Twenty First Session of the ASEAN Climate Outlook Forum (ASEANCOF-21)

17th, 20th, 21st and 23rd November 2023, ASEAN Specialised Meteorological Centre

Consensus Bulletin for December-January-February (DJF) 2023/2024 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 Twenty-First session of ASEANCOF (ASEANCOF-21) was organised by MSS and the ASEANCOF Working Group. ASEANCOF-21 marked 10 years since the first ASEANCOF was held in December 2013. Participants from the NMHSs of ASEAN Member States created a consensus forecast for the boreal winter monsoon 2023/2024 in the ASEAN region. The consensus for the December-January-February (DJF) 2023/2024 outlook was achieved through an online session, which included presentations from different NMHSs, questionnaires, and discussions regarding the current climate conditions and predictions for Southeast Asia. The theme of ASEANCOF-21 was 'The Future of Climate Services in Southeast Asia''. On the last day of ASEANCOF-21, a sharing session was held which included presentations on the review of 10 years of ASEANCOF, Pilot Hydrological Outlook Forum, and WISER Asia Pacific project.

CONDITIONS AND OUTLOOK

Recent analysis of sea surface temperature (SST) anomalies over the equatorial Pacific shows well above-average SSTs over the Nino3.4 region, along with atmospheric indicators such as trade wind strength and cloudiness, indicating El Niño conditions. In the Indian Ocean, a positive Indian Ocean Dipole is present.

For DJF 2023/2024, the current El Niño conditions are likely to continue. After DJF 2023/2024, global climate models predict the El Niño conditions to gradually weaken, though continue to indicate El Niño

conditions for much of the first half of 2024. The peak strength of the ongoing El Niño, based on Nino3.4 index, is predicted to be moderate to strong.

The positive IOD is predicted to weaken and return to IOD-neutral over DJF 2023/2024.

The onset of the Northeast monsoon season has been or is expected to be later than average for much of Mainland Southeast Asia, with near or later than average over some parts of the Maritime Continent. The strength of the Northeast monsoon is expected to be weaker than normal over most of the Southeast Asia, based on model predictions and supported by the ongoing El Niño conditions.

During DJF 2023/2024, tropical cyclone frequency is predicted to be below average around the Philippine Sea and the Bay of Bengal, and below to near average around South China Sea.

Taking into consideration the national level forecasts, the present state of the climate, and the forecasts available from the GPCs, ASEANCOF-21 agreed on the following consensus-based outlook for DJF 2023-24 over the ASEAN region:

RAINFALL

For the upcoming boreal (Northern Hemisphere) winter season (DJF 2023/2024):

Over much of the Maritime Continent, below- to near-normal rainfall is predicted, apart from over the equatorial region, where a mix of below- to above-normal rainfall is predicted.

For Mainland Southeast Asia, a mix of near- to above-normal rainfall is predicted. Near- to above-normal rainfall is predicted over parts of northern and central Mainland Southeast Asia, while below- to near-normal rainfall is predicted mainly over western parts. Elsewhere over this region, near-normal rainfall is predicted.

