Nineteenth Session of the ASEAN Climate Outlook Forum (ASEANCOF-19)

21 – 25 November 2022, Meteorological Service Singapore

Consensus Bulletin for December-January-February (DJF) 2022/2023 Season

INTRODUCTION

The ASEAN Climate Outlook Forum (ASEANCOF) is an avenue to collaboratively develop consensus-based seasonal climate outlooks and related information on a regional scale. The forum's outlook and its activities contribute significantly to one of the key roles of the ASEAN Specialised Meteorological Centre (ASMC), which is to conduct climate and seasonal prediction for the Association of Southeast Asian Nations (ASEAN) region through pooling the expertise of ASEAN National Meteorological and Hydrological Services (NMHSs). In 2021, the ASEANCOF Working Group was established with the goal to guide and support the long-term development of ASEANCOF, in particular with regard to the implementation of objective outlooks.

The Nineteenth session of ASEANCOF (ASEANCOF-19) was organised by Meteorological Service Singapore (MSS) in collaboration with ASMC and the ASEANCOF Working Group. Participants from the NMHSs of ASEAN Member States created a consensus forecast for the boreal winter monsoon 2022-2023 in the ASEAN region. The consensus for the December-January-February (DJF) 2022-2023 outlook was achieved through an online session, which included presentations from different Global Producing Centres (GPCs), NMHSs, questionnaires, and discussions regarding the current climate conditions and predictions for Southeast Asia. In particular, ASEANCOF considered the influence of the El Niño Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) on the climate system over Southeast Asia. The theme of ASEANCOF-19 was climate services for agriculture. On the last day of

ASEANCOF-19, a webinar was held involving both producers and users of seasonal outlooks, including presentations on using climate services for agriculture.

CONDITIONS AND OUTLOOK

Recent analysis of sea surface temperature (SST) anomalies over the equatorial Pacific shows below-average SSTs across the central and eastern equatorial Pacific Ocean indicative of La Niña.

The international climate outlook predicts that the La Niña is likely to weaken during DJF 2022/2023, although overall still indicates La Niña conditions. After DJF 2022/2023, most models predict the ENSO state to gradually return to neutral.

While a negative Indian Ocean Dipole (IOD) was present for much of the second half of 2022, models predict the IOD to return to neutral by the end of 2022.

The onset of the Northeast monsoon season has been or is expected to be near average in many parts of the region. Over much of Southeast Asia, the strength of the Northeast monsoon is expected to be near average or stronger than average, based on model predictions and supported by the La Niña conditions.

Overall, the tropical cyclone frequency is expected to be near average in the Bay of Bengal and around the South China Sea and the Philippine Sea.

Taking into consideration the national level forecasts, the present state of the climate, and the forecasts available from the GPCs, ASEANCOF-19 agreed on the following consensus-based outlook for DJF 2022/2023 over the ASEAN region:

RAINFALL

For the upcoming boreal (Northern Hemisphere) winter season (DJF 2022/2023):

Over the Maritime Continent, a mix of below to above normal rainfall is predicted. In particular, near to above normal rainfall is most likely over much of the Philippines and Brunei Darussalam, while near normal rainfall is most likely over much of Malaysia and Singapore.

Over Mainland Southeast Asia, below normal rainfall is most likely over northern parts, including northern Myanmar as well as northern Viet Nam. Above normal rainfall is most likely over southern and southeastern Mainland Southeast Asia, including southern Thailand, parts of Cambodia, and southern Viet Nam. Elsewhere, near normal rainfall is predicted.[1]

---

[1] This is based on the climatology period 1991-2020. However, at the national level, Myanmar is using the 1981-2010 climatology as their base period.

TEMPERATURE

For the upcoming boreal (Northern Hemisphere) winter season (DJF 2022/2023):

