

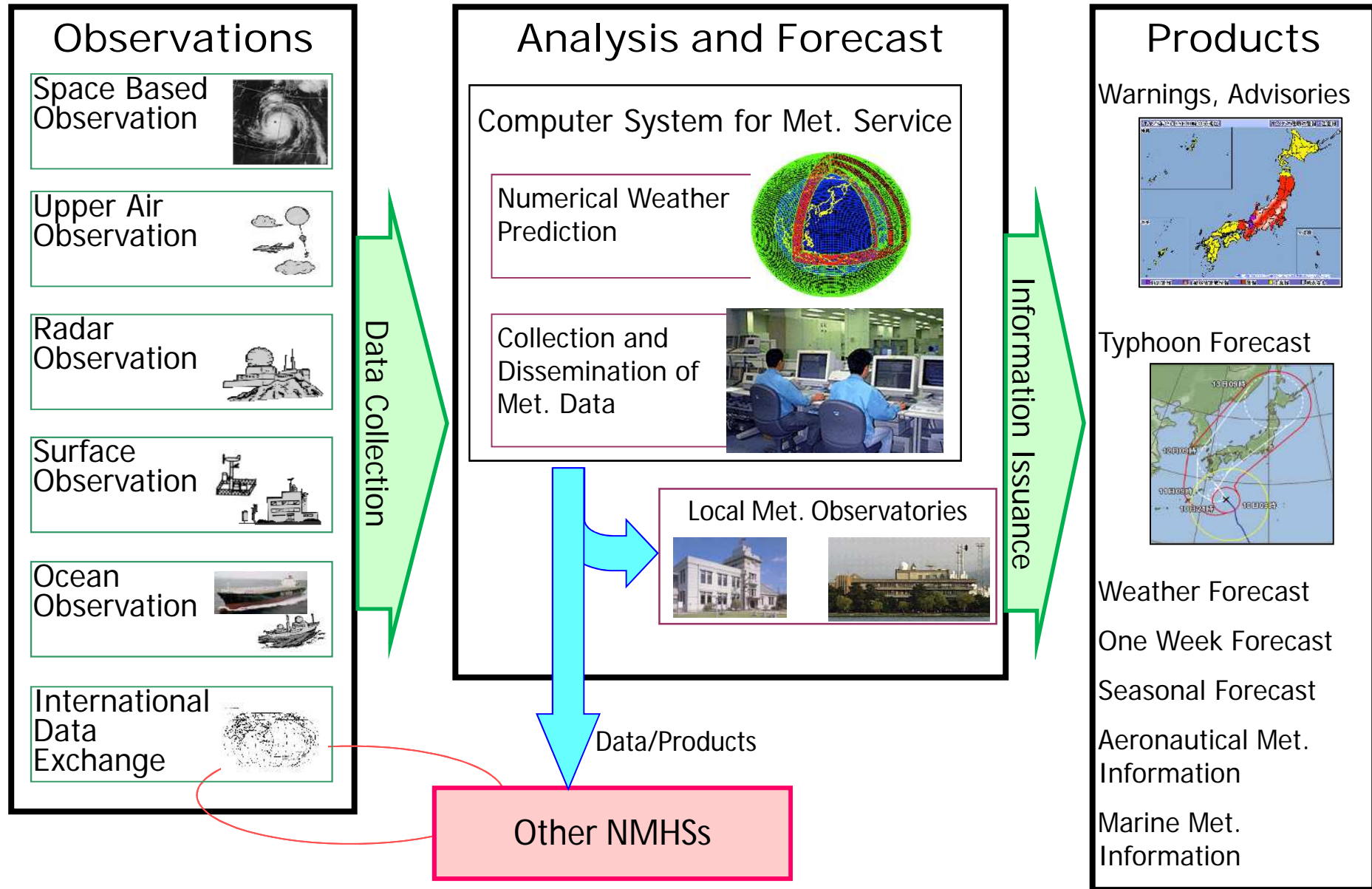


Early Warning System in Japan and Lessons learnt from recent TC Disasters

14 March 2014

Yosuke IGARASHI
Japan Meteorological Agency

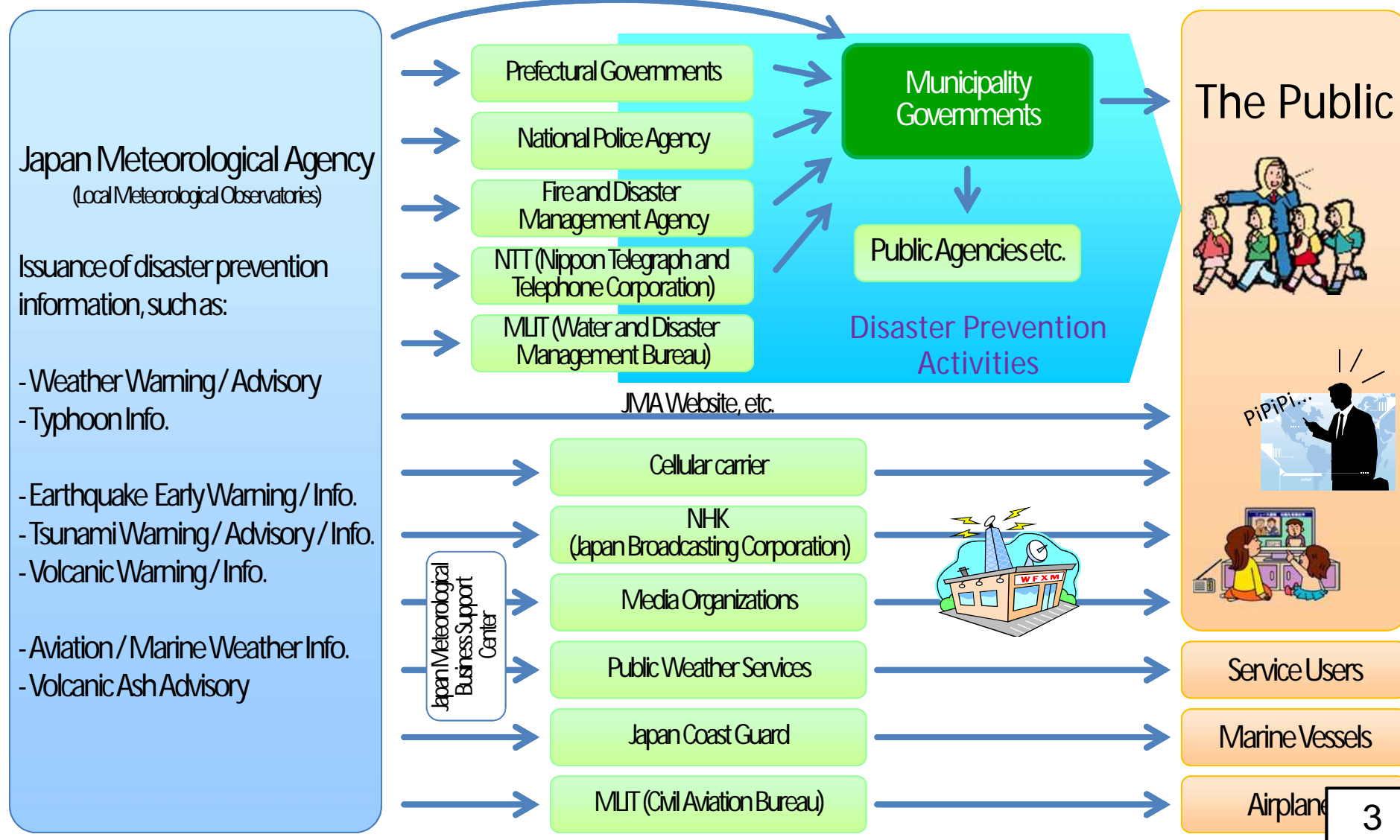
JMA's Operational Service





Dissemination of Warnings

JMA disseminates warnings and information via various channels in order to reach people surely and quickly.