TEMPERATURE

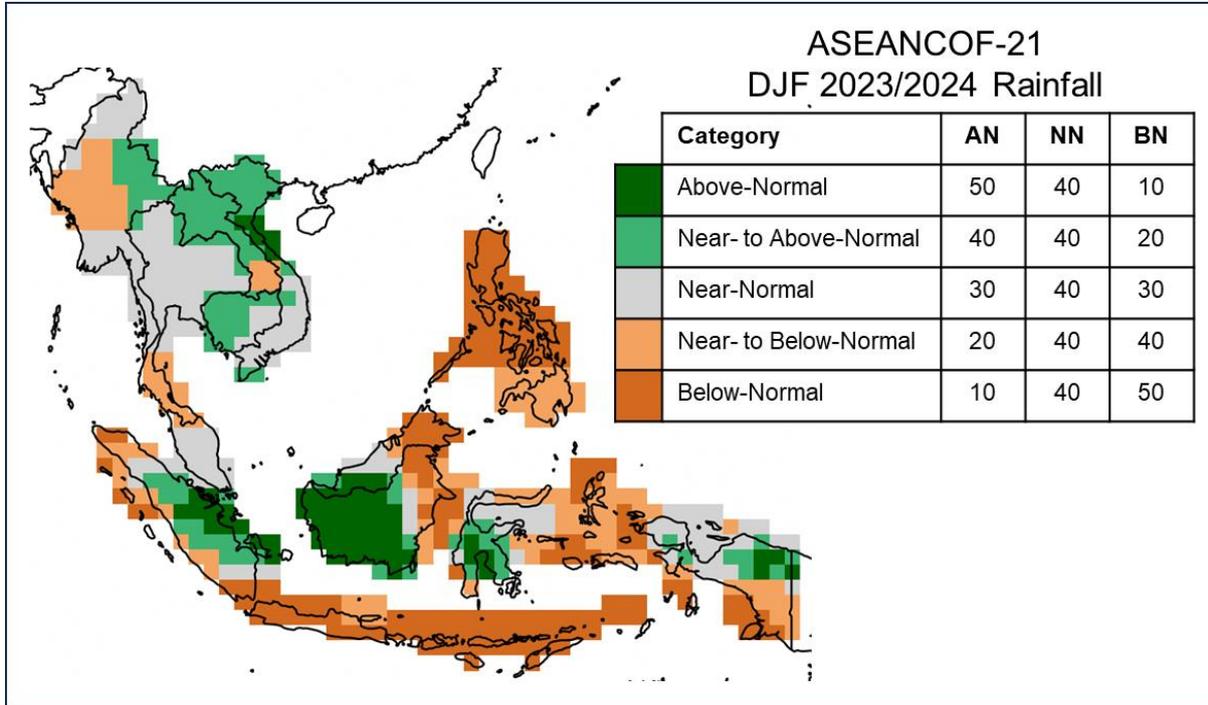For the upcoming boreal (Northern Hemisphere) winter season (DJF 2023/2024):

Near- to above-normal temperature is predicted over Southeast Asia. While above-normal temperature is predicted for most of the region, near-normal temperature is predicted over parts of northern and western Myanmar, and near- to above-normal temperature is predicted over parts of Lao PDR, Viet Nam, and the Philippines.

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**).
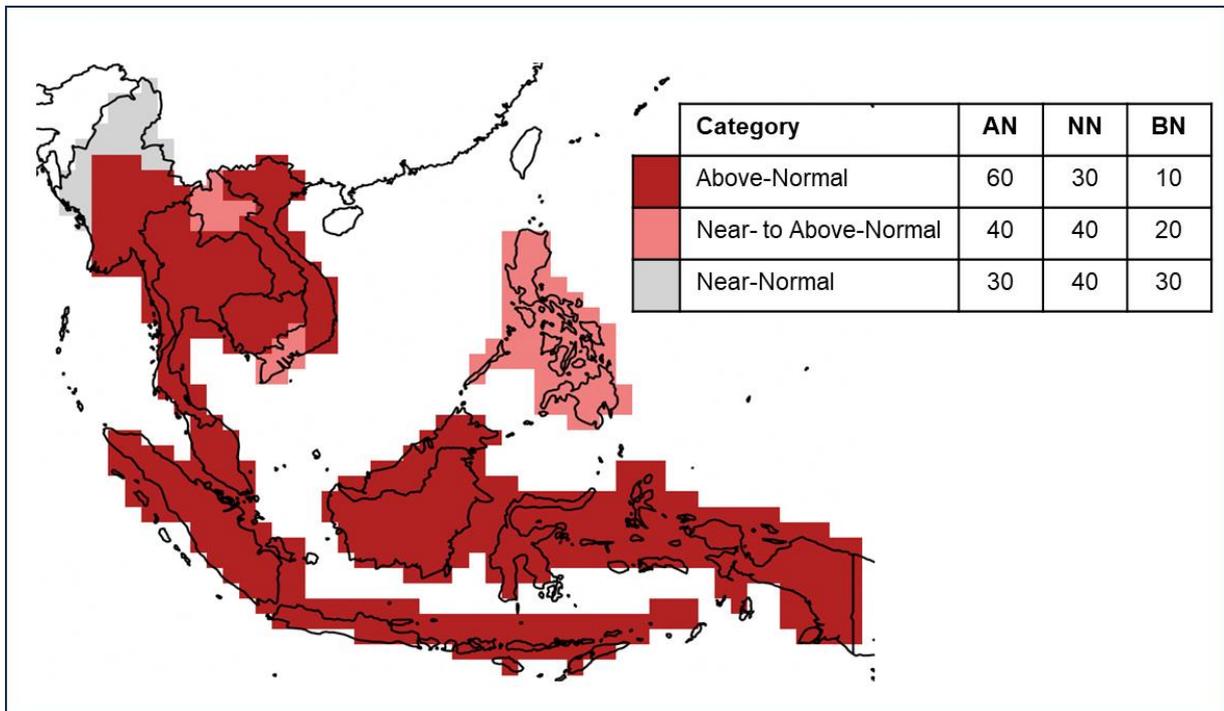
CONSENSUS MAPS FOR DJF 2023

