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COMPARATIVE STUDY ON EARTHQUAKE AND TSUNAMI EARLY WARNING SYSTEM IN MALAYSIA AND JAPAN

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INTRODUCTION

Seismicity and tectonic setting around Malaysia

Malaysia is close to the two most seismically active plate:

- Indian-Australian and Eurasian plates in the west
- Eurasian and Philippine Sea plates in the east

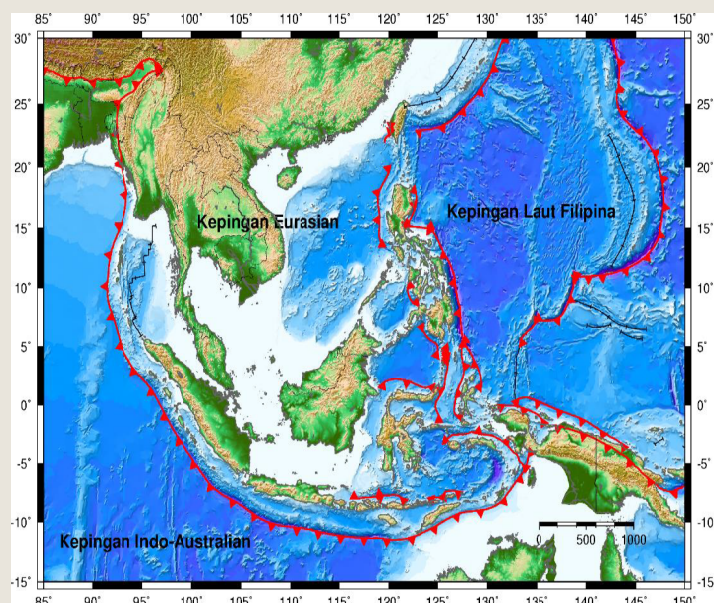
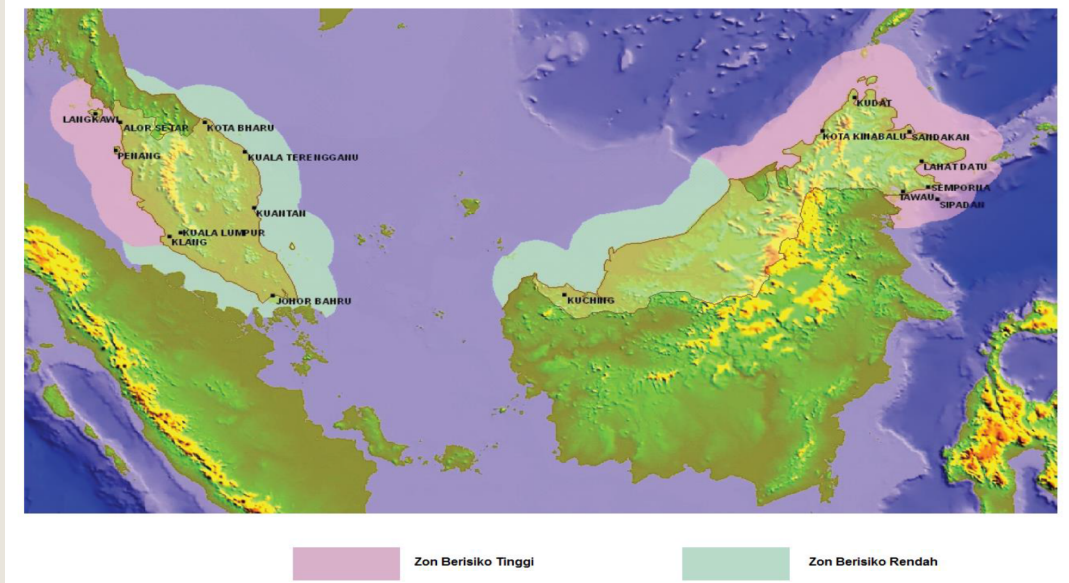


Plate tectonics around Malaysia (MMD)

Tsunami Risk in Malaysia



The tsunami risk areas in Malaysia are divided into two zones:

- Perlis, Kedah, Penang, Perak and Sabah are in high-risk zones
- Other states are in low-risk zones.

