



ANNUAL REPORT 2022/2023 Celebrating 30 Years of Weather and Climate Services for ASEAN

Key Milestones in ASMC's 30-year Journey

1993: Establishment of ASMC

ASMC was established to enhance regional capabilities among the ASEAN Member States' National Meteorological and Hydrological Services (NMHSs) in weather and climate science.



1993 to 2018 - First ASMC logo.

1994: Commissioning of first Supercomputer

The first supercomputer was commissioned to perform Numerical Weather Predictions (NWP).

1997: Designation of ASMC as regional centre for fires and transboundary haze

ASMC was designated as a regional centre for forest fire and transboundary haze monitoring, assessment and early warning for the southern ASEAN region.



Inauguration of ASMC by Mr Mah Bow Tan, then Singapore's Minister for Communications and Minister for the Environment.

1998: Launch of ASMC website

ASMC launched a website to provide weather, haze and satellite products for monitoring and early warning for ASEAN meteorological services and environmental agencies.



First ASMC Website.

2003: Expansion of ASMC's regional fires and haze monitoring role

ASMC's purview expanded to include forest fire and transboundary haze monitoring, assessment and early warnings for the ASEAN region.

2003: Developed dispersion modelling capabilities

Dispersion modelling capabilities were developed to support the prediction and early warning of transboundary haze occurrences.



2011: Regional training for fires and haze

Regional training in satellite analysis for hotspot and haze monitoring commenced, and the training conducted for regional officers in the environment sector.



2013: Inaugural session of ASEANCOF

Inaugural session of the ASEAN Climate Outlook Forum (ASEANCOF), supported by the WMO, in collaboration with ASEAN NMHSs and regional/international climate centres.



2015: Revamp of the ASMC Website

The website was revamped to include new information, features and a more user-friendly interface.



2018: Launch of ASMC Bulletin

The publication of ASMC bulletins commenced in 2018. The bulletins include climate reviews, reviews of key meteorological events affecting the ASEAN region and subseasonal outlooks focused on the regional forest fire and haze situation.



2018: Launch of new ASMC logo

The ASMC logo was refreshed to mark the $25^{\rm th}$ Anniversary of ASMC in 2018.



2018 to Present - New ASMC logo launched to mark its 25th Anniversary

2021: Launch of ASMC LinkedIn and media releases

ASMC set up its LinkedIn page to improve its outreach and foster new connections between ASMC and the region.

2022: Launch of new supercomputer

Following the first supercomputer facility established in 1994, a new supercomputer was commissioned to run NWP models at higher resolutions to predict convective-scale weather systems.



2023: Commencement of ASMC Attachment Programme

An attachment programme for ASEAN officials was among ASMC's new initiatives to mark its $30^{\rm th}$ anniversary.





2022 State of Climate and 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) and Indian Ocean Dipole (IOD). These climate drivers affect the year-to-year variability of rainfall and temperature in Southeast Asia while the IOD can influence the region too. ASMC also monitors land/forest fires and haze, and provides early warnings for both the Mekong and Southern ASEAN sub-regions.

The influence of La Niña and negative IOD on the 2022 regional climate

The La Niña event that developed in 2021 persisted throughout 2022, resulting in three consecutive years of La Nina conditions. A negative IOD was also present for much of the second half of the year.

Both La Niña and negative IOD events typically bring wetter conditions to Southeast Asia, depending on the time of the year. The persistent La Niña conditions and the negative IOD may have contributed to the lower hotspot count in 2022.



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. Tracking the development of such events helps us forecast whether the upcoming months will be wetter or drier than normal. When the monitoring system is in Watch state, this means there are signs of a La Niña or El Niño condition 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-alert

Lower hotspot counts in 2022

The Mekong sub-region's dry season stretched from December 2021 to May 2022. Alert Level 3 for the Mekong sub-region was issued on 11 Apr 2022 due to widespread transboundary haze and escalating hotspot activity. The overall hotspot count for the sub-region was around 22% lower in 2022 compared to 2021.

