Twentieth Session of the ASEAN Climate Outlook Forum (ASEANCOF-20)

25th, 26th and 30th May 2023, ASEAN Specialised Meteorological Centre

Consensus Bulletin for June-July-August (JJA) 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 Twentieth session of ASEANCOF (ASEANCOF-20) was organised by ASMC and the ASEANCOF Working Group. Participants from the NMHSs of ASEAN Member States created a consensus forecast for the boreal summer monsoon 2023 in the ASEAN region. The consensus for the June-July-August (JJA) 2023 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. 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-20 was 'Advances in climate services on subseasonal to seasonal timescales'. On the last day of ASEANCOF-20, a sharing session was held on the impact of El Niño on Southeast Asia, involving NMHSs and users of ASEANCOF information.

CONDITIONS AND OUTLOOK

Recent analysis of sea surface temperature (SST) anomalies over the equatorial Pacific shows average to slightly above-average SSTs across most of the equatorial Pacific Ocean, and along with atmospheric indicators such as trade wind strength and cloudiness, indicate ENSO-neutral conditions. In the Indian Ocean, the Indian Ocean Dipole (IOD) is also neutral.

An El Niño is highly likely to become established during JJA 2023. After JJA 2023, most global climate models predict the El Niño conditions to continue until the end of the year. The strength of the upcoming El Niño is uncertain, although some models are predicting that it could be moderate to strong.

A positive IOD is predicted to become establish during JJA 2023. Most models predict the IOD to return to neutral before the end of 2023.

The onset of the Southwest monsoon season has been or is expected to be later than average for much of Mainland Southeast Asia, while near average for the rest of the region. Over western parts of the region, the strength of the Southwest monsoon is expected to be stronger than average, with weaker than average or near average strength for the rest of the region, based on model predictions and supported by the predicted El Niño conditions.

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

Taking into consideration the national level forecasts, the present state of the climate, and the forecasts available from the GPCs, ASEANCOF-20 agreed on the following consensus-based outlook for JJA 2023 over the ASEAN region:

RAINFALL

For the upcoming boreal (Northern Hemisphere) summer season (JJA 2023):

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].

TEMPERATURE

For the upcoming boreal (Northern Hemisphere) summer season (JJA 2023):

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.
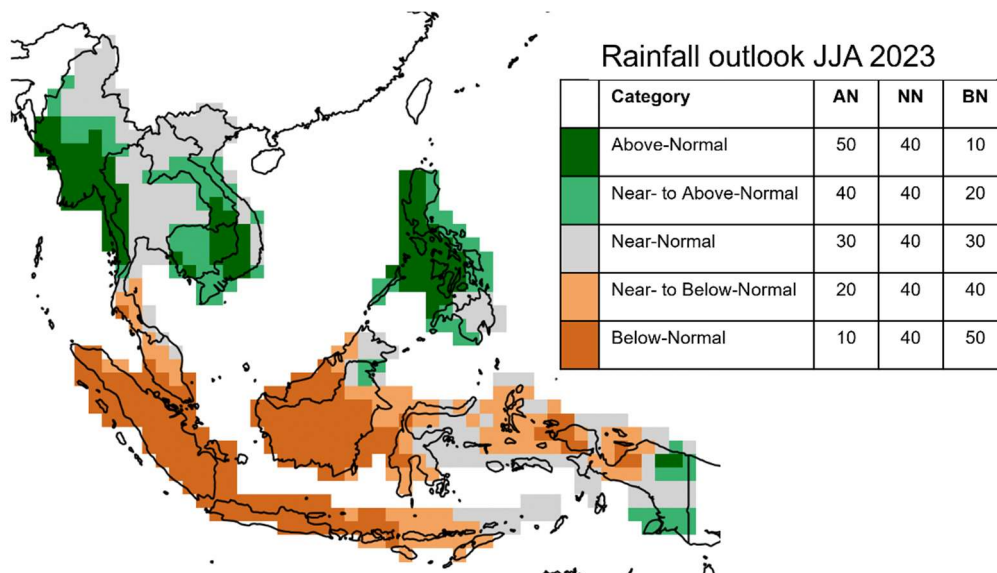
Refer to **Annex A** for reference on what is meant by "above, near, or below normal" in the outlook. For more information on the boreal (Northern Hemisphere) summer monsoon outlook and further updates on the national scale, the relevant NMHSs should be consulted (see **Annex B**).