Impact of 26 December 2004 Tsunami in Malaysia

- Deaths – 68
- Missing – 6
- Loss and damage of properties amounting to RM100 million



Source: MMD

Malaysian National Tsunami Early Warning System

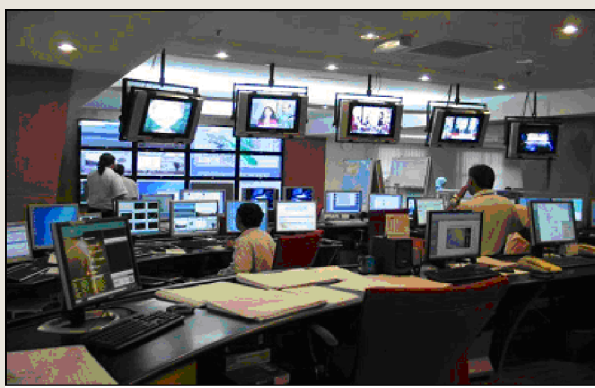
(MNTEWS) was established in 2005

Key features of MNTEWS:

Real-time continuous monitoring of earthquake occurrences and tsunami on a 24-hour basis.

To detect, locate and determine the magnitude of earthquakes occurring in and outside Malaysia.

Issuance of information/advisory/warning on the occurrence of earthquake and tsunami that threaten the security and safety of Malaysia.



Components of The Malaysian National Tsunami Early Warning System (MNTEWS)

Data & Information Collection

- National, Regional & **International** Seismic Network
- National, Regional & **International** Tide Gauge Network
- Regional & **International** Deep Ocean Buoy Network
- **National** Coastal Camera Network
- **Linkage** PTWC/ JMA/ TSP

Processing

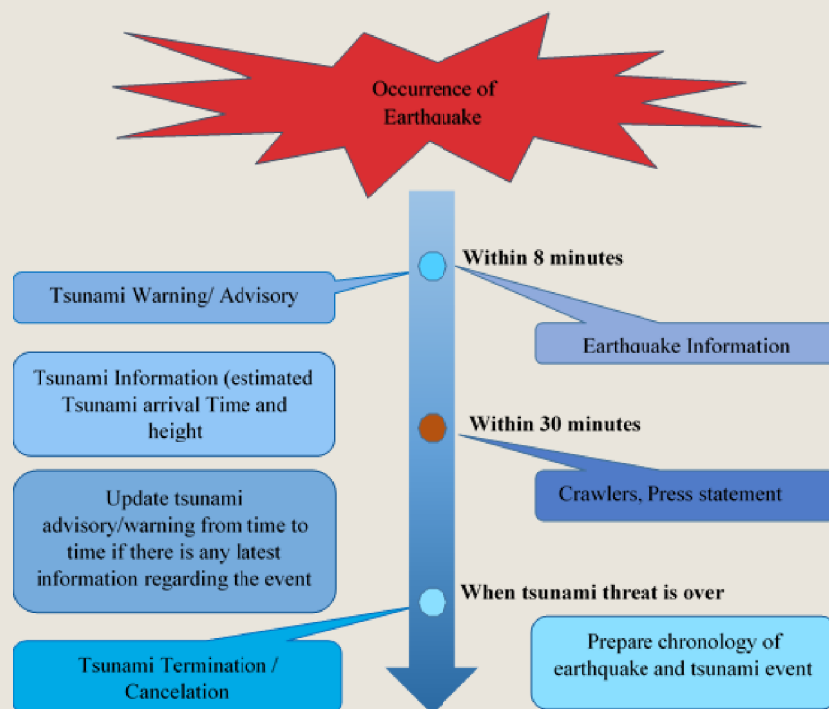
- Earthquake Determination:
(1) Antelope
(2) SeisComP
- Tsunami Evaluation:
Tsunami Database

Dissemination

- SMS
- Fax
- Website
- TV & Radio
- Social Media: FB, IG, Twitter
- myCuaca apps
- Siren Tsunami
- Mini Studio

