



**ASIA AND
THE PACIFIC**

EARLY WARNING SYSTEMS in the Asia and the Pacific Region



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Introduction

Early warning systems are crucial for disaster preparedness and response in Asia and the Pacific, a region frequently affected by a wide range of natural hazards. From tropical cyclones and tsunamis to earthquakes and food insecurity, these early warning mechanisms play a vital role in saving lives and protecting livelihoods.

A growing number of early warning systems is available to disaster managers in the region. Early warning systems vary in geographic and thematic coverage, and they offer different levels of situational awareness, alerting and executive decision-making support to national Governments and their partners.

This report provides a comprehensive overview of the diverse range of early warning systems available in the Asia-Pacific region including weather forecasting systems, multi-hazard early warning platforms, tsunami early warning centers, and food security monitoring networks.

Summary

The key sources that provide early warning advisories for different hazards in Asia and the Pacific region are:

1. Weather Forecasting Systems:

- **Joint Typhoon Warning Center (JTWC):** Provides alerts for tropical cyclones and tsunamis in the Asia-Pacific region.
- **Fiji Meteorological Service:** Offers alerts for tropical cyclones in the Southwest Pacific.

2. Multi-Hazard Early Warning Systems:

- **Australian Bureau of Meteorology (BoM):** Provides alerts for tropical cyclones, severe storms, floods, heatwaves, and fires across Australia and the Asia-Pacific.
- **Japan Meteorological Agency (JMA):** Issues alerts for typhoons, heavy rainfall, snowstorms, earthquakes, and tsunamis in Japan and East Asia.
- **Indonesia BMKG (Badan Meteorologi, Klimatologi, dan Geofisika):** Provides alerts for tropical cyclones, tsunamis, earthquakes, and volcanic eruptions in Indonesia.
- **ASEAN Disaster Monitoring and Response System (DMRS):** Offers alerts for earthquakes, tsunamis, tropical cyclones, and floods in Southeast Asia.
- **Hazard Hunter Philippines:** Provides alerts for earthquakes, tsunamis, active volcanoes, floods, storms, severe winds, and other hazards in the Philippines.
- **India National Disaster Management Authority (NDMA):** Issues alerts for cyclones, floods, earthquakes, tsunamis, and wildfires in India.
- **DisasterAWARE:** Offers global alerts for earthquakes, tsunamis, tropical cyclones, floods, and volcanic eruptions.
- **Global Disaster Alert and Coordination System (GDACS):** Provides automatic alerts for global disasters, including impact estimations.
- **Automatic Disaster Analysis and Mapping (ADAM):** Issues alerts for multiple hazards globally, including earthquakes, tsunamis, and floods.

3. Tsunami Early Warning Systems:

- **Northwest Pacific Tsunami Advisory Center (NWPTAC):** Provides tsunami alerts for the Northwest Pacific.
- **South China Sea Tsunami Advisory Center (SCSTAC):** Offers tsunami alerts for countries in the South China Sea region.
- **Global Tsunami Warning System:** Provides global tsunami alerts.

4. Food Security Early Warning Systems:

- **ASEAN Food Security Information System (AFSIS):** Offers alerts related to staple food production and regional food security in East Asia.
- **Anomaly Hotspots of Agricultural Production (ASAP):** Provides alerts for hotspots of agricultural production anomalies globally.

- **WFP Vulnerability Analysis and Mapping (VAM):** Offers alerts and insights on global food security situations and trends.
- **Famine Early Warning Systems Network (FEWS NET):** Provides alerts for acute food insecurity globally.
- **Integrated Food Security Phase Classification (IPC):** Issues alerts for the severity and magnitude of food insecurity and malnutrition globally.

