



# OUR SERVICES

Public weather service



Climate and past weather



Aviation weather service



Data services



Early warning services



Climate change



River information and monitoring



Glacier monitoring



Flood Warning and hazard maps



GLOF and lake monitoring



Research and development

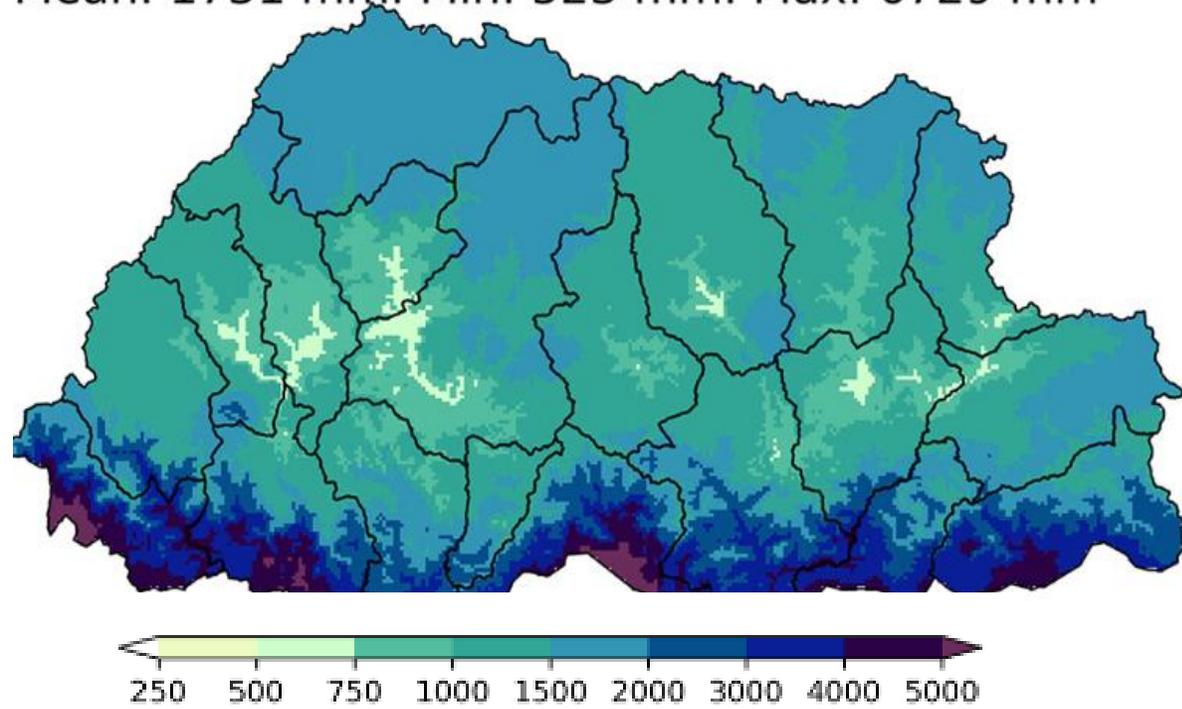


Education and awareness

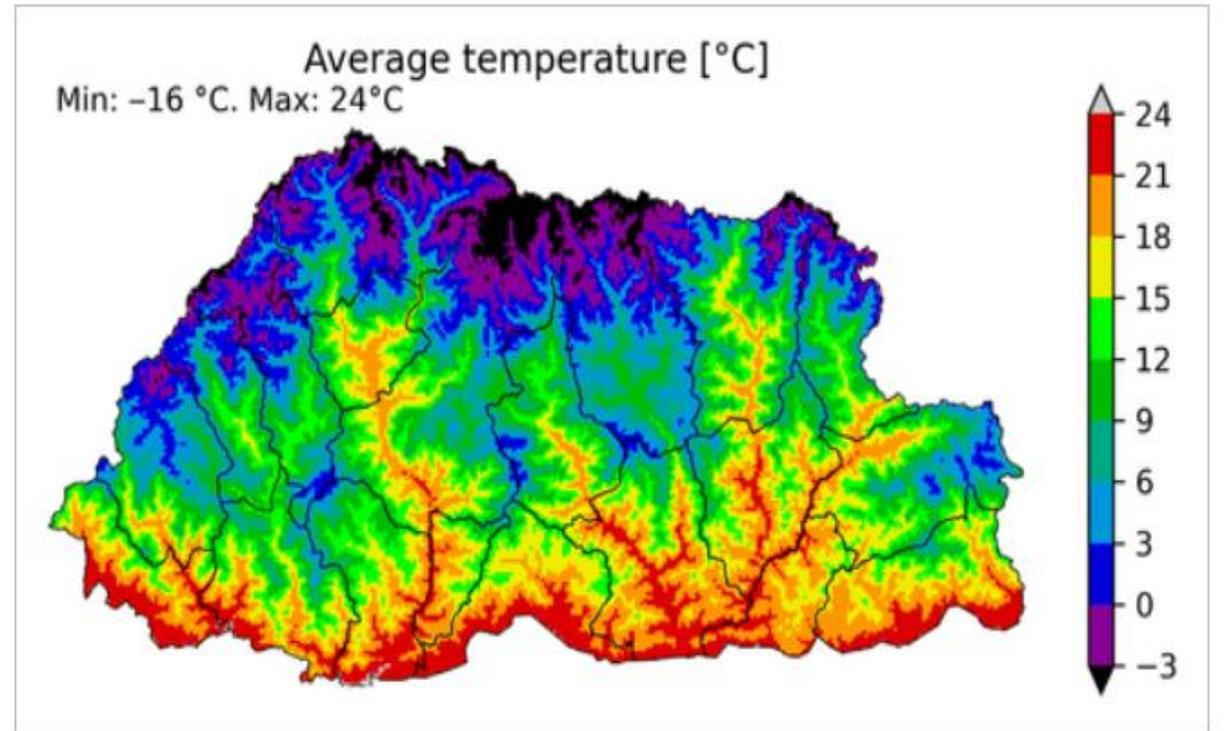


# CLIMATE OF BHUTAN

Mean: 1731 mm. Min: 523 mm. Max: 6729 mm



Rainfall

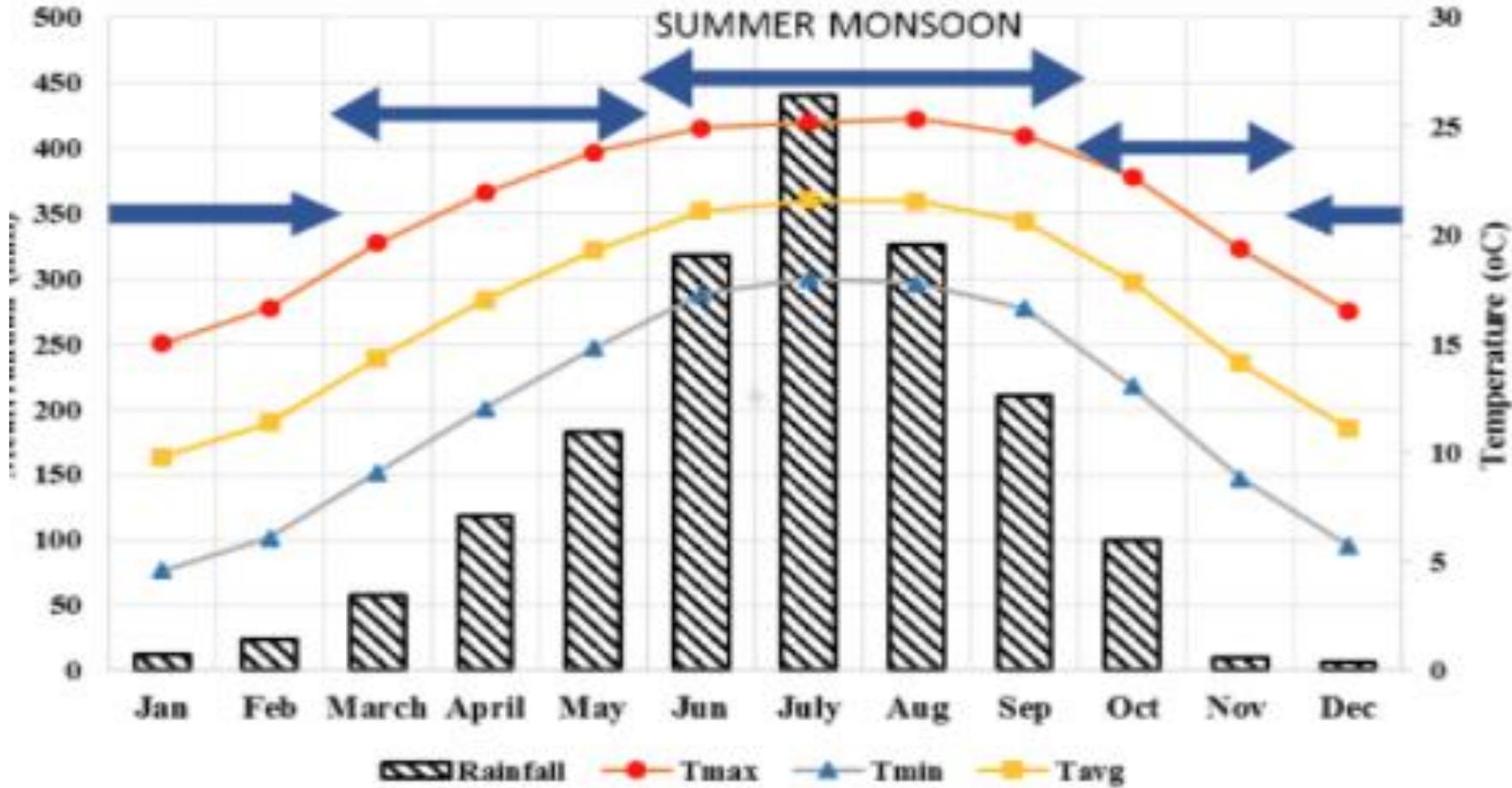


Temperature



# CLIMATE OF BHUTAN

**72 % Rainfall  
in JJAS**

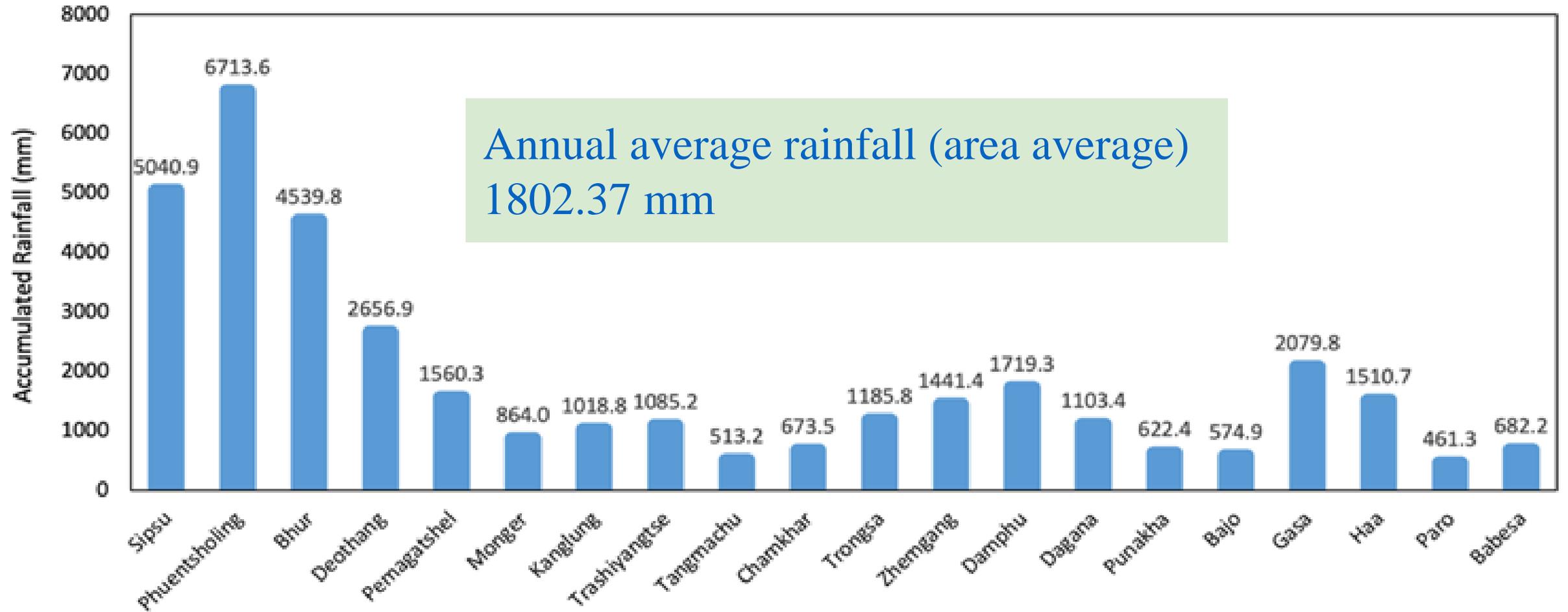


