

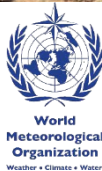
# DROUGHT MONITORING AND ASSESSMENT IN SOUTH ASIA

**Giriraj Amarnath**

*International Water Management Institute (IWMI), Sri Lanka*

**06 September 2017**

**AC Meeting of the IDMP, Geneva, Switzerland**



A water-secure world

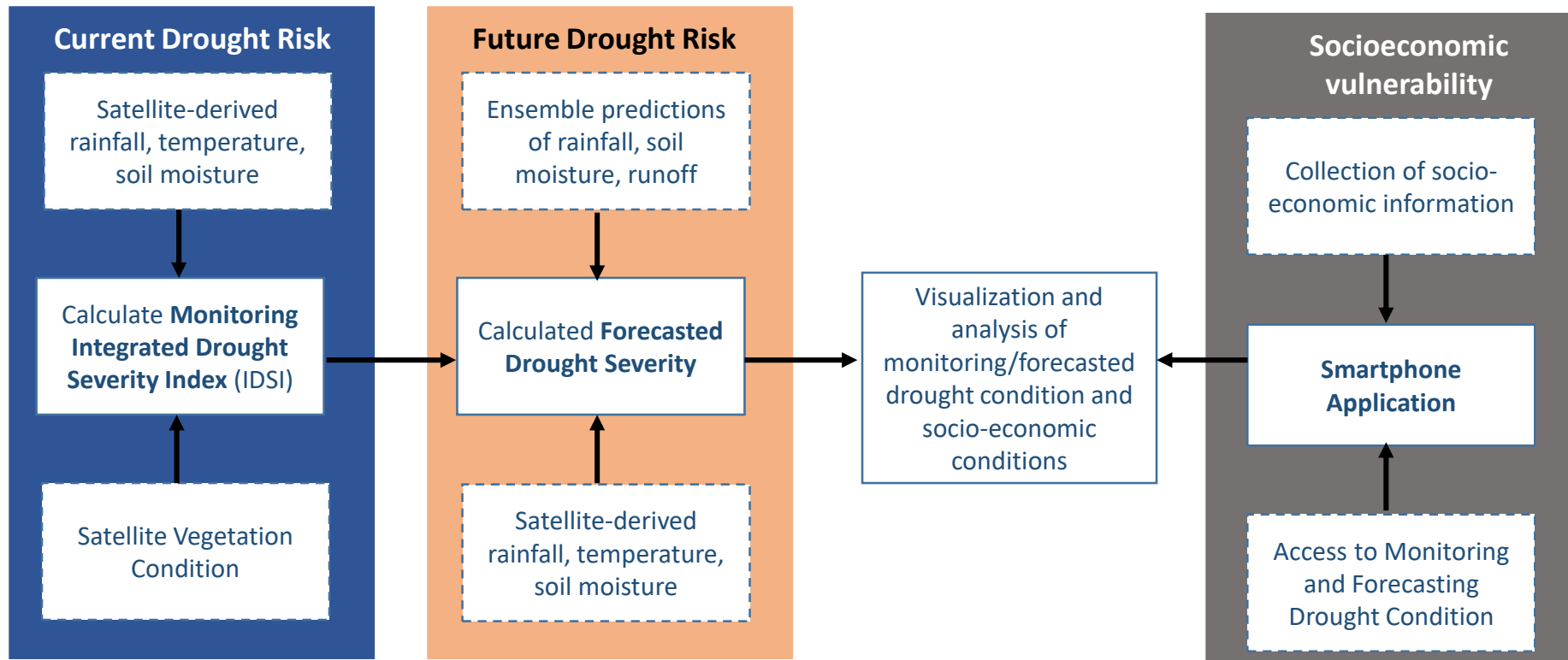
[www.iwmi.org](http://www.iwmi.org)

# **SOUTH ASIA DROUGHT MONITORING SYSTEM (DMS): OVERVIEW**

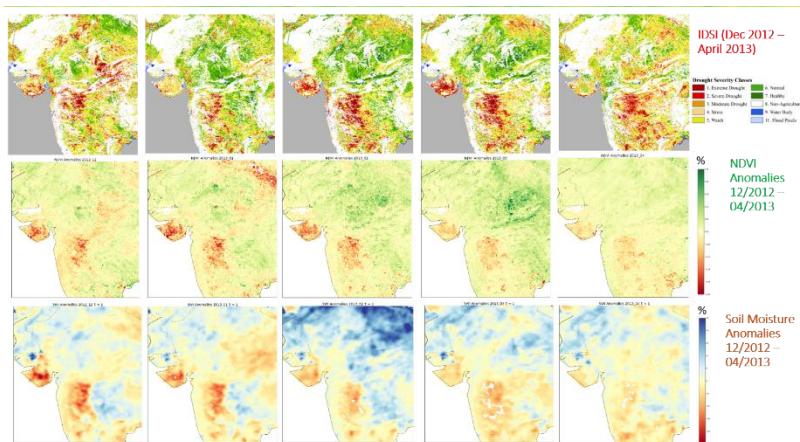
- Goal - build climate resilience, reduce economic and social losses, and alleviate poverty in drought - affected regions in SA through an integrated approach to drought management
- SADMS Integrates remote sensing and ground truth data (vegetation indices, rainfall data, soil information, hydrological data)
- SADMS supports regionally coordinated drought mitigation efforts that can be further tailored to national level
- SADMS is a partnership initiative of IWMI, WMO, GWP, CGIAR CCAFS and WLE and Governments in SA.



