UPDATE OF REGIONAL WEATHER AND SMOKE HAZE (July 2017)

1. Review of Regional Weather Conditions in June 2017

1.1 Southwest Monsoon conditions became established over the ASEAN region in June 2017. The intensification of the sub-tropical high pressure system in the southern hemisphere gave rise to persistent southeasterly winds south of the equator and southwesterly winds north of the equator. During this period, the monsoon rain band was located between 5S and 20 N. Heavy rainfall fell along the coastal areas of Myanmar as well as in the eastern parts of the Maritime Continent. The rainfall distribution for June 2017 is shown in Figure 1.

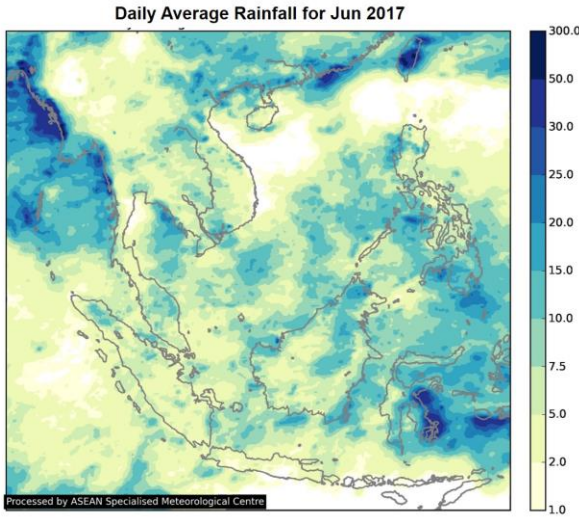

Figure 1: Daily average rainfall for the ASEAN region in June 2017. (Source: JAXA Global Satellite Mapping of Precipitation)

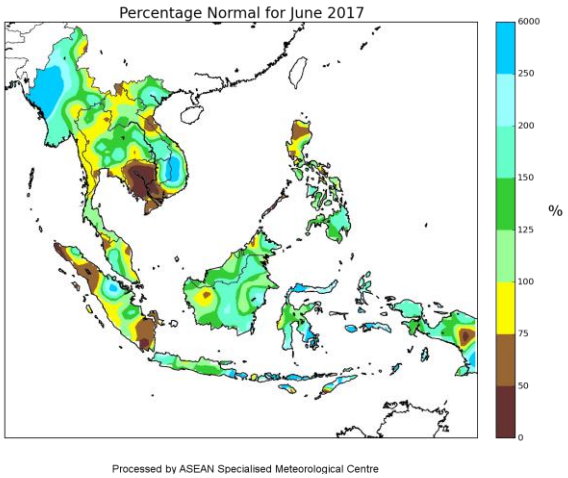

Figure 2: Percentage of Normal Rainfall for June 2017. The rainfall data may be less representative for areas with low density of rainfall network.

1.2 In June 2017, rainfall was above normal over Myanmar, parts of Vietnam and southern Philippines. In the southern ASEAN region, near-normal to above-normal rainfall prevailed over most parts of the region. However, rainfall was below-normal in northern and southern Sumatra. Figure 2 shows the percentage normal of rainfall for June 2017.

1.3 The prevailing winds during June 2017 were predominantly from the south or southwest in the northern ASEAN region. In the southern ASEAN region, prevailing winds blew from the southeast or south-southwest. There was no significant wind anomaly in the region except for an easterly anomaly over southern Philippines and a southerly anomaly over Myanmar, which could have contributed to the wetter-than-usual conditions in these areas. Figure 3 shows the average and anomalous winds at 5000 feet.

