



ASMC ANNUAL REPORT
2021



**Advancing Weather
and Climate Services
for ASEAN**

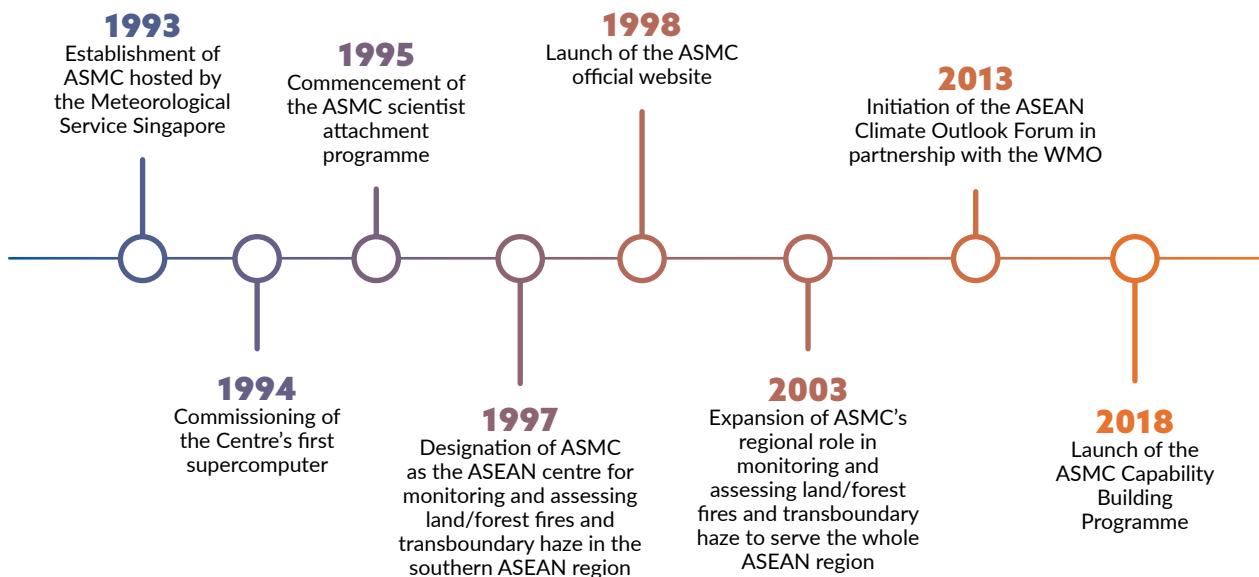
THE ASEAN SPECIALISED METEOROLOGICAL CENTRE (ASMC) AT A GLANCE

The ASMC was officially established in 1993 and hosted by the Meteorological Service Singapore (MSS). The proposal for its establishment was made by the ASEAN Committee on Science and Technology and endorsed by the ASEAN Standing Committee.

Our Purpose

- Undertake research and development to improve scientific understanding and prediction of tropical weather and climate systems.
- Serve as the ASEAN regional centre for monitoring land/forest fires and haze, including provision of early warnings for transboundary haze.
- Conduct regional capability development programmes to help ASEAN National Meteorological Services leverage advances in science and technology to support important economic sectors.

Our Milestones



2021 SNAPSHOT

What we achieved



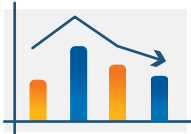
7

ASEAN haze meetings that we attended to present the regional weather and haze outlook



6

Haze warnings/alerts issued to ASEAN Member States



1,095

Hotspot graphs and charts



580

Regional Weather/Haze assessments and Haze Situation Maps

38

Subseasonal weather review and outlook

12

Seasonal Outlooks

2

Biannual ASMC Bulletins

6

Capability-building workshops and fora for ASEAN stakeholders

Reach of our services



279,274

Visitors to our website

150

New LinkedIn followers

19

Regional and international collaborators

60

Responses to media and public enquiries

RESEARCH HIGHLIGHTS

To advance weather and climate services in the region, the ASMC undertakes Research and Development (R&D) activities that cover a range of timescales targeting various applications tailored for the region.



