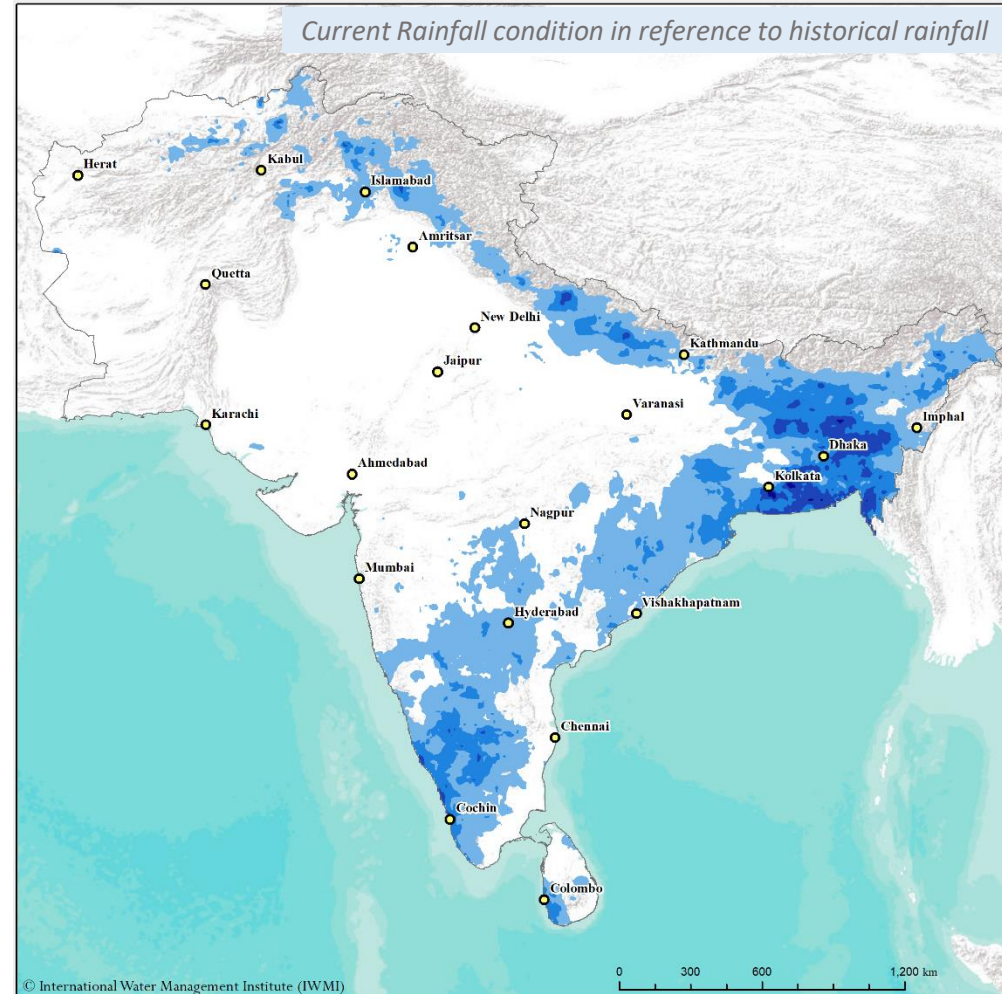
