



Regional Drought Monitoring and Outlook System

Seasonal outlook

June to September 2021

Background

The Regional Drought Monitoring and Outlook System ([RDMOS](#)) is an operational service which produces reliable drought indicators for the Hindu Kush Himalaya (HKH) region with a specific focus on Afghanistan, Bangladesh, Nepal, and Pakistan. The system incorporates climatic models with suitable Earth observation data and land surface models to produce drought indices – precipitation, temperature, soil moisture, and evapotranspiration – and vegetation conditions at 10-day intervals for near real-time monitoring of droughts. The RDMOS also provides seasonal outlooks at four-month intervals to support drought management and preparedness processes.

This system applies the Noah-MultiParameterization (NoahMP) Land Surface Model (LSM) in the NASA Land Information System (LIS), driven by downscaled meteorological fields from the Global Data Assimilation System (GDAS) and Climate Hazards InfraRed 20 Precipitation products (CHIRP and CHIRPS) to optimize initial conditions. The NASA Goddard Earth Observing

System (GEOS) Model - sub-seasonal to seasonal (S2S) forecasts, downscaled using the National Center for Atmospheric Research (NCAR) General Analog Regression Downscaling (GARD) tool and quantile mapping, are then applied to drive 5-km resolution hydrological forecasts to a 9-month forecast time horizon.

A web-based graphical user interface provides a user-friendly means to analyse drought indices across river basins, national administrative boundaries, or a pre-defined area of interest and to aggregate results along cropping seasons. This capability has been in operation since April 2019, and has provided reliable outlooks of emerging seasonal water availability scenarios for the region.

The following brief presents seasonal anomaly maps from June to September 2021 in major river basins of the HKH region based on data generated by the RDMOS. These four months cover the Asian summer monsoon season, known for flood disasters. Long-term average conditions (climate normal) are also provided for an overall understanding of precipitation and temperature patterns in the region. Read more about the RDMOS [here](#).

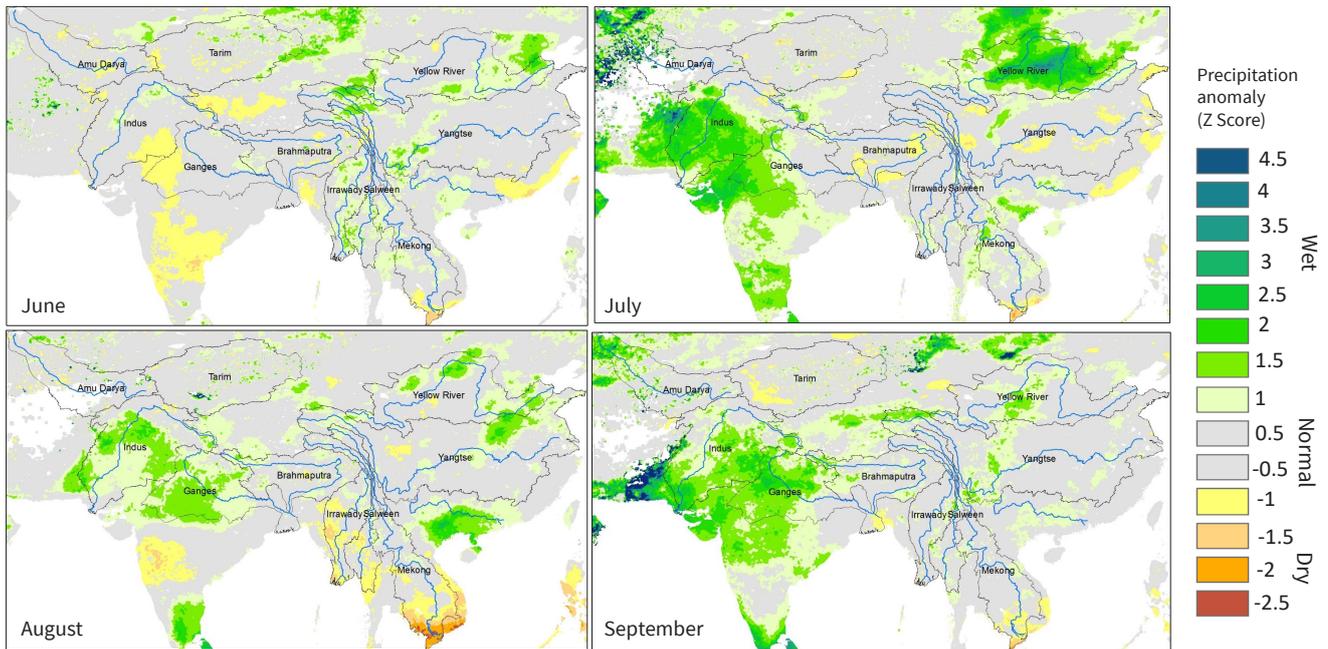
¹ Anomaly maps based on Z-score. The Z-score (anomaly) is a measure that reflects the departure from normal conditions in a particular month observed from 2001 to 2018.

