CLIMATE OUTLOOK AND REVIEW OF SOUTHEAST ASIA

A BIANNUAL BULLETIN OF ASMC

Highlights

- Weak La Niña conditions developed in late 2017 and is forecast to continue until April 2018.
- Above average rainfall and temperature conditions were observed over Southeast Asia during the October-December 2017 season.
- MJO was active in October and December 2017.
- Lowest annual hotspot count for 2017 since 2011.

CLIMATE REVIEW (JUL – DEC 2017)

From neutral conditions to late-developing, weak La Niña

Sea-surface temperatures (SSTs) over the east-central tropical Pacific were within neutral thresholds in July 2017. Atmospheric conditions also reflected neutral patterns. Thus, El Niño Southern Oscillation (ENSO) was in the neutral phase in July 2017. Correspondingly, model outlook and experts' consensus in July and August from the Climate Prediction Centre/International Research Institute (CPC/IRI) predicted neutral conditions to prevail in the tropical Pacific for the rest of 2017.

In September, the ENSO outlook (Figure 1) changed to La Niña conditions being more likely than neutral conditions in the later part of 2017 in response to the rapid cooling of sub-surface temperatures over the equatorial Pacific Ocean from August 2017. The Nino3.4 index crossed La Niña thresholds by October 2017 (Figure 2), which was late given that ENSO conditions typically develop from mid-year.

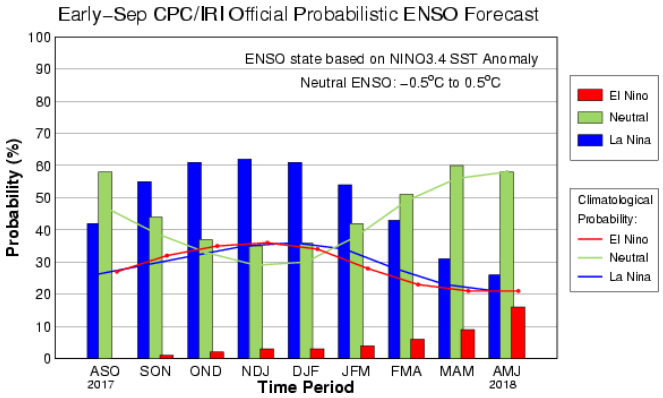

Figure 1: ENSO probabilistic forecast based on the Nino3.4 index which shows a higher likelihood of La Niña conditions occurring in the later part of 2017. Credit: CPC/IRI.

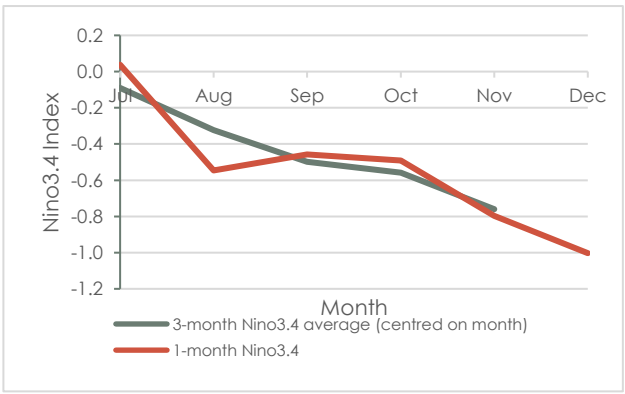

Figure 2: The Nino3.4 index for 3-month average, centred on the month (grey), and 1-month average (red) values which crossed the La Niña threshold by October 2017. Data: ERSST version 4.