Over the ASEAN region, a mix of below- to above-normal temperature is predicted. Above normal temperature is most likely over parts of Myanmar, northwestern Viet Nam and the eastern Maritime Continent, while below to near normal temperature is most likely over southeastern Mainland Southeast Asia. Elsewhere, near or near to above normal temperature is predicted.[2]
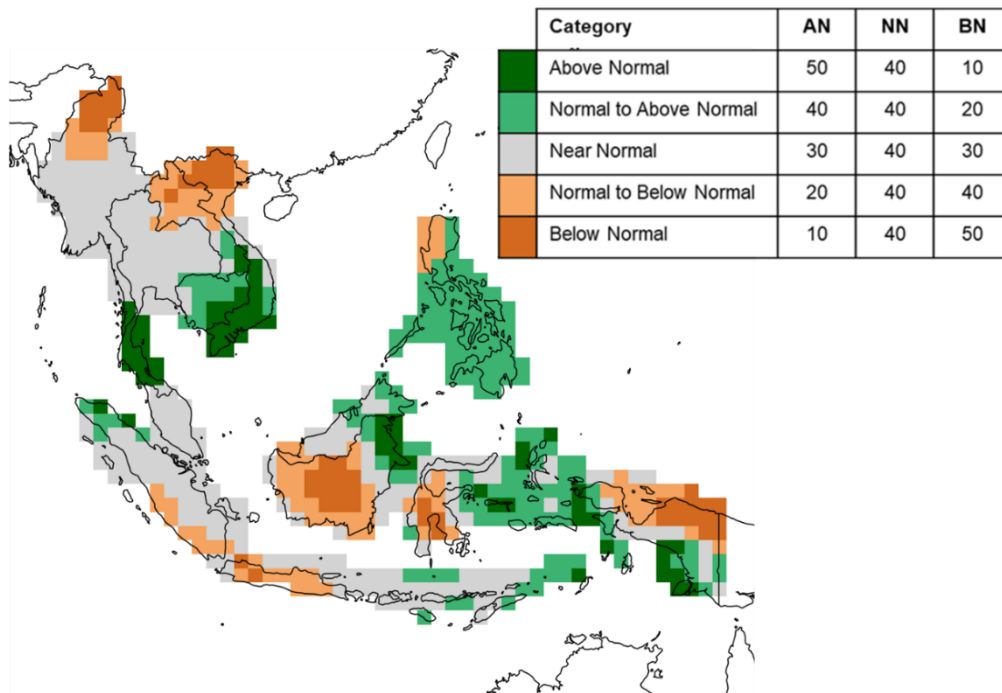
Refer to **Annex A** for reference on what is meant by "above, near, or below normal" in the outlook. For more information on the boreal (Northern Hemisphere) winter monsoon outlook and further updates on the national scale, the relevant NMHSs should be consulted (see **Annex B**).

---

[2] This is based on the climatology period 1991-2020. However, at the national level, Myanmar is using the 1981-2010 climatology as their base period.
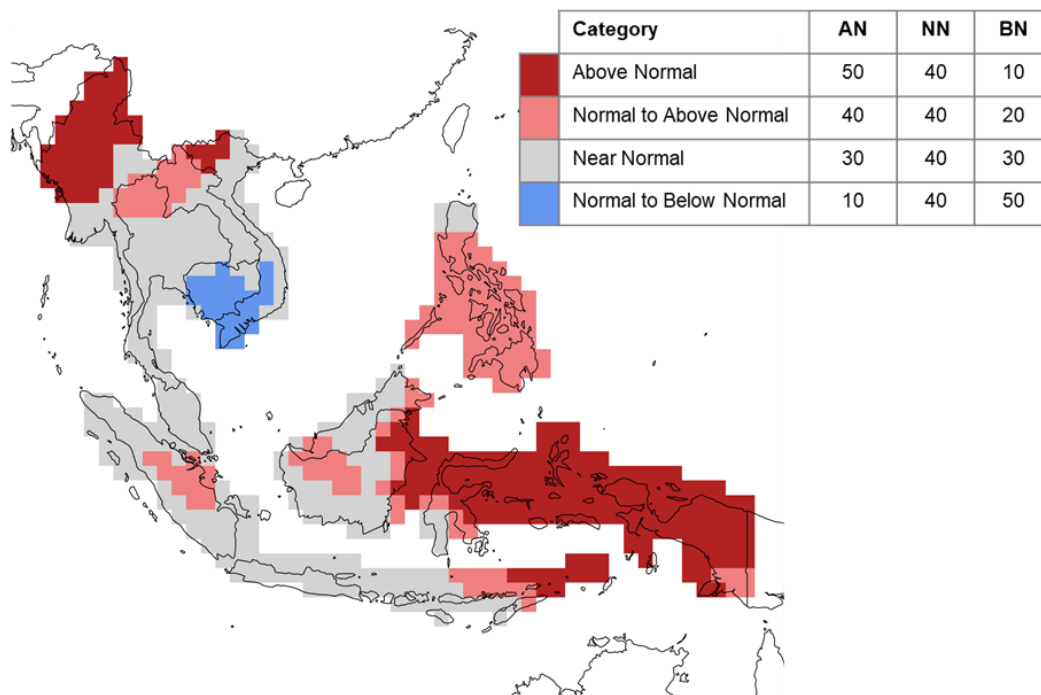
The following maps provide the probabilistic outlooks for DJF 2022/2023 season in terms of tercile categories of "Above Normal" (AN: upper tercile), "Near Normal (NN: middle tercile) and "Below Normal" (BN: lower tercile).