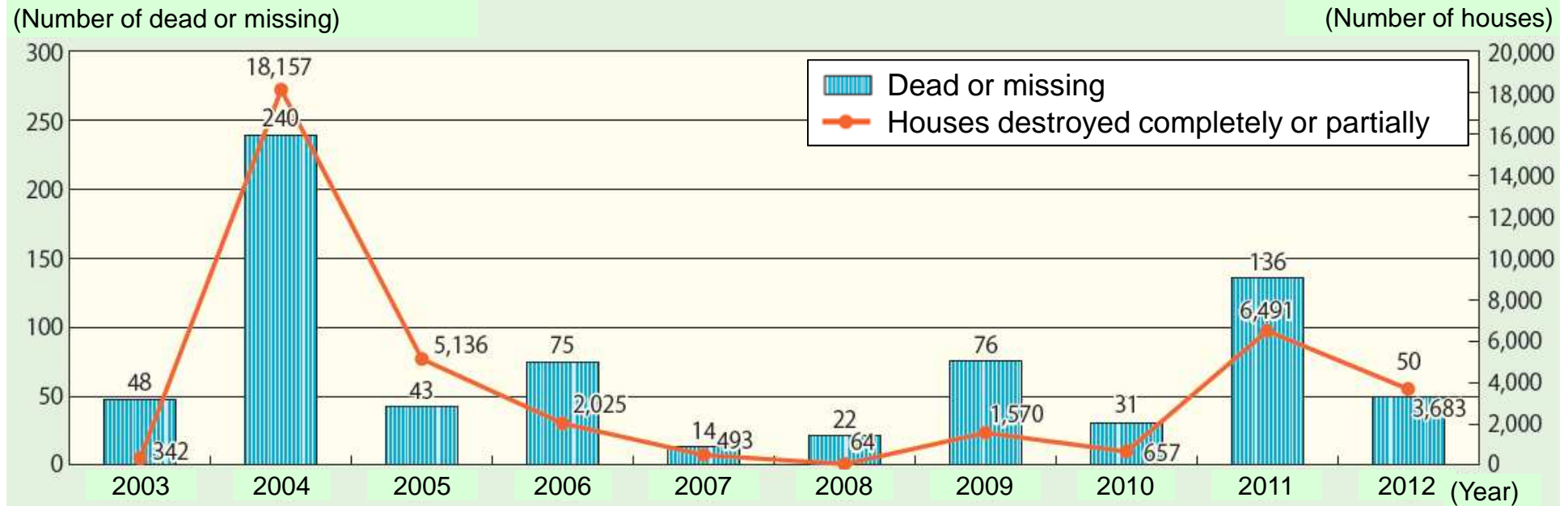


Recent Heavy Rain, Flood and Storms in Japan



Damages caused by heavy rain, flood and storms

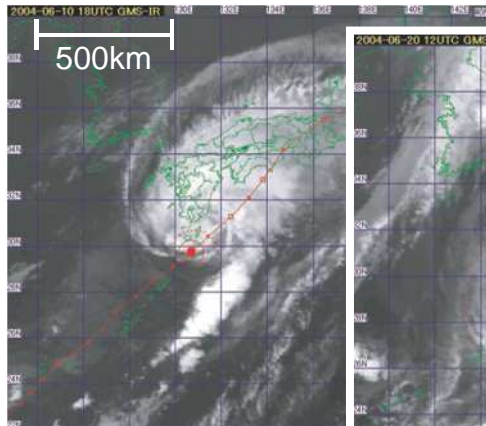
Source: "Shobo Hakusho 2013" (white paper on fire and disaster management)



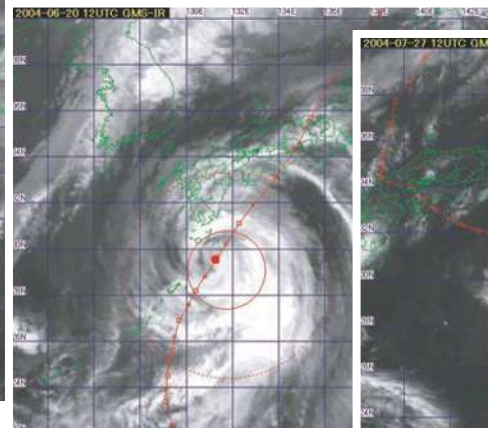
2004: 10 typhoons struck Japan!

2011: Heavy rain caused by typhoon Talas

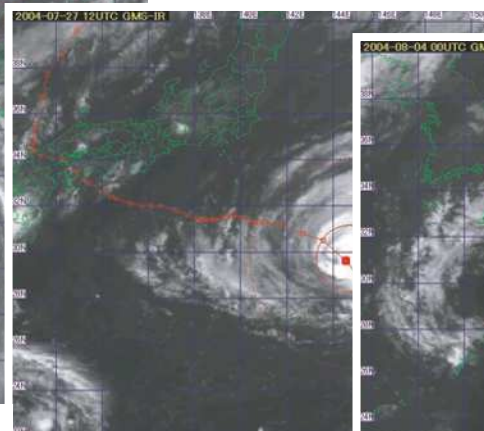
10 Typhoons struck Japan from June to October 2004



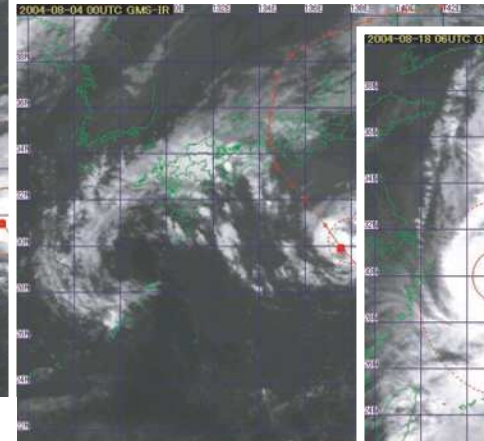
T0404
(landed on Japan around
16:00JST, Jun 11)



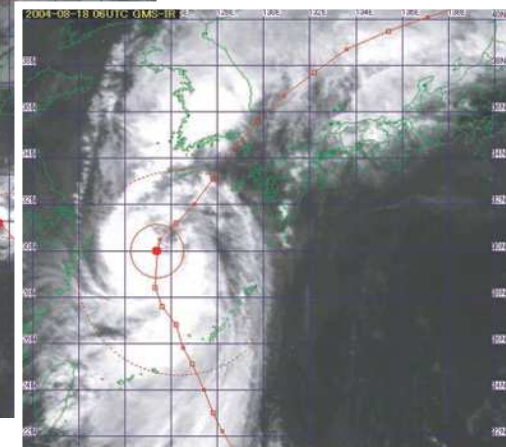
T0406
(landed on Japan around
09:30JST, Jun 21)



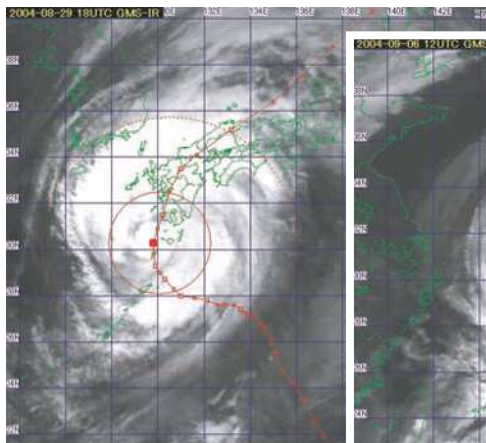
T0410
(landed on Japan around
16:00JST, Jul 31)



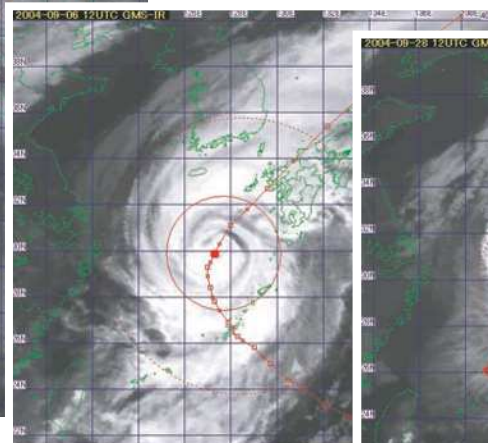
T0411
(landed on Japan around
22:30JST, Aug 4)