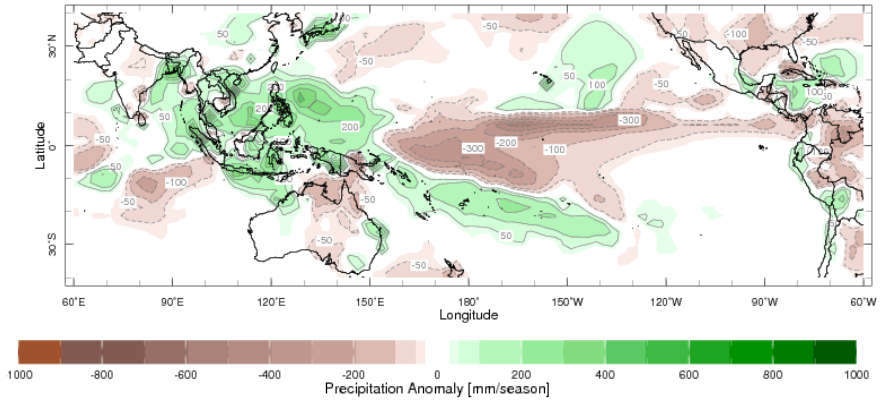

Figure 3: October-December 2017 seasonal average rainfall anomaly (mm/season) over the Pacific and the eastern Indian Ocean showing large-scale wet anomalies (green shades) over Southeast Asia. Credit: IRI Maproom.

As La Niña conditions developed, Southeast Asia experienced above average rainfall in many parts of the region during the October-December 2017 season (Figure 3). Despite the wetter conditions, surface temperatures over land were either near or above average in the region (Figure 4). The Indian Ocean Dipole (IOD) was slightly positive from mid-2017 and turned negative towards the end of 2017 but remained within neutral thresholds throughout without impacting rainfall.

The Madden-Julian Oscillation (MJO) was inactive from July to September 2017 but became active in October and December where it traversed strongly in phases 5-8 (Figure 5). These MJO phases typically bring large-scale suppressed rainfall over the region and westerly wind bursts over the western tropical Pacific and could have moderated the developing La Niña conditions then.

Apart from the weak La Niña conditions, the relatively wet weather over Southeast Asia was contributed by other factors. These included the presence of the monsoon rainband between 5 °N and 20 °N, the occurrence of several tropical storms that brought torrential rain and strong winds to the region, in particular Viet Nam and the Philippines, and from the monsoon surges that brought widespread moderate to heavy rains and strong winds to the South China Sea, Peninsular Malaysia and southern Thailand in the last two months of 2017.

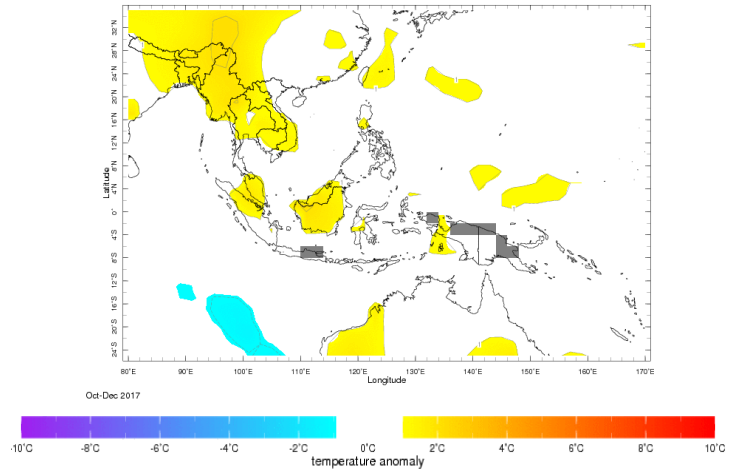

Figure 4: October-December 2017 seasonal average surface temperature anomaly (˚C) showing warmer conditions over mainland Southeast Asia and central parts of the Maritime Continent (Kalimantan, Peninsular Malaysia, and central-north Sumatra). Credit: IRI Maproom.

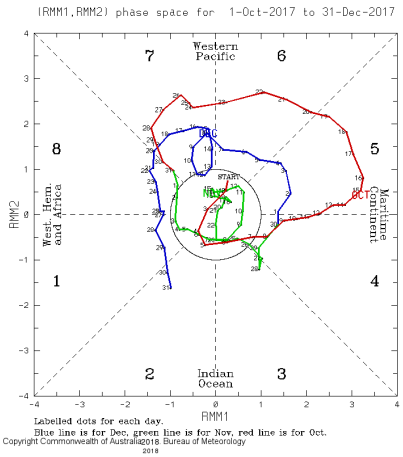

Figure 5: MJO phases in October (red) and December (blue) where it was mainly active in phases 5-8. Credit: BoM, Australia.

