# 1st Third Pole Climate Forum Consensus Statement

# (TPCF-1)

Lijiang, China, 4-6 June, 2024

## Summary of the Climate for December 2023 to April 2024 and the Climate Outlook for June to September 2024

## Background and Contributing Institutions

The WMO Third Pole Regional Climate Center-Network (TPRCC-Network), focusing on the Third Pole (TP) region, was established to meet the region-specific climate and cryosphere service requirements. It is comprised of three Nodes based on the geographical and functional distribution of responsibilities: Northern Node (led by China), Southern Node (led by India), and Western Node (led by Pakistan), with China as an overall coordinator of the Network. Broad partnerships have been developed with GCW, GEWEX, ICIMOD, MRI, TPE, and UNESCAP. The TPRCC-Network will play a pivotal role in fostering collaborative regional climate services within its domain, effectively addressing the needs of stakeholders on adaptation to climate change, and decision-making across the region. These tasks will be accomplished to develop products and services and disseminate through the TPRCC-Network web portal (http://www.rccra2.org/tp-rcc/). The regular update and online publication of seasonal climate bulletins and consensus statements during the biannual climate forums, will ensure a continuous flow of information and engagement.

The consensus statements are the primary outcomes of the TPCF. Incorporating regional expertise, the statements integrate observational data, historical trends, state of current climate and seasonal forecasts. The statements provide an overview of surface air temperature (SAT), precipitation, snow cover, and the extreme events and hazards observed during the preceding season and offer an outlook for SAT and precipitation for the upcoming season. The procedure adopted to develop a Consensus Statement (CS) is given as Annex-I.

This consensus statement was produced and mutually agreed at the inaugural session of the TPCF held in Lijiang, China, 4-6 June, 2024, co-hosted by the Beijing Climate Centre (BCC) of the China Meteorological Administration (CMA) and the World Meteorological Organization (WMO). The

content and graphics were prepared in partnership with the CMA, PMD and IMD, and were supported by the Technical Team on Long-Range Forecast (TT-LRF) in terms of the objective method of producing LRF products. The guidance provided by the WMO and contributions made by all partners are greatly appreciated.

# Highlights

- In winter (DJF) 2023/2024, most of the Third Pole core region (TPCR[1]) experienced higher surface air temperature, except for the inner and southeastern Qinghai-Tibet Plateau. The western Tianshan (Tien Shan) mountains and the southwestern part of the TP region experienced significantly drier conditions than normal, while northeastern and central parts of the TP region experienced wetter conditions. The extent of snow cover was slightly below normal over the TP region as a whole.

- During December 2023–April 2024, Mongolia experienced the harshest Dzud[2] in the last 50 years. Pakistan and Afghanistan were severely affected by heavy rain and flash floods in April and May 2024. Northern Kazakhstan suffered from floods caused by the exceptional snow melt in March–April 2024.

- Surface air temperatures are likely to be above normal over most parts of the TP region, especially over the Karakoram. The southwestern and northwestern parts are likely to experience normal to above normal surface air temperatures.

- Precipitation is likely to be near or above the climatological normal over most parts of the TP region, however, it is likely to be below normal in the western and southeastern parts of the TP region.

[1] TPCR refers to the region with altitude above 2000 m within the TPRCC-Network domain, i.e. the region within black contour in Figures 1-10 in the Consensus Statement.

[2] A Dzud (a Mongolian term that describes 'severe winter conditions', sometimes spelled zud) is a cold-season disaster that anomalous climatic (i.e., heavy snow and severe cold) and/or land-surface (snow/ ice cover and lack of pasture) conditions lead to reduced accessibility and/or availability of forage/pastures, and ultimately to high livestock mortality during winter–spring.

# Climate Summary for December 2023 – April 2024

## Temperature

In winter (DJF) 2023/2024, most of the TPCR (Figure 1) experienced above normal[3] SAT, except for the inner and southeastern Qinghai-Tibet Plateau. The northeastern and southwestern parts of the TP region were colder than normal (with respect to the baseline period 1991-2020), with 2-4℃ negative anomalies observed over the parts of western Mongolia.

