

Enhancing Early Response to Extreme Weather with AI and Direct Alert Systems at KMA

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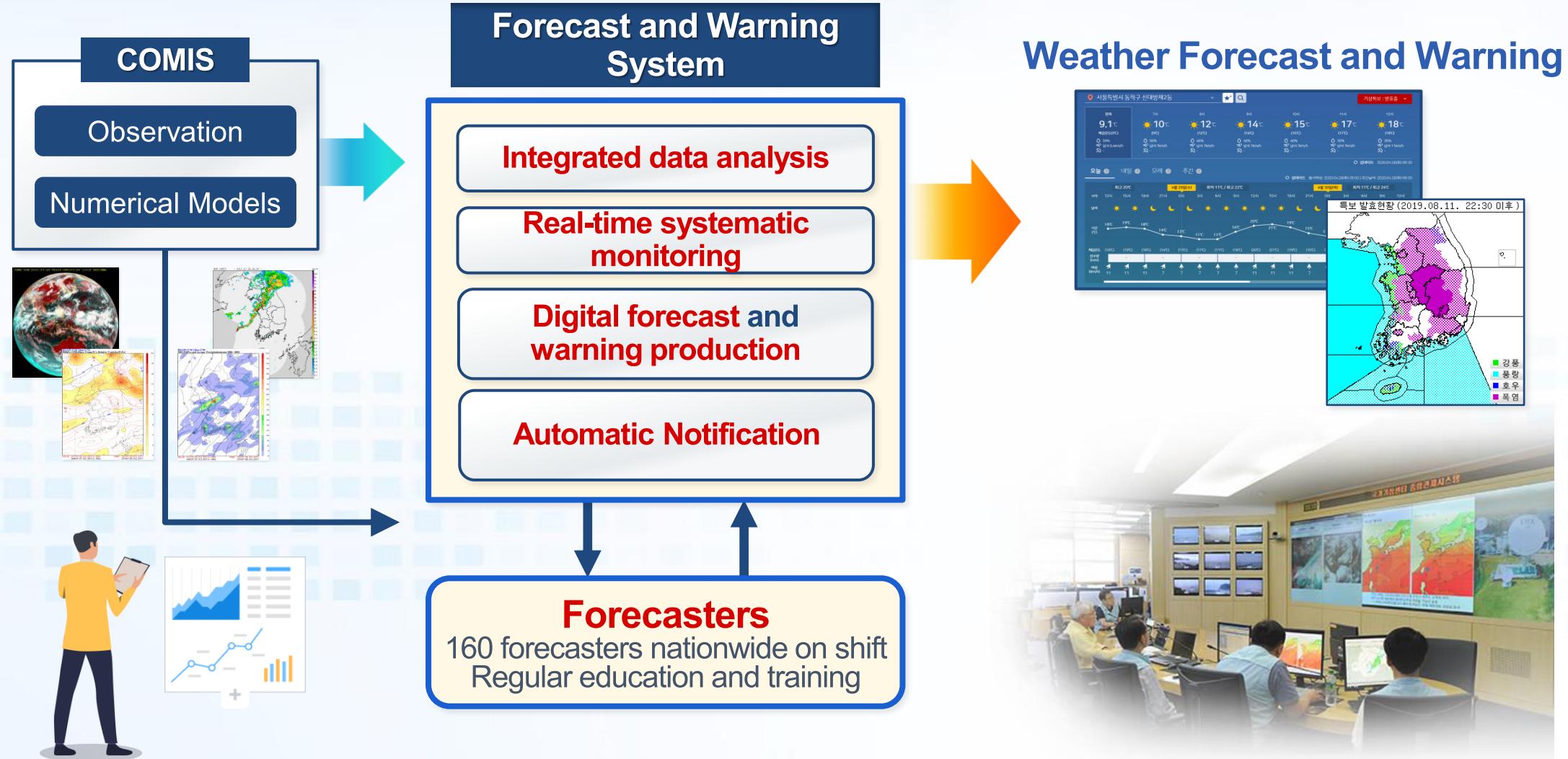
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1. Enhancing Typhoon Forecast Service