REGIONAL FIRE AND HAZE SITUATION (JUL – DEC 2017)

Wetter conditions contributed to low hotspot count

Wetter conditions over Southeast Asia between July and December 2017 was a contributing factor to the low incidence of land and forest fires and transboundary haze in the region. The southern Southeast Asia region (covering Brunei Darussalam, Indonesia, Malaysia, Singapore, and southern Thailand) was in the traditional dry season between July and October. However, the wetter than usual conditions helped to keep the hotspot count relatively low. Figure 6 shows the hotspot density map from July to December 2017.

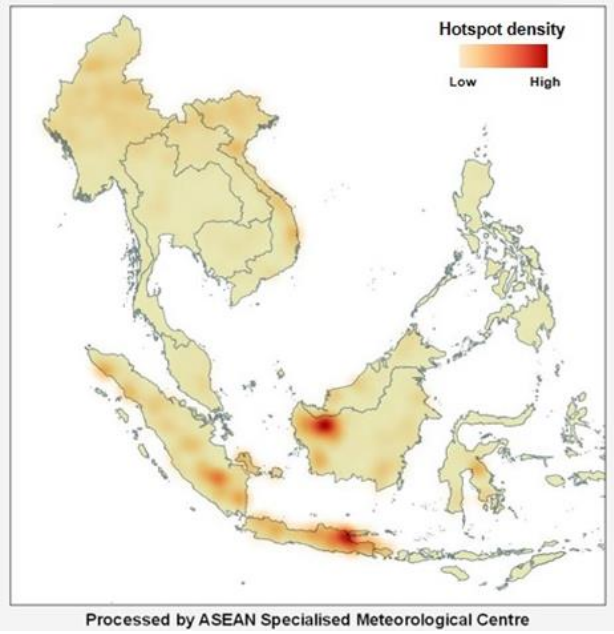

Figure 6: Hotspot density map based on NOAA-19 satellite from July to December 2017 showing low hotspot counts in the region except West Kalimantan. The hotspots in West Kalimantan gave rise to smoke plumes on several occasions.

There were a few occasions when short periods of drier weather led to increased hotspot activities in parts of Sumatra and Kalimantan. Between 23 and 26 July 2017, the eastward passage of a dry air mass from the Indian Ocean brought dry and warm weather conditions over Sumatra, Peninsular Malaysia, and Singapore. The dry weather conditions led to some land/forest fires in West Aceh, northern Sumatra. The incidence of haze and poor visibility (2-3 km) were largely localised as mitigation activities helped curb the occurrence of the transboundary smoke haze. Dry weather conditions in West Kalimantan on 22 and 23 September 2017 led to localised burning activities (Figure 7) but the resultant haze and smoke plumes observed were short-lived with the return of shower activities in the region.

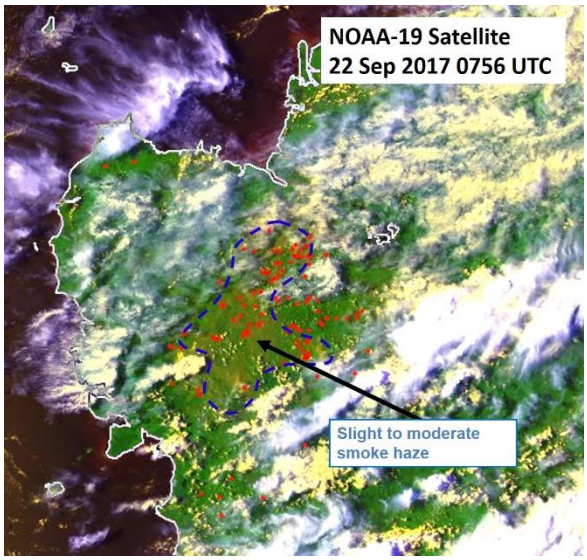

Figure 7: Scattered hotspots denoted by red dots and resultant smoke plumes demarcated by dotted blue line over West Kalimantan on 22 September 2017.

For the northern Southeast Asia region (Cambodia, Lao PDR, Myanmar, Philippines, Thailand, and Viet Nam), July to October was the traditional wet season and land/forest fire activities were generally subdued. The traditional dry season onset in November 2017 and there were no significant land/forest fires or haze in the last two months of 2017.