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[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.
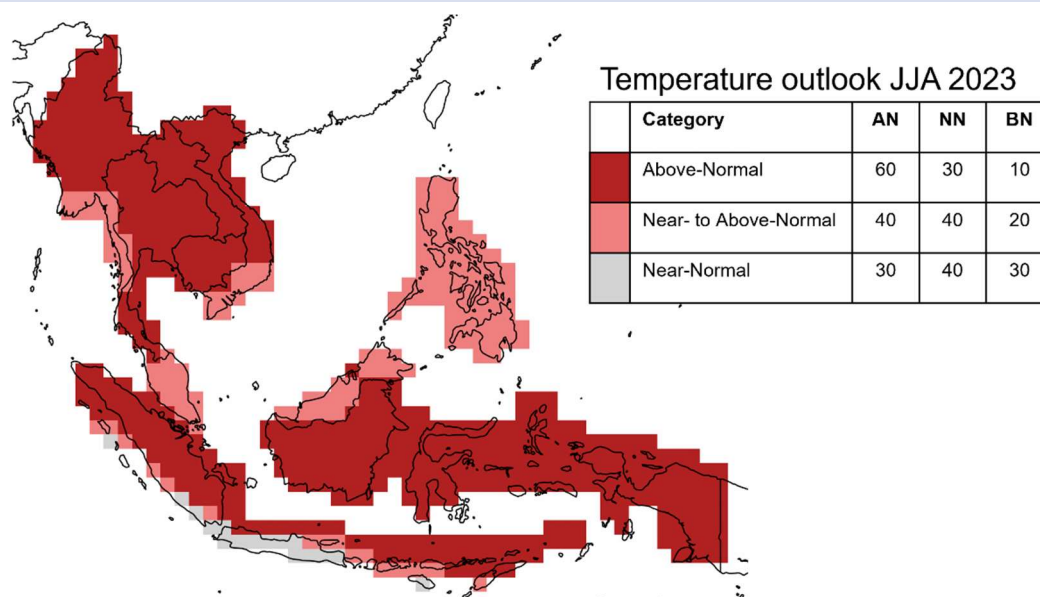
CONSENSUS MAPS FOR JJA 2023

The following maps provide the probabilistic outlooks for JJA 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

Rainfall outlook JJA 2023

	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

Temperature outlook JJA 2023

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

ACKNOWLEDGEMENTS

Photo of online participants from NMHSs, ASMC, WMO-RAP, ASEANCOF-WG, and presenters for ASEANCOF-20. Top row: Thea Turkington, Wee Leng Tan, Shipra Jain, Gavin Yeap, Paromita Chakraborty, second row: Harnina binti Morani, Kang Sovichea, Lonh Nrak, Mayphou Mahachaleun, Norjana Jamal, third row: Myint Myint Aye, Su Myat Naing, Analiza Solis, Joseph Basconcillo, fourth row: Joey Figuracion, Kristel Anne Valerie Villasica, May Escol-Canlas, Rusy Abastillas, fifth row: Chen Schwartz, Theeraluk Pianmana, Nichanun Trachow, Thanh Hoa Nguyen, lower row: Muhibuddin Usamah, Nina Karla Jaim, Itesh Dash, Nachiketa Acharya.