# IWMI's Drought Monitoring Framework

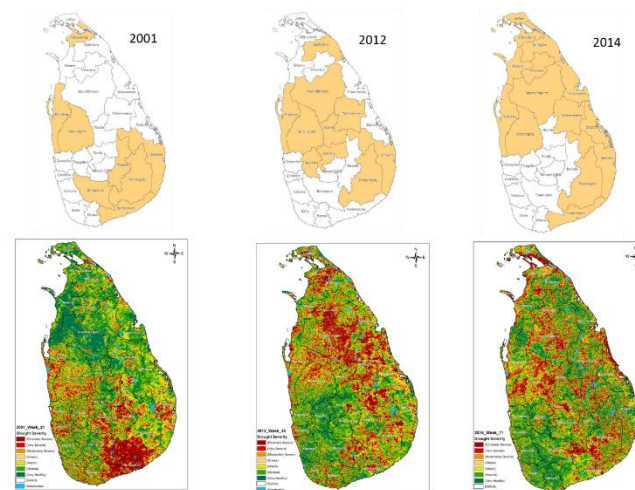


# DMS validation from maps to field scale

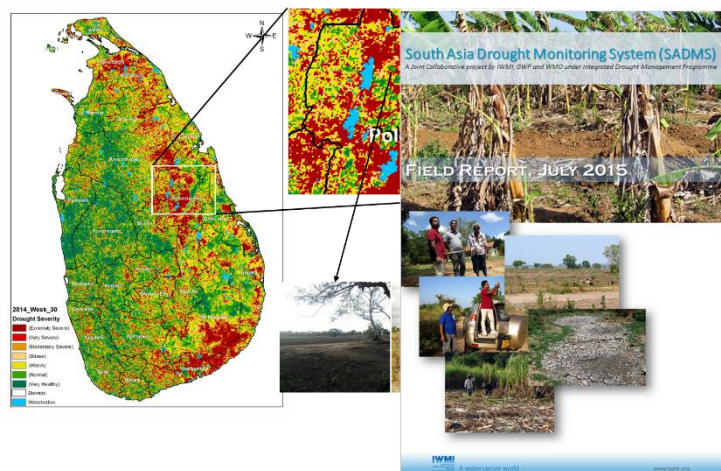


- Comparison of IDSI, NDVI and Surface Soil Moisture anomaly for the drought year Dec 2012 – April 2013
- High correlation observed among the IDSI and other essential variables in drought prediction and early warning.
- The SM can be used to predict by 15-30days in advance on the vegetation condition for better decision making among stakeholders

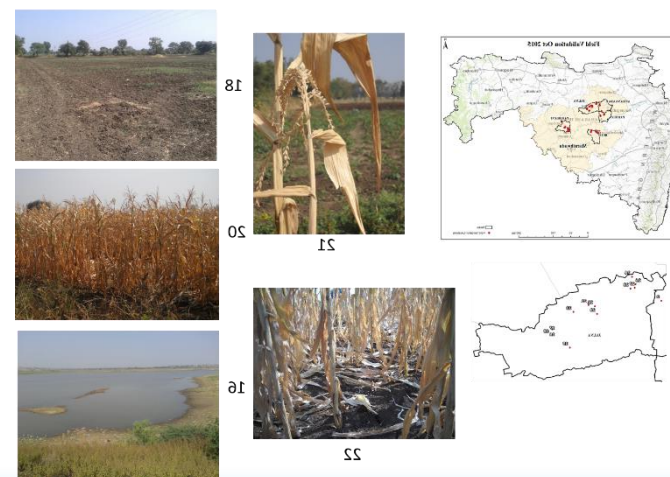
## SL Disaster Management Centre (DMC) Drought Maps