Overall, the land/forest fires for Southeast Asia in 2017 were far less active compared to historical records and the recorded annual hotspot count was the lowest since 2011 (Table 1).

Table 1: Annual hotspot counts for 2011-2017 based on NOAA-series satellites.

SE Asia	2011	2012	2013	2014	2015	2016	2017
North	79,273	126,885	115,921	101,082	79,721	46,893	28,130
South	27,605	35,113	20,995	32,880	22,153	5,338	2,374

CLIMATE & HAZE OUTLOOK (FEB – JUL 2018)

Weak La Niña continuing in early 2018

Cool SST anomaly patterns over the central and eastern equatorial Pacific are predicted for the February-April 2018 season (Figure 8). Correspondingly, model outlook and experts' consensus from the CPC/IRI predict weak La Niña conditions to continue until April 2018. Beyond April, ENSO is predicted to return to neutral conditions (Figure 9).

For rainfall, models from the WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble (WMO LC-LRFMME) predict above normal conditions to be more likely (wetter) for the February-April 2018 season over the north-east Maritime Continent (Figure 10). This corresponds to the predicted continuation of La Niña conditions. Below normal (drier) conditions, on the other hand, are predicted to be more likely for the southern parts of the region between the equator and 10 ˚S. For the May-July 2018 season, models predict similar rainfall patterns for the region but with lower probabilities for wetter and drier conditions to occur than the February-April season.

For the February-April 2018 season's surface temperature, the eastern and the north-western parts of Southeast Asia are more likely to experience above normal (warmer) conditions (Figure 11). Below normal (cooler) conditions are more likely to occur over the southern parts of the Greater Mekong Sub-region and the South China Sea. Elsewhere near-normal conditions are more likely to occur.

For the Indian Ocean Dipole (IOD), models predict neutral conditions for the first half of 2018.

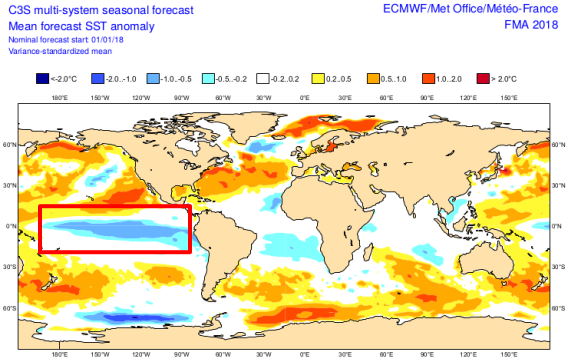

Figure 8: SST anomaly forecast for season February-April (FMA) 2018 from C3S model ensemble showing cool SST anomalies over tropical Pacific (red box). Credit: C3S Copernicus.

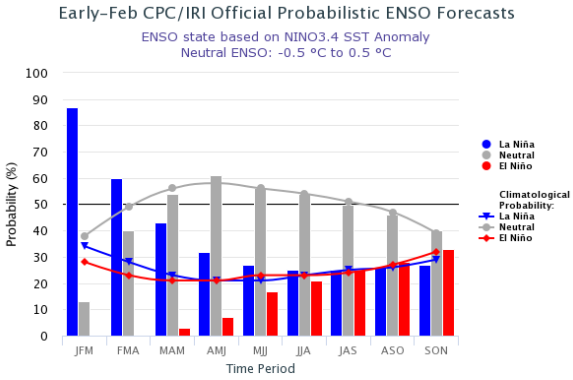

Figure 9: ENSO probabilistic forecast based on the Nino3.4 index which shows a higher likelihood of neutral conditions (grey) occurring from the March-May (MAM) 2018 season onwards. Credit: IRI/CPC.

