

## 1. Review of Regional Weather Conditions in May 2017

1.1 In May 2017, inter-monsoon conditions, characterised by light winds and afternoon shower activities, prevailed over the ASEAN region. During this period, rainfall activities increased over the northern ASEAN region. In the southern ASEAN region, drier weather conditions began to set in over the surrounding region of Java Sea. The rainfall distribution for May 2017 is shown in Figure 1.

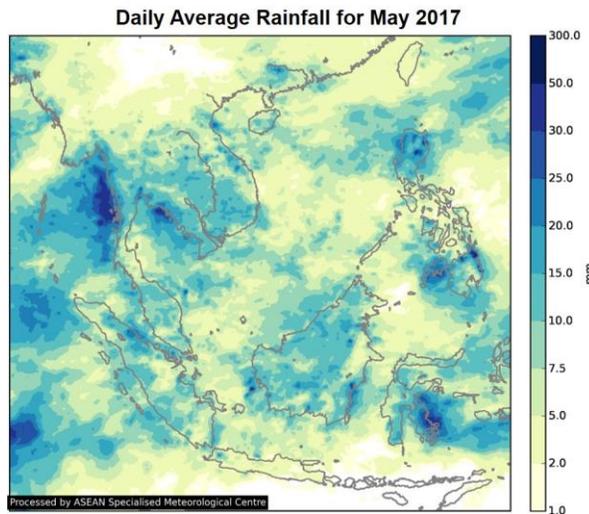


Figure 1: Daily average rainfall for the ASEAN region in May 2017. (Source: JAXA Global Satellite Mapping of Precipitation)

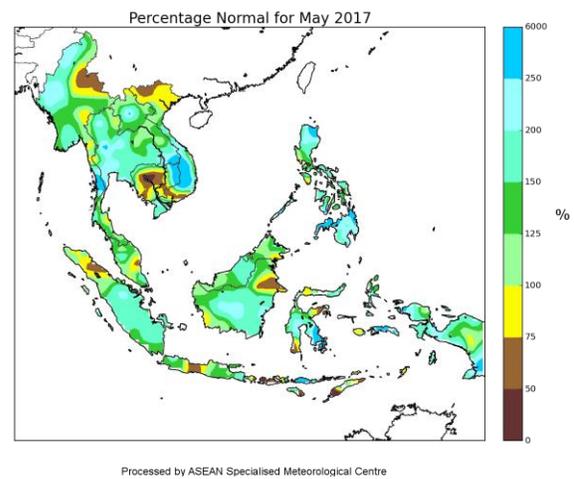


Figure 2: Percentage of Normal Rainfall for May 2017. The rainfall data may be less representative for areas with low density of rainfall network.

1.2 In May 2017, most parts of the ASEAN region received near normal to above normal rainfall. In particular, rainfall was above normal over the eastern parts of the Philippines, southern Vietnam, Thailand, and over most parts of Sumatra and Kalimantan. Figure 2 shows the percentage normal of rainfall for May 2017.

1.3 The prevailing winds during May 2017 were predominantly from the southeast or south in the northern ASEAN region. In the southern ASEAN region, prevailing winds continued to remain light but blew from the southeast or southwest. An anomalous cyclonic circulation observed over the Andaman Sea brought enhanced rainfall activities over southern Thailand. Figure 3 shows the average and anomalous winds at 5000 feet.

