

Sep 2021 | Issue 8

South Asia Drought Outlook



RESEARCH PROGRAM ON
Water, Land and
Ecosystems



MAFF
Ministry of Agriculture,
Forestry and Fisheries
農林水産省

How to use the bulletin?

- Tracks how likely the weather forecast for the next four weeks will have the dry spell or droughts, and to a lesser extent of lesser rainfall
- Maps drought situations at regional and national levels and for range of products from rainfall anomaly, SPI, vegetation index and composite drought index i.e. IDSI to assess the overall drought impacts
- Determine areas of short and long-term drought outlooks and drought alert maps
- Briefing of media reporting on drought impacts affecting the region's

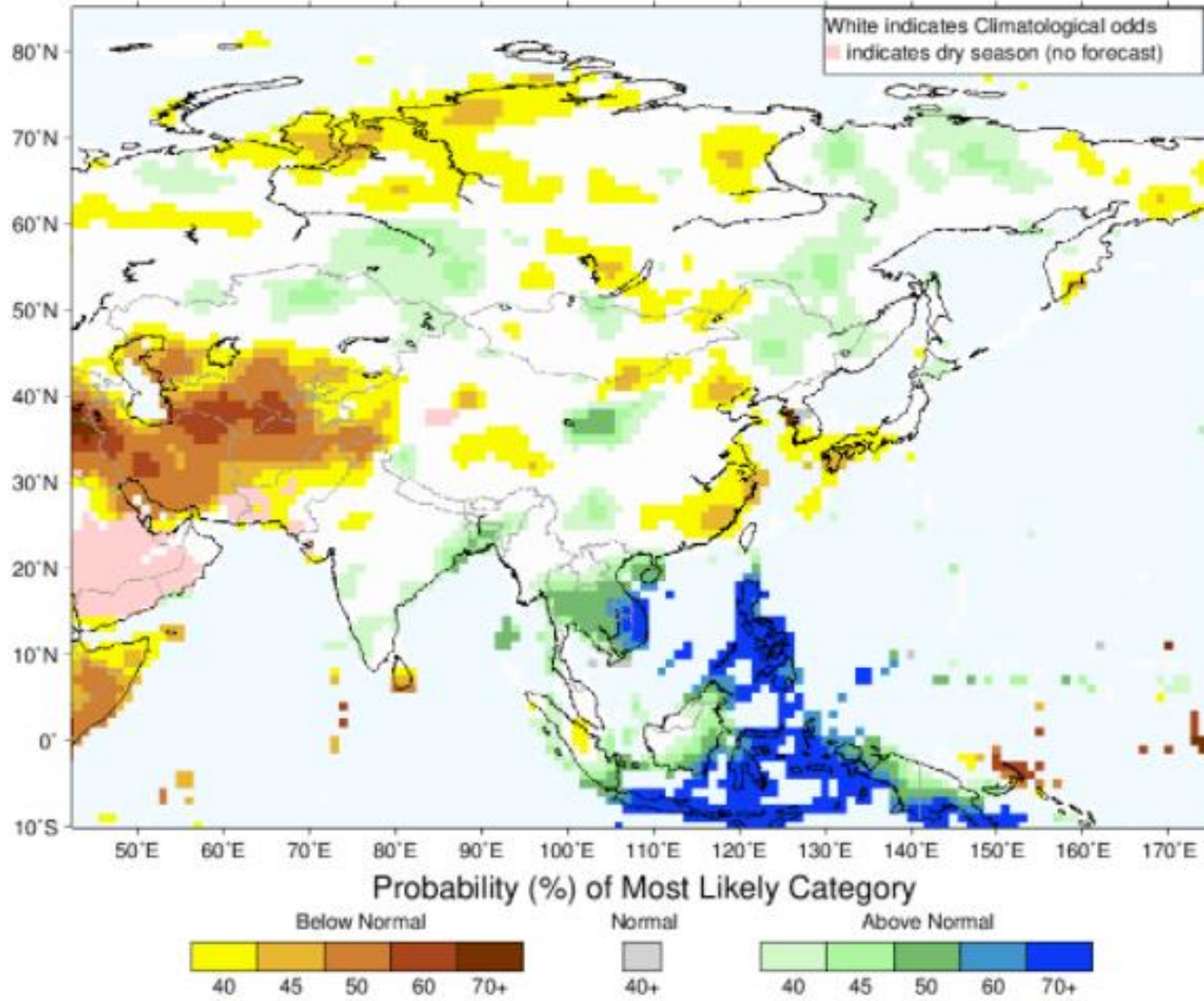
The SADMS bulletin is published by the 15th of each month.
View and download the latest issues at :

<https://www.iwmi.cgiar.org/resources/drought-monitoring-system/drought-bulletin/>

Drought Outlook Summary

- Although the southwest monsoon forecast for Bangladesh, Nepal and northern, central and northeastern states of India, remained moderate, significant reduction in rainfall was expected across South Asia by mid-October.
- The sub-season forecast valid till end of December 2021 shows a significant decrease (40-70 below normal) in rainfall in Afghanistan, Pakistan and southern part of Sri Lanka, while above normal rainfall is forecasted for India, Bangladesh, Nepal and Bhutan.
- Significant rainfall in South Asia in July and August has led to a significant increase in vegetation health growth in all other states of India except some parts of Maharashtra at the end of early September 2021. Furthermore, Bangladesh Sri Lanka, Nepal as well as many parts of India received some level of showers, while the maximum rainfall was received in the northern and northeastern parts of India.
- India is expected to experience a reduction in mild droughts reported from August to early September in the coming weeks as India is receiving significant rainfall.
- It is important the stakeholders adopt timely drought relief and response strategies to mitigate drought risks;

IRI Multi-Model Probability Forecast for Precipitation for October–November–December 2021, Issued September 2021

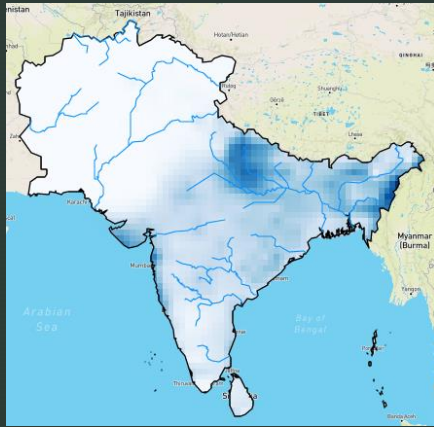


Source: IRI

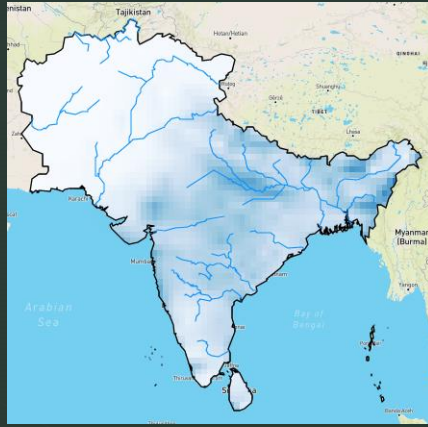
Precipitation forecast for most parts of India, Bangladesh, Nepal and Bhutan is above normal for Oct-Nov-Dec 2021. However, most parts of northern Pakistan, Afghanistan and southern Sri Lanka receive 40-70 below average rainfall.

Weather forecast (Current and anomaly rainfall)

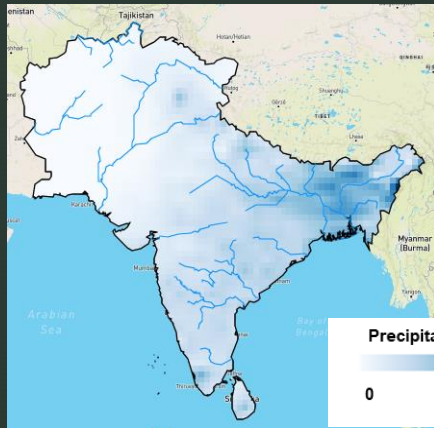
Week 1: 16 to 22 Sep



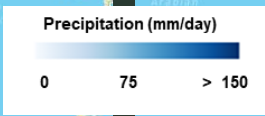
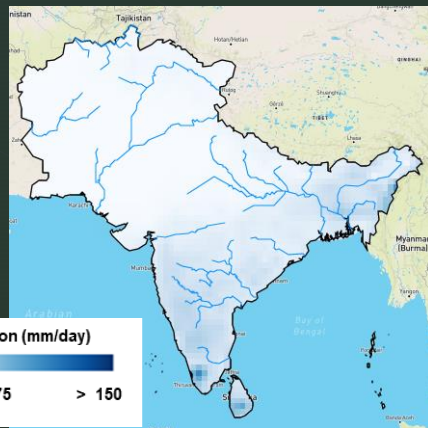
Week 2: 23 to 29 Sep