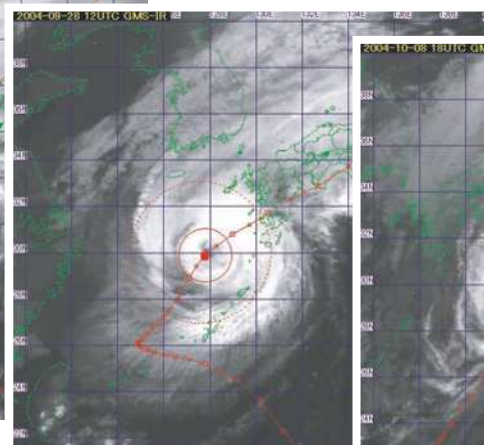
T0415
(landed on Japan around
06:00JST, Aug 20)



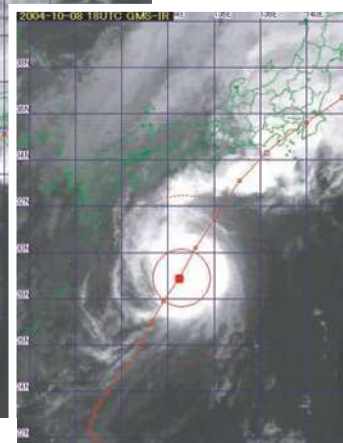
T0416
(landed on Japan around
10:00JST, Aug 30)



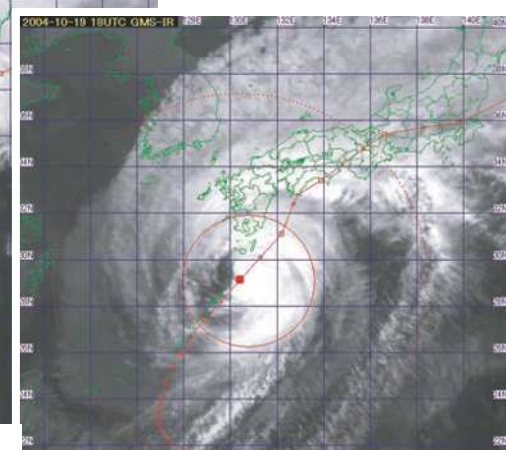
T0418
(landed on Japan around
09:30JST, Sep 7)



T0421
(landed on Japan around
08:30JST, Sep 29)



T0422
(landed on Japan around
16:00JST, Oct 9)



T0423
(landed on Japan around
13:00JST, Oct 20)

“Guidelines for Producing a Decision and Dissemination Manual for Evacuation Advisories and Orders” (Cabinet Office, 2005)

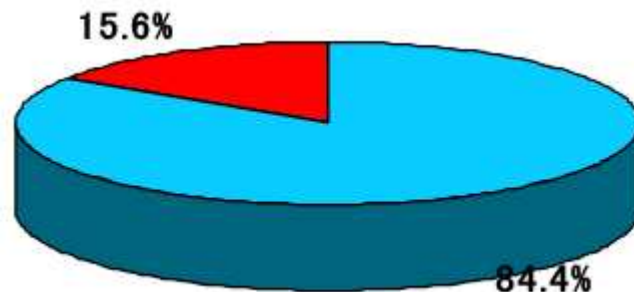


During the disasters in 2004, mayors did not issue the evacuation advisory / order for appropriate hazardous areas in a timely manner.

Background:

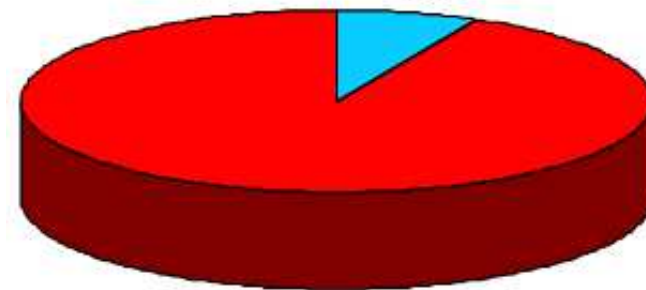
Mayors can not make decision because they have not pre-determined specific criteria for evacuation advisory / order.

Not determined: 15.6%



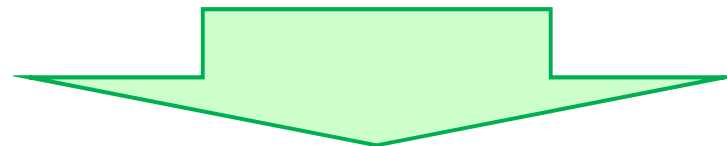
Criteria is pre-determined: 84.4%

Specific criteria is pre-determined: 7.1%



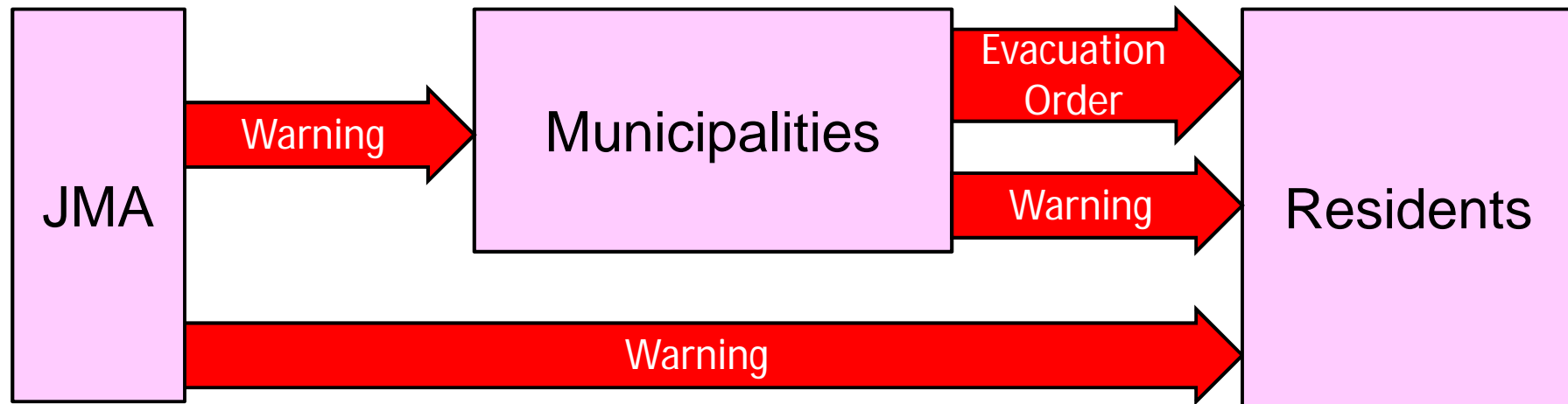
Not determined: 92.9%

Source: Cabinet Office, 2004

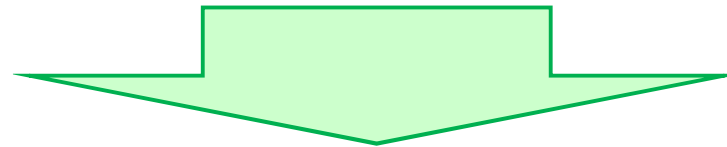


Municipalities should determine specific criteria.

Improvement of Warning



In order that JMA's warnings help mayors' decision...