Climate Change Scenarios

- Collaboration with the Centre for Climate Research Singapore to generate future climate change projections for the ASEAN region.
- Based on a high-resolution 8-km regional climate model, driven by the latest scenarios that inform the IPCC Assessment Report 6.
- The climate projections data and assessment are planned for release in the fourth quarter of 2023 to regional stakeholders for them to conduct climate impact assessments.



Seasonal Climate Predictions

- Developed the El Niño Southern Oscillation (ENSO) monitoring system for the ASEAN region in 2019.
- Ongoing research to enhance monitoring of other key drivers that influence seasonal rainfall and temperature in the region, such as the Indian Ocean Dipole and monsoon systems.
- Research outcomes will expand the region's toolbox for early warning of impending climate extremes.



Weather and Air Quality Forecasts

- Studying the application of advanced, machine-learning-based postprocessing techniques to tailor weather products for the region.
- Enhancing our multi-pollutant dispersion modelling system for haze to incorporate air chemistry that would enable better air quality impact assessment.



REGIONAL CAPABILITY-BUILDING

The ASMC Capability-Building Programme (ACaP) is a structured training programme tailored for ASEAN National Meteorological and Hydrological Services (NMHSs) and end-users to enhance regional capabilities. Since 2018, ASMC has conducted 23 workshops and fora, welcoming more than 600 participants from the ASEAN region. ACaP activities have brought together stakeholders from the meteorological, environment and disaster management sectors in ASEAN for training and exchanges on issues of relevance and importance to the region. The four key areas of the ACaP are:



Haze Monitoring

Hotspot and Haze Assessment (H2A)

Annual series of H2A workshops targeting Environment Officials of ASEAN Member States working in the area of fires and haze monitoring.



- H2A webinar for Mekong sub-region: 12–13 Jan 2021
- H2A webinar for southern ASEAN region: 1–2 Jul 2021



Weather Forecasting and Numerical Weather Prediction

Weather Prediction by Numerical Methods (WPNM)

Annual series of four training workshops, each focusing on a different aspect of Numerical Weather Prediction modelling, namely a) Governing equations and numerical methods b) Physical parameterisation c) Data assimilation and d) Predictability



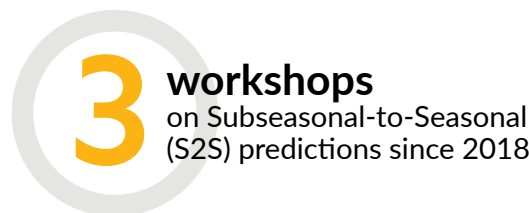
- Weather Prediction by Numerical Methods Module 2 (WPNM-M2): 3–5 May 2021



Seasonal Predictions and Climate Outlook

Capability-Building Programme in Subseasonal-to-Seasonal Prediction for Southeast Asia (S2S-SEA)

Initiated in 2017 by ASMC in collaboration with the World Meteorological Organization (WMO) S2S Prediction Project. The Programme aims to promote research and uptake of weather and climate outlooks in the subseasonal (2 weeks) to seasonal (3 months) timescale by the NMHSs in the region, with a focus on high impact weather events.



ASEAN Climate Outlook Forum (ASEANCOF)

ASEANCOF is a biannual forum for ASEAN NMHSs, international climate experts and climate information users to discuss the upcoming seasonal outlook.



Climate Change Projections

ASEAN Regional Climate Data, Analysis and Projections (ARCDAP)

ARCDAP is a series of training workshops that engages ASEAN NMHSs, international climate experts and climate information users to enhance synergies in generating regional and national climate change projections.



- Third workshop on ARCDAP-3: 15–18 Mar 2021

COLLABORATIONS

Partnership with AHA Centre on disaster management

In February 2020, ASMC, AHA Centre, UNESCAP and RIMES¹ embarked on a pilot initiative - the WMO Subseasonal-to-Seasonal (S2S) Predictions Project. It aims to promote the use of S2S predictions for weather-related disaster risk reduction. ASMC provides temperature/rainfall extremes predictions 2-3 weeks in advance to include in AHA Centre's Weekly Disaster Update Report for national disaster management organisations, which support disaster monitoring and management in Southeast Asia.