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).
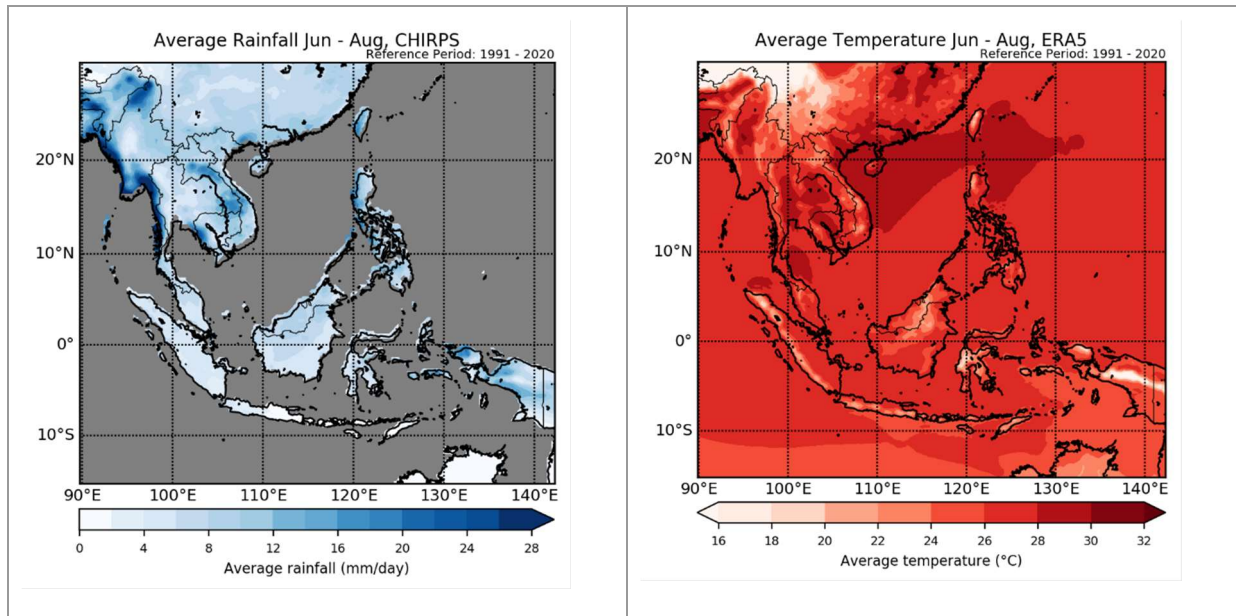

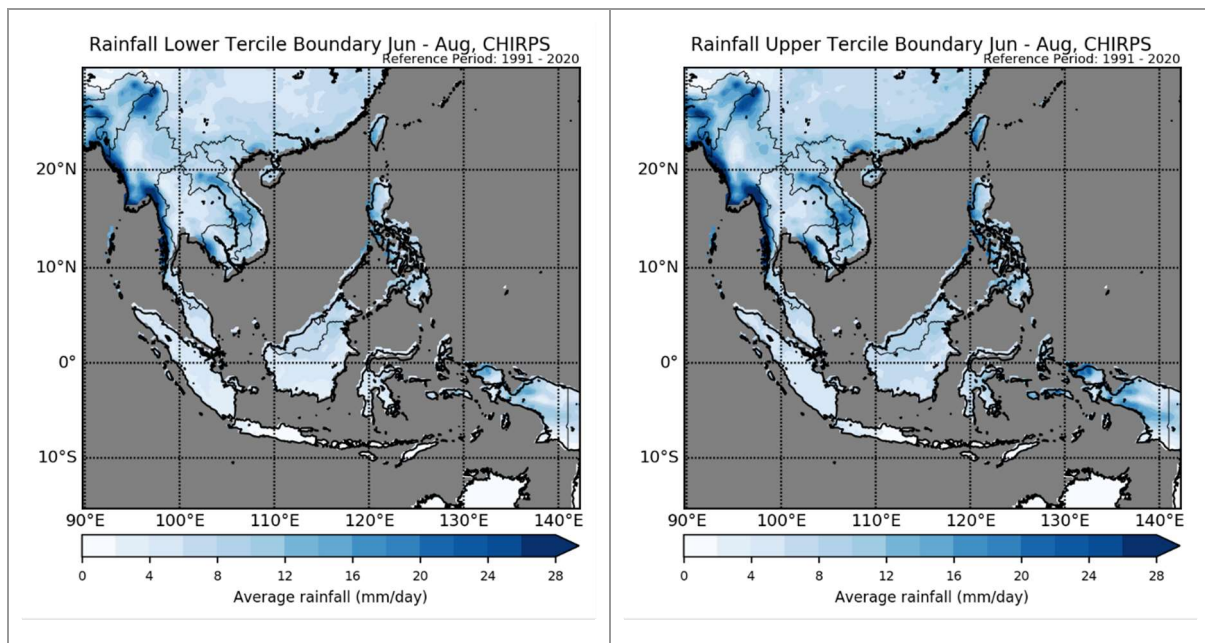**Figure A1: Mean rainfall (left, CHIRPS) and mean temperature (right, ERA5) for JJA for the climatology period 1991-2020.**