The following maps provide the probabilistic outlooks for DJF 2023/2024 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

ASEANCOF-21
DJF 2023/2024 Rainfall

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

PROBABILISTIC TEMPERATURE OUTLOOK

Category		AN	NN	BN
	Above-Normal	60	30	10
	Near- to Above-Normal	40	40	20
	Near-Normal	30	40	30

ACKNOWLEDGEMENTS

Twenty First Session of the ASEAN Climate Outlook Forum | ASEANCOF-21

Photo of online participants from NMHSs, GPCs, ASMC, ASEANCOF Working Group, RIMES, and presenters of the webinar for ASEANCOF-21. From left to right:

First row: Wee Leng Tan, Shipra Jain, Chen Schwartz, Paromita Chakraborty, Vincent Yan, Ryan Ma, *Second row:* Thea, Eugene, Dayang Nurulinani binti Haji Jahari, Awang Satry Nugraha bin Abd Razak, Lonh Nrak, Ms. Sengchan Silattana, *Third row:* Ms. Nor Sherizan Darus, Ms. Heernani Abu Bakar, Ms. Nur Izzati Zaharah Mohamed Azam, Dr. Myint Myint Aye**,** Ms. Su Myat Naing, Wint Wint Thu, *Fourth row:* Mr. Junie G. Ruiz, Ms. Joanne Mae B. Adelino, Mr. Ryan T. Diocampo, Ms. Kesrin Hanprasert, Miss Ruthaikarn Buaphean, Ms**.** Nguyen Thanh Hoa, *Fifth row:* Ms. Le Lan Phuong, Rusy Abastillas, Itesh Dash, Mr. Jie Qui, Peter Khallil, Bill Merryfield, *Sixth row:* Andrew Colman, Elisabeth Thompson, Sarah Holmes, Anna Steynor , Mr. Hitoshi SATO, Hyun-ju Lee, Yuriy Kuleshov, *Seventh row:* Erkin Isaev, Soomi Hong, Nakul Prasad, Sadhu Zukhruf Janottama, Jasmine Tabije Alviar.

