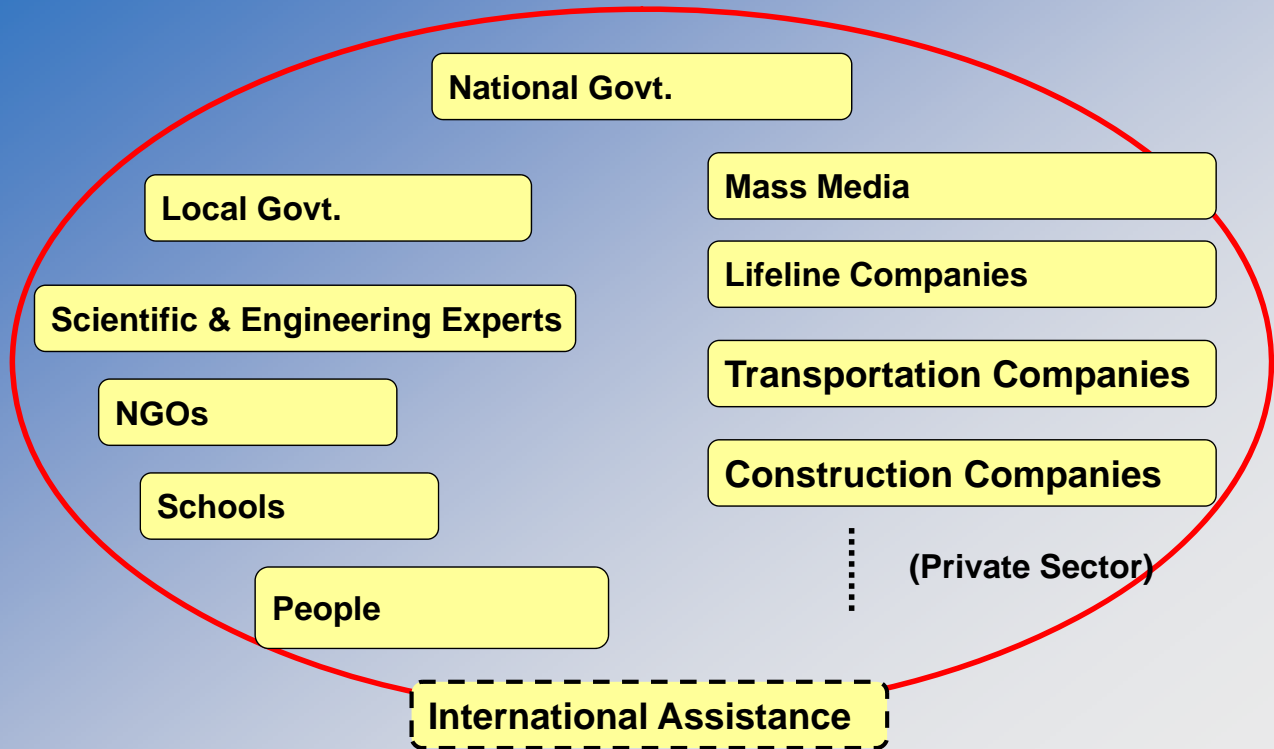
**Duties**

- ◆ Formulate and promote implementation of the Basic Disaster Management Plan and Earthquake Countermeasures Plans.
- ◆ Formulate and promote implementation of the urgent measures plan for major disasters
- ◆ Deliberate important issues on disaster reduction according to request from the Prime Minister or Minister of State for Disaster Management (basic disaster management policies)
- ◆ Other opinions regarding important issues on disaster reduction to the Minister and Minister of State for Disaster Management

**DISASTER RESPONSE MECHANISM**



# Involvement and Cooperation of All Stakeholders



## Disaster Management Budget

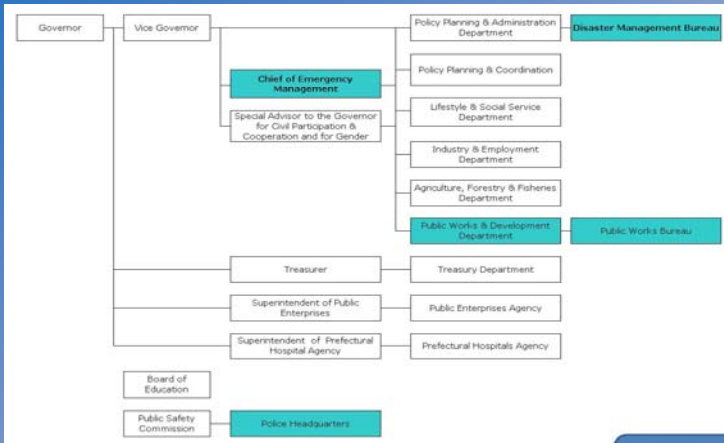
The national budget for disaster management is approximately 1.2 trillion yen.

Scientific and Technology Research	-	0.6 %
Disaster Prevention and Preparedness	-	17.5 %
National Land Conservation	-	62.4 %
Disaster Recovery and Rehabilitation	-	19.5 %

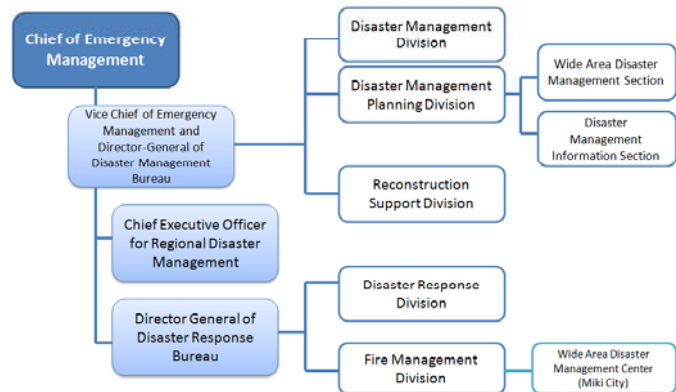


## Disaster Management at Prefecture Level

To carry out its disaster management responsibilities relevant departments and divisions is established within each prefecture.



### Disaster Management Bureau of Hyogo Prefectural Government



## Disaster Management at Prefecture Level

### HYOGO PREFECTURE - Case

#### Phoenix Disaster Management System –

collects disaster information from 334 terminals installed in such disaster management agencies as prefectural governments offices, district administration offices, local administrative organs, municipalities, fire headquarters, police headquarters, police stations, self-defense forces, national government (Fire and Disaster Management Agency, etc.), lifeline providers, etc.

Main function of the system are: collection of observation data, prediction of earthquake damage, collection of damage information, geographic information, image information, estimation of demand and supply of people.

#### Hyogo Satellite Communication Network –

166 satellite-based stations across the prefecture has been installed to collect and transmit emergency contacts, meteorological, disaster and other information (transmission of voice, video, facsimiles and other data) via disaster administration wireless system that connects the prefectural office, district administration offices, municipalities, fire headquarters, and other points using satellite communications and goods, etc.

**Video Phone System** –has been set up for information exchange between prefectural and municipal disaster management headquarters during disasters.

**Helicopter Video Transmission system** – Besides the prefectural police helicopter system, prefectural fire and disaster-prevention helicopters are utilized to transmit video images to the Disaster Management Center..

**24-hour monitoring** – 24-hour monitoring and quick-response system is maintained in anticipation of the occurrence of a disaster or other emergency.

## Providing Disaster Management Information to Citizens

- Case of Hyogo Prefecture Government -

### Transmitting disaster related information using the Internet

- Put Disaster management related information on the website (<http://web.bosai.pref.hyogo.jp/>)
- Provide meteorological information to cellular phones (<http://hyogo.bosai.info/mobile/>)



### Establishment of an Emergency Information Transmission System

The Hyogo Disaster Net was launched in 2005 to transmit earthquake and tsunami information, meteorological information, evacuation orders and instructions, and other emergency information to residents in Hyogo prefecture using cell-phone e-mail and the Internet.

For foreigners living in the prefecture, the Hyogo E (Emergency) Net provides emergency information translated and formatted in five languages (English, Korean, Chinese, Portuguese and Vietnamese).