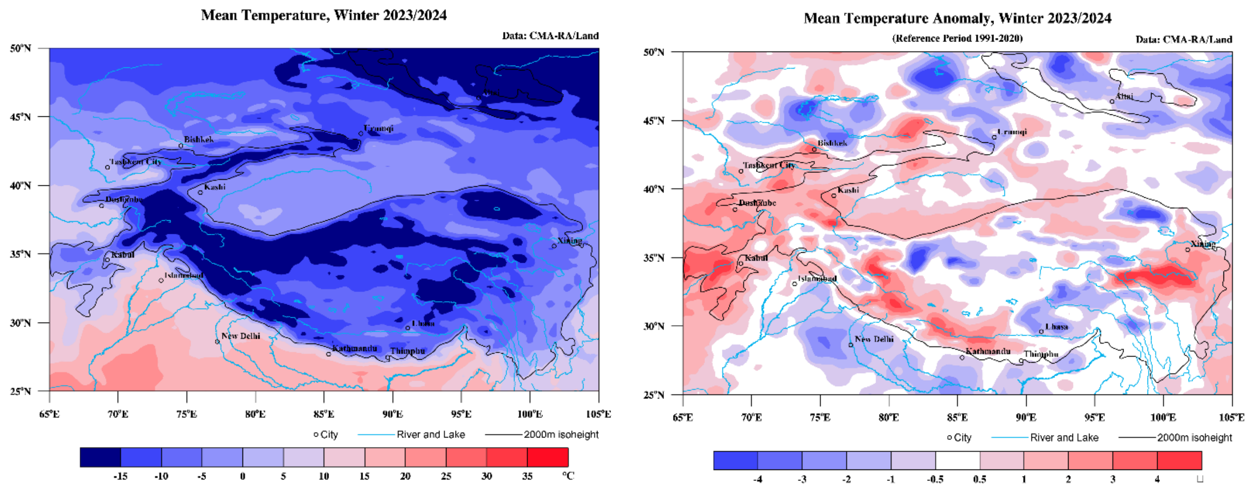


*Figure 1 Winter (DJF2023/2024) mean surface air temperature (left) and anomalies. (relative to 1991-2020, right). Data source: CMA-RA/Land*

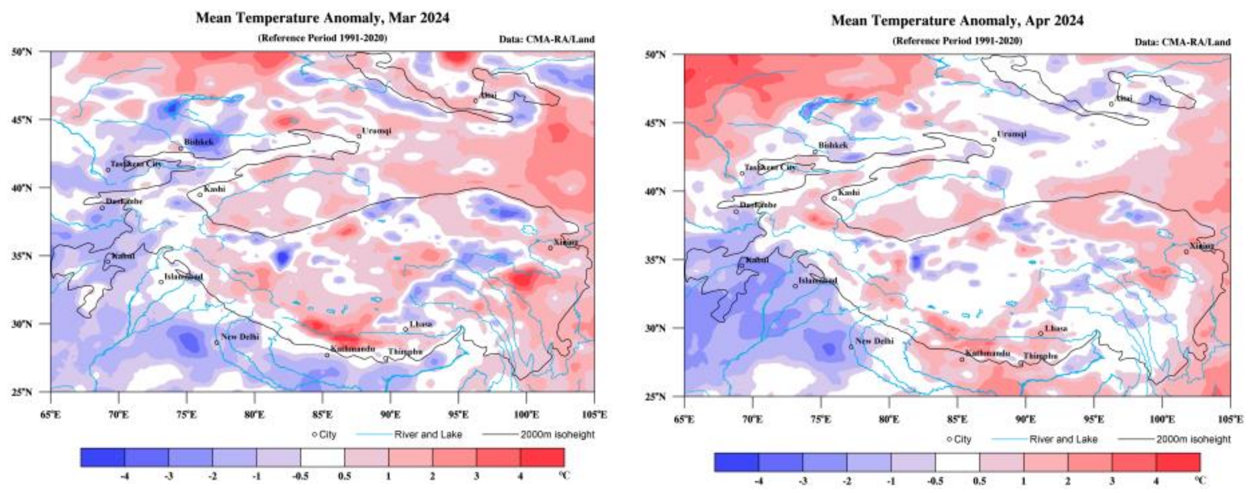


*Figure 2 Monthly mean surface air temperature anomalies (relative to 1991-2020) in March 2024 (left) and April 2024 (right). Data source: CMA-RA/Land*

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[3] The baseline period 1991-2020 for SAT and Precipitation

In March, positive SAT anomalies were observed from the Qinghai-Tibet Plateau to northwestern China while negative SAT anomalies were dominant over the southwestern and southern part of the TP region and eastern Central Asia. This pattern persisted through April with weaker positive anomalies in the southern TP region. In April, SAT was close to the normal over most of the TPCR except eastern Kazakhstan where SAT was considerably above the normal (Figure 2).

## Precipitation

In winter (DJF) 2023/2024, precipitation exceeded the normal in most sub-regions of the Third Pole, except for the western Tianshan (Tien Shan) mountains and the southwestern part of TP region which experienced significantly drier conditions, with 20-80% less precipitation than normal (Figure 3). The northeastern and central parts of the TP region experienced particularly wet conditions, with precipitation exceeding the normal by 50%–200% and even stronger anomalies were observed locally.