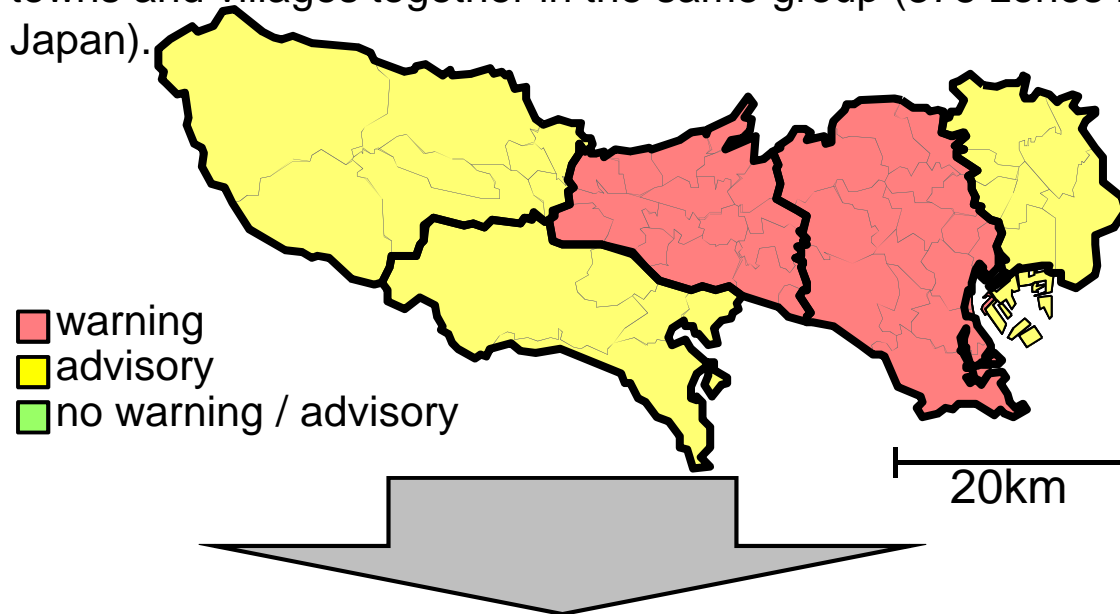


1. Warnings should be issued to city / town / village respectively.
2. Warning criteria should be consistent with the criteria for evacuation advisory and order.

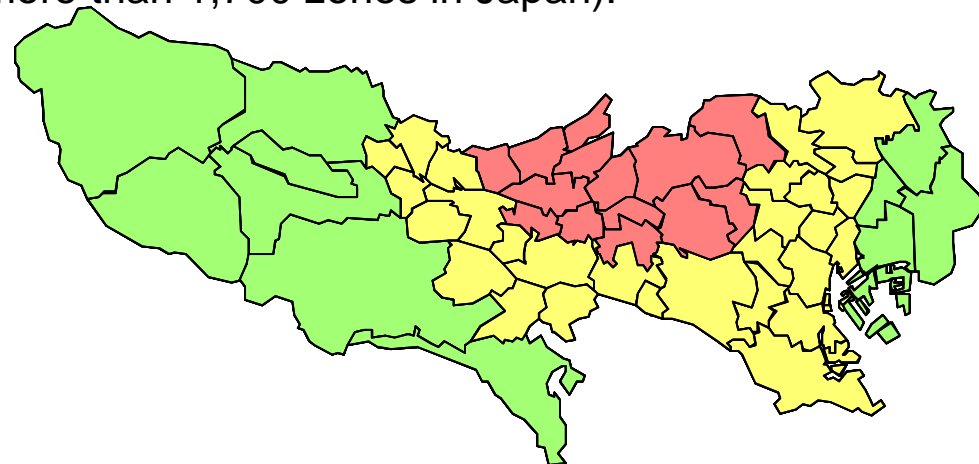
Warning for Cities, Towns and Villages



Warnings used to be issued by zones that include several cities, towns and villages together in the same group (375 zones in Japan).



JMA divided warning zones into city, town and village basis in 2008 (more than 1,700 zones in Japan).



Tokyo

Improvement of the Criteria for Flood Forecast



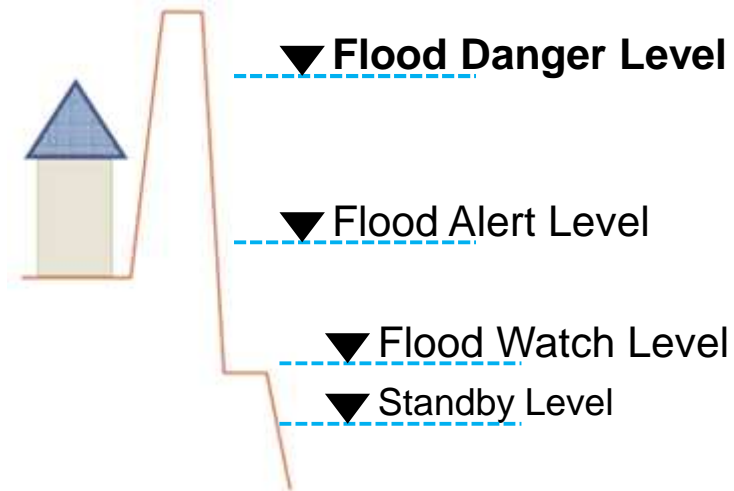
Criteria recommended in the Guideline

Mayor's Decision	Criteria
Evacuation Order	<ul style="list-style-type: none"> ✓ Water level of the river has reached "Flood Danger Level." ✓ Embankment is broken.
Evacuation Advisory	<ul style="list-style-type: none"> ✓ Water level of the river is expected to reach "Flood Danger Level" in certain hours*. <p>*: Necessary time for people to evacuate</p>
Evacuation Preparation Information	<ul style="list-style-type: none"> ✓ Water level of the river is expected to reach "Flood Danger Level" in certain hours*. <p>*: Necessary time for people <u>who require assistance</u> to evacuate</p>



Flood Forecast with Level

Water Level Setting



Flood Forecast Title	Water Level
Lv5: Flood Occurrence Info.	(Flood occur)
Lv4: Flood Danger Info.	Flood Danger Level
Lv3: Flood Alerting Info.	Flood Alert Level
Lv2: Flood Advisory Info.	Flood Watch Level
-	Standby Level

Improvement of the Criteria for Storm Surge Warning



Criteria recommended in the Guideline

Mayor's Decision	Criteria
Evacuation Order	<ul style="list-style-type: none"> ✓ Sea level has reached "Storm Surge Danger Level." ✓ Tidal embankment is broken.
Evacuation Advisory	<ul style="list-style-type: none"> ✓ Sea level is expected to reach "Storm Surge Danger Level" in certain hours*. <p>*: Necessary time for people to evacuate, however, storm will be also expected as the typhoon approaching, mayors should <u>consider the advisory when it meets the criteria for preparation information</u>.</p>
Evacuation Preparation Information	<ul style="list-style-type: none"> ✓ Sea level is expected to reach "Storm Surge Danger Level" in certain hours*. <p>*: Necessary time for people <u>who require assistance</u> to evacuate</p>

JMA set the criteria for storm surge warning consistent with "**Storm Surge Danger Level**."

1. If the municipality already set the "**Storm Surge Danger Level**", JMA set the level as the warning criterion for the city, town or village.
2. If the municipality is NOT set the "Storm Surge Danger Level", JMA set the warning criterion based on the survey (e.g. design high tide level for embankment, lowest altitude of the wharf).