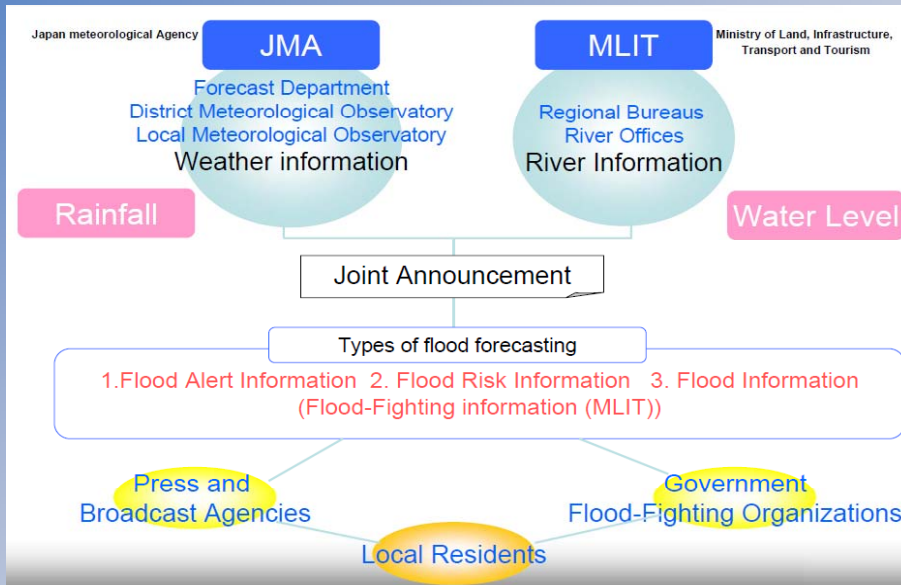


If you would like to receive emergency information as soon as a disaster occurs, go to the following URL and register under your municipality.  
<http://bosai.net/e/>

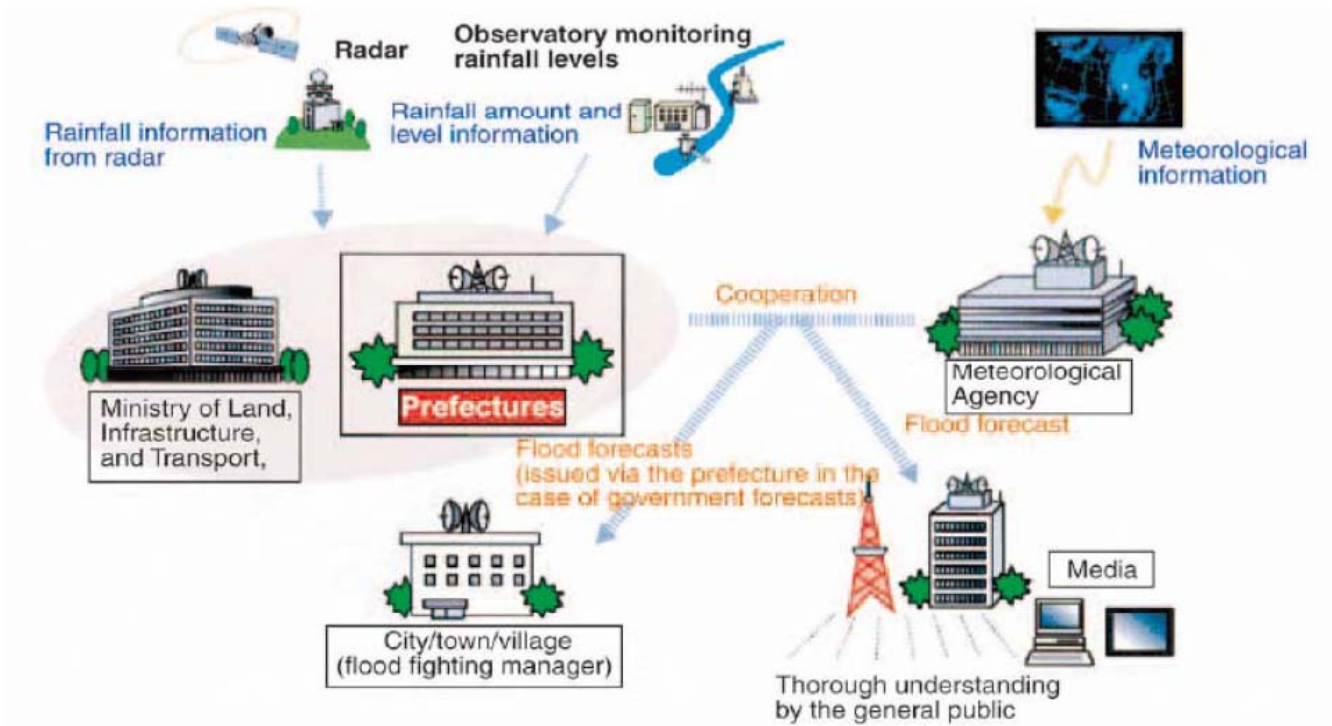
## Early warning at National Level

### JAPAN METEOROLOGICAL AGENCY

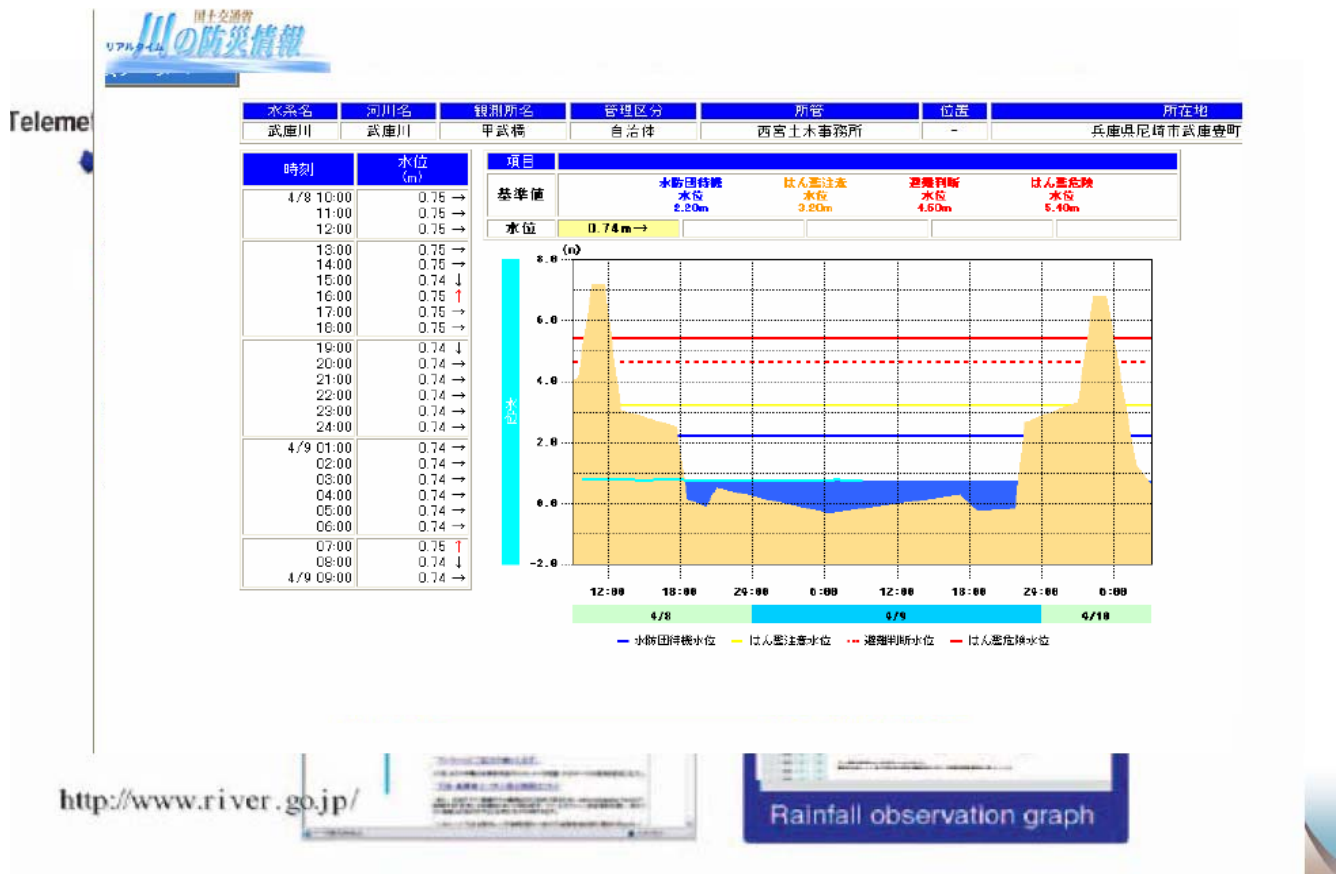
JMA is semi-autonomous agency of the MLIT. Besides, functioning as the central weather service agency of Japan, the agency has established comprehensive surveillance and awareness providing mechanism with regard to earthquake, typhoon and volcano hazards. Regarding flood forecast Director-General of Japan Meteorological Agency (JMA) In the event of the imminence of a flood or storm surge, the Director-General of JMA informs the Minister of Land, Infrastructure, Transport and Tourism and the prefectural governors concerned of the present state.



