

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

1.1 The prevailing Northeast Monsoon conditions continued into January 2017. Dry weather conditions interspersed with brief periods of showers prevailed over the Mekong sub-region. In southern Thailand and the Philippines, wet weather conditions prevailed. With the monsoon rain band over the equatorial region between 10°N and 15°S, most parts of the southern ASEAN region experienced wet weather conditions. The rainfall distribution for January 2017 is shown in Figure 1.

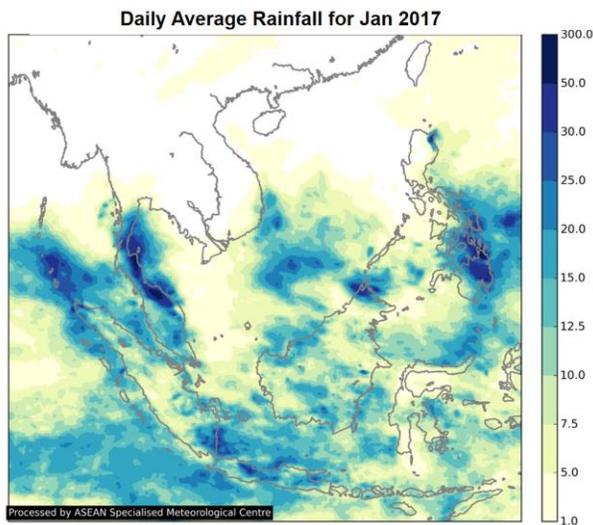


Figure 1: Daily average rainfall for the ASEAN region in January 2017. (Source: JAXA Global Satellite Mapping of Precipitation)

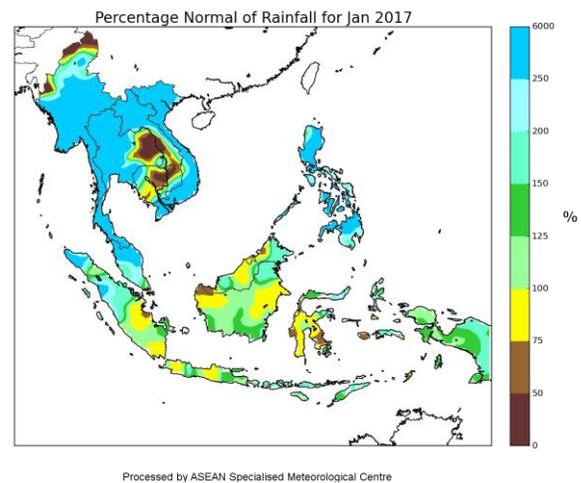


Figure 2: Percentage of Normal Rainfall for January 2017. The rainfall data may be less representative for areas with low density of rainfall network.

1.2 In January 2017, rainfall was above-normal over most parts of the northern ASEAN region except in Cambodia and the eastern parts of Thailand where rainfall was below-normal. In the southern ASEAN region, rainfall was near-normal to above-normal. The percentage normal of rainfall for January 2017 is shown in Figure 2.

1.3 The rainfall in January 2017 was distributed mainly across the equatorial region. Heavy rains affected parts of southern Thailand, Malaysia, southern Philippines and the surrounding region of Java Sea. In southern Philippines, a slow moving low-pressure system over the Mindanao and Visayas areas brought heavy rainfall to these areas. In addition, several monsoon surges, characteristic of the Northeast Monsoon season affected the region. Monsoon surges refer to the strengthening of winds over the South China Sea due to the intensification of high pressure system over northern China. In the first week of January, a monsoon surge brought heavy rains and caused widespread flooding in southern Thailand that affected over 12 provinces.

Between 20 and 24 January, a second monsoon surge brought heavy rain showers that affected the near-equatorial region including the east coast of Peninsular Malaysia, Singapore and parts of central Sumatra.

1.4 In January 2017, northeasterly winds prevailed in the northern ASEAN region while northwesterly and westerly winds blew predominantly in the southern ASEAN region. The average and anomalous winds at 5000 feet are shown in Figure 3. Between the Equator and 10°S, there were large-scale westerly anomaly winds over an area extending from the Indian Ocean to the Java Sea. In addition, the presence of two distinct cyclonic circulations due to the formation of low pressure systems in the Andaman Sea and in southern Philippines brought well-above normal rainfall to the region.