❖ Analyzing observation data and NWP products, and provides forecast guidance



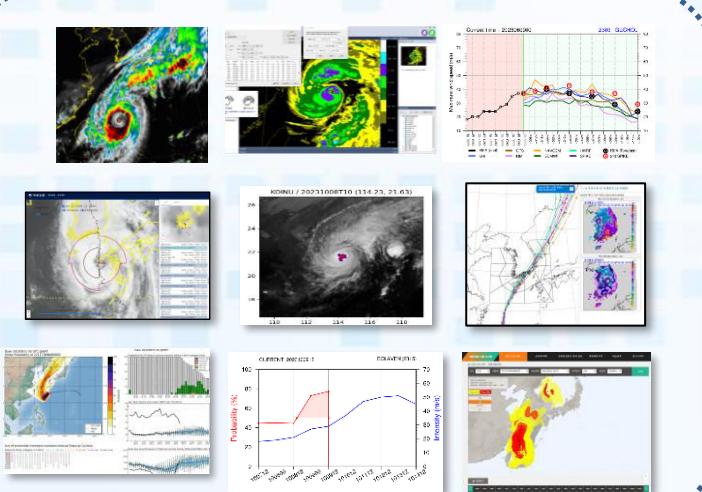
1. Enhancing Typhoon Forecast Service

❖ KMA's Typhoon Forecast and Warning Service

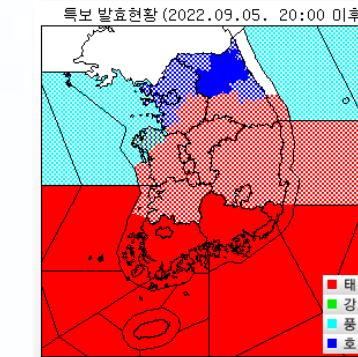
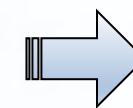
- NTC/KMA provides forecast information for all typhoons in the Western North Pacific, including the forecast track, intensity and radius of strong winds.
- NMC is responsible for issuing warnings and delivering regional weather forecasts based on the latest TC forecast.
- When impacts are expected, KMA actively provides information to support response and preparedness.

Forecasting Bureau of KMA

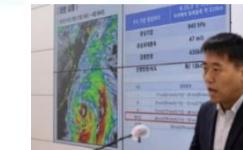
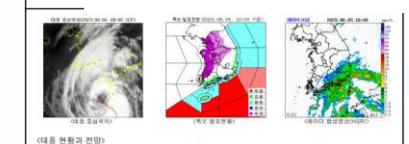
National Typhoon Center(NTC)



National Meteorological Center(NMC)



Real-time Release



1. Enhancing Typhoon Forecast Service

- ❖ All the produced information is provided to the media and related agencies.
- ❖ People can easily access to KMA's weather information via Weather App.

Service Channels



Mobile App Service



Automatic
weather alerts



Support Emergency Broadcasting



2. Cell Broadcast Service(CBS) for extreme weather

❖ We must ensure that the lives of our citizens are never threatened again

Aug 8, 2022 Heavy rain

'22. 08. 07. 11:00

100~200mm of rainfall (up to 300mm or more in some areas) in Seoul and Gyeonggi regions from the 8th to the 9th

'22. 08. 07. 16:00

Issue an early warning for a heavy rain

'22. 08. 08. 06:00

Issue a heavy rain advisory

'22. 08. 08. 12:50

Issue a heavy rain warning including south of Seoul



Forecast



Warning

Sep. 06, 2022 TC Hinnamnor

'22. 09. 03. 11:00

100~300mm of rainfall nationwide (up to 400mm or more in some areas) from the 3rd to the 6th

'22. 09. 04. 05:00

Issue a TC early warning for south of Korea

'22. 09. 05. 05:00

Issue a TC early warning for most part of Korea

'22. 09. 05. 22:00

Issue a TC advisory for the central and southern regions, including Pohang

Nevertheless

'22. 08. 08. around 9 PM

In Dongjak, a maximum 141.5mm/h was recorded

3 fatalities in a basement apartment



Accident

'22. 09. 06. around 07 AM

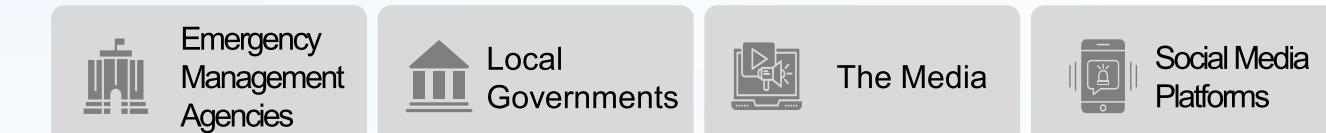
In Pohang, a maximum 111.0mm/h was recorded

7 fatalities in an underground parking lot

2. Cell Broadcast Service(CBS) for extreme weather

- Three Steps for Weather Safety to protect People from Extreme Weather
- Direct Emergency Text Alerts (CBS) for Heavy Rain

Prepare with Forecasts → Get Ready with Special Weather Reports → **Promptly Respond with Wireless Emergency Alerts(WEA)**



KMA

KMA sends **Heavy rain WEA** when extreme rain occurs.
When precipitation levels reach 50mm/h and 90mm/3h simultaneously