## Information Dissemination

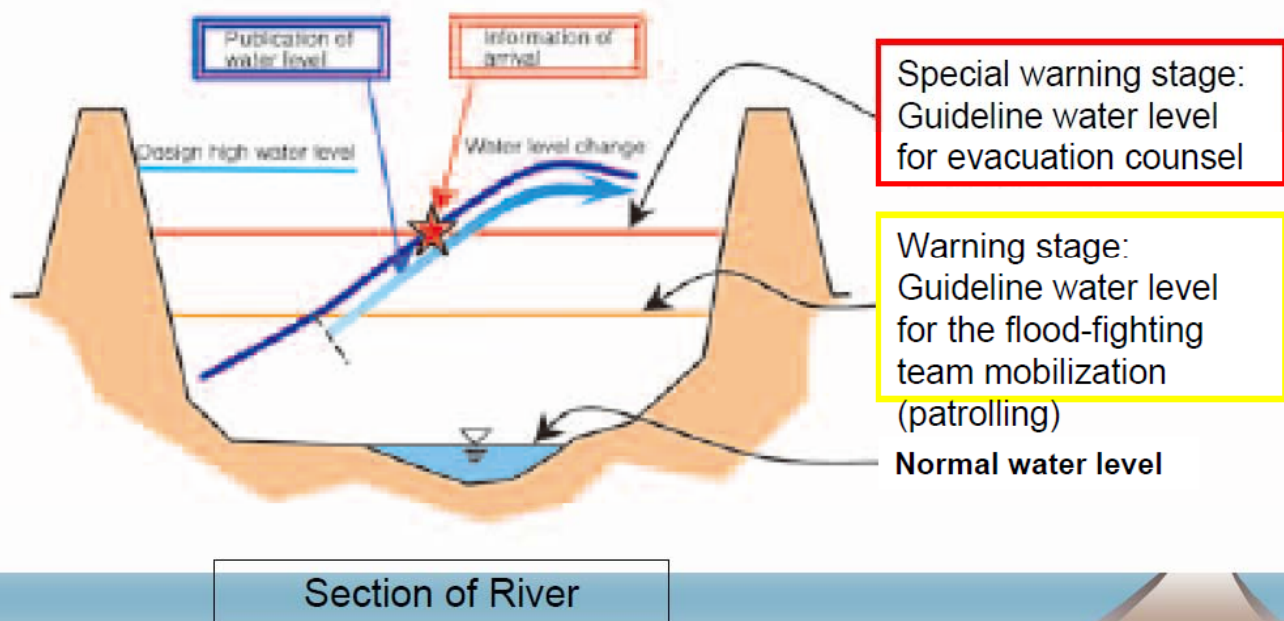


# Information Dissemination to Citizens



## Warning Water Level

### Image of setting the special warning stage



## Seismic Intensity (1)

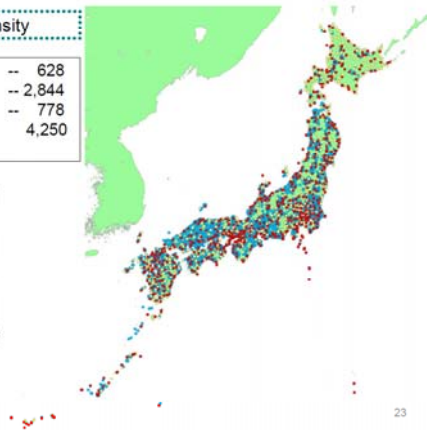
### Network of Seismic Intensity Meter

■ : JMA	-- 628
● : Local Government	-- 2,844
● : NIED	-- 778
<b>Total:</b>	<b>4,250</b>

(2010/07/01)



Seismic Intensity Meter



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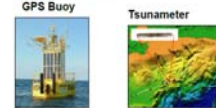
## Tsunami Monitoring Network in Japan

■ : Tide Gauges (on the coast)	-- 172
JMA (77), Others (95)	
■ : GPS Buoy	-- 12
▲ : Tsunameter	-- 12
JMA (6), ERI (2), JAMSTEC (4)	
<b>Total:</b>	<b>-- 196</b>

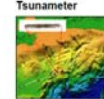
Tsunameter data is under evaluation (12/05/2011)