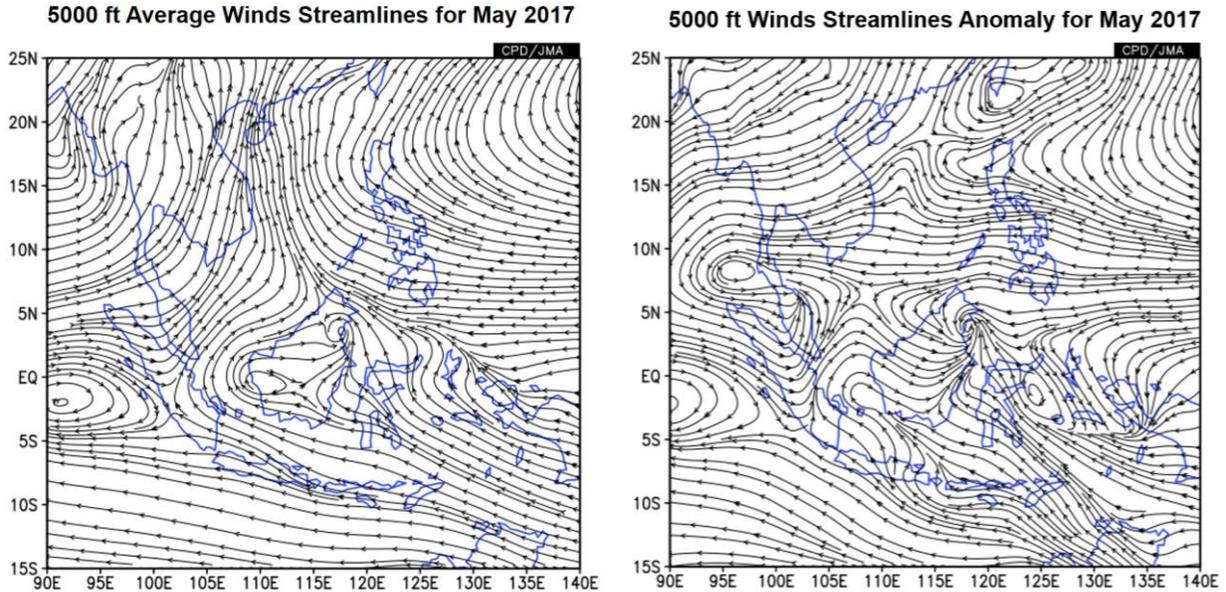


Figure 3: 5000 ft average winds streamlines (left) and anomaly (right) for May 2017. (Source: JMA)

1.4 In Bay of Bengal, a low pressure system began to develop on 28 May and quickly strengthened into Cyclone Mora the next day. As the cyclone tracked northward toward Bangladesh, it brought strong winds and heavy rains over Arakan and Chin states in Myanmar. Cyclone Mora eventually made landfall in Bangladesh on 30 May and dissipated the next day.

1.5 The equatorial Pacific Ocean's sea-surface temperature (SST) over the Nino3.4 region remained at neutral (neither El Niño nor La Niña) values. Atmospheric indicators such as cloudiness and winds over the equatorial Pacific were in the near average conditions.

1.6 In the first half of May 2017, the Madden Julian Oscillation (MJO)<sup>1</sup>, in Phase 8 and Phase 1, did not have significant impact on the weather patterns in the Maritime Continent. The MJO subsequently weakened and was non-discernible during the third week of May. By the last week of May, the MJO redeveloped and emerged in Phase 2 and 3, which brought enhanced rainfall activities particularly over the surrounding region of Indian Ocean and Andaman Sea.

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<sup>1</sup> 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.

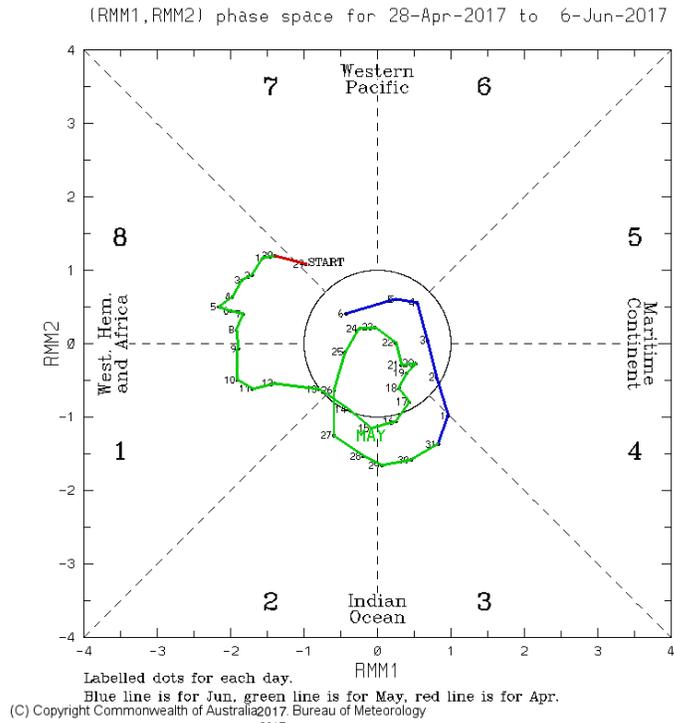


Figure 4: The MJO phase diagram for May 2017 (green). The MJO phase diagram illustrates the movement of the MJO through different phases, which correspond to different locations along the equator. The distance of the index from the centre of the diagram is correlated with the strength of MJO. When the 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 In the northern ASEAN region, isolated to scattered hotspots with localised smoke haze were observed in the northern half of Myanmar, Lao PDR and Vietnam in early May 2017. Increased shower activities over the northern ASEAN region in the second week of May 2017 signalled an end to the traditional dry season. The hotspot activities in the region were then generally subdued by shower activities.

