UPDATE OF REGIONAL WEATHER AND SMOKE HAZE
(December 2017)

1. Review of Regional Weather Conditions for November 2017

1.1 In November 2017, Southeast Asia experienced inter-monsoon conditions in the first half of the month where the low level winds were generally light and variable in direction. A gradual strengthening of winds to blow predominantly from the northeast in the second half of November 2017 signalled the start of the Northeast Monsoon season. In the latter half of the month, the monsoon rain band was observed to shift southwards to lie between latitudes 100S and 100N. Most of the rainfall in November 2017 was recorded over the southern ASEAN region. The rainfall distribution for November 2017 is shown in Figure 1.
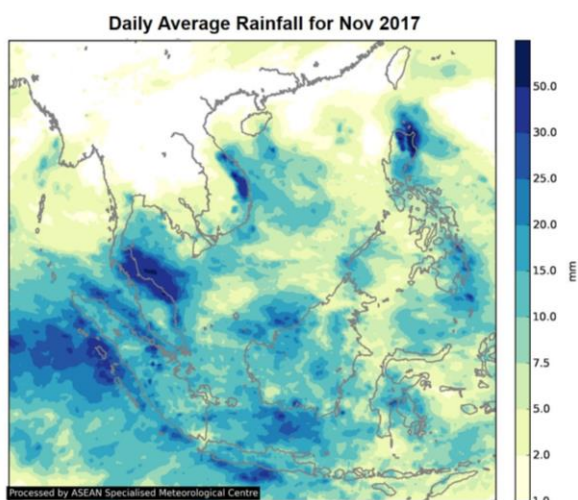

Figure 1: Daily average rainfall for the ASEAN region in November 2017. (Source: JAXA Global Satellite Mapping of Precipitation)
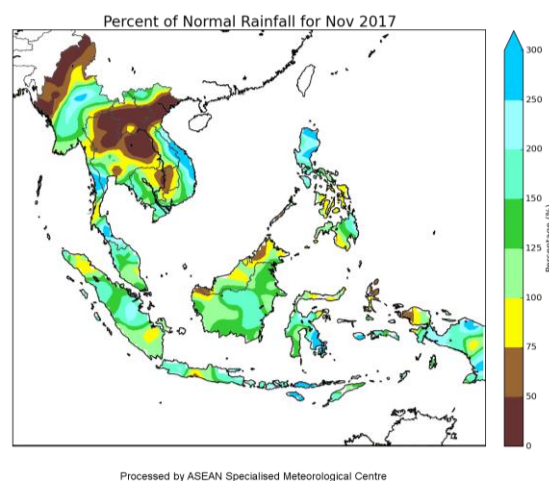

Figure 2: Percent of Normal Rainfall for November 2017. The rainfall data may be less representative for areas with a less dense rainfall network.

1.2 In the last week of November 2017, an intensification of a high pressure system in northern Asia led to a strengthening of northeast monsoon winds or a monsoon surge[1] over the South China Sea. The surge brought prolonged moderate to heavy rainfall over southern Thailand and the north-eastern parts of Peninsular Malaysia. Widespread flooding was reported in Songkhla, Thailand, as well as in parts of Kelantan and Terengganu, Peninsular Malaysia.

1.3 In November 2017, rainfall was above normal in central Vietnam, southern Thailand and in the northern parts of the Philippines, and below normal in northern Thailand, Lao PDR and northern Vietnam. For the southern ASEAN region, normal to above-normal rainfall was recorded over most parts of the region. Figure 2 shows the percent of normal rainfall for November 2017.

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[1] Monsoon surges refer to the strengthening of winds over the South China Sea due to the intensification of high pressure system over central Asia.
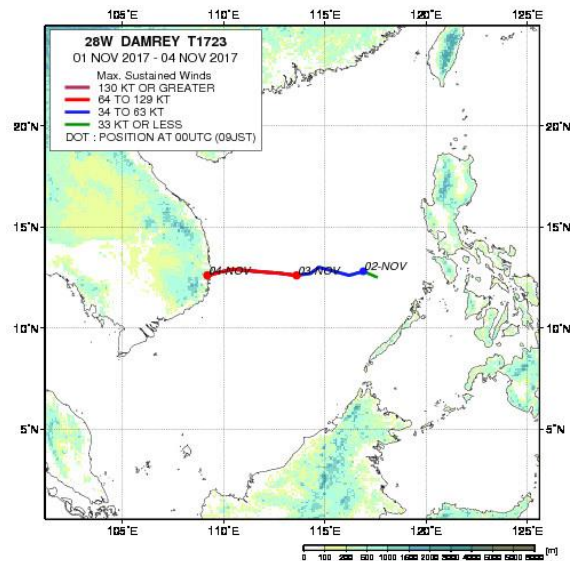
Figure 3: Historical storm track for Typhoon "Damrey". (Source: JAXA)