Improvement of the Criteria for Sediment Disaster Alert

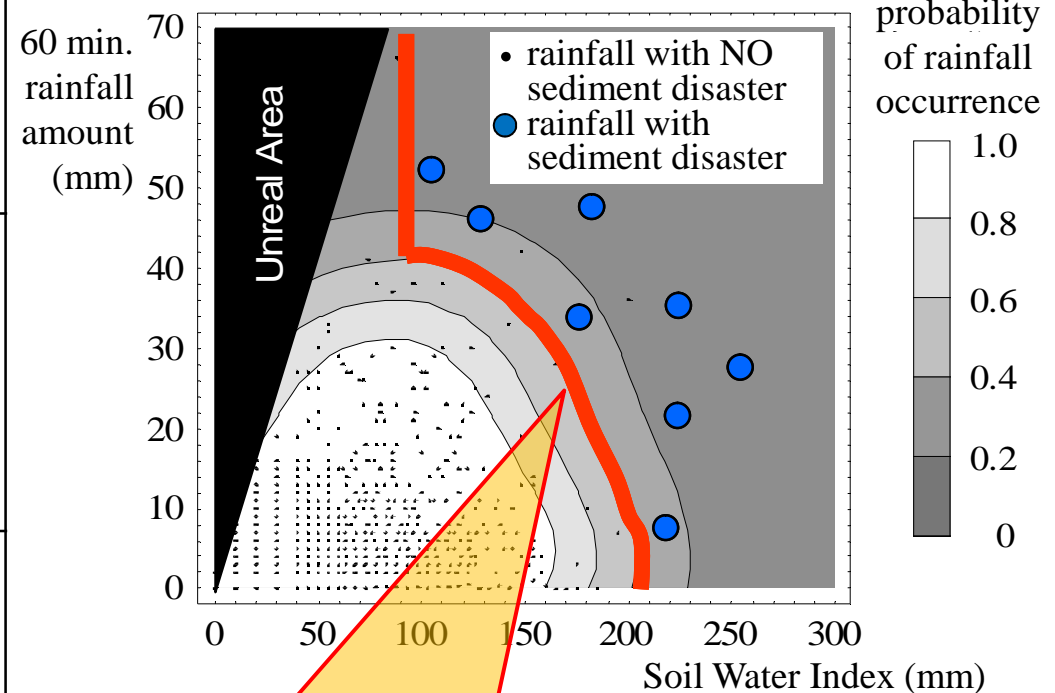


Criteria recommended in the Guideline

Mayor's Decision	Criteria
Evacuation Order	<ul style="list-style-type: none"> ✓ The rainfall situation has reached "Critical Line." ✓ A sediment disaster has occurred in neighbours.
Evacuation Advisory	<ul style="list-style-type: none"> ✓ The rainfall situation is expected to reach "Critical Line" in certain hours*. <p>*: Necessary time for people to evacuate</p>
Evacuation Preparation Information	<ul style="list-style-type: none"> ✓ The rainfall situation is expected to reach "Critical Line" in certain hours*. <p>*: Necessary time for people <u>who require assistance</u> to evacuate</p>



JMA set the "**Critical Line**" as the criteria for Sediment Disaster Alert.

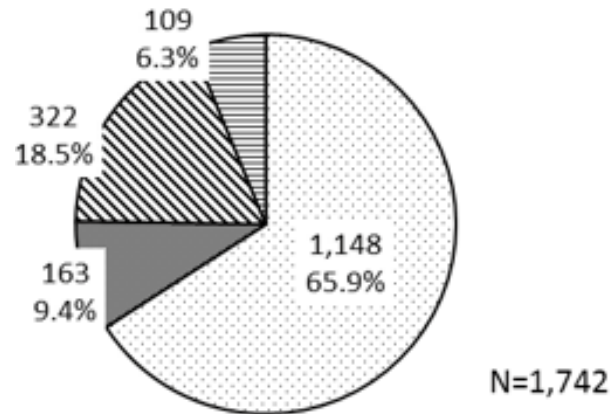


Critical Line of Sediment Disaster Occurrence

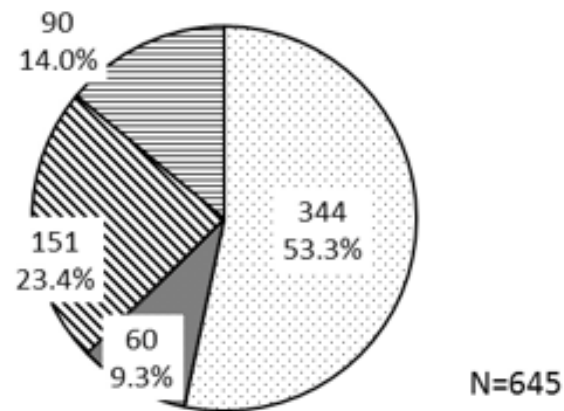
Situation on Pre-setting Specific Criteria in 2012



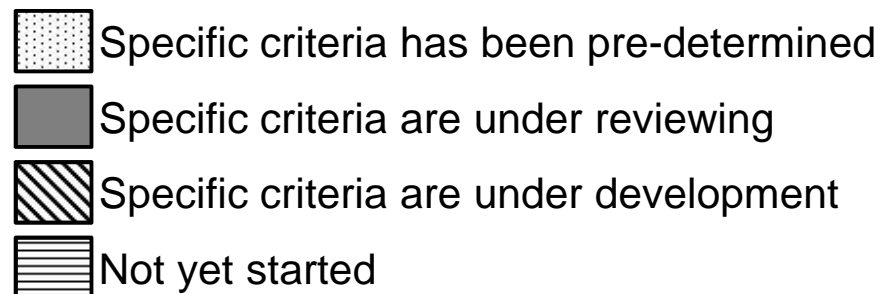
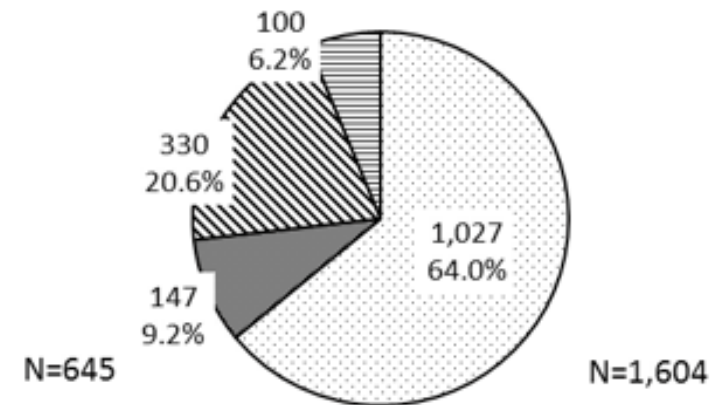
Flood



Storm Surge



Sediment Disaster



Source: Fire and Disaster Management Agency, 2013

Achievement of the Link between Warnings and Mayors Decision

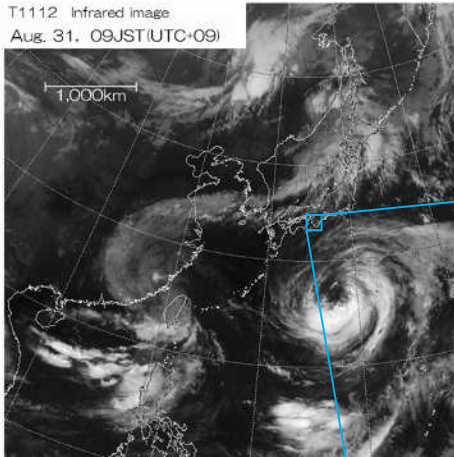


Disaster Mayors Decision	Sediment Disaster	River Flooding		Storm Surge Flooding
Evacuation Advisory	Sediment Disaster Alert		Flood Alerting Information	Storm Surge Warning
Evacuation Preparation Information	Heavy Rain Warning	Flood Warning	Flood Advisory Information	
Setting Up Disaster Countermeasures	Heavy Rain Advisory	Flood Advisory		Storm Surge Advisory