PROBABILISTIC RAINFALL OUTLOOK

Category	AN	NN	BN
Above Normal	50	40	10
Normal to Above Normal	40	40	20
Near Normal	30	40	30
Normal to Below Normal	20	40	40
Below Normal	10	40	50

PROBABILISTIC TEMPERATURE OUTLOOK

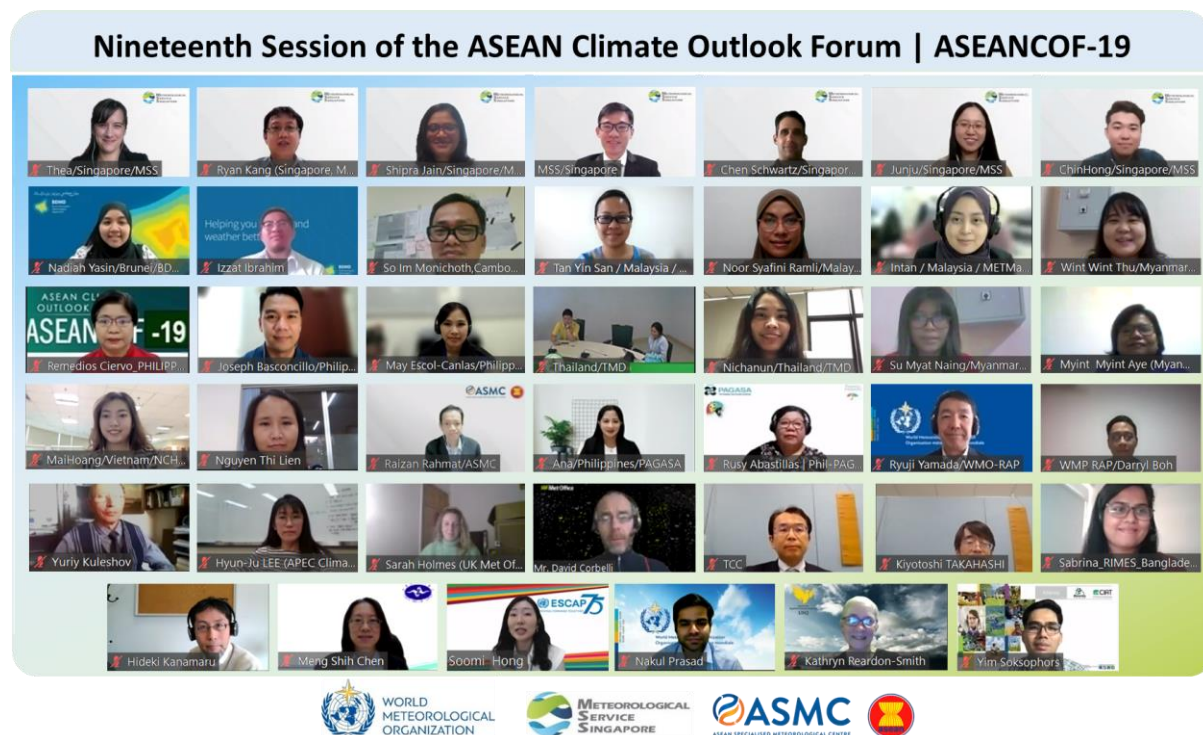| Category	AN	NN	BN
Above Normal	50	40	10
Normal to Above Normal	40	40	20
Near Normal	30	40	30
Normal to Below Normal	10	40	50

