

Oct 2021 | Issue 10

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?

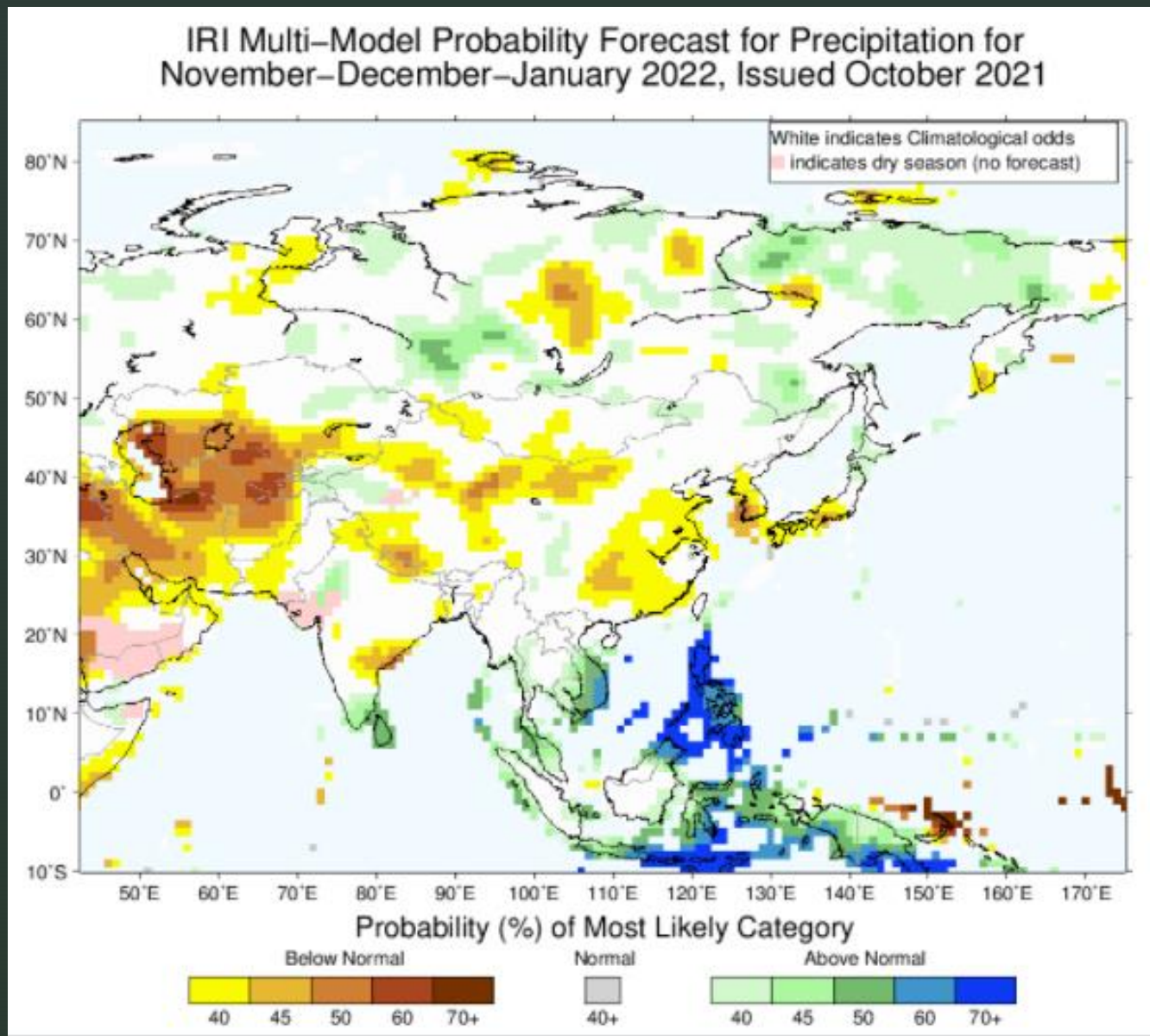
- Tracks how likely the weather forecast for the next four weeks will have the dry spell or droughts, and to a lesser extent of lesser rainfall
- Maps drought situations at regional and national levels and for range of products from rainfall anomaly, SPI, vegetation index and composite drought index 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

- As shown in the November-December- January (2022) sub-season forecast, only the North and East part of India will receive below average rainfall (30%) while South India and Sri Lanka will receive 50% above average rainfall. However, below-normal rainfall is forecast for some parts of Pakistan and major portion of Afghanistan.
- South Asia received significant rainfall in July and August, while in September it dropped by about 50%. However, due to the activation of Inter-monsoon in South India and Sri Lanka have received significant rainfall in October compared to other areas.
- In terms of the SPI index, In October 2021 show a fairly meteorological drought compared to 2020. However, the IDSI index and rainfall from August to October show that there are no reports of significant agricultural droughts. This is mainly due to occasional light rains stop the continuation of dry-spells for a long time period.
- The Soil Moisture Condition Index (SMCI), like other droughts indices, shows the significant reduction of soil moisture stress in October compared to September 2021 in South India and Sri Lanka while other parts show slight increases in Soil Moisture stress, especially in the center part of India.
- It is important the stakeholders adopt timely drought relief and response strategies to mitigate drought risks;



Source: IRI

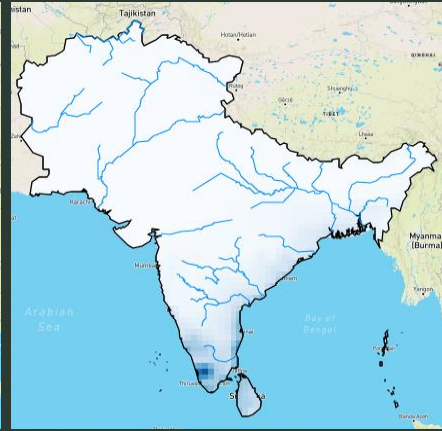
Precipitation forecast for most parts of Sri Lanka and South India is above normal for Nov-Dec-Jan 2021 while most part of India, Nepal, and Bhutan are under normal rainfall. However, most parts of northern Pakistan, Afghanistan, receive 40-70 below-average rainfall.

Weather forecast (Current and anomaly rainfall)

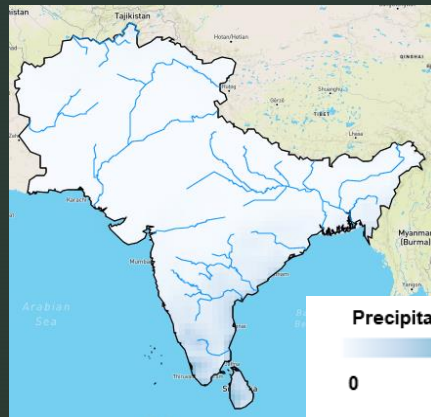
Week 1: 05 to 11 Oct



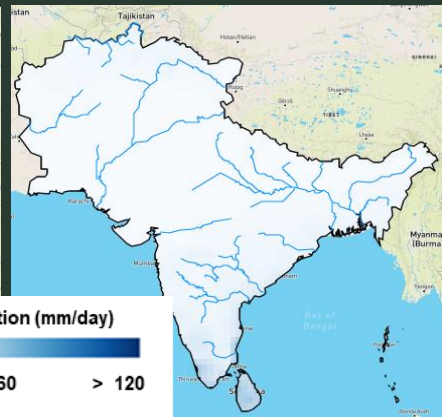
Week 2: 12 to 18 Oct



Week 3: 19 to 25 Oct



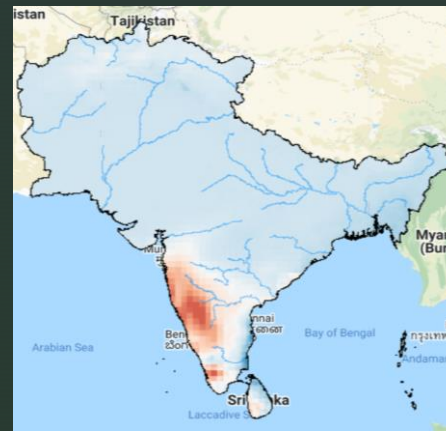
Week 4: 26 Oct to 02 Nov



Precipitation (mm/day)