1.4   On 1 November 2017, a tropical depression developed to the west of Cebu, the Philippines. The system tracked westward over the South China Sea where it intensified into Typhoon "Damrey" on 3 November 2017. Typhoon "Damrey" brought rough seas and strong winds along its path and made landfall in central Vietnam on 4 November 2017. The typhoon brought heavy rains and strong winds, and caused widespread flooding over many provinces in central Vietnam before dissipating over land on 5 November 2017.

1.5   In November 2017, the prevailing winds over the northern ASEAN region blew mainly from the northeast or east while winds in the southern ASEAN region were generally light and blew from the west or northwest. Broad easterly wind anomalies were observed over the western Pacific Ocean while westerly or north-westerly wind anomalies extended from the Indian Ocean to the Java Sea. The presence of the monsoon trough, coupled with the convergence of winds and strong solar heating enhanced the convective activity over southern Southeast Asia. Figure 4 shows the average and anomalous winds at 5000 feet.
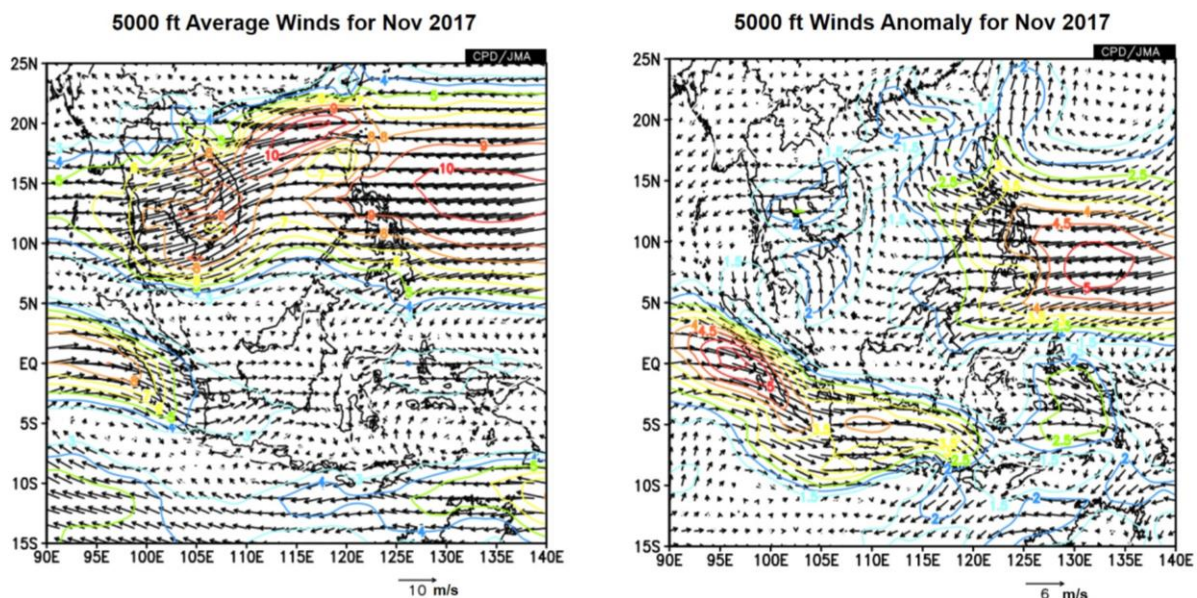

Figure 4: 5000 ft average winds (left) and anomaly (right) for November 2017. (Source: JMA)

1.6   During the month, the equatorial Pacific Ocean's sea-surface temperature (SST) over the Nino 3.4 region remained at borderline La Niña values, with the 3-month (Aug-Sep-Oct) Nino 3.4 index at -0.46. Atmospheric conditions, such as trade winds and cloudiness, over the equatorial Pacific were suggestive of weak La Niña conditions.