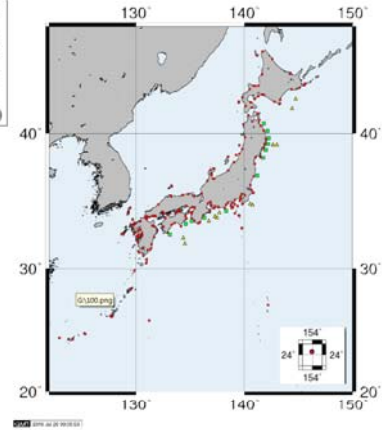
Tide Gauges



GPS Buoy

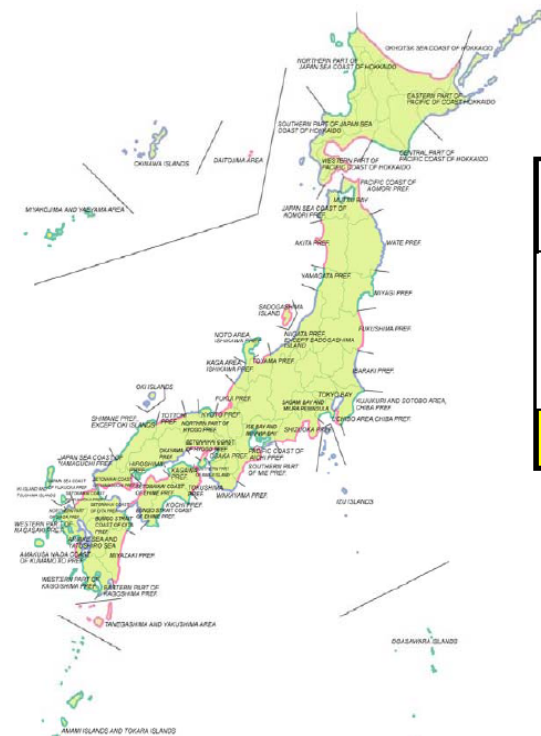


Tsunameter



55

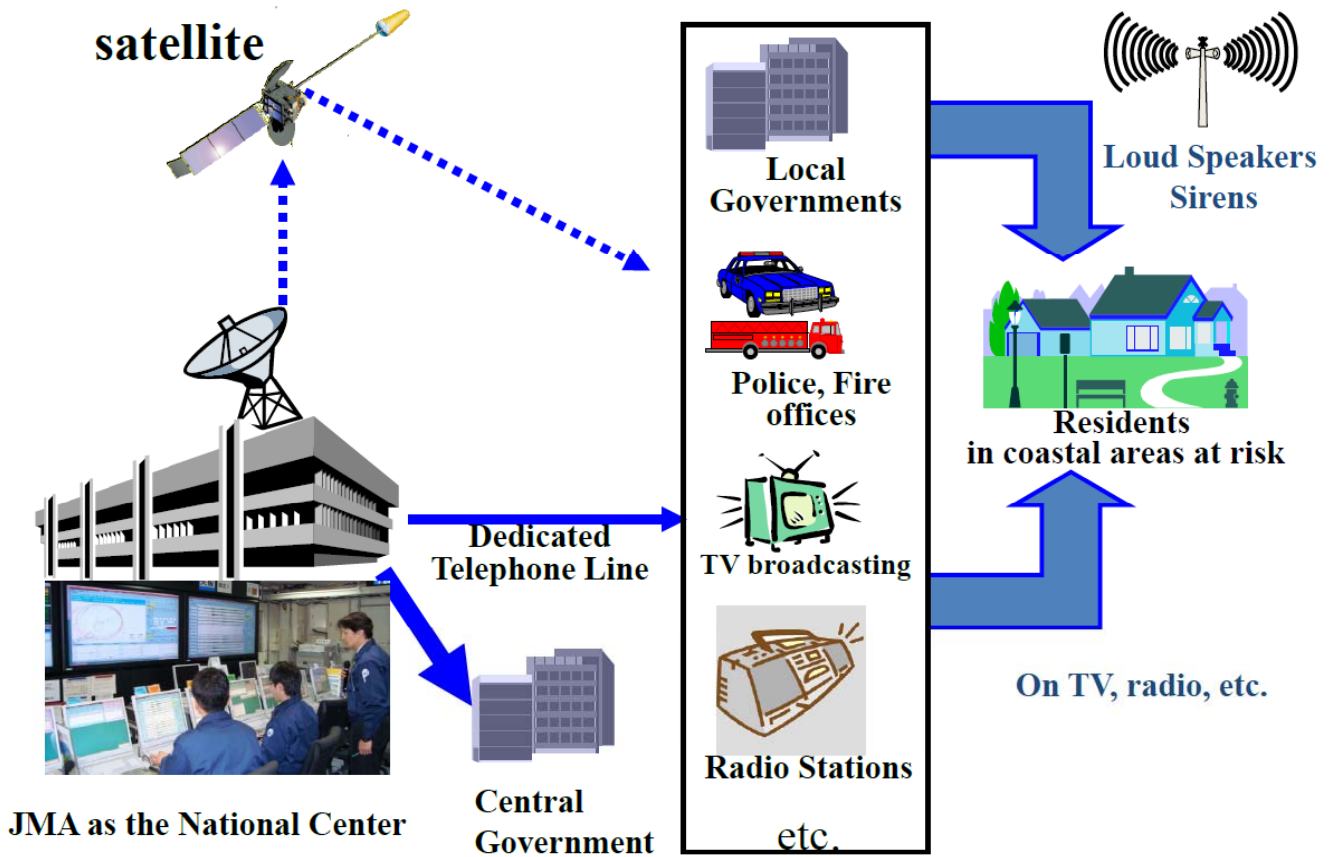
## Tsunami Warning Classification



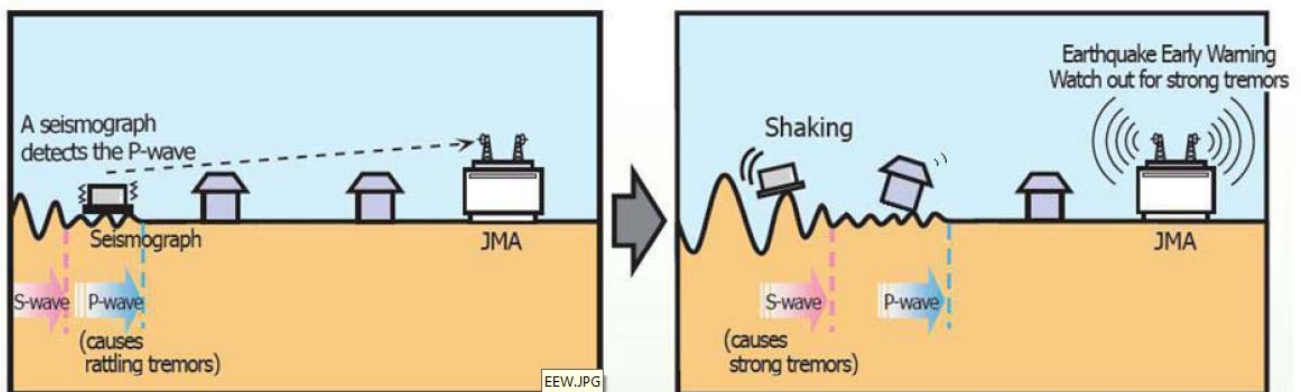
Type of Tsunami Bulletin		Estimated Tsunami Height
Tsunami Warning	Major Tsunami	"3m", "4m", "6m", "8m", "over 10m"
	Tsunami	"1m", "2m"
Tsunami Advisory		"0.5m"

**66 Regional Blocks for Tsunami Warning/Advisory**

## Dissemination of Tsunami Warning and Earthquake Information



## Concept of Earthquake Early Warning (EEW)

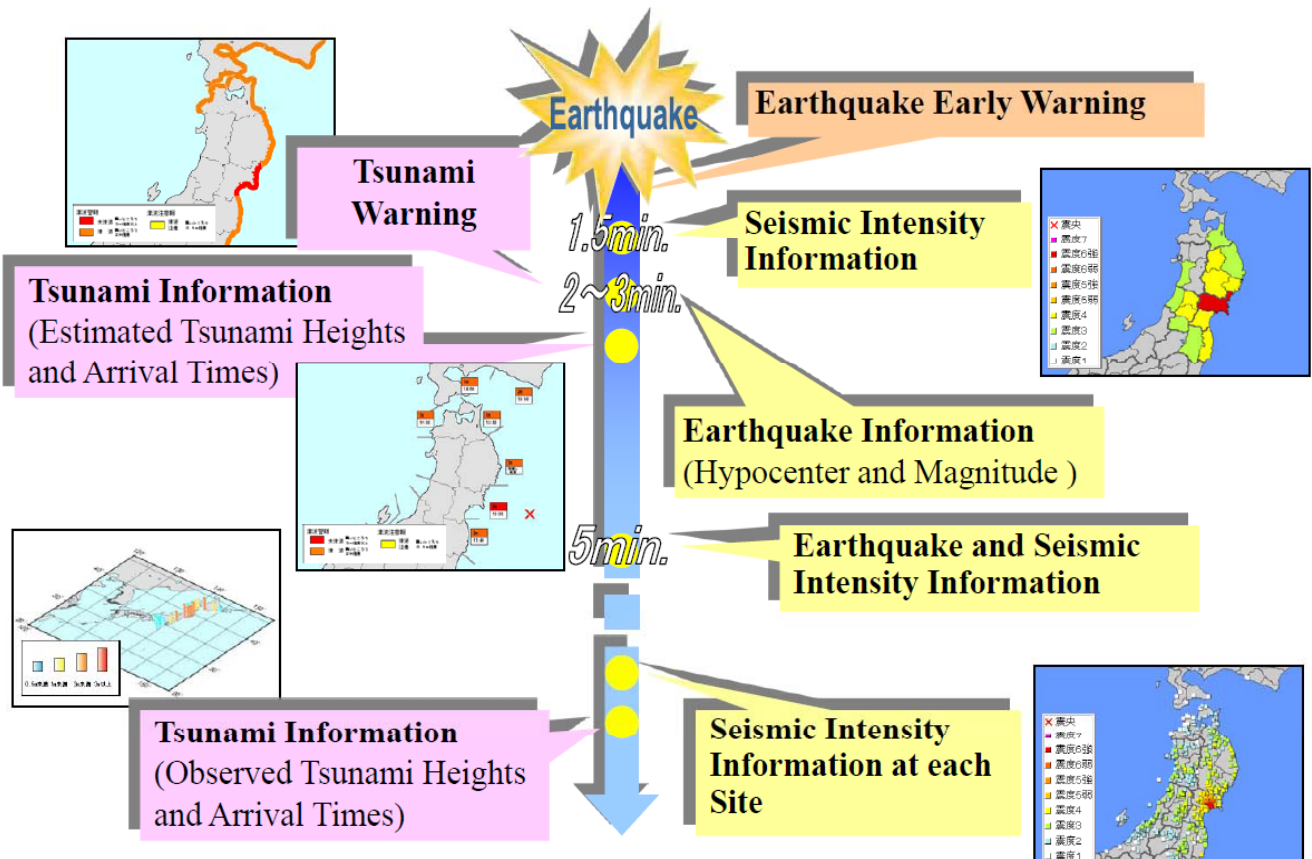


① The EEW System automatically calculates the earthquake epicenter and magnitude from the P-waves detected near the epicenter, then estimates the strengths of following ground shaking (seismic intensities) at numbers of cities, towns and villages.

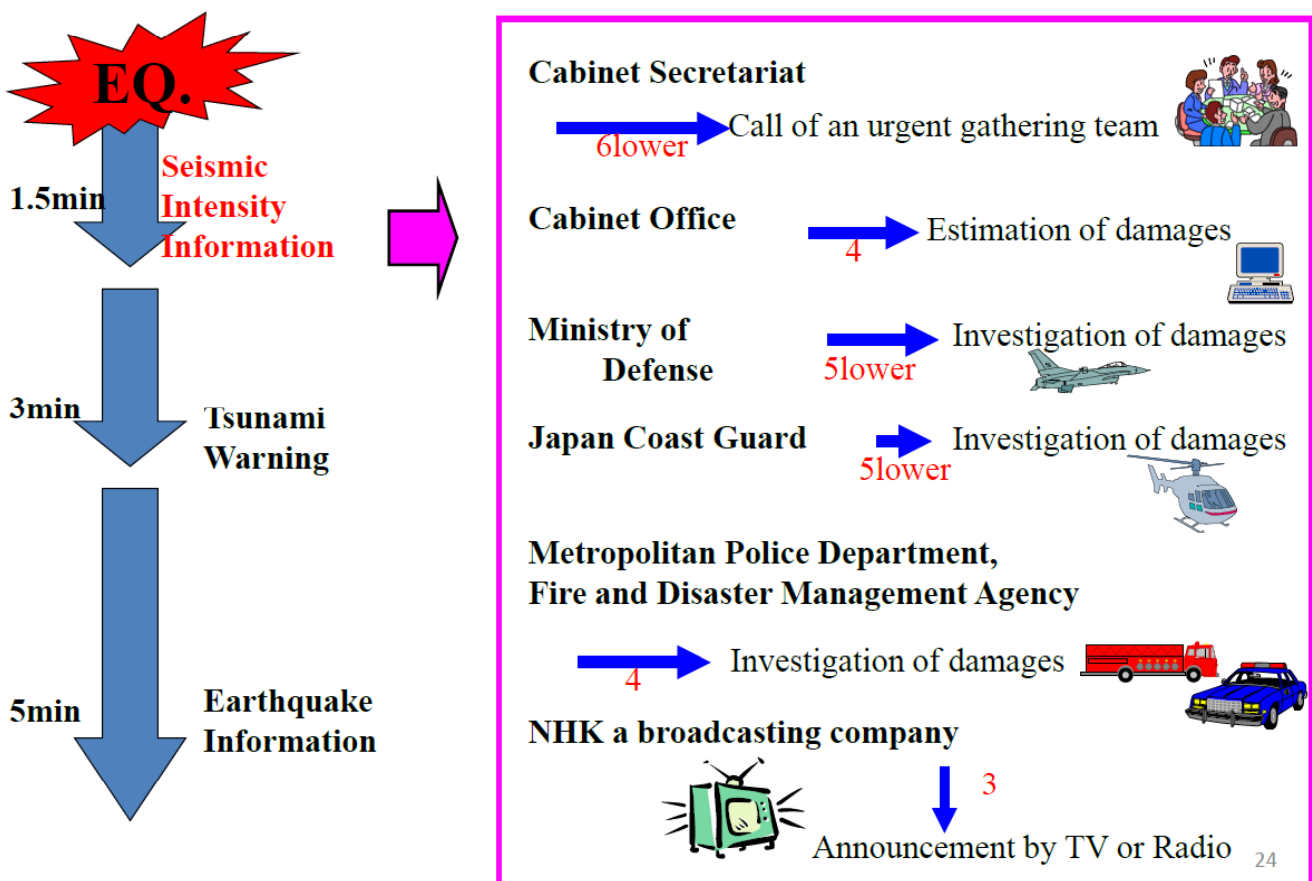
② An EEW is provided a few seconds to a few tens of seconds before the S-wave or strong tremor arrival.