0 60 > 120

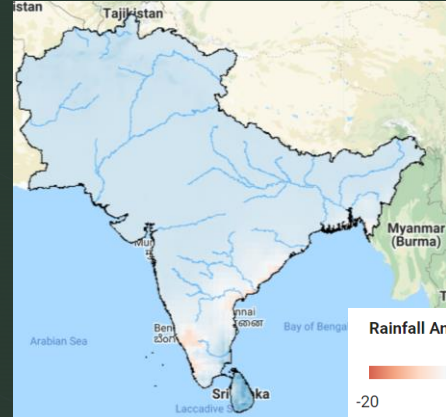
Week 1: 05 to 11 Oct



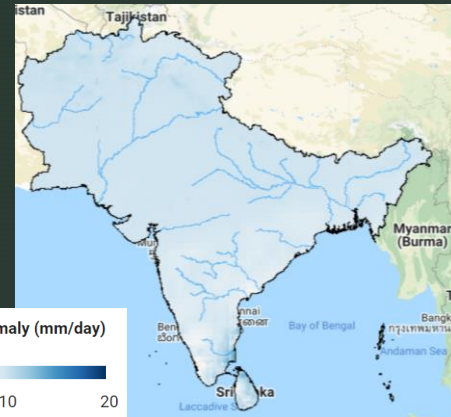
Week 2: 12 to 18 Oct



Week 3: 19 to 25 Oct



Week 4: 26 Oct to 02 Nov



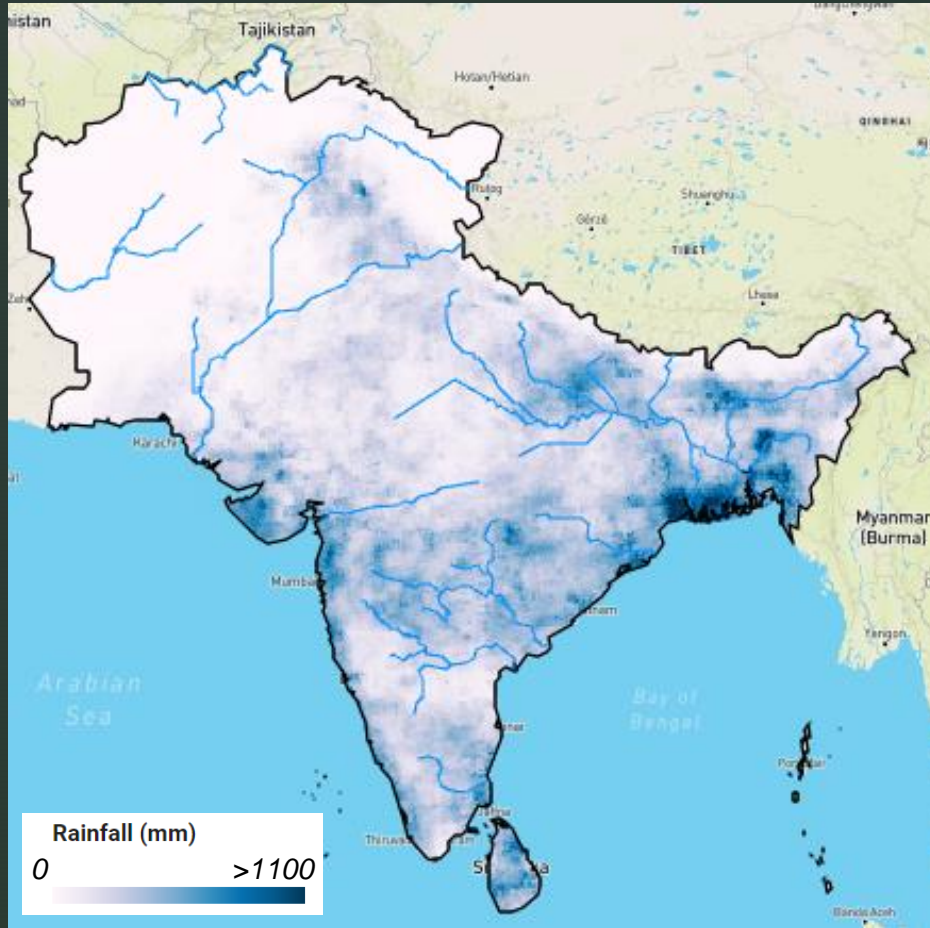
Rainfall Anomaly (mm/day)

-20 10 20

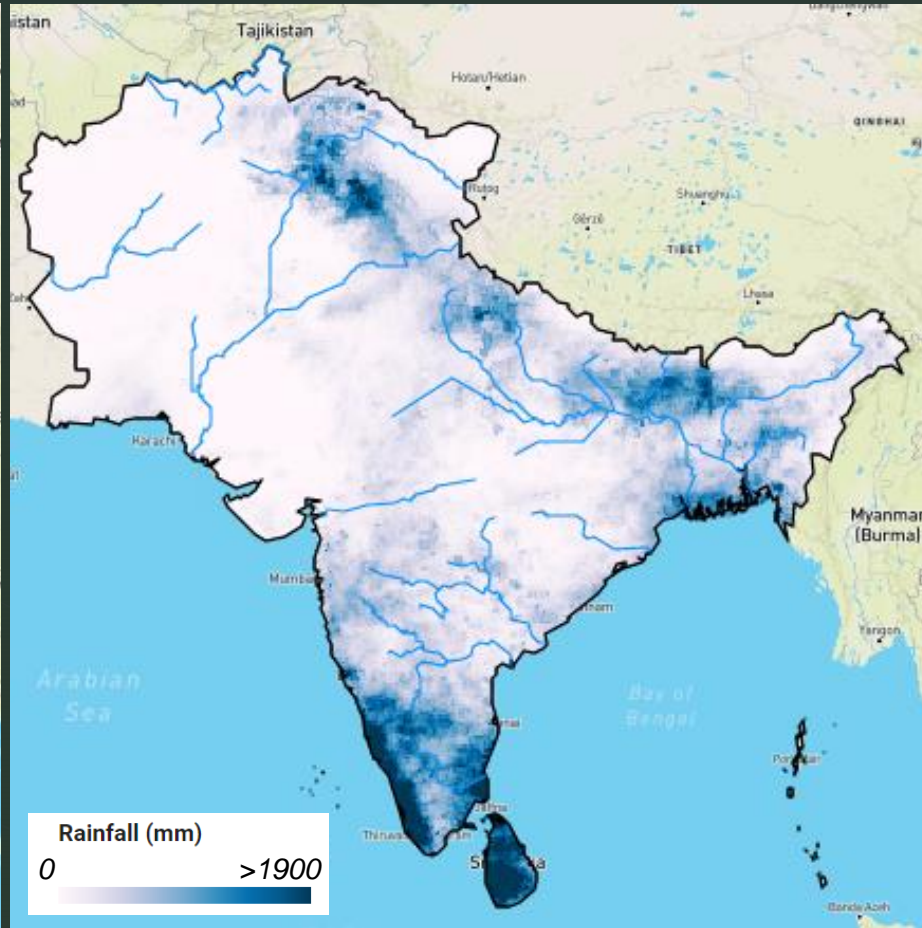
Sub-seasonal forecast and Extended Range Prediction group of IITM has been providing experimental real-time forecast of the active-break spells of Indian Summer Monsoon Rainfall since 2011 up to 4 pentad lead using an indigenously developed Ensemble Prediction system (EPS) based on the state-of-the-art 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.