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NATIONAL CENTER FOR HYDROLOGY AND METEOROLOGY

# ANNUAL RAINFALL 2024

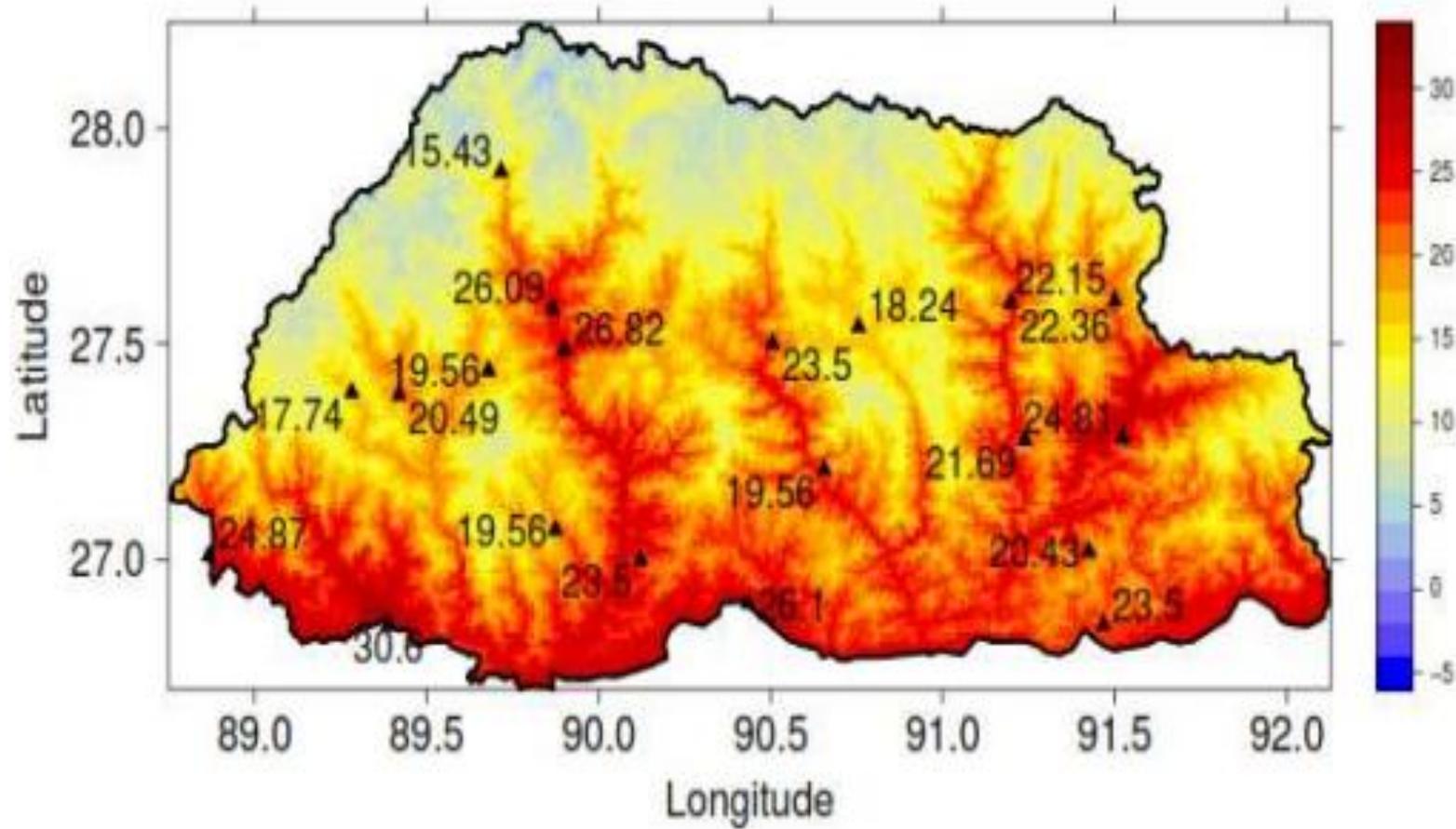
## Annual Accumulated Rainfall for 2024



ལྷོ། རྒྱལ་ཡོངས་ཚུ་དབྱུང་དང་གནམ་གཤིས་རིག་པའི་རྩེ་བ།

NATIONAL CENTER FOR HYDROLOGY AND METEOROLOGY

# ANNUAL TEMPERATURE 2024



Annual average maximum temperature was 23.31°C

Annual minimum temperature was 12.51°C

Annual mean temperature was 17.2°C

2023 Annual mean temperature was 17.1°C



ལྷོ། རྒྱལ་ཡོངས་ཚུན་བྱུང་དང་གནམ་གཤིས་རིག་པའི་རྩེ་བ།

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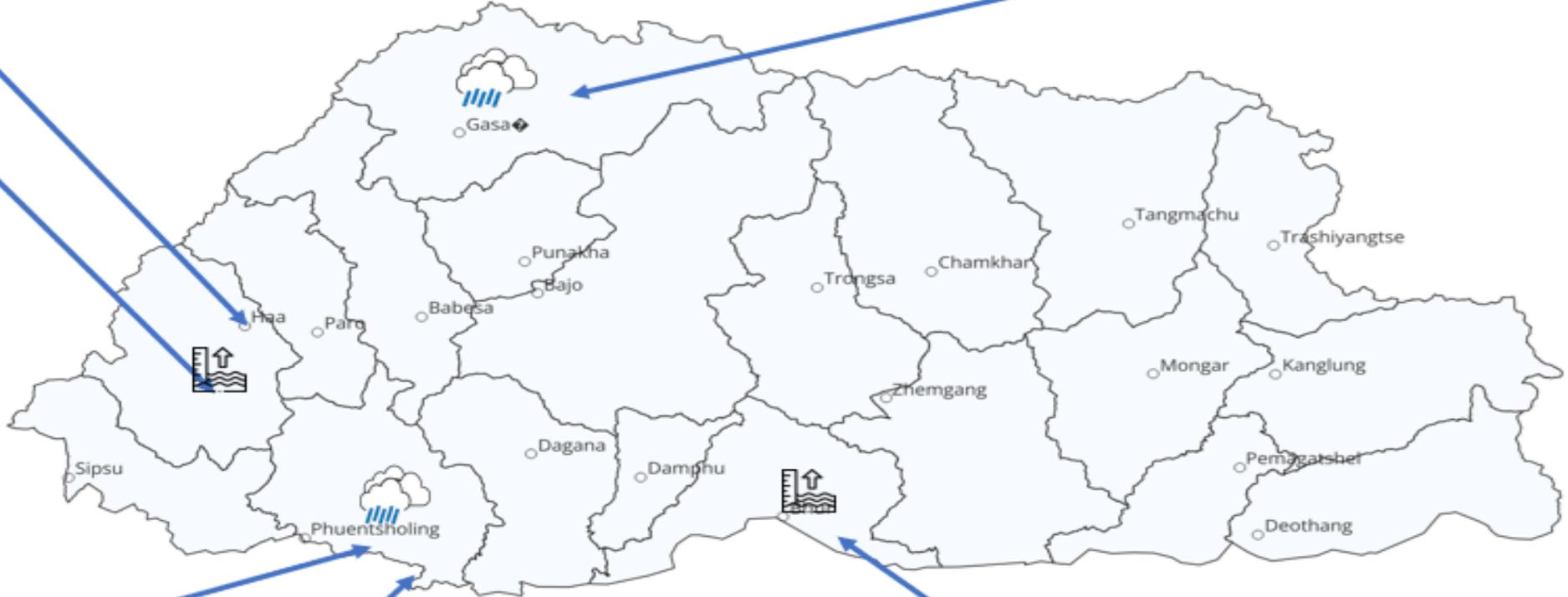
# METEOROLOGICAL EXTREMES 2024