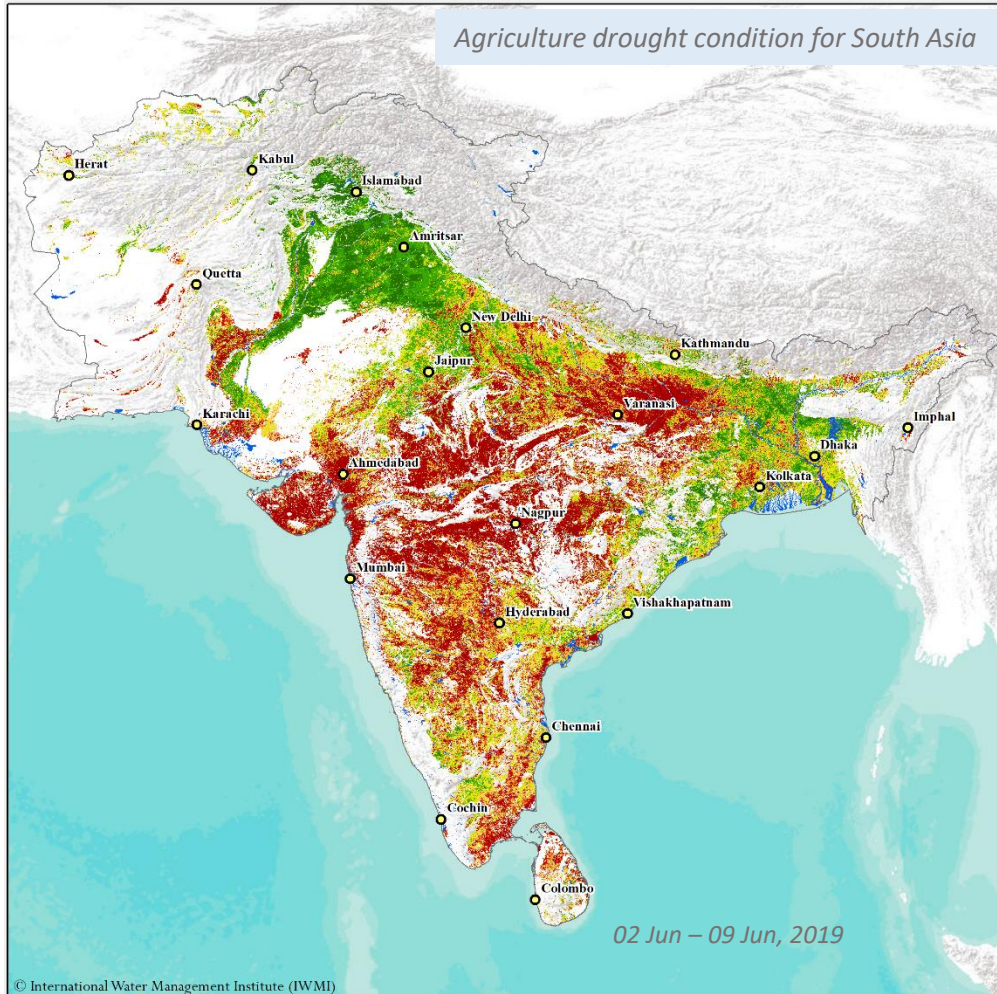