2.2 In the southern ASEAN region, hotspot activities remained subdued due to wet weather conditions. Nonetheless, isolated hotspots were detected in parts of Sumatra on some days. Satellite images depicting some of the hotspot activities over parts of the ASEAN region during May 2017 are shown in Figure 5 - Figure 9.

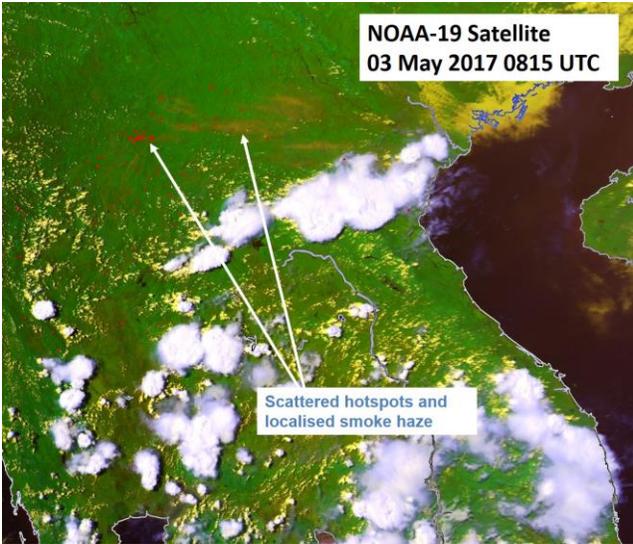


Figure 5: NOAA-19 satellite image on 3 May 2017 shows scattered hotspots and localised smoke haze in northern Lao PDR and Vietnam.

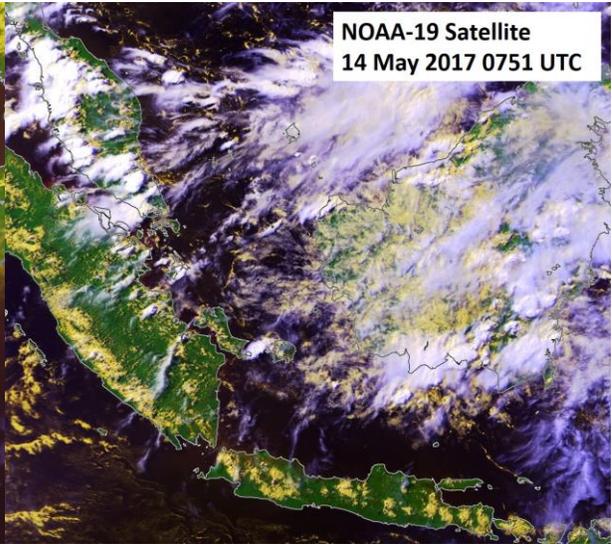


Figure 6: NOAA-19 satellite image on 14 May 2017 shows scattered shower activities prevailed over the southern ASEAN region.

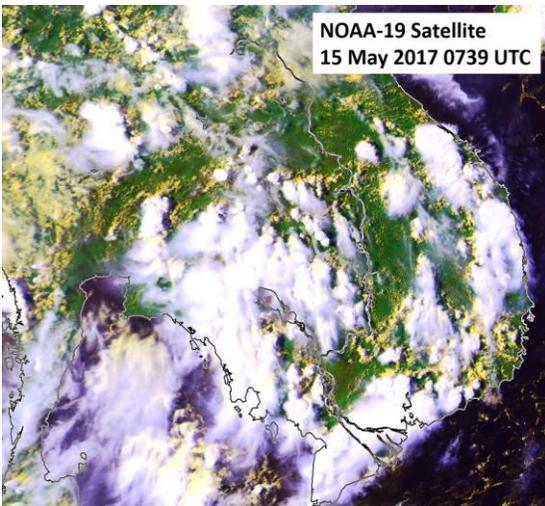


Figure 7: NOAA-19 satellite image on 15 May 2017 shows hotspot activities in the northern ASEAN region subdued by wet weather conditions.