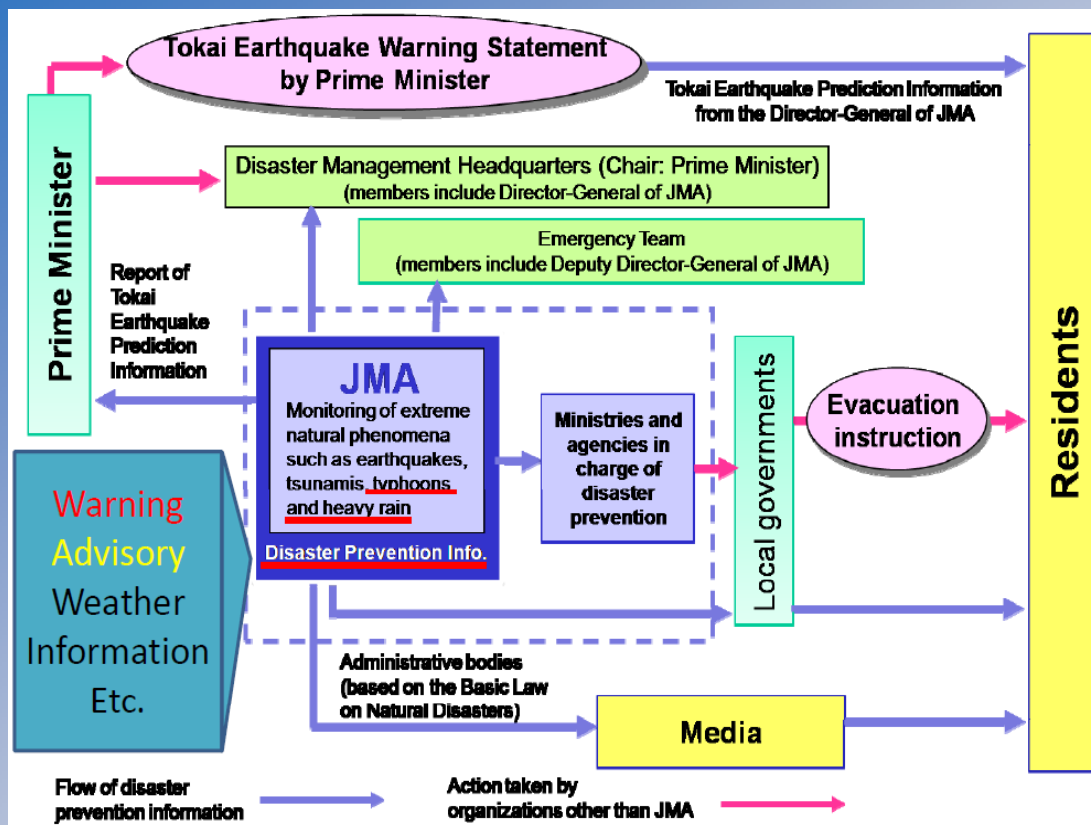
※ Strong tremors may hit areas close to the earthquake focus at the same time as the Earthquake Early Warning.

# Time Sequence of Earthquake Information and Tsunami Warning in JMA

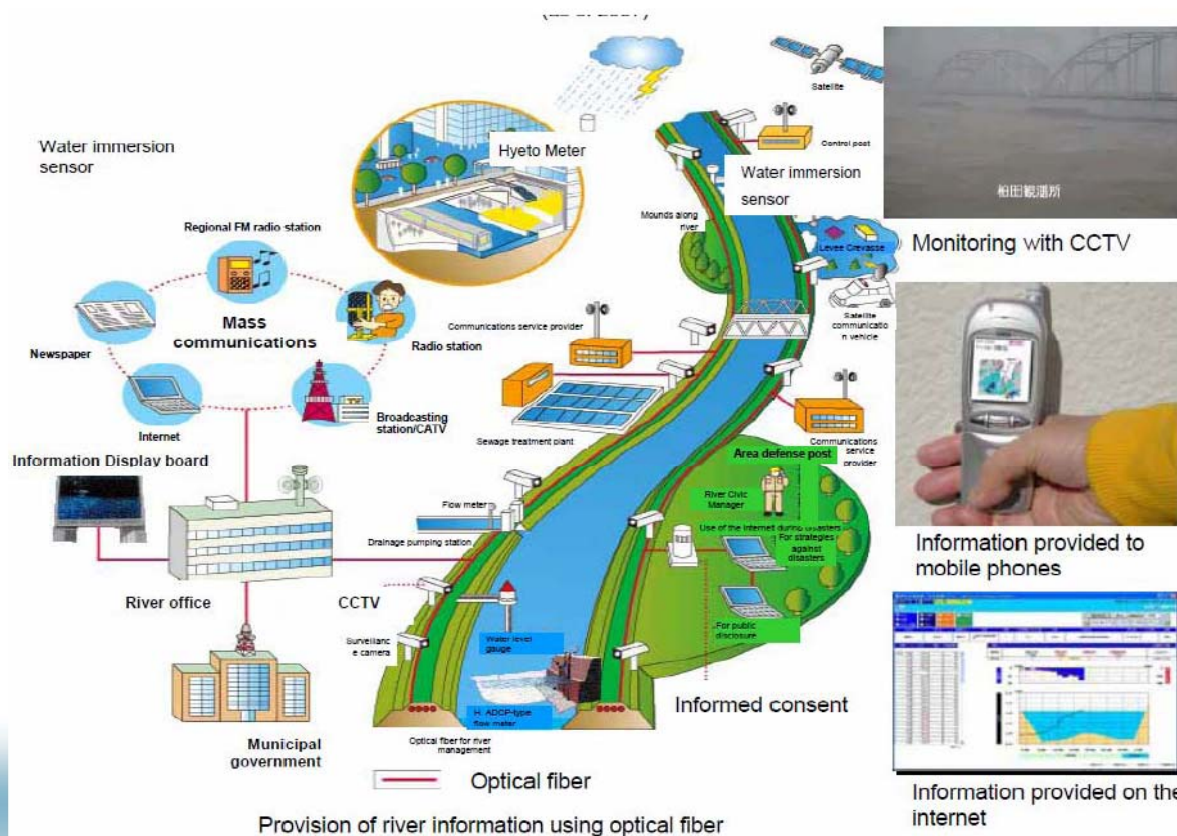


## Emergency Operation Triggered by Seismic Intensity Information





# Collection of River-related Information





## JAPAN BROADCASTING COMPANY – NHK

◆ VAST RESOURCES DEDICATED TO DISASTER RESPONSE 14 HELICOPTERS AT 12 LOCATIONS AND 460 REMOTE CONTROLLED CAMERAS COUNTRYWIDE.

COMPREHENSIVE COORDINATION ESTABLISHED WITH JMA

Small quakes detected the JMA before strong earthquake occurs, automatically redirected to NHK within a few seconds, (moreover, NHK has installed seismic intensity meters at 73 locations countrywide) what enables it to issue public alert promptly and provide necessary information regarding the magnitude and precise location of the earthquake as well as tsunami information nationwide.

Emergency Warning System (EWS) utilized in collaboration the JMA is carried out only in special emergency cases such as large-scale tsunami and earthquake warnings or based on the request of governors and mayors – the system switches on tv sets and radios – 4 tv channels and 3 radio channels belong to NHK – automatically.