For the southern ASEAN region, the 2022 traditional dry season extended from July to October 2022 and was relatively wet, due to above normal rainfall under La Niña conditions and the negative phase of the IOD. Although there was a spike in hotspot count in Kalimantan in August 2022, overall hotspot count for the region was around 23% lower in 2022 (when compared to 2021).





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ASMC Regional Capability Building Programme (ACaP)

Extension of ACaP to 2027

The ASMC Capability Building Programme (ACaP) was launched in 2018 to support the capability development needs of ASEAN Member States over a five-year period, through a series of training workshops, customised courses, and discussion forums. Between 2018 and 2022, a total of 25 workshops had been conducted for more than 700 participants in the ASEAN region. The ACaP will be extended for another 5 years till 2027.

The four main focus areas of ACaP are:

- -Weather Forecasting
- -Subseasonal-to-Seasonal (S2S) Predictions
- -Climate Change Monitoring
- -Haze Monitoring



ASMC Regional Capability Building Programme 2023-2027

Regional Capability Building

19th Session of the ASEAN Climate Outlook Forum (ASEANCOF-19)

The 19th session of ASEANCOF was held online over four days from 21 to 25 November 2022, culminating in a final webinar on 25 November. The virtual format enabled a larger audience to attend, with a total of 80 participants from the ASEAN Member States NMHS, experts and representatives from agriculture-related climate services attending the meeting over the various days.

The first three days covered the development of the consensus outlook, including sharing from NMHSs and experts, updates from the Southeast



ASEANCOF-19 participants group photo.

Weather Prediction by Numerical Methods Module 3 (WPNM-M3)

WPNM-M3 was held in Singapore from 6 to 10 February 2023. The 5-day capability building and knowledge sharing training module was attended by 17 participants from nine ASEAN NMHS.

The objectives of the training module were to equip participants with knowledge on the mathematical conceptualisation and limitations of data assimilation methods, data assimilation applications in weather and climate science, and to allow participants to experiment with a realworld community atmospheric data assimilation system to enhance their theoretical understanding.

A series of 16 lectures were conducted during WPNM-M3, covering a wide range of topics including variational methods, ensemble methods, and reanalysis applications. Hands-on practical sessions were conducted using the Weather and Research Forecasting Data Assimilation (WRFDA) system. The sessions were adapted from the United States National Center for Atmospheric Research (NCAR) WRFDA tutorial, tailored for Southeast Asia. These were used to illustrate the concepts and practicalities in a real-world atmospheric data assimilation system and allow participants to familiarise with WRFDA.



WPNM-M3 participants with staff from ASMC.

Asia Regional Climate Centre Network, as well as an introduction to the Forecast Customization System (FOCUS) by the Regional Integrated Multi-Hazard Early Warning System (RIMES) for Africa and Asia.

The fourth and last day focused on climate services for the agriculture sector in Southeast Asia and was held as a webinar. PAGASA conducted the session using Managing Risk and Uncertainties (MARITIES) – an interactive game they developed to provide a better understanding of forecast uncertainties and simulate decisions based on uncertainties in seasonal forecast for the agriculture sector. This was followed by a series of presentations by representatives from the NMHSs and agricultural sector. Throughout the webinar, both the presenters and the audience highlighted key challenges and opportunities related to climate services for the agriculture sector in SEA.



Snapshot of the MARITIES game developed by PAGASA.

Overall, the training module was very well-received by the participants. Participants found the lectures interesting and easy to follow. Many of the participants implement WRF in their respective NMHS, so they found the WRFDA-based practical sessions very beneficial for their work. Almost all participants indicated strong interest to attend future training modules.



A snapshot of one of the WRFDA practical sessions.



Participants sharing their key takeaways from the training.

Hotspot and Haze Assessment (H2A) Workshop 2023

The H2A Workshop for ASEAN Member States was held over three days from 21 to 23 February 2023 at Furama City Centre in Singapore. This marked the first time since 2020 that this workshop was held in person, as the workshops were held virtually during the pandemic.

