

Management of the Organization for Sustainable Operation of the Tsunami Early Warning System

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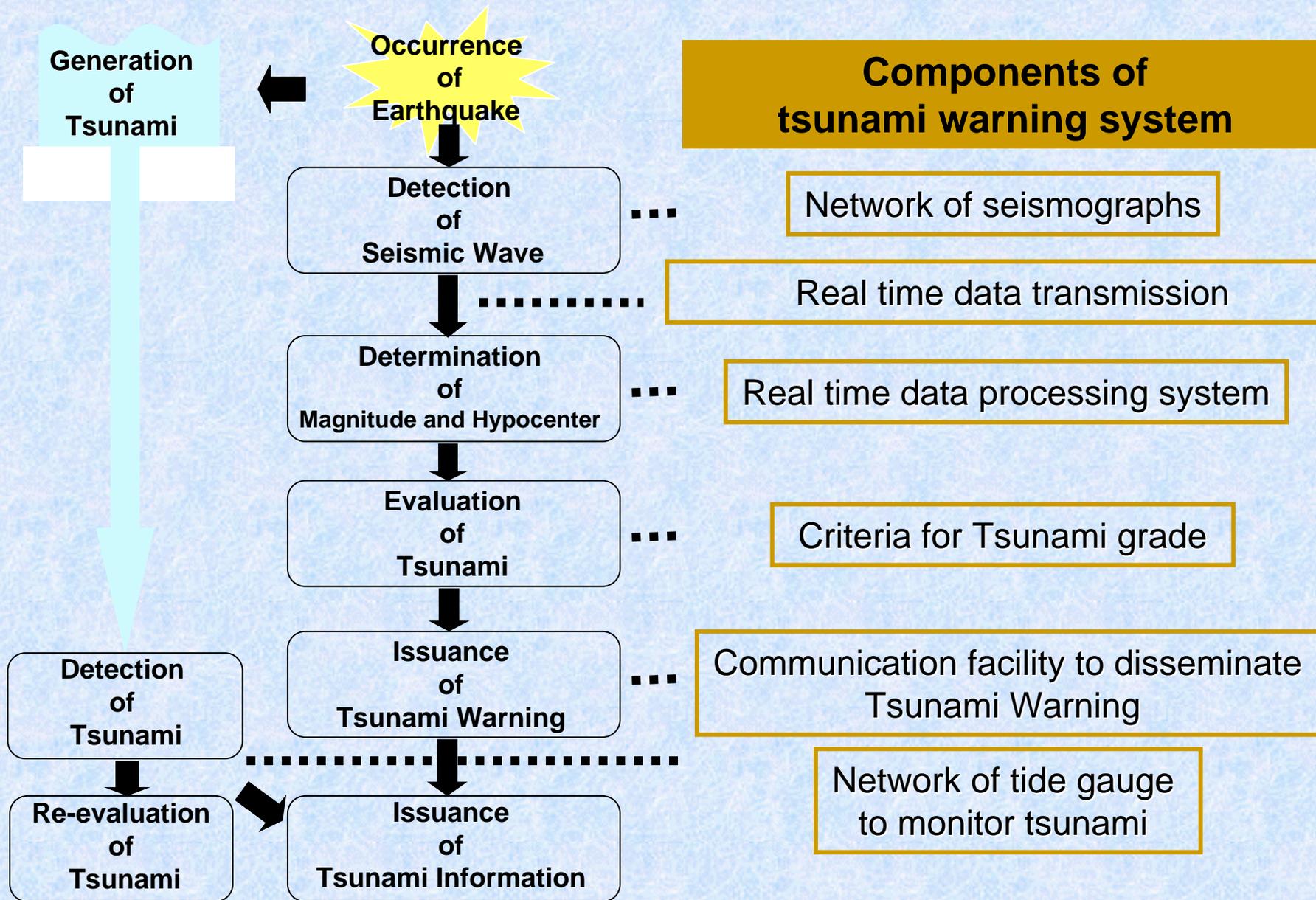
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National Tsunami Warning Center

- ▲ Tsunamis both from Distant and Nearby Origin
- ▲ Operation and Maintenance on a 24 Hours a Day 7 Days a Week Basis
- ▲ Training and Exercise of Staffs
- ▲ Multi-channels Dissemination to Residents
- ▲ International Cooperation for Data and Information Exchange

--->How do you operate and manage your organization sustainably as the tsunami warning center?

What we need for Tsunami Warning



Tsunami Warning System for each country

Structure of Tsunami warning system depends on Geological Setting!

*What does your country need? Local tsunami?
Distant tsunami? or Both?*

Components of Tsunami Warning System	Local Tsunami	Distant Tsunami
Seismic Network		
Sea Level Monitoring		
Real Time Data Transmission		
Real Time Data Processing (Hypocenter and Magnitude)		
Evaluation of Tsunami		
Communication Facility to Disseminate Tsunami Warning		
Communication System among National Tsunami Centers		

Minimum Requirement

: on your responsibility

: under international cooperation

Which Type Do You Choose?

Tsunami	Opreration	Type of Tsunami Warning Center
LOCAL TSUNAMI	Issue tsunami warning by determining the hypocenter and magnitude by themselves	Type A
DISTANT TSUNAMI	Issue tsunami warning by determining the hypocenter and magnitude by themselves	Type B
	Issue tsunami warning by interpreting tsunami advisory information from other countries	Type C

Operation on a 24 Hours a Day 7 Days a Week Basis -1

Tsunami Warning Center should be operated on a “24 hours a day 7 days a week” basis.