SADMS DROUGHT BULLETIN

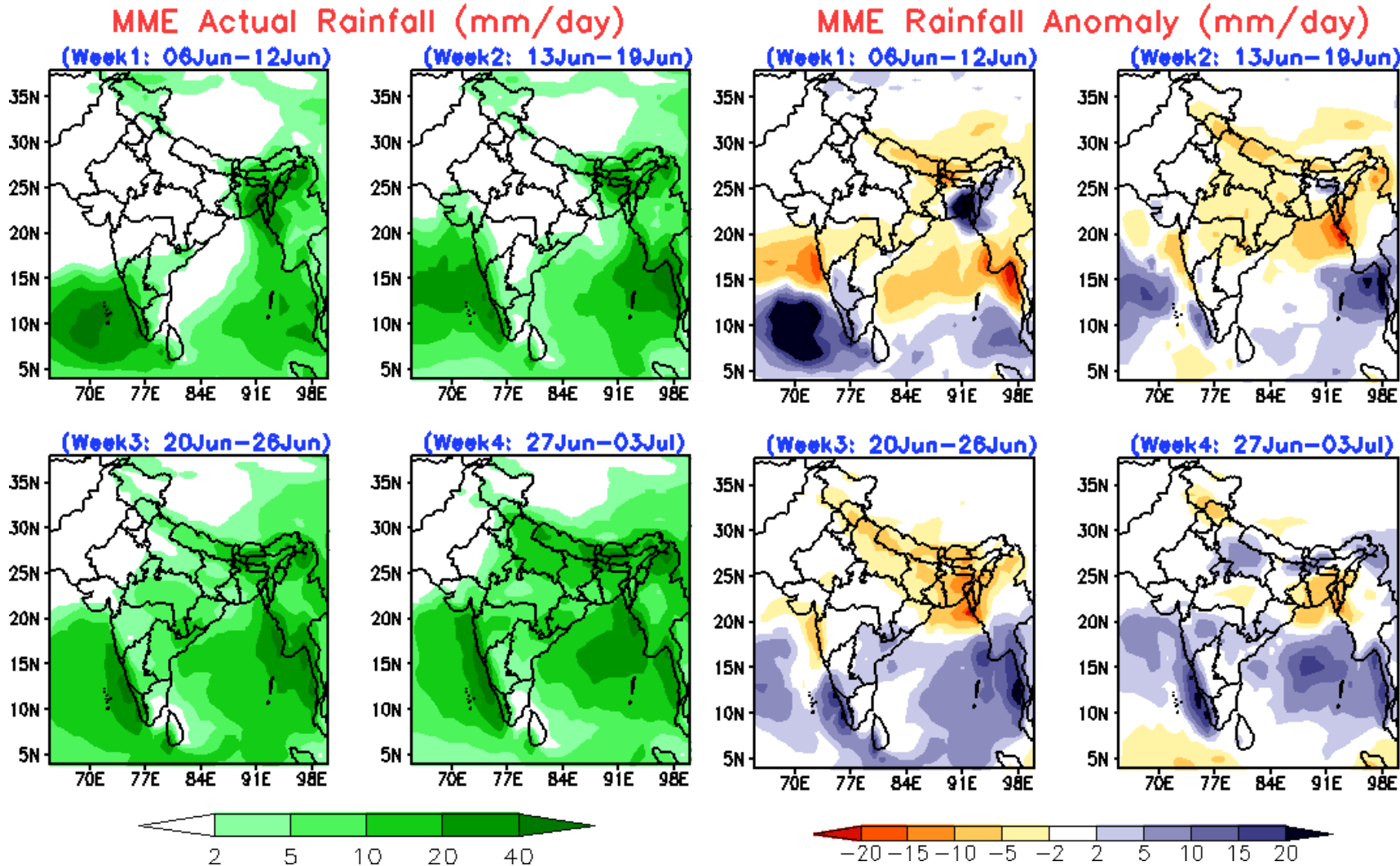
14 June 2019 | ISSUE 01



South Asia Drought Monitoring System (SADMS) drought weekly bulletin is produced by International Water Management Institute (IWMI) and is funded by the Indian Council of Agricultural Research (ICAR), the CGIAR Research Program on Water, Land and Ecosystems (WLE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF), Japan. Development of the beta-monitoring system was made possible at this inception through IDMP supported by WMO/GWP. The bulletin supports the government and other users to strengthen the potential use of satellite technology and modeling tools to reduce the impacts on agriculture risks and support in drought contingency plans and mitigation efforts.

Rainfall Summary - Predicted week wise rainfall for South Asia

Multi Model Ensemble (MME) Seasonal Prediction System for 2019 Monsoon Season



- Rainfall for South and South-west, Karnataka, west Maharashtra and Kerala might experience in the next week; east Bhutan, north west Assam, south west Arunachal might experience a slight increase in rainfall, however the rainfall anomaly explains deficit rainfall.
- Most of India might experience increasing in rainfall by beginning of July.
- MP, UP, Bihar, Odisha, Jharkhand, Telangana and West Bengal may experience deficit rainfall from 13th June to 19th. But from 27th to 03rd Jun will experience excess rainfall
- Sri Lanka for Northern, North Central and Eastern province explains normal rainfall but western and central might experience excess rainfall in month of June.
- Nepal rainfall anomaly explains a decrease in rainfall including Bhutan and it will slightly increase in end of June.
- Overall Pakistan shows no anomaly in rainfall.