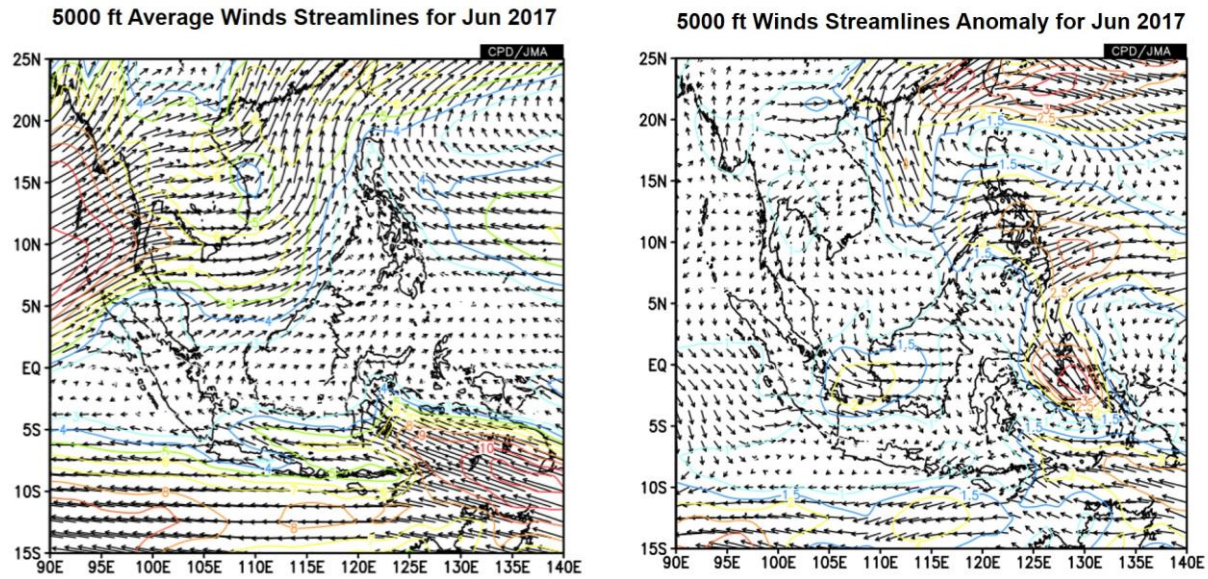

Figure 3: 5000 ft average winds streamlines (left) and anomaly (right) for June 2017. (Source: JMA)

1.4 The equatorial Pacific Ocean's sea-surface temperature (SST) over the Nino3.4 region continued to remain at neutral (neither El Niño nor La Niña) values. Atmospheric indicators such as cloudiness and winds over the equatorial Pacific were consistent with neutral El Niño Southern Oscillation (ENSO) conditions.

1.5 In June 2017, the Madden Julian Oscillation (MJO)[1] was in Phase 3 for a few days and weakened rapidly in the subsequent days. The MJO remained in a non-discernible state until 9 June 2017. It emerged in Phase 8 and Phase 1 during the second and third week of June 2017 respectively before weakening again. There was no MJO signal until the end of June 2017. Overall, the MJO did not contribute significantly to the weather patterns over the Maritime Continent in June 2017.

[1] 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.

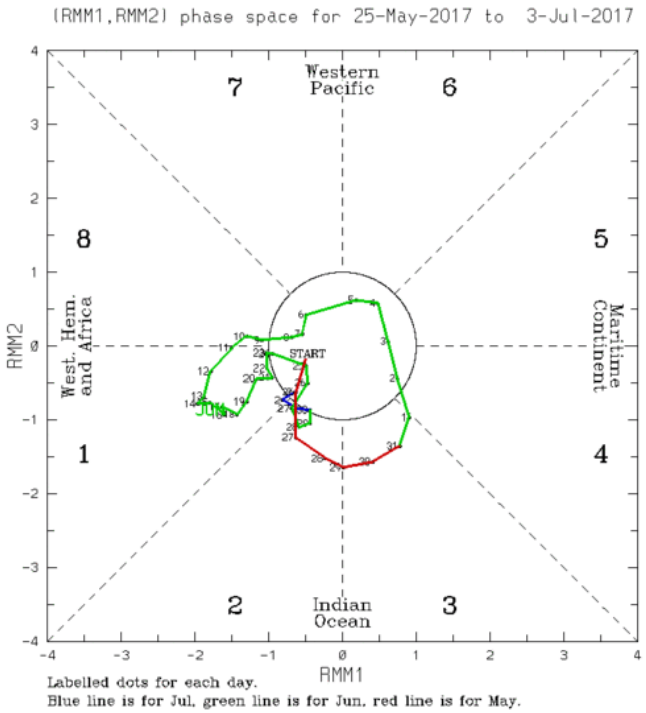

Figure 4: The MJO phase diagram for June 2017 (green). The MJO phase diagram illustrates the movement of the MJO through different phases, which correspond to different locations along the equator. The distance of the index from the centre of the diagram is correlated with the strength of MJO. When the 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 June 2017, hotspot activities in the northern ASEAN region were generally subdued due to the occurrence of increased rainfall brought by the onset of the Southwest Monsoon season.