1.7   The Madden Julian Oscillation (MJO)[2] was weak and non-discernible throughout most parts of November 2017. However, signs of Phase-4 MJO were observed in late-November which coincided with a monsoon surge. The development of Phase-4 MJO could have enhanced the intensity of the monsoon surge that affected the region.
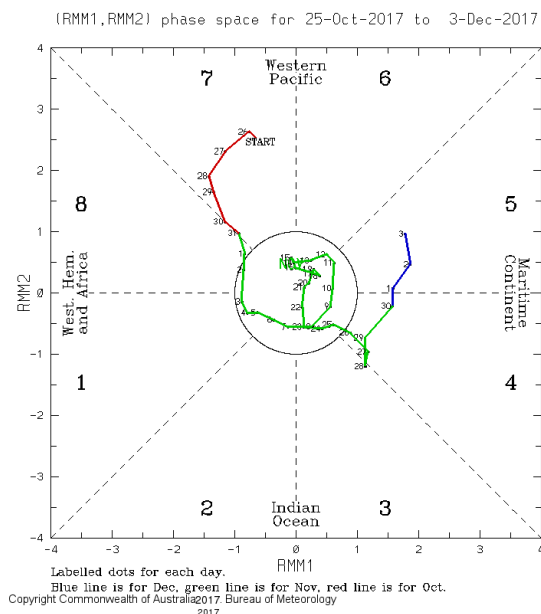

Figure 5: The MJO phase diagram for November 2017 (green). The MJO phase diagram illustrates the movement of the MJO through different phases, which correspond to different locations along the equator. The distance of the index from the centre of the diagram is correlated with the strength of MJO. When the index falls within the circle, the MJO is considered weak or indiscernible. (Source: Bureau of Meteorology)

2.   Review of Land/Forest Fires and Smoke Haze Situation

2.1   With the gradual transition to the traditional dry season in the northern ASEAN region, an increase in hotspot activities was observed in the Mekong sub-region. The hotspots were detected mainly in the northern parts of the Mekong sub-region but there were no significant smoke haze emanating from these hotspots.

2.2   In the southern ASEAN region, the prevailing wet weather conditions helped subdue hotspot activities. Satellite images for parts of the ASEAN region in November 2017 are shown in Figure 6 to Figure 10.

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[2] The MJO is characterised by an eastward propagation of clouds and rainfall over the tropics with an average cycle of 30 to 60 days. The MJO is more prominent between the Indian and western Pacific Ocean, and consists of two phases – an enhanced rainfall (convection) phase and a suppressed rainfall phase.
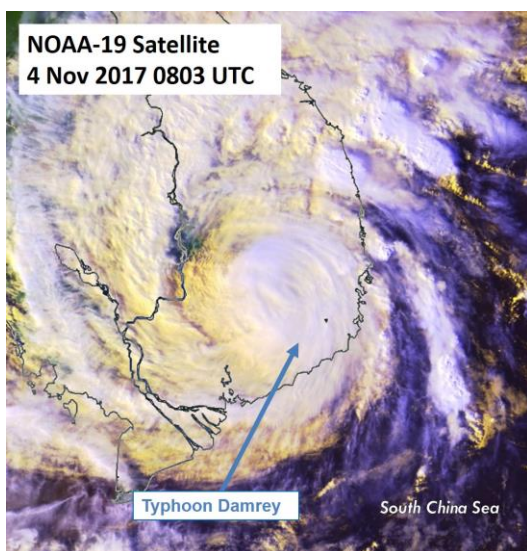
Figure 6: NOAA-19 satellite image on 4 Nov 2017 shows Typhoon "Damrey" over central Vietnam.
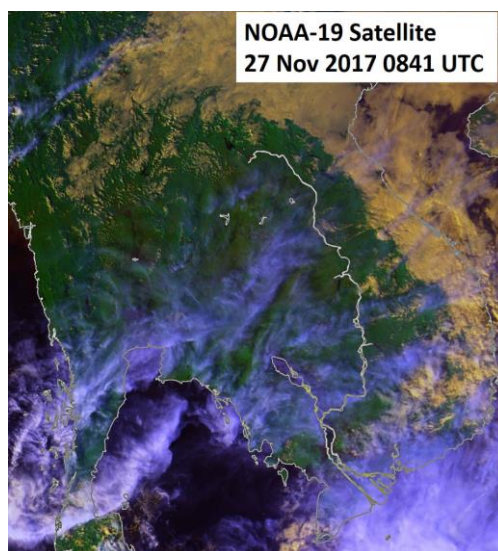