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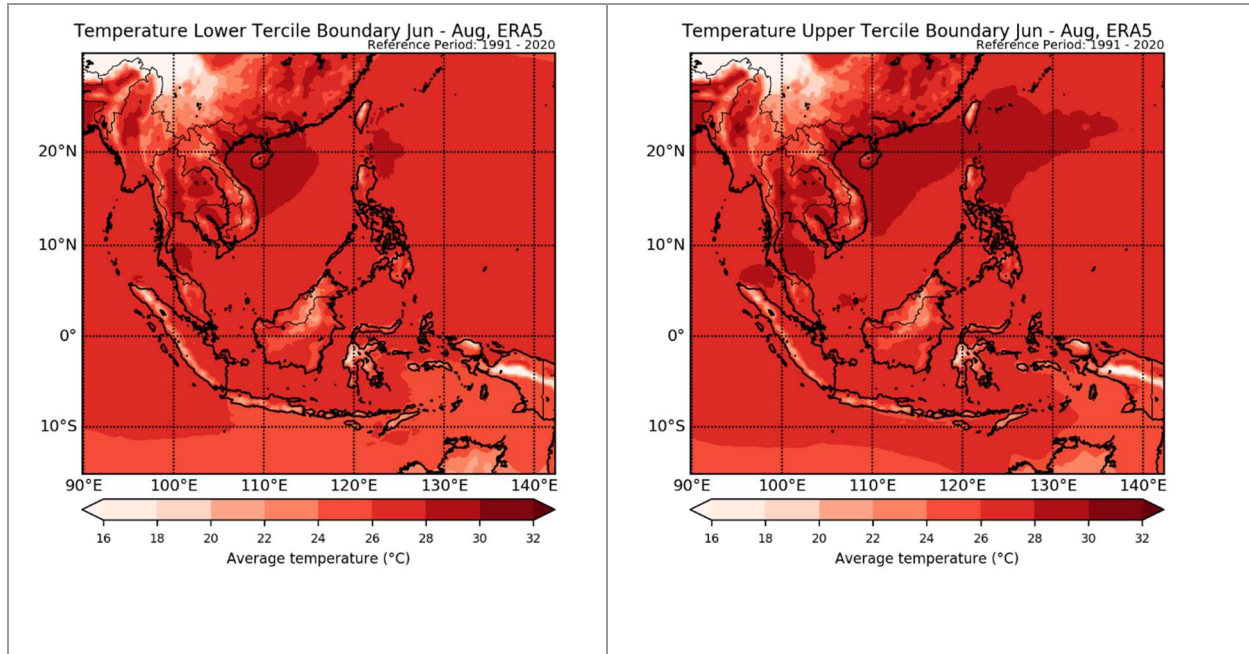
Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for JJA from 1991-2020 from ERA5.

ANNEX B: 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 C: REVIEW OF DJF 2022/2023 CONSENSUS OUTLOOK

SUMMARY

The rainfall and temperature outlooks were representative of the actual conditions over parts of Southeast Asia for December-January-February (DJF) 2022/2023. The region experienced a mix of below- to above-normal rainfall during DJF.

In December 2022, La Niña conditions were present. The international climate outlooks predicted a weakening of La Niña conditions during DJF 2022/2023 (although still overall indicating La Niña conditions), after which the ENSO state was predicted to gradually return to neutral. The consensus from ASEANCOF-19 was that La Niña conditions were likely during DJF 2022/2023, with IOD neutral conditions by the end of 2022.

Based on the assessment as part of ASEANCOF-20, SEA RCC Climate Monitoring Node, and the WMO El Niño/La Niña Updates, the DJF 2022/2023 period experienced La Niña conditions while Indian Ocean Dipole was in neutral state.

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.

DJF 2022/2023 RAINFALL OUTLOOK

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.[2]

Overall, the regions with an increased chance of above- or below-normal rainfall aligned with the CHIRPS gridded product in **Figure C1.** A mix of above-normal rainfall was observed over much of the Maritime Continent, broadly in line with the DJF outlook. The observed conditions were relatively wetter than predicted over the western Maritime Continent, including western parts of Indonesia, Singapore, and Malay Peninsula. For the central and eastern Maritime Continent, there is a better agreement between the observations and predictions for Borneo, Philippines, and eastern Indonesia.