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).
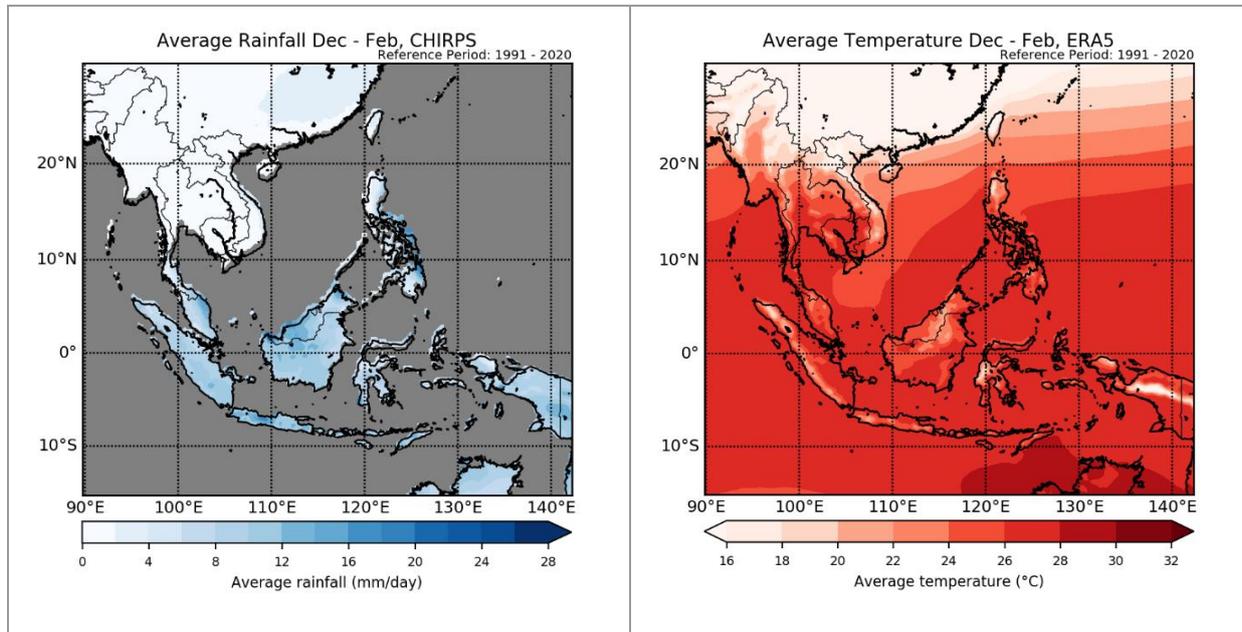

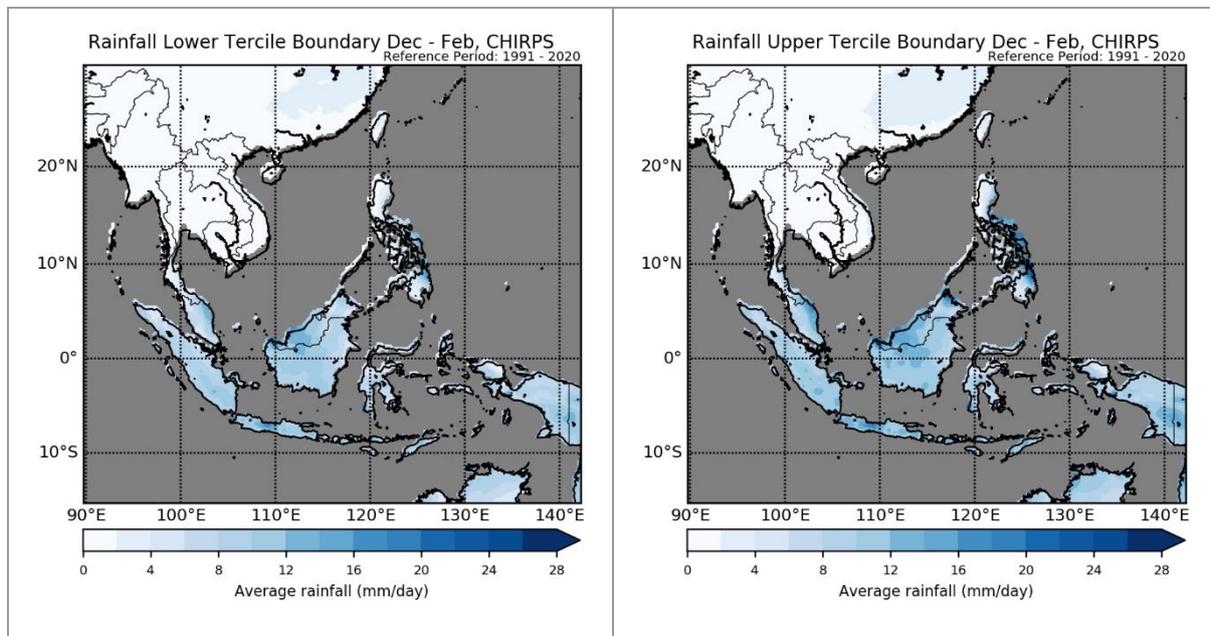**Figure A1: Mean rainfall (left, CHIRPS) and mean temperature (right, ERA5) for DJF for the climatology period 1991-2020.**