Figure 7: NOAA-19 satellite image on 27 Nov 2017 shows dry and fine weather conditions over most parts of the Mekong sub-region.
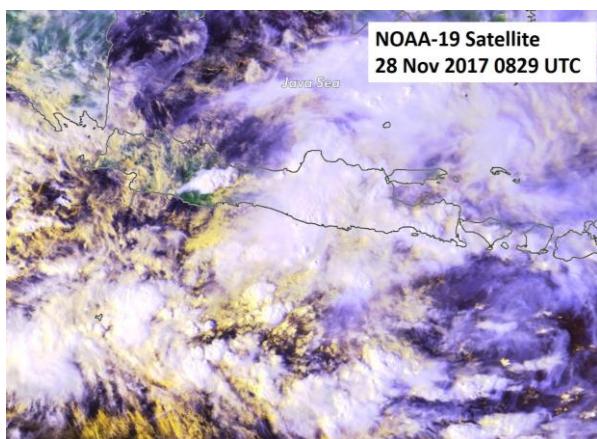

Figure 8: NOAA-19 satellite image on 28 Nov 2017 shows heavy thunderstorm activities in central Java associated with a low pressure system off the southern coast of Java.
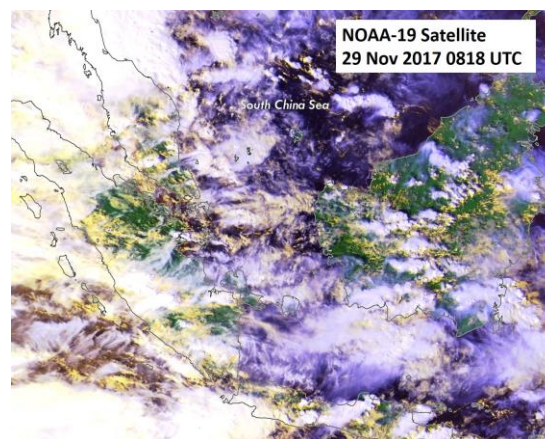

Figure 9: NOAA-19 satellite image on 29 Nov 2017 shows widespread shower activities prevailed over many parts of the southern ASEAN region.
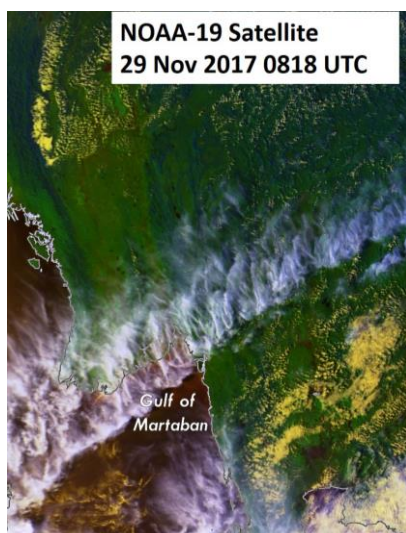

Figure 10: NOAA-19 satellite image on 29 Nov 2017 shows dry weather conditions over Myanmar.

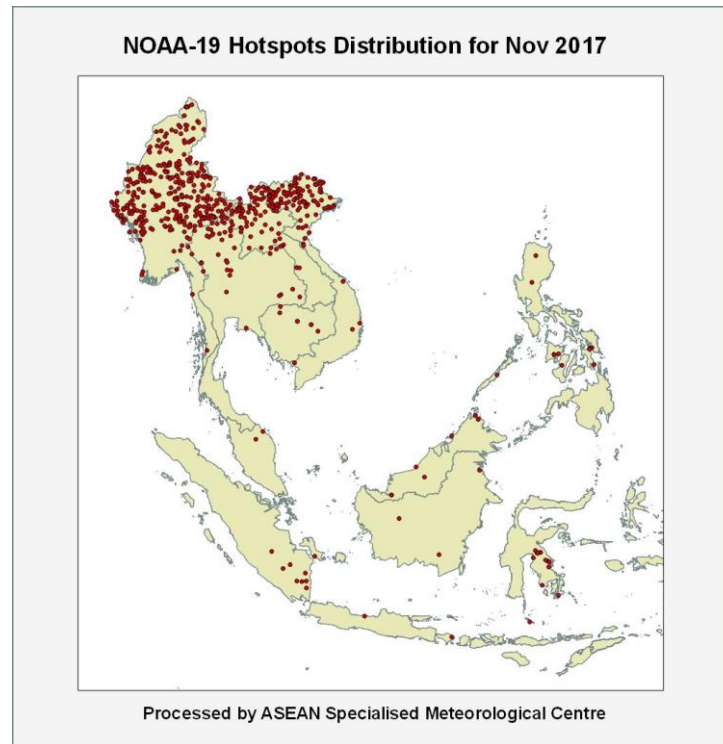2.3   The hotspot distribution and daily hotspot charts for November 2017 are shown in Figure 11 - 13.