2.2 In the southern ASEAN region, the number of hotspots detected remained low as wet weather conditions continued to persist, particularly over Sumatra and Kalimantan. Nonetheless, isolated hotspots with localised and short-lived smoke plumes were still observed in parts of Sumatra on a few days. Satellite images depicting some of the hotspot activities over parts of the ASEAN region during June 2017 are shown in Figure 5 - Figure 9.

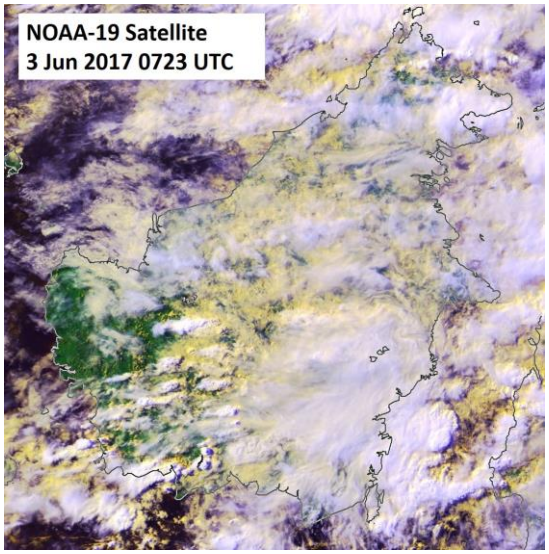

Figure 5: NOAA-19 satellite image on 3 June 2017 shows hotspot activities subdued by prevailing wet weather conditions in Kalimantan.

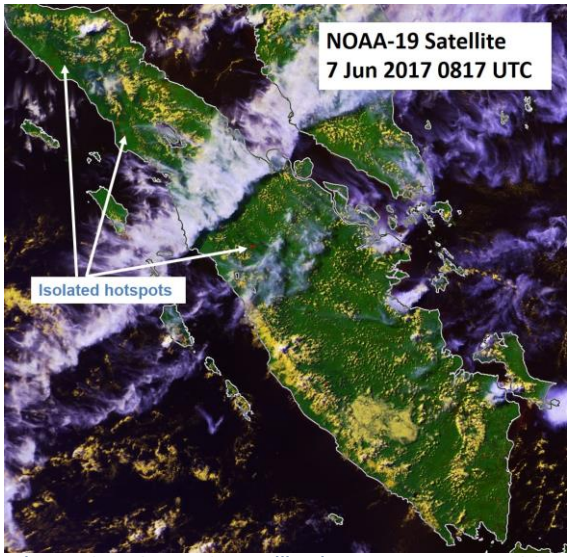

Figure 6: NOAA-19 satellite image on 7 June 2017 shows isolated hotspots detected in northern and western parts of Sumatra.

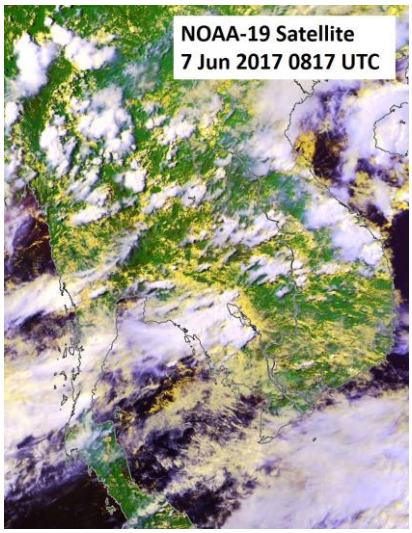

Figure 7: NOAA-19 satellite image on 7 June 2017 shows increasing shower activities over the Mekong sub-region.