ASMC-AHA Centre Biweekly Outlook Guidance

Subseasonal Forecasts

S2S-SEA Pilot Project Outlook Guidance

Issued by: ASMC
 Issued To: AHA Centre
 Date Issued: 01 June 2020
 Forecast Valid: 01 June 2020 – 21 June 2020
 Next update by: 15 June 2020
 Forecast Region: Southeast Asia [10°S – 20°N; 90°E – 140°E]

Regional Assessment: Current situation and active drivers
 Inputs from ASEAN Specialised Meteorological Centre, ASMC

Wetter conditions are expected over most parts of the Maritime Continent in the first fortnight of June 2020. However, the wetter conditions may ease in the western Maritime Continent in Week 2. Over Mainland Southeast Asia, particularly over parts of Myanmar and Lao PDR, drier conditions are expected in the first week of June. Drier conditions are also expected over northern and central parts of the Philippines over the first two weeks in June. The drier conditions are associated with weaker-than-normal Southwest Monsoon winds during the fortnight.

Extreme Rainfall Forecast

Regional Assessment of Extremes:
 Inputs from ASEAN Specialised Meteorological Centre, ASMC

Is there an increased chance of very heavy rainfall events? Where?

For the week of 01 Jun – 07 Jun (day forecasts):
 Low chance Small increase in chance Moderate increase in chance Very likely
 Location: eastern Borneo and Sulawesi (Figure 1)

For the week of 08 Jun – 14 Jun (day forecasts):
 Low chance Small increase in chance Moderate increase in chance Very likely
 Location: NA

For the week of 15 Jun – 21 Jun (day forecasts):
 Low chance Small increase in chance Moderate increase in chance Very likely
 Location: A few scattered areas along the Equator and 10°N (Figure 2)

Remarks:
 For the week of 01–07 June 2020, there is a moderate increase in chance for extreme rainfall to develop in parts of eastern Borneo and Sulawesi (Figure 1), which is part of the larger region (Maritime Continent) experiencing above-normal rainfall conditions in the first week of June. Likelihood of extreme rainfall increases again for the week of 15–21 June, but these are only in a few scattered locations around the Equator and 10°N (Figure 2), and the model skill during for this week is also lower.

Extreme Temperature Forecast

Is there an increased chance of extreme hot conditions? Where?

For the week of 01 Jun – 07 Jun (day forecasts):
 Low chance Small increase in chance Moderate increase in chance Very likely
 Location: parts of Myanmar, and Java; northern parts of Thailand, Lao PDR, Vietnam, and Philippines (Figure 5).

For the week of 08 Jun – 14 Jun (day forecasts):
 Low chance Small increase in chance Moderate increase in chance Very likely
 Location: Lao PDR; northern parts Thailand, Philippines, and Vietnam; around eastern Java (Lesser Sunda Islands) (Figure 6).

For the week of 15 Jun – 21 Jun (day forecasts):
 Low chance Small increase in chance Moderate increase in chance Very likely
 Location: parts of Myanmar, Thailand and Lao PDR and around eastern Java (Lesser Sunda Islands) (Figure 7)

Remarks:
 Extremely hot conditions are predicted up to the weeks of 08–14 June, mainly over northern Southeast Asia and around eastern Java and Lesser Sunda Island. The warmer conditions in the northern parts of Southeast Asia is associated with the predicted drier conditions. Model skill tend to be good for temperature extremes even up to three weeks' lead time.

Hosting of WMO Regional Vegetation Fire and Smoke Pollution Warning Advisory and Assessment System (RVFSP-WAS) R&D Centre

As a region recurrently affected by vegetation fires and smoke pollution, the first WMO Regional Vegetation Fire and Smoke Pollution Warning Advisory and Assessment Centre was proposed to be established in Southeast Asia. ASMC is hosting the RVFSP-WAS R&D Centre for Southeast Asia, in support of WMO's new initiative to enhance the ability of regions to deliver timely and quality vegetation fire and smoke pollution forecasts, observations and information to users. The RVFSP-WAS is intended to serve as a prototype for other future regional centres to be established around the world.