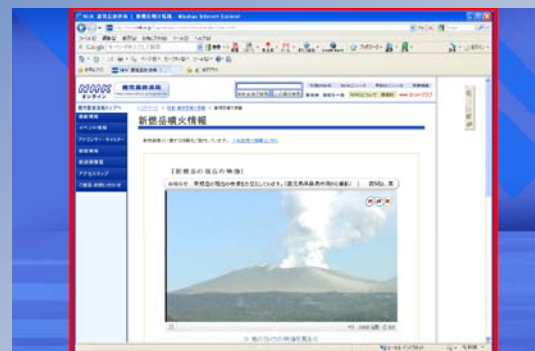
## JAPAN BROADCASTING COMPANY – NHK

### ◆ Disaster Information in the Digital Age

- Data Broadcasting
- One-segment broadcasting
- Mobile-phone website
- Internet

### ◆ 4 Stages of NHK's disaster reporting

- 1) Before the disaster – Reduce damages.
  - Broadcasting the warning quickly
  - Calling on the aged or disabled to evacuate
- 2) On the disaster – Support rescue operations
  - Broadcasting the damage situation without delay
- 3) After the disaster – Support recovery
  - Providing information to the victims
  - Encouraging recovery in the long-term
- 4) Normal times – Build safe society
  - Taking up the issue of disaster prevention positively in normal times.



Live motion picture of Mt. Shin-Moedake in Miyazaki

# Conclusion

- Comprehensive mechanism of emergency broadcasting by national television –Close collaboration with JMA and established automated emergency warning, huge facilities and equipments in its disposal NHK plays central role in disaster broadcasting and emergency warning.

- As one of the public corporations designated for disaster management under the Disaster Countermeasure Basic Act, NHK plays the key role in disaster broadcasting and emergency JMA is the key body in prediction major natural hazards such as earthquakes, tsunamis, typhoons and volcano eruptions while MLIT is for flood and sediment disasters and cooperation with them is essential for municipalities and other disaster response organizations. It must be noted that application of latest technologies for disaster warning and communication by JMA had greatly improved disaster response system in Japan. In addition, state lifeline agencies, railway companies, NHK has established quick information sharing with JMA and other relevant bodies as well as response mechanism within respective fields of activity.

- Crucial collaboration with JMA and MLIT – JMA and MLIT are key bodies for disaster prediction and good co-operation mechanism between them enables responding disaster timely and in coordinated manner.

- Successful promotion of voluntary emergency response and disaster awareness among public –Big number of voluntary response organizations and people involved in voluntary diareness and social responsibility for disaster reduction in the country. During disaster times acting in collaboration with the professional responders, voluntary teams demonstrate remarkable efforts in psychological support of the affected people and provided basic utilities.

- Changes and advancements driven by previous large-scale disasters –based on the lessons of previous national disasters system has undergone both organizational changes and enhancements. Large-scale natural disasters in recent decades, such as, Isewan Typhoon, Great Hanshin-Awaji Earthquake have influenced currents disaster response system in Japan. The system has undergone some organizational changes, new disaster response forces – DMAT, and disaster response mechanisms – ex, Phoenix System and Emergency Medical Information System in Hyogo Prefecture – has been introduced and integrated.

- Multilevel emergency response – Depending on the scale of disaster emergency response is conducted on local ,prefectural and national levels.

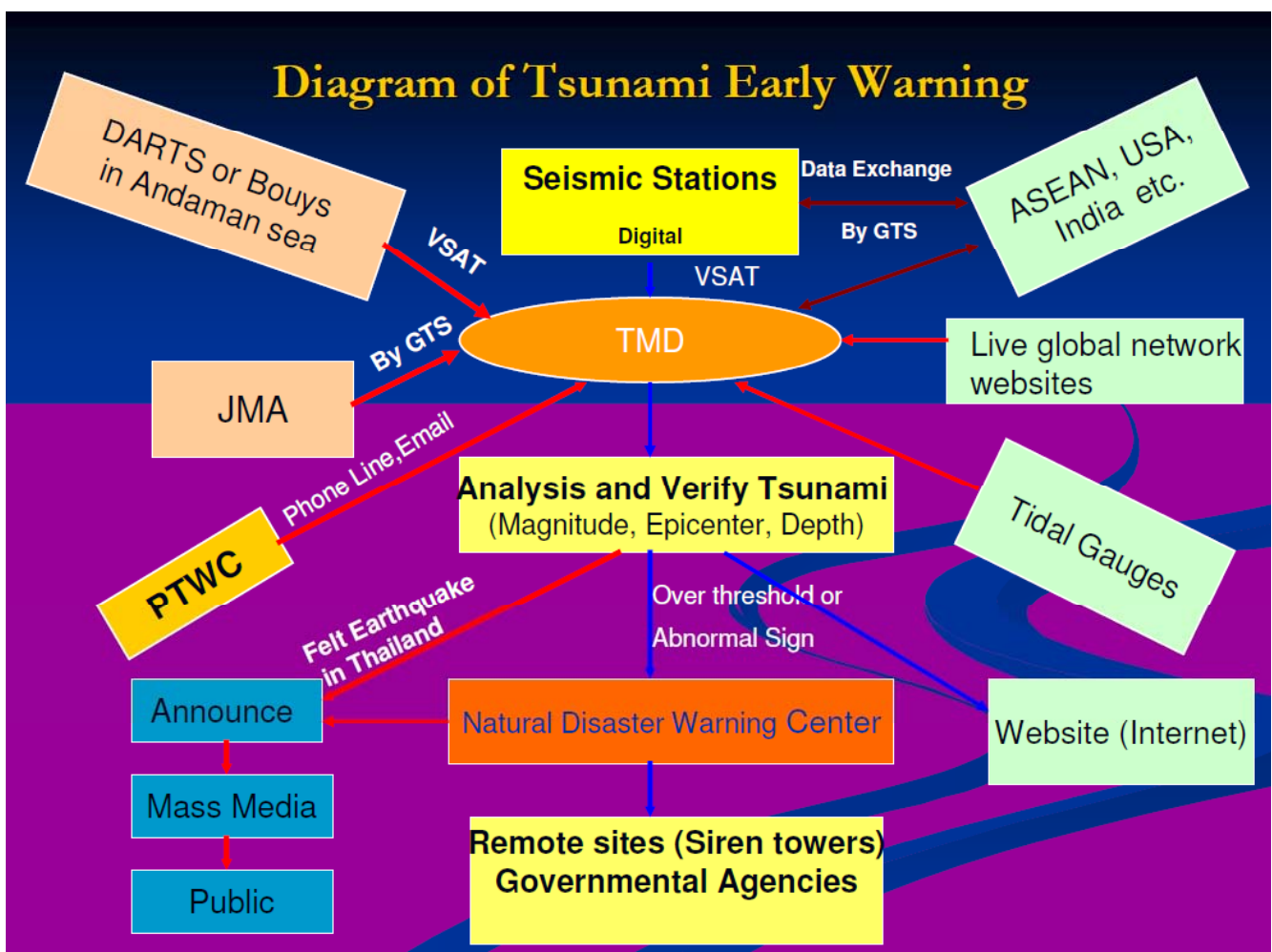
- Effective lifeline crisis management system – recent disasters proved high level of emergency response preparedness and capabilities by lifeline – electricity and gas – providers. integration of advanced technologies for disaster prediction, control and resilience and comprehensive collaboration with other relevant bodies are the key reasons

# Early Warning System in Thailand

## National DRR Institutions

- The National Disaster Warning Center (NDWC)
- The Department of Disaster Prevention and Mitigation (DDPM)
- The Thailand Meteorology Department (TMD)
- The Department of Mineral Resources (DMR)
- The Department of Water Resources (DWR)
- The Royal Irrigation Department (RID)
- Hydrographic Department of the Royal Thai Navy (HDRTN)