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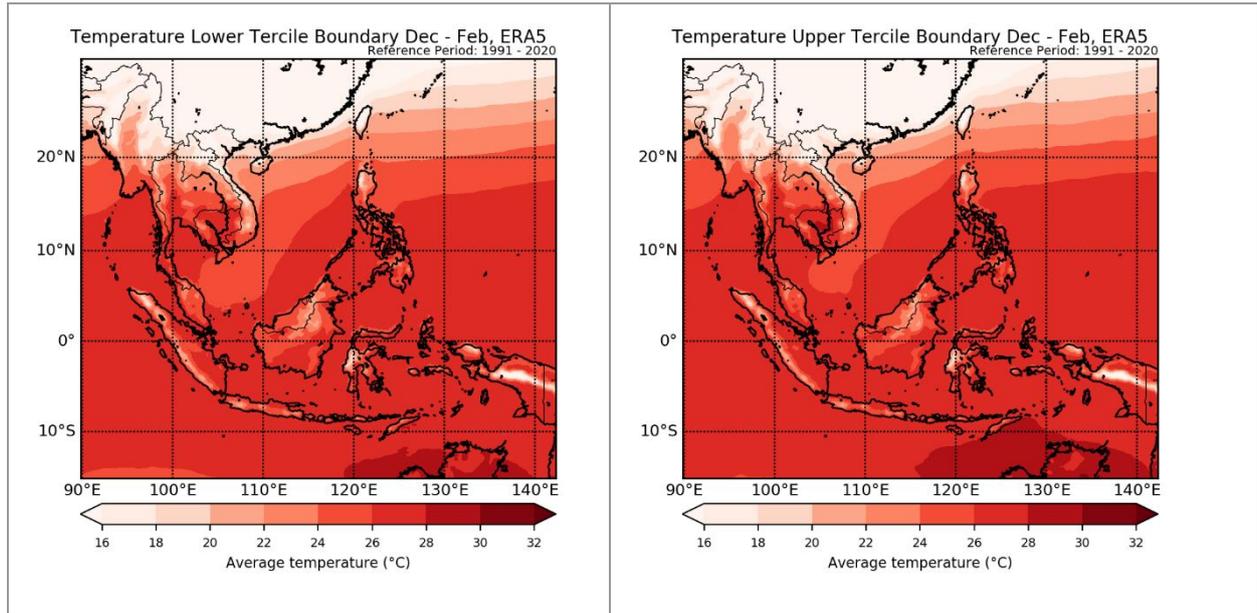
Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1991-2020 from ERA5.