For Mainland Southeast Asia, the observations agree well for northern Myanmar, northern Viet Nam and Lao PDR, where below-normal rainfall were predicted. Parts of southern Viet Nam, southern Thailand and Cambodia were above-normal and therefore also agree well with the DJF predictions. While the near-normal rainfall was predicted elsewhere over the Mainland Southeast Asia, the observations showed a mix of below- to above-normal rainfall including central and southern Myanmar and central Thailand.

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, including Malay Peninsula, southern Lao PDR, and central Viet Nam (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 parts of northern Lao PDR and the northern

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[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.

Philippines where CHIRPS show more rainfall than national assessment (BN). However, some differences between the gridded data and rain gauge data are usually expected.
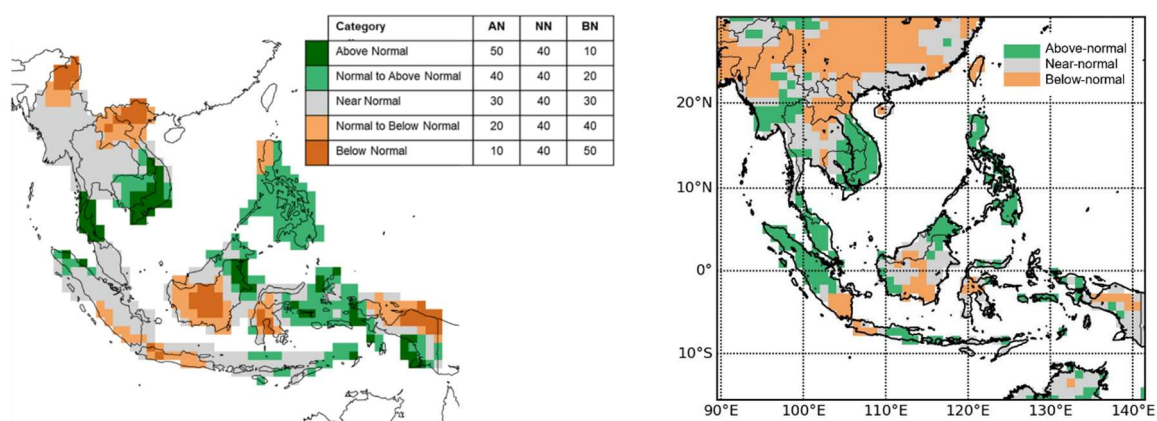

Figure C1: DJF 2022 ASEANCOF outlook (left) observed DJF rainfall in terciles (right, climatology 1991-2020). The rainfall dataset is CHIPRS (Funk et al 2014).

Table C1: Observed Rainfall based on the national level assessment. The Most Likely Category from the ASEANCOF-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	Location (- indicates the entire country)	Outlook (MLC*)	NMHS obs. tercile
Brunei Darussalam	-	NN – AN	NN
Cambodia	-	NN – AN	AN
Lao PDR	Northern half	BN – NN	BN
	Southern half	**NN – AN**	**BN**
Malaysia	Parts northeastern Malaysia	NN – AN	AN
	Rest	**NN**	**AN**
Myanmar	Northern	BN – NN	BN
	Rest	NN	NN-AN
Philippines	Northern	BN – NN	BN
	Rest	NN – AN	AN
Singapore	-	**NN**	**AN**
Thailand	Southern parts	AN	AN
	Rest	NN	NN except Eastern (BN)
Viet Nam	Southern parts	AN	AN
	Central	NN	BN (northern), AN (southern)
	Northern parts	BN	BN

DJF 2022/2023 TEMPERATURE OUTLOOK

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.[3]

Most of central and southeastern parts of the Maritime Continent experienced above-normal temperature whereas western and southern parts of the Maritime experienced near-normal temperature as depicted in the ERA5 observation-based data (**Figure C2**). A mix of below- to above-normal temperature is observed over Mainland Southeast Asia. Overall, regions of near to above normal temperature in the outlook is in good agreement with the gridded observations, except parts of Mainland Southeast Asia.