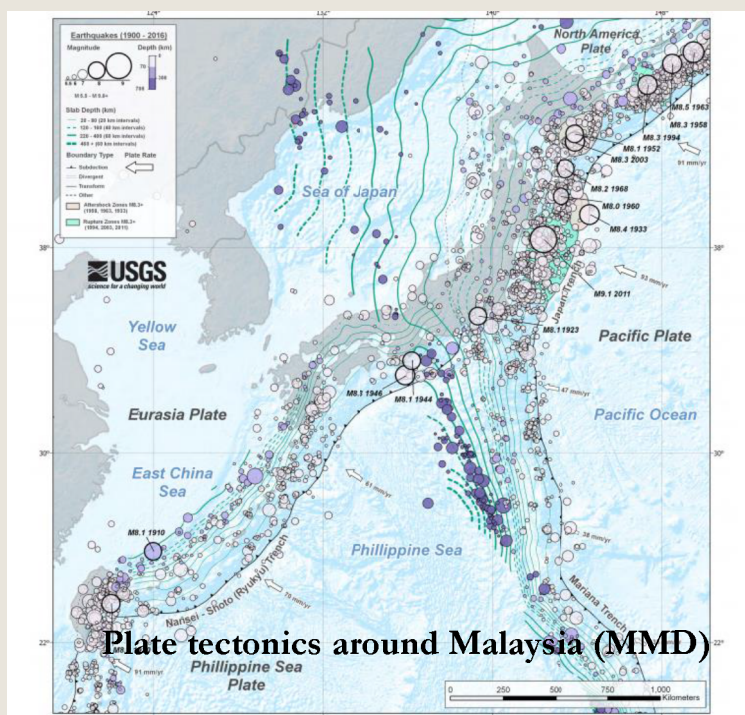


Flow of issuance of information about tsunami and earthquake in Malaysia



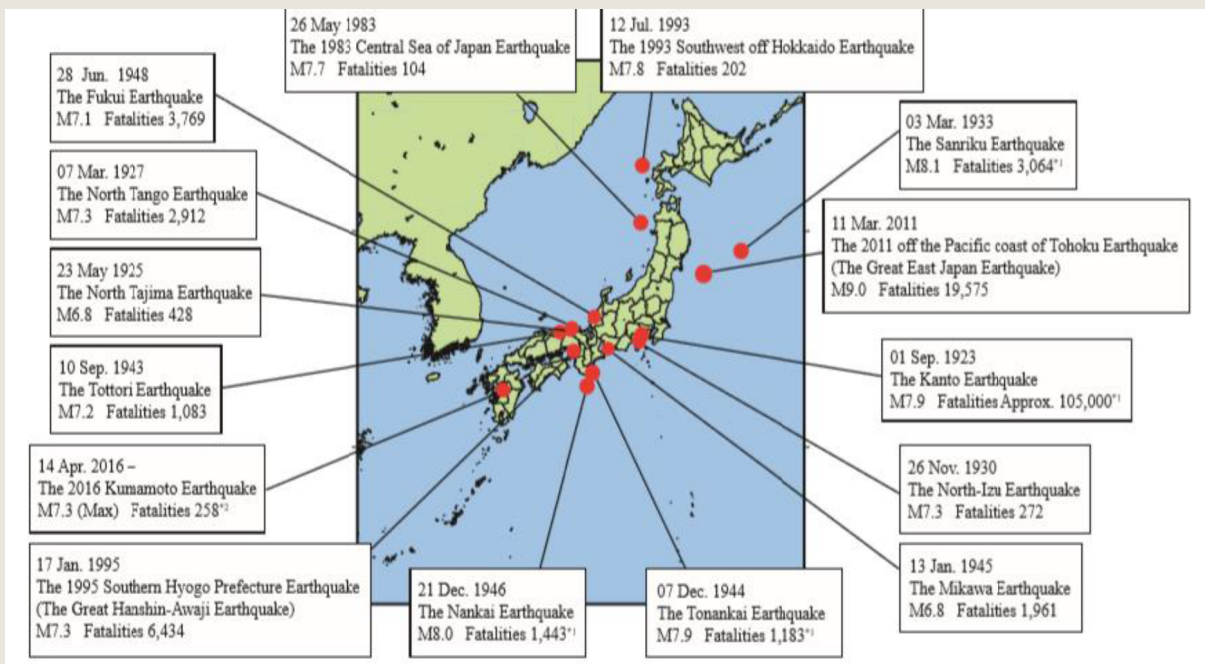
Seismicity and tectonic setting around Japan

- ❑ Japan's stretch of the Ring of Fire is where the North American, Pacific, Eurasian and Philippine plates come together.
- ❑ Northern Japan is largely on top of the western tip of the North American plate.
- ❑ Southern Japan sits mostly above the Eurasian plate.