Precipitation outlook for June to September 2021

The four-month precipitation outlook from June to September indicates that near normal conditions will persist in most of the basins except lower Indus and lower Ganges basins where relatively high water surplus is expected. A minor deficit is expected in the Mekong and Salween basins. The stated near normal conditions are linked to transition of 2020 La Nina, in tropical Pacific, to neutral phase (neither *La Nina* nor *El Nino*). Also the *Indian Ocean Dipole (IOD)* index is expected to be neutral during the summer season.

MONTHLY BREAKDOWN

June exhibits near normal conditions of spatial distribution of precipitation across the region with some moderate deficits over the Indian Peninsula. During July, the peak monsoon precipitation month in the Indian sub-continent's river basins, the lower Indus, Ganges and Yellow River basins will transition towards wetter conditions. The lower Indus and Ganges basins will continue to receive more than normal precipitation in August while the Salween and Mekong basins are likely to face drier conditions. Precipitation in all other basins is expected to remain near normal.



Extremely dry (<-3), Very dry (-2 to -3), (-1 to -2), Near normal (1 to -1), Wet (1 to 2), Very wet (2 to 3), Extremely wet (>3)

FIGURE 1: PRECIPITATION OUTLOOK FOR JUNE-SEPTEMBER 2021

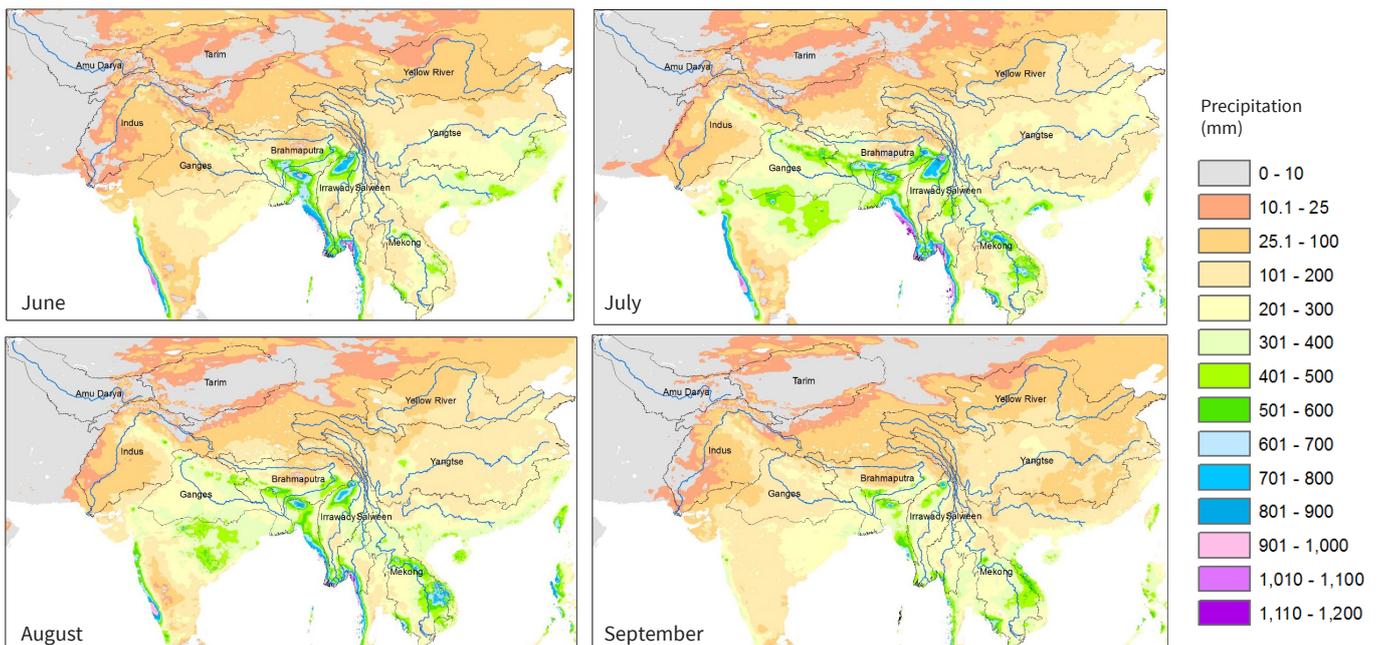


FIGURE 2: AVERAGE MONTHLY PRECIPITATION FOR JUNE-SEPTEMBER BASED ON OBSERVATIONS DURING 2001-2018

Above normal rains are anticipated during September in the western regions of Ganges and Indus basins. This positive anomaly should not be misunderstood on a seasonal scale as that is a very dry belt and the normal rainfall amount is minimal (10-25 mm as shown in Figure 2). The tropical cyclone season of the Bay of Bengal and the Arabian Sea also starts in September, leading to a probability of a cyclonic storm washing the shores of Indo-Pak sub-continent, and pushing the amounts of precipitation above the normal level.

IMPACT ON AGRICULTURE

Monsoon rains are a lifeline for the predominantly non-irrigated cultivation in the HKH region. Sufficient rains with normal temporal and spatial distribution will have a positive impact on agricultural production and farm incomes. At the same time, embedded extreme precipitation events during the monsoon season trigger floods and associated hazards like landslides.