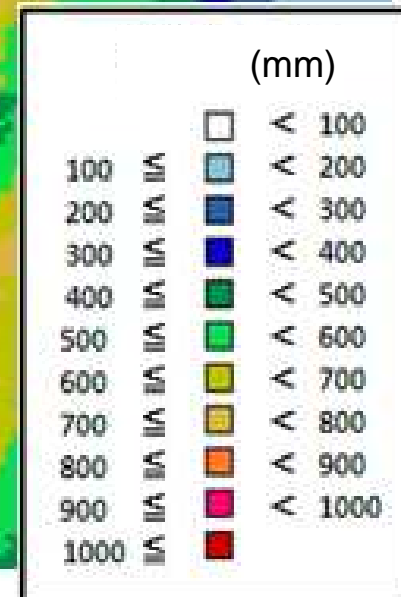
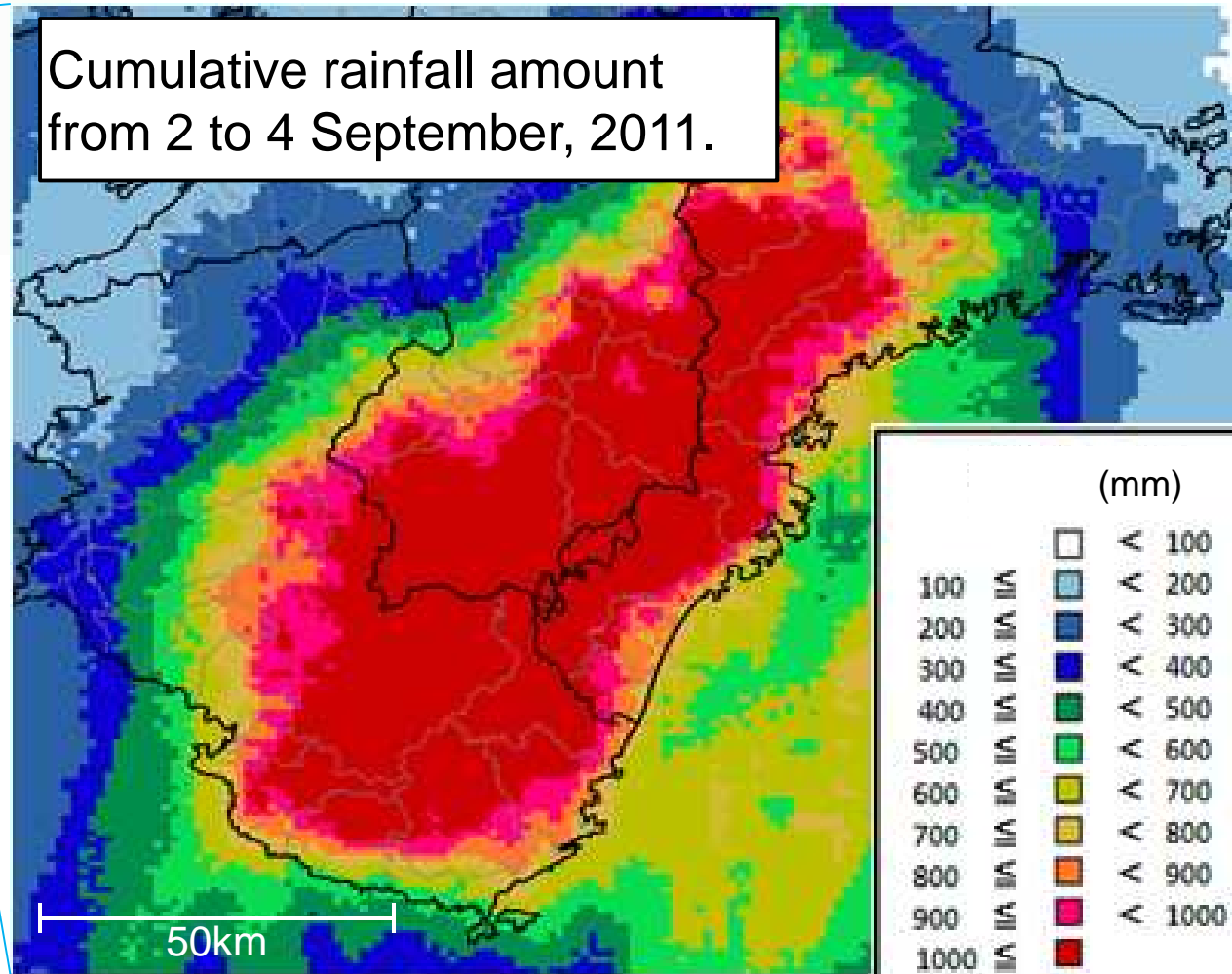
Typhoon Talas Brought a Long-term Heavy Rainfall in 2011



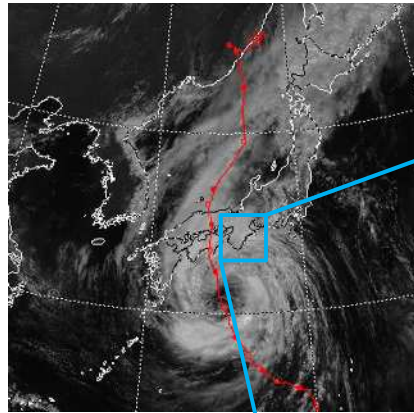
T1112 Infrared image
Aug. 31. 09JST(UTC+09)



Cumulative rainfall amount
from 2 to 4 September, 2011.



Heavy Rain by Talas caused Catastrophic Damage



Talas visible image and its track (red line) at 12JST of Sep. 2.

Damages:

98 dead or missing

3,538 houses comp / part destroyed

22,094 houses flooded

Source: Fire and Disaster Management Agency, 2012

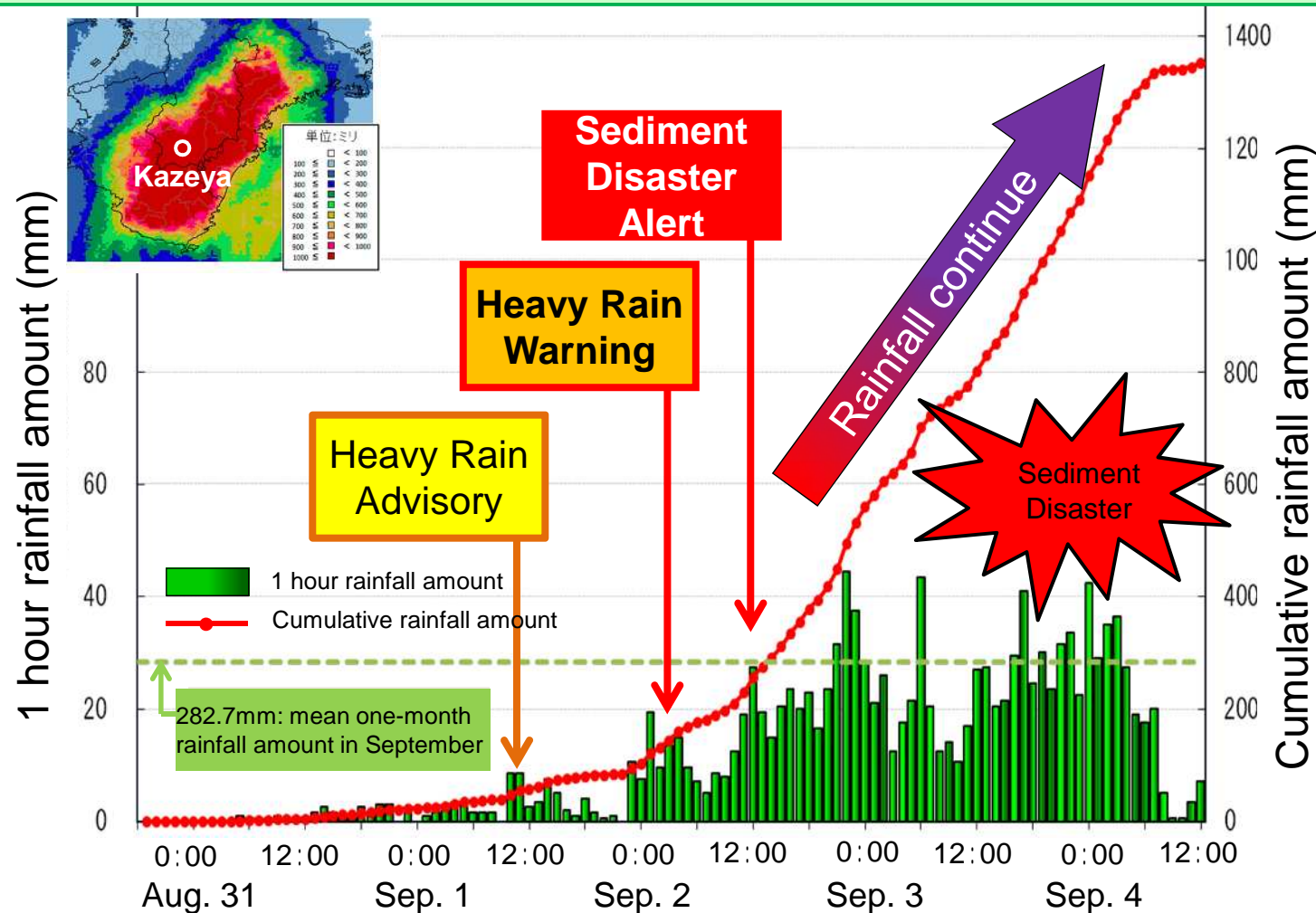


Source: Ministry of Land, Infrastructure, Transport and Tourism, 2011 (figure)