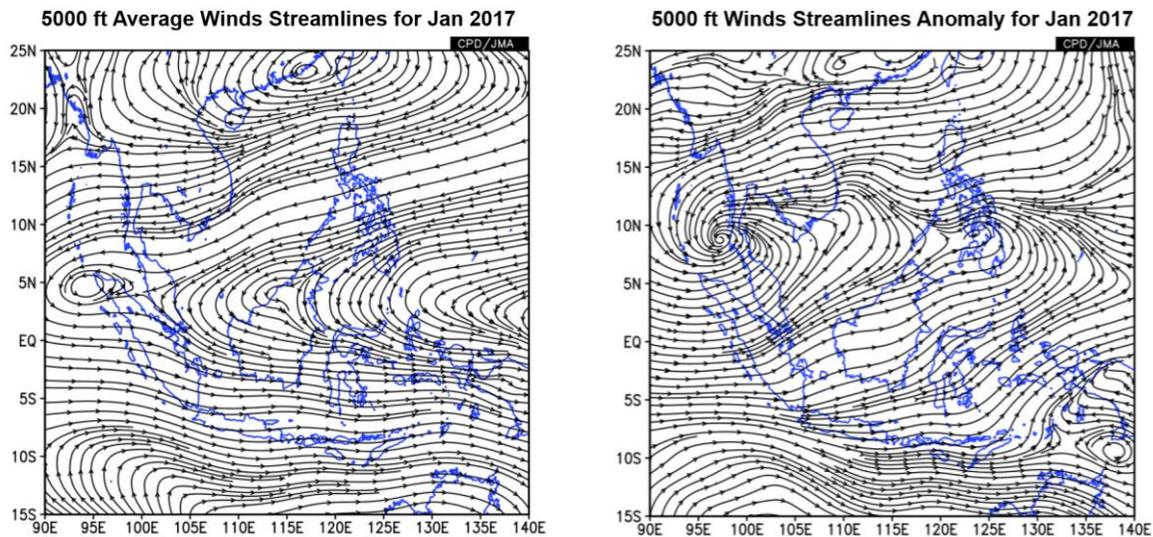


Figure 3: 5000 ft average winds streamlines (left) and anomaly (right) for January 2017.

1.5 For the month, the equatorial Pacific Ocean's sea surface temperature (SST) over the Niño 3.4 region was within neutral ENSO<sup>1</sup> threshold values, and the atmospheric indicators such as the trade winds and cloudiness over the equatorial Pacific, indicated either weakening La-Niña or neutral conditions.

1.6 In the first half January 2017, the Madden Julian Oscillation (MJO) was weak or indiscernible and did not contribute significantly to the weather in the region. The MJO however, emerged from Phase 1 and progressed through Phase 2 to Phase 3 in the latter half of January. The passage of MJO through Phase 2 and 3 was likely to have enhanced the impact of monsoon surge which brought heavy rainfall over southern Thailand and east coast of Peninsular Malaysia between 20 and 24 January.

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<sup>1</sup> ENSO: El Niño Southern Oscillation

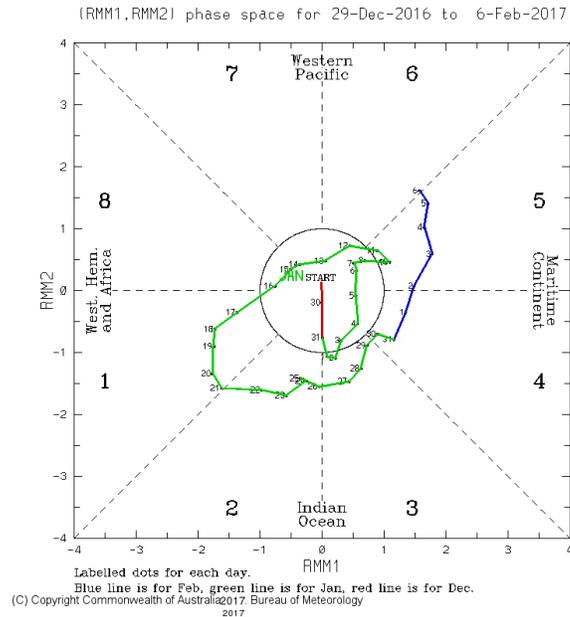


Figure 4: The MJO phase diagram for January 2017 (green). The MJO phase diagram illustrates the movement of the MJO through different phases, which correspond to different locations along the equator. The distance of the index from the centre of the diagram is correlated with the strength of MJO. When the index falls within the circle, the MJO is considered weak or no signal exhibited. (Source: Bureau of Meteorology)