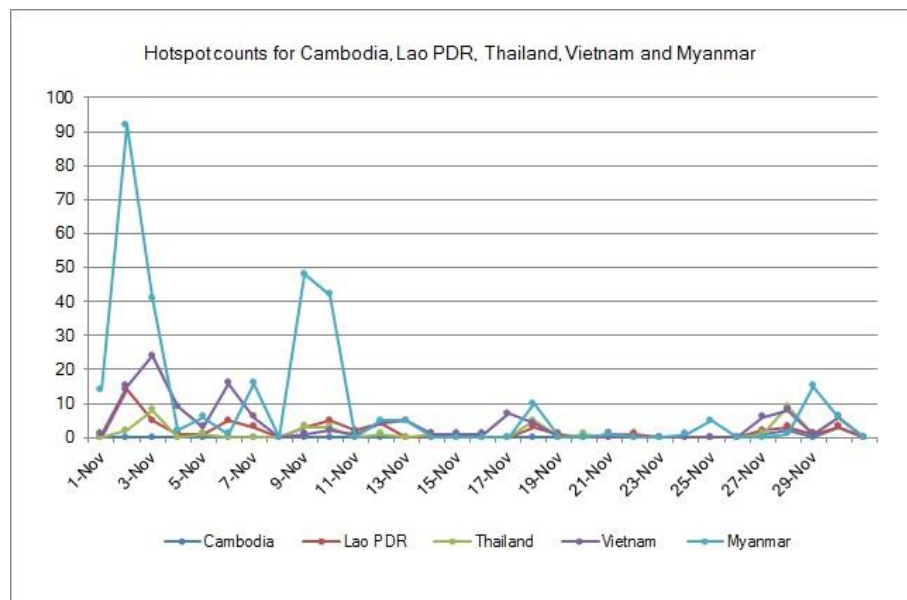*Figure 11: NOAA19 hotspots distribution in November 2017.*

Figure 12: Hotspot Counts in Cambodia, Lao PDR, Thailand, Vietnam and Myanmar in November 2017.
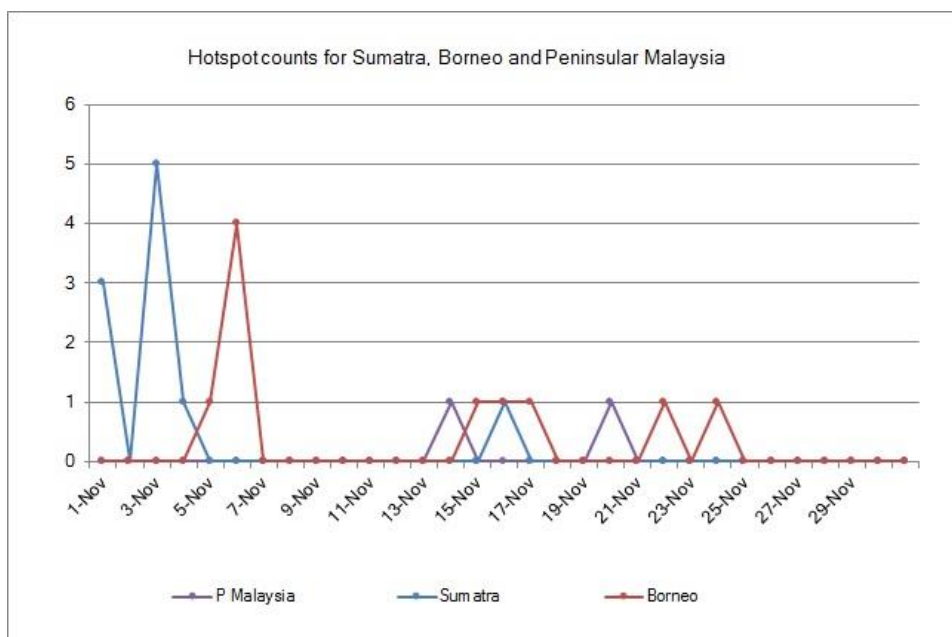
Figure 13: Hotspot Counts in Sumatra, Borneo and Peninsular Malaysia in November 2017.