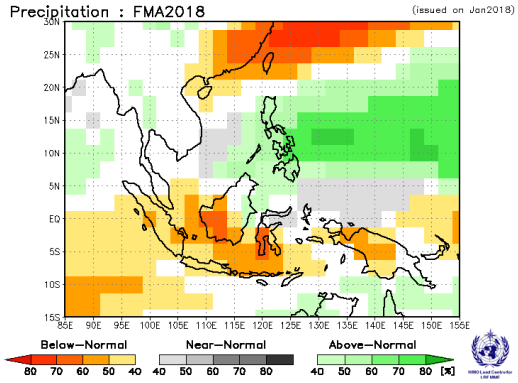

Figure 10: Multi-model ensemble rainfall probabilistic forecast from WMO Global Producing Centres for the February-April (FMA) 2018 season. Credit: WMO LC-LRFMME.

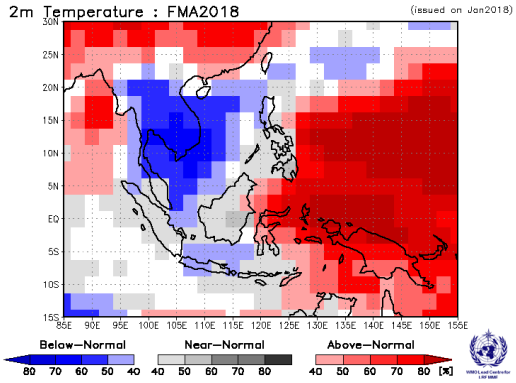

Figure 11: Multi-model ensemble temperature probabilistic forecast from WMO Global Producing Centres for the February-April (FMA) 2018 season. Credit: WMO LC-LRFMME.

During the traditional dry season over northern Southeast Asia, vegetation fire activities are likely to peak between February and April. This may lead to the occurrence of transboundary haze pollution. For the southern Southeast Asia region, on the other hand, the traditional rainy season is expected to prevail for most months in the first half of 2018. During this period, land/forest fire activities in southern Southeast Asia would likely be mostly suppressed. However, given the increased risk of drier conditions for the February-April season (Figure 10), occasional fire activities could still emerge, in particular between February and early March, during the dry phase of the Northeast Monsoon season. The fire activities are likely to be isolated and localised.

NORTHWEST PACIFIC TC SEASON SYNOPSIS (JUL – DEC 2017)

Guest article contributed by Ms. Analiza Solis

From the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

Over the Northwest Pacific, a total of 22 tropical cyclones (TCs) developed and/or entered the Philippine Area of Responsibility in 2017, which is slightly above the annual average count of 19-20 TCs. Twenty of these TCs occurred from July to December. Based on the Japan Meteorological Agency's (JMA) tropical cyclone information, only 16 tropical cyclones developed/affected Southeast Asia from July to December 2017 which is lower than Philippine's report. This difference is due to the Philippines using slightly different wind strength for categorising TCs. Based on tracks in Figure 12 (left), there were 8 TCs that made landfall over the Philippine landmass. Of these land-falling TCs, Tropical Storm (TS) Kaitak and Typhoon (TY) Tembin (Figure 12, right) were the most disastrous cyclones in terms of damages to properties and affected individuals. Both TCs occurred in succession in December 2017 and came closest to the equator with paths ending near 10 ˚N. Both TCs brought heavy rainfall that caused floods and landslides, resulting in damages to infrastructure and agriculture mostly in central and southern parts of the Philippines (most parts of Visayas and Mindanao), based on the National Disaster Risk Reduction and Management Council Reports. Several local government units affected by TS Kaitak and TY Tembin were placed under a state of calamity.