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

2.1 In the Mekong sub region, hotspot activities were relatively low in the first half of January 2017. A few contributing factors could be due to the presence of cloud cover, obscuring detection by satellites, and occurrence of showers activities over parts of the northern ASEAN region which could have helped to subdue hotspot activities in parts of the northern ASEAN region. In the second half of January, dry weather conditions in the region brought a significant increase in the number of hotspots, in particular over Thailand and Cambodia. Clusters of scattered hotspots persisted in parts of central Thailand and the northern half of Cambodia. In addition, localised smoke plumes were seen to emanate from some of the hotspots detected.

2.2 In the southern ASEAN region, most of the hotspots were detected in central Sumatra where brief periods of dry weather conditions were experienced in the first half of January 2017. Overall, the hotspot activities in the region remained largely subdued due to the prevailing shower activities.

2.3 Satellite images depicting some of the hotspot activities over parts of the ASEAN region during January 2017 are shown in Figure 5 - Figure 9.

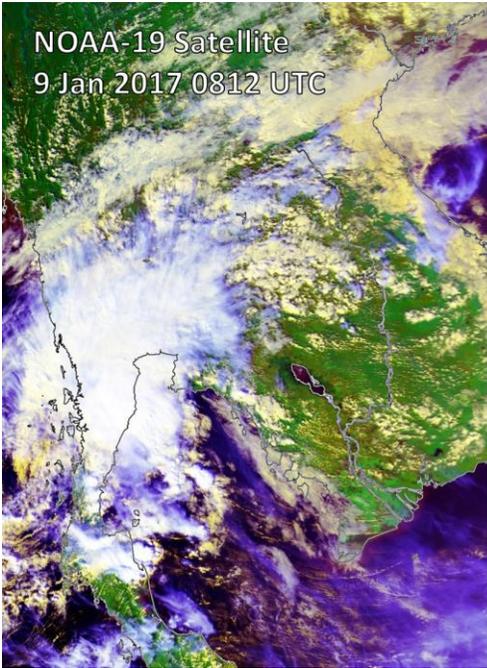


Figure 5: NOAA-19 satellite image on 9 January 2017 shows hotspot activities over the Mekong sub-region were relatively inactive in the first half of January due to shower activities.

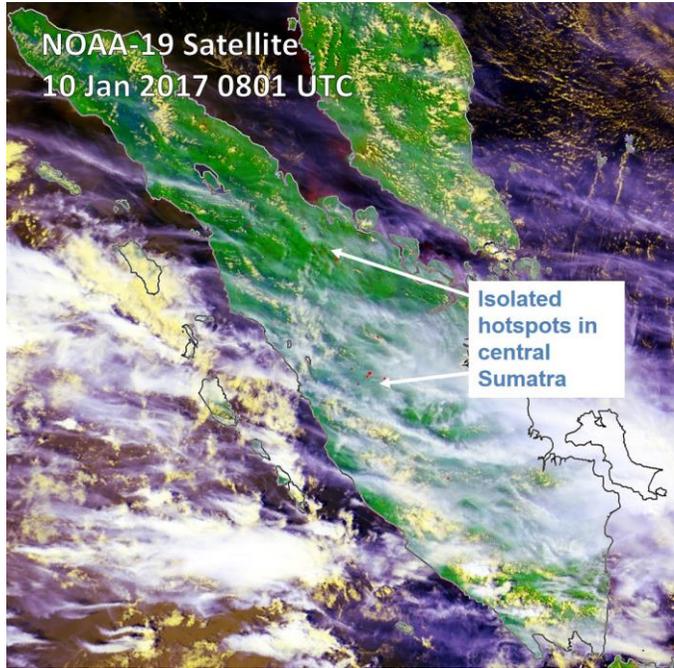


Figure 6: NOAA-19 satellite image on 10 January 2017 shows isolated hotspots emerged over parts of central Sumatra during brief period of dry weather.