3.   Outlook of El Niño/La Niña and the Indian Ocean Dipole

3.1   International climate centers have indicated that for the rest of 2017, the tropical Pacific Ocean will continue to cool, and that there would be at least a 60% chance of a weak La Niña developing by December 2017. Expert consensus have also projected that if a La Niña develops, the event is not expected to last beyond March 2018.

3.2   The region is currently experiencing Northeast Monsoon conditions. Typically, the impact from La Niña for Southeast Asia is wetter-than-normal rainfall conditions. The impact of La Niña on the weather over the near-equatorial region is usually less pronounced during the Northeast Monsoon as compared to the Southwest Monsoon (Jun – Sep).

3.3   In November 2017, the Indian Ocean Dipole (IOD) index was at neutral levels (Figure 14). In the coming months, models from international climate centres forecast the IOD to remain neutral and that it would have a significant influence on the weather in the region over the next few months. The formation of IOD typically starts around May or June, and peaks between August and October before decaying rapidly between December and April.
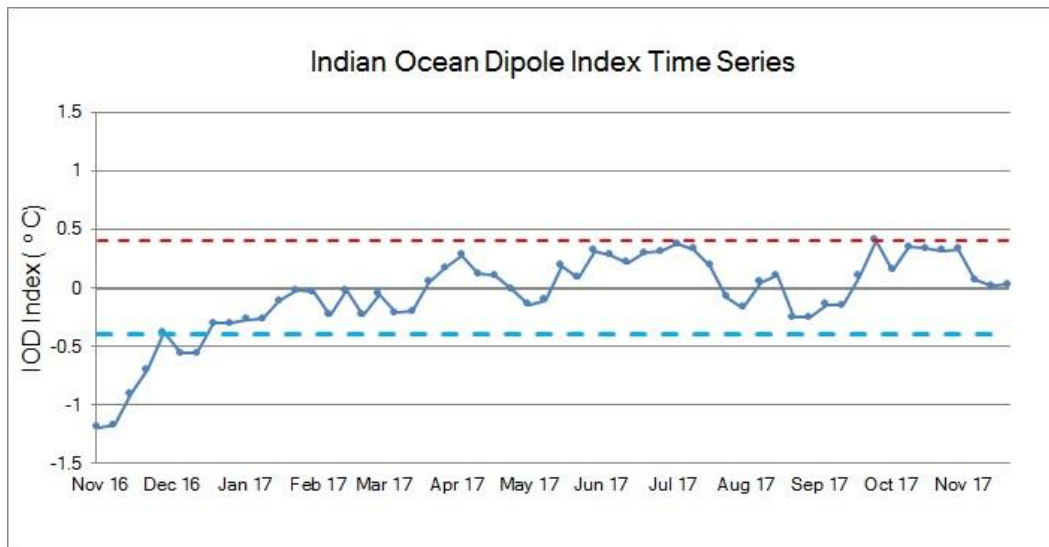
Figure 14: Indian Ocean Dipole (IOD) index time series. The IOD index was at neutral levels in November 2017. (Source: Bureau of Meteorology, Australia)

4. Outlook

4.1.   The current Northeast Monsoon season is expected to extend into March 2018, with prevailing winds in the region blowing predominantly from the northwest or northeast. The Northeast Monsoon will generally bring drier and cooler conditions to the northern ASEAN region. Hotspot activities are expected to gradually increase in the Mekong sub-region as the traditional dry season becomes established in January 2018.

4.2.   In the southern ASEAN region, shower activities coupled with occasional periods of prolonged moderate to heavy rain can be expected in the coming season. Hotspot activities are likely to be subdued by the expected wet weather conditions.