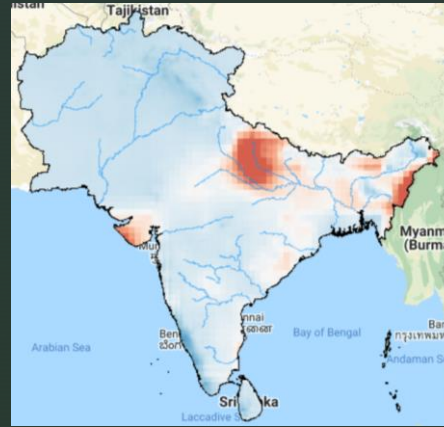
Week 3: 30 to 06 Oct



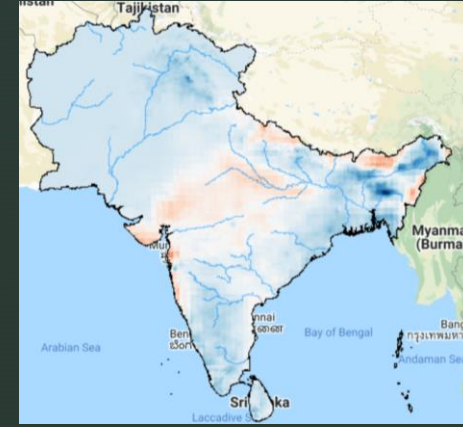
Week 4: 07 to 13 Oct



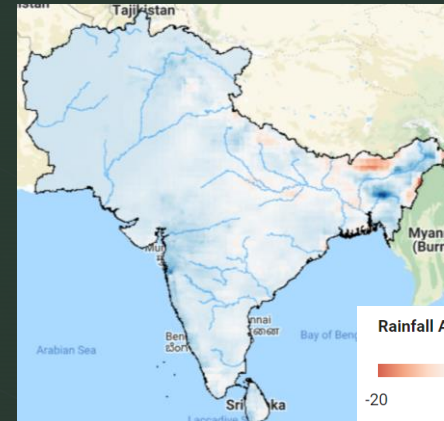
Week 1: 16 to 22 Sep



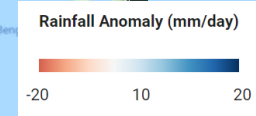
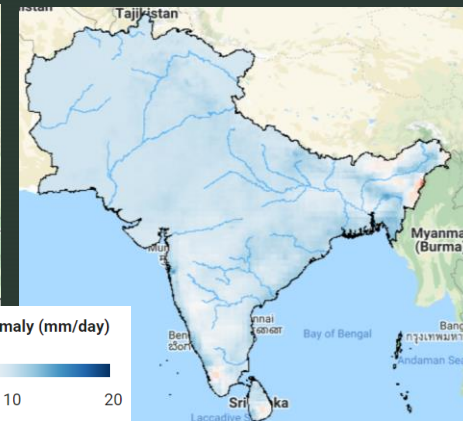
Week 2: 23 to 29 Sep



Week 3: 30 to 06 Oct



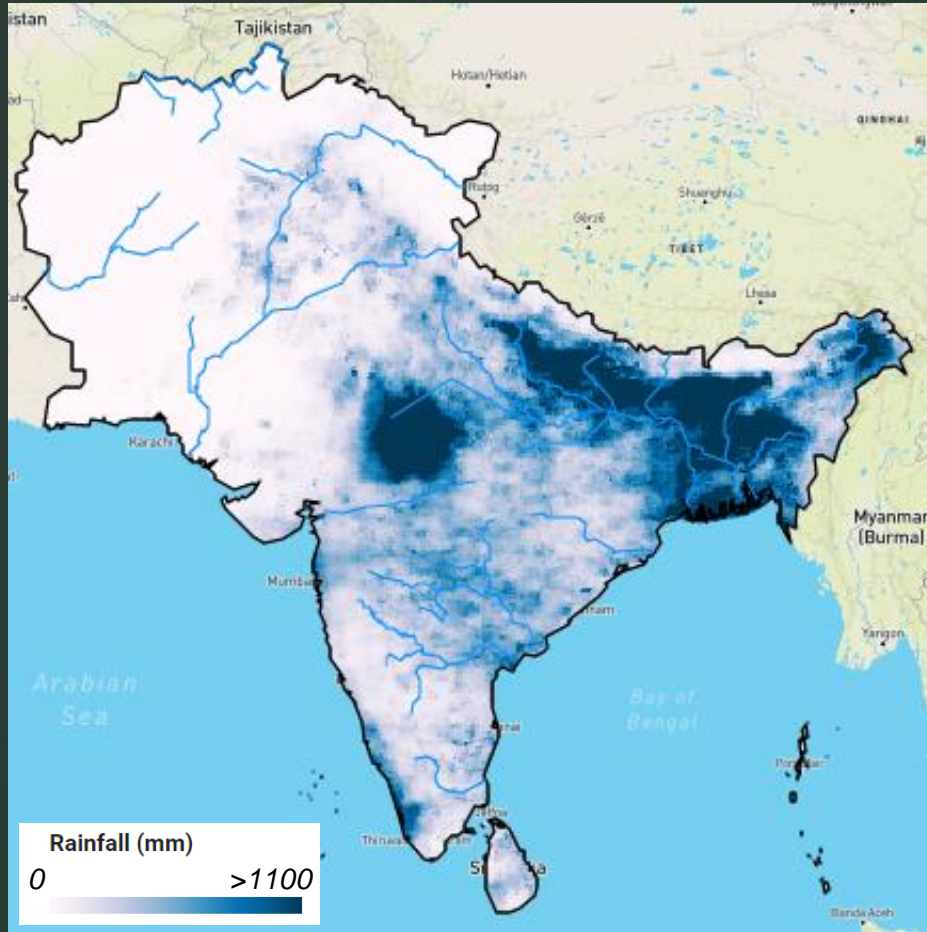
Week 4: 07 to 13 Oct



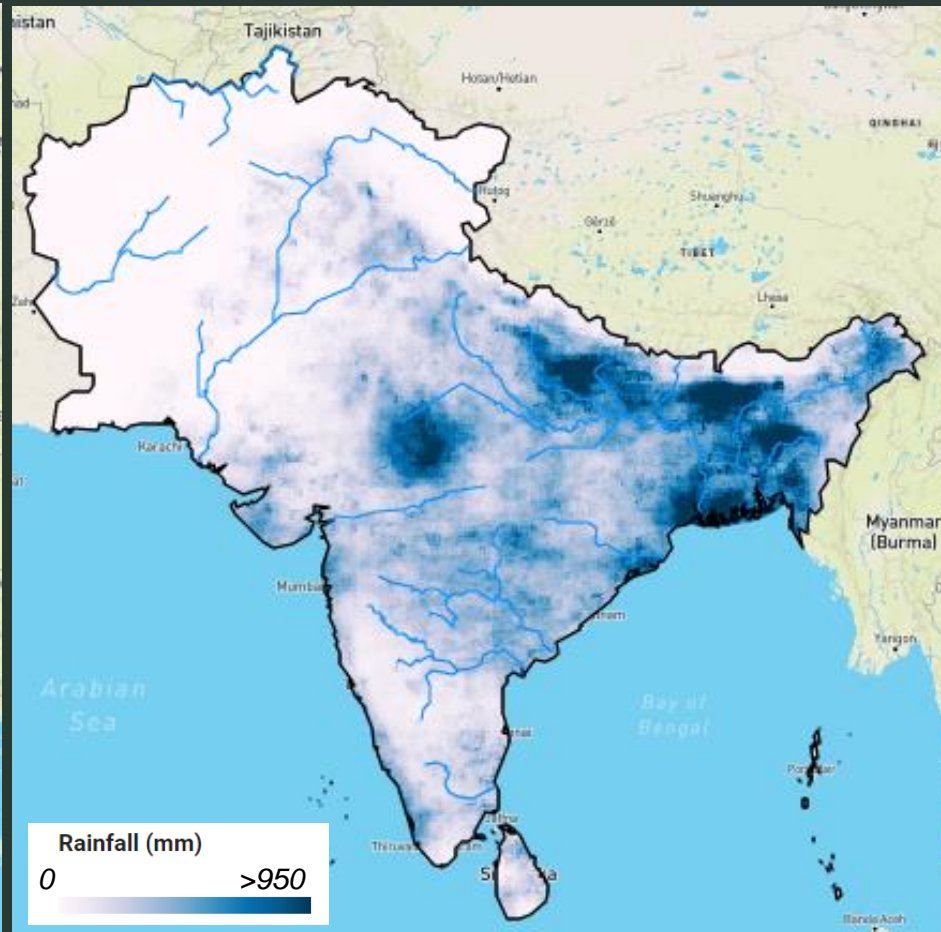
Sub-seasonal forecast and Extended Range Prediction group of IITM has been providing experimental real-time forecast of the active-break spells of Indian Summer Monsoon Rainfall since 2011 up to 4 pentad lead using an indigenously developed Ensemble Prediction system (EPS) based on the state-of-the-art Climate Forecast System Model Version 2 (CFSv2). This product provides 32 days of forecasted precipitation data with spatial resolution of ~50-km (0.5-deg x 0.5-deg).

To identify rainfall variability the sub-seasonal forecast data in reference to historical rainfall product from CHIRPS are used to determine areas of rainfall deficit. Values greater than 10 (mm/day) explains positive rainfall and values less than 10 (mm/day) shows possible areas of deficit rainfall which are likely under drought.