Note: The summary on country specific details described above based on the ERPAS MME information product do not imply the expression of any opinion whatsoever on the part of the IWTM and its partners as well the data provided by IITM.

SOUTH ASIA DROUGHT EARLY WARNING SYTEM (SADEWS)

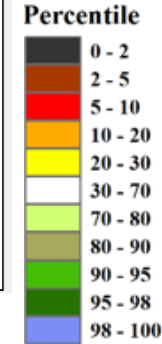
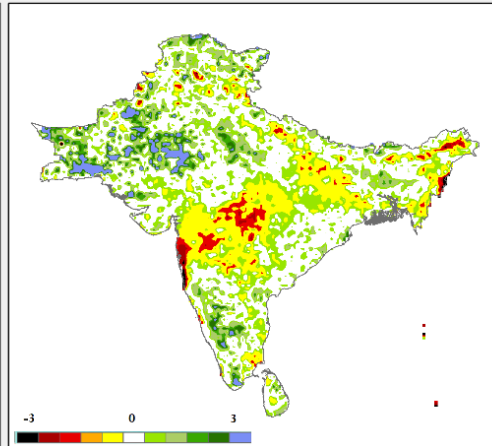
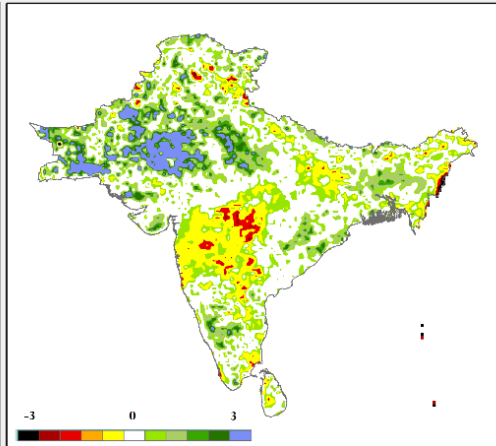
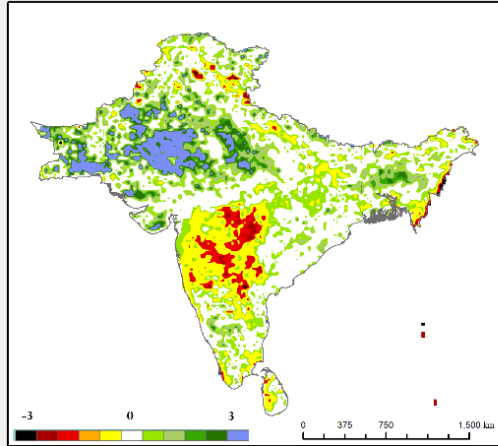
Current Condition: 09 Jun 2019
Forecast Period : 09 Jun and 24 Jun 2018
Standardized Soil Moisture and Runoff Index
for regional drought and early warning

SOIL MOISTURE PERCENTILE (SMP)