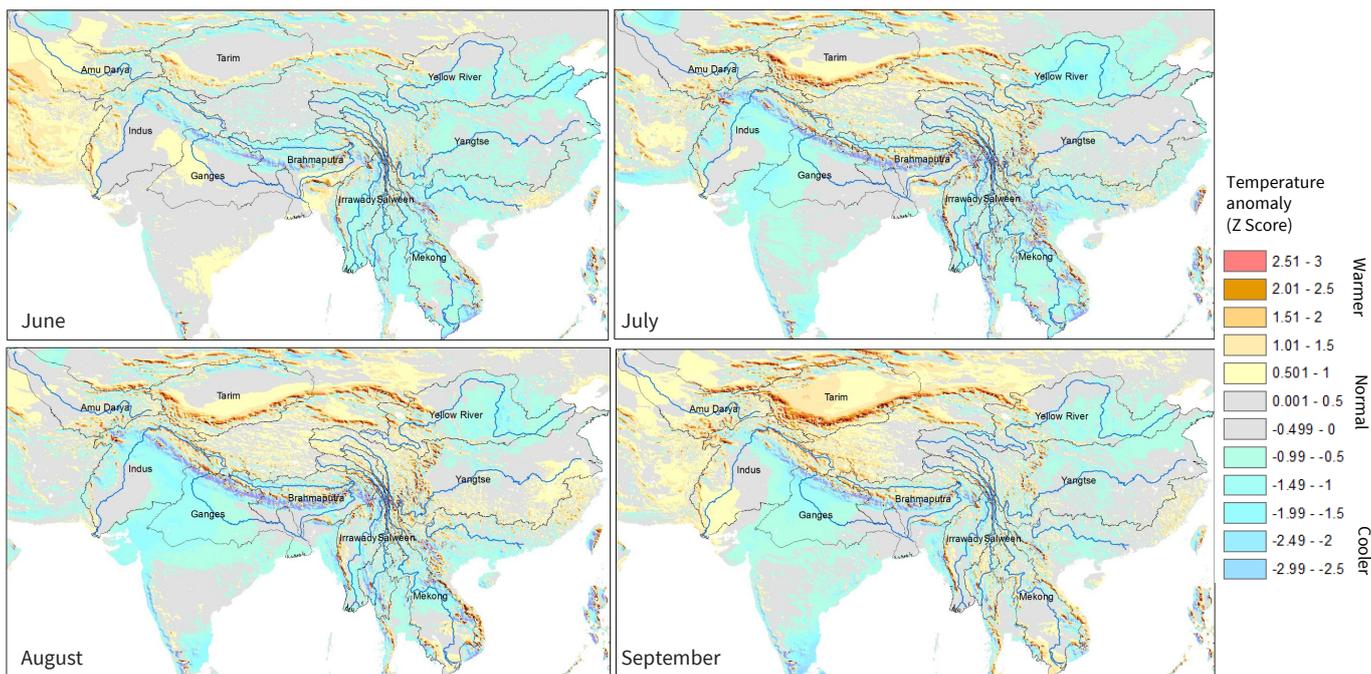


FIGURE 3: TEMPERATURE OUTLOOK FOR JUNE–SEPTEMBER 2021

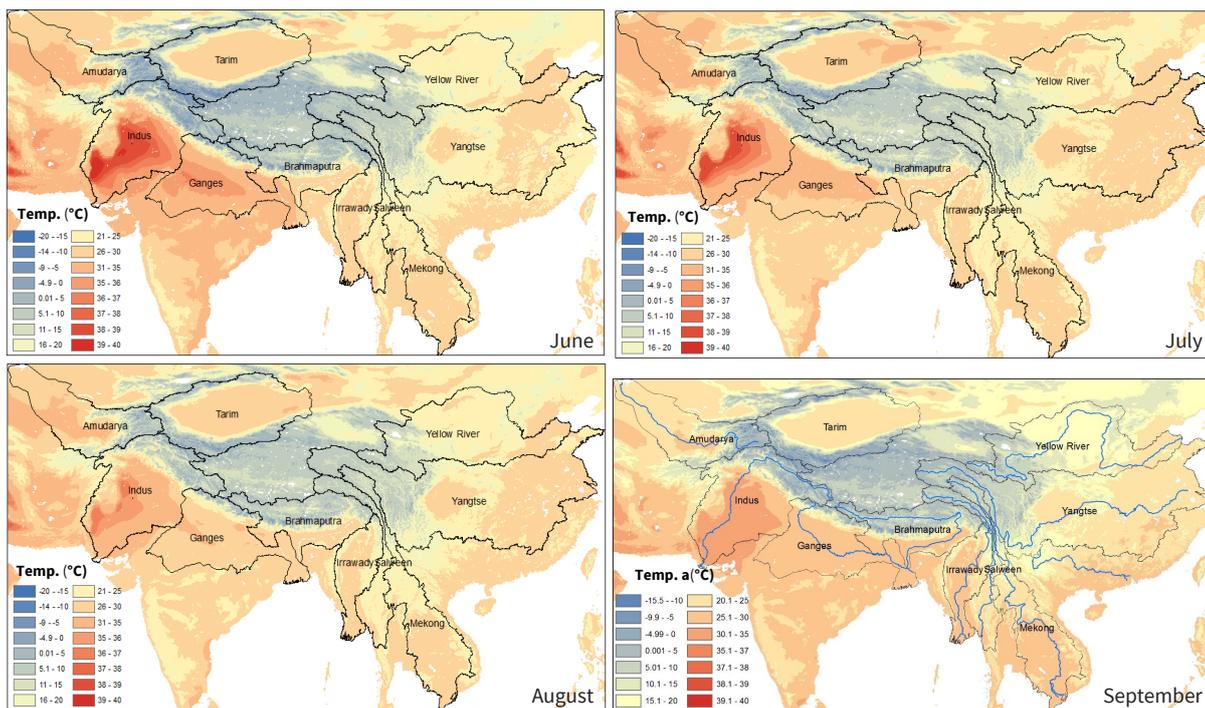


FIGURE 4: AVERAGE MEAN MONTHLY TEMPERATURE FOR JUNE–SEPTEMBER BASED ON OBSERVATIONS DURING 2001–2018



REGIONAL KNOWLEDGE FORUM ON DROUGHT: EARTH OBSERVATION AND CLIMATE SERVICES FOR FOOD SECURITY AND AGRICULTURAL DECISION MAKING IN SOUTH AND SOUTHEAST ASIA, 8–10 OCTOBER 2018, KATHMANDU, NEPAL.

Temperature outlook for December 2020–March 2021

As shown in the temperature anomaly map above, most of the areas are expected to remain under cooler-than-normal temperatures; except Tibetan region, Tarim basin and extreme western parts of the HKH region. Only small warm anomalies are expected in the parts of Indus basin during September.