Sep 2021

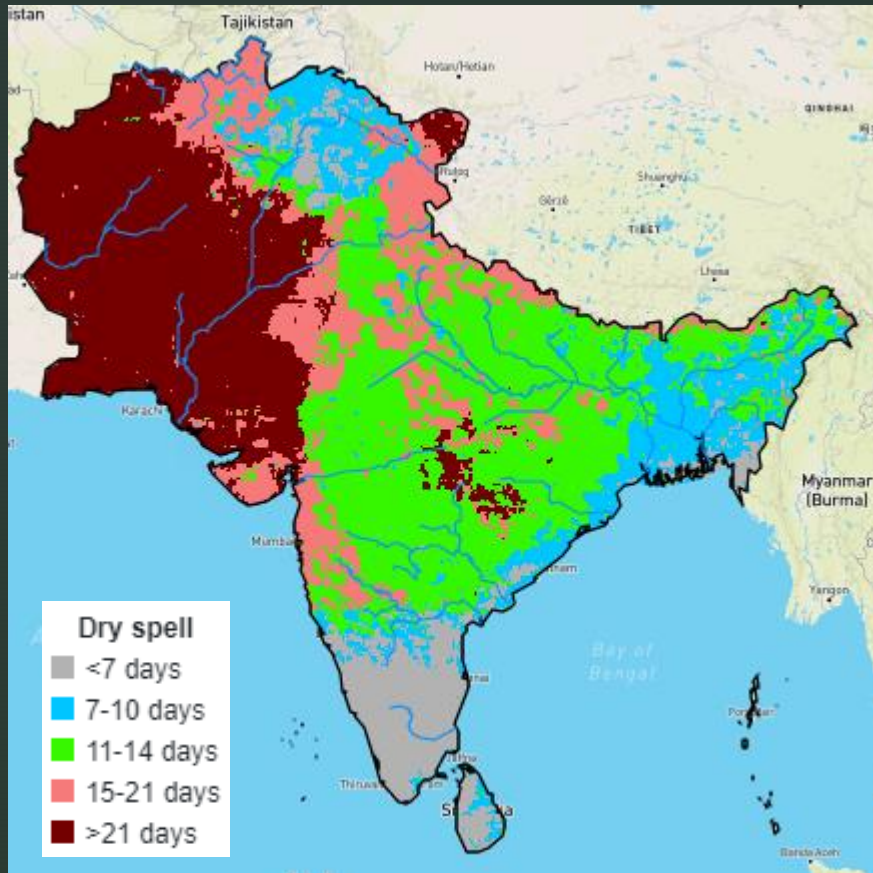


Oct 2021

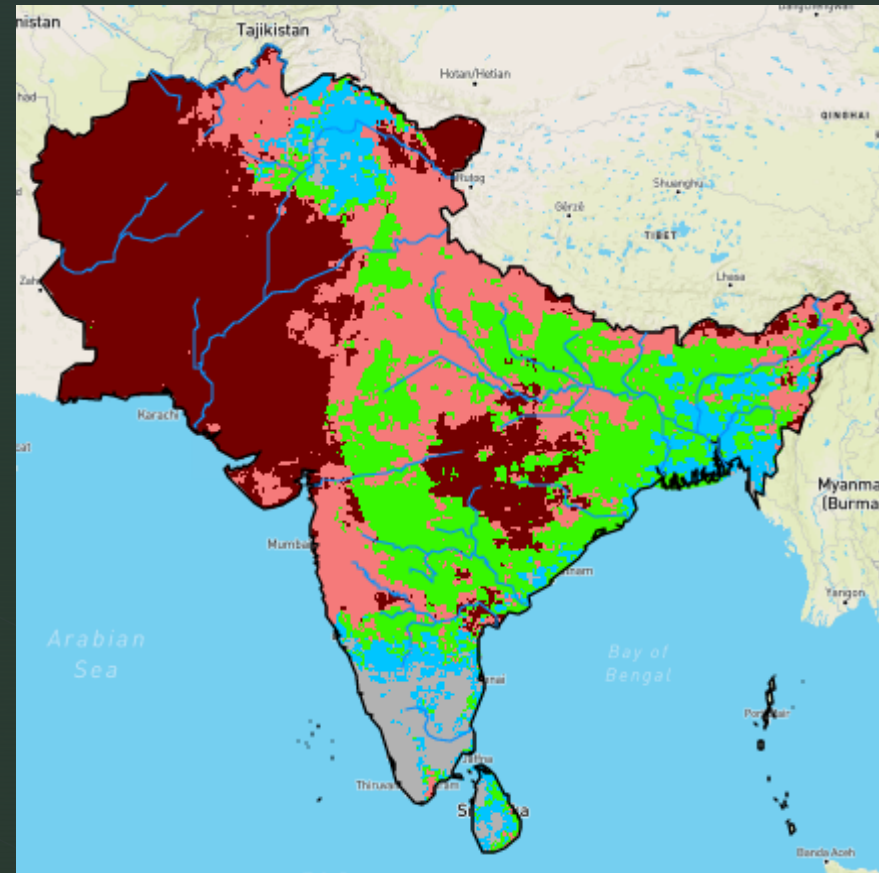


The Global Precipitation Measurement (GPM) data from the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center sources was used to produce the spatial distribution of the monthly precipitation for South Asia. In October, South India and Sri Lanka received significant rainfall while other parts of South Asia received less rainfall.

Sep 2021 (<2.5mm)



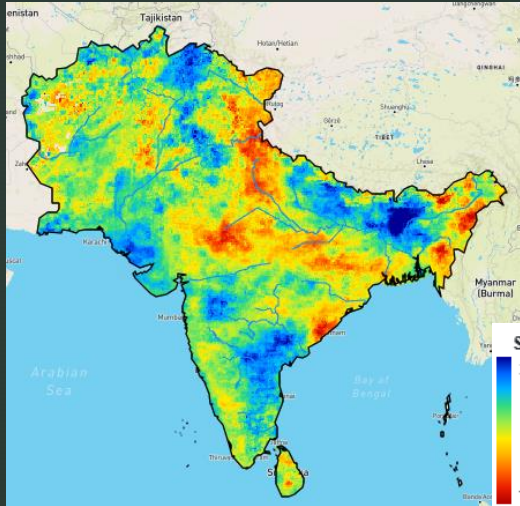
Sep 2021 (<10 mm)