## Characterizing Drought Severity

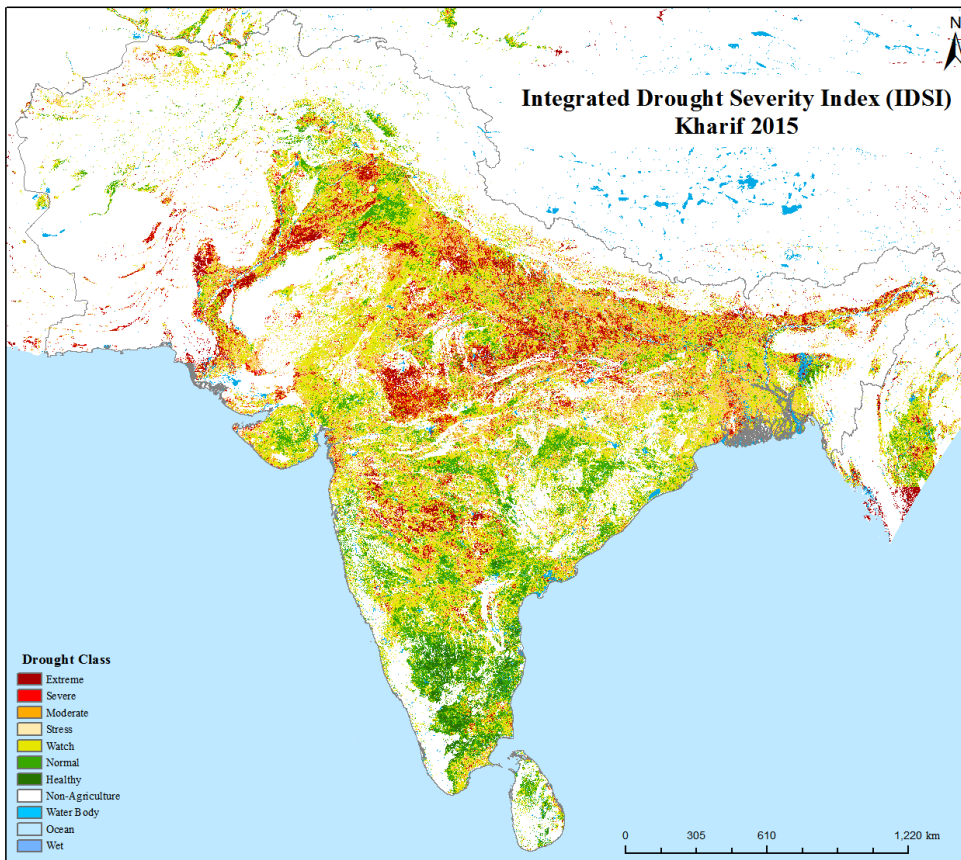


## 2015 DROUGHT IN MAMARATHA STATE, INDIA



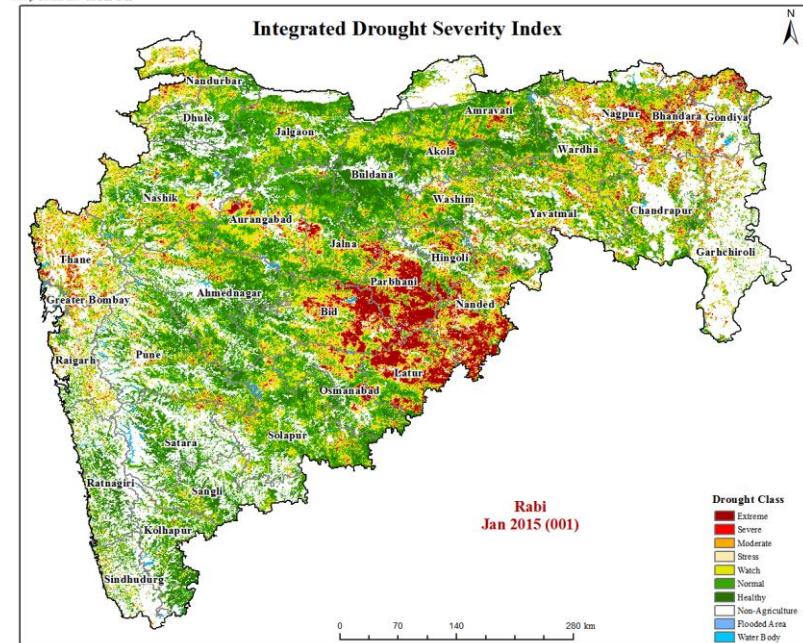


# SOUTH ASIA DROUGHT MONITOR SYSTEM (SA-DMS)



- First of its kind to establish for entire South Asia using multisource remote sensing observations;
- Historical drought risk mapping and assessment covering SA countries (2000 – Current);
- IDSI allows better understanding on drought frequency, duration over the 16years;
- Products are useful tools in drought mitigation studies and in decision-making process;

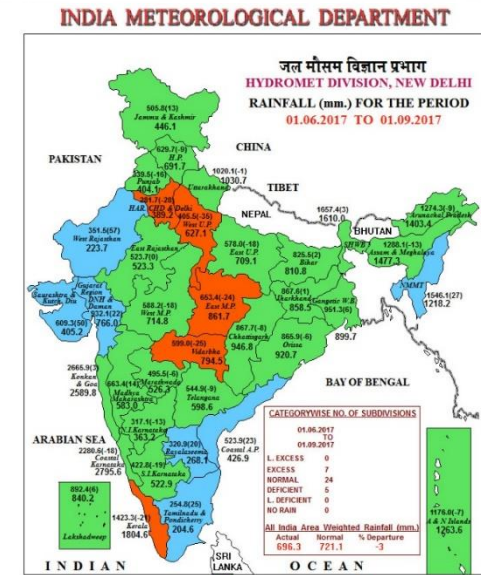
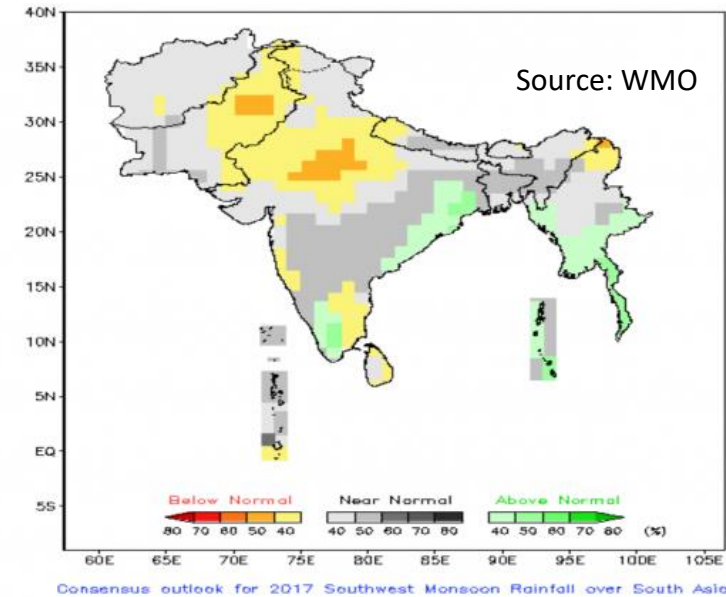
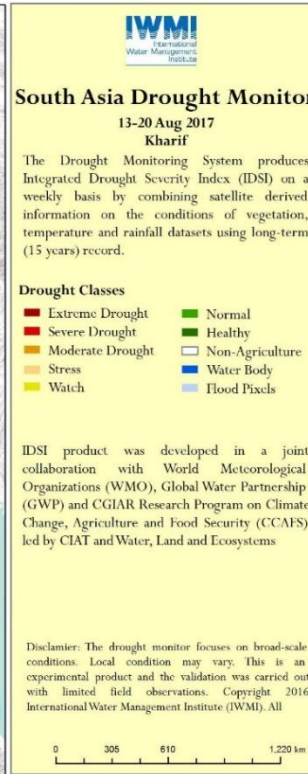
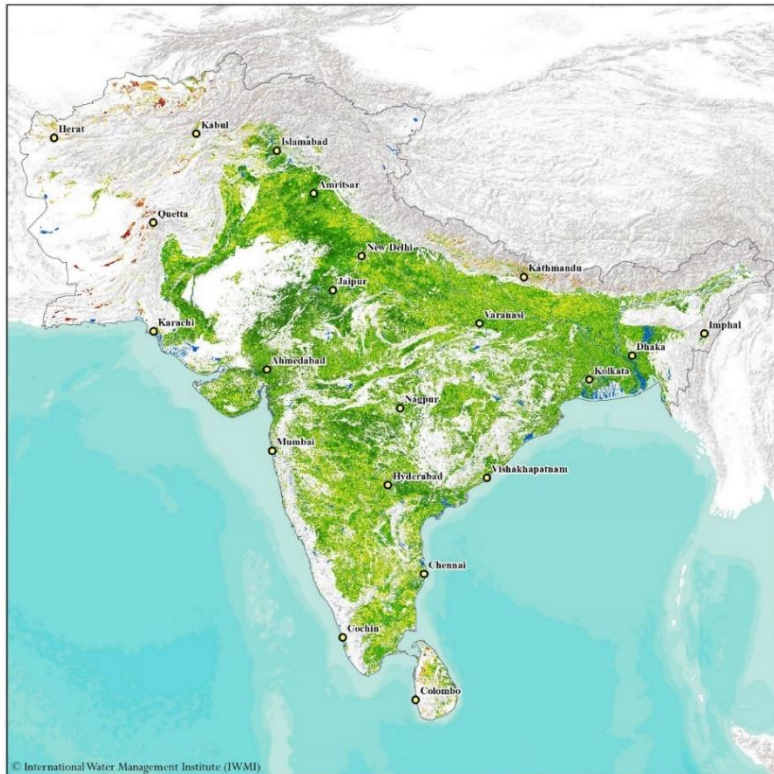
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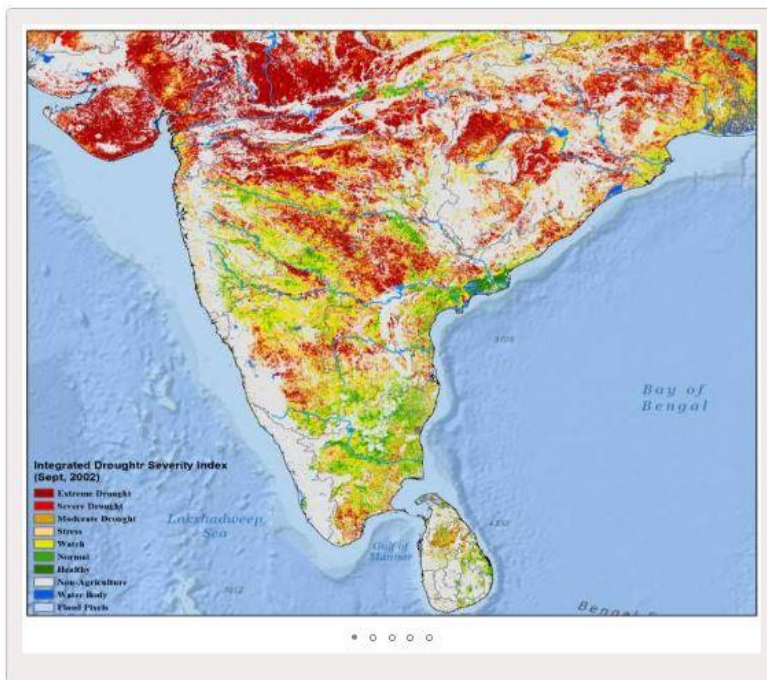
2015 field observations in Jalna, Maharashtra