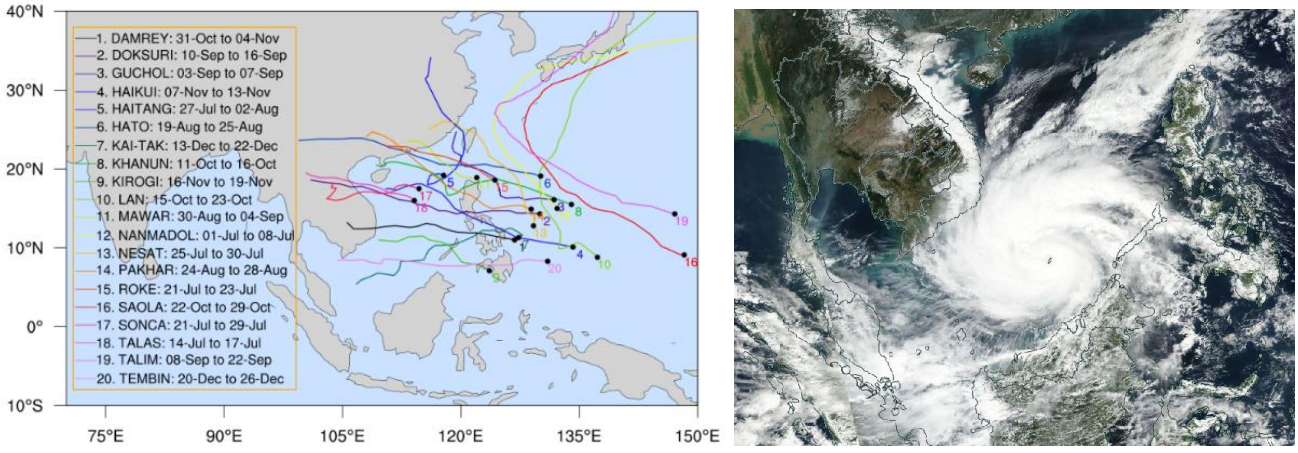

Figure 12: (Left) tropical cyclone tracks from Northwest Pacific (black dots denote starting points) affecting Southeast Asia for July – December 2017. (Right) satellite image of Typhoon Tembin on its way to Viet Nam on the eve of Christmas 2017. Credit: NASA Worldview).

ASMC EVENTS

ASEANCOF-9, Hanoi, 15-17 November 2017

In collaboration with the National Hydro-Meteorological Service (NHMS) of Viet Nam and WMO, ASMC organised The Ninth ASEAN Climate Outlook Forum (ASEANCOF-9) in Hanoi from 15-17 November 2017. The Environment and Climate Change Canada (ECCC), WMO and NHMS Viet Nam co-funded the event.

An observer at an agro-meteorological station showing how he measured soil temperature and moisture.

Apart from the regular forum proceedings to generate consensus rainfall and temperature outlooks for the December-January 2017-18 boreal winter monsoon season, a two-day workshop themed "Applications to the agricultural community – impacts, user requirements and forecast communications" was held to discuss how seasonal predictions can be useful to the agricultural sector.

Participants were also brought for a tour of the new forecasting facility of the NHMS Viet Nam and for an educational visit to an agro-meteorological observation station in the outskirts of Hanoi where they learnt some of the unique observation functions at the station.

Training Workshop on "The Use & Interpretation of Data on Land & Forest Fires & Transboundary Haze", Singapore, 31 January-2 February 2018

As part of the ASMC's regional capacity-building programme, a training workshop was held in Singapore (31 Jan – 2 Feb 2018) for the Mekong Sub-region on using and interpreting data on land and forest fires as well as transboundary haze.

Workshop activities included training on the meteorological aspects of fire and smoke haze monitoring, use and interpretation of satellite remote sensing and on the theory and practical of dispersion modelling tools. During these activities, both participants and trainers shared their expertise and work experiences generously to learn from one another.

Participants discussing the challenges of fire and smoke haze monitoring.

Upcoming Events

20–23 March 2018, Singapore: *Best Practice Workshop on Climate Change Projections & Their Applications in ASEAN Countries*. The workshop aims to compare the various climate change projection studies for the region and to define guidelines for best practices in the generation of climate change scenarios.

3rd quarter of 2018, Singapore: *Second Subseasonal-to-Seasonal Predictions Workshop for Southeast Asia (S2S-SEA II)*. Following last year's workshop in March, this event will be the second in the series of workshops aimed at building capability in subseasonal predictions (2-week to 2-month timescale) in Southeast Asia. The workshop aims to analyse S2S models for their ability to predict specific parameters of importance to the region (e.g. extended dry periods).

This bulletin is a biannual publication of ASMC. It is published annually in February and August, providing a review and outlook of weather and climate phenomena of importance to the region (e.g. ENSO, MJO, and monsoon) and their influence on the region's temperature and rainfall conditions. **For feedback and contributions to articles, please email: ASMC_Enquiries@nea.gov.sg.**