<Types of Alerts in Korea>

Type	Alert Sound Volume
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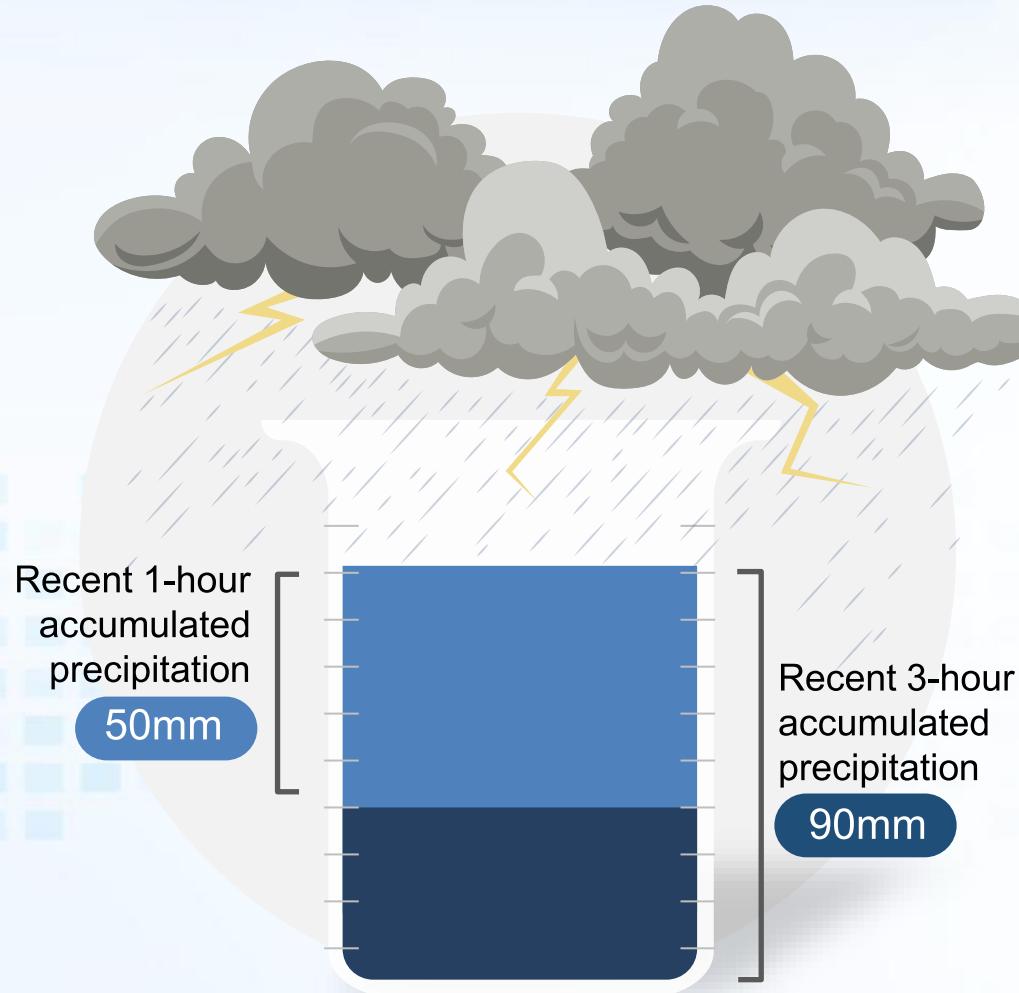
Emergency Alerts	More than 40dB
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Public Safety Alerts	Same as Regular Texts
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“ To enable immediate safety measures at the most critical moment,
KMA sends emergency alerts directly to those exposed to danger ”