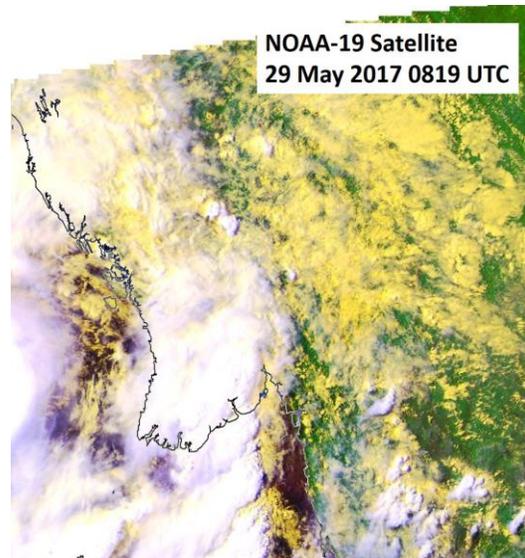


Figure 8: NOAA-19 satellite image on 29 May 2017 shows enhanced rainfall activities in Myanmar due to the influence of Cyclone Mora over the Bay of Bengal.

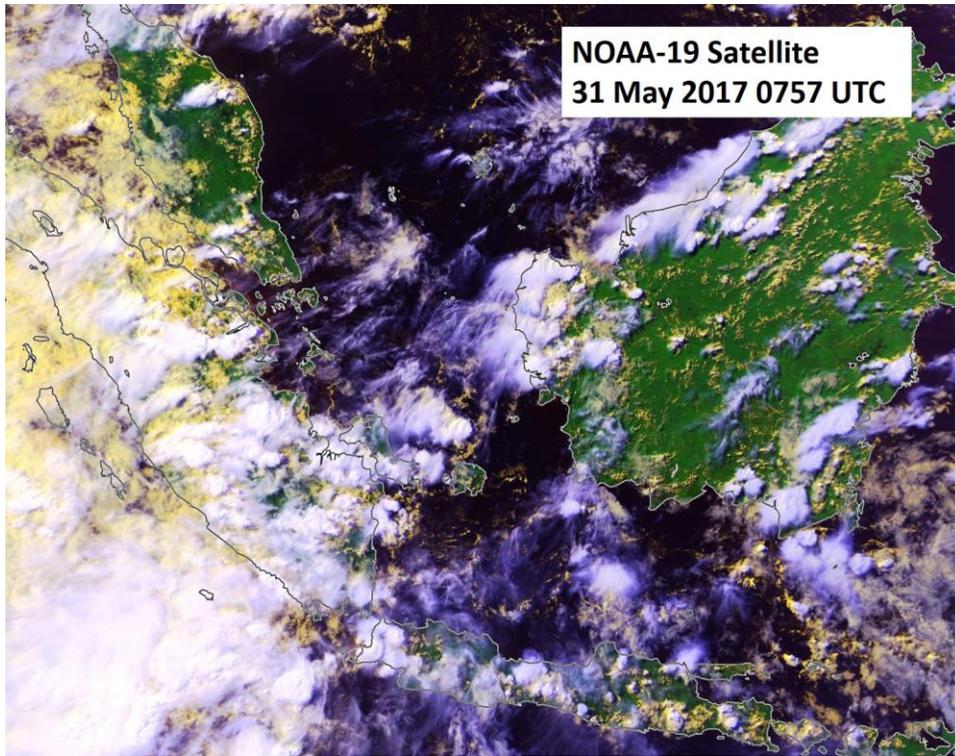


Figure 9: NOAA-19 satellite image on 31 May 2017 shows prevailing wet weather conditions over Sumatra.

2.3 The hotspot distribution and daily hotspot charts for May 2017 are shown in Figure 10, Figure 11 and Figure 12 respectively.