7-day Percentile 09th June 2019

7-day Forecast Percentile 16th June 2019

15-day Forecast Percentile 24th June 2019

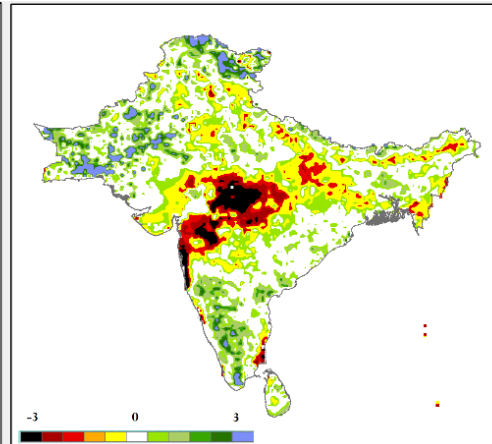
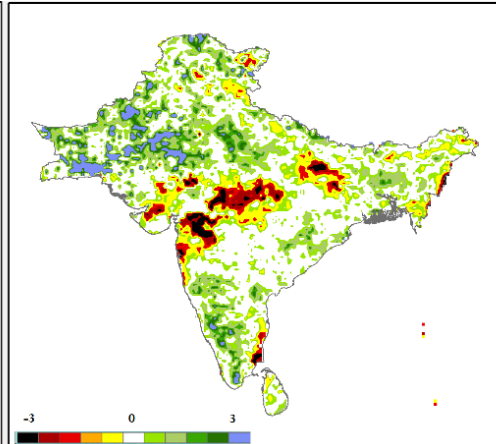
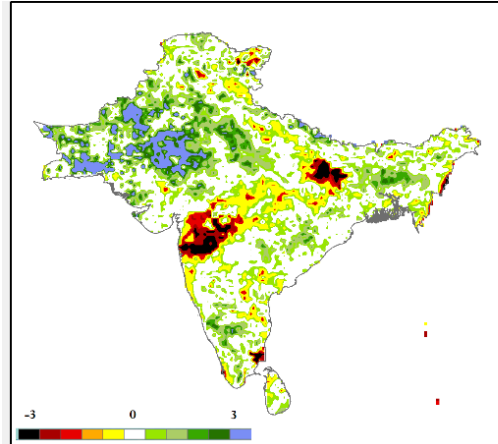


SOIL RUNOFF PERCENTILE (SRP)

7-day Percentile 09th June 2019

7-day Forecast Percentile 16th June 2019

15-day Forecast Percentile 24th June 2019



SOIL RUNOFF PERCENTILE (SRP)

Summary:

The experimental drought forecast products for research/scientific use based on 09th June 2019 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:

- Rainfall of Karnataka, Tamil Nadu, Kerala, Andhra Pradesh, Odisha, Chhattisgarh, Rajasthan, Haryana, Punjab will be increasing while rainfall of Maharashtra, UP, Bihar, MP and Telangana will be decreasing slightly in coming two weeks.
- Initial condition on the Soil Runoff Index (SRI) explains similar trend to SSI.
- Dryness is increasing in the following week and it will be further increasing in the 3rd week of June over center part of India such as Maharashtra, MP and UP.
- South and South west of Sri Lanka will get more rain when rainfall in Jammu & Kashmir and Bhutan is normal.
- The areas are in deficit rainfall condition which may affect 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 – Gandhinagar (IIT-GN).

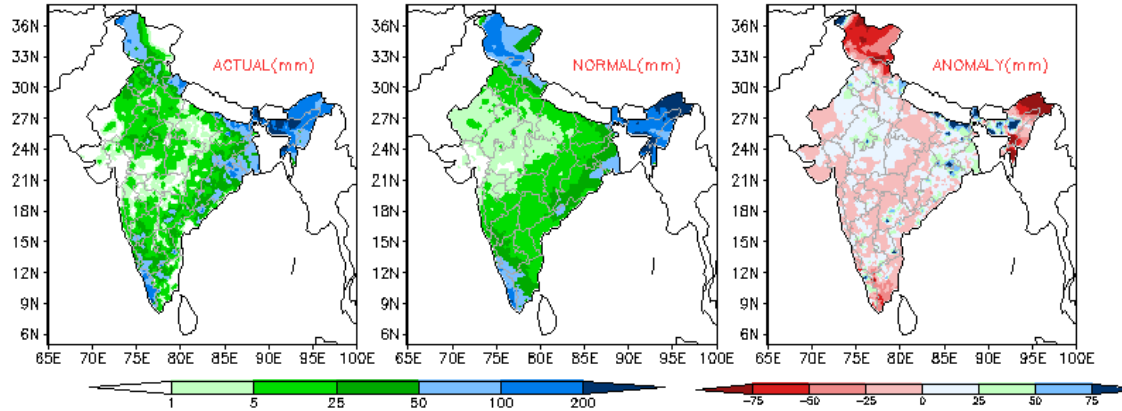
Disclaimer: The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the International Water Management Institute (IWMI) and its partners concerning the legal or development status of any country, territory, 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.