2. Cell Broadcast Service(CBS) for extreme weather

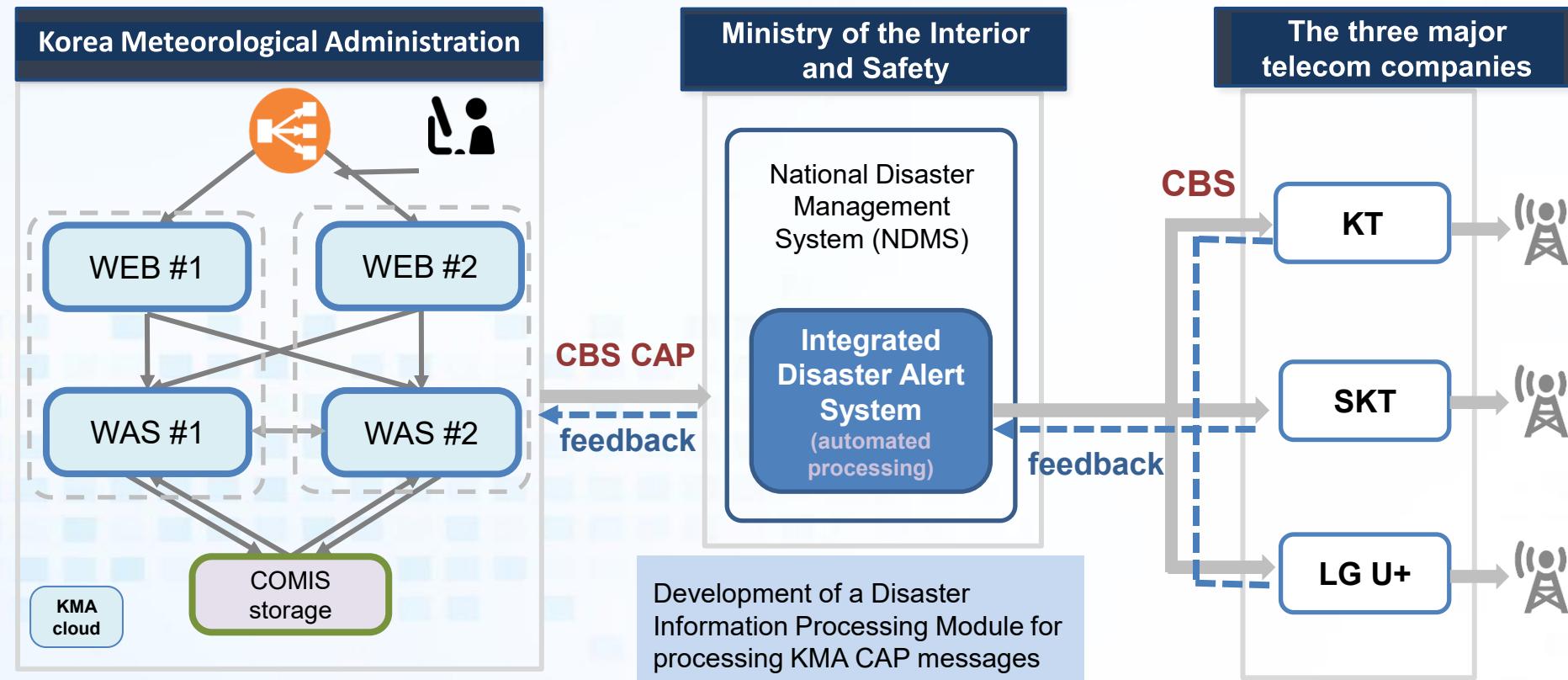
- When rainfall reaches **50mm/1h & 90mm/3h**, immediate notification will be sent WEA (Wireless Emergency Alerts)



- Notification will be sent when both the conditions of 1-hour and 3-hour rainfall are met
- There was an 80% probability of disaster occurring under these conditions
- Notification can be sent even if 72 mm of rainfall within one hour to secure the golden time

2. Cell Broadcast Service(CBS) for extreme weather

- Configuration of a Dedicated Server Cluster for monitoring thresholds for heavy-rain disaster alerts and automated execution of CBS messages
- Automated processing from the KMA to the mobile telecom companies



✓ CAP: Common Alerting Protocol

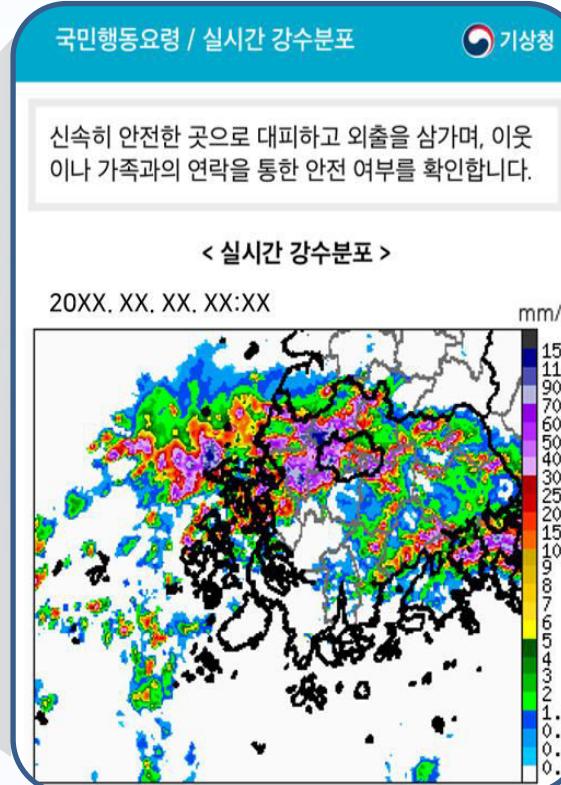
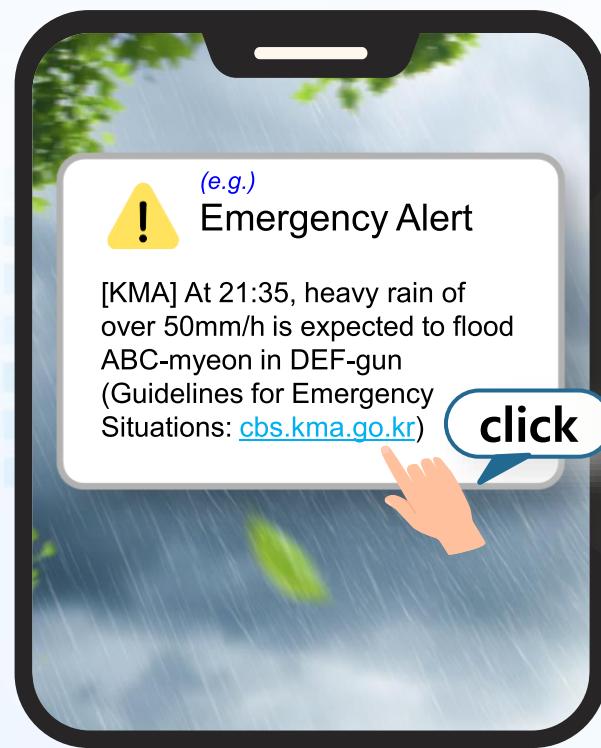
2. Cell Broadcast Service(CBS) for extreme weather