The workshop served to bring stakeholders from the environment and meteorological sectors together to learn and share on their home country experiences in preparation for the dry season. Topics covered during the workshop included remote sensing, fire and haze detection using satellites, sub-seasonal and seasonal prediction, meteorological instrumentation and dispersion modelling. Lecturers were from the ASMC as well as Met Malaysia who presented on the Fire Rating Danger System (FDRS) for Southeast Asia. Representatives from the ASEAN Environment Division were also present at the workshop.

The workshop included a mix of lectures, discussions and quizzes to introduce participants to key concepts required to utilise meteorological products for fires and haze monitoring, assessment and prediction. Participants also had the opportunity to visit the ASMC operations and



Dr Shipra Jain from ASMC engaging the participants through an activity on interpreting Subseasonal and Seasonal forecast products.

ASMC Attachment Programme

The first run of the ASMC Attachment Programme kicked off in March 2023. Two officers from the Mekong sub-region, Ms Khaing Yi Mon Lin from Myanmar and Mr Pankham Soundala from Lao PDR were attached to the ASMC Operations Centre for a 6-to-8-week period during the northern ASEAN dry season. Together with ASMC staff, they were involved in the preparation of the daily weather and haze assessment and outlook for the ASEAN region, and familiarised with the regional weather, satellite data and numerical weather prediction tools. During their attachment, they also conducted a data analysis study on the hotspots and haze conditions in their home country and performed real-time analysis of the evolving haze situation in the Mekong sub-region. Using ASMC hotspot and haze coverage geospatial data, they assessed the siting of air quality monitoring stations, and conducted a comparison of hotspot persistency with their national land coverage information.



Attachment programme participants taking part in the daily discussion on the regional weather and haze situation.

satellite centre, as well as a local air quality monitoring station. Participants shared that the lectures were very informative and beneficial, and appreciated the sharing sessions and visits conducted during the workshop.



ASMC Director of Operations, Mr Lesley Choo, giving a speech at the opening of the workshop.



Attendees and representatives from ASMC at the H2A Workshop 2023.

This programme is very useful for ASEAN Member States, including Lao PDR which are affected by fires and smoke haze during the dry season. The knowledge acquired from this programme allows us to better understand ASMC operations and satellite data analysis for the ASEAN region. Back home, we can perform satellite data analysis ourselves to effectively report the fire and haze situation in the country and share that information with the ASMC in the future.

- Mr Pankham Soundala, Technical Researcher Modelling Division, Natural Resources and Environment Research Institute (NRERI), Ministry of Natural Resources and Environment (MONRE), Lao PDR

During my time at ASMC, Ilearned about satellite interpretation, the regional haze situation assessment and weather forecasts. I conducted data analysis such as for fire hotspot persistency and intensity, as well as spatial distribution of yearly mean hotspots. All the knowledge and information will be very useful in my future career. When I return to my country, I can share and provide this knowledge to my colleagues and other departments. I can also give some suggestions to the decisionmakers regarding the fire hotspot and haze situation.

- Ms Khaing Yi Mon Lin, Assistant Director, Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation, Myanmar Collaborations

Partnership with AHA disaster Centre on management

The S2S Southeast Asia Pilot project ended in November 2022. Between 2020 and 2022, ASMC, AHACentre, UNESCAP and RIMES¹ worked together to promote the use of S2S predictions for weatherrelated disaster risk reduction. ASMC provided temperature/ rainfall extremes predictions 2-3 weeks in advance for inclusion in AHA Centre's Weekly Disaster Update Report for national disaster management organisations, which support disaster monitoring and management in Southeast Asia. The final project report will be released in 2023.



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

ASMC has been hosting the first WMO Regional Vegetation Fire and Smoke Pollution Warning Advisory and Assessment System (VFSP-WAS) R&D Centre since 2018. The prototype RVFSP-WAS website (www.mssint.sg/vfsp-was) currently provides multi-model ensemble smoke forecasts, forecast model evaluations, ground- and satellite-based observation data. Through this collaboration with WMO, ASMC seeks to enhance the delivery of timely and reliable transboundary haze forecasts and observation data to end users.



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



For the latest ASMC's initiatives, please visit the <u>http://asmc.asean.org/</u>Events or Publications pages or follow us on <u>www.linkedin.com/company/asean-specialised-meteorological-centre/</u>