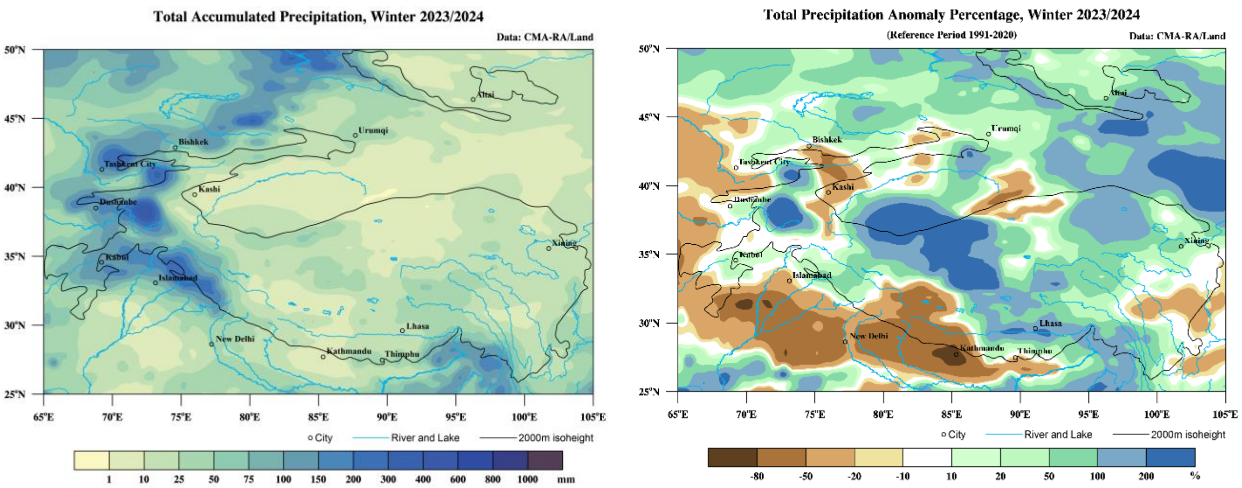


*Figure 3 Winter (DJF 2023/2024) precipitation totals (left) and anomalies by percentage (relative to 1991-2020, right). Data source: CMA-RA/Land*

In March, the strongest negative precipitation anomalies occurred in the northeastern TP region, while positive anomalies were observed over the southern part of the TP region. In April, precipitation was above normal in the southwestern and northeastern TP region but over 50% below the normal in the south and southeastern TP region (Figure 4).

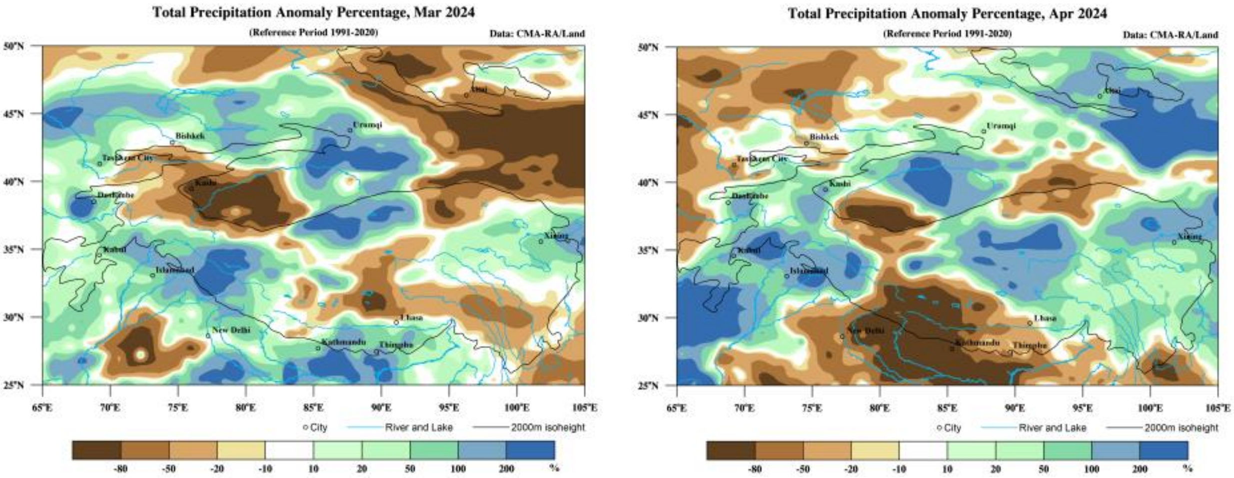


*Figure 4 Monthly precipitation anomalies by percentage (relative to 1991-2020) March 2024 (left) and April 2024 (right). Data source: CMA-RA/Land*