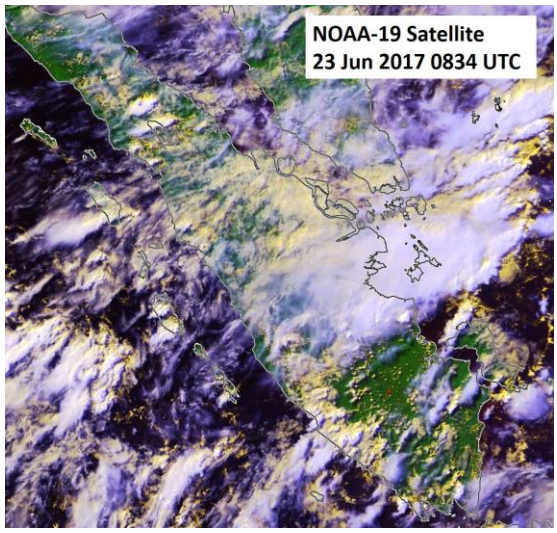

Figure 8: NOAA-19 satellite image on 23 June 2017 shows extensive shower activities and cloudy conditions over Sumatra.

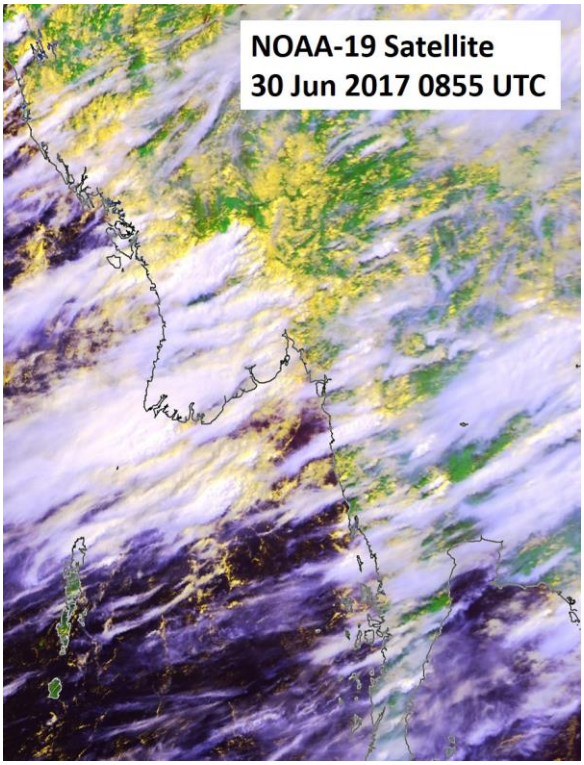

Figure 9: NOAA-19 satellite image on 30 June 2017 shows wet weather conditions prevailing over Myanmar.

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

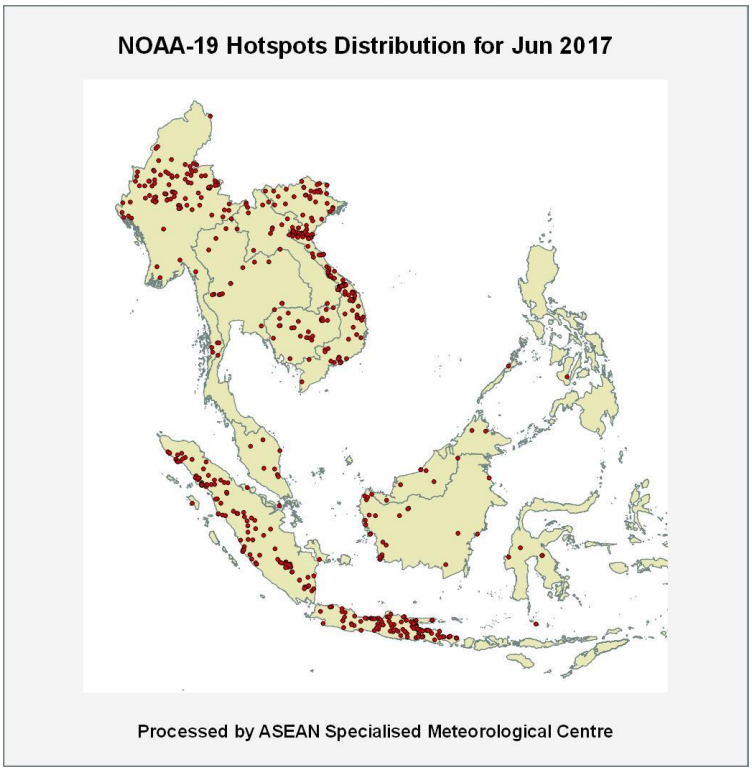

Figure 10: NOAA-19 hotspots distribution in June 2017.