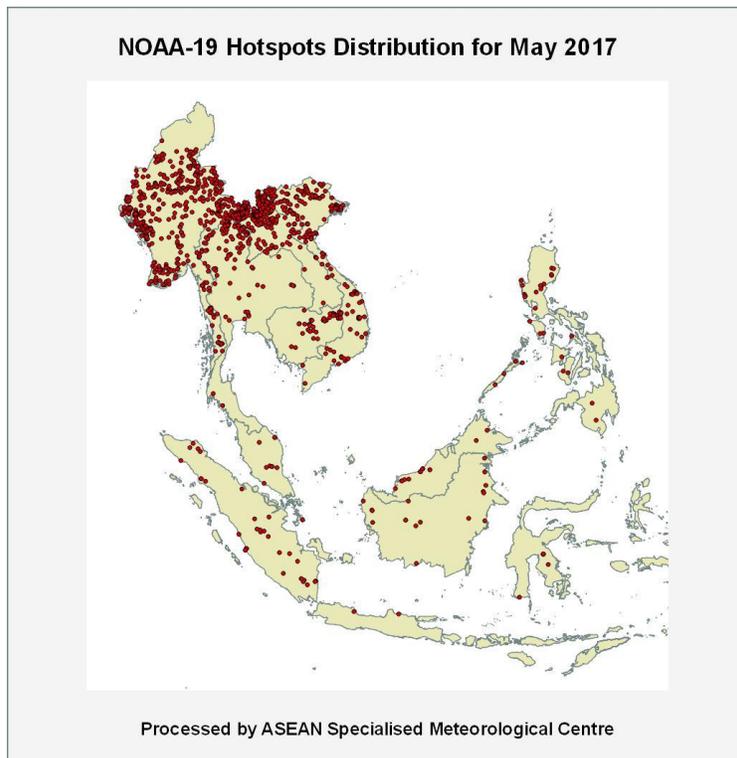


Figure 10: NOAA-19 hotspots distribution in May 2017.

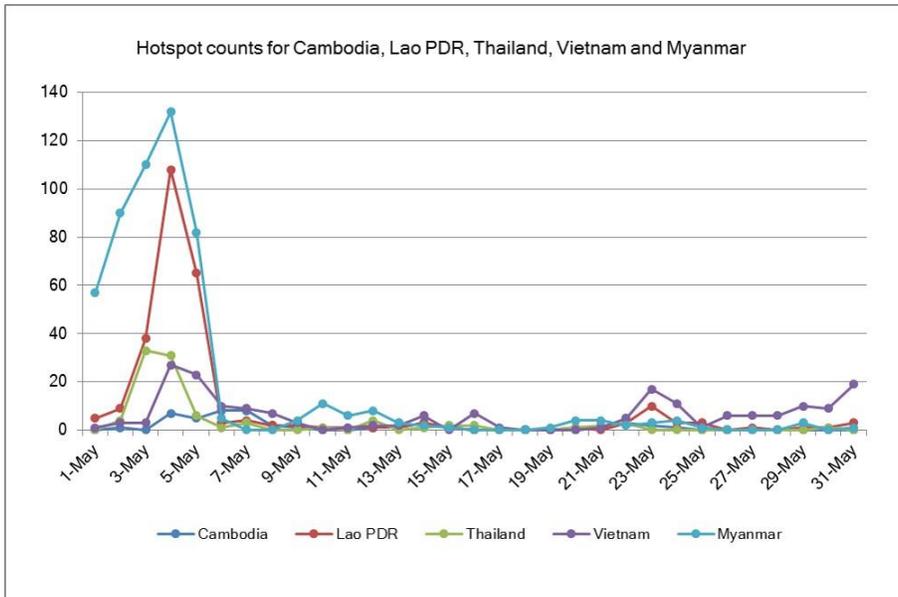


Figure 11: Hotspot Counts in Cambodia, Lao PDR, Thailand, Vietnam and Myanmar in May 2017.