Warnings during the Heavy Rain by Talas

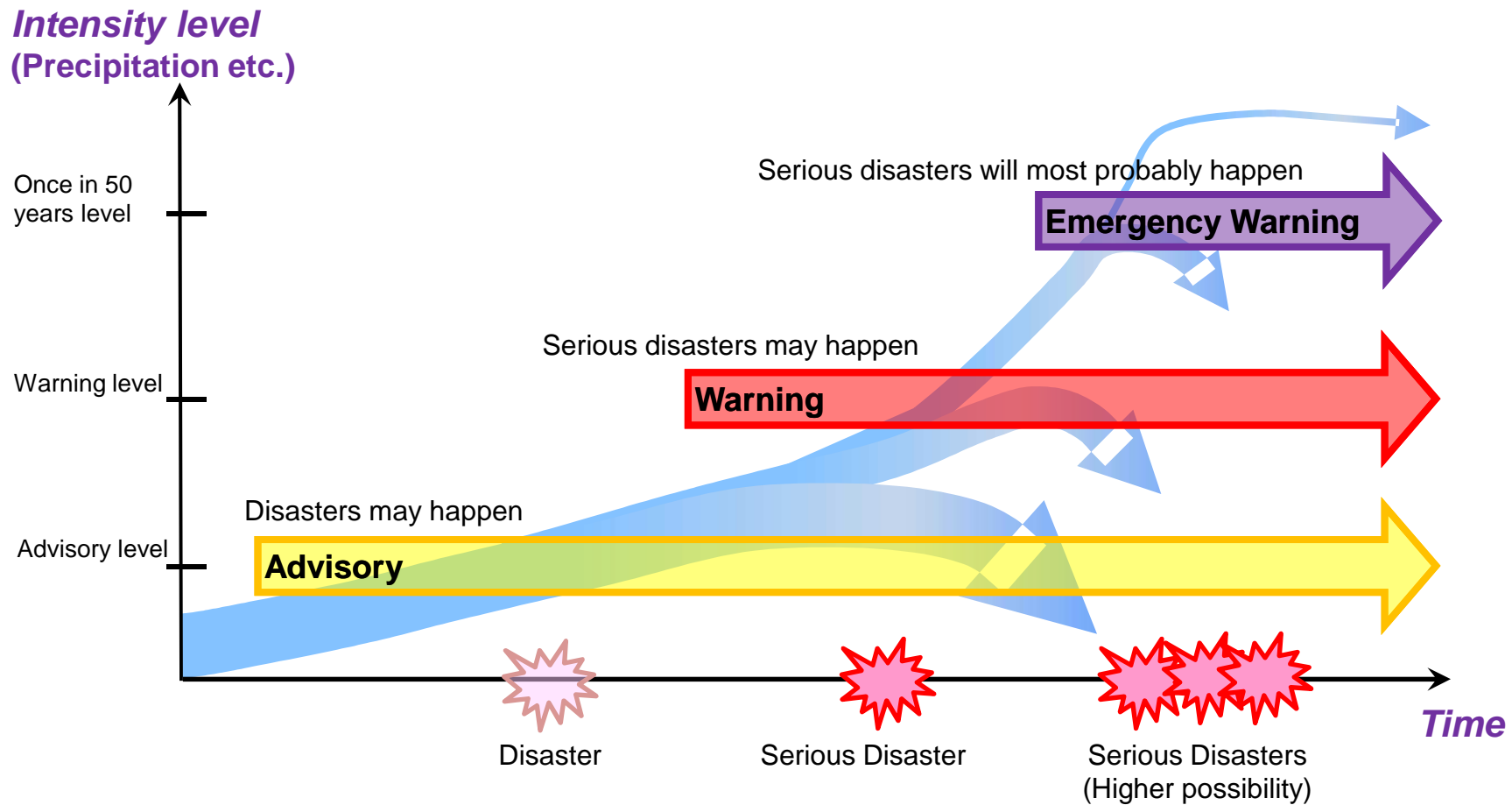


Rainfall continued after JMA had issued warning, and the situation became worse and worse. However, there was no effective way to inform the public of the catastrophic situation we never experienced!



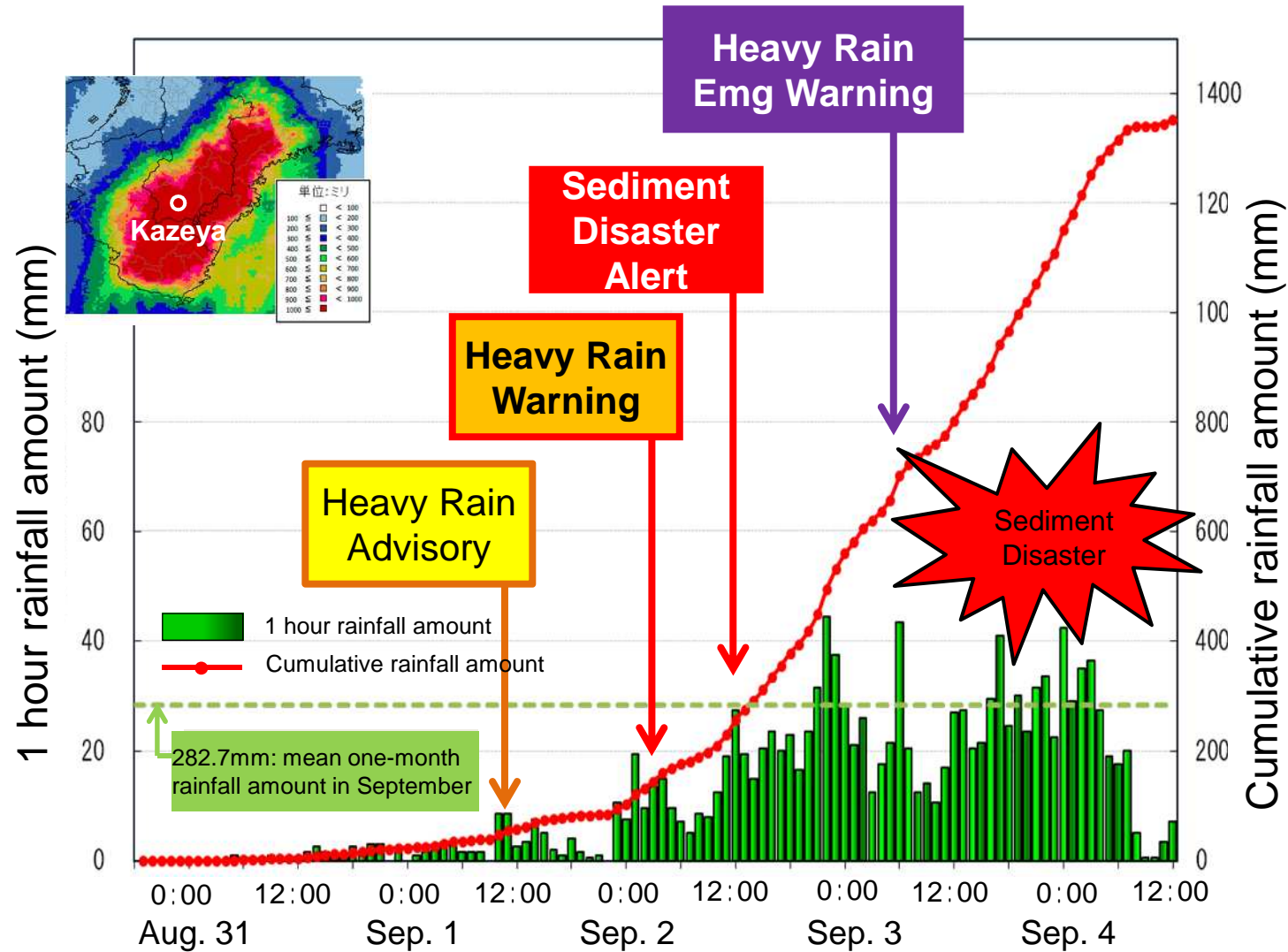
Observed Rainfall Amount at Kazeya in Totsukawa village, Nara prefecture

Establishment of "Emergency Warning"