# Current status of drought condition over South Asia and Rainfall distribution over India



- Drought condition over South Asia seems relatively low compare to the previous years of 2012, 2014 and 2016.
- Areas under drought condition includes India (Southern Karnataka, Marathawada, Madhya Maharashtra, East & West MP), Sri Lanka (North Central, northwestern and eastern provinces), parts of Southern Nepal



## Drought

The South Asia Drought Monitoring System (SADMS), established in 2014, is a weekly map of drought conditions that is produced and maintained at the International Water Management Institute (IWMI). Numerous drought indices - including the Integrated Drought Severity Index, Standardized Precipitation Index, and Soil Moisture Index - have been developed to provide advanced drought monitoring and assessment information for various purposes. In tandem, these indices not only paint an accurate picture of any particular drought episode, but provide invaluable decision-making tools.

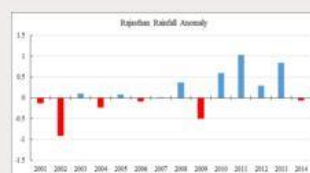


Through the SADMS website, the International Water Management Institute (IWMI) provides a wide array of

## Key remarks

- An operational platform that integrates various drought products to provide advanced drought monitoring and assessment information for various purposes
- A first regional platform for South Asia and have inherently finer spatial detail (500m resolution) than other commonly available global drought products

## South Asia Drought Stats



## Important Links

- ▶ Global Drought Management Info
- ▶ US Drought Monitor
- ▶ Global Drought Monitor
- ▶ Standardized Precipitation Index
- ▶ Standardized Precipitation and Evapotranspiration Index

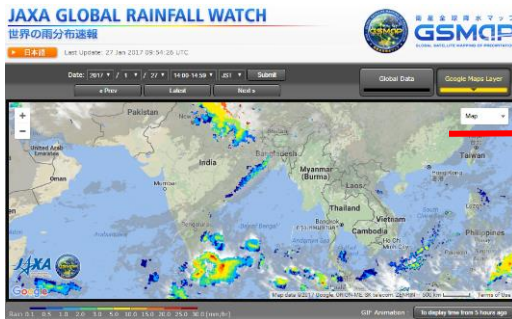
## News Alerts

- ▶ IWMI-developed tool to give Sri Lanka advance warning of drought
- ▶ Monitoring drought in Bundelkhand region, India
- ▶ IMD ends drought of hope, predicts above normal monsoon for India
- ▶ With months to go for the rains, this is the drought map of India
- ▶ Ray of light in Pakistan's drought-hit Thar desert