Aug 2021

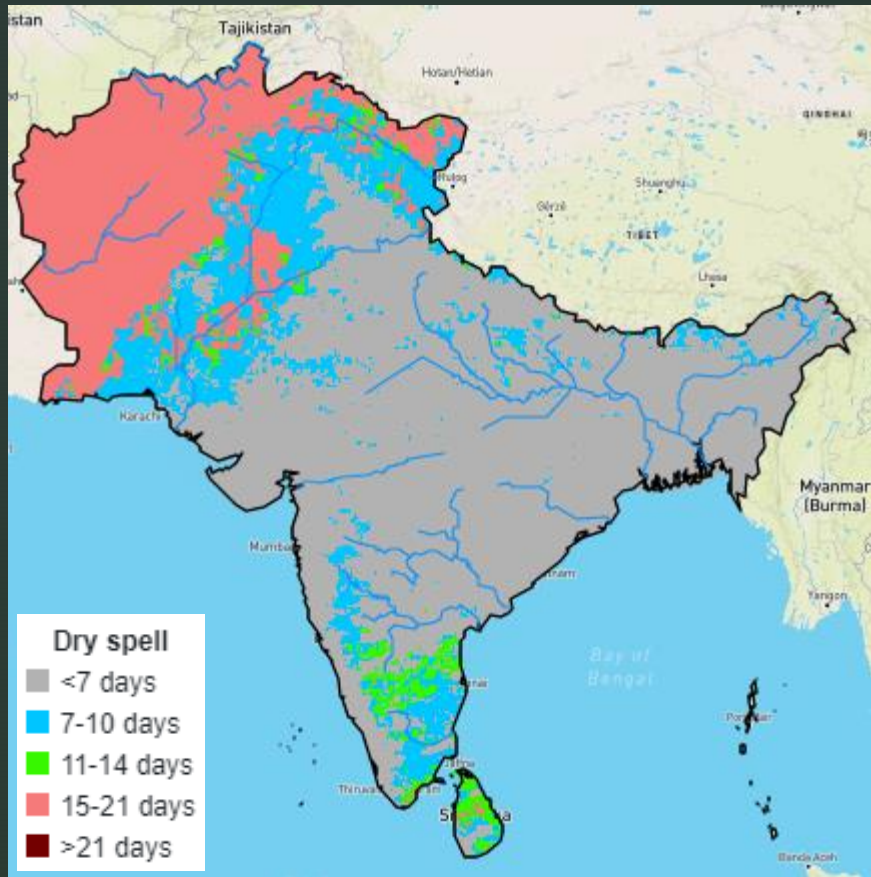


01 – 20 Sep 2021

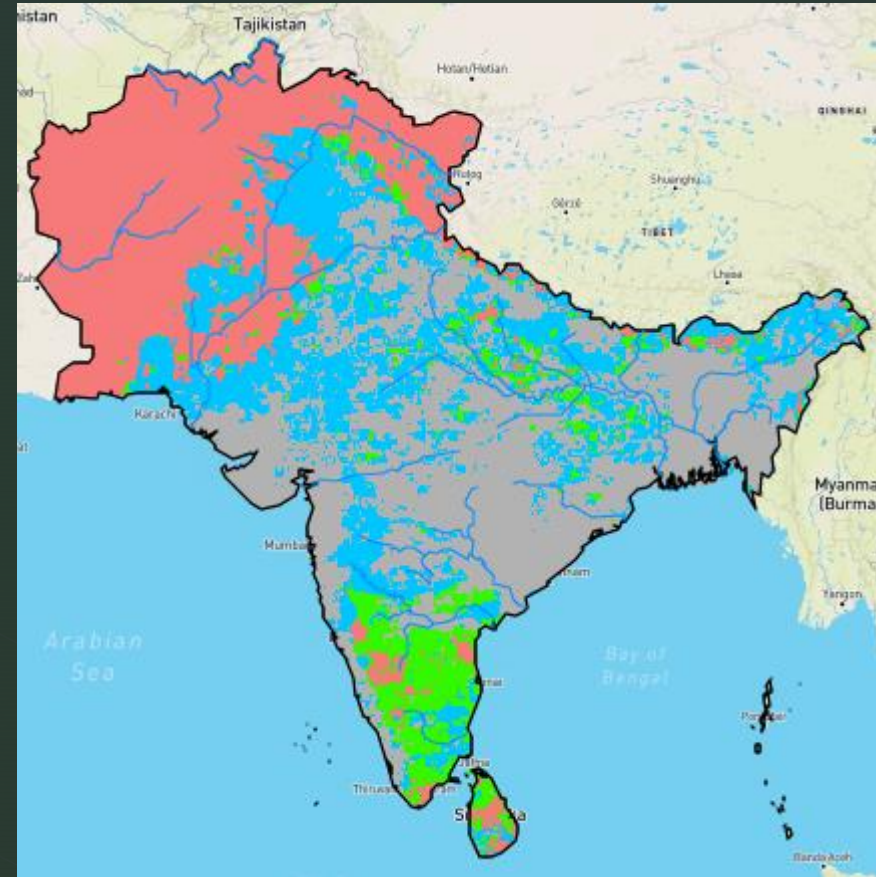


The Global Precipitation Measurement (GPM) data from the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center sources was used to produce the spatial distribution of the monthly precipitation for South Asia. In early September, all parts of South Asia received no significant rainfall except northern, northeastern and central India.

01 -20 Sep 2021 (<2.5mm)



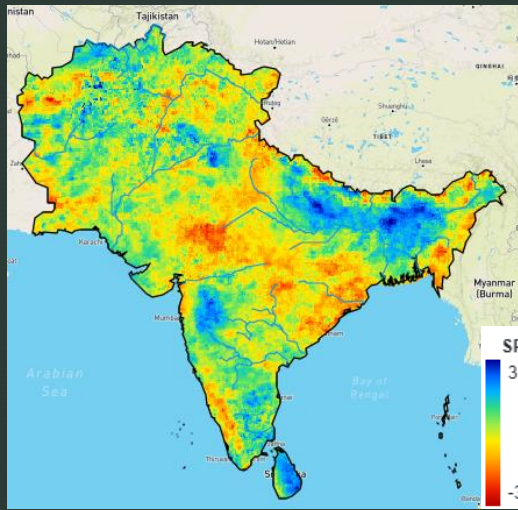
01 – 20 Sep 2021 (<10 mm)



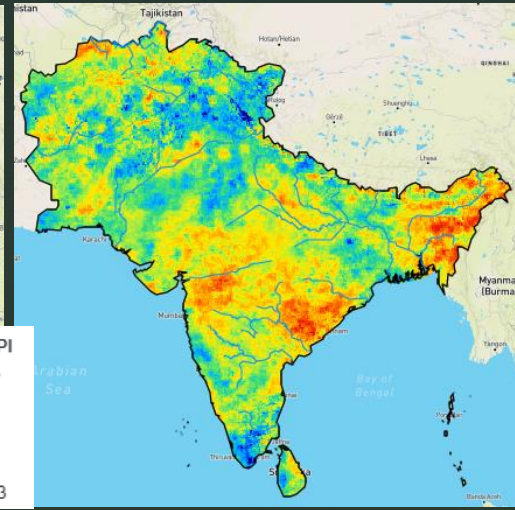
- The dry-Spell is a good indicator of the likelihood of a drought as well as the presence of a prolonged period of drought. Similarly, this indicator reflects the tendency of rainfall over a period of time (short-term, medium-term or long-term).
- A dry spell is defined as the number of consecutive days with a daily precipitation amount below a certain threshold, such as 2.5, 5, 10 mm, preceded and followed by at least one day with rainfall exceeding the threshold. The maps uses rainfall product from GPM to calculate the dry spell for July at 2.5 and 10 mm
- The sub seasonal forecast and the dry spells can help users to develop agriculture contingency plan depending on the crop type and its condition.