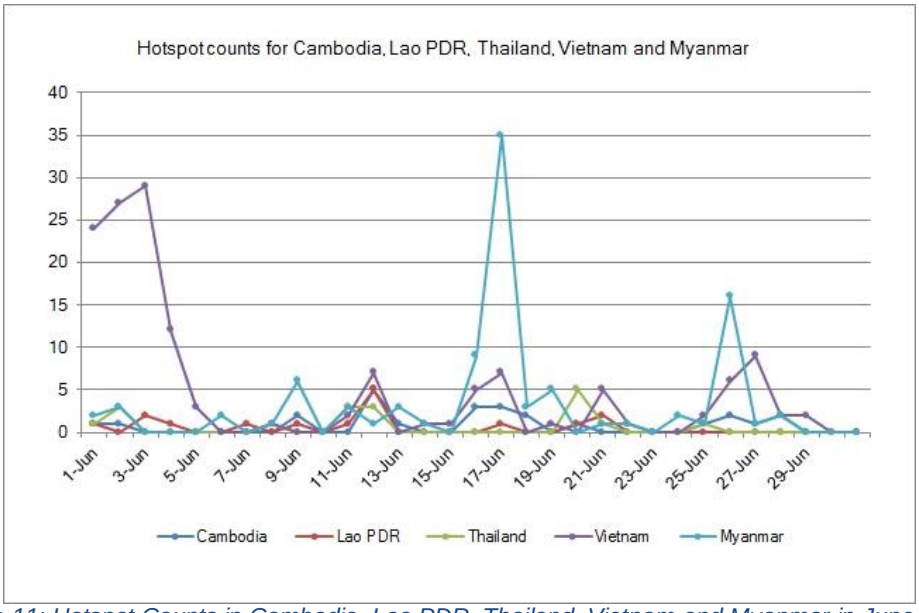

Figure 11: Hotspot Counts in Cambodia, Lao PDR, Thailand, Vietnam and Myanmar in June 2017.

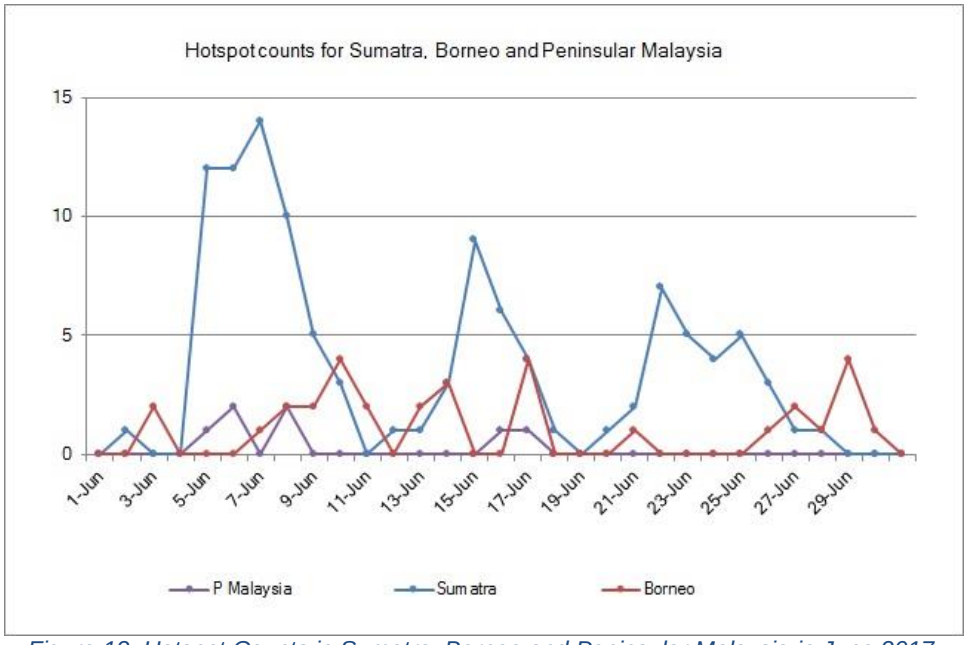

Figure 12: Hotspot Counts in Sumatra, Borneo and Peninsular Malaysia in June 2017.