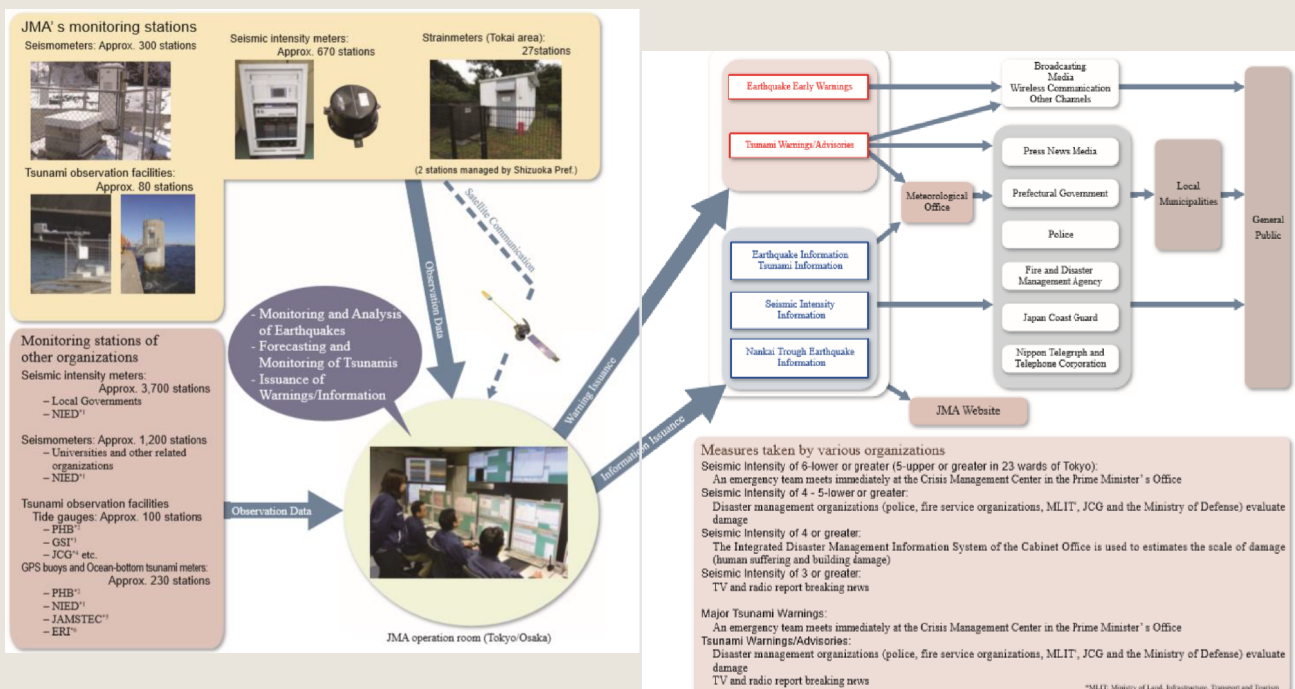


Map of Tectonic in Japan (USGS)

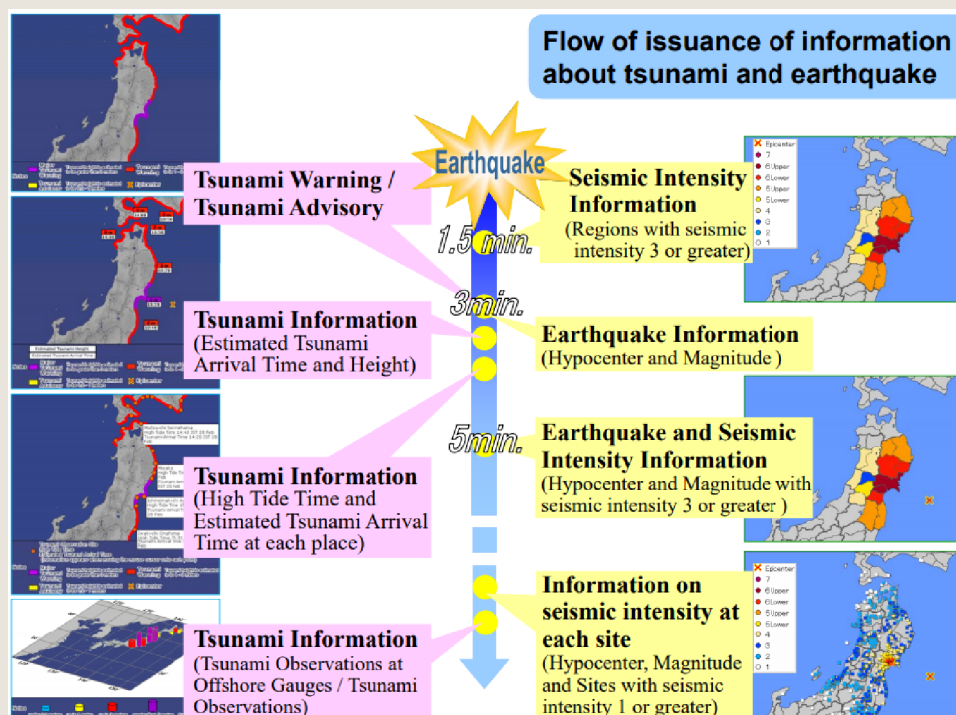
Earthquakes causing more than 100 fatalities (from 1900 to 2016, as of 14 February 2018)