ANNEX B: RAINFALL AND TEMPERATURE OUTLOOK FROM MODELS

The following figures show the starting point for the consensus discussion. From this point, NMHS representatives proposed changes, based on the typical impact during El Niño and IOD events, additional models (including statistical post-processed models), and assessment of model skill.
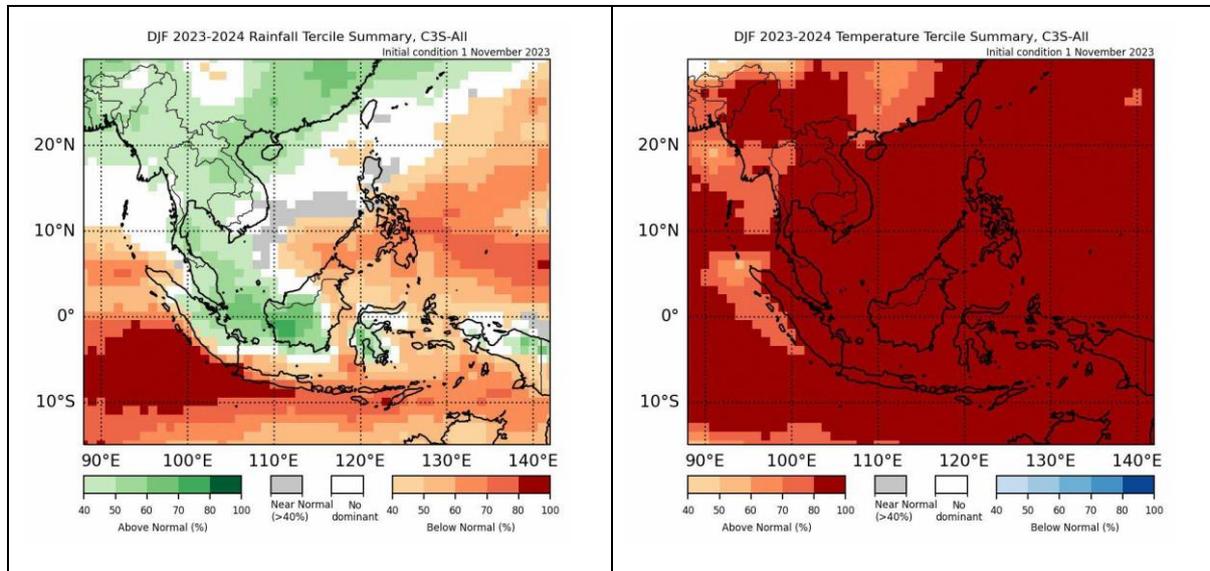

Figure B1: Outlook from the C3S seasonal models for DJF 2023/2024 for rainfall (left) and temperature (right). The models used included NCEP, ECMWF, JMA, UK Met Office, DWD, CMCC and MeteoFrance.

ANNEX C: NATIONAL METEOROLOGICAL SERVICES' CONTACT INFORMATION

- 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

ANNEX D: REVIEW OF JJA 2023 CONSENSUS OUTLOOK

SUMMARY

The rainfall outlooks were representative of the actual conditions over some parts of Southeast Asia whereas temperature outlooks were representative of actual conditions over most parts of Southeast Asia for June-July-August (JJA) 2023. The region experienced a mix of below to above-normal rainfall during JJA 2023.

In JJA 2023, Nino3.4 index showed El-Nino conditions, but atmospheric indicators continued to show ENSO-neutral conditions. The international climate outlooks predicted a high likelihood for El Niño to become established during JJA 2023. After JJA 2023, most global climate models predicted the El Niño conditions to continue until the end of the year. Based on the consensus from ASEANCOF-20, El-Niño conditions were likely during JJA 2023. For the IOD, a positive IOD was predicted to become establish during JJA 2023.

Based on the assessment as part of ASEANCOF-21, SEA RCC Climate Monitoring Node, and the WMO El Niño/La Niña Updates, during the JJA 2023 period **El Niño conditions** developed, with **a neutral to positive IOD** starting to develop in August in the Indian Ocean.

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 2023 RAINFALL OUTLOOK

Over most of the southern ASEAN region, below- to near-normal rainfall is predicted. The exceptions include northeastern Borneo and eastern Maritime Continent where near- to above-normal rainfall is predicted.

Over much of the northern ASEAN region, a mix of near- to above-normal rainfall is predicted. Above-normal rainfall is predicted over parts of southwestern and southeastern Mainland Southeast Asia, while near- to above-normal rainfall is predicted elsewhere over this region. Above-normal rainfall is predicted for much of the western half of the Philippines, with near- to above-normal rainfall elsewhere[1].

A mix of below- to above-normal rainfall was observed over much of the ASEAN region as can be seen by CHIRPS rainfall in **Figure D1**. There is only a limited agreement between the predicted and observed rainfall, mainly over the eastern Maritime Continent and parts of Mainland Southeast Asia and the Philippines.

Overall, the southern ASEAN region was relatively wetter than predicted, particularly over the western and central Maritime Continent. Near-normal rainfall was observed over the western and central Maritime Continent including Indonesia and Borneo, in contrast to predicted drier conditions. For the eastern Maritime Continent, there is agreement between the observations and predictions, where near-normal rainfall was predicted.