ACKNOWLEDGEMENTS

Photo of online participants from NMHSs, GPCs, WMO-RAP, ASMC, ASEANCOF Working Group, RIMES, and presenters of the webinar for ASEANCOF-19. From top left (across): Thea Turkington, Ryan Kang, Shipra Jain, Wee Leng Tan, Chen Schwartz, Ng Junju, Tjoa Chin Hong, Nadiahtul 'Afifah Haji Mohd Yasin, Muhammad Khairul Izzat Ibrahim, So im Monichoth, Myint Myint Aye, Su Myat Naing, Wint Wint Thu, Tan Yin San, Nur Intan Irzwanee Nurashid, Noor Syafini Ramli, Remedios L Ciervo, Dr Joseph Q Basconcillo, Mary Joe Alma R Escol-Canlas, Mr. Worapon Sitchanukrist, Ms. Kesrin Hanprasert, Miss Nichanun Trachow, Hoang Thi Mai, Nguyen Thi Lien, Raizan Rahmat, Analiza Solis, Rusy Abastillas, Ryuji Yamada, Darryl Boh, Yuriy Kuleshov, Hyun -ju Lee, Sarah Holmes, David Corbelli, Takashi Yamada, Kiyotoshi Takahashi, Sabrina Sultana, Hideki Kanamaru, Meng-Shih Chen, Soomi Hong, Nakul Prasad, Kathryn Reardon-Smith, and Yim Soksophors.

The following figures include mean rainfall and temperature and tercile boundary climatologies to reference against the consensus outlook. Only a single source of data for each variable is provided: for rainfall CHIRPS (Funk et al. 2014) and for temperature ERA5 (Hersbach et al. 2019). For more representative climatologies, reference should be made also against observational datasets known to better characterize local patterns (e.g. quality-controlled station data from the respective NMHSs).
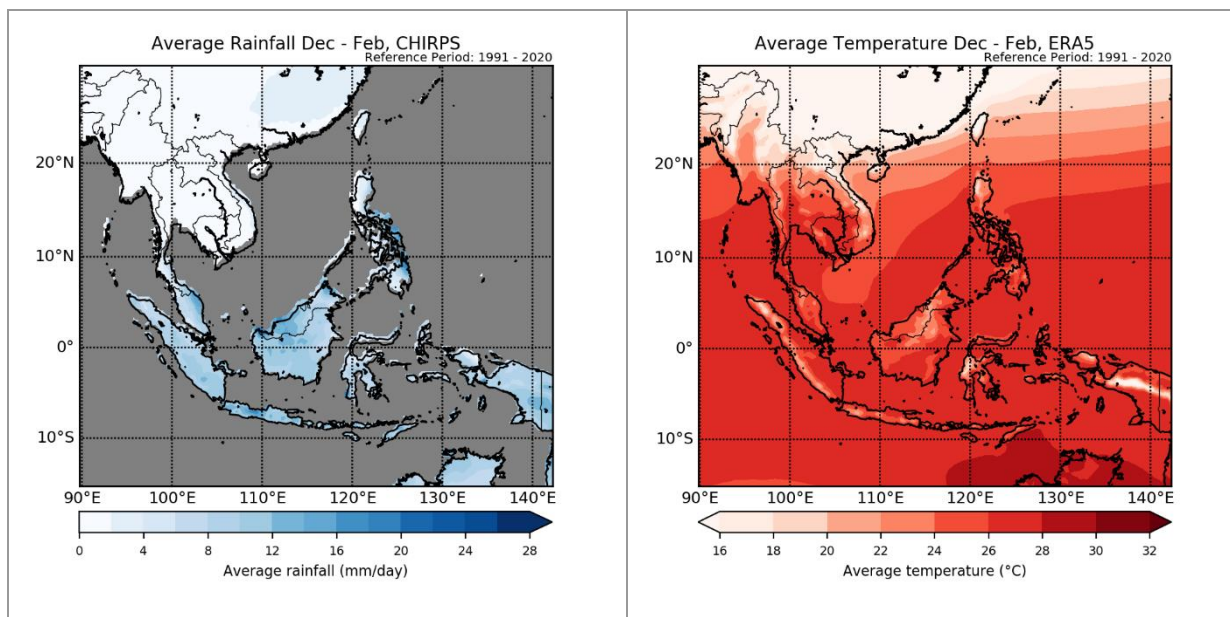