Standardize Precipitation Index (3 month SPI)

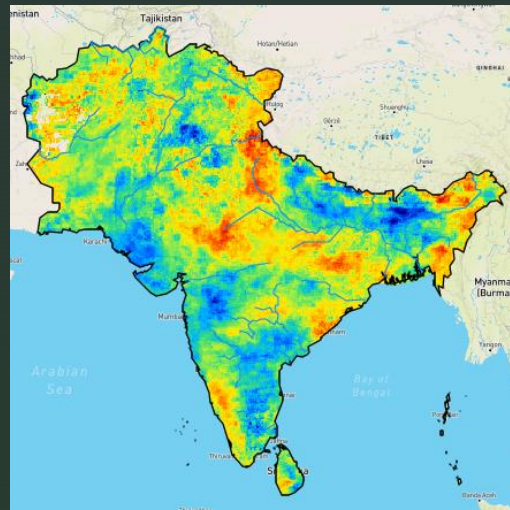
3month SPI – Jul 2020



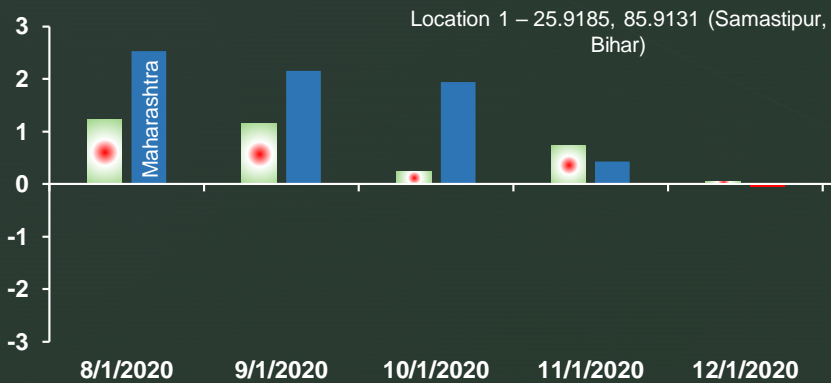
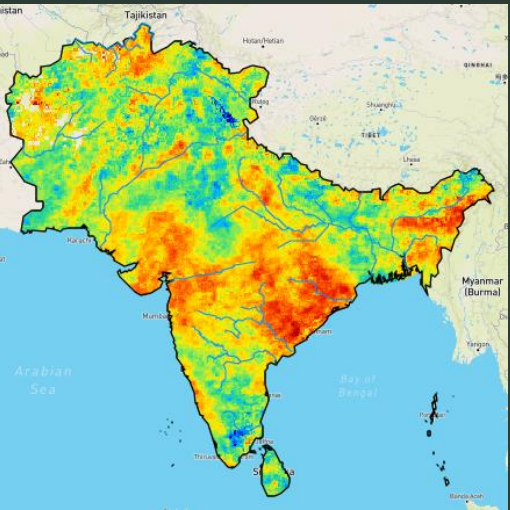
3month SPI – Jul 2021



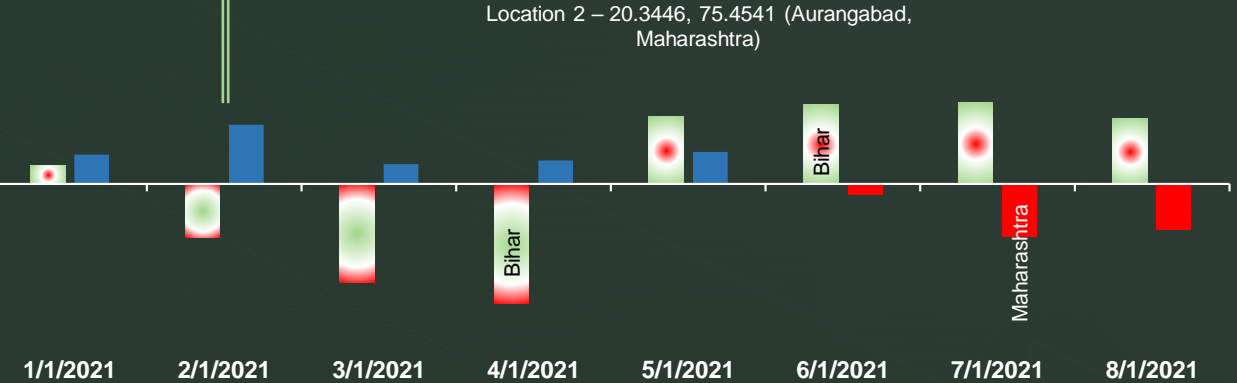
3month SPI – Aug 2020



3month SPI – Aug 2021

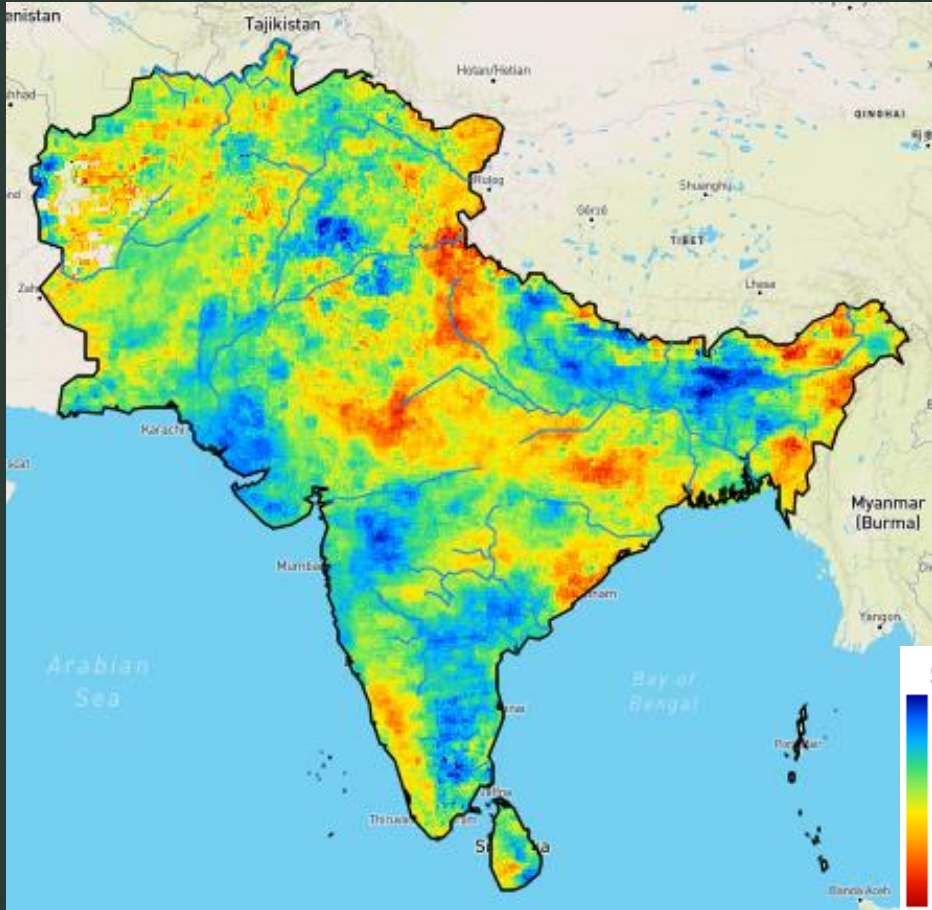


Location 2 – 20.3446, 75.4541 (Aurangabad, Maharashtra)

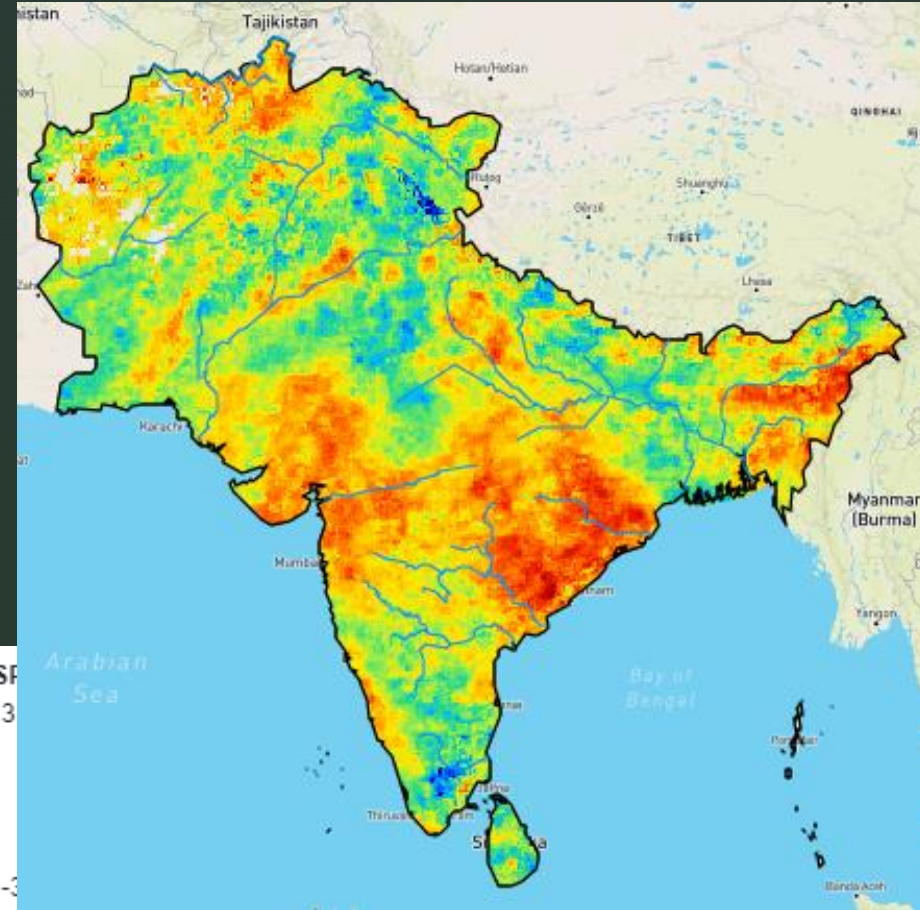


- The SPI is a measure of the number of standard deviations of observed cumulative precipitation deviates from the climatological average. The SPI values range are from -3 to +3 with negative values indicate droughts, while positive values indicate wet conditions. Severe drought conditions are determined by high negative values.
- The current SPI condition and sub-seasonal rainfall forecast together provides better understanding of the future drought occurrences and its impact on agriculture and smallholder farmers.