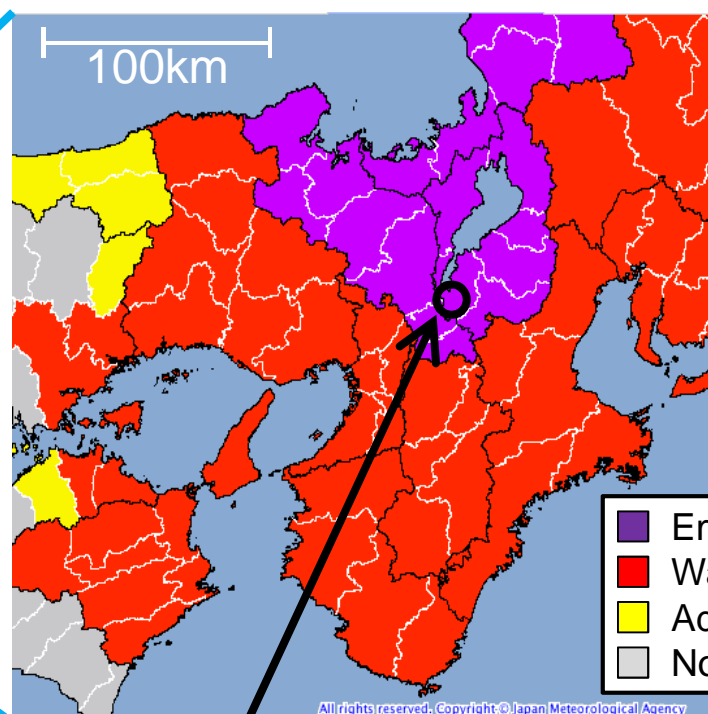
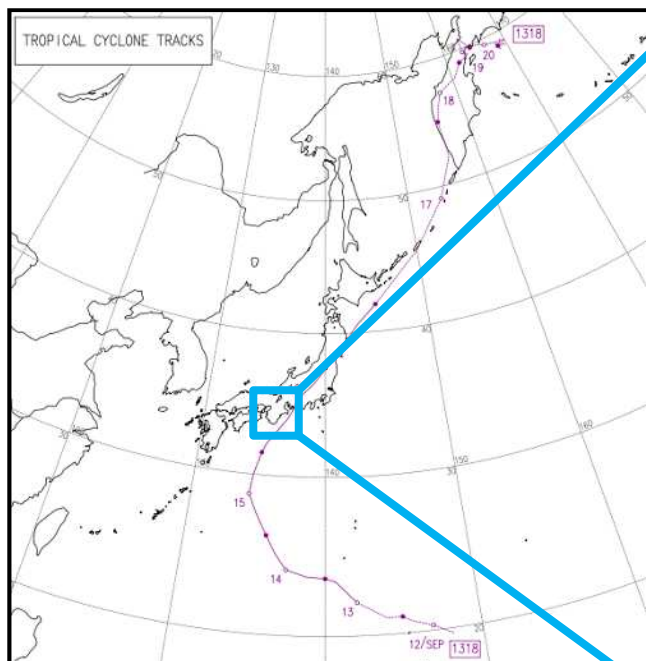
Emergency Warning is issued when JMA expects the precipitation amount of statistically estimated once in 50 years.

Expected Timing of Issuance of Emergency Warning

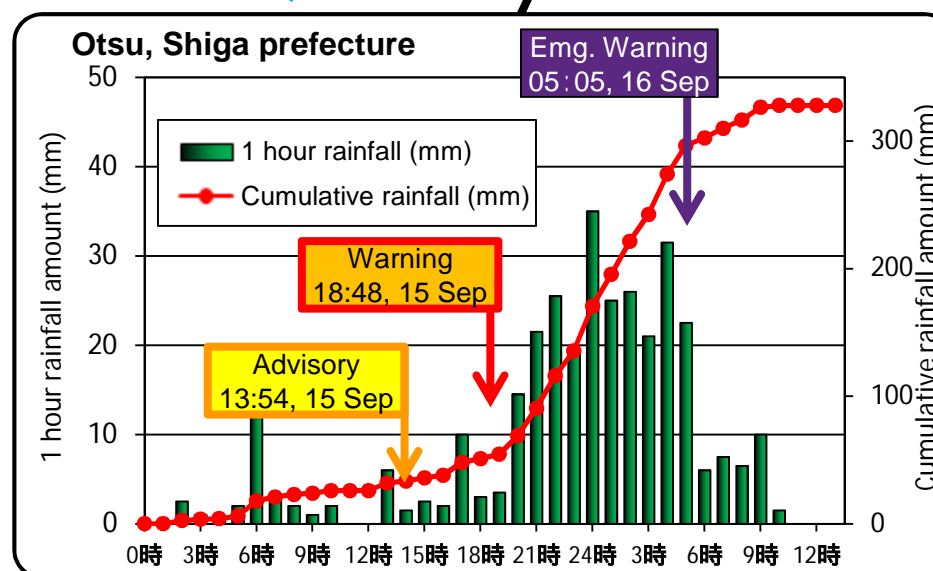


Observed Rainfall Amount at Kazeya in Totsukawa village, Nara prefecture

Emergency Warning during the Typhoon Man-yi in 2013



- Emergency Warning
- Warning
- Advisory
- No Warning / Advisory



Press briefing

Categories of Weather Warnings



		Weather Warning/Advisory type							Municipal responses	Resident responses
		Heavy rain		Storm	Storm surge	High waves	Heavy snow	Snowstorm		
		Sediment incident	Inundation							
Emergency Warning (Significant likelihood of catastrophe)	Sediment Incident Alert	Heavy rain Emergency Warning (sediment incident)	Heavy rain Emergency Warning (inundation)	Storm Emergency Warning	Storm surge Emergency Warning	High wave Emergency Warning	Heavy snow Emergency Warning	Snowstorm Emergency Warning	<ul style="list-style-type: none">• Immediately urge residents to take all possible steps for self-protection• Alert residents to the issuance of an Emergency Warning and highlight the exceptionally dangerous situation	<ul style="list-style-type: none">• Take immediate action for self-protection (head to an evacuation center, or if it is dangerous to go outside, evacuate to a safer place within the building)
Warning (Chance of catastrophe)		Heavy rain Warning (sediment incident)	Heavy rain Warning (inundation)	Storm Warning	Storm surge Warning	High wave Warning	Heavy snow Warning	Snowstorm Warning	<ul style="list-style-type: none">• Urge residents to evacuate• Issue evacuation advisories and orders to areas as necessary• Prepare for emergency response• Issue evacuation preparedness information to trigger evacuation of people requiring assistance• Establish evacuation centers• Disseminate Warnings to residents	<ul style="list-style-type: none">• Start voluntary and early evacuation or follow evacuation advisories/orders• For Storm Warnings, evacuate to a safe place• Report abnormalities to municipalities and other authorities• Stay away from hazardous places• Prepare for evacuation
Advisory (Possible development of serious adverse conditions)		Heavy rain Advisory		Gale Advisory	Storm surge Advisory	High waves Advisory	Heavy snow Advisory	Snowstorm Advisory	<ul style="list-style-type: none">• Patrol areas requiring caution• Advise residents to pay attention• Monitor weather bulletins and information on rainfall conditions• Prepare to call out relevant officials	<ul style="list-style-type: none">• Check emergency supplies• Check evacuation routes and centers• Check windows and storm shutters• Monitor weather bulletins on TV, radio and JMA's website

Summary of History on our Improvement



2 grades information --- advisory, warning

2004: 10 typhoons hit Japan

Lesson: Warnings need to connect to action

After 2004: Restructuring of warning

- ✓ warning zones be set as city, town and village areas
- ✓ warning criteria be consistent with the criteria of evacuation order

2011: Unprecedented rainfall by typhoon Talas

Lesson: Effective message in emergency situation.

2013: Emergency warning launched

Our efforts will continue forever so that the warnings save people from natural disasters more effectively!

Public Awareness & Cooperation with other Organizations

Public Awareness

✓ Leaflets



✓ Movies



✓ Workshop / events



Cooperation

✓ Consensus on warning criteria

Warning criteria are fixed under the consensus through the discussion with municipalities concerned.

✓ Joint information

JMA issues flood forecasts jointly with the river administrators, namely, Ministry of Land, Infrastructure, Transport and Tourism or prefectural governments. Sediment disaster alerts are also issued jointly by JMA and prefectural governments.

✓ Personnel exchange

JMA exchanges personnel with other national and municipal governments related to disaster management.

✓ Education



Lecture at schools



Cooperation with the Japanese Red Cross Society

Thank you