Summary Table

Category	Name of Source	Coverage	Alert for
1. Weather Forecasting	Joint Typhoon Warning Center (JTWC)	Asia-Pacific	tropical cyclones, tsunami
	Fiji Meteorological Service	Southwest Pacific	tropical cyclones
2. Multi-Hazard Early Warning	Australian Bureau of Meteorology (BoM)	Australia, Asia-Pacific	tropical cyclones, severe storms, floods, heatwaves, and fires
	Japan Meteorological Agency (JMA)	Japan, East Asia	severe weather events such as typhoons, heavy rainfall, and snowstorms as well as earthquakes and tsunamis
	Indonesia Badan Meteorologi, Klimatologi, dan Geofisika (BMKG)	Indonesia	weather-related hazards, including tropical cyclones, tsunamis, earthquakes, as well as volcanic eruptions
	ASEAN Disaster Monitoring and Response System (DMRS)	Southeast Asia	multiple hazards, including earthquakes, tsunamis, tropical cyclones, and floods
	Hazard Hunter Philippines	Philippines	earthquakes and tsunamis, active volcanoes, floods, storms, severe winds as well as Health and Safety, Chemical and Occupational hazards.
	India National Disaster Management Authority (NDMA)	India	Natural and man-made disasters, including cyclones, floods, earthquakes, tsunamis, and wildfires
	DisasterAWARE	Global	earthquakes, tsunamis, tropical cyclones, floods, and volcanic eruptions
	Global Disaster Alert and Coordination System (GDACS)	Global	Automatic disaster alerts, impact estimations
	Automatic Disaster Analysis and Mapping (ADAM)	Global	multiple hazards including earthquakes, Tsunami and floods
3. Tsunami Early Warning	Northwest Pacific Tsunami Advisory Center (NWPTAC)	Northwest Pacific	Tsunami
	South China Sea Tsunami Advisory Center (SCSTAC)	South China Sea	Tsunami
	Tsunami Warning System	Global	Tsunami
4. Food Security Early Warning	4.1. AFSIS (ASEAN Food Security Information System)	East Asia	on staple food production and regional food security
	4.2. Anomaly Hotspots of Agricultural Production (ASAP)	Global	hotspots of agricultural production anomalies
	4.3. WFP VAM (World Food Program Vulnerability Analysis and Mapping)	Global	Insights and key trends on food security situations and their drivers
	4.4. FEWS NET (Famine Early Warning Systems Network)	Global	Early warning and analysis on acute food insecurity
	4.5. IPC (Integrated Food Security Phase Classification)	Global	severity and magnitude of food insecurity and malnutrition

1. WEATHER FORECASTING

Weather forecasting systems are crucial for predicting and preparing for various meteorological hazards. These systems use sophisticated models and data from multiple sources to provide accurate forecasts and warnings. There are a couple of weather forecasting systems in Asia and Pacific region including:

1.1. Joint Typhoon Warning Center (JTWC)

The Joint Typhoon Warning Center (JTWC) provides critical early warnings and forecasts for tropical cyclones across the Western Pacific and Indian Oceans. It delivers real-time updates, satellite imagery, and detailed forecast products, which are essential for maritime safety and disaster preparedness in affected regions. The JTWC operates by collecting data from various satellites and weather stations, analyzing this information to predict cyclone paths and intensities. This capability is crucial for countries in the Asia-Pacific region, which frequently experience typhoons and cyclones, thereby enhancing preparedness and response strategies.

1.2. 2.1. Fiji Meteorological Service

The Fiji Meteorological Service offers comprehensive weather forecasts, warnings, advisories, and marine weather information for Fiji and the broader Southwest Pacific Ocean. This service is particularly valuable for smaller Pacific Island nations, which may lack extensive meteorological resources. The Fiji Meteorological Service gathers data from weather stations, satellites, and ocean buoys to issue timely warnings about severe weather events, such as cyclones and heavy rainfall. Its accurate and timely information supports disaster risk reduction efforts, enabling these communities to better prepare for and respond to adverse weather conditions.

2. MULTI-HAZARD EARLY WARNING

These systems take a more comprehensive approach, integrating data from various sources to provide a broader picture of potential hazards.

2.1. [Australian Bureau of Meteorology](#)

The Australian Bureau of Meteorology (BoM) provides early warning services for various hazards, including tropical cyclones, severe storms, floods, heatwaves, and fires across Australia and the Asia-Pacific region. BoM operates by integrating data from weather radars, satellites, and ground-based observations. This comprehensive approach allows the Bureau to issue real-time warnings and forecasts, which are critical for disaster managers and emergency services. By offering accurate and timely information, BoM supports effective disaster response and enhances community resilience to diverse weather-related threats.