3month SPI – Aug 2020



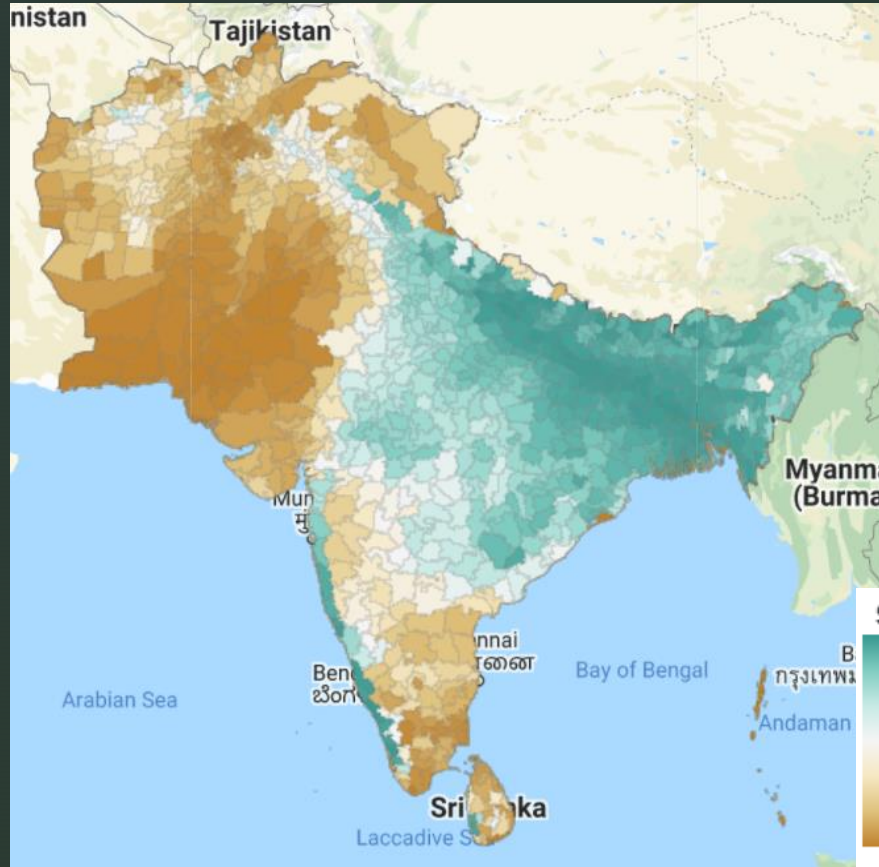
3month SPI – Aug 2021



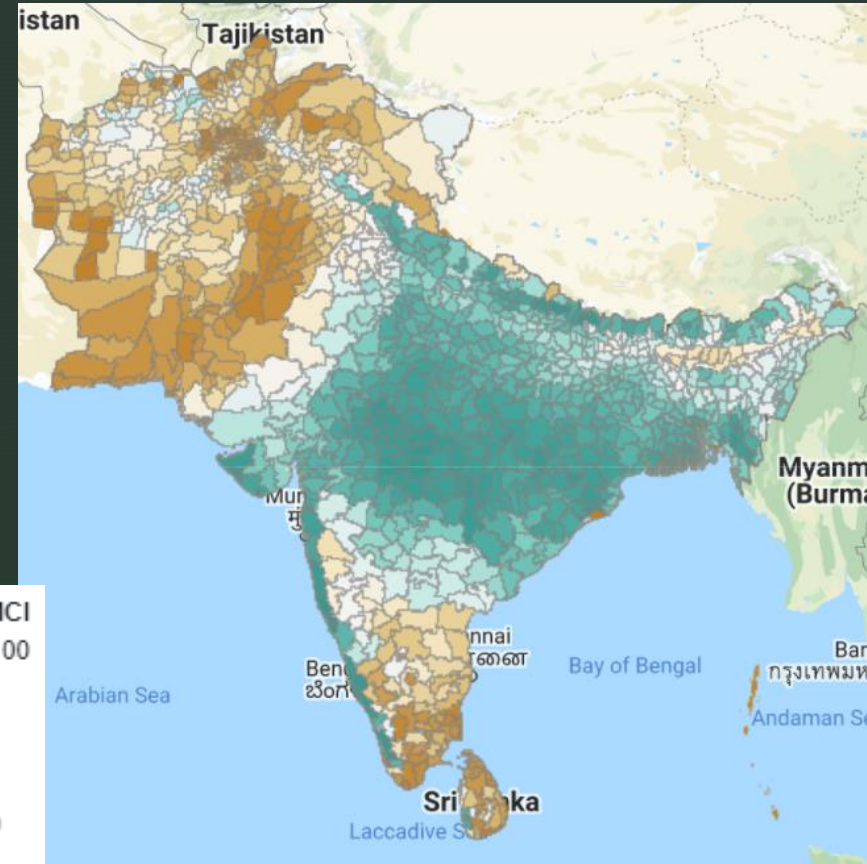
- The SPI is a measure of the number of standard deviations of observed cumulative precipitation deviates from the climatological average. The SPI values range are from -3 to +3 with negative values indicate droughts, while positive values indicate wet conditions. Severe drought conditions are determined by high negative values.
- The states of Orissa, Maharashtra, Chhattisgarh, Assam and Gujarat showed significantly lower SPI in end of August 2021 compared to August 2020, which can also be identified as a meteorological drought.

Soil Moisture Condition Index (SMCI)

Aug 2021

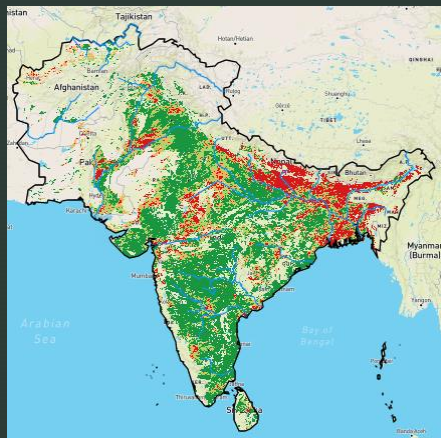


1- 20 Sep 2021

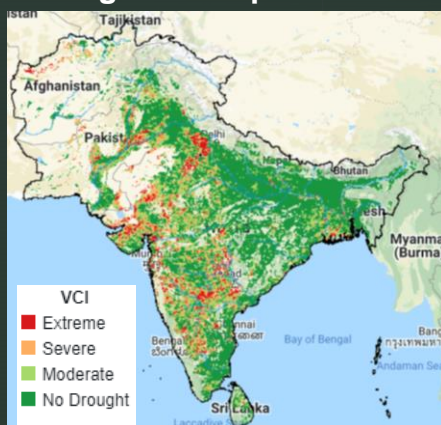


- SMAP satellite developed by NASA provides direct sensing of soil moisture in the top 5 cm of the soil column. Soil Moisture Condition Index (SMCI) represents soil moisture condition with respect to the historical values and the SMCI value range varies between 0-100, where the value nearby 0 represents extreme soil moisture stress, while values close to 100 explains extremely wet condition.
- Low soil moisture values can detect dry conditions while high values can be used to detect wet conditions. These conditions occur in proportion to the change in rainfall.