# Snow Cover

In the TP region, inter-annual variations were noted, but no significant trends in Snow Cover Extent (SCE) were observed over the past 20 year. In DJF 2023/2024, SCE was $1299.3\times10^3$ km$^2$, which was $40.9\times10^3$ km$^2$ (3.1%) below the normal (relative to the 2005-2020 period). The number of snow cover days (NSCD) was below the normal across most of the region (Figure 5). In southern Kazakhstan and in the areas south of Tianshan (Tien Shan), along Gangdise Mountains, west of the Pamirs, and eastern TPCR, negative anomalies exceeded 10 days and, in some regions, 20 days. In the northeastern TP region and the central part of the TPCR, positive NSCD anomalies were observed exceeding the normal by up to 20 days.

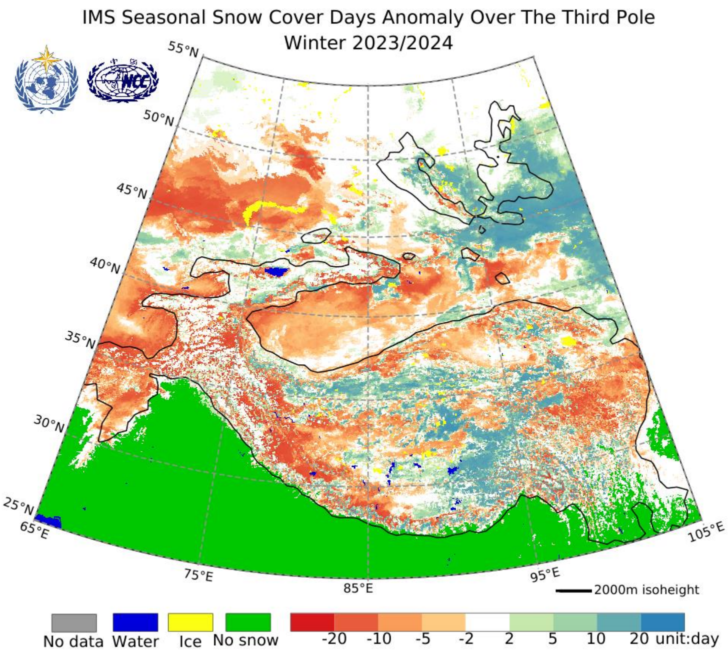


*Figure 5 Winter (DJF 2023/2024) anomalies of the number of snow cover days (relative to 2005-2020). Data source: IMS/NSIDC*

During March and April 2024, the mean SCE in the Third Pole region was estimated as $1024.4\times10^3$ $km^2$ and $596.2\times10^3$ $km^2$, respectively, and were marginally above the normal with $18.8\times10^3$ $km^2$ (1.9%) and $28.9\times10^3$ $km^2$ (5.1%) positive anomalies. Positive anomalies mainly occurred in the western and northeastern TPCR and negative anomalies were observed in the middle and southern edge of the TPCR (Figure 6). The magnitudes of both positive and negative anomalies in both months were lower than magnitudes of the anomalies observed in winter 2023/2024.