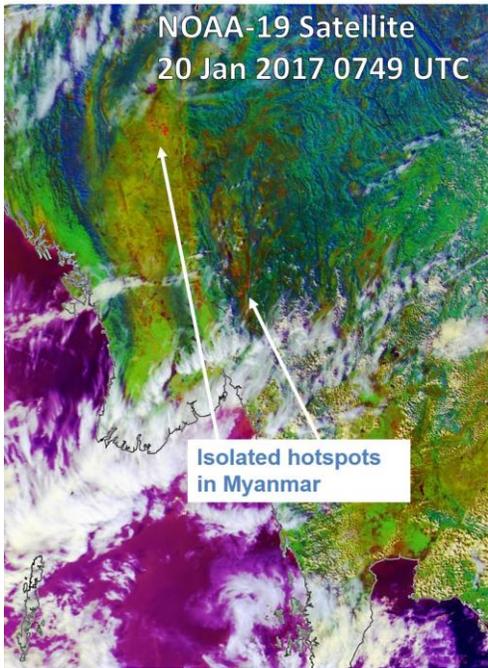


Figure 7: NOAA-19 satellite image on 20 January 2017 shows isolated hotspots began to emerge in Myanmar.

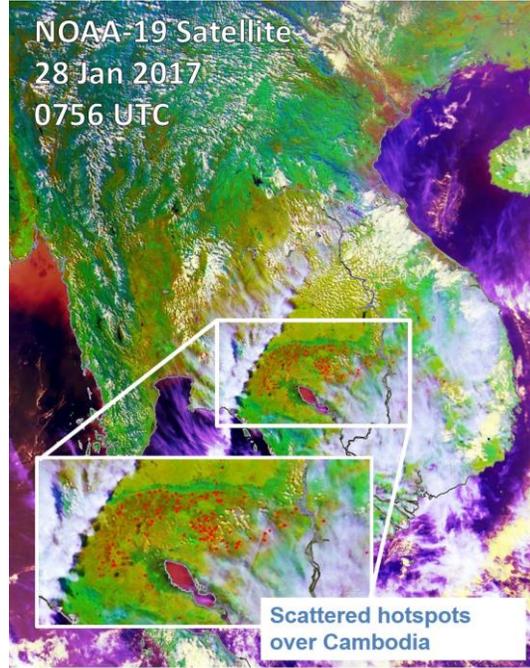


Figure 8: NOAA-19 satellite image on 28 January 2017 shows a cluster of scattered hotspots detected over northern Cambodia. Localised smoke plumes were observed to emanate from some of the hotspots.



*Figure 9: NOAA-19 satellite image on 30 January 2017 shows hotspot activities subdued over Kalimantan due to shower activities.*

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

2.5 In January 2017, there were several clusters of scattered hotspots detected in the northern ASEAN region (as shown in Figure 10). Most notably, a cluster of high density hotspots was detected in the northern half of Cambodia including the provinces of Preah Vihear, Kampong Thom, Kratie and Mondulkiri. Scattered hotspots were also detected in Myanmar, central Thailand and Lao PDR. In the southern ASEAN region, the overall number of hotspots detected remained low. Isolated hotspots were detected mainly in Sumatra, West Kalimantan and Sarawak.