Prepare based on
Forecasts

Get Ready with
Special Weather Reports

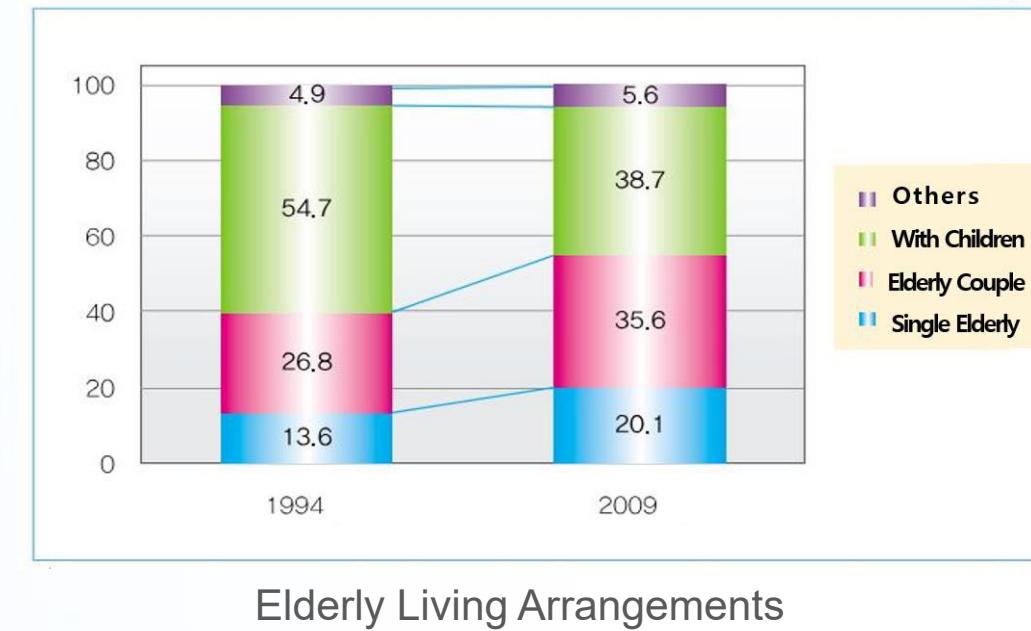
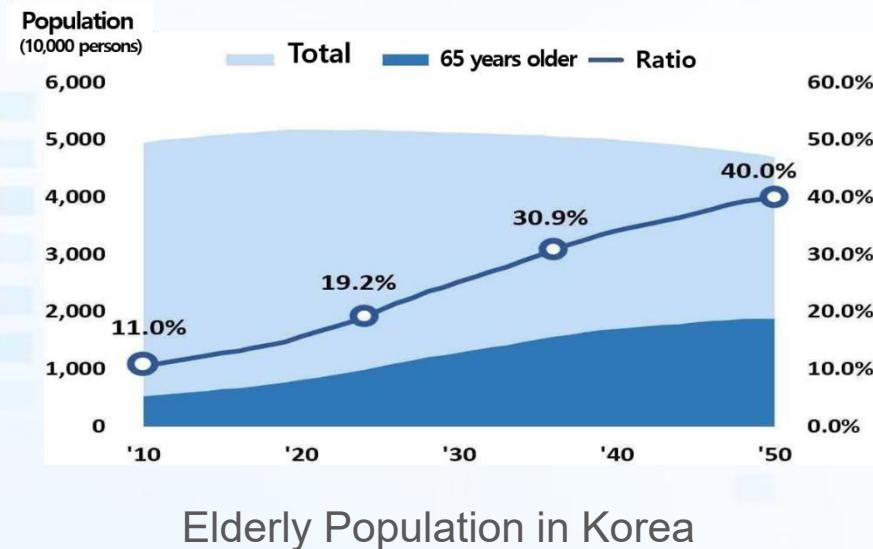
Promptly Respond with
Wireless Emergency Alerts