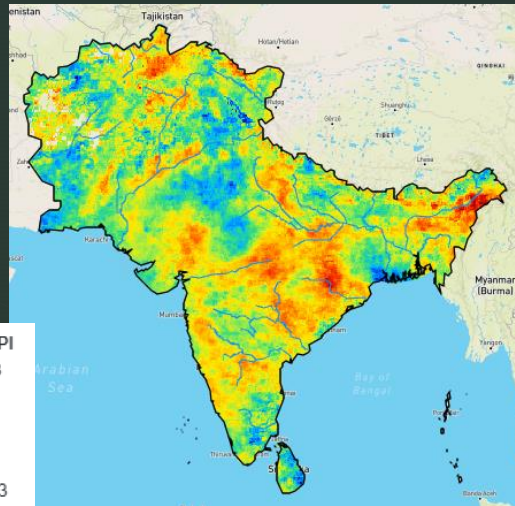
- The dry-Spell is a good indicator of the likelihood of a drought as well as the presence of a prolonged period of drought. Similarly, this indicator reflects the tendency of rainfall over a period of time (short-term, medium-term or long-term).
- A dry spell is defined as the number of consecutive 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)

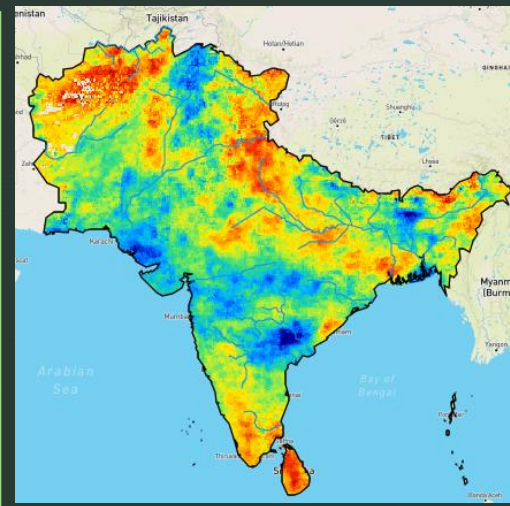
3month SPI – Sep 2020



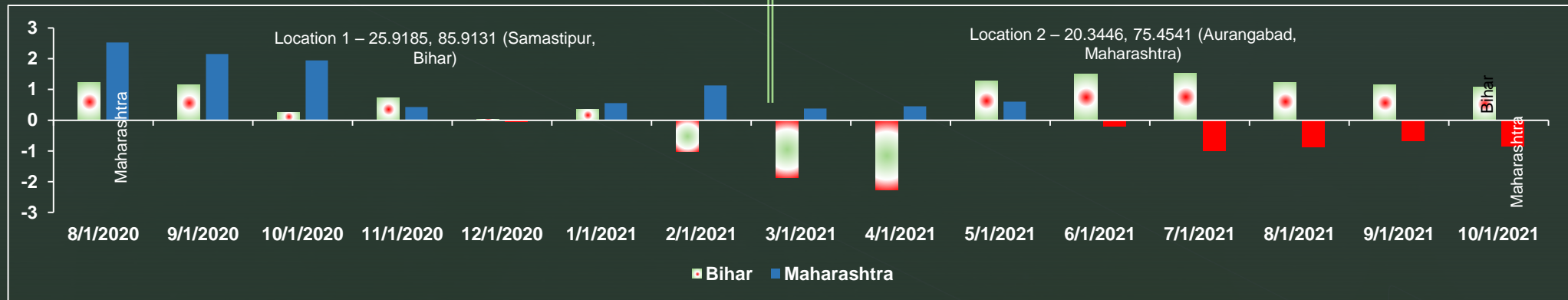
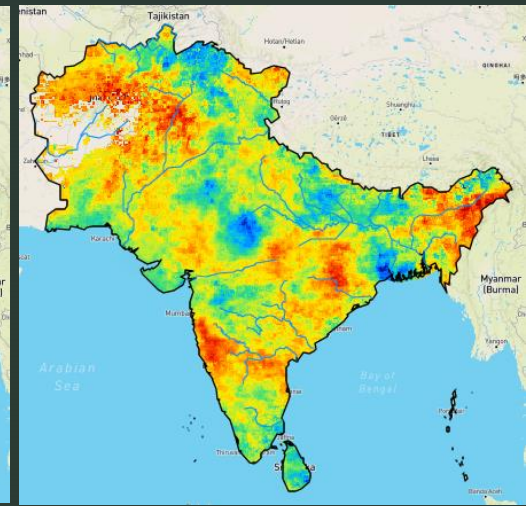
3month SPI – Sep 2021