2.2. [ASEAN Disaster Monitoring and Response System \(DMRS\)](#)

The ASEAN Disaster Monitoring and Response System (DMRS) is a platform that enhances disaster management capabilities across Southeast Asia. The DMRS integrates data from national and international sources into a single, comprehensive system and provides real-time monitoring and alerting for multiple hazards, including earthquakes, tsunamis, tropical cyclones, and floods. The system can issue alerts about potential disasters, report on ongoing incidents, and provide updates on disaster parameters. The DMRS plays a crucial role in improving the region's disaster preparedness and response.

2.3. [Japan Meteorological Agency \(JMA\)](#)

The Japan Meteorological Agency (JMA) monitors the earth's environment and forecasts natural phenomena related to the atmosphere, the oceans and the earth in Japan and the broader East Asian region. As Japan is prone to a variety of natural hazards, their particular emphasis is placed on the prevention and mitigation of natural disasters, heavy rains and earthquakes. The agency issues warnings and advisories for severe weather events such as typhoons, heavy rainfall, and snowstorms as well as earthquakes and tsunamis to contribute to prevention and mitigation of natural disasters and improvement of public welfare in Japan.

2.4. [India: National Disaster Management Authority \(NDMA\)](#)

India's National Disaster Management Authority (NDMA) issues a wide range of alerts for natural and man-made disasters, including cyclones, floods, earthquakes, tsunamis, and wildfires. Operating as the central body for disaster management, NDMA leverages a technology-driven, multi-hazard approach that integrates data from various agencies to provide timely and accurate warnings. By collaborating with government bodies, NGOs, and local communities, NDMA ensures a coordinated response that emphasizes prevention, mitigation, and preparedness.

2.5. [Indonesia: Badan Meteorologi, Klimatologi, dan Geofisika \(BMKG\)](#)

The Meteorological, Climatological, and Geophysical Agency (BMKG) of Indonesia plays a crucial role in regional disaster preparedness by issuing early warnings for weather-related hazards, including tropical cyclones, tsunamis, earthquakes, and volcanic eruptions. Utilizing advanced technology and a network of observation systems, BMKG provides accurate and timely information that is critical for both national and regional disaster management efforts. Through collaboration with neighboring countries and

international organizations, BMKG contributes to enhancing early warning systems and disaster resilience across Southeast Asia, ensuring that communities are better prepared to respond to natural hazards.

2.6. Hazard Hunter Philippines

HazardHunterPH is a tool that provides indicative hazard assessment to raise awareness of natural hazards for the Philippines. They provide alerts on various types of hazards including earthquakes and tsunamis, active volcanoes, floods, storms, severe winds as well as Health and Safety, Chemical and Occupational hazards. The hazard assessment is based on the latest data from government agencies via the GeoRiskPH Integrated System and aim to increase people's awareness to natural hazards and advocates the implementation of plans to prepare for and mitigate the effects of hazards.

2.7. DisasterAWARE

DisasterAWARE is a powerful early warning and multi-hazard monitoring platform, used by thousands of the most demanding government customers and humanitarian assistance organizations around the globe. The agency, while not exclusive to the Asia-Pacific region, plays a crucial role in providing timely alerts and impact assessments for natural hazards such as earthquakes, tsunamis, tropical cyclones, floods, and volcanic eruptions in the Asia and the Pacific region. The platform's key strength is its ability to combine hazard information with demographic and infrastructure data, enabling rapid assessment of potential impacts on populations and critical facilities. By providing a common operating picture and decision support tools, it enhances situational awareness and facilitates proactive planning and resource allocation in the critical hours before a disaster strikes.

2.8. Global Disaster Alert and Coordination System (GDACS)

GDACS is a cooperation framework between the United Nations and the European Commission, designed to improve alerts, information exchange, and coordination in the first phase after major disasters. Its early warning function covers a wide range of natural hazards including earthquakes, tsunamis, tropical cyclones, floods, fire and volcanoes. GDACS provides automatic disaster alerts and impact estimations following events, using models to assess potential humanitarian impact. The system integrates data from various sources and uses multi-hazard disaster risk models to generate alerts. A key feature of GDACS is its ability to estimate the humanitarian impact of disasters, considering factors such as population density, vulnerability, and local response capacity. This information is crucial for international organizations and national authorities in the Asia-Pacific region to quickly assess situations and mobilize appropriate resources for disaster response.