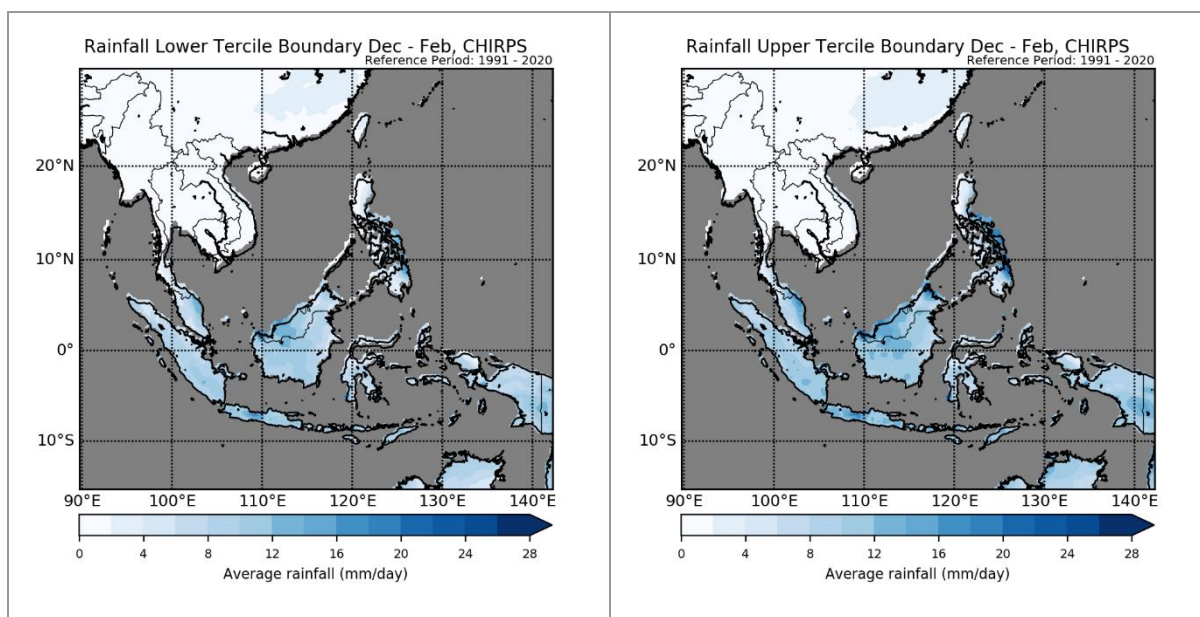**Figure A1: Mean rainfall (left, CHIRPS) and mean temperature (right, ERA5) for DJF for the climatology period 1991-2020.**

Figure A2: Rainfall climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1991-2020 using CHIRPS.
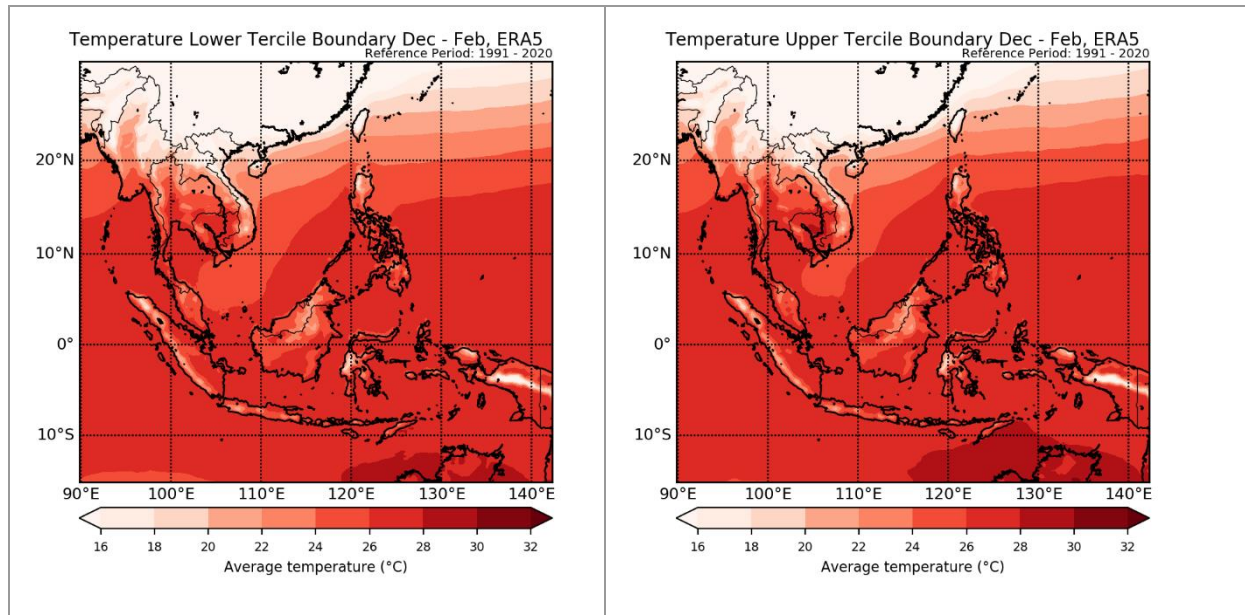
Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1991-2020 from ERA5.