Earthquake/ Tsunami Monitoring and flow of Warning/ Information in Japan



Flow of issuance of information about tsunami and earthquake in Japan



Source: https://www.jma.go.jp/frcs/research/earthquake/earthquake_and_tsunami_early_warning_system/

OBJECTIVE

- To study the Earthquake and Tsunami Early Warning System in Japan Meteorology Agency (JMA)
- To compare Standard Operation Procedure (SOP) used by JMA and MMD in dissemination of earthquake and tsunami warning information.
- To improve MMD Standard Operation Procedure (SOP) in dissemination of earthquake and tsunami warning information.

METHODOLOGY

Qualitative research methods - field visits (JMA in Tokyo, JMA in Kobe Office), lecture, discussions, official website.



Visiting Researcher visited Japan Meteorological Agency in Tokyo



Visiting Researcher visited the Japan Meteorological Agency in Tokyo

DISCUSSION

Observation Network for Earthquake/ Tsunami Monitoring in Japan and Malaysia (Source: JMA and MMD)

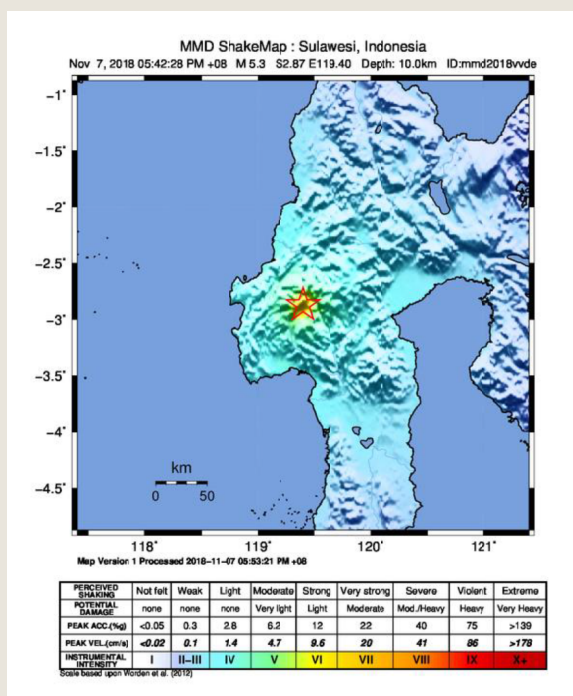
NETWORK	JAPAN	MALAYSIA
Seismometer	Approx. 1700 stations	77 stations
Seismic Intensity Meters	Approx. 4374 stations	Not Available
Tide Gauge	Approx. 188 stations	16 stations
GPS Buoys and Ocean Bottom Tsunami Meters	Approx. 240 stations	Not Available
Strain Meters	27 stations	Not Available

DISCUSSION

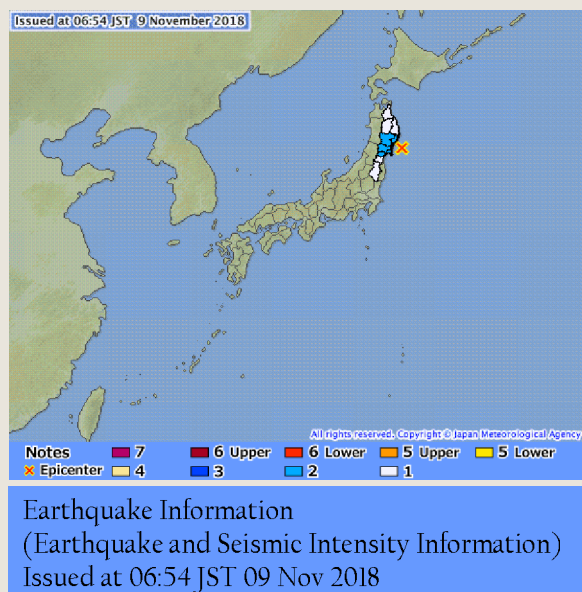
Time of Issuance Earthquake and Tsunami Warning Information in Japan and Malaysia (Source: JMA and MMD)