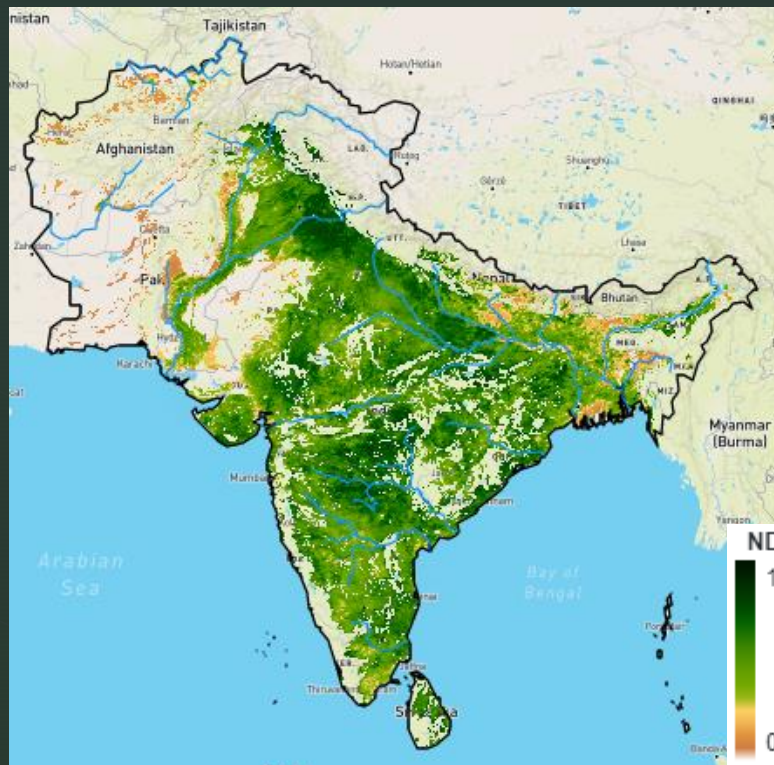
Aug 2021



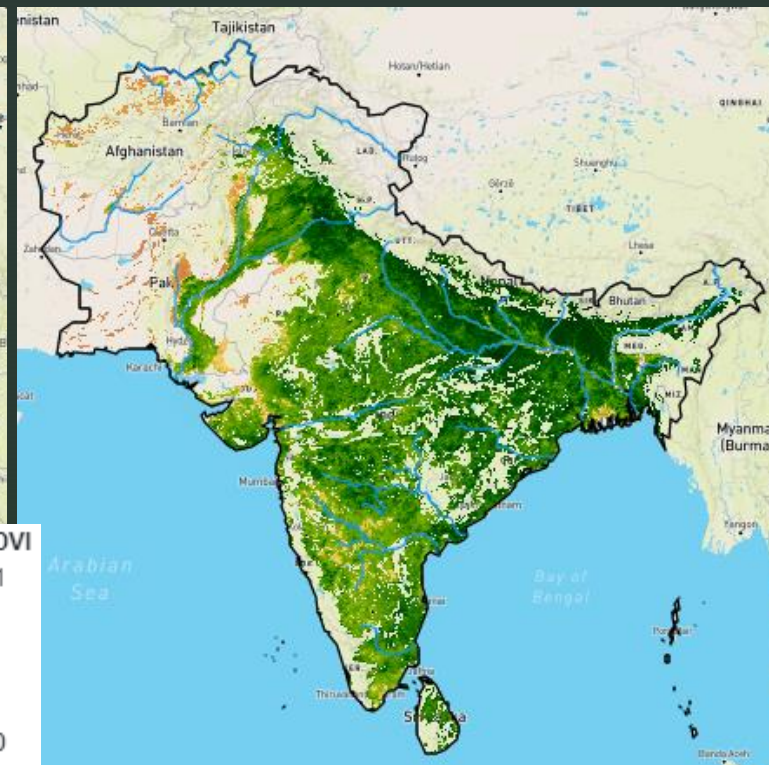
29 Aug to 14 Sep 2021



Aug 2020



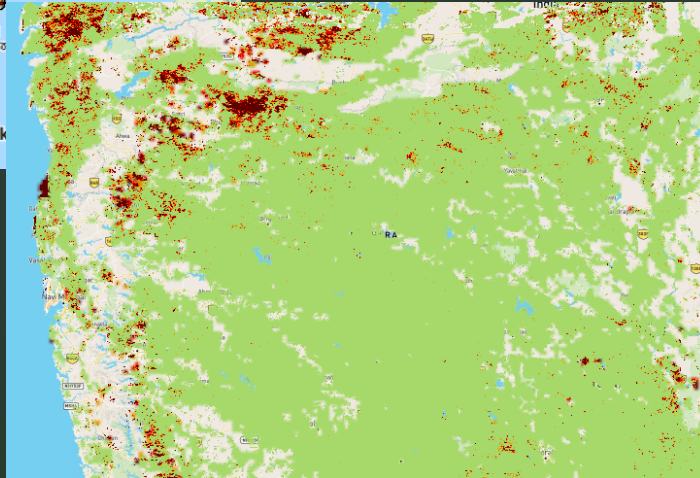
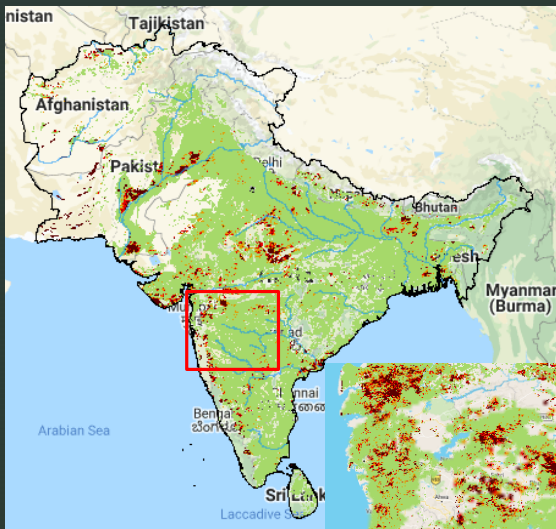
29 Aug to 14 Sep 2021



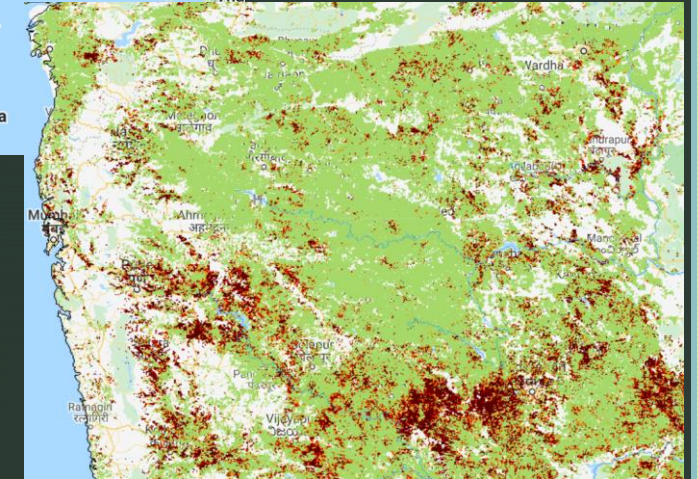
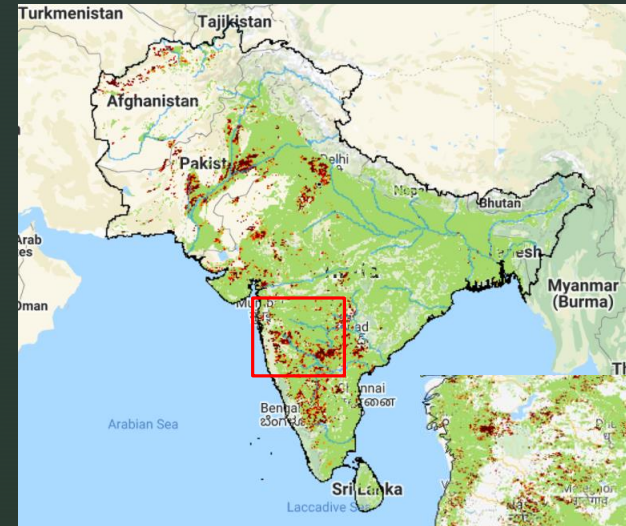
- Vegetation Health Index (VHI) is a potential index for agricultural drought monitoring and forecasting. The VHI was developed using NASA' MODIS 16-day combined Terra and Aqua satellite data with a spatial resolution of 250m.
- VHI is an index characterizes the health of the vegetation by integrating NDVI and Temperature. The VHI is used for various purposes, of which its applicability in detecting and monitoring the phenomenon of drought.
- Extreme and Severe VHI classes indicating poor vegetation health while no-drought indicating high vegetation health status. Locations in eastern region of India e.g. Bihar with low values indicates areas of flooding.

Integrated Drought Severity Index (IDSI)