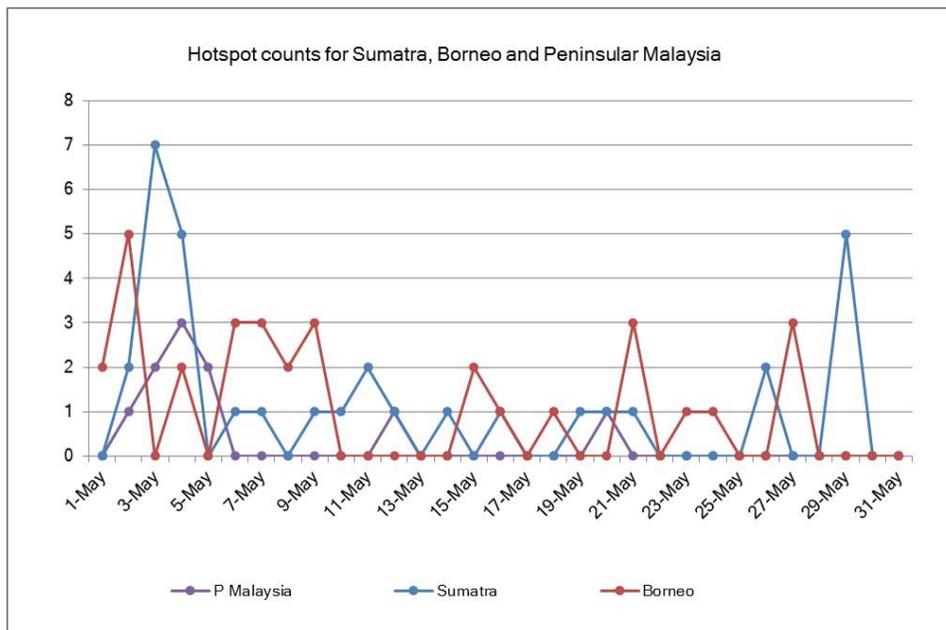


Figure 12: Hotspot Counts in Sumatra, Borneo and Peninsular Malaysia in May 2017.

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

3.1 International climate centres are projecting a near equal chance of the El Niño Southern Oscillation (ENSO) remaining neutral and a chance of weak El Niño developing in the latter half of the year.

3.2 Should an El Niño develop, the conditions are expected to be weak and the impact over the Maritime Continent is unlikely to be significant.

3.3 Typically, El Niño brings drier-than-normal rainfall conditions to most parts of Southeast Asia during the Southwest Monsoon season. During La Niña events, the opposite, i.e. wetter-than-normal condition, normally occurs. Locally specific impact differs from place to place and for different seasons.

3.4 In May 2017, the Indian Ocean Dipole (IOD) index continued to remain at neutral levels (Figure 13). In the next few months, based on international climate models, the IOD is forecast to remain neutral, with some chance that a positive IOD may develop toward the end of the year. The IOD is unlikely have a significant influence on the weather over the ASEAN region for the next few months.

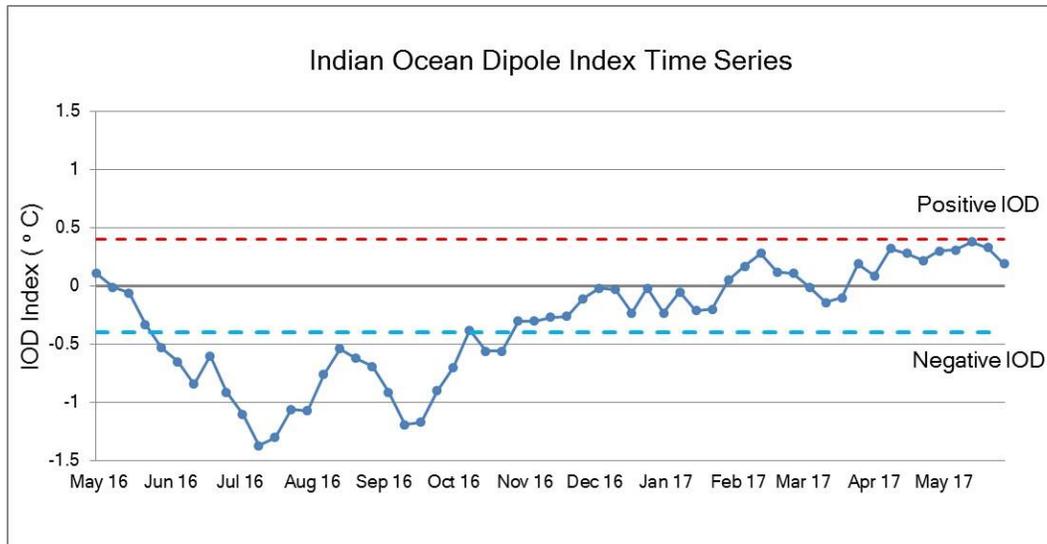


Figure 13: Indian Ocean Dipole (IOD) index time series. The IOD index was at neutral levels in May 2017. (Source: Bureau of Meteorology, Australia)

## 4. Outlook

4.1. The Southwest Monsoon onset in early June 2017 and will persist for the next few months. The monsoon season is usually associated with the traditional dry (rainy) season of the southern (northern) ASEAN region, with the prevailing winds blowing from the southeast or southwest. During the season, the presence of tropical cyclones in the Western Pacific Ocean and South China Sea could bring heavy rainfall over parts of the northern ASEAN region, particularly over the Philippines and Vietnam.