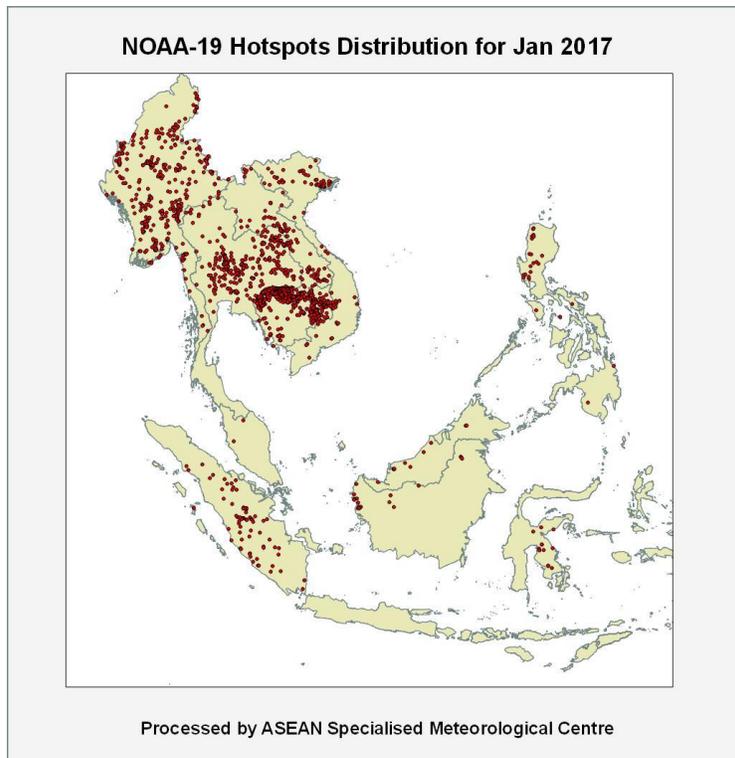


Figure 10: NOAA-19 hotspots distribution in January 2017.

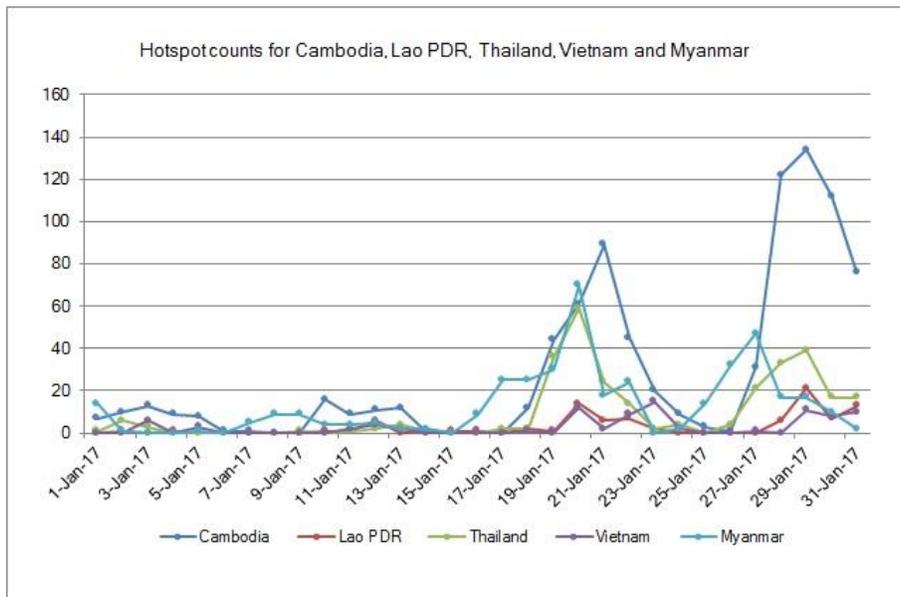


Figure 11: Hotspot Counts in Cambodia, Lao PDR, Thailand, Vietnam and Myanmar in January 2017.

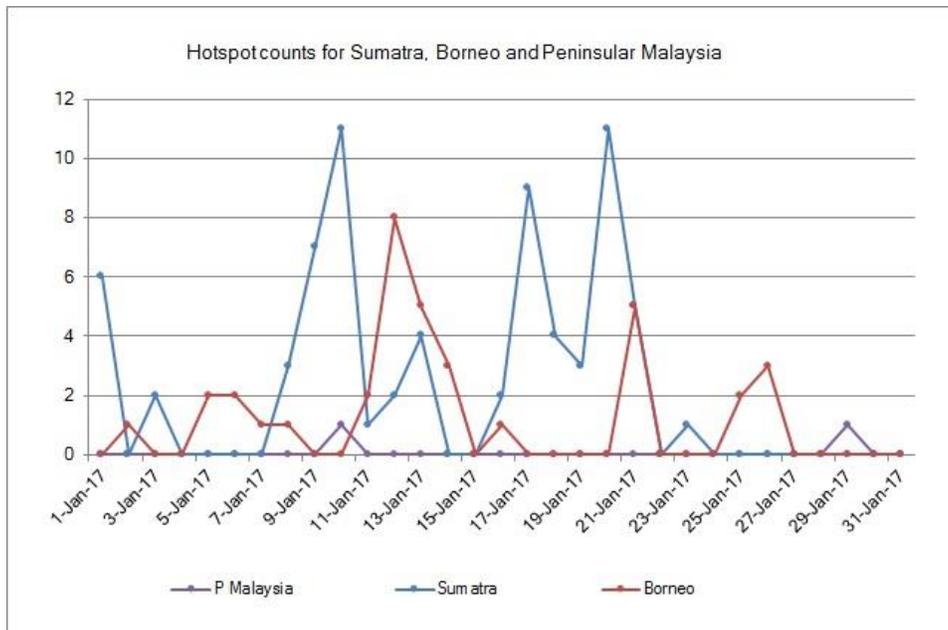


Figure 12: Hotspot Counts in Sumatra, Borneo and Peninsular Malaysia in January 2017.