Overall, the northern ASEAN region was relatively drier than predicted. The observations agree over parts of Cambodia and the Philippines, where above-normal rainfall was predicted. There are some agreements over southern Thailand for below-normal rainfall, with limited agreements elsewhere in the region.

Based on the country reviews by NMHSs (**Table D1**), there was reasonable agreement between the outlook values averaged over the country and the observed values. The exception was for parts of

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[1] This is based on the climatology period 1991-2020.

Mainland Southeast Asia, including southern Myanmar, western Philippines, Singapore, and southern Thailand (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. Brunei observed mix of below- to above-normal rainfall whereas gridded product show near normal. Malaysia observed near- to above-normal rainfall but CHIRPS showed below normal rainfall over parts of eastern Malaysia. Similarly, Myanmar and Philippines observed near-normal rainfall however a mix of below- to above-normal rainfall is seen in the gridded data. Singapore observed above-normal rainfall, but CHIRPS show near-normal rainfall. Over parts of Thailand CHIRPS show more rainfall than national assessment. However, some differences between the gridded data and rain gauge data are usually expected.
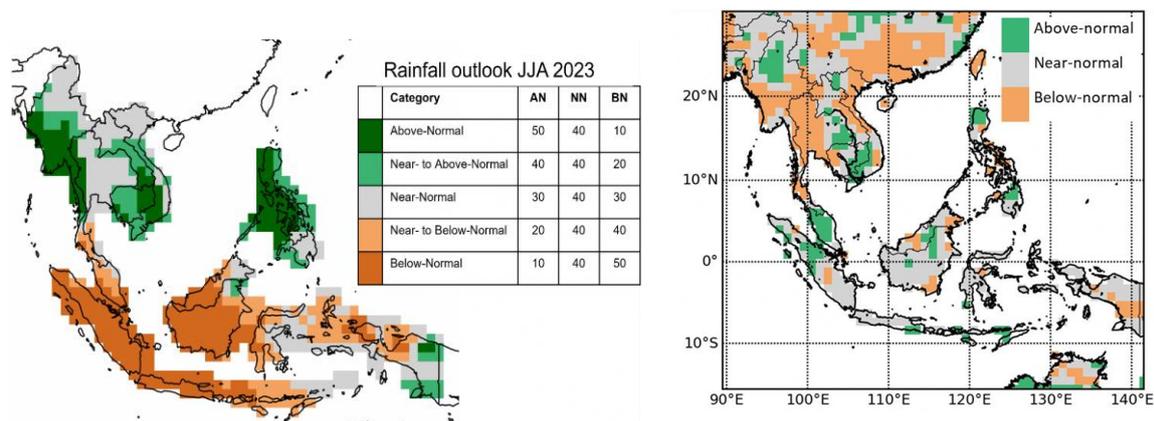

Figure D1: JJA 2023 ASEANCOF outlook (left) observed JJA rainfall in terciles (right, climatology 1991-2020). The rainfall dataset is CHIRPS (Funk et al 2014).

Table D1: Observed Rainfall based on the national level assessment. The Most Likely Category from the ASEANCOF-19 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	Outlook (MLC*)	NMHS OBS TERCILE
Brunei	BN – NN	BN – AN
Cambodia	NN – AN	BN – AN
Malaysia	BN – NN	NN – AN
Myanmar	Northern Half: NN **Southern Half: AN**	**NN**
Philippines	Southern: NN **Western: AN** Eastern: NN – AN	**NN**
Singapore	**BN**	**AN**
Thailand	**Southern: NN** Rest: BN – NN	**BN**

Viet Nam	Southern: NN – AN Rest: NN	NN – AN

JJA 2023 TEMPERATURE OUTLOOK

Near- to above-normal temperature is predicted over Southeast Asia[1]. Near-normal temperature is predicted over parts of the southern Maritime Continent, including southern Sumatra and Java. Near-to above-normal temperature is predicted over the southwestern and southeastern parts of Mainland Southeast Asia, Malaysia, and the Philippines. Elsewhere in Southeast Asia, above-normal temperature is predicted[2].