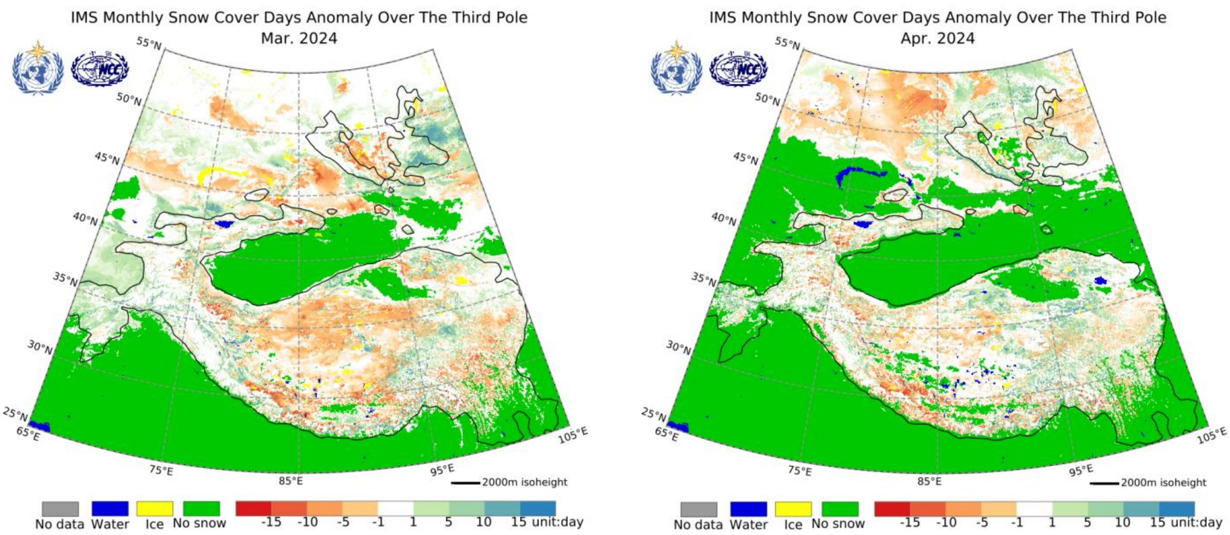


*Figure 6 Monthly anomalies of the number of snow cover days in March 2024 (left) and April 2024 (right) (relative to 2005-2020). Data source: IMS/NSIDC*

# High-impact Climate Events

## Dzud

Between December 2023 and April 2024, Mongolia experienced the harshest Dzud in the last fifty years, with severe blizzards and harsh weather conditions affecting over 188,300 people. Twenty people have lost their lives due to severe blizzard. As of 25 April 2024, the country has lost 7.1 million livestock, amounting to 11.1% of the total.

## Heavy rainfall and floods

**Pakistan:** In April 2024, the national area-weighted rainfall of 59.3 mm was observed exceeding the normal by 164% and making it the wettest April on record since 1961. Pakistan experienced floods due to heavy rainfall from April 12 to 28, primarily affecting Khyber Pakhtunkhwa and Balochistan provinces. Satellite imagery of UNOSAT revealed that approximately 9,000 $km^2$ of land was affected by flood between April 20-24, 2024, with an estimated 1.5 million people potentially exposed or residing close to the flooded areas in Pakistan.

**Afghanistan:** From April 10 to 16, 2024, Afghanistan experienced heavy rain and flash floods. Preliminary reports indicate that there were at least 90 fatalities and numerous injuries, more than 2,000 houses have been damaged and thousands of livestock have died across the country. On May 10 and 11, heavy rainfall and flash floods struck northeastern Afghanistan, leading to 180 fatalities.

**Kazakhstan:** Severe flooding due to the heavy and intensive snow melt caused by the rapid warming and subsequent rainfall affected northern and western Kazakhstan in the first half of April, resulting in widespread damage. As of 19 April, approximately 118,200 people were displaced and / or evacuated from the flooded areas.

# Climate Prediction (JJAS)

## Temperature

In JJAS 2024, positive SAT anomalies are expected over most of the TP region (Figure 7). The maximum anomaly is expected to be centered over the Karakoram region surpassing 2℃ with anomaly values decreasing gradually eastward along the Qinghai-Tibet plateau. Similarly, the probabilistic forecast of temperature for TP region suggests that higher temperature is likely to occur over the most of TP region (Figure 8). However, near normal SATs are expected along the Himalaya-Karakoram ranges in the south-west of the TP region.