INDIA – Monthly Rainfall Condition (Actual vs. Anomaly)

Actual Rainfall – April 2019

RAINFALL OVER THE COUNTRY FOR APRIL 2019

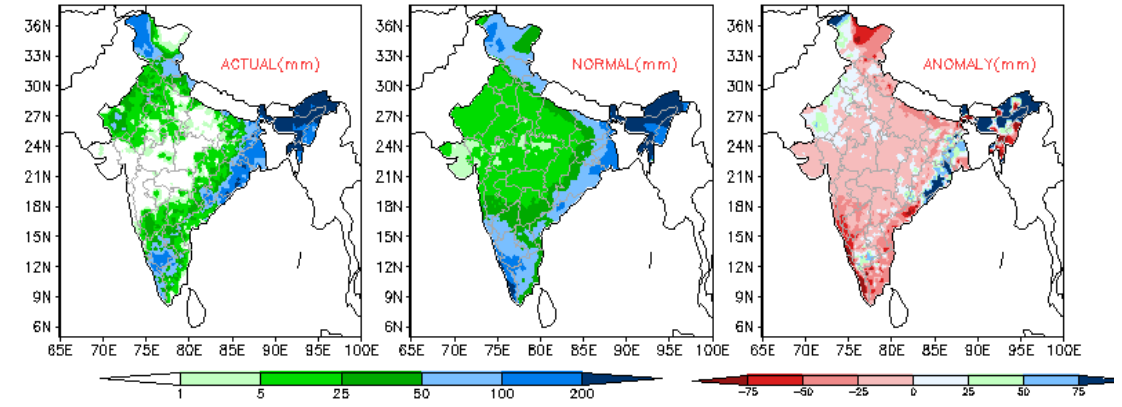
(CLIMATE MONITORING AND ANALYSIS GROUP)



Actual Rainfall – May 2019

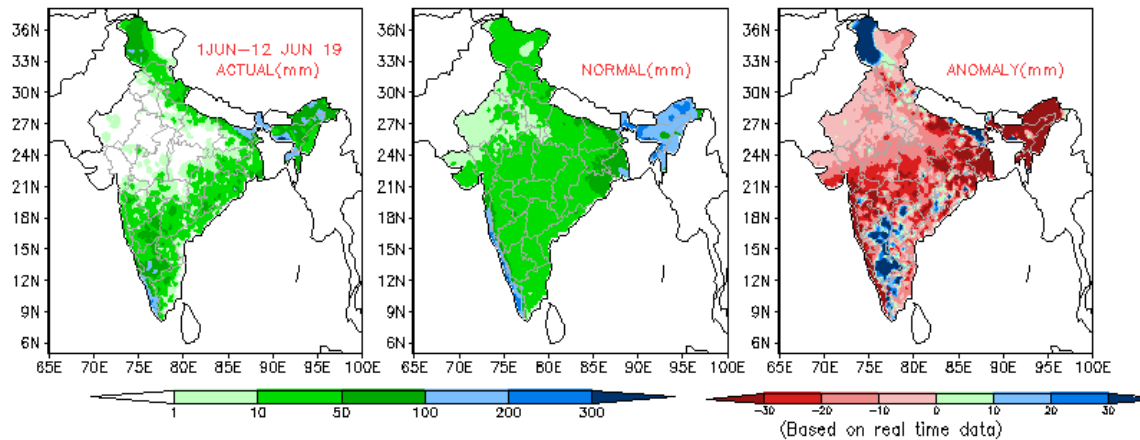
RAINFALL OVER THE COUNTRY FOR MAY 2019

(CLIMATE MONITORING AND ANALYSIS GROUP)