67





# National Disaster Warning Center (NDWC)

## Role and Responsibility

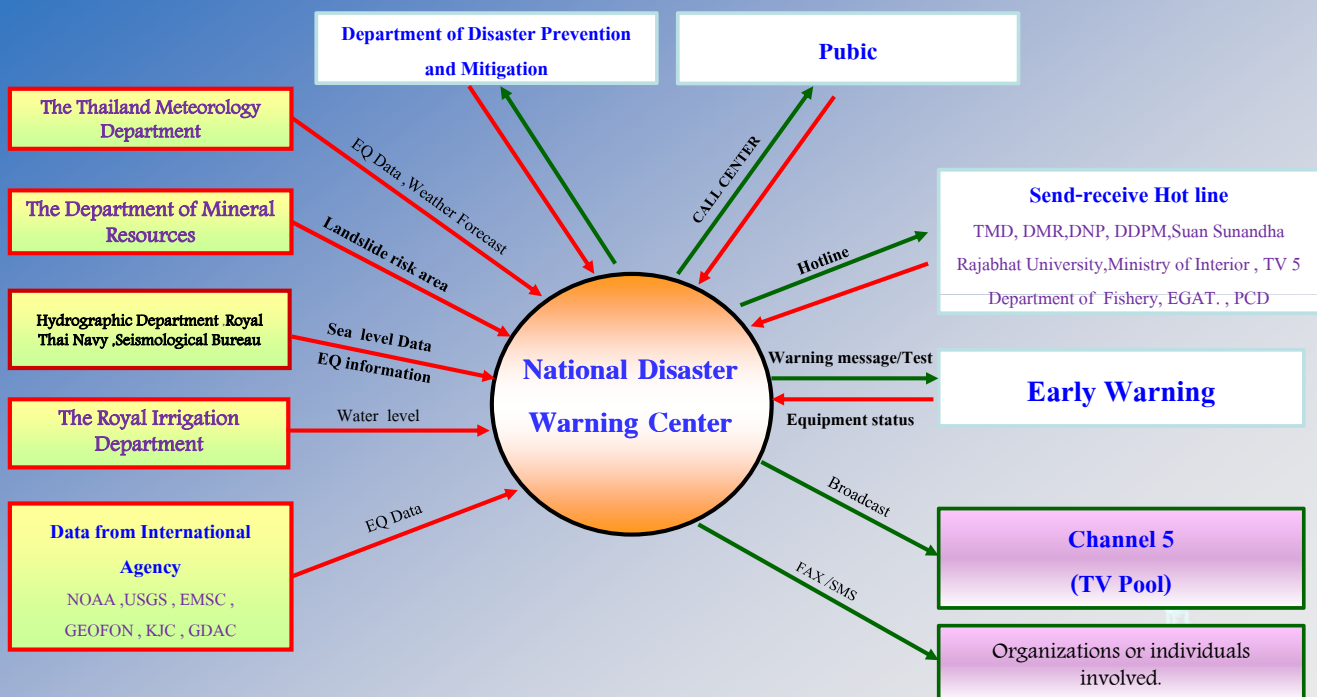


NDWC is responsible for end-to-end multi-hazards including earthquake and tsunami :

- Receiving data
- Analysis
- Dissemination of Warning Message
- Coordinating and Planning
- Supervising the Preparedness and Response, and the recovery.

## National Disaster Warning Center

National Disaster Warning Center



การส่งสัญญาณเตือนภัย โดยส่งจากสถานีถ่ายทอดสัญญาณเตือนภัย

National Disaster Warning Center



## Tsunami Warning Criteria

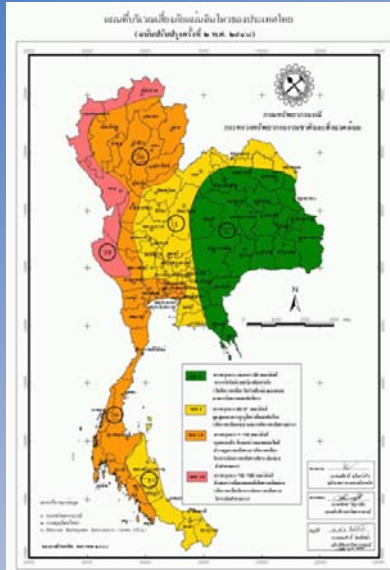
Magnitude	Depth of Hypocenter	
	less than 100 km.	more than 100 km.
5.0 - 6.4	Low possibility to generate Tsunami <b>Advisory</b>	Low possibility to generate Tsunami <b>Advisory</b>
6.5 - 6.9	Possibility to generate Tsunami <b>Alert / Watching</b>	Low possibility to generate Tsunami <b>Advisory</b>
7.0 - 7.7	High possibility to generate Tsunami <b>Alert / Watching</b>	Possibility to generate Tsunami <b>Alert / Watching</b>
> 7.8	Very high possibility to generate Tsunami <b>Warning</b>	High possibility to generate Tsunami <b>Alert / Watching</b>



## Department of Mineral Resources (DMR),

Ministry of Natural Resources and Environment

### Earthquake risk map of Thailand



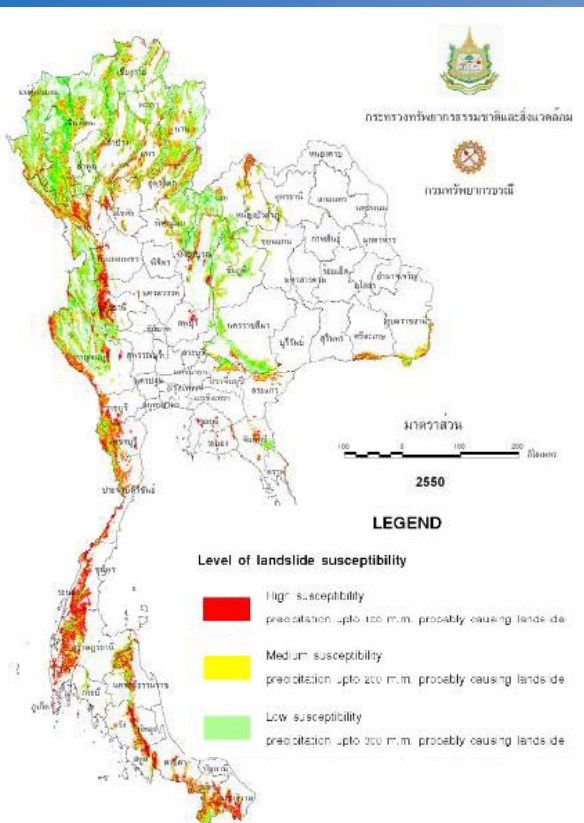
#### DMR Activities :

- Geohazard monitoring and warning in tsunami-affected areas
- Established the Special Center for monitoring of earthquake incident, evaluating of geological impact, issue public warning and disseminating the fact for the public.
- Analyzed and evaluated causes and the risk of earthquake such as cave collapse, landslide and coastal erosion.

Earthquake monitoring networks were set up along the main active faults in Thailand

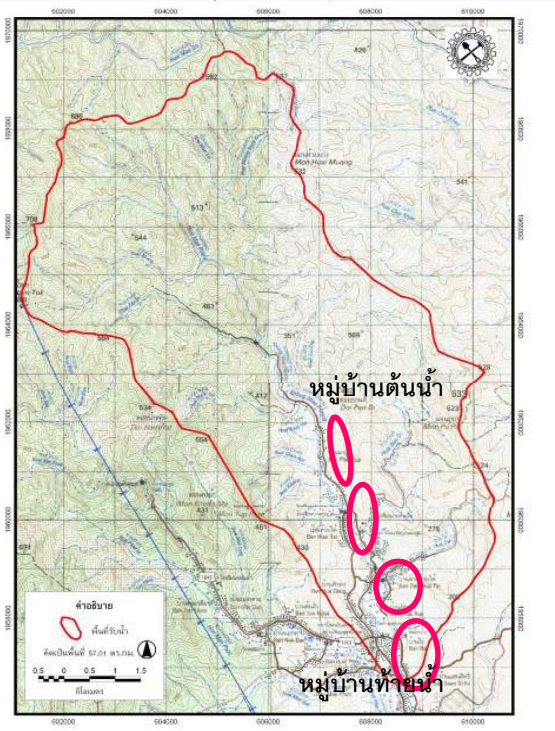
Seismometers were installed for ground motion monitoring

## • Landslide hazard maps



- Geological surveys were conducted in landslide hazard areas
- Establishment of Landslide Early Warning Networks.

## Landslide Early Warning Network



DMR has established local warning networks or self-protection networks in risk areas. The networks include local people working for their communities or villages as volunteers.

## Public Warning Notice

ข่าวประชาสัมพันธ์ กระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม  
Ministry of Natural Resources and Environment โทร 0 2278 8550, 0 2265 8188  
กรมทรัพยากรธรณี โทร 0 2821 9500, 0 2821 8700  
Department of Mineral Resources Green Call 1310

ประกาศกรมทรัพยากรธรณีฉบับที่ ๑/๒๕๕๓  
ให้อาสาสมัครเครือข่ายเฝ้าระวังแจ้งเตือนภัยดินถล่ม กรมทรัพยากรธรณี  
เฝ้าระวังภัยดินถล่มและน้ำป่าไหลหลาก

นางพรทิพย์ ปิ่นเจริญ อธิบดีกรมทรัพยากรธรณี กระทรวง  
ทรัพยากรธรรมชาติและสิ่งแวดล้อม ขอให้อาสาสมัครเครือข่ายเฝ้าระวังแจ้งเตือน  
ภัยดินถล่มของกรมทรัพยากรธรณี ในจังหวัดสตูล เฝ้าระวังภัยดินถล่มและน้ำป่า  
ไหลหลาก โดยเฉพาะในพื้นที่อำเภอทุ่งหว้า ละงู และมะนัง จังหวัดสตูล เนื่องจาก  
มีฝนตกหนักและตกต่อเนื่อง วัดปริมาณน้ำฝนได้มากกว่า ๒๐๐ มิลลิเมตร  
และระดับน้ำในลำคลองเพิ่มสูงขึ้นหลายพื้นที่ ทั้งนี้ให้อาสาสมัครเครือข่าย  
ของกรมทรัพยากรธรณี เฝ้าระวังภัยดินถล่มและน้ำป่าไหลหลาก  
และวัดปริมาณน้ำฝนอย่างต่อเนื่อง หากเกิดเหตุให้แจ้งเตือนและเปิดไซเรน  
แจ้งสถานการณ์ดินถล่มและน้ำป่าไหลหลากให้ประชาชนในหมู่บ้านได้รับทราบ  
และแจ้งหน่วยงานที่เกี่ยวข้อง พร้อมปฏิบัติตามแผนเฝ้าระวังที่ได้มีการอบรมไว้แล้ว

ศูนย์ปฏิบัติการธรณีพิบัติภัย  
กรมทรัพยากรธรณี  
กระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม  
ประกาศ ณ วันที่ ๒๑ มิถุนายน ๒๕๕๓  
เวลา ๑๘.๒๕ น.