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

3.1 International climate centres indicate that the tropical Pacific Ocean will continue to warm gradually in the second half of 2017, and favors neutral ENSO conditions over El Niño.

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. Despite the low likelihood of an El-Nino developing, periods of dry weather condition are expected and could lead to the occurrence of transboundary haze in the region. Member states are to remain vigilant, take preventive measures

and to take immediate fire suppression procedures to mitigate land and forest fires and to minimise any possible occurrence of transboundary smoke haze from land and forest fires during periods of drier weather.

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 June 2017, the Indian Ocean Dipole (IOD) has showed signs of transitioning into a positive IOD event although the IOD index continued to remain in the neutral state (Figure 13). In the next few months, based on international climate models, the IOD is forecast to remain neutral, with possibility that a positive IOD may develop toward the end of the year.

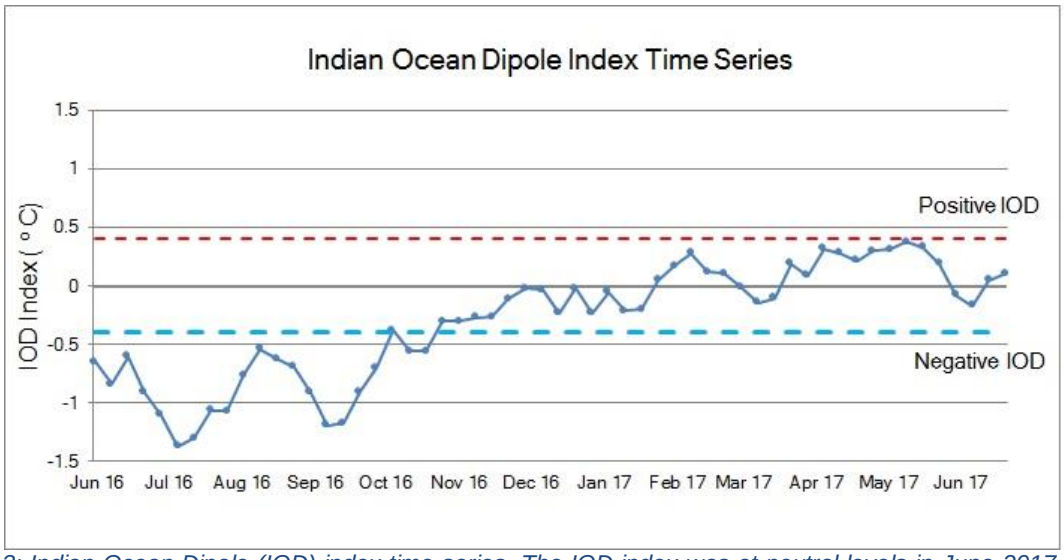

Figure 13: Indian Ocean Dipole (IOD) index time series. The IOD index was at neutral levels in June 2017. (Source: Bureau of Meteorology, Australia)

4. Outlook

4.1. The prevailing Southwest Monsoon conditions are expected to strengthen over the next few months. The monsoon is associated with the traditional wet (dry) season of the northern (southern) ASEAN region. During the season, prevailing winds are expected to blow from the southeast or southwest. The development of tropical cyclones in the Western Pacific Ocean and South China Sea can be expected and could bring heavy rainfall over parts of the northern ASEAN region, particularly over the Philippines and Vietnam.

4.2. For the southern ASEAN region, the dry weather conditions could lead to an escalation in hotspot activities over the fire-prone provinces of Sumatra and Kalimantan. Vigilance should be stepped up for any escalation of fire activities in the coming dry season.