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

3.1 Climate models from major climate centres project neutral ENSO conditions in the coming season until May 2017, and the weak cool anomalies over the Niño 3.4 region to gradually weaken by April 2017.

3.2 Typically, La Niña brings wetter-than-normal rainfall conditions to most parts of Southeast Asia, and has a less pronounced impact on the weather over the near-equatorial region during the Northeast Monsoon season. Locally-specific impact differs from place to place and for different seasons.

3.3 In January 2017, the Indian Ocean Dipole (IOD) continued to remain at neutral levels, as shown in Figure 13. International climate models forecast the IOD to be neutral and would unlikely have a significant influence on the weather over the region for 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.

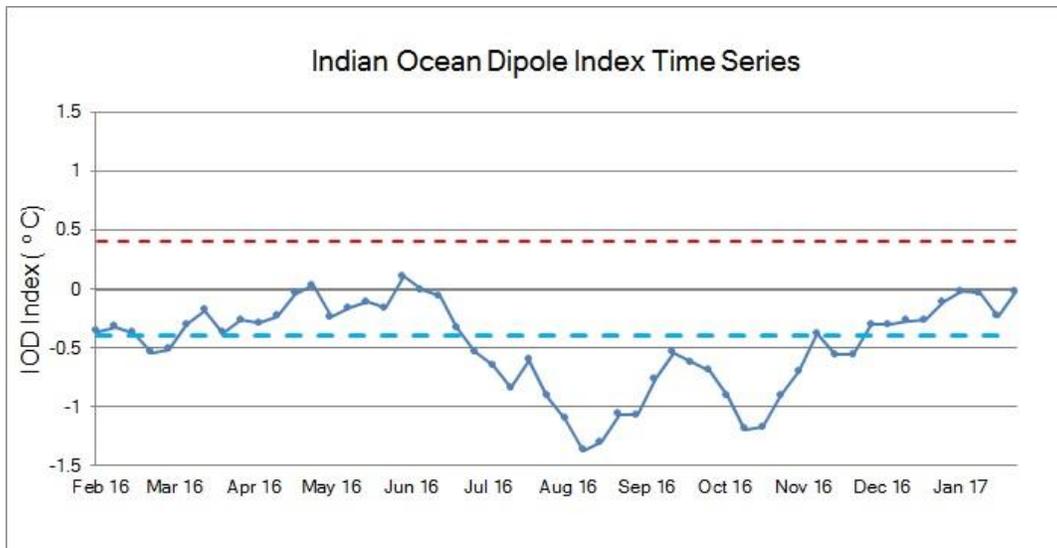


Figure 13: Indian Ocean Dipole (IOD) index time series. The IOD index is at the neutral level for January 2017. (Source: Bureau of Meteorology)

#### 4. Outlook

4.1. In the upcoming February-March-April season, Northeast Monsoon conditions are expected to persist over the ASEAN region until March 2017. During the Northeast Monsoon season, extended periods of dry weather conditions can be expected over the northern ASEAN region. Hotspot activities are likely to be high during this period. Vigilance should therefore be maintained for any escalation in hotspot activities in the fire-prone areas during this period. In late March or early April, the Northeast Monsoon is expected to gradually give way to the Inter-monsoon season, which is typically accompanied by an increase of shower activities.

4.2. In the southern ASEAN region, the wet weather conditions are expected to persist particularly over Indonesia. For the near-equatorial region, shower activities interspersed with brief periods of drier weather are likely to prevail. Isolated hotspot activities may emerge during brief periods of dry weather conditions particularly in Sumatra and Kalimantan. As the Northeast Monsoon season gradually transitions to the Inter-monsoon season, the monsoon rain band would migrate northwards towards the Equator. The prevailing north-westerly or north-easterly winds in the region are expected to weaken and becoming light and variable in direction.