Most of ASEAN region experienced above-normal temperature, with near normal temperature over southern parts of the Maritime Continent as depicted in the ERA5 observation-based data (**Figure D2**). Overall, regions of near to above normal temperature in the outlook is in good agreement with the gridded observations, except parts of southeastern Maritime Continent.

The results from NMHS country reviews (Table D2) also show predominantly near- to above-normal temperatures. A good agreement between the outlook values averaged over the country and the observed values exists. There were some differences between the national reviews (Table D2) and the ERA5 data (Figure D2). Brunei and Cambodia observed mix of below- to above-normal temperature where gridded product show near- to above-normal. Malaysia observed near-normal temperature whereas the gridded product shows above-normal temperatures over most parts.
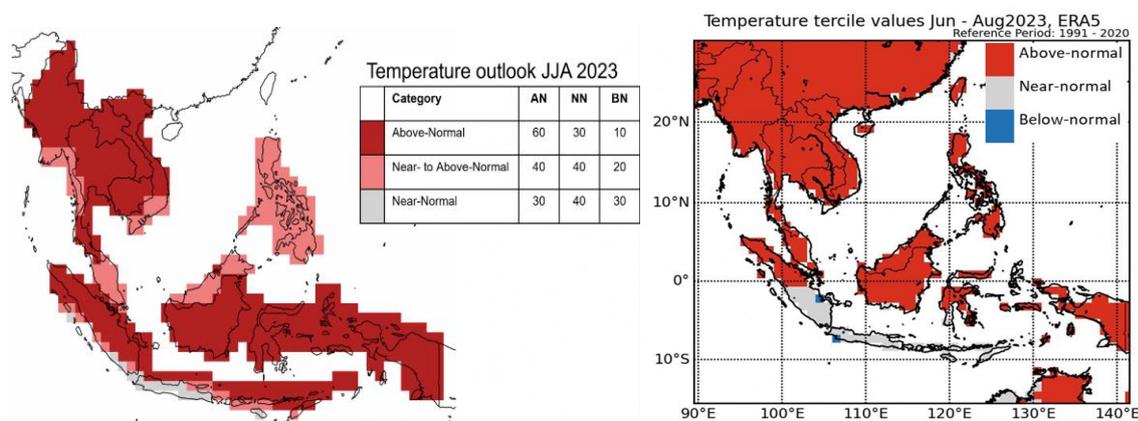

Figure D2: DJF 2022/2023 ASEANCOF outlook (left) observed temperature in terciles (right, climatology 1991-2020). The temperature dataset is ERA5-Land (Muñoz Sabater et al. 2019).

Table D2: Observed temperature based on the national level assessment. The Most Likely Category from the ASEANCOF-19 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	Outlook (MLC*)	NMHS OBS TERCILE
Brunei	AN	BN – AN
Cambodia	AN	BN – AN

Malaysia	NN – AN	NN
Myanmar	Southern: NN – AN Rest: AN	NN – AN
Philippines	NN – AN	NN – AN
Singapore	NN – AN	AN
Thailand	AN	AN
Viet Nam	Southern: NN – AN Rest: AN	NN - AN

SIGNIFICANT EVENTS

There were several notable low pressure and rainfall-related events throughout the ASEAN region between June to August 2023. Myanmar observed multiple heavy rainfall and low-pressure events. One of the low-pressure systems in Bay of Bengal further intensified into a depression affecting Myanmar. Myanmar observed record rainfall at multiple monitoring stations between June to August. Vietnam also observed record daily and monthly rainfall in June and July. In July 2023, Brunei observed rainfall that was ~80% above the normal value, with first 2 days receiving an accumulated rainfall of ~152 mm. Over Philippines, 6 tropical cyclones were observed, which led to enhanced rainfall and flooding over western parts of the country. Some ITCZ related rainfall and flooding was also observed over the southern regions of the Philippines. Heavy rain, flood and drought conditions were reported over Cambodia.

For the ASEAN region, extreme temperature events were reported during JJA 2023. New records for minimum temperature were observed over 6 stations and maximum temperature over 5 stations for Myanmar. Vietnam also observed record maximum temperatures in June and July. Average temperature in JJA was highest on record since 1981 for Thailand.

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.