## Royal Irrigation Department (RID)

Royal Irrigation Department (RID) and Water Resource Department (DWR) of Thailand are responsible for water management. DWR's main functions relates to water policy, planning and strategy. RID is responsible for water source development, water management, including flood and drought relief, especially in floodplains and downstream watershed, whereas DWR takes care of natural rivers and steep-slope upstream watershed.

The Water Watch and Monitoring System for Warning Centre (WMSC) was set up to monitor flood situations on a 24 hourly basis.

There is also collaboration with other related organizations to plan flood prevention. Local flood protection systems were set up in important economic areas where severe floods may occur.

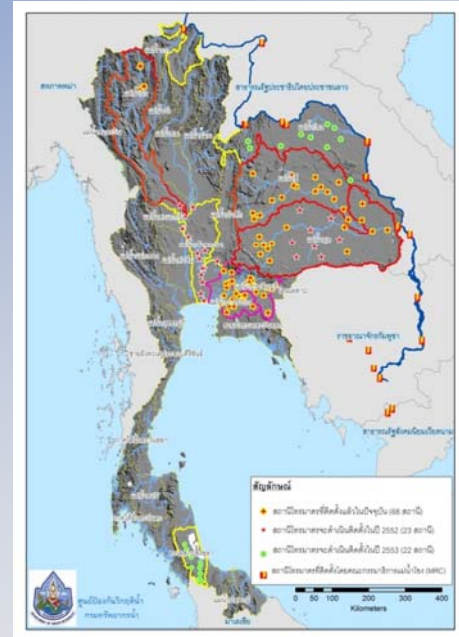
In addition, early warning systems using various technologies were established. This includes a telemetry and flood forecasting system for water management.



# Department of Water resources

Ministry of Natural Resources and Environment

## Early warning System



Automatic remote monitoring system

14 มกราคม 2554

## Thailand

Areas	National Mechanism/System	Weakness
1. Risk Assessment	<ul style="list-style-type: none"> <li>National DPM Committee/ National Plan</li> <li>Landslide risk assessment by DMR</li> <li>Earthquake risk assessment by TMD, DMR</li> <li>Flood risk assessment by RID, DDPM</li> <li>Drought risk assessment by DDPM</li> <li>The Provinces/Local governments</li> <li>Local Risk Assessment via CBDRM</li> </ul>	<ul style="list-style-type: none"> <li>The assessments are conducted by various government departments. For instance, landslide risk assessment is mainly done by The Department of Mineral Resources. DDPM is also in charge of conducting flood and drought risk assessment.</li> </ul>





# Thailand

Areas	National Mechanism/System	Weakness
2. Warning/Monitoring	<ul style="list-style-type: none"> <li>• National DPM Committee/ National Plan</li> <li>• National Disaster Warning Centre (Tropical cyclone, tsunami, earthquake)</li> <li>• TMD (Tropical Cyclone, earthquake)</li> <li>• The Department of Water Resources (DWR)</li> <li>• The Royal Irrigation Department (RID)</li> <li>• Etc.</li>   <li>• DDPM               <ul style="list-style-type: none"> <li>• Mr. Disaster Warning Project</li> </ul> </li> <li>• The Provinces/Local governments</li>   <li>• The National Disaster Warning Centre (NDWC) and The Thai Meteorological Department (TMD) are the key actors in Disaster Early Warning and Monitoring .</li> </ul>	<p>-The framework for disaster management in Thailand adopts a multi-stakeholder approach with the involvement of many institutions at the national, provincial and local levels. However, this is not altogether complete, with some gaps and some overlaps.</p> <p>- Management system at national, provincial and local levels is not clear and unity. It causes problem on coordination and create inefficient works for government agencies, state enterprises, private agencies and other respected agencies.</p> <p>-The new institutions such as DDPM and NDWC have disaster management as their role responsibilities, and the various long-standing departments and technical agencies that have some role in different phases of the disaster management cycle.</p> <p>-Having too many laws and regulations confines work management</p> <p>The causes for Early warning problem are</p> <ol style="list-style-type: none"> <li>1) inadequate political commitment,</li> <li>2) weak coordination among various actors,</li> <li>3) lack of public awareness and lack of public participation in the development and operation of early warning systems.</li> <li>4) Lack of decision support systems that could help to avoid overcautious and inefficient cross-checking of data.</li> <li>5) the need for real time connections rather than reliance on the Internet</li> <li>6) Insufficient budget allocation of DRR</li> <li>7) One way communication of Early warning , No feed back evaluation from community</li> <li>8) Warning Message understood and trusted but do not know how to respond.</li> </ol>

## Thailand –Challenge and Future Plan

- Development of multi-stakeholder partnerships and citizen participation
- Improvement of information sharing and management
- Promotion of education and public awareness
- Integration of disaster reduction concepts into development planning
- Promoting continuous efforts among the government and various stakeholders on public awareness and preparedness
- Strengthen partnership of Government and Private Sector
- Develop a comprehensive policy and legal framework to cover EWS in structural and operational detail, and define roles and responsibilities of governmental and nongovernmental actors.
- Develop a mechanism for assigning resources to cover the needed inputs.
- Ensure feedback into the EWS development process by sharing results from evaluations of EWS activities and outputs of workshops.
- Enhance the critical role of the media in the dissemination of early warning messages.
- Analyze the effectiveness of warning messages by using feedback from the community.
- Enhance data reliability and interagency data sharing by assessing and prioritizing needs for each organization participating in the system to improve access to real time data and to provide effective analysis to decision makers.
- Develop a Warning alerts and messages that are geographically-specific to ensure warnings are targeted to those at risk only.

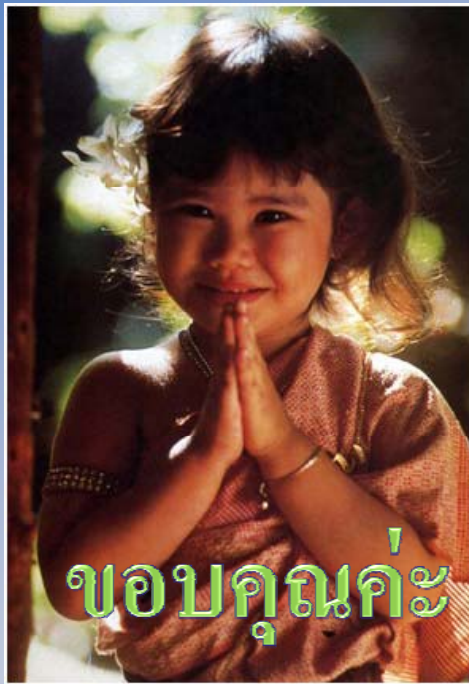
# Thailand –Challenge and Future Plan

- Enhance technology to support interagency data sharing by assessing and prioritizing the needs of each participating organization to improve access to real time data and provide a reliable analysis to decision makers.
- Prepare early warning guide or handbooks that collect all the currently fragmented pieces of information in a practical format for use by government staff, communities, NGOs, media and the private sector.
- Strengthen communication networks, particularly to and from and within communities,
- Also strengthen and map feedback communications from relevant agencies and communities
- Support development of media partnerships in EWS, such as with the NDWC and at local levels.
- Set up Mister Warning in communities and Disaster Warning Network
- Design standard and practical guidebook for community leaders.
- Create warning system in communities
- Strengthen participation skills for disaster management with planning skill, creating network, giving knowledge and disseminating information.
- Provide trainings to situation commanders, operation staff, community leaders, planners, and general people
- Improve database system and risk maps for risk areas/communities
- Enhancing and improving on local wisdom for disaster warning
- Cooperate warning system from respected agencies

# Thailand –Challenge and Future Plan

- Connect early warning system from respected agencies
- Improve overall disaster forecast system
- Connect disaster information system from respected agencies
- Evaluate and improve the responsibilities and authorities of government agencies periodically
- Add knowledge on disasters into educational curriculum of primary to university levels including community level and all management levels
- Strengthen people's participation in planning and networking. Encourage them to use museum for disseminating information on disasters
- Build up cooperation with mass media such as television, newspaper and radio for building culture on safety and flexible community
- Strengthen early warning system - Create standard guidebook, set up method and steps to be guidelines for community leader used for emergency response after receiving warning alarm.

ありがとうございます



Department of Disaster Prevention and Mitigation, Ministry of Interior