4.3.   In the second week of December 2017, below-normal rainfall is expected for most parts of the Mekong sub-region. A monsoon surge can be expected over the South China Sea and the surrounding region, and could bring a few days of cooler temperatures, occasionally windy conditions and widespread moderate to heavy rain to the southern Southeast Asian countries. Above-normal rainfall is forecast for the northern parts of Borneo, central and southern Philippines. In the third week of December, drier than usual conditions will prevail for most parts of the equatorial region, including Sumatra and Borneo. Near-normal to above-normal rainfall is expected for the northern ASEAN region. In the last week of December, near-normal rainfall is expected for the western parts of the Maritime Continent. Above-normal rainfall is forecast for the Philippines and rainfall is likely to be below-normal for the eastern parts of southern ASEAN region.

4.4.   For the upcoming boreal winter (Dec-Jan-Feb 2017/2018) season, above-normal rainfall is favoured over the eastern Maritime Continent, southern Vietnam, and central and southern Thailand. Below-normal rainfall is slightly favoured over western Borneo and northern Southeast Asia. Elsewhere near-normal rainfall is favoured.

4.5.   Above-normal temperatures are favoured over much of the Southeast Asia region for the upcoming boreal winter monsoon season, with higher probabilities over the eastern Maritime

Continent, northern Southeast Asia, and Sumatra. Below-normal temperatures are favoured over northern Philippines and southern Vietnam. The probabilistic rainfall and temperature forecast maps are shown in *Figure 15* and *Figure 16*.
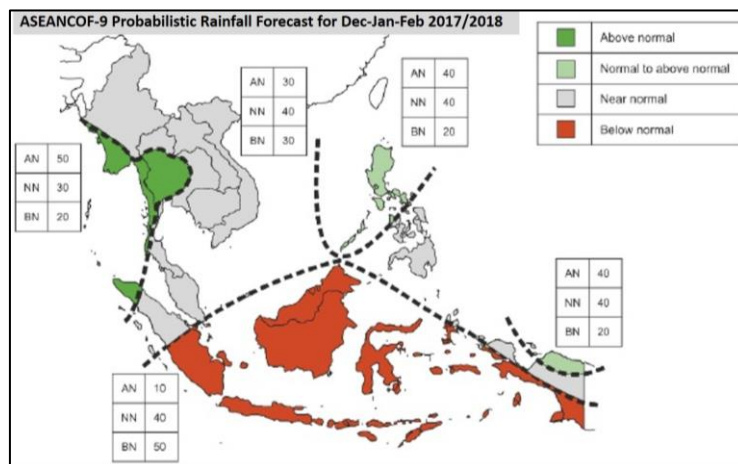

Figure 15: Probabilistic Rainfall Forecast of the ASEAN Region for Dec-Jan-Feb 2017/2018 season.
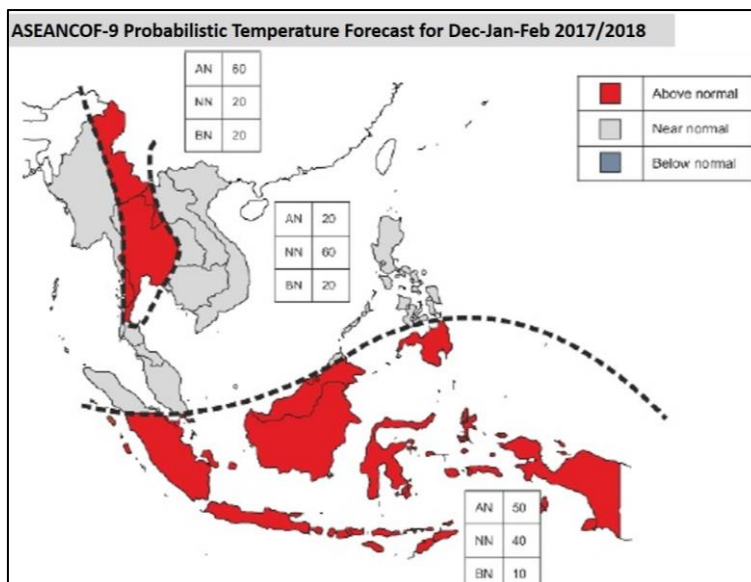

Figure 16: Probabilistic Temperature Forecast of the ASEAN Region for Dec-Jan-Feb 2017/2018 season.

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