INFORMATION	JAPAN	MALAYSIA
Seismic Intensity / Shake Map	1.5 to 2 minutes	Within 8 minutes after earthquake detected
Earthquake	Within 5 minutes	Within 8 minutes after earthquake detected
Tsunami Warning	2 to 3 minutes	Within 8 minutes after earthquake detected
Earthquake Early Warning	Several to over ten seconds	Not

Example of Shake Map issued by MMD and Seismic Intensity Map issued by JMA

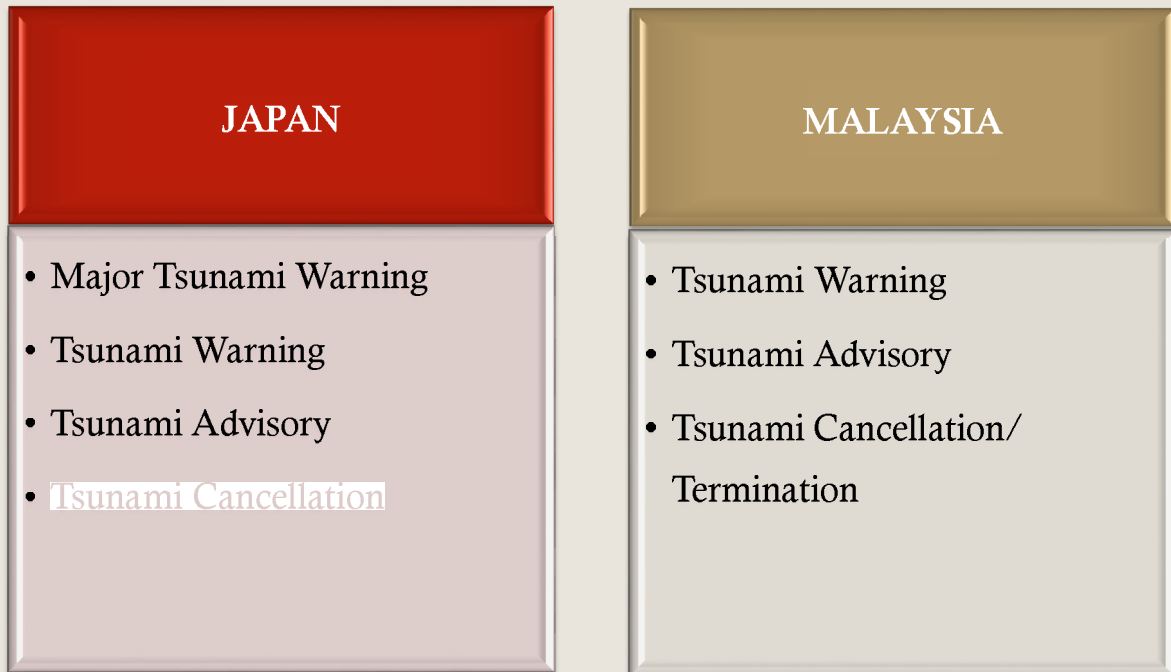


MMD

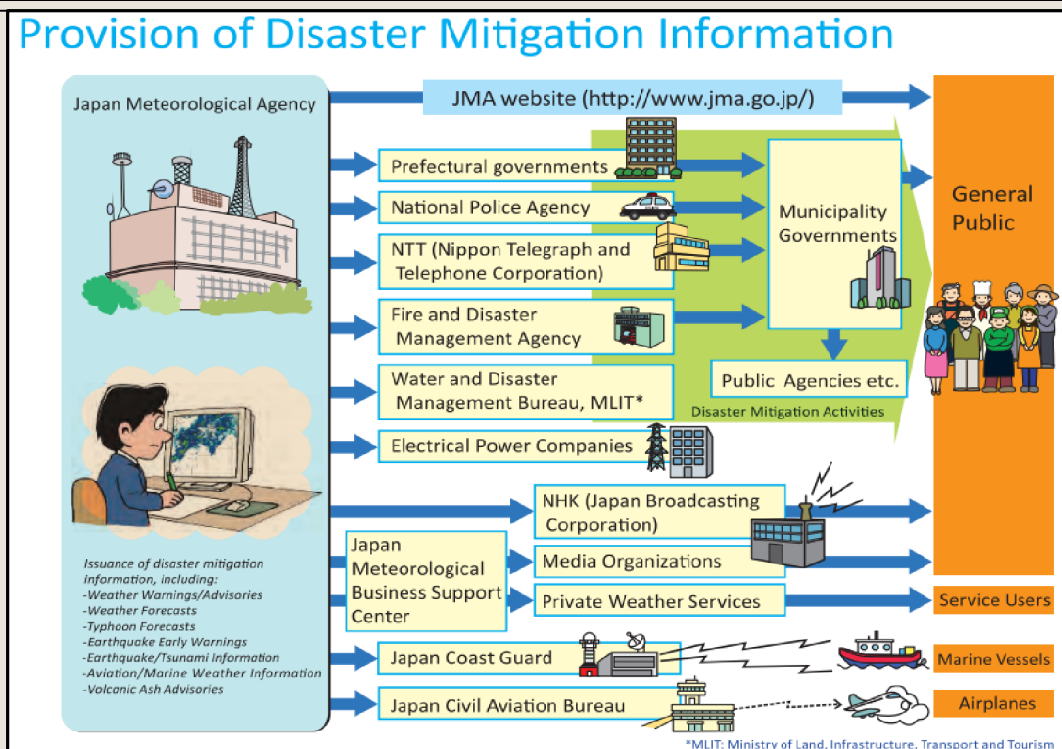


JMA

Categories of Tsunami Warning in Japan and Malaysia

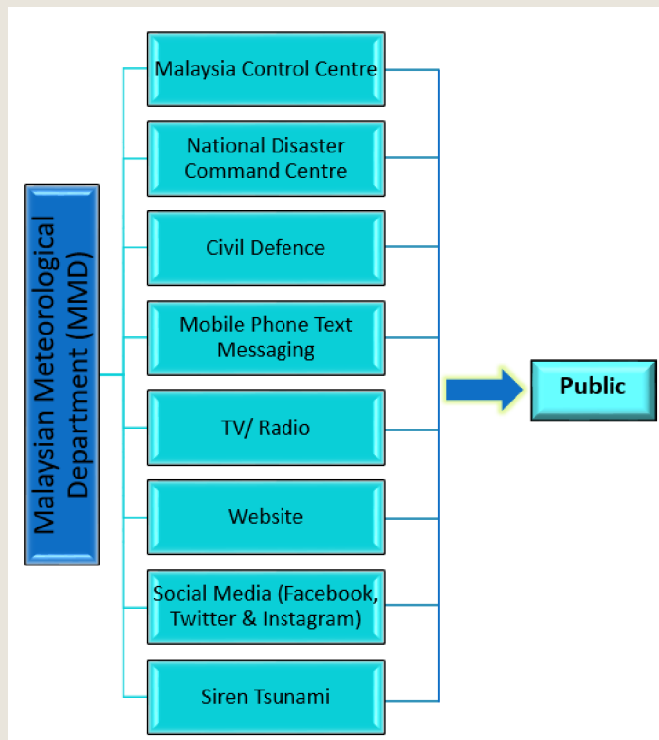


Dissemination of Earthquake and Tsunami Warning Information in Japan and Malaysia



Dissemination of Disaster Mitigation Information in Japan
Source: JMA

Dissemination of Earthquake and Tsunami Warning/ Advisory Information in Malaysia



Siren Tsunami Operated by MMD for

CONCLUSION

- Japan is country prone to earthquake and tsunami threats, therefore Japan has established Early Warning System by using the latest technology and proven can reducing the risk of disaster.
- In Malaysia, the tsunami warning system installed nationwide is sufficient to give early warning on tsunami. MMD need to improved time for issuance earthquake information.
- Tsunami early warning system can be combined with other type hazards to give information in Malaysia.
- Cooperation of local or state authorities is important in enhancing understanding of the early warning system in Malaysia.
- Education on disaster management is one of the important aspects that must be applied to all Malaysians.

Thank you for your
kind attention