24th December: -9 deg C at Haa

Highest no. of raining days: 218 days at Gasa

Highest no of freezing days: 131 days at Haa



7th May: 210.6 mm Rainfall in Phuntsholing

25th May and 23rd September: 40 deg C at Bhur, Sarpang

Highest no. of hot days: 215 days at Phuntsholing

# EXTREME WEATHER EVENTS

## Extreme weather events in Bhutan 2024



29th December: Snowfall at Lunana, Gasa



29 December: Light snow fall at Lingzhi, Thimphu



5th August: Swollen stream (Flash flood) due to heavy rain in Bhumthang



10 August: Flash flood at Dechencholing, Thimphu



- 15 July: Flash flood at Stream near Begana Guru Lhakhang, Thimphu (17:05 hrs)
- 5 August: Flash Flood at stream near Lamigonpa, Bumthang (17:00 hrs)
- 10 August: Flash flood at Stream in Dechenpgug (14:30-15:00 hrs)
- 18 August: Flash Flood at Bayta chu at Gangtey, Wangdue (14:00 hrs)



10 April: Hail Stone at Tsirang (2-3pm)



3 May: Windstorm at Trashigang and Zhemgang



# CLIMATE DRIVERS OF BHUTAN

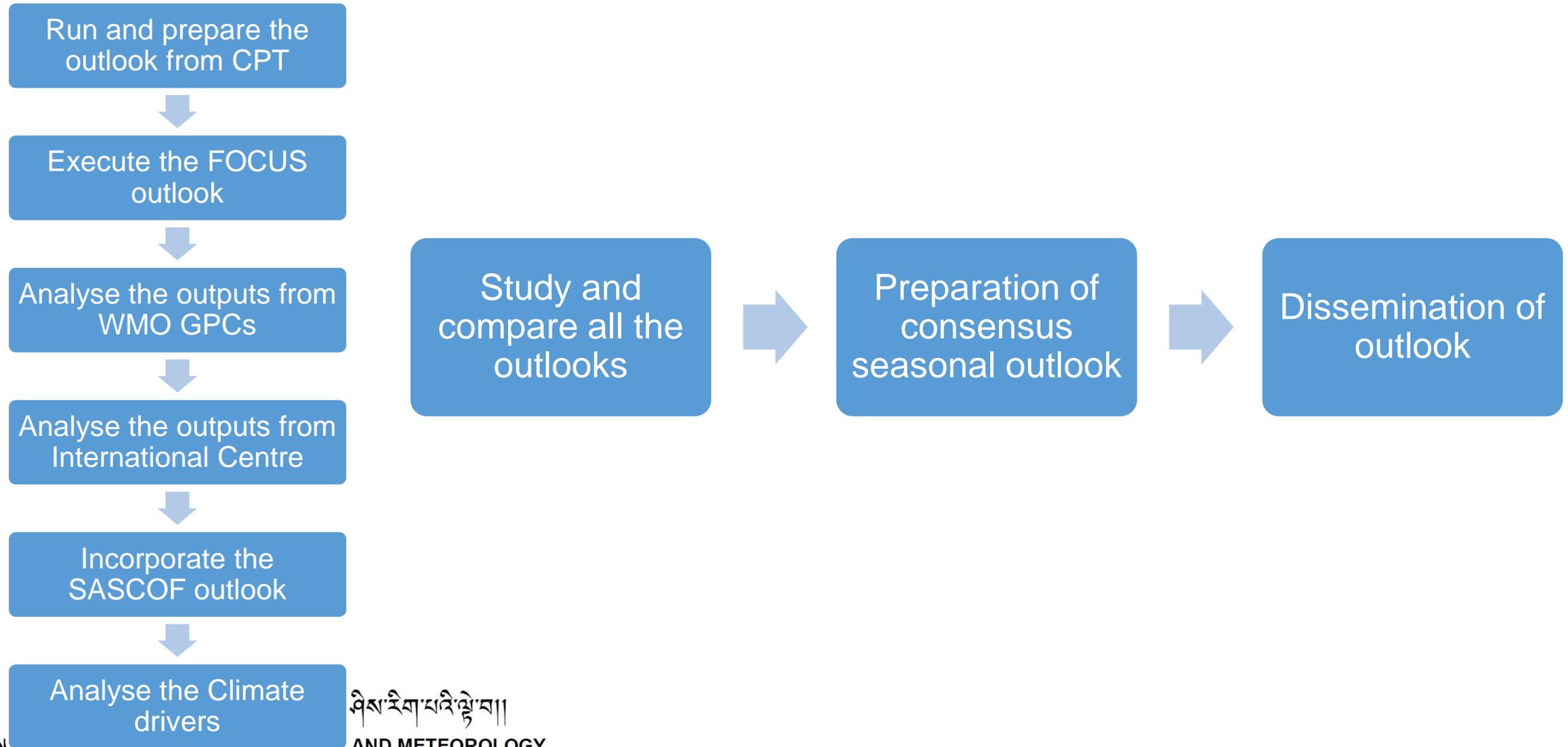
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- ✓ Monsoon (winter and summer Monsoon )
- ✓ Western disturbance
- ✓ Cyclones
- ✓ El Nino Southern Oscillation (ENSO)
- ✓ Indian Ocean Dipole



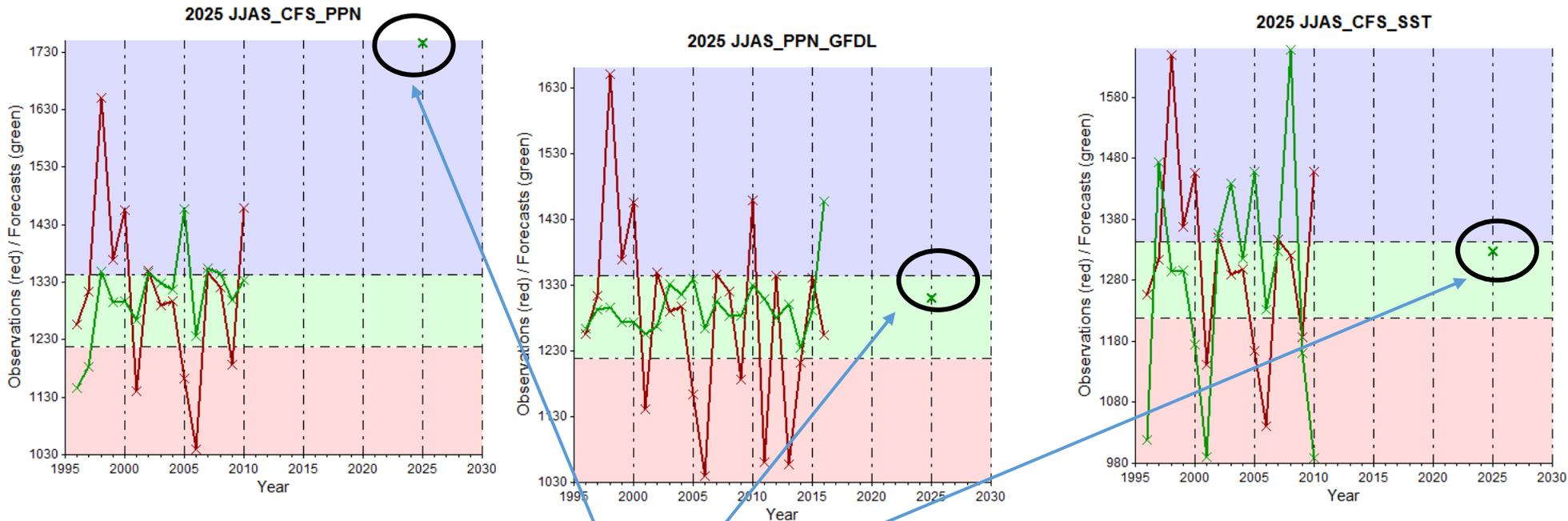
# Summer Monsoon Outlook – JJAS 2025

## Flow for Generating national consensus seasonal forecast



# National Outlook JJAS 2025

## (i) Precipitation



JJAS 2025 Forecast

Considering CPT GCMs and station data, the forecast is slightly above normal precipitation over the region