Actual Rainfall – Seasonal 2019

CLIMATE MONITORING AND ANALYSIS GROUP



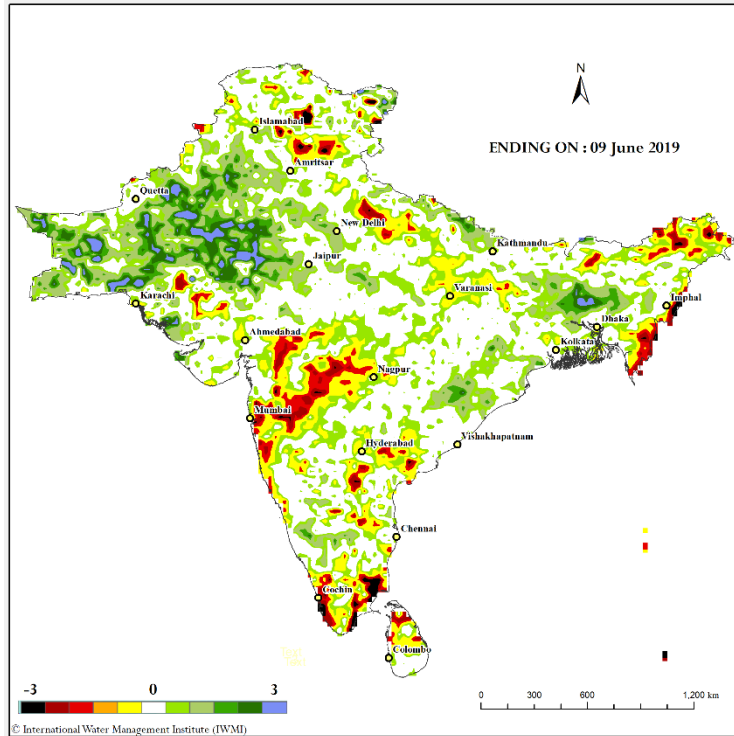
Data Source: IMD

- Overall there is an decrease in rainfall for the month of May compared to the long-term anomaly, however some coastal areas in Odisha and West Bengal, had excess rainfall.
- Month of April has experienced mostly negative anomalies across India except small patches. Arunachal Pradesh, Manipur, Jammu & Kashmir experiences an excess negative rain anomaly.
- There has been a high reduction in rainfall in the month of April, May and until June 12 all over the India.
- Overall there has been an slightly excess rainfall central south belt (Karnataka) of India.

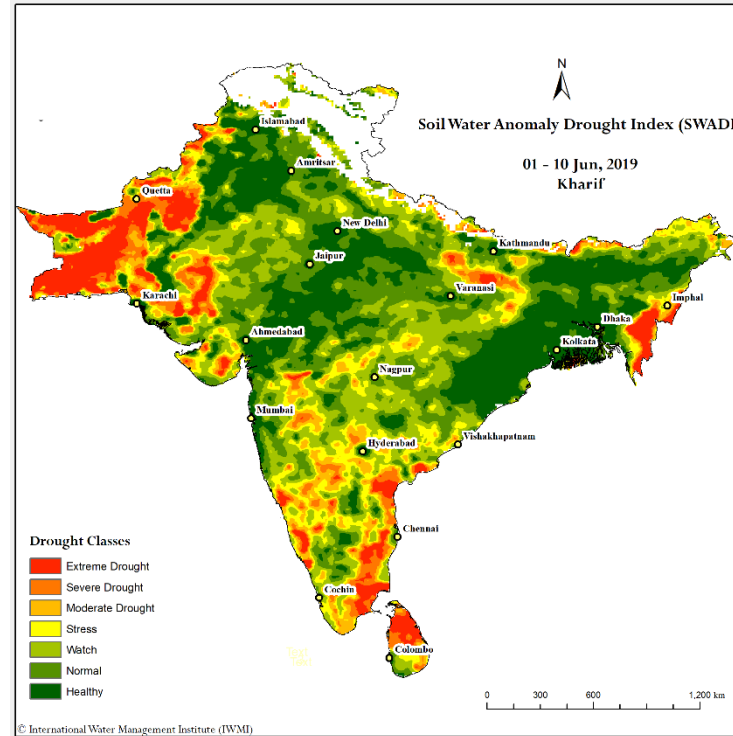
Note: Simple qualitative assessment on the performance on rainfall condition was described here to cross compare with SADMS – IDSI products for evaluation purpose only.

South Asia Drought Indices – A Comparison & Assessment