2.9. Automatic Disaster Analysis and Mapping (ADAM)

ADAM, developed by the World Food Program (WFP), is a global automated system that collects and analyzes data about natural hazards, providing near real-time information about their potential humanitarian impact. ADAM automatically collects data from various sources, including global hazard monitoring systems, weather forecasts, and satellite imagery. It then processes this data to produce standardized maps and reports detailing the extent and severity of disasters, as well as their potential impact on vulnerable populations. ADAM's automated approach ensures that critical information is available to decision-makers within hours of a disaster occurring, facilitating faster and more targeted response efforts.

3. TSUNAMI EARLY WARNING

3.1. [Japan Northwest Pacific Tsunami Advisory Center](#)

The Northwest Pacific Tsunami Advisory Center (NWPTAC), operated by the Japan Meteorological Agency (JMA), provides timely tsunami advisories and warnings for the Northwest Pacific region. NWPTAC monitors seismic activity and sea levels using a network of observation systems to issue alerts for potential tsunamis. Its efforts significantly enhance regional preparedness and response capabilities, helping mitigate the impact of tsunamis on affected communities in Japan and neighboring countries.

3.2. [South China Sea Tsunami Advisory Center](#)

The South China Sea Tsunami Advisory Center (SCSTAC), established under UNESCO's Intergovernmental Oceanographic Commission (IOC), offers tsunami advisories for nine countries in the South China Sea region. SCSTAC uses seismic stations and tide gauges to monitor real-time seismic activity and sea levels, providing timely warnings for potentially destructive tsunamis. By fostering regional cooperation and coordinating with national tsunami warning centers, SCSTAC contributes to enhanced safety and resilience in one of the world's most tsunami-prone areas.

3.3. [The U.S. Tsunami Warning System](#)

The U.S. Tsunami Warning System, operated by NOAA's National Weather Service, includes the National Tsunami Warning Center (NTWC) and the Pacific Tsunami Warning Center (PTWC). These centers monitor seismic activity and sea levels to issue tsunami warnings and conduct public outreach. By providing timely and accurate warnings, the system protects life and property from tsunamis across the continental United States, Alaska, Hawaii, and U.S. territories.

4. Food Security Early Warning

4.1. [AFSIS \(ASEAN Food Security Information System\)](#)

AFSIS provides Early Warning Information Reports on staple food production and regional food security for East Asian countries. These reports analyze various factors such as planted area, harvested area, production, yield, damaged areas, and crop conditions to forecast potential emergency situations in the region. By offering detailed insights into these agricultural metrics, AFSIS helps policymakers and stakeholders prepare for and mitigate food security risks, ensuring a more resilient food supply chain.

4.2. [Global Source: Anomaly Hotspots of Agricultural Production \(ASAP\)](#)

ASAP is an online decision support system for early warning about hotspots of agricultural production anomalies in crops and rangelands. It provides monthly agricultural hotspot classification analysis, seasonal rainfall forecasts, and updates of agro-meteo and biophysical indicators. This system enables timely identification of areas at risk of production shortfalls, allowing for proactive measures to be taken to address potential food security issues before they escalate.

4.3. [Global Source: WFP VAM \(World Food Program Vulnerability Analysis and Mapping\)](#)

WFP VAM offers insights and key trends, providing a near real-time overview of food security situations and their drivers. The platform covers various indicators of acute food insecurity, including food consumption and food-based coping strategies. By offering comprehensive data and analysis, WFP VAM helps stakeholders understand the underlying causes of food insecurity and develop targeted interventions to improve food access and availability.

4.4. [FEWS NET \(Famine Early Warning Systems Network\)](#)

FEWS NET provides early warning and analysis on acute food insecurity. It releases monthly reports and outlooks that detail current and projected food security conditions, along with possible scenarios and their implications. By offering forward-looking insights, FEWS NET helps governments, NGOs, and other stakeholders prepare for and respond to food crises, ultimately aiming to reduce the incidence and severity of famine.

4.5. [IPC \(Integrated Food Security Phase Classification\)](#)

The IPC is a multi-partner initiative that provides a common scale for classifying the severity and magnitude of food insecurity and malnutrition. It uses a five-phase scale ranging from Minimal (IPC Phase 1) to Famine (IPC Phase 5). The IPC produces regular analyses for participating countries, offering a standardized approach to understanding and communicating food security situations and trends. This consistency in classification helps ensure that responses to food insecurity are appropriately scaled and targeted.