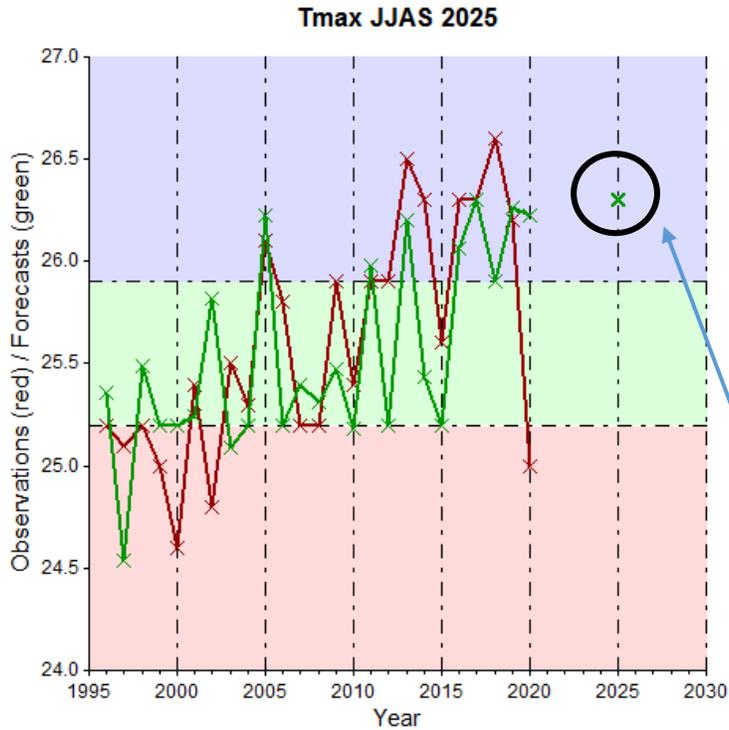
Climate  
Predictability  
Tool



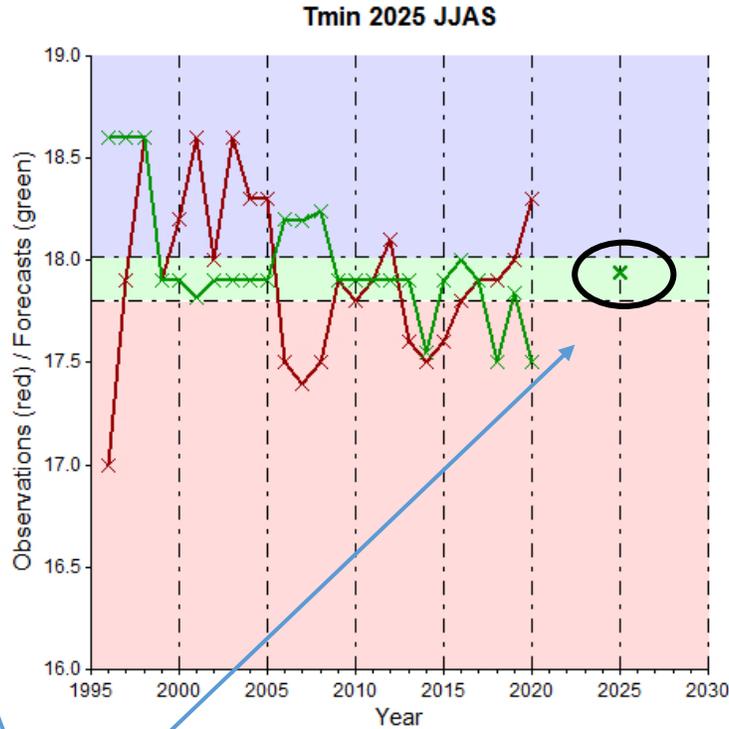
# National Outlook JJAS 2025

## Climate Predictability Tool

### (ii) Temperature



Maximum Temperature



Minimum Temperature

JJAS 2025 Forecast

The outlook from CPT GCMs and station data suggests above normal maximum temperature and normal minimum temperature



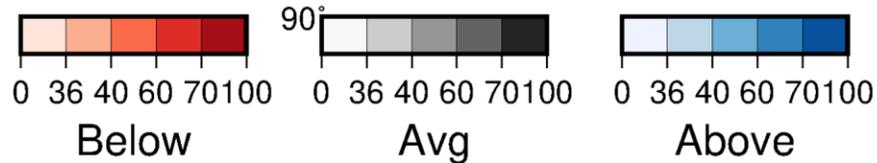
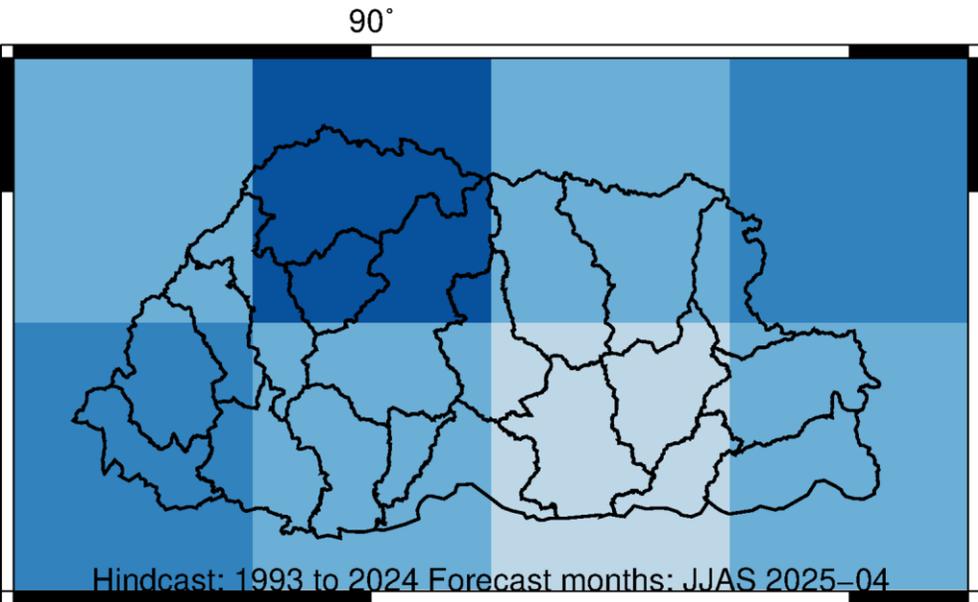
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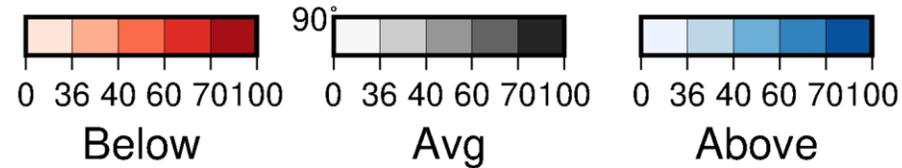
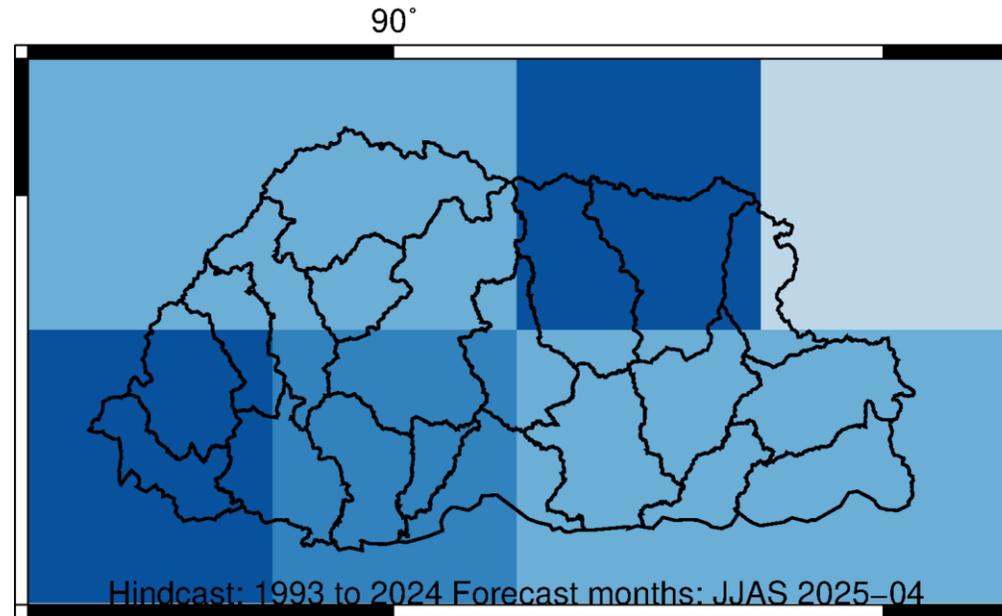
# National Outlook JJAS 2025 (April initial)

ERA5

## Simple Mean



## Skilled Weighted Average



FOCUS  
Customization  
n tool



The outlook from ERA5 data, suggests above normal precipitation over the region



# National Outlook JJAS 2025

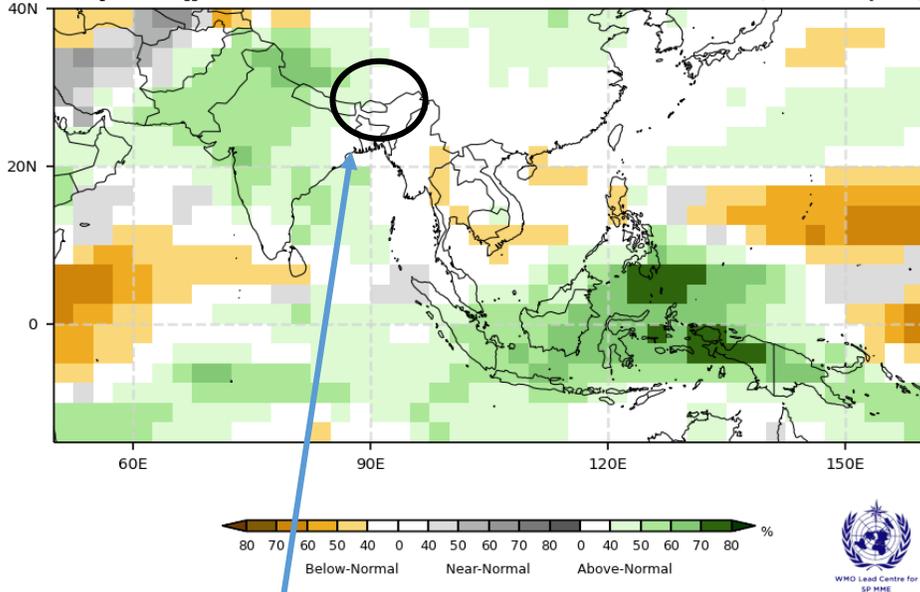
## (i) Precipitation

Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Offenbach, Seoul, Tokyo, Toulouse, Washington