ASMC
Southeast Asia
Regional Centre
RVFSP - WAS

ABOUT ~ FORECASTS ~ OBSERVATIONS ~ FIRE RISK ~ NEWS AND EVENTS ~ FAQ ~

Southeast Asia Regional Centre

WMO Vegetation Fire and Smoke Pollution
 Warning Advisory and Assessment System
 (VFSP - WAS)

FORECASTS

Multi-model ensemble forecasts of smoke aerosol optical depth and surface particulate matter concentrations.

[View More](#)

OBSERVATIONS

Products on the regional fire images, weather and air quality.

[View More](#)

WMO VFSP-WAS Southeast Asia Regional Centre
 Ensemble MEDIAN PM_{2.5} Surface Concentration (µg/m³)
 Run: 04 Sep 2019 12Z Valid: 04 Sep 2019 12Z (T+00)

WMO VFSP-WAS Southeast Asia Regional Centre
 Ensemble MEAN PM_{2.5} Surface Concentration (µg/m³)
 Run: 04 Sep 2019 12Z Valid: 04 Sep 2019 12Z (T+00)

¹AHA Centre: ASEAN Coordinating Centre for Humanitarian Assistance on disaster management, UNESCAP: The UN Economic and Social Commission for Asia and the Pacific, RIMES: Regional Integrated Multi-hazard Early Warning System

2021 STATE OF CLIMATE & HAZE IN SOUTHEAST ASIA

ASMC monitors and provides outlook for key climate drivers that affect Southeast Asia, such as the El Niño Southern Oscillation (ENSO). ENSO is an important climate driver for year-to-year variability in Southeast Asia’s rainfall and temperature. ASMC also monitors land/forest fires and haze activities, including provision of early warnings for transboundary haze for both the Mekong sub-region and the Southern ASEAN Region.

The influence of La Niña on the 2021 regional climate

In 2021, there were two periods of La Niña conditions. The first started in the second half of 2020 and extended into 2021. After a period of neutral conditions, a second La Niña event developed in the third quarter of 2021.

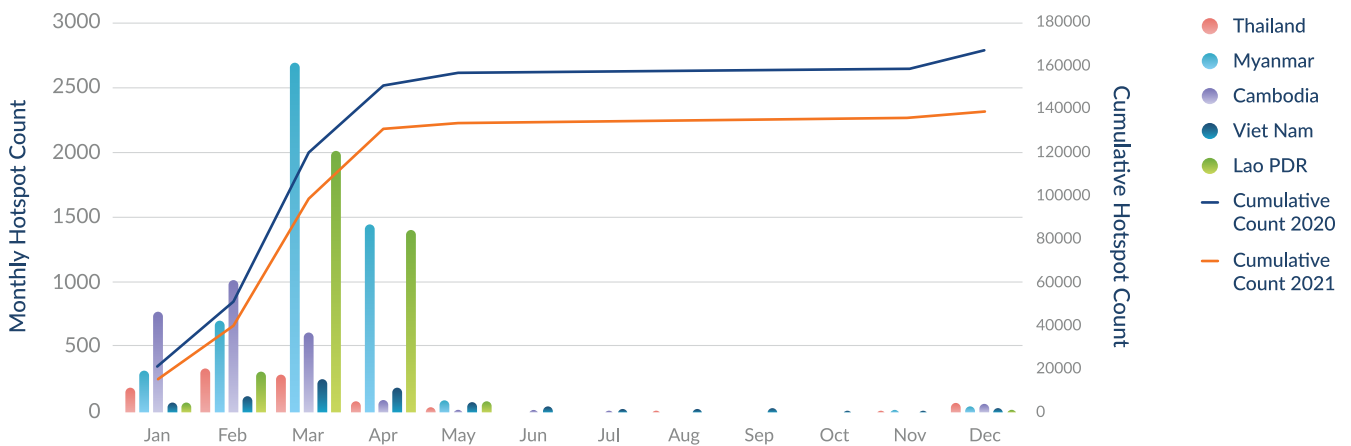
La Niña conditions typically bring wetter conditions to Southeast Asia, and this has contributed, to some extent, lower hotspot counts in 2021 relative to the years before. For example in the second half of 2019, the southern ASEAN region experienced significant transboundary haze episodes.