3month SPI – Oct 2020

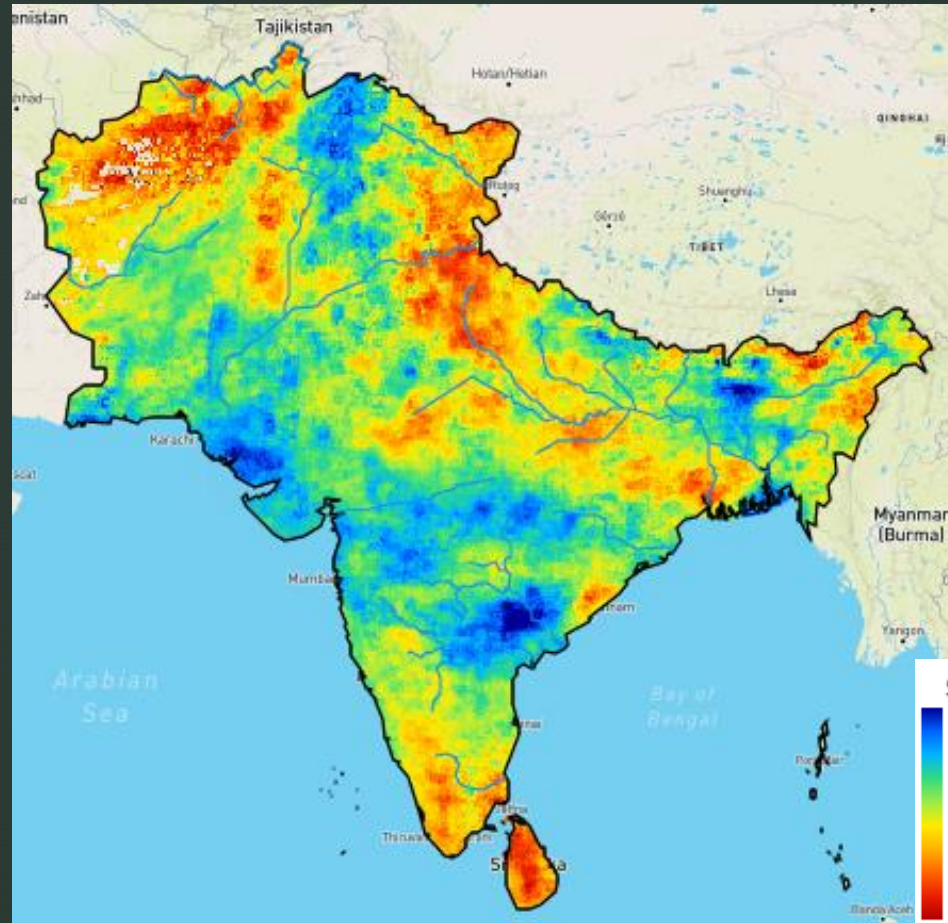


3month SPI – Oct 2021

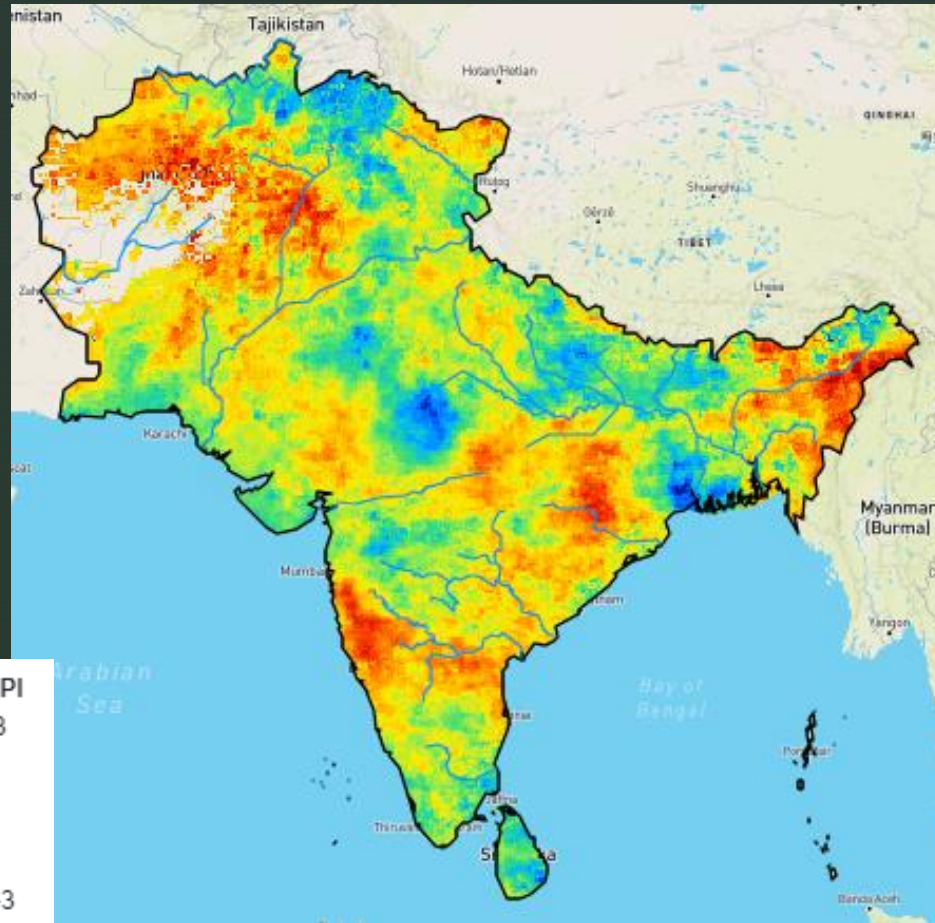


- The SPI is a measure of the number of standard deviations of observed cumulative precipitation deviates from the climatological average. The SPI values range are from -3 to +3 with negative values indicate droughts, while positive values indicate wet conditions. Severe drought conditions are determined by high negative values.
- The 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 – Oct 2020



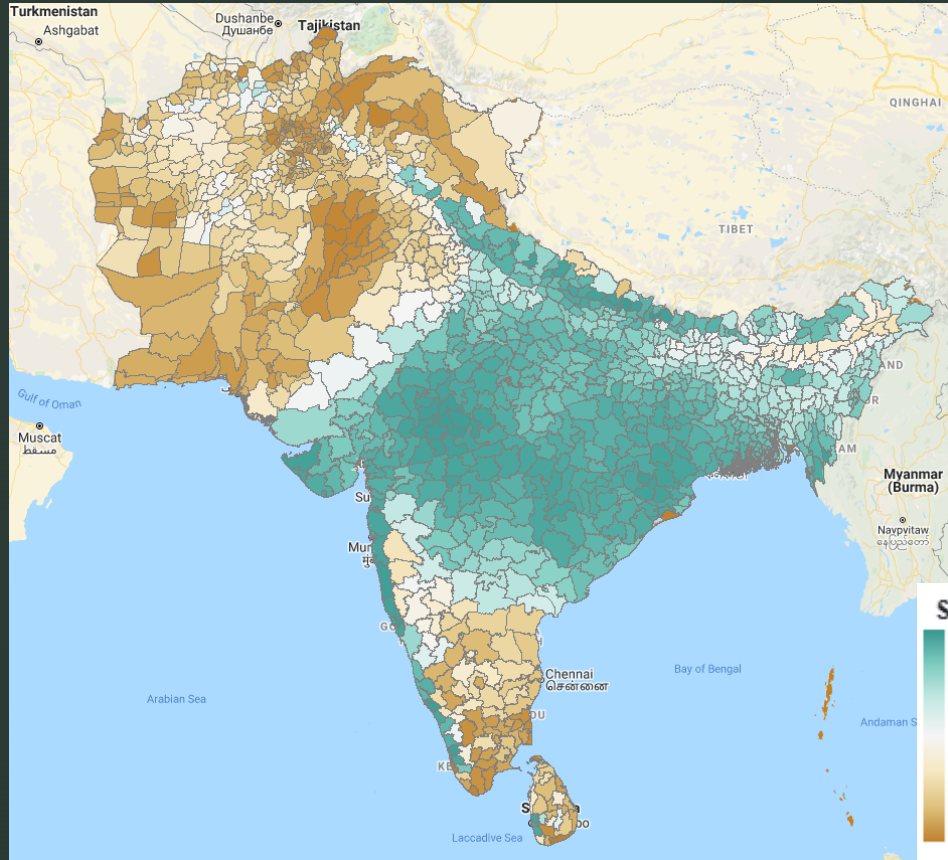
3month SPI – Oct 2021



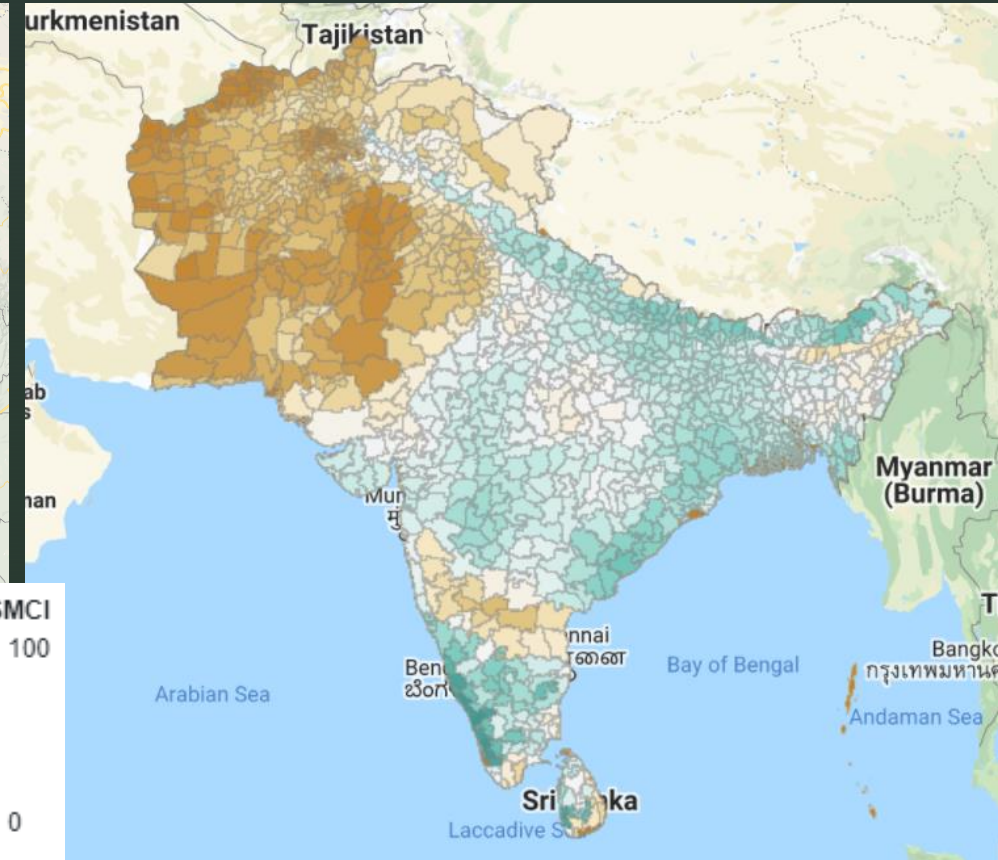
- The SPI is a measure of the number of standard deviations of observed cumulative precipitation deviates from the climatological average. The SPI values range are from -3 to +3 with negative values indicate droughts, while positive values indicate wet conditions. Severe drought conditions are determined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