- Brunei Darussalam Meteorological Department (BDMD)

http://www.met.gov.bn/

- Department of Meteorology, Cambodia

http://www.cambodiameteo.com/map?menu=3&lang=en

- Badan Meteorologi, Klimatologi dan Geofisika, Indonesia (BMKG)

http://www.bmkg.go.id

- Department of Meteorology and Hydrology (DMH), Lao PDR

http://dmh.monre.gov.la/

- Malaysian Meteorological Department (MMD)

http://www.met.gov.my/

- Department of Meteorology and Hydrology (DMH), Myanmar

https://www.moezala.gov.mm/

- Philippines Atmospheric, Geophysical and Astronomical Services Administration

(PAGASA)

http://bagong.pagasa.dost.gov.ph/

- Meteorological Service Singapore (MSS)

http://www.weather.gov.sg/home/

- Thai Meteorological Department (TMD)

http://www.tmd.go.th/en/

- National Center for Hydro-Meteorological Forecasting (NCHMF), Vietnam

https://nchmf.gov.vn/KttvsiteE/en-US/2/index.html

SUMMARY

The rainfall and temperature outlooks were representative of the actual conditions over much of Southeast Asia for June-July-August 2022 (JJA 2022). Much of the equatorial region experienced above-normal rainfall with a range of below to above normal rainfall elsewhere.

In May 2022, La Niña conditions were present. The international climate outlooks predicted a weakening of La Niña conditions during JJA 2022 (although still overall indicating La Niña conditions), after which the ENSO state was predicted to be either cool ENSO neutral or La Niña. The consensus from ASEANCOF-18 was that La Niña conditions were likely during JJA 2022, with a negative IOD to develop during JJA 2022.

Based on the assessment as part of ASEANCOF-19, SEA RCC Climate Monitoring Node, and the WMO El Niño/La Niña Updates, the JJA 2022 period experienced La Niña conditions while a negative Indian Ocean Dipole developed.

In the sections below, a combination of global gridded data and reviews by National Meteorological and Hydrological Services (NMHSs) was used to verify the outlook.

JJA 2022 RAINFALL OUTLOOK

Over much of the southern ASEAN region, near to above normal rainfall is predicted. Near to above normal rainfall is predicted over Brunei Darussalam and many parts of Malaysia, with above normal rainfall predicted most elsewhere. The exceptions include parts of the western and eastern Maritime Continent, where near to below normal rainfall is predicted.

Over much of the northern ASEAN region, a mix of below to above normal rainfall is predicted. Near to below normal rainfall is predicted over the western and southeast portion of Mainland Southeast Asia, and northwest Philippines. Near to above normal rainfall is predicted over portions of northeast and southern Mainland Southeast Asia, and southern Philippines. Elsewhere in the northern ASEAN region, near normal rainfall is predicted.

Much of the outlook agreed with the CHIRPS gridded product in **Figure C1.** Most of the southern ASEAN region typically experiences above normal rainfall during JJA when a La Niña is present, similar to what was seen in JJA 2022. For the northern ASEAN region, where a mix of below- to above-normal rainfall was predicted, a mix of below to above normal rainfall was observed. Typically, coastal parts of Myanmar experience less rainfall during JJA when a La Niña is present, similar to in Figure C1.

Based on the country reviews by NMHSs (**Table C1**), there was also generally good agreement between the outlook values averaged over the country and the observed values. The exception was for parts of Mainland Southeast Asia, where more rainfall was generally observed (Table C1, in bold). There were some differences between the country reviews