“
Taking immediate safety measures
Upon receiving KMA's Heavy rain WEA



3. Voice-Delivered Hazard Warnings Using AI Speakers

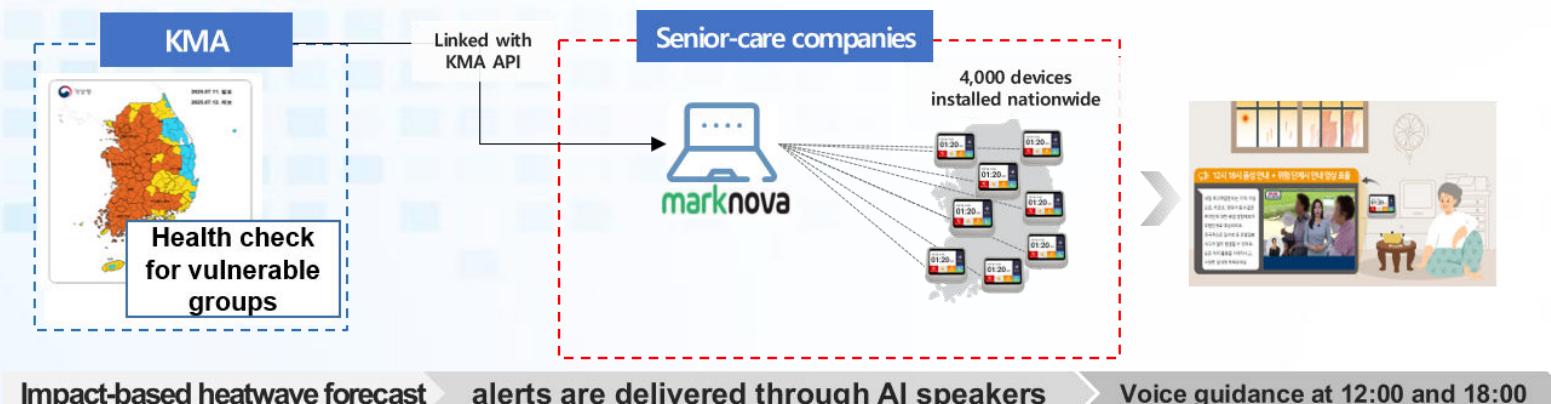
- ❖ As more elderly people live alone, **improving the delivery of hazardous weather information** becomes important
- ❖ KMA is expanding from text-based alerts to voice-based communication
- ❖ In 2025, KMA launched a pilot service **delivering heatwave information to seniors living alone through AI speakers**



3. Voice-Delivered Hazard Warnings Using AI Speakers

- ❖ **(Local Government)** Providing AI speakers to seniors living alone through Elderly Care Services Programs.
- ❖ **(KMA)** Using AI speakers Notification Functions to provide impact-based heatwave forecasts. Delivers impact-based heatwave forecasts(for health vulnerable groups) quickly and directly to seniors who need this information most, through AI speakers installed in their homes.
- ❖ **(Voice Message Service)** Provides weather information and action guidelines by voice twice a day when Caution, Warning and Danger levels are issued.

Risk Levels		Attention	Caution	Warning	Danger
The highest daily apparent temperature	general public	31°C or higher for two days or more	33°C or higher for two days or more	35°C or higher for two days or more	38°C or higher for one day or more
	Vulnerable groups	29°C or higher for two days or more	31°C or higher for two days or more	34°C or higher for two days or more	37°C or higher for one day or more