Jul 2021



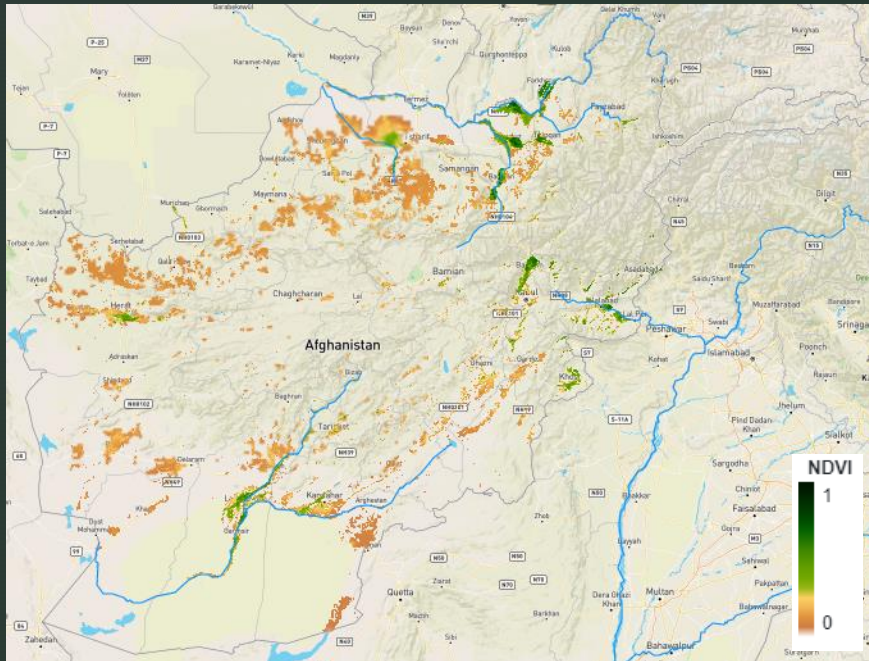
29 Aug to 14 Sep 2021



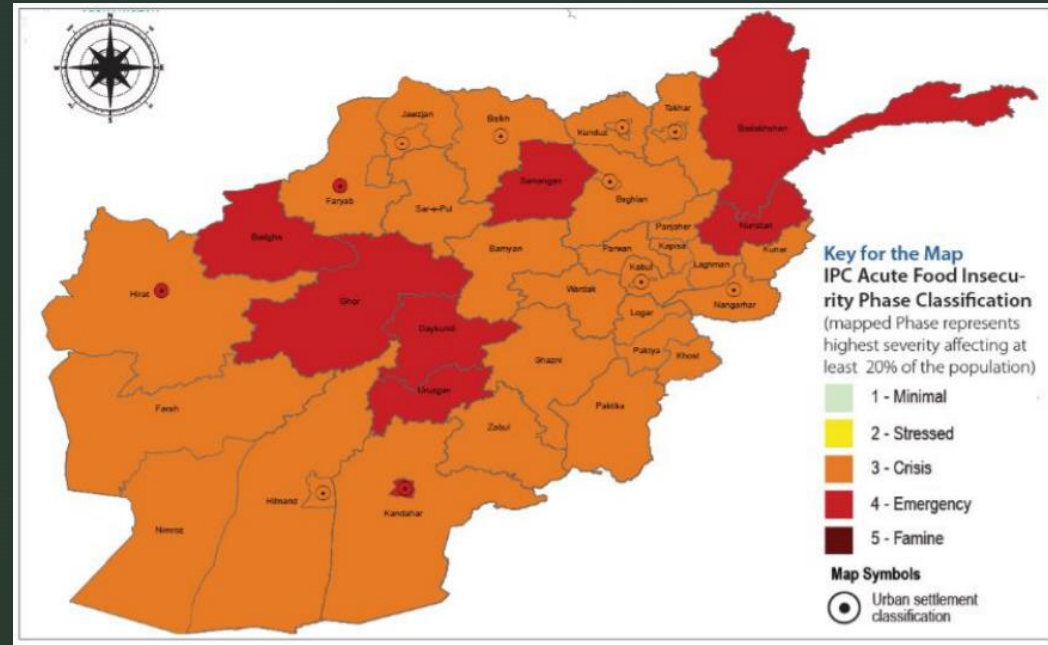
- IDSI explains areas of drought severity by considering precipitation (input to the system), soil moisture (storage of the system), actual ET (loss to the system) and VCI (vegetative response of the system). IDSI being a composite indicator would help determine the drought condition more reliably. The IDSI developed by IWMI incorporates multisource satellite data from MODIS to define Vegetation and evapotranspiration, precipitation data from CHIRPS, and soil moisture conditions derived FLDAS and SMAP.
- The IDSI of the zoomed areas Maharashtra, clearly indicate a slight increase in drought from July to mid-September.
- IDSI can be used as impact indicators to alert relevant agencies to develop timely early warning to early action to promote drought response strategies e.g. agriculture contingency plans at district level to mitigate drought risks;

- <https://www.reuters.com/world/asia-pacific/drought-leaves-afghans-hungry-economic-collapse-looms-un-2021-09-02/>
- <https://www.thethirdpole.net/en/climate/2021-monsoon-drought-floods-batter-south-asia/>
- <https://www.newindianexpress.com/nation/2021/sep/07/drought-like-situation-in-30-per-centof-india-thanks-toinadequate-rainfall-2355334.html>
- <https://reliefweb.int/sites/reliefweb.int/files/resources/1632125700.pdf>
- <https://www.ifrc.org/press-release/afghanistan-over-80-country-serious-drought>

29 Aug to 14 Sep 2021 (NDVI)



Drought Severity (July)



Source : Emergency Plan of Action (EPOA)

Afghanistan is experiencing drought situation similar to 2018 drought, which majority of the provinces are either acute food insecurity as per the IPC classification.

Drought situation is corroborated with the AF-DEWS tool explaining wide spread agricultural drought as captured from Integrated Drought Severity Index (IDSI) for first half of September 2021.

Sub-seasonal forecast explains 50-70 bellow normal rainfall condition over entire Afghanistan for the month of October to December.

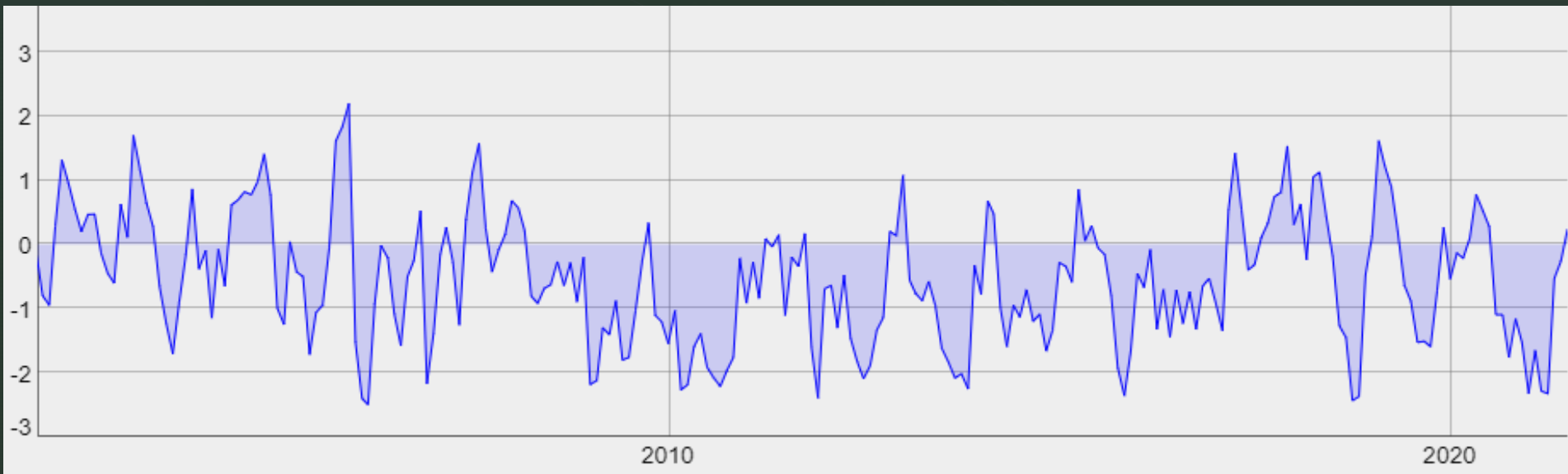
29 Aug to 14 Sep 2021 (NDVI)



Normalize Difference Vegetation Index (NDVI) usually used to identify vegetative health, and in Khulan, Rajshahi and Sylhet provinces of Bangladesh shows significant increases of NDVI in first half of September compared to July and August indicates the decreases in vegetative stress.

Standardized Precipitation Evapotranspiration Index (SPEI) showed negative values till the end of July and was turn to positive at the end of August. Therefore, the drought-like conditions that were shown until the end of July and mid of August will subside in the next few weeks.

However, IRI 3-month sub-seasonal precipitation forecast with the possibilities of 40-50 above average rainfall from October – November- December, the current vegetation further enhance to a healthy condition during next three months.



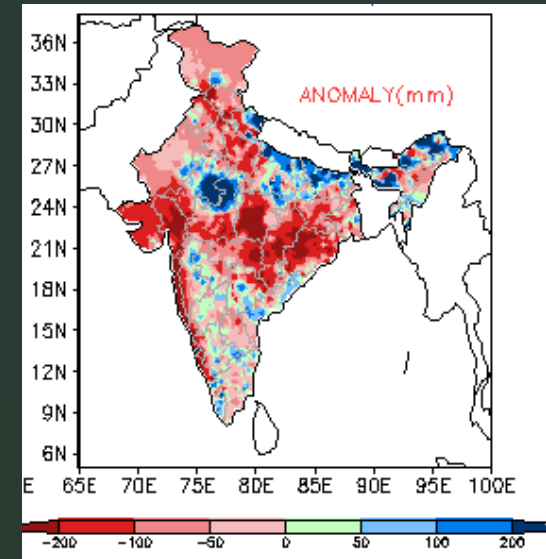
Source: <https://spei.csic.es/> SPEI

In reference to rainfall anomaly map, several states i.e. Odisha, Gujarat, parts of Madhya Pradesh, part of Assam, West Bengal Chhattisgarh and costal region of Maharashtra and Karnataka received deficit rainfall and states such as Bihar, Part of Madhya Pradesh, etc. received excess rainfall.