Lower hotspot counts in 2021 compared to recent years

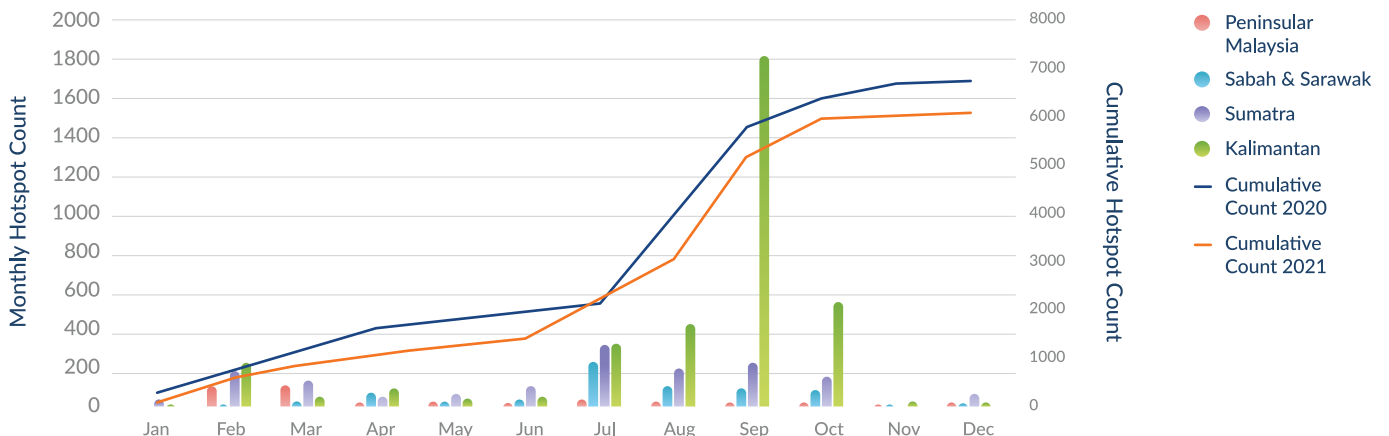
In 2021, the Mekong sub-region’s dry season stretched from Dec 2020 to May 2021. Alert Level 2 was issued from 14 Jan 2021 to 30 Apr 2021 and transboundary smoke haze was observed on several days. Overall, hotspot count was around 15% lower than that in 2020.

For the southern ASEAN region, the traditional dry season stretched from Jul to Oct 2021. There was no occurrence of significant transboundary smoke haze, and the hotspot count was around 10% lower than in 2020.

HOTSPOT COUNT FOR MEKONG SUB-REGION IN 2021



HOTSPOT COUNT FOR SOUTHERN ASEAN REGION IN 2021



ASMC's ENSO Monitoring States and Haze Alert Levels for Early Warning

ENSO States

There are three phases of ENSO: El Niño, Neutral and La Niña. La Niña (El Niño) events typically bring wetter (drier) conditions to Southeast Asia, although there can be year-to-year variability. The formation of a La Niña (El Niño) event can help us predict whether the upcoming months will be wetter (drier) than normal. When the monitoring system is in Watch state, this means there are signs of a La Niña or El Niño conditions developing and possibly leading to a full event.

For further details, please visit:



<http://asmc.asean.org/asmc-el-nino>

Haze Alert Levels

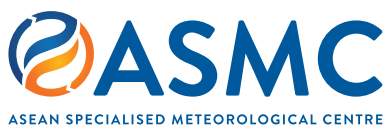
Early warning for occurrence of transboundary haze is issued in the form of an advisory according to a three-tier system that takes into consideration meteorological forecasts (rainfall and wind), smoke haze density, hotspot counts and location.

Level 0:	No transboundary smoke haze/stand down
Level 1:	Dry season
Level 2:	Increasing risk of transboundary haze in the region
Level 3:	High risk of severe transboundary haze in the region

For further details, please visit:



<http://asmc.asean.org/asmc-alerts>



For the latest ASMC's initiatives,
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