Visualization of drought outlook at the sub-basin level

Users can interact with the RDMOS to view and download different snapshots; the map control element in the web-based interface allows users to select different sub-basins, indices, periodicity, and filter forecast ensemble via drop-down menus. The map/visualization and corresponding

graph are updated as per the selected variables. The system can be accessed from <http://tethys.icimod.org/apps/regionaldrought/>

The system has been further customized to generate drought outlook at the provincial level for Afghanistan, Bangladesh, Nepal, and Pakistan and can be directly accessed from the following URLs:

National Agricultural Drought Watch – Afghanistan
<http://tethys.icimod.org/apps/droughtaf/>

National Agricultural Drought Watch – Bangladesh
<http://tethys.icimod.org/apps/droughtbd/>

National Agricultural Drought Watch – Nepal
<http://tethys.icimod.org/apps/droughtnp/>

National Agricultural Drought Watch – Pakistan
<http://tethys.icimod.org/apps/droughtpk/>

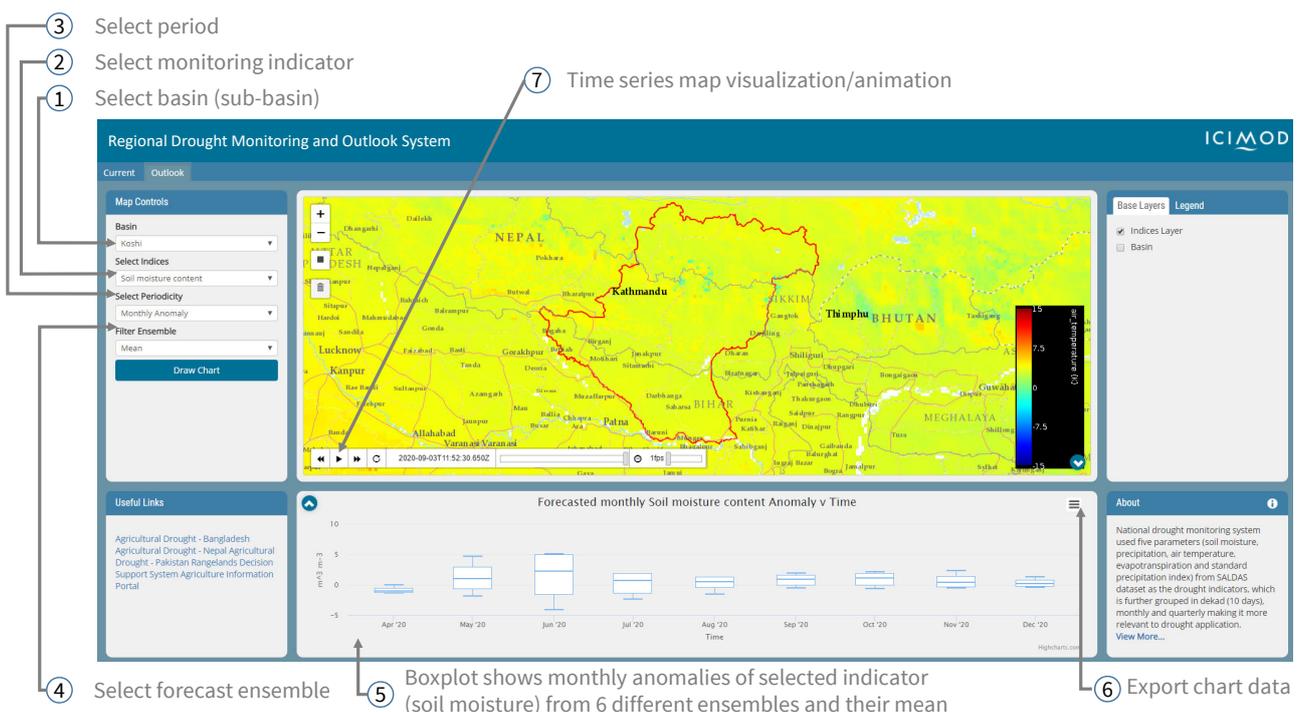


FIGURE 5: VISUALIZATION OF DROUGHT OUTLOOK AT THE SUB-BASIN LEVEL FOR THE KOSHI SUB BASIN

<http://tethys.icimod.org/apps/regionaldrought/>



FIGURE 6: VISUALIZATION OF DROUGHT OUTLOOK AT THE DISTRICT LEVEL FOR PROVINCE 2 IN NEPAL
<http://tethys.icimod.org/apps/droughtnp/>

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ICIMOD implements the SERVIR Hindu Kush Himalaya (SERVIR-HKH) Initiative – one of five regional hubs of the SERVIR network – in its regional member countries, prioritizing activities in Afghanistan, Bangladesh, Myanmar, Nepal, and Pakistan. For more, visit servir.icimod.org

For further information

Birendra Bajracharya servirhkh@icimod.org
servir.icimod.org | geoportal.icimod.org



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