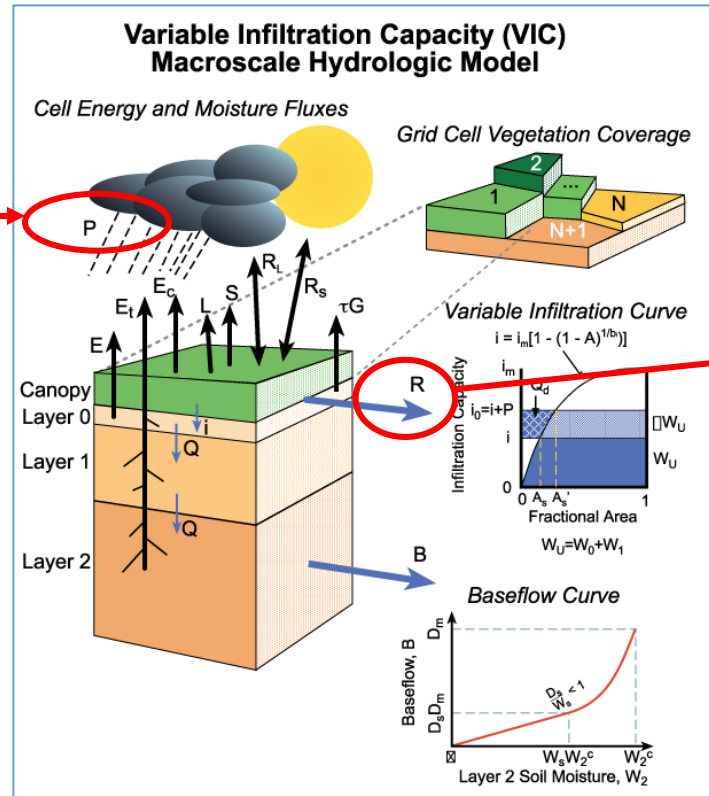
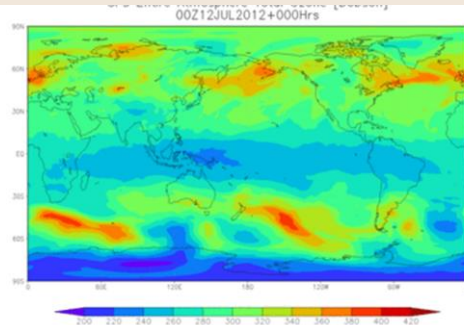


# South Asia Drought Forecasting and Early Warning (SADEWS)

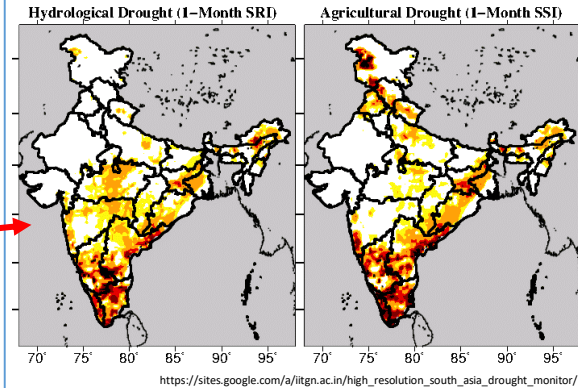
Near-real-time rainfall estimate



Rainfall forecast by NOAA GCFS and IITM



SRI: Hydrological drought severity  
SSI: Agricultural drought severity



Forecasting impact on agriculture



*Joint Collaboration of IIT-GN in model development and exploring with IITM/IMD to obtain weather forecast data*



# South Asia Drought Early Warning System (SADEWS)

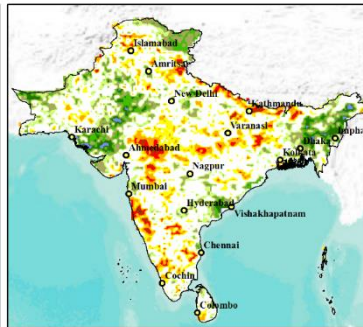
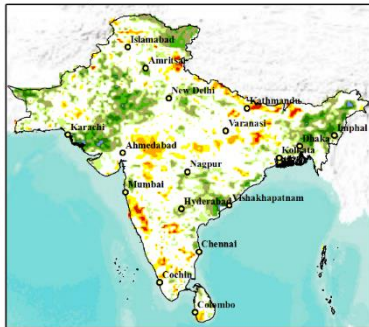
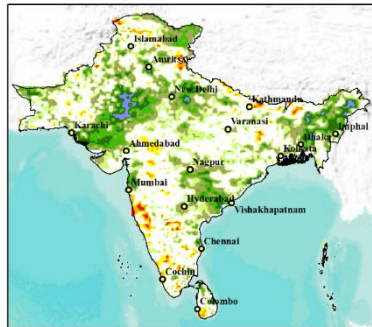
## SOUTH ASIA DROUGHT EARLY WARNING SYSTEM (SADEWS)

### SOIL MOISTURE PERCENTILE (SMP)

7-day Percentile 10 Jul 2017

7-day Forecast Percentile 17 Jul 2017

7-day Forecast Percentile 25 Jul 2017

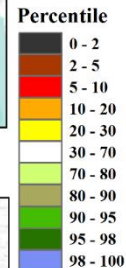
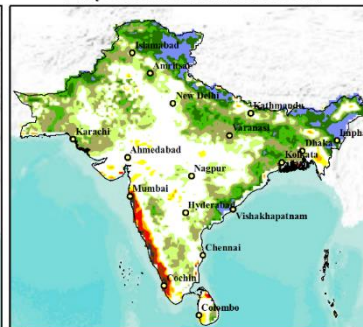
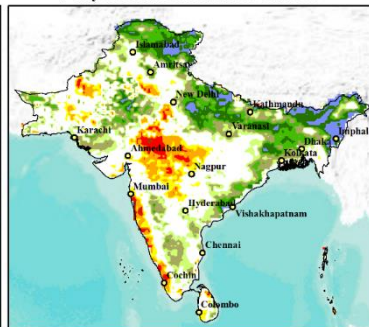
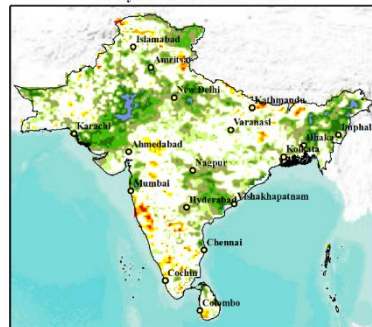


### SOIL RUNOFF PERCENTILE (SRP)

7-day Percentile 10 Jul 2017

7-day Forecast Percentile 17 Jul 2017

7-day Forecast Percentile 25 Jul 2017



**Current Condition: 10 July 2017**

**Forecast Period : 17 July and 25 July 2017**

**Standardized Soil Moisture and Runoff Index for regional drought and early warning**

### Summary:

The experimental drought forecast products for research/scientific use based on 10<sup>th</sup> July 2017 initial condition. These forecast products are based on the real time weekly operational forecast generated by Global ENsemble (GENS), a weather forecast model made up of 21 separate forecasts, or ensemble members developed at The National Centers for Environmental Prediction (NCEP), NOAA.