For **Type A** and/or **Type B** Center:

Collect real-time seismic data, analyze them and issue tsunami warning.

For **Type C** Center:

Don't miss the receipt of tsunami information from other countries.

JMA Shift Schedule (Example for operation of Type A and B)

Team	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	A	B	O	X	a	A	B	O	X	X	A	B	O	X	a	A	B	O	X	X	A										
2	a	A	B	O	X	X	A	B	O	X	a	A	B	O	X	X	A	B	O	X	a										
3	X	X	A	B	O	X	a	A	B	O	X	a	A	B	O	X	X	A	B	O	X										
4	O	X	X	A	B	O	X	a	A	B	O	X	X	A	B	O	X	a	A	B	O										
5	B	O	X	a	A	B	O	X	X	A	B	O	X	a	A	B	O	X	a	A	B										

Rotate five teams in duty to cover 24 hours a day 7 days a week operation
 A: Daytime duty 09:00-17:30
 B: Nighttime duty 16:00-10:00
 O: Off duty (the day after nighttime duty)
 X: Day off
 a: Other Working Day (Research, Training Plan, etc.)

Succession of the Operation

Morning / Evening Briefing

Daytime staffs give a briefing to nighttime staffs during the overlap time in evening when the nighttime team takes over the duty from the daytime team. Next morning, the nighttime staffs also give a briefing to the next daytime staffs.

Daily Report

Staffs take note of the issued earthquake information, seismic activities and status of the system during their working hours.

Daily Schedule Sheet

Daily schedule sheet is a check list of the daily tasks in order not to leave the tasks uncompleted. Staffs check the tasks which they have completed.

Staff's Skill Required for the Operation of a Tsunami Warning Center

Type of Tsunami Warning Center	Mechanics	Analysis of Seismic Wave Data and Evaluation of Tsunamigenic Potential	Receipt of Tsunami Information from Other Countries	Issuance of Tsunami Warning	Monitoring of Sea Level Data
A	<i>INDISPENSABLE</i> <i>Operation and maintenance of the systems including observation sites, data processing systems and communication systems</i>	<i>INDISPENSABLE</i> <i>Analyze seismic data and evaluate tsunamigenic potential</i>	<i>USEFUL</i> <i>for Reference</i>	<i>INDISPENSABLE</i> <i>Issue and disseminate tsunami warning</i>	<i>INDISPENSABLE</i> <i>Announcement of tsunami observation and caution in tsunami until cancellation of the warning</i>
B	<i>INDISPENSABLE</i> <i>Operation and maintenance of the systems including data processing systems and communication systems</i>	<i>INDISPENSABLE</i> <i>Analyze seismic data and evaluate tsunamigenic potential</i>	<i>USEFUL</i> <i>for Reference</i>	<i>INDISPENSABLE</i> <i>Issue and disseminate tsunami warning</i>	<i>INDISPENSABLE</i> <i>Monitoring of propagation of tsunami wave in the ocean</i>
C	<i>INDISPENSABLE</i> <i>Operation and maintenance of the systems including communication systems</i>	<i>UNNECESSARY</i>	<i>INDISPENSABLE</i> <i>Pay the most attention in order to notice the receipt of information from other countries immediately</i>	<i>INDISPENSABLE</i> <i>Issue and disseminate tsunami warning</i>	<i>INDISPENSABLE</i> <i>Monitoring of propagation of tsunami wave in the ocean</i>

Maintain and Improve the Staff's Skill -1

Operating Staffs

for

- *Monitoring Earthquakes and Tsunamis*
- *Issuance of Earthquake Information*
(*more than 2,000 felt earthquakes per year in Japan*)
- *Issuance of Tsunami Warning*

*Frequency of generation of destructive Tsunami : **once a few years!***



Staff's Skill for tsunami warning should be maintained and improved!

- **Tsunami Warning Issuance Drill**
- **Analysis of non-Tsunamigenic Earthquakes**
(* for organizations which make tsunami forecast by themselves, i.e. Type A or B Center)
- **Training Courses for the Operators**
- **Development of Operational Guide**

Maintain and Improve the Staff's Skill -2

Tsunami Warning Issuance Drill

Comprehensive Exercise for Tsunami Warning Issuance, on the Assumption that a Tsunami Occurs around Japan (7 times / year)

Analysis of non-Tsunamigenic Earthquakes

(* for Type A or B Center)

Determination of the Epicenters

Monitoring of Seismic Activities

Training Courses for the Operators

Apr: Training for new members (5 days)

Jun: Training for operators (10 hours)

Oct: Training for operators (10 hours)

Jan: Training for operators (10 hours)

Operational Manuals

Develop and periodically review operational manuals to ensure the succession of operational practice and technique

Prevention of Occurrence of Errors

Manuals & Training

Unexpected errors occur

Survey the Causes and the Consequences

Organize a Team to Consider Measures to Prevent Recurrence

Cause 1

The system went wrong.

Measure 1

- Improve the system to avoid the error.

Cause 2

Staffs made mistakes.

Measure 2

- Develop check lists.
- Review the guide to operating the system.
- Train the staffs for operating the system.
- Consider measures for similar situations.

*All of the staffs share the information on the error, causes and countermeasures.
Keep their awareness by carrying out case studies and examination regularly.*