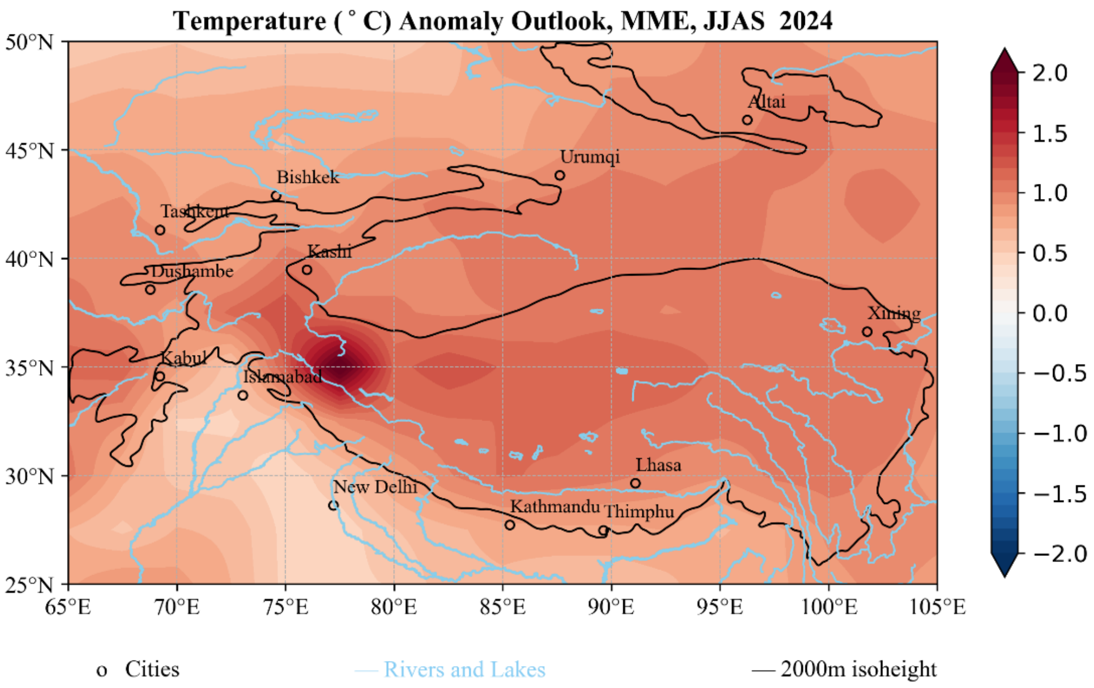


*Figure 7 Surface Air Temperature anomaly outlook, MME, JJAS 2024 for TP region*

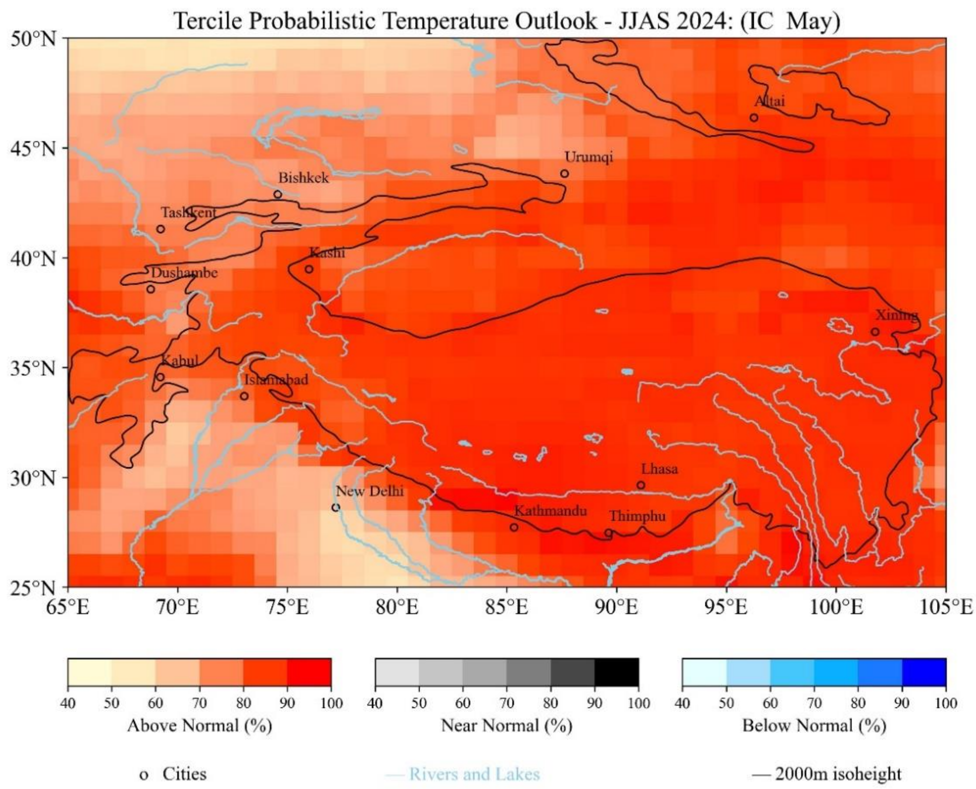


*Figure 8 Surface Air Temperature Probabilistic outlook, JJAS 2024 for TP region*

## Precipitation

In JJAS 2024, no significant precipitation anomalies are expected to develop over most of the TP region (Figure 9). A moderate positive anomaly is predicted along the Himalaya-Karakoram ranges in the southwestern TP region, while negative anomalies are predicted in the Hengduan mountains and adjacent areas in the eastern TP region.