Precipitation : JJAS2025

(issued on May2025)



JJAS 2025 Forecast

The outlook suggests climatological probability for precipitation over the region [No skills]

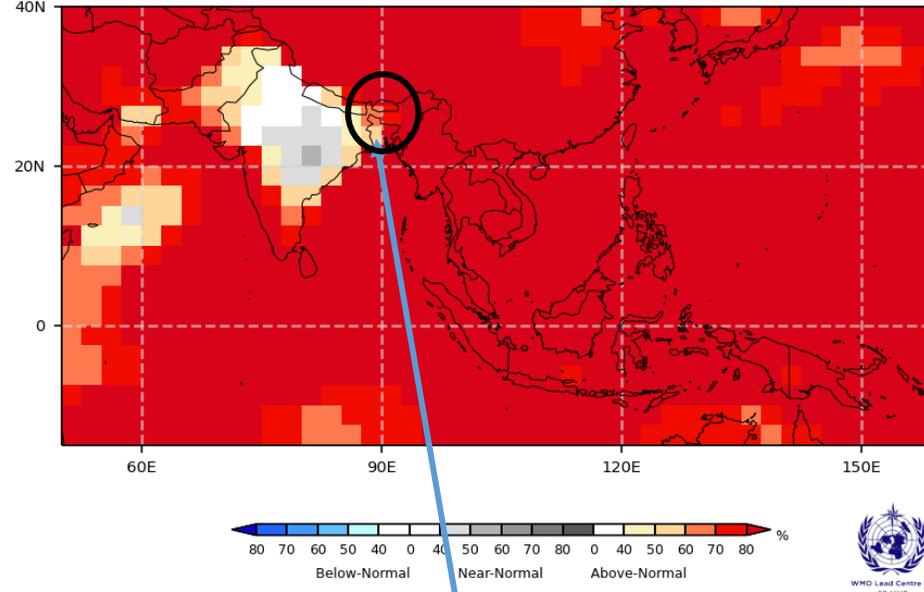
## (ii) Temperature

Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Offenbach, Seoul, Tokyo, Toulouse, Washington

2m Temperature : JJAS2025

(issued on May2025)



JJAS 2025 Forecast

The outlook suggests above normal temperature over the region

WMO  
LC\_LRF MME  
Global  
Producing  
Centres



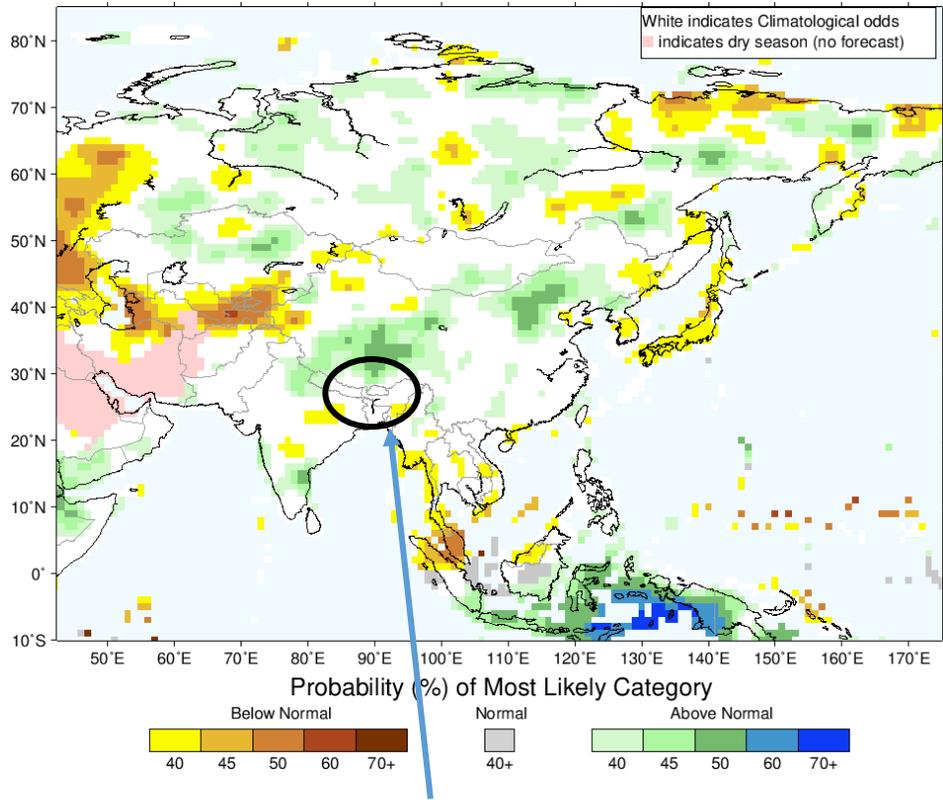
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# National Outlook JJAS 2025

## (i) Precipitation

IRI Multi-Model Probability Forecast for Precipitation for June–July–August 2025, Issued April 2025



JJA 2025 Forecast

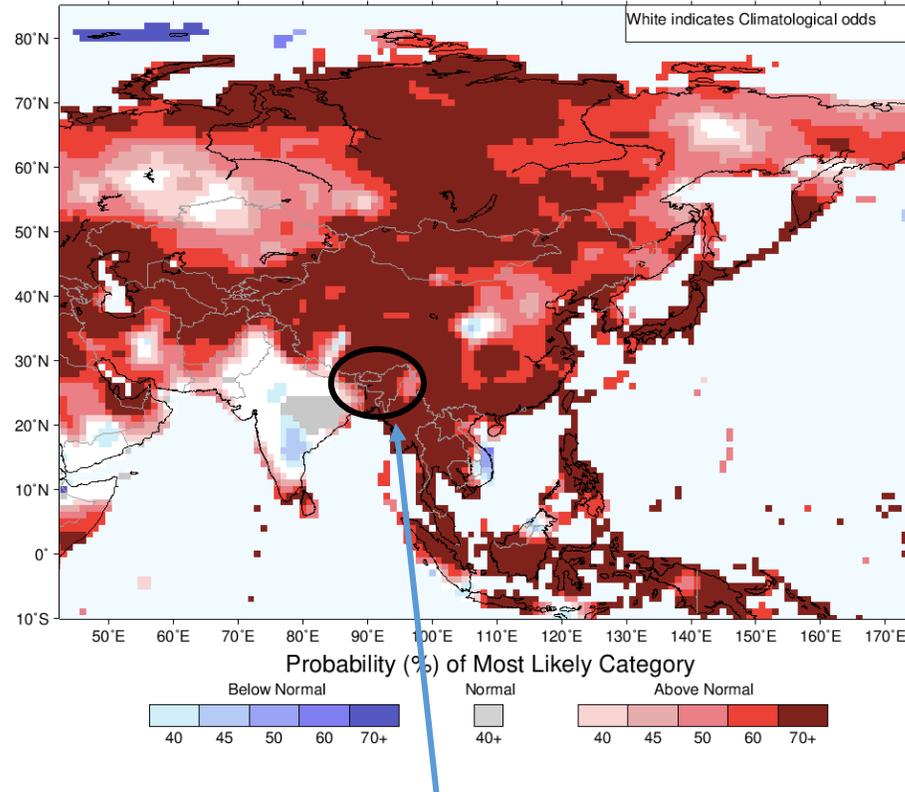
The outlook suggests climatological probability for precipitation over the region [No skills]

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NATIONAL CENTER FOR HYDROLOGY AND METEOROLOGY

## (ii) Temperature

IRI Multi-Model Probability Forecast for Temperature for June–July–August 2025, Issued April 2025



JJA 2025 Forecast

The outlook suggests above normal temperature over the region

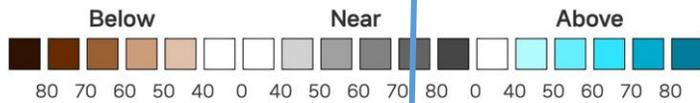
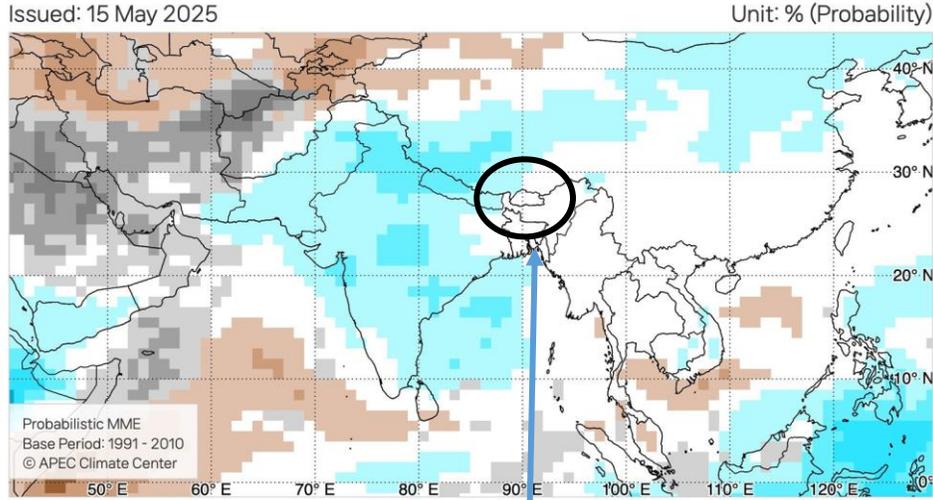
International  
Research  
Institute for  
Climate and  
Society