The results from NMHS country reviews (Table C2) also show predominantly near- to above-normal temperatures. A good agreement between the outlook values averaged over the country and the observed values exists, except for Cambodia, parts of Lao PDR, Singapore, and northwestern Viet Nam (Table C2, in bold). There were some differences between the national reviews (Table C2) and the ERA5 data (Figure C2). Cambodia observed near-normal temperature as opposed to above-normal temperature by the gridded product. Lao PDR observed above-normal temperatures where gridded product shows a mix of below- to above-normal temperatures. Most parts of Myanmar observed near-normal temperature whereas the gridded product shows above-normal temperatures over most parts. Singapore and northwestern Thailand observed below-normal temperatures as compared to above-normal temperature in the gridded product.
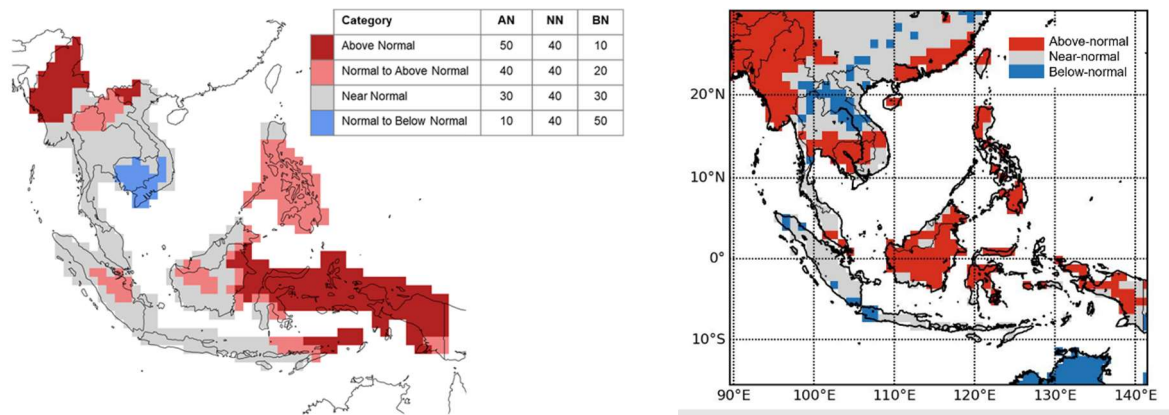

Figure C2: DJF 2022/2023 ASEANCOF outlook (left) observed temperature in terciles (right, climatology 1991-2020). The temperature dataset is ERA5-Land (Muñoz Sabater et al. 2019).

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[3] 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.

Table C2: 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	Location (- indicates the entire country)	Outlook (MLC*)	NMHS obs. tercile
Brunei Darussalam	-	NN	NN
Cambodia	-	**BN**	**NN**
Lao PDR	Northern	NN – AN	AN
	Rest	**NN**	**AN**
Malaysia	-	NN	NN
Myanmar	Northwestern half	AN	NN-AN
	Rest	NN	NN
Philippines	Northern	NN	NN
	Rest	NN – AN	AN
Singapore	-	**NN**	**BN**
Thailand	Northwestern	NN – AN	AN
	Rest	NN	NN
Viet Nam	Southern	BN– NN	NN-AN
	Northwestern	**AN**	**BN-NN**
	Rest	NN	BN-NN

SIGNIFICANT EVENTS

There were several notable rainfall-related events throughout the ASEAN region between December 2022 to February 2023. For the ASEAN region, both flood and drought related events were reported. Myanmar reported widespread rainfall in northern and southern parts of Myanmar due to the western disturbances as well as cold surges from China. Philippines reported floods, owing to the above average rainfall over most parts of the country. Brunei Darussalam and Lao PDR reported below-normal rainfall for January and February 2023. Singapore had a monsoon surge and saw the record-breaking daily total rainfall for the month of February. Viet Nam also observed heavy rain over central parts of Viet Nam exceeding 750mm, which is almost twice the normal values, causing flooding in the region.

There were also notable temperature related events in the ASEAN region between December 2022 and February 2023. Myanmar reported record breaking minimum temperatures as well as maximum temperatures. Cambodia faced heat waves. Lao PDR reported cold weather in northern parts whereas hot weather in southern parts in February.

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.