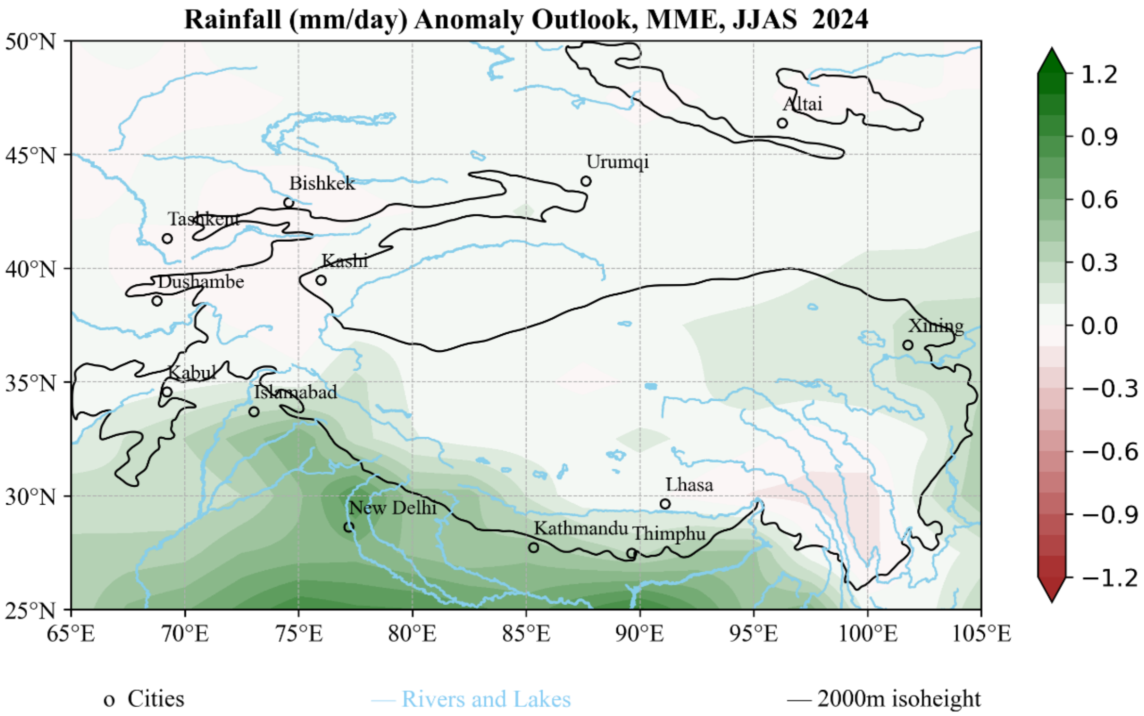


*Figure 9 Precipitation anomaly outlook, MME, JJAS 2024 for TP region*

According to the probabilistic forecast, normal to slightly above normal precipitation is expected in most parts of the TP region while above average precipitation is likely along the Himalaya-Karakoram ranges in the southwestern and southern TP region during JJAS 2024 (Figure 10). However, below average precipitation is likely over the southeastern and western parts of the TP region.