# National Outlook JJAS 2024

## (i) Precipitation

Precipitation for June 2025-August 2025



JJA 2025 Forecast

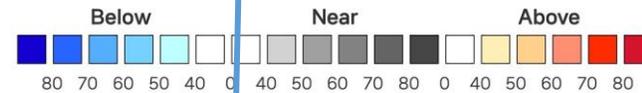
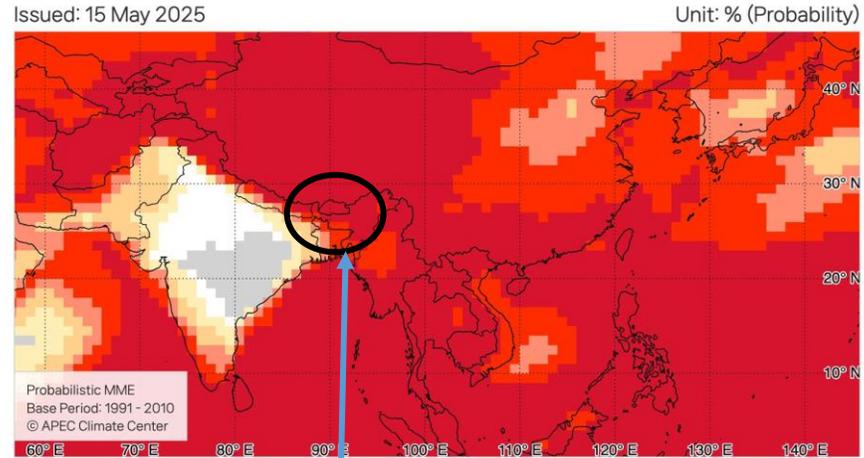
The outlook suggests climatological probability for precipitation over the region  
[No skills]

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NATIONAL CENTER FOR HYDROLOGY AND METEOROLOGY

## (ii) Temperature

Temperature at 2m for June 2025-August 2025



JJA 2025 Forecast

The outlook suggests above normal temperature over the region

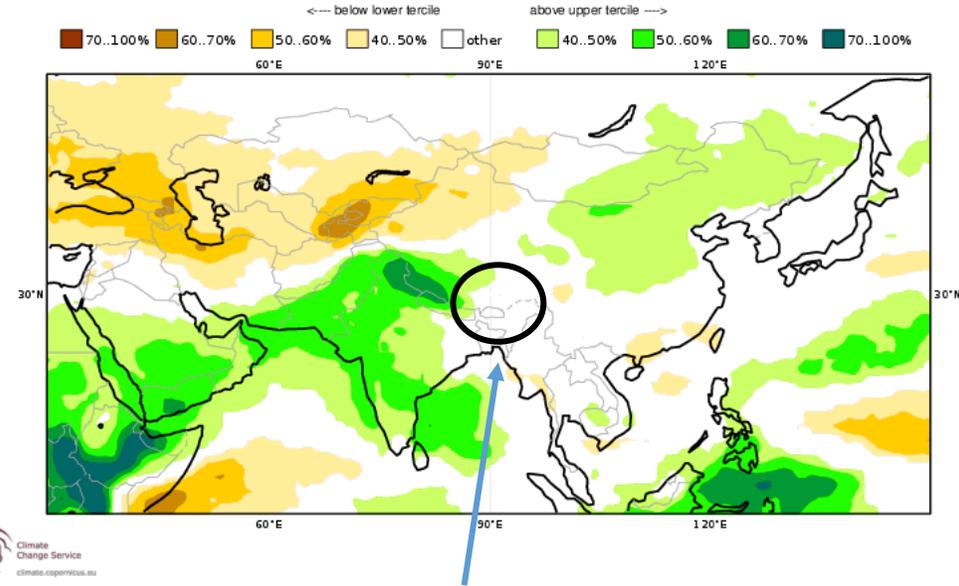
APEC Climate Centre



# National Outlook JJAS 2025

## (i) Precipitation

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC/BOM  
 Prob(most likely category of precipitation) JJA 2025  
 Nominal forecast start: 01/05/25  
 Unweighted mean

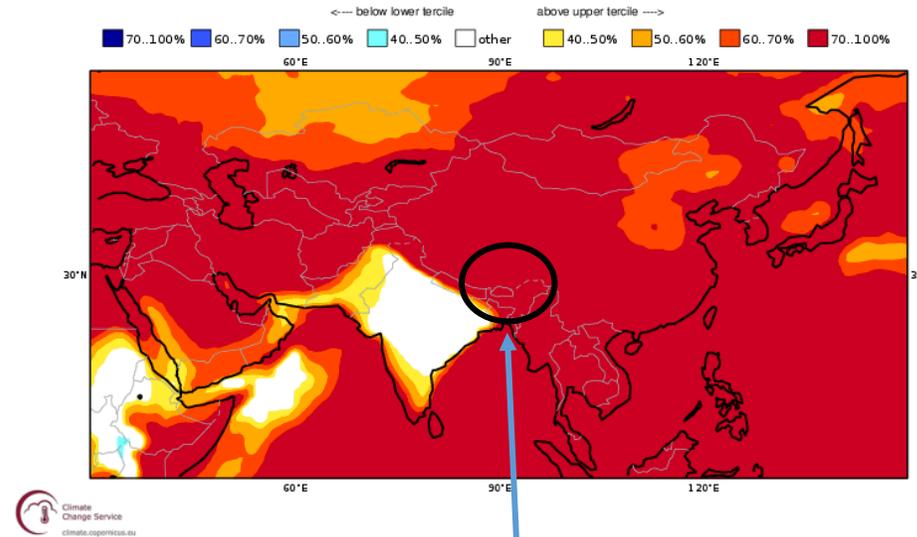


JJAS 2025 Forecast

The outlook suggests suggests climatological probability for precipitation over the region [No skills]

## (ii) Temperature

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC/BOM  
 Prob(most likely category of 2m temperature) JJA 2025  
 Nominal forecast start: 01/05/25  
 Unweighted mean



JJA 2025 Forecast

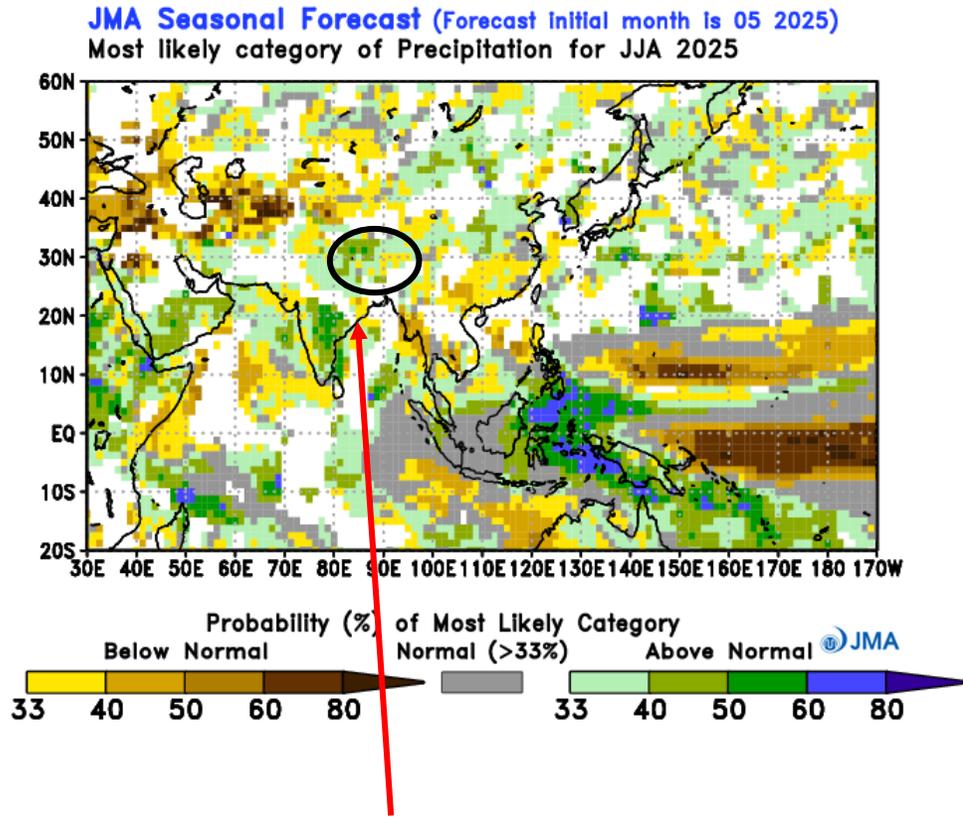
The outlook suggests above normal temperature over the region