Soil Moisture Condition Index (SMCI)

Sep 2021

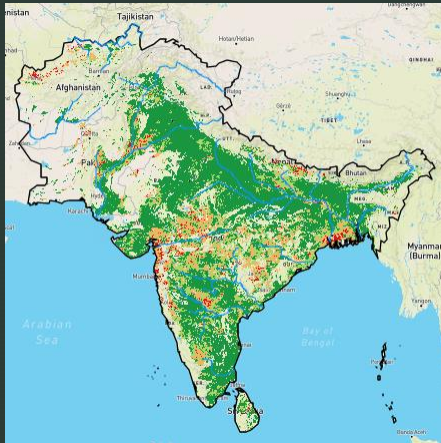


Oct 2021

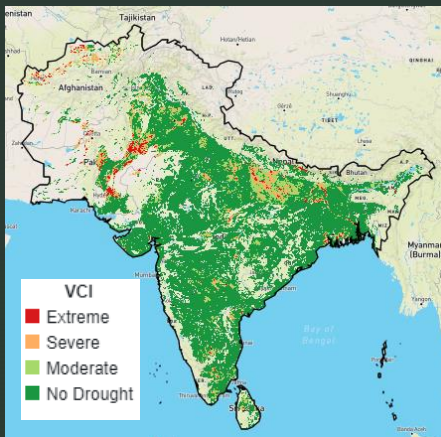


- SMAP satellite developed by NASA provides direct sensing of soil moisture in the top 5 cm of the soil column. Soil Moisture Condition Index (SMCI) represents soil moisture condition with respect to the historical values and the SMCI value range varies between 0-100, where the value nearby 0 represents 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.

Sep 2021



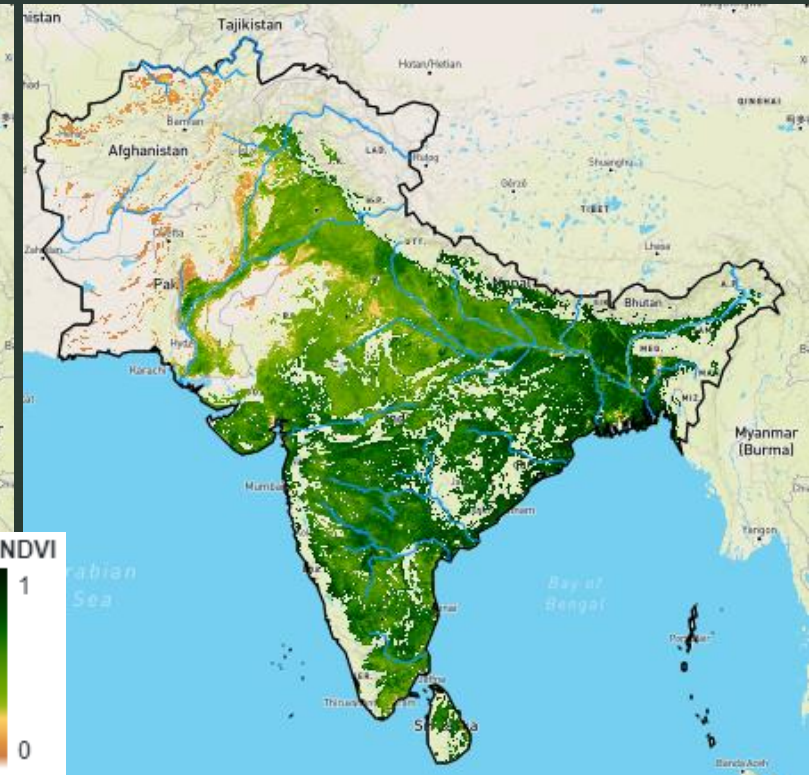
Oct 2021



Oct 2020



Oct 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.

Integrated Drought Severity Index (IDSI)