(based on rain gauge data) and the CHIRPS gridded product in Figure C1. Over Myanmar and the Philippines, CHIRPS recorded below normal rainfall (BN), less rainfall compared to the national assessment (NN and AN). For parts of Thailand and Malaysia, CHIRPS above normal rainfall (AN), more rainfall compared to the country assessment (NN). However, some differences between the gridded data and rain gauge data are to be expected.
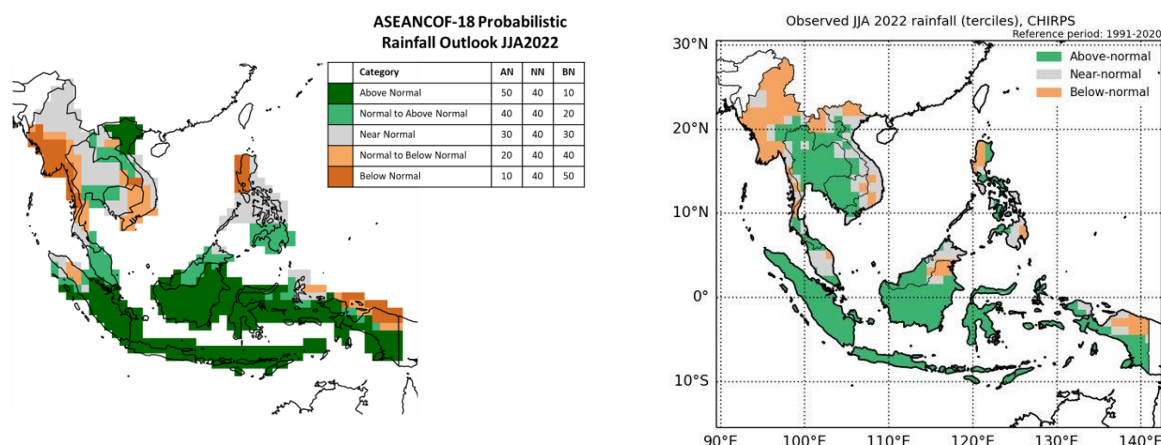

Figure C1: JJA 2022 ASEANCOF outlook (left) observed JJA rainfall in terciles (right, climatology 1991-2020). The rainfall dataset is CHIPRS (Funk et al 2014).

Table C1: Observed Rainfall based on the national level assessment. The Most Likely Category from the ASEANCOF-18 outlook (MLC), the observed rainfall as noted by the NMHS (obs. tercile) are included. The tercile categories are above normal (AN), near normal (NN), and below normal (BN). Bold texts highlights discrepancies between the outlook and observed.

Country	Location (- indicates the entire country)	Outlook (MLC)	NMHS observed tercile
Brunei	-	NN – AN (40%)	NN
Cambodia	Northwest	NN – AN (40%)	AN
	East	BN – NN (40%)	**AN**
	Rest	NN (40%)	**AN**
Malaysia	West Sarawak	AN (50%)	**NN**
	Rest	NN – AN (40%)	NN
Myanmar	North	NN (40%)	NN
	Rest	BN (50%)	**AN**
Philippines	Northwest	BN (50%)	**NN**
	South	NN – AN (40%)	NN
	Rest	NN (40%)	NN
Singapore	-	AN (50%)	AN
Thailand	Westernmost	BN – NN (40%)	NN
	Southeast	NN – AN (40%)	NN
	Rest	NN (40%)	**AN**
Viet Nam	North	AN (50%)	NN
	South	BN – NN (40%)	BN
	Rest	NN (40%)	NN

JJA 2022 TEMPERATURE OUTLOOK

Near to above normal temperature is predicted over the ASEAN region. The highest likelihood of above normal temperature is over the southern Maritime Continent and Lao PDR, while near normal temperature is predicted over northern Myanmar, northern and central Viet Nam, and parts of the western Maritime Continent. An equal chance of near to above normal temperature is predicted over southern Myanmar, Thailand, Cambodia, southern Viet Nam, the Philippines, Malaysia, and Brunei Darussalam.

Most of Mainland Southeast Asia, along with central and southeastern parts of the Maritime Continent, experienced above normal temperature as depicted in the ERA5 observed data (**Figure C2**). The western and central parts of the equatorial region experienced a mix of below and near normal temperature, in line with the above normal rainfall (Figure C1, right). Overall, regions of above normal and near to above normal temperature in the outlook is in good agreement with the gridded observations.