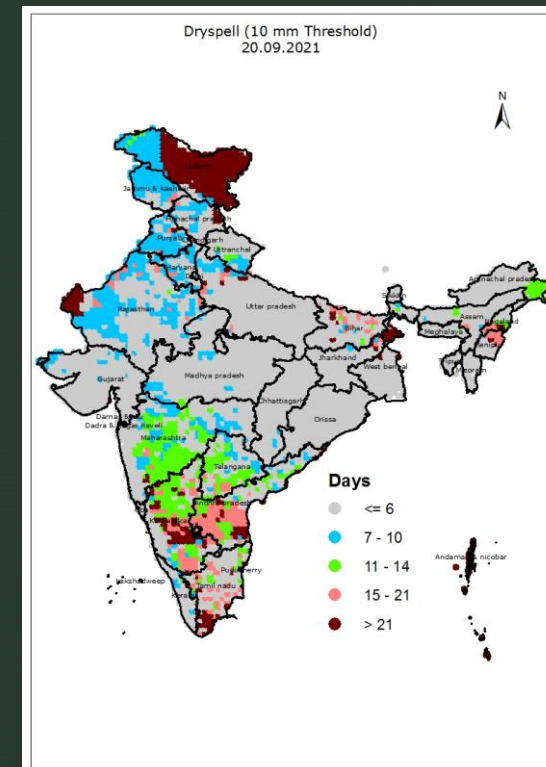
SPI (3-month i.e. Jun-Jul-Aug) indicator for meteorological drought shows states of Odisha, parts of Maharashtra, Kerala, Chhattisgarh, Telangana, Madhya Pradesh, Gujarat and Western Uttara Pradesh are likely with deficit rainfall

Vegetation Health Index (VHI) shows considerable increases of vegetation health specially in North and north-eastern state such as Northern UP, Bihar, Assam states while center Maharashtra states represent the increases of dryness.

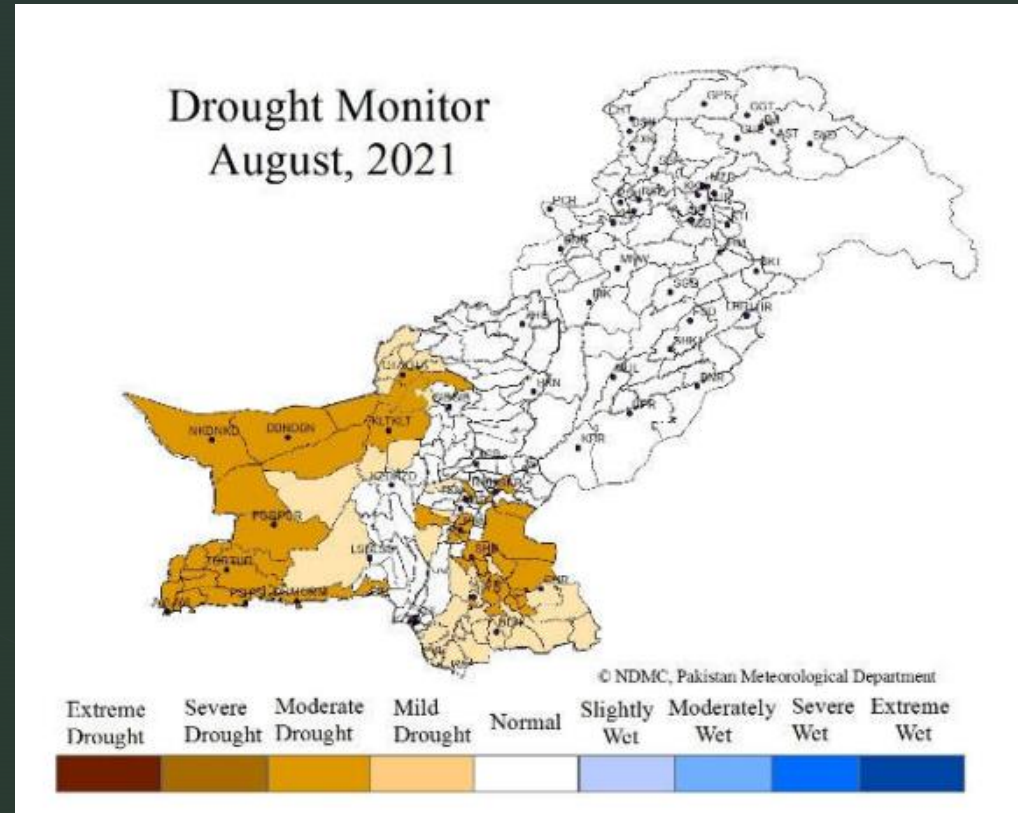
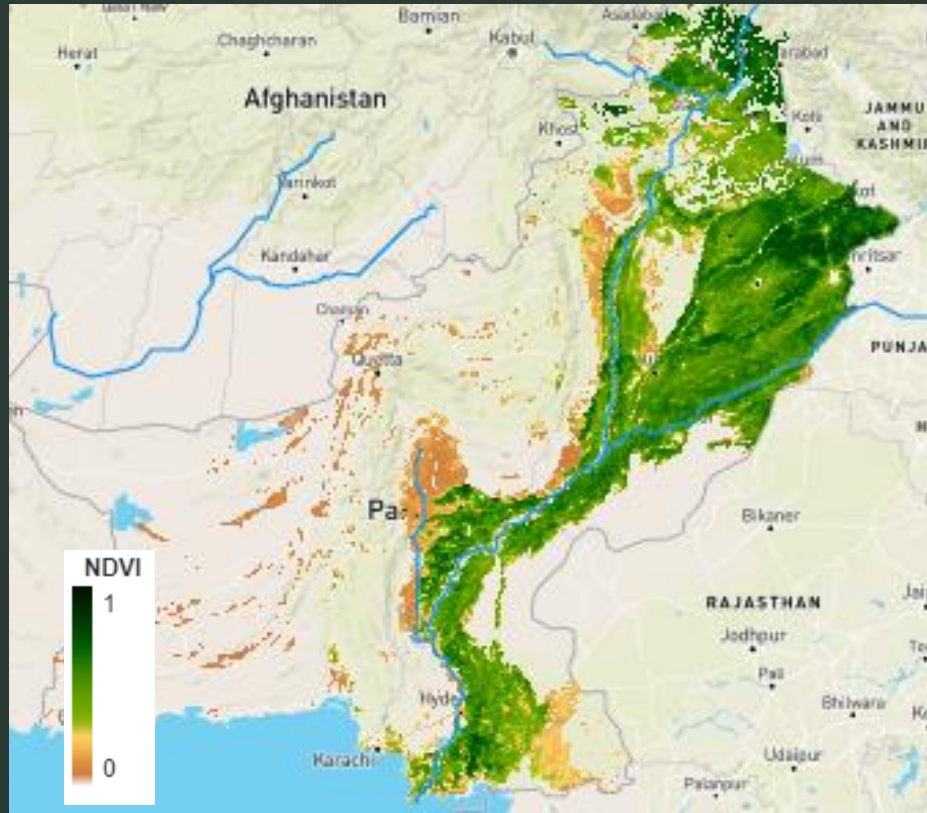
Agricultural drought i.e. Integrated Drought Severity Index (IDSI) explains States such as part of Maharashtra, Madhya Pradesh parts of Rajasthan and Wet Bengal are under drought like situation, it is expected to recover till mid of October as per the sub-seasonal forecast with above normal rainfall across India.



Rainfall anomaly for Aug 2021; Map Source: IMD



Dry spell (10mm threshold) Map Source: CRIDA



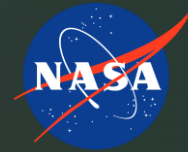
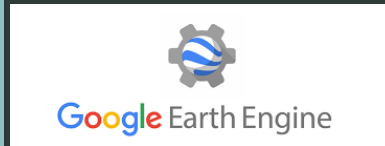
Source; NDMC

According to the National Drought Monitoring Centre of Pakistan, 10 districts of Sindh Province and 6 districts of Balochistan province mild to moderate drought conditions in August further enhanced (relief-web) in the first half of September 2021.

Normalize difference Vegetation Index (NDVI) shows slightly reduction in vegetation condition compare to both July and August over Sindh province.

As per ERPAS (1-month) and IRI (3-month) forecast explains significant reduction in rainfall (40-70 bellow average) for the period of October to December, drought situation will further enhanced as reduction of rainfall.

SADMS team would like to acknowledge the support from the following partners for sharing the data and access to the geospatial platform.



SADMS Team

IWMI: Giriraj Amarnath; Surajit Ghosh;
Niranga Alahacoon; Alok Sikka

CRIDA/ICAR: KV Rao

Access archived south Asia bulletin ([Click here](#))

For additional information or sharing feedback contact the team

Dr. Giriraj Amarnath
a.giriraj@cgiar.org or
wrd@iwmi.org

Disclaimer

The South Asia Drought Monitoring System (SADMS) was created by the International Water Management Institute (IWMI) with the support from CGIAR Research Program of Water, Land and Ecosystems (WLE); Indian Council of Agricultural Research (ICAR) and Japan's Ministry of Agriculture, Forestry and Fisheries (MAFF). The SADMS tool was developed specifically for the purpose of drought early warning to monitor the near real-time drought situation and enable timely action to be taken by the government authorities and relevant development organizations in South Asia.

IWMI, CGIAR WLE, ICAR or Japan's MAFF do not make any warranties on the country or basin boundaries used in this drought outlook, or about the completeness, reliability, and accuracy. Any decisions/actions taken based on this drought outlook are strictly at the discretion of the user, and IWMI, CGIAR WLE, ICAR or Japan's MAFF will not be liable for any loss or damage that may occur as a result of using the tool.

**Thank
You**