### Drought Forecast Outlook:

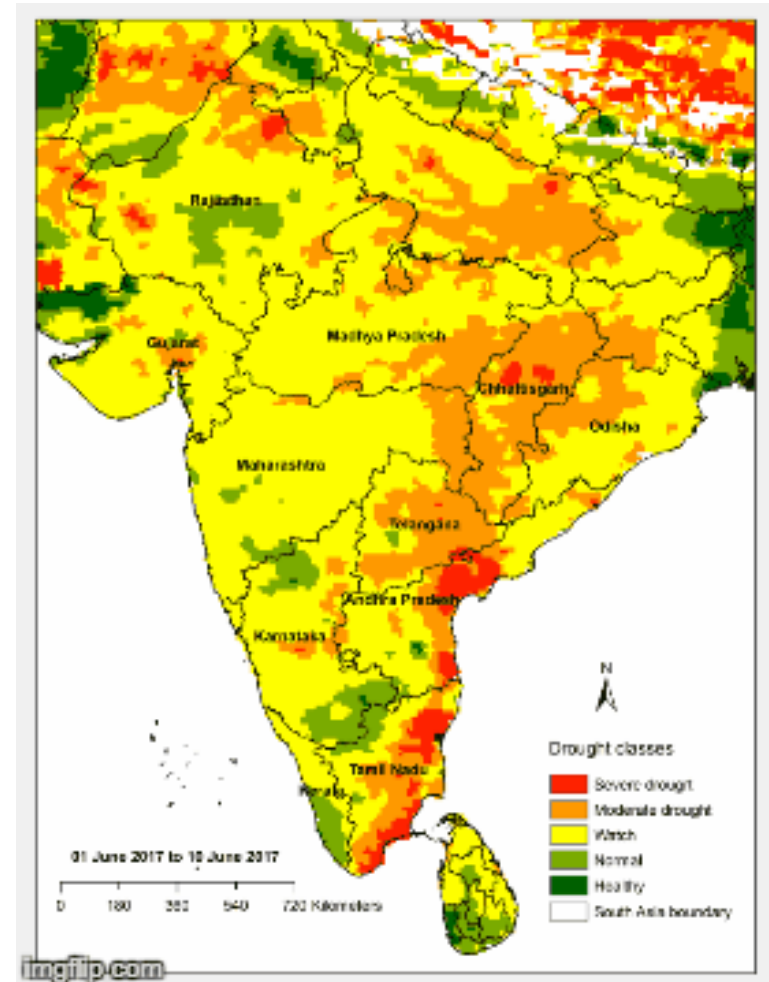
- The initial condition has improved over Telangana, Andhra Pradesh, Rajasthan, Western UP and North-eastern states..
- Initial condition on the Soil Runoff Index (SRI) explains similar trend to SSI.
- Some level of dryness is expected in the following weeks over central parts of the region such as MP, eastern Gujarat and Jharkhand.
- The leeward side of the western ghats along the southern Maharashtra seems to be progressing towards dryness.
- In reference to IMD actual rainfall for India, several east-central states are in deficit rainfall condition which is affecting the crop productivity and advance need for State and Local authorities for better planning and coordination on water resources management.

The SADEWS is regional scale early warning system developed as a collaborative project between International Water Management Institute (IWMI) and Indian Institute of Technology – Gandhi Nagar (IIT-GN).

*Disclaimer: The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the International Water Management Institute (IWMI) and its partners concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of IWMI.*

# Soil Moisture based Drought Index

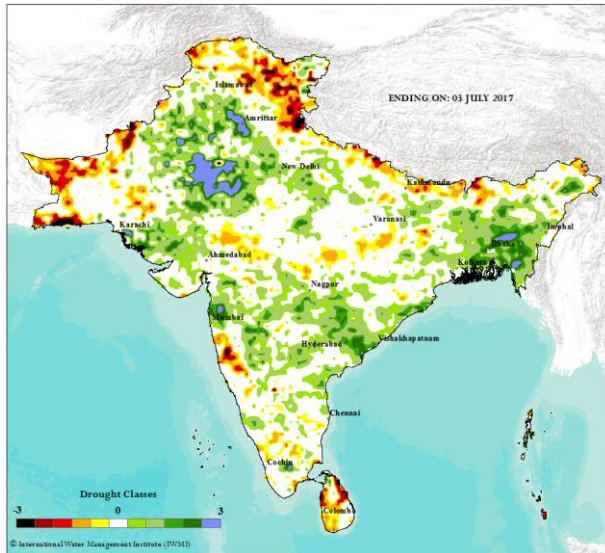
- [Soil Water Index \(SWI\)](#), developed by Europe's Copernicus Programme was used to calculate Soil Water Anomaly Drought Index (SWADI)
- SWADI involves the use of radar backscatter measurements from the Advanced Scatterometer (ASCAT) aboard the EUMETSAT MetOp satellite.
- Over the last 10 days, soils in parts of the region have been much drier than usual. Nowhere is current soil moisture as abnormally low as in Northern Sri Lanka and India's Tamil Nadu state.
- Although such conditions are a regular occurrence, the current situation stands out for its intensity and persistence, as was also the case during severe droughts in 2012 and 2014.