3. Voice-Delivered Hazard Warnings Using AI Speakers

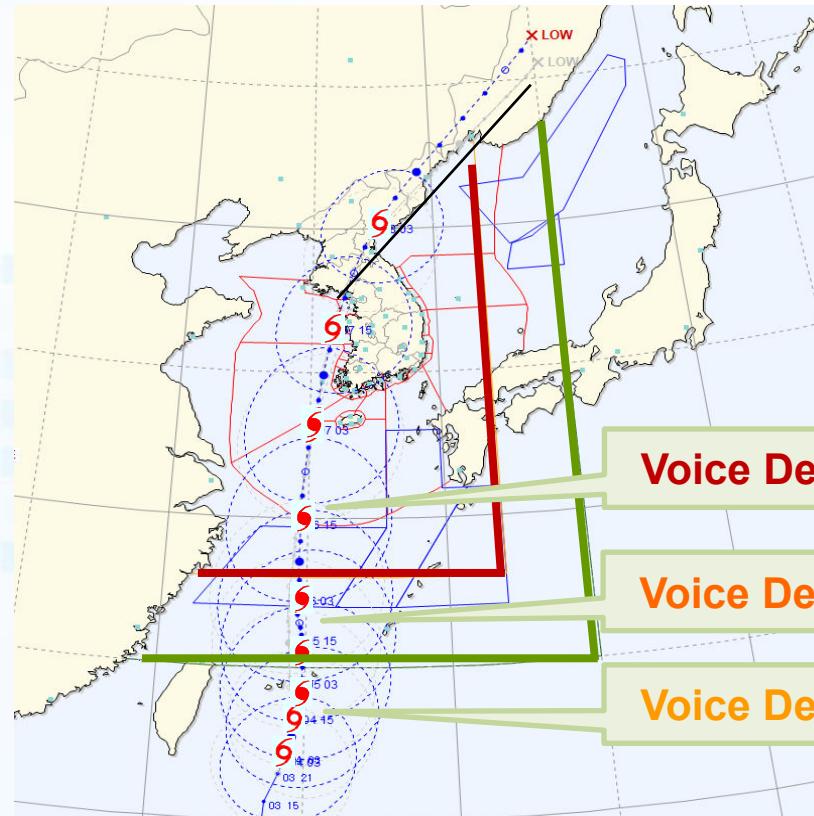
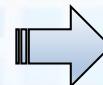
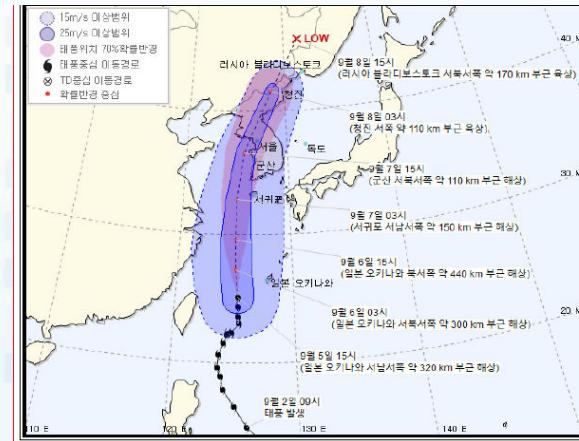
- Through collaboration between the KMA and the Jeju Support Center for Elderly Living Alone, **typhoon impact information** and **safety guidelines** are provided by voice via AI speakers to help prevent typhoon-related damage among elderly people living alone.

Risk Level	Level 1	Level 2	Level 3
Typhoon Location	Typhoon Impact Expected	Alert Zone Entry	Emergency Zone Entry



3. Voice-Delivered Hazard Warnings Using AI Speakers

- From 2026, KMA will expand the service using AI speakers to provide timely typhoon forecast information and recommended safety actions when a typhoon is approaching.
 - Service Activation: **When a typhoon is forecast to affect Korea**
 - Pilot Service: **For elderly residents living alone in Jeju**