4.3. Wetter than usual weather conditions are forecast over the southern ASEAN region in the third week of February 2017. In the last week of February 2017, a monsoon surge is forecast to bring enhanced shower activities over the southern ASEAN region and above-normal rainfall can be expected over the equatorial region.

4.4. For the February 2017 to April 2017 season, slightly above-normal to above-normal rainfall is expected mainly for Thailand, southern Vietnam and northern Philippines. For the rest of the northern ASEAN region, near-normal rainfall is forecast. In the southern ASEAN region, near-normal rainfall to slightly above-normal rainfall is expected to prevail except in Kalimantan, southern Sumatra and Java, where slightly below-normal rainfall is forecast in February 2017. The rainfall outlooks for the February 2017 – April 2017 season are shown in Figure 14.

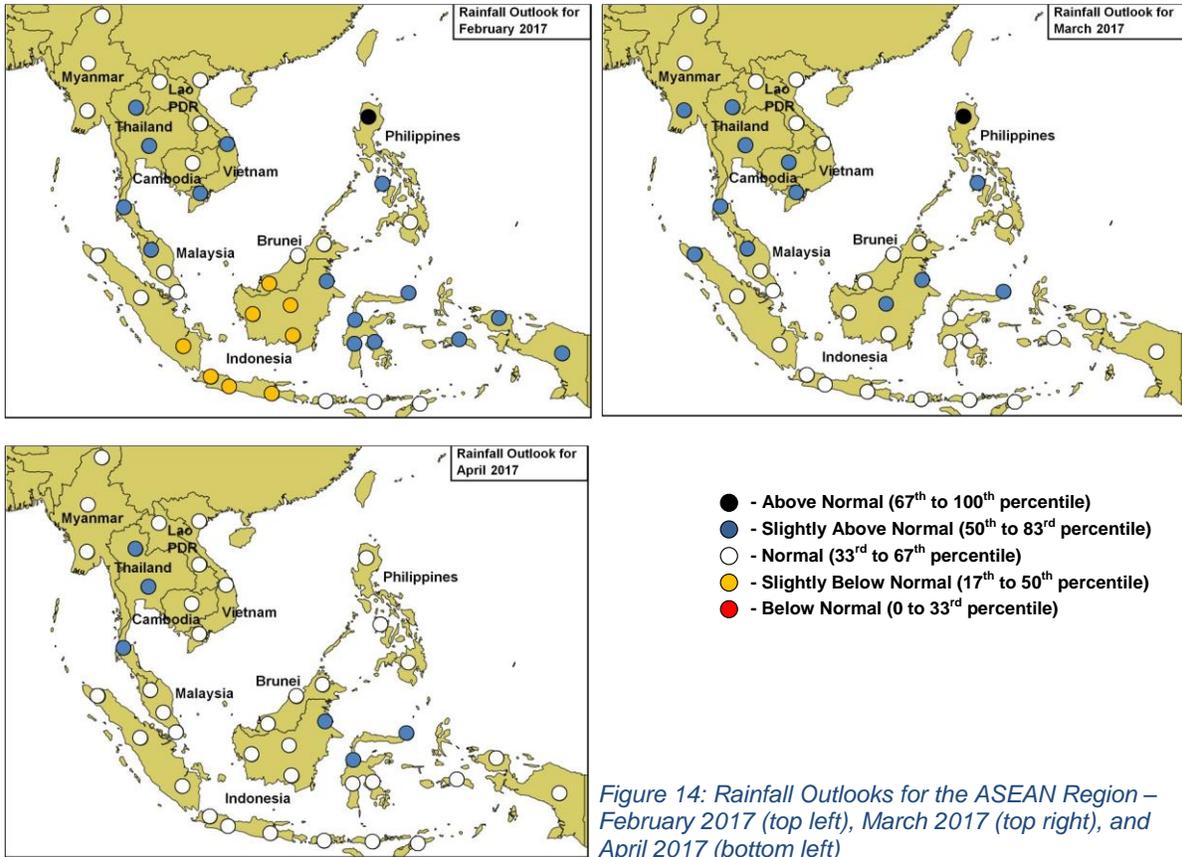


Figure 14: Rainfall Outlooks for the ASEAN Region – February 2017 (top left), March 2017 (top right), and April 2017 (bottom left)