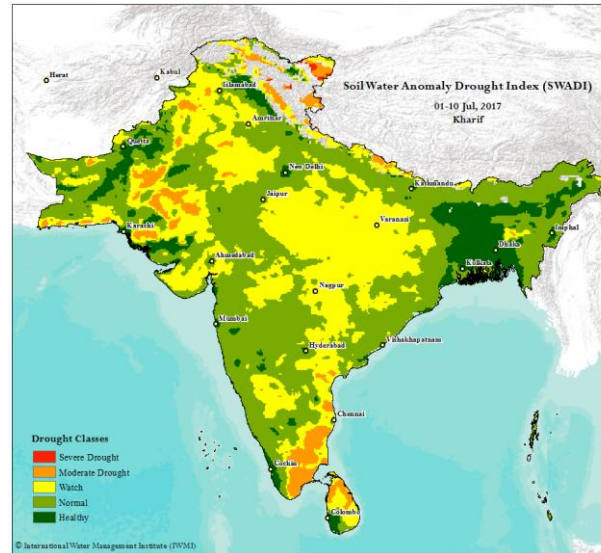


# SADMS – Drought Forecasting, Early Warning and Now casting

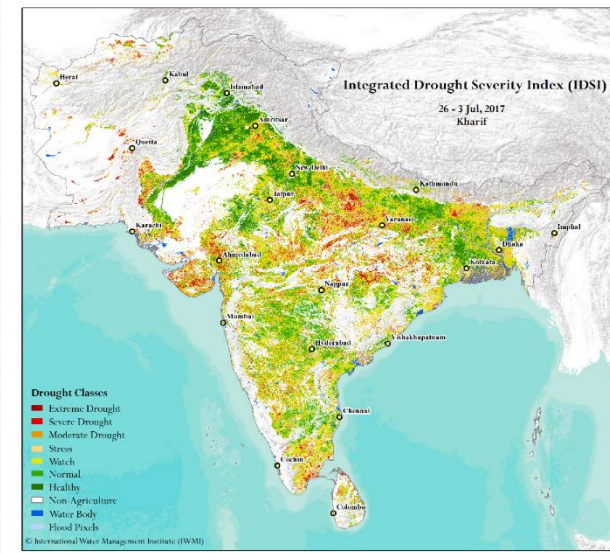
**SA-DEWS**



**SWADI**

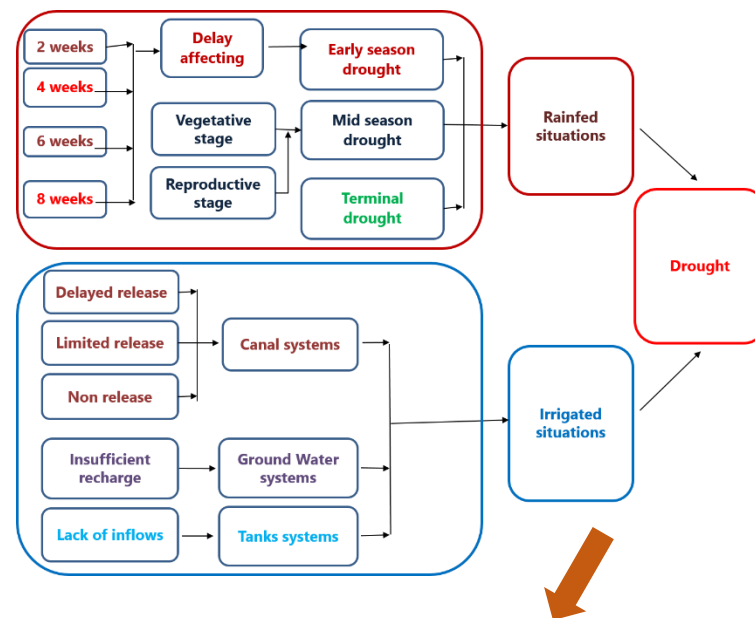
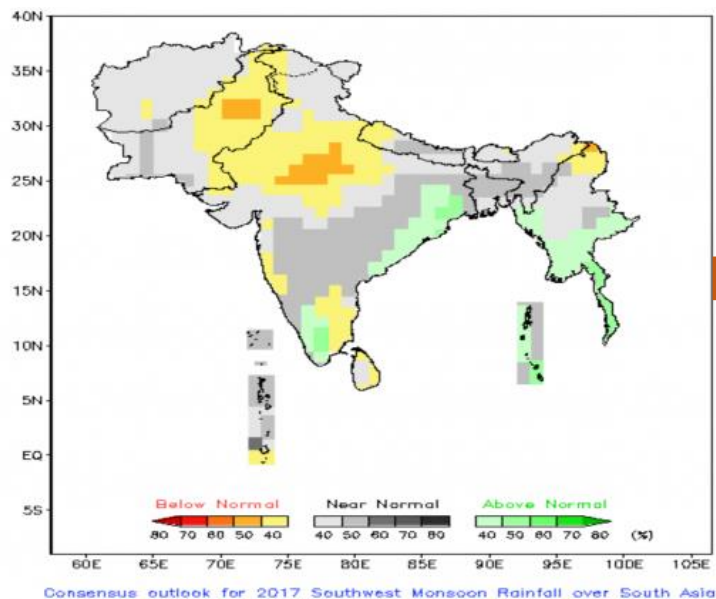


**IDSi**



- South Asia-Drought Early Warning System (SA-DEWS) is an integrated approach based on satellite estimates of rainfall temperature, wind and soil type utilized in VIC model and the derived outputs namely Standardized Precipitation Index (3-Month), Standardized Soil Moisture Index (SSI) and Standardized Runoff Index (SRI).
- Soil Water Anomaly Drought Index (SWADI) is derived from satellite based decadal soil moisture product of ASCAT provided by EUMETSAT.
- Integrated Drought Severity Index (IDSi) is an integrated index that has been formulated using VCI, TCI & PCI at 500m resolution for agricultural land-use over South Asia.
- It can be observed, that during this time period all the three indices shows a close relation between each other. The peninsular India has reviving well from the drought situation. Parts of Bihar, Jharkhand and UP is facing some scarcity of rainfall which is well reflected in all the three indices. Some parts of Tamil Nadu is still facing moderate drought like scenario. North and Eastern parts of Sri Lanka is severely facing water stress resulting into crop damage and shortage of ground water.