Sep 2021



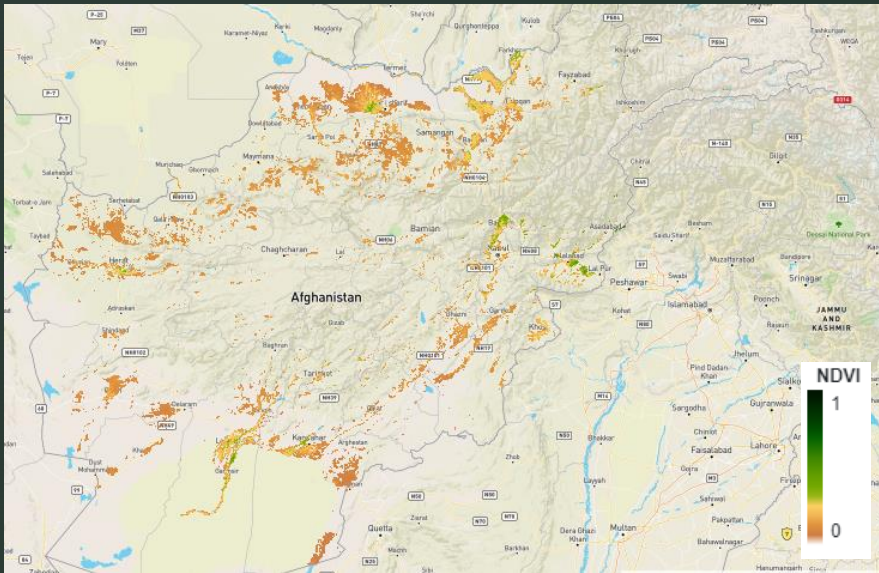
Oct 2021



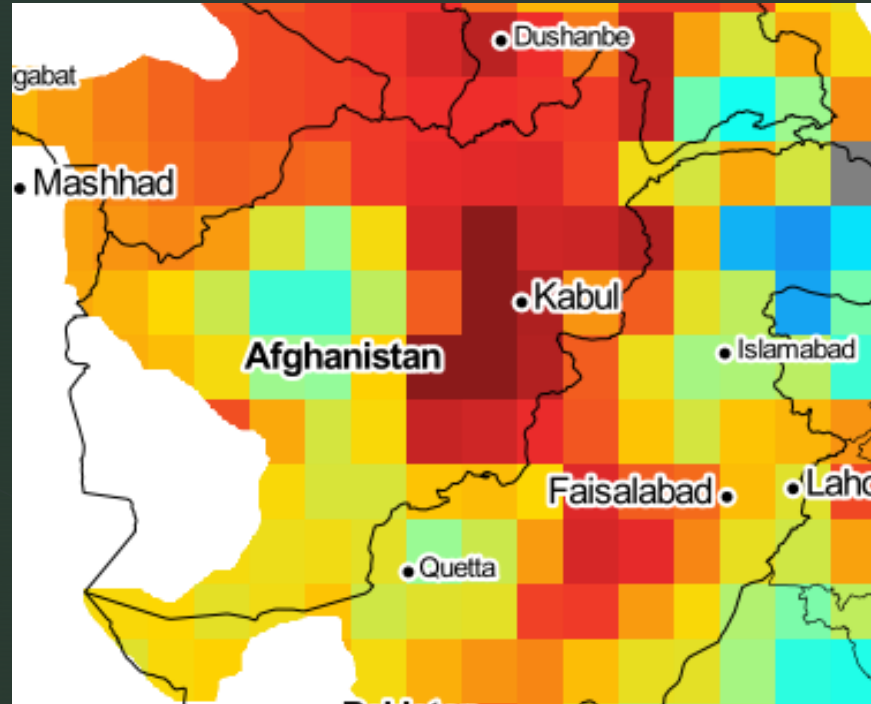
- IDSI explains areas of drought severity by considering precipitation (input to the system), soil moisture (storage of the system), actual ET (loss to the system) and VCI (vegetative response of the system). IDSI being a composite indicator would help determine the drought condition more reliably. The 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.
- 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.thenewhumanitarian.org/news/2021/10/6/rural-drought-to-urban-shortages-Afghanistans-new-hungry>
- <https://reliefweb.int/report/pakistan/drought-bulletin-pakistan-september-2021>
- <https://www.aninews.in/news/world/asia/pakistan-balochistan-facing-drought-like-situation20210927193258/>
- <https://www.newindianexpress.com/nation/2021/sep/07/drought-like-situation-in-30-per-centof-india-thanks-toinadequate-rainfall-2355334.html>
- <https://www.circleofblue.org/2021/daily-stream/the-stream-september-9-2021-90-of-india-experiencing-drought/>

Oct 2021 (NDVI)



Drought Severity (July)



Source : Emergency Plan of Action (EPoA)

Afghanistan's drought situation is still continuing as indicated in both the indices i.e. NDVI and SPEI but the center part of Afghanistan showing an improvement of drought in SPEI data.

Drought situation is corroborated with the AF-DEWS tool with wide spread agricultural drought from Integrated Drought Severity Index (IDSI) for October 2021.

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

Like the IDSI, the SPEI is also representing severe droughts in many parts of northern Afghanistan..

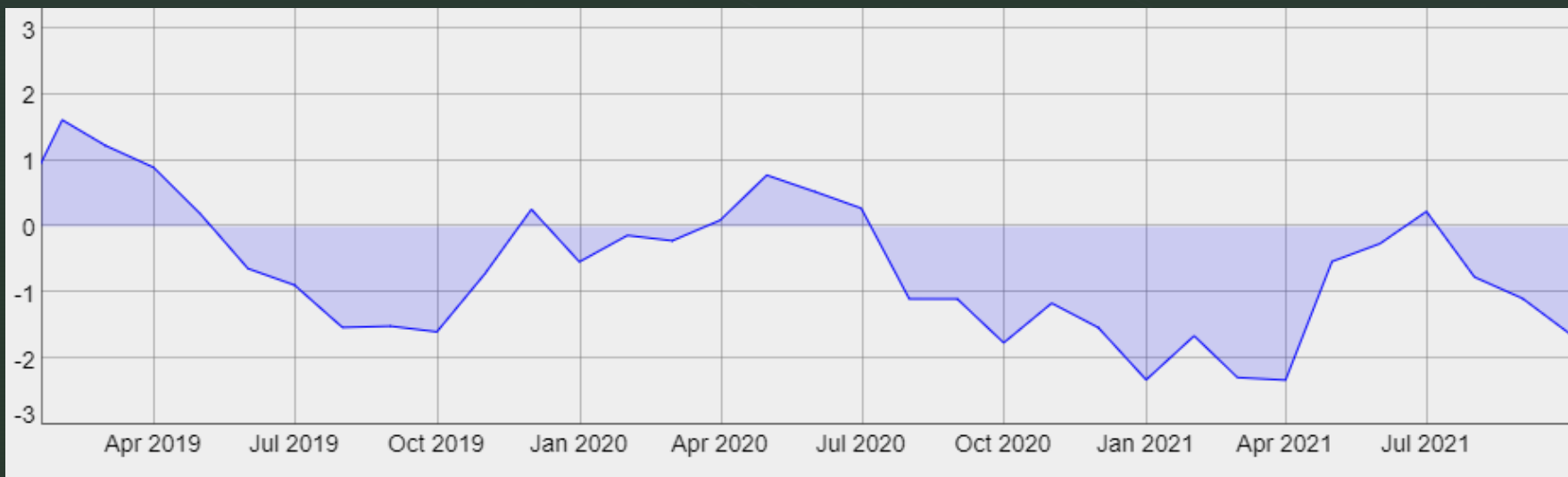
Oct 2021 (NDVI)



Normalize Difference Vegetation Index (NDVI) usually used to identify vegetative health, and whole Bangladesh shows Healthy vegetation (high NDVI) in October compared to August and September.

The Standard Rainfall Evaporation Index (SPEI) showed negative values until the end of July and turned positive by end of August. But in October, the index continue negative form August but the rainfall in Bangladesh shows a average value (ref - Rainfall map). Therefore, it may not have vegetation stress in Bangladesh for next few weeks..

However, IRI 3-month sub-seasonal precipitation forecast normal rainfall from November – December- January (2022), the there will be a high chance vegetation enhance to a healthy condition during next three months.



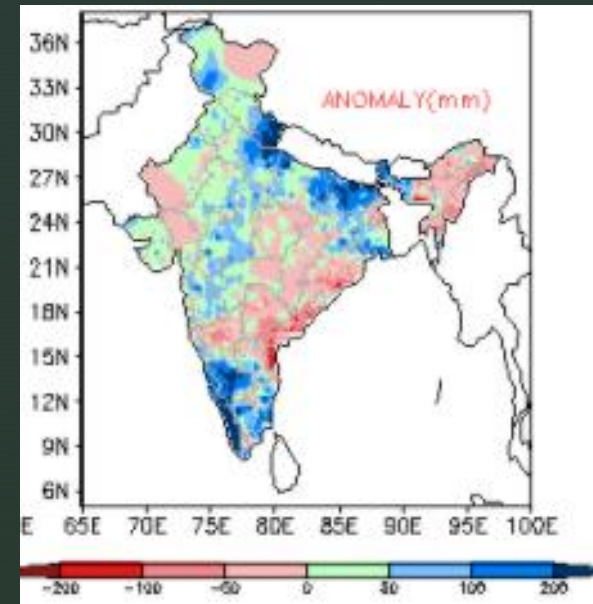
Source: <https://spei.csic.es/> SPEI

In reference to rainfall anomaly map, several states i.e. Karnataka, Tamil Nadu, Southern Maharashtra, Bihar, and parts of UP and MP received Significant rainfall and states in the central and eastern India, etc. received low (below average) rainfall.