Voice Delivery : Level 3

Voice Delivery : Level 2

Voice Delivery : Level 1

Future Plans

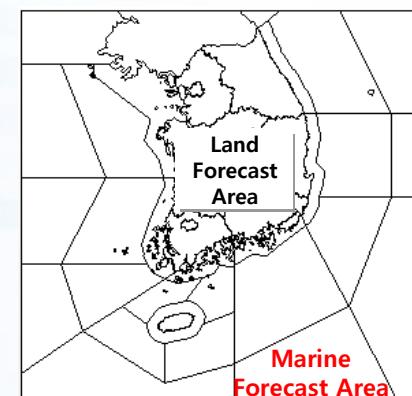
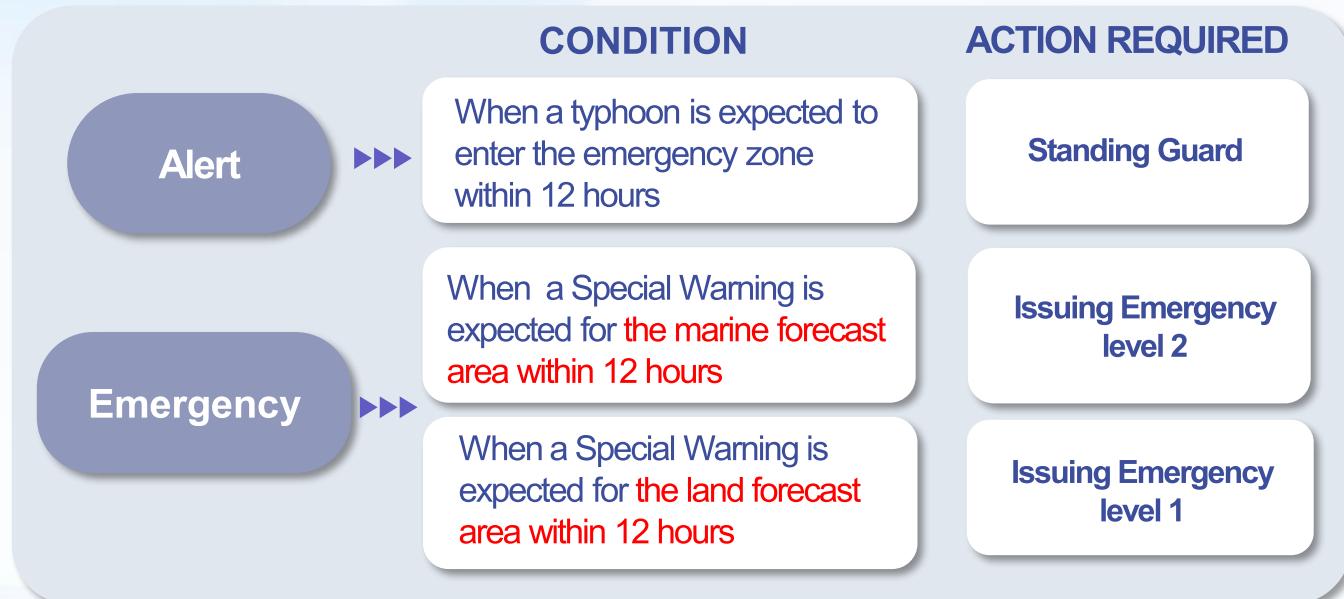
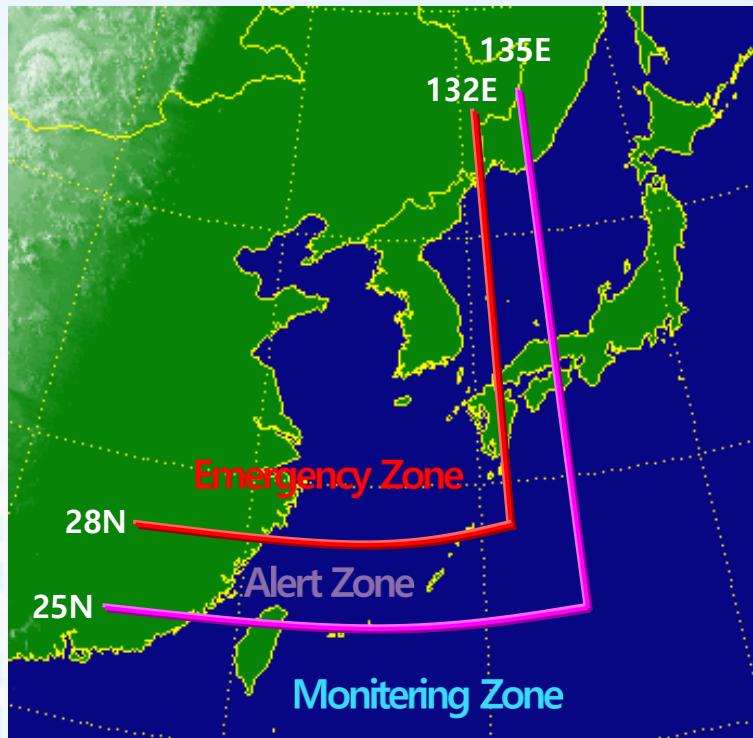
- ❖ KMA will continue to enhance typhoon information services.
- ❖ CBS alerts will be expanded to cover damage from additional hazardous weather conditions, including heavy snow, in addition to heavy rainfall.
- ❖ A pilot AI-speaker service delivering typhoon information will begin in Jeju in 2026, with plans for broader regional expansion and automated message delivery.



Thank you for your attention.

Reference

❖ Typhoon Warning Zone of KMA



- ✓ Preliminary Special Notice : Before a Special Notice
- ✓ Special Notice : Advisory : Warning

❖ Typhoon Warning Criteria

- **Typhoon Advisory:** Issued when typhoon-related strong winds, high waves, heavy rain, or storm surge
 - are expected to reach **advisory thresholds**
- **Typhoon Warning:** Issued when any of the following are expected
 - ① **Strong wind, high wave, or storm-surge warning-level conditions**

	Advisory Thresholds	Warning Thresholds
Strong Wind	≥ 14 m/s (50.4 km/h) sustained or ≥ 20 m/s (72 km/h) gusts Mountain areas: ≥ 17 m/s (61.2 km/h) sustained or ≥ 25 m/s (90 km/h) gusts	≥ 21 m/s (75.6 km/h) sustained or ≥ 26 m/s (93.6 km/h) gusts Mountain areas: ≥ 24 m/s (86.4 km/h) sustained or ≥ 30 m/s (108 km/h) gusts
Wave	≥ 14 m/s winds for ≥ 3 hours, or waves ≥ 3 m	≥ 21 m/s winds for ≥ 3 hours, or waves ≥ 5 m
Heavy Rain	≥ 60 mm in 3 hours, or ≥ 110 mm in 12 hours	≥ 90 mm in 3 hours, or ≥ 180 mm in 12 hours
Storm Surge	Sea level expected to exceed locally defined advisory thresholds due to combined effects of tides, wind, and low pressure	Sea level expected to exceed locally defined warning thresholds due to combined meteorological effects