The results from NMHS country reviews (Table C4) also observed primarily near to above normal temperature, although again there were some differences between the national reviews and the ERA5 data. Near normal temperature was observed by most NMHSs, with just Myanmar and Viet Nam observing above normal temperatures. Cambodia and Thailand observed near normal temperature as opposed to above normal temperature by the gridded product, while northern Myanmar, the Philippines and Malaysia observed near normal temperature as opposed to a mix of below to above normal temperature by the gridded product. However, some differences between the gridded data and station data are to be expected.
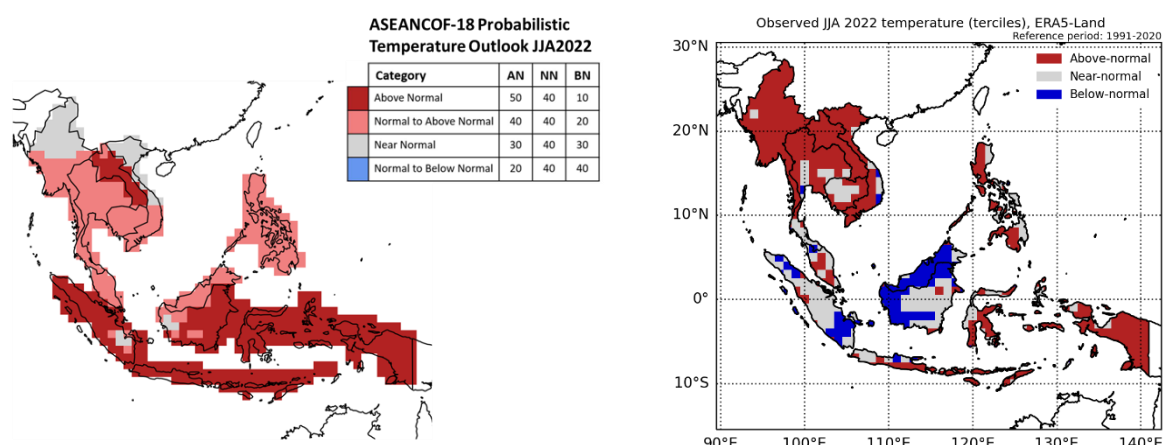

Figure C2: JJA 2022 ASEANCOF outlook (left) observed JJA temperature in terciles (right, climatology 1991-2020). The temperature dataset is ERA5-Land (Muñoz Sabater et al. 2019).

Table C2: Observed temperature based on the national level assessment. The Most Likely Category from the ASEANCOF-18 outlook (MLC), the observed temperature as noted by the NMHS (obs. tercile) are included. The tercile categories are above normal (AN), near normal (NN), and below normal (BN). Bold texts highlights discrepancies between the outlook and observed.

Country	Location (- indicates the entire country)	Outlook (MLC)	NMHS observed tercile
Brunei	-	NN – AN (40%)	NN
Cambodia	-	NN – AN (40%)	NN
Malaysia	-	AN (50%)	**NN**
Myanmar	North	NN (40%)	NN
	Rest	NN – AN (40%)	AN
Philippines	-	NN – AN (40%)	NN
Singapore	-	AN (50%)	**NN**
Thailand	-	NN – AN (40%)	NN
Viet Nam	North and central	NN (40%)	**AN**
	Rest	NN – AN (40%)	AN

SIGNIFICANT EVENTS

There were several notable rainfall-related events throughout the ASEAN region between June and August 2022. For the ASEAN region, both flood and drought related events were reported. Malaysia reported floods in June with 598 people affected and Brunei Darussalam had squall-type weather that led to flash floods, fallen trees, and damages to properties (e.g., roof blown off). Thailand had heavy rainfall and flash floods reported over several areas in July, and Cambodia experienced flood and drought in JJA 2022. The Philippines recorded 6 tropical cyclones during JJA 2022, with one enhancing the Southwest monsoon and leading to flooding.

There were fewer notable temperature-related events in the ASEAN region between June and August 2022. Viet Nam experienced extreme temperatures with heat waves during 8 periods between June and August. Notably, during the period of July 25-27, some places had the maximum temperature values exceeding the historical value of the same period: including Muong La reaching 40.5°C on 26/7/2022 (historical record value: 39.0°C).

REFERENCES

CHIRPS: Funk et al. 2014: A quasi-global precipitation time series for drought monitoring: U.S. Geological Survey Data Series 832, 4 p., doi:110.3133/ds832.

ERA5: Hersbach et al. 2019: Global reanalysis: goodbye ERA-Interim, hello ERA5. ECMWF Newsletter, doi:10.21957/vf291hehd7.

Muñoz Sabater et al. 2019: ERA5-Land monthly averaged data from 1981 to present. Copernicus Climate Change Service (C3S) Climate Data Store (CDS), doi:10.24381/cds.68d2bb3.