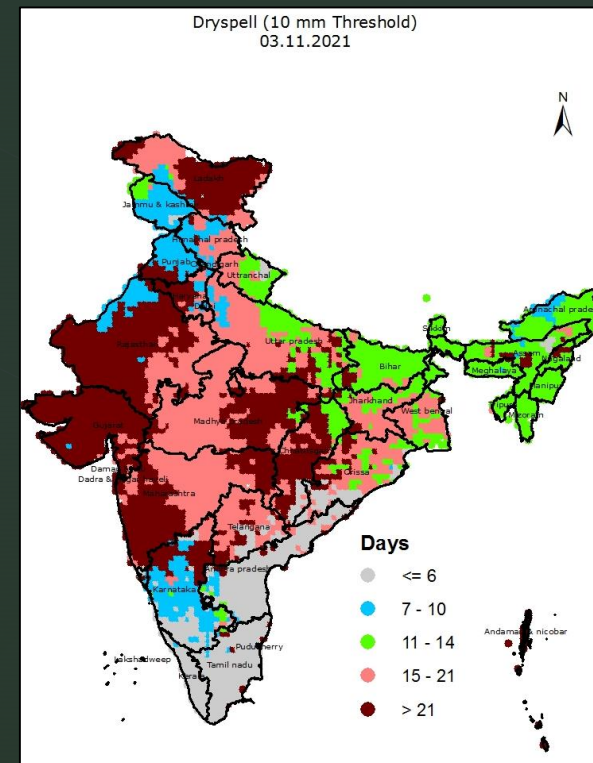
SPI (3-month i.e. Jun-Jul-Aug) indicator for meteorological drought shows states of Orissa, Maharashtra, Chhattisgarh, Assam, Telangana and MP are likely with deficit rainfall.

Vegetation Health Index (VHI) shows considerable increase in vegetation condition almost all the part of India.

Agricultural drought i.e. Integrated Drought Severity Index (IDSI) explains there is no significant drought in any part of India.

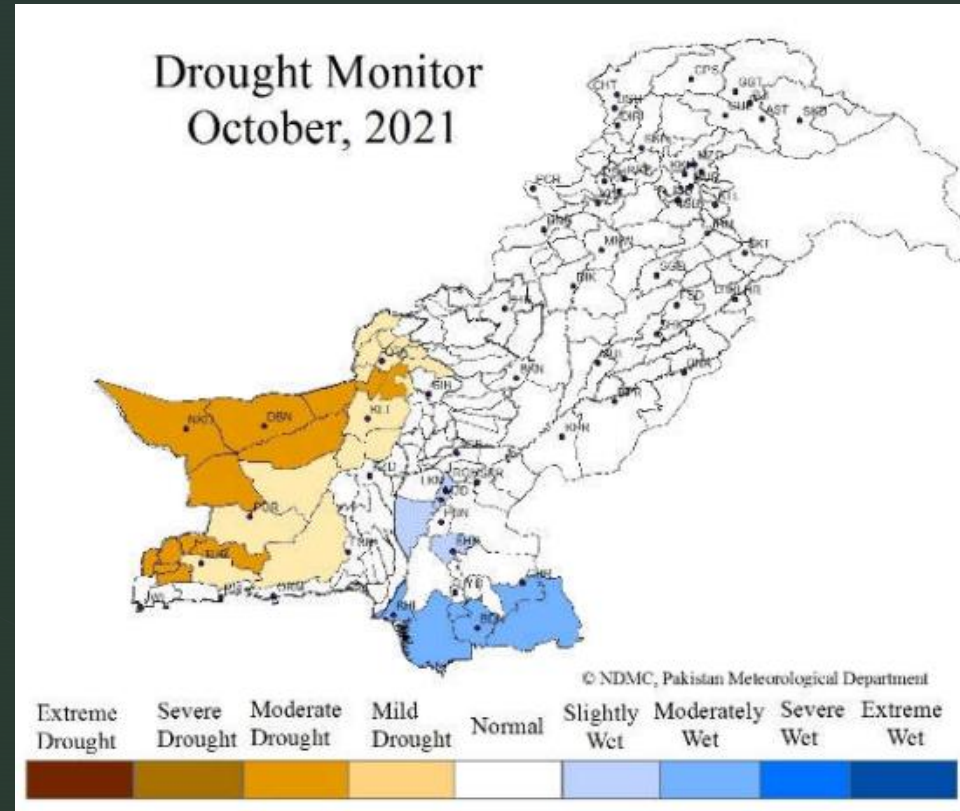
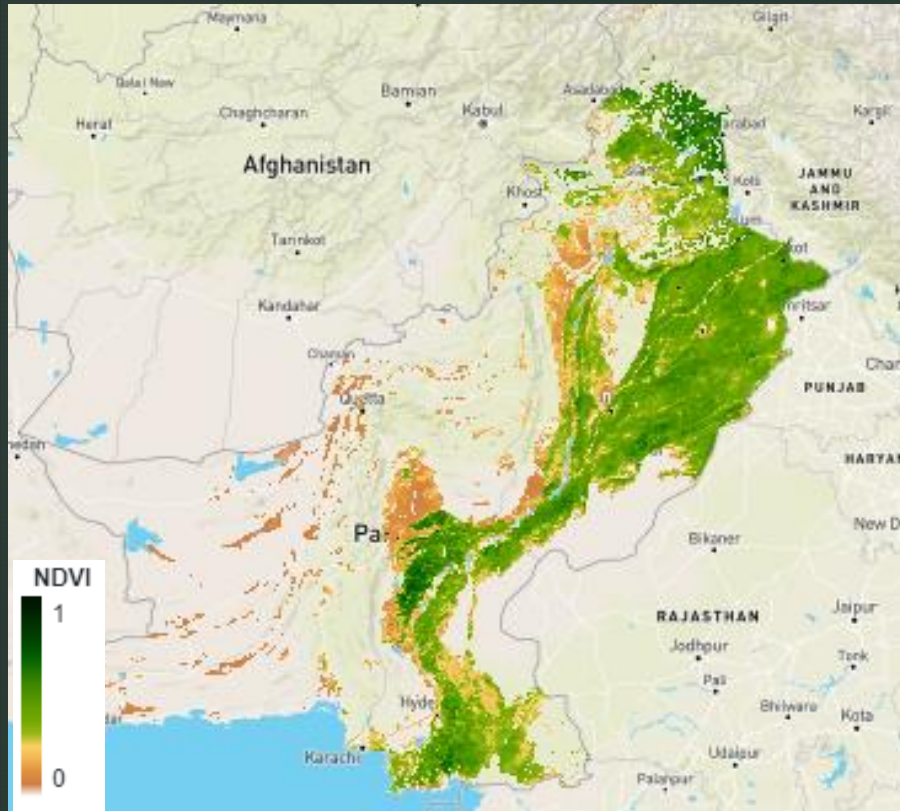


Rainfall anomaly for October 2021; Map Source: IMD



Dry spell (10mm threshold) Map Source: CRIDA

Oct 2021 (NDVI)



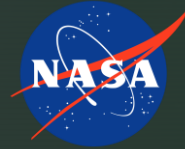
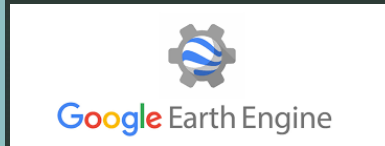
Source; NDMC

According to the National Drought Monitoring Centre of Pakistan, except for a few districts in Balukistan, all other districts has recovered from the drought (relief-web) in October 2021.

Normalize difference Vegetation Index (NDVI) shows dryness in vegetation as it is continue from July onwards in Sindh and Balukistan Provinces .

As per ERPAS (1-month) and IRI (3-month) forecast explains in rainfall (40 below average) for the period of November to December in Balukistan province while all the other provinces are receiving normal rainfall as the forecast.

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**