Copernicus  
 Climate  
 Change Service



# National Outlook JJAS 2025

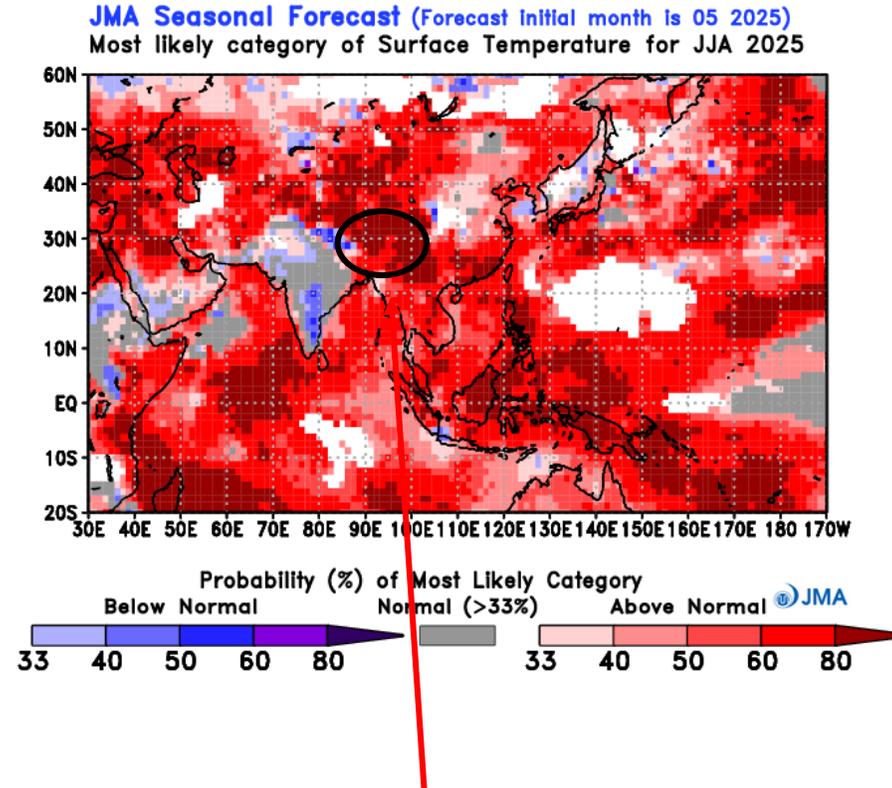
## (i) Precipitation



JJA 2025 Forecast

The outlook suggests slightly above normal precipitation over the region

## (ii) Temperature



JJA 2025 Forecast

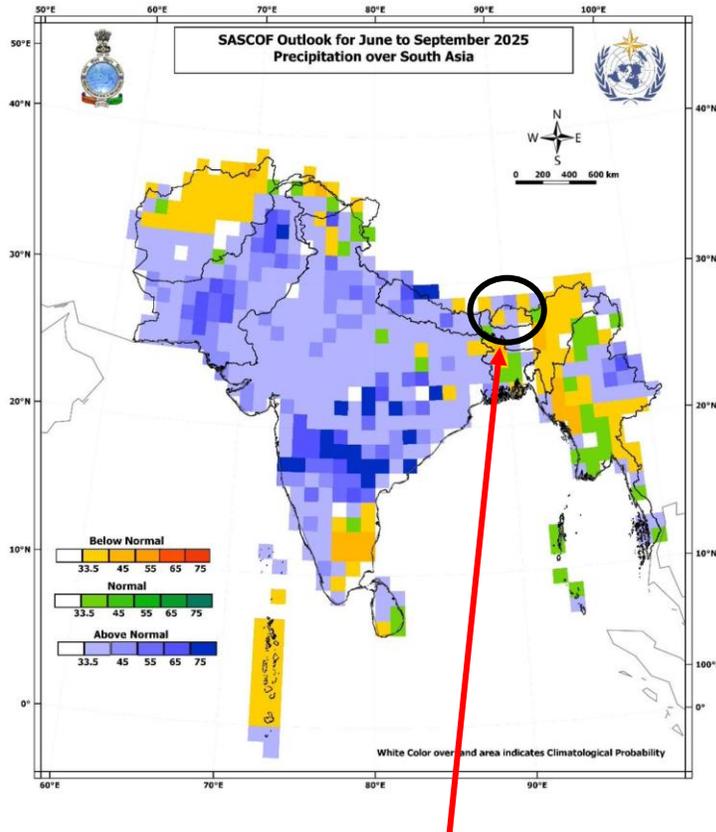
The outlook suggests above normal temperature over the region

Japan  
Meteorological  
Agency



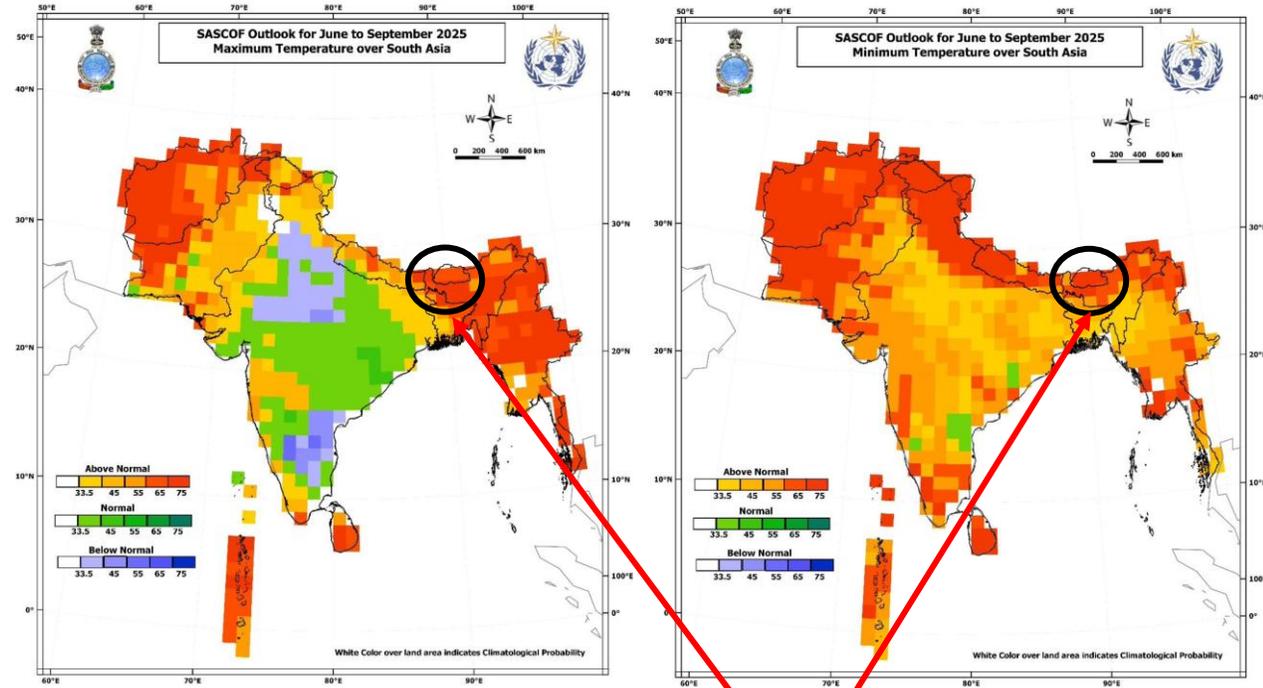
# National Outlook JJAS 2025

## (i) Precipitation



JJAS 2025 Forecast

## (ii) Temperature



JJAS 2025 Forecast

## South Asian Climate Outlook Forum (SASCOF)



08

The outlook suggests slightly above normal precipitation over the region

The outlook suggests above normal temperature over the region

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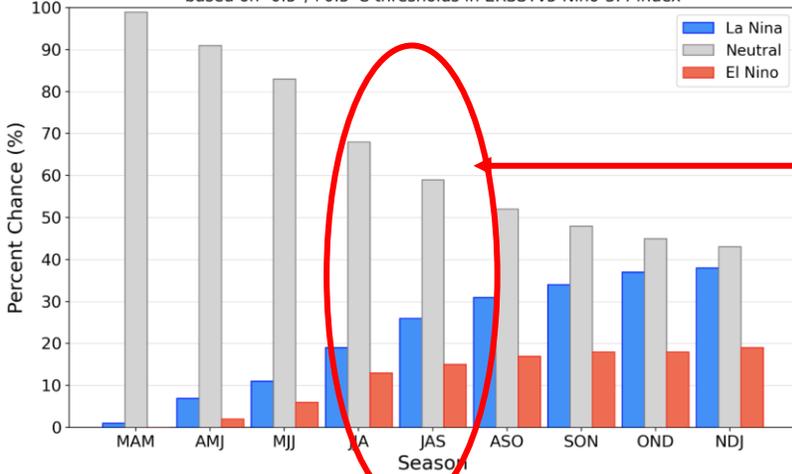


# National Outlook JJAS 2025

## (i) ENSO

Official NOAA CPC ENSO Probabilities (issued April 2025)

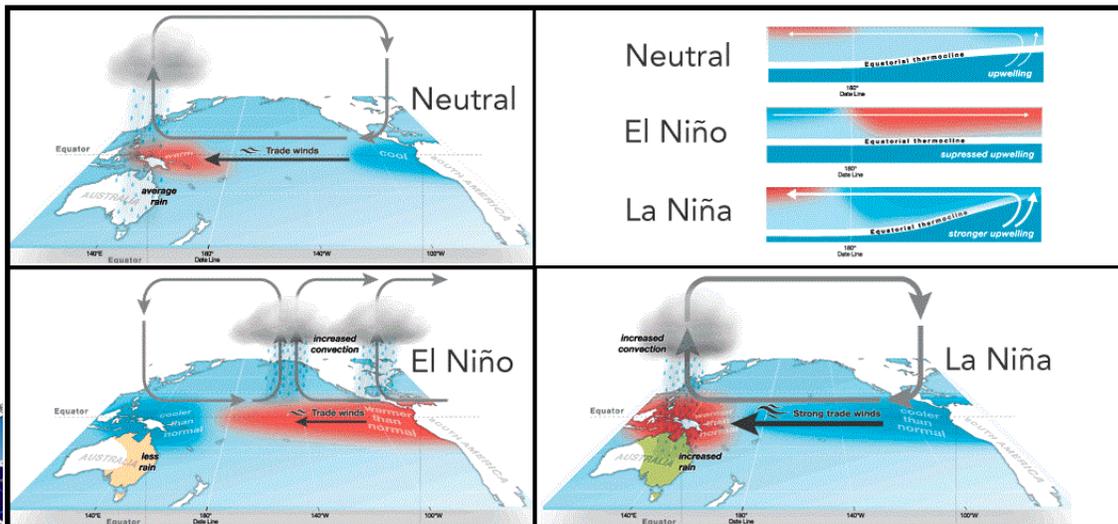
based on  $-0.5^{\circ}/+0.5^{\circ}\text{C}$  thresholds in ERSSTv5 Niño-3.4 index



JJAS 2024 Forecast

The outlook suggests neutral condition

## ENSO



## Phases of ENSO

The El Niño-Southern Oscillation (ENSO) is a recurring climate pattern involving changes in the temperature of waters in the central and eastern tropical Pacific Ocean.