4.2. For the southern ASEAN region, extended periods of dry weather conditions can be expected. This could lead to an escalation in hotspot activities over the fire-prone provinces of Sumatra and Kalimantan. Typically, in the early part of the traditional dry season in the southern ASEAN region, most of the fires emerge in northern and central Sumatra and western Kalimantan. Vigilance should be stepped up for any escalation of fire activities in the coming dry season.

4.3. In the second and third week of June 2017, near-normal to above-normal rainfall is expected for the northern ASEAN region while below-normal to near-normal rainfall is forecast for the southern ASEAN region. Toward the end of June 2017, increased rainfall activities are expected to bring wetter than usual conditions over the southern ASEAN region. For the northern ASEAN region, drier than usual weather conditions are expected.

4.4. For the upcoming Northern Hemisphere summer monsoon season (June-July-August), drier than normal conditions are expected over central and southern Southeast Asia, including southern Sumatra, southern Kalimantan, Java, Singapore and Sarawak. There is a slightly enhanced probability of wetter than normal conditions over coastal Myanmar, northern Thailand, northern Philippines, northern Papua, and northern Kalimantan. Near normal conditions are predicted for the rest of the region, including most of mainland Southeast Asia. The rainfall outlook for the June to August 2017 season is shown in Figure 14.

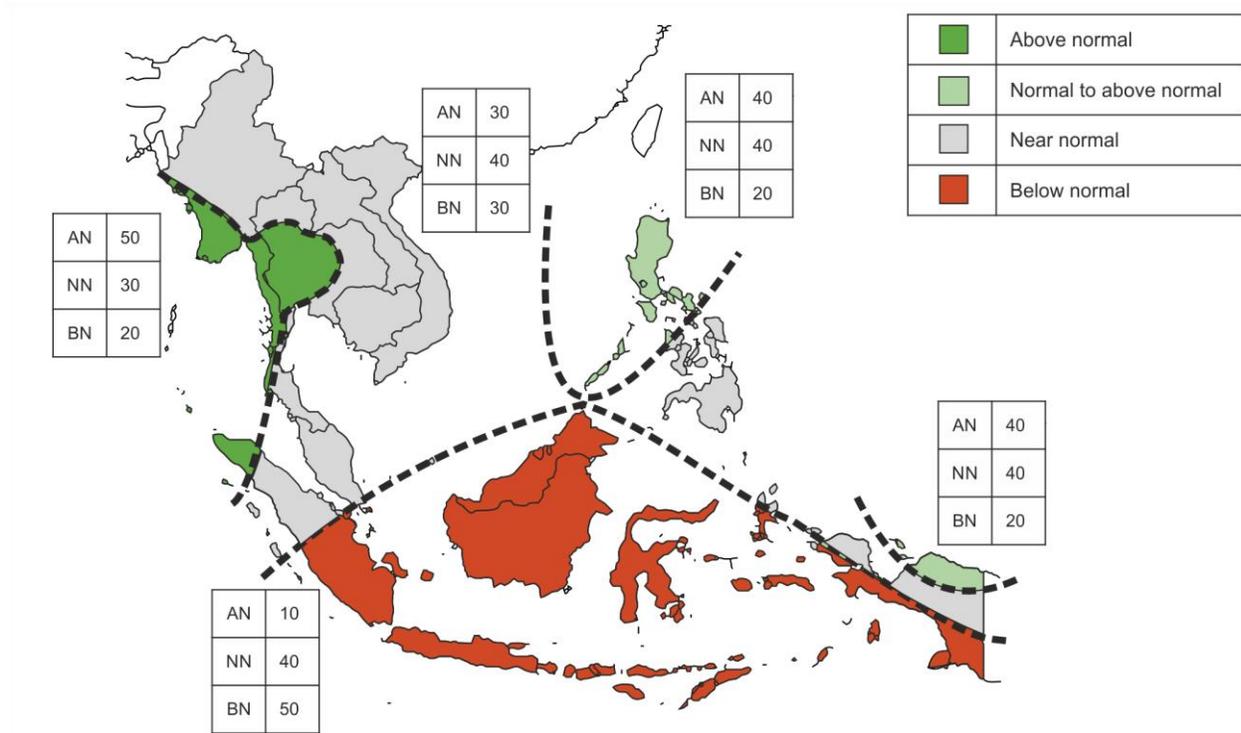


Figure 14: ASEAN Climate Forum Outlook (ASEANCOF) consensus rainfall outlook for the ASEAN region – June-July-August 2017.