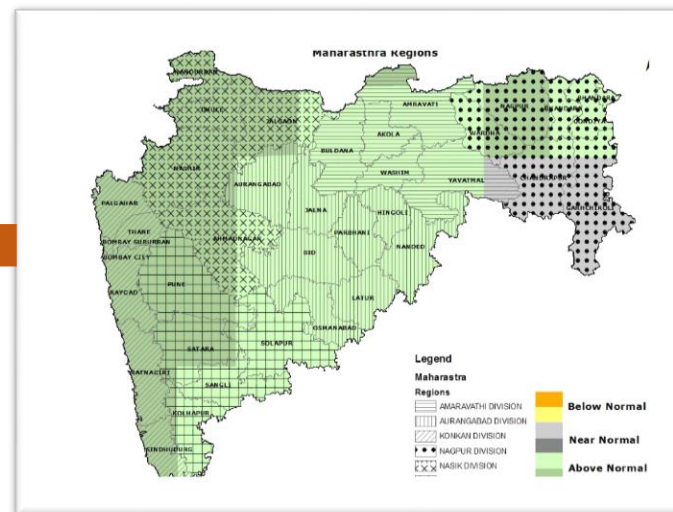
# Drought Management & Contingency Plans



Based on the previous years i.e., 2015 and 2016 experience, during Kharif – 2017 contingency plan was proposed as below

If the rains are not received till 15 <sup>th</sup> July, 2017									
S. No.	District	Crop wise Normal area (ha)	Crop wise area likely to be sown	Left over area	Crop wise areas proposed for Contingency		Seed requirement		Remarks
1	2	3	4	5	Crop	Area	Crop/variety	Qty. of seed req (Qtls)	10
1	Anantha puramu	801675			Groundnut+Redgram crops				

If the Rains are not received till 31 <sup>st</sup> July, 2017									
S. No.	Mandal	Crop wise Normal area (ha)	Crop wise area likely to be sown	Left over area	Crop wise areas proposed for Contingency		Seed requirement		Remarks
1	2	3	4	5	Crop	Area	Crop/variety	Qty. of seed req (Qtls)	10
1	Anantha puramu	801675			Groundnut+Redgram crops				



Joint project of ICAR-CRIDA and IWMI on promoting drought resilience in pilot states in India

Source: CRIDA

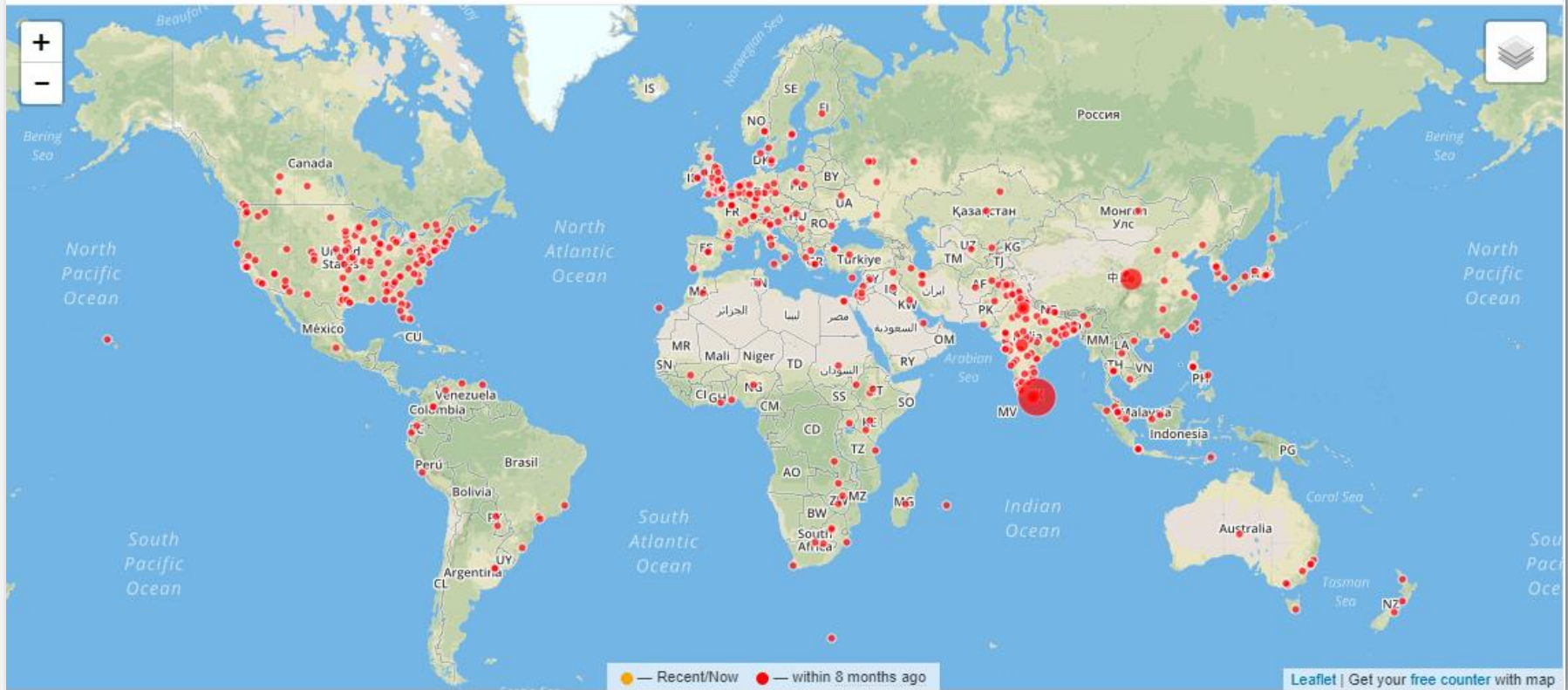


# Visitors to DMS Portal

Visitor Map for Project 3

2,611 total visits for:

Jan 11, 2017 - Sep 5, 2017



- More than 2600 visit to DMS and spread over 84 countries since Jan 2017
- Approx. 300 visit per month and dominant being India, Sri Lanka, USA, Canada, UK





# Proposed activities / (Sep 2017 – Dec 2018)

- Briefing government officials in Sri Lanka to promote SADMS initiatives / fund raising jointly with GWP SAS and CWP (Oct 2017)
- Field visit in Andhra Pradesh, Maharashtra to evaluate the drought contingency plans with ICAR-CRIDA and state level officials (Sept 2017);
- Workshop and training on drought monitoring indices in Lao PDR jointly with MOST and UNSPIDER (Nov 2017);
- Improving the DMS platform and developing open source DMS toolbox (mid 2018);
- Validation and evaluation of range of drought products with national stakeholders in target countries and its application Climate Smart Agriculture (continuous activity);
- Fund raising with key donors – support from IDMP (continuous activity);
- Promote use of drought monitor products with insurance industry. Initial discussion with AICI, MunichRe, SwissRe to pilot the product for the rabi season (April 2018)
- Research publications and communication products



Visit SADMS

<http://dms.iwmi.org>