**El Niño:** A warming of the ocean surface, or above-average sea surface temperatures (SST), in the central and eastern tropical Pacific Ocean

**La Niña:** A cooling of the ocean surface, or below-average sea surface temperatures (SST), in the central and eastern tropical Pacific Ocean

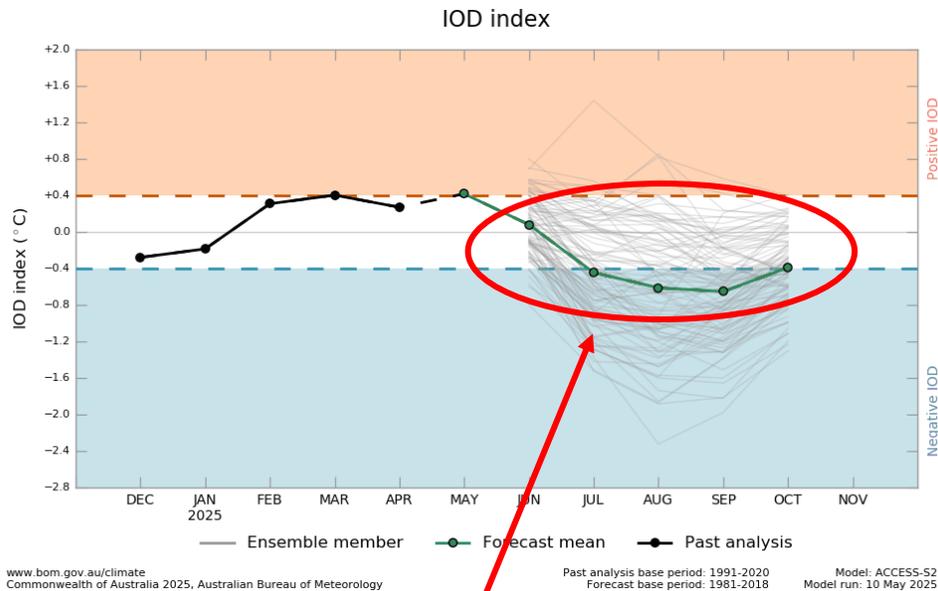
**Neutral:** Neither El Niño or La Niña. Often tropical Pacific SSTs are generally close to average.

## Climate Drivers



# National Outlook JJAS 2024

## (ii) IOD



JJAS 2025 Forecast

The outlook suggests neutral IOD

## Phases of IOD

The Indian Ocean Dipole (IOD) is defined as the difference in sea surface temperature anomalies between two areas – western Indian Ocean and eastern Indian Ocean

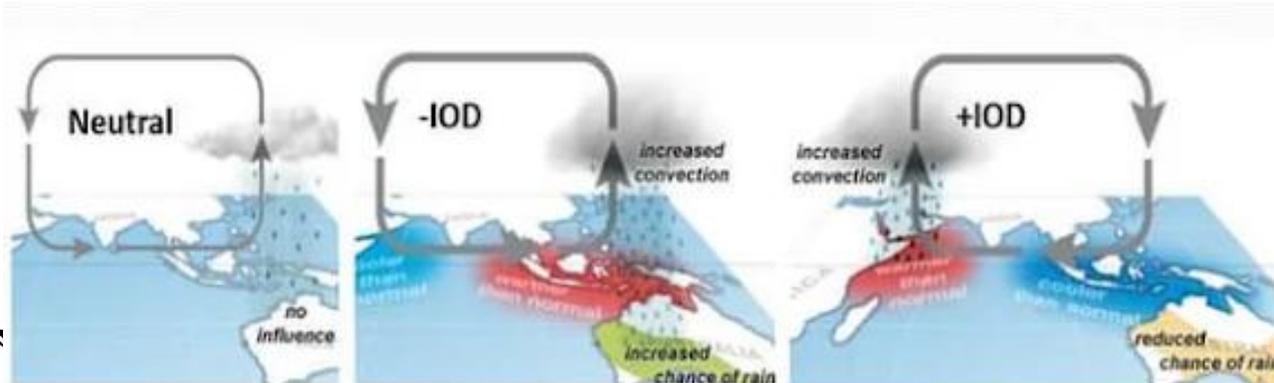
### Positive event:

- warmer sea surface temperatures in the western Indian Ocean relative to the east

### Negative event:

- cooler sea surface temperatures in the western Indian Ocean relative to the east

## Climate Drivers



জাতীয় ক্রিয়া-বিদ্যা

NATIONAL CENTER FOR HYDROLOGY AND METEOROLOGY

# Summary: JJAS 2025 rainfall and temperature forecast

SI No.	Indicators	Precipitation	Maximum Temperature	Minimum Temperature
1	CPT	Slightly above normal	Above normal	normal
2	FOCUS	Above normal		
3	GPCs	Climatological Probability	Above normal	
4	IRI	Climatological Probability	Above normal	
5	APEC	Climatological Probability	Above normal	
6	C3S	Climatological Probability	Above normal	
7	JMA	Slightly above normal	Above normal	
8	SASCOF	Normal to slightly above normal	Above normal	
9	ENSO	Neutral to continue		
10	IOD	Neutral		



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# Consensus forecast for JJAS 2025

11<sup>th</sup> National Climate Outlook Forum for Bhutan was held on 23<sup>rd</sup> May, 2025

***Bhutan outlook: Normal Rainfall.  
Maximum and minimum temperature is likely to be slightly above normal.***

Note\* The summer monsoon outlook has to be used and interpreted along with the extended, medium, daily weather forecasts and other advisories released by the Centre. The stakeholders and users are advised to follow the NCHM website and Facebook pages for advisories and updates.

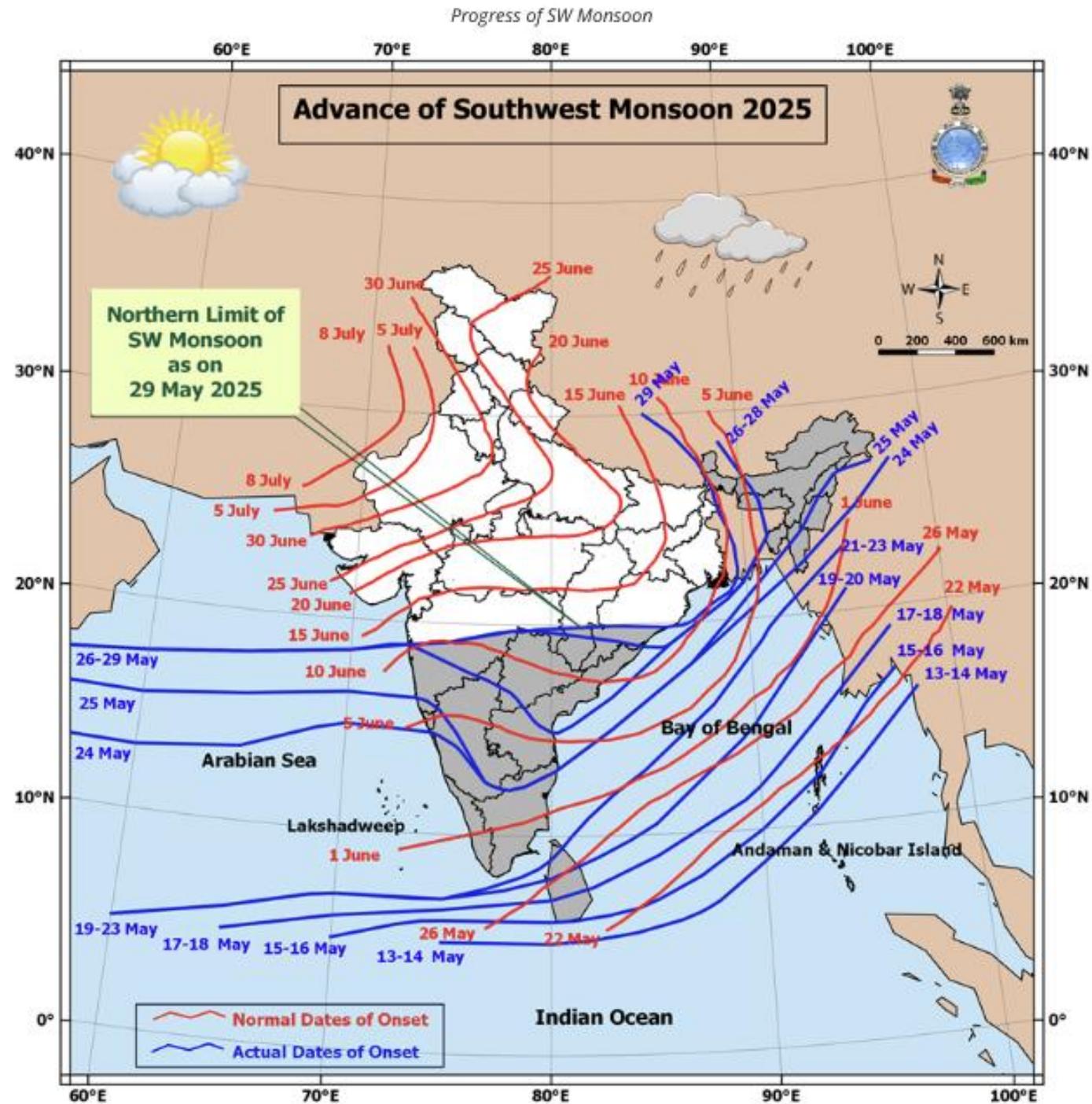


# MONSOON 2025 UPDATE

NORMAL ONSET FOR  
BHUTAN 5 JUNE

MONSOON ONSET 2025

1st WEEK OF JUNE



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# THANK YOU