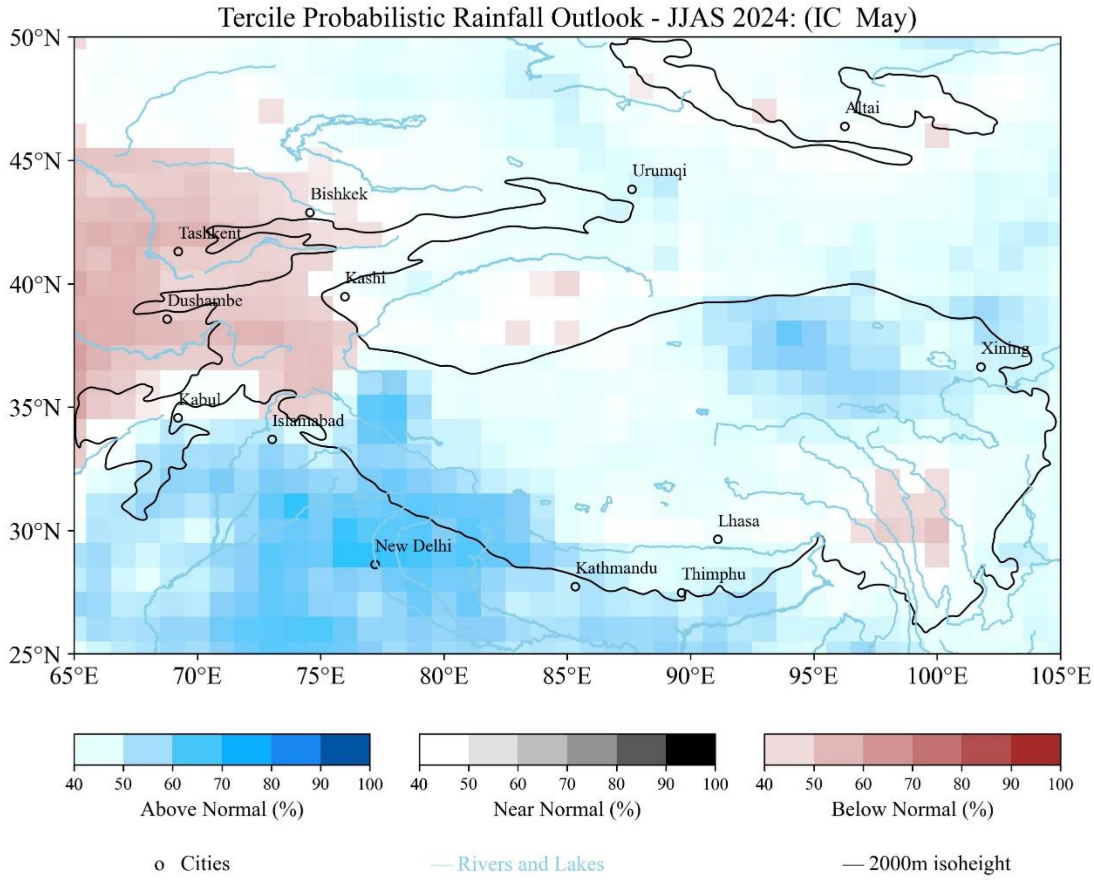


*Figure 10 Precipitation Probabilistic outlook, JJAS 2024 for TP region*

## Annex-I

# Understanding of Consensus Statement

The predictions of air temperature and precipitation are based on eleven climate models (APCC-SCOPS, BCC-CSM1.1M, BOM-ACCESS-S1, CMCC-SPS3.5, CWB-TCWB1Tv1.1, HMC-SL-AV, KMA-GLOSEA5GC2, METFR-SYS8, NCEP-CFSv2, PNU-CGCMv2, and UKMO-GLOSEA5) and consolidated by the Long-Range Forecast provided by the geographical lead nodes and the forecast provided by the regional centers whose domains overlap with the TP region.

In terms of model skill (i.e., the ability of a climate model to predict seasonal climate), a multi-model ensemble (MME) approach merges information from all individual models. This provides a forecast with higher confidence in regions where different model outputs are consistent, and lower confidence where models show less agreement. Ensemble means are calculated from the outputs of the individual models using a simple composite method (SCM). The ensemble mean anomaly forecasts for each individual model is calculated using their own climatology obtained from the hindcast. The anomaly for each model is based on the reference period (1991 – 2020) of the model's climatology. Ensemble mean anomaly is calculated from those of the individual models using SCM. The MME approach is a well-recognized methodology for providing the most reliable objective forecasts.

Snow cover products were produced using 4-km daily data of the IMS released by the NSIDC (https://nsidc.org/home). The number of snow cover days within a specific period was determined by counting the days with recorded snow cover. To calculate the SCE for each grid cell in a certain period, the following two-step methodology was employed: (1) calculate the snow cover fraction for each grid cell by dividing the number of days with snow cover by the total number of days in the period, and (2) multiply the snow cover fraction by grid cell area (16 $km^2$) to obtain SCE for individual grid cells. The regional SCE for the period was determined by summing the SCEs of all grid cells within the domain of the TPRCC-Network.

# Acronyms

1. **BCC** – Beijing Climate Centre
2. **CMA** – China Meteorological Administration
3. **GCM** – Global Climate Model
4. **GCW –** Global Cryosphere Watch
5. **GEWEX** – Global Energy and Water EXchanges
6. **ICIMOD** – International Centre for Integrated Mountain Development
7. **IMD** – India Meteorological Department
8. **IMS** – Interactive Multisensor Snow and Ice Mapping System
9. **JJAS** – June, July, August, September
10. **LRF** – Long-Range Forecast
11. **MME** – Multi-Model Ensemble
12. **MRI** – Mountain Research Initiative
13. **NSCD** – Number of Snow Cover Days
14. **NSIDC** – National Snow and Ice Data Center
15. **PMD** – Pakistan Meteorological Department
16. **SAT** – Surface Air Temperature
17. **SCE** – Snow Cover Extent
18. **SCM** – Simple Composite Method
19. **TP** – Third Pole
20. **TPCR** – Third Pole Core Region
21. **TPE** – Third Pole Environment Programme
22. **TPRCC-Network -** Third Pole Regional Climate Centre Network
23. **TT-LRF** – Technical Team on Long-Range Forecast
24. **UNESCAP** – United Nations Economic and Social Commission for Asia and the Pacific
25. **WMO** – World Meteorological Organization