4.3. In the second week of July 2017, well above-normal rainfall conditions are expected over many parts of the ASEAN region. For the third week of July, the situation is expected to continue over the northern ASEAN region and South China Sea, although drier than usual conditions are

forecast over Sumatra, Peninsular Malaysia and parts of Kalimantan. By the last week of July, below-normal rainfall is expected over Kalimantan while slightly above-normal rainfall is forecast for the Mekong sub-region and the Philippines.

4.4. For the upcoming July-August-September season, near-normal rainfall is expected for most parts of the northern ASEAN region, except in northern and central Thailand where slightly above-normal rainfall is expected in July and September. In most parts of the southern ASEAN region, near-normal rainfall is forecast to prevail. However, slightly below-normal rainfall is expected over Singapore, southern Sumatra and Java. The rainfall outlook for the July to September 2017 season is shown in Figure 14.

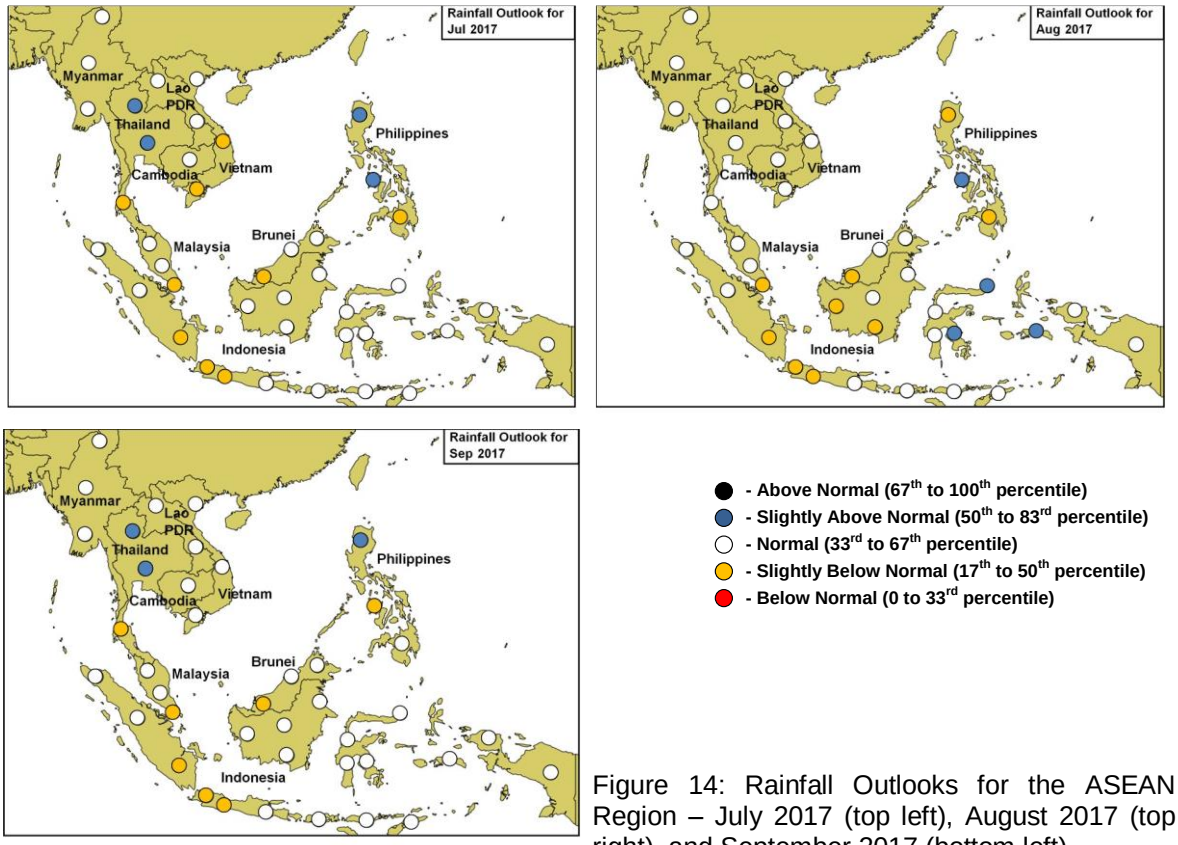

Figure 14: Rainfall Outlooks for the ASEAN Region – July 2017 (top left), August 2017 (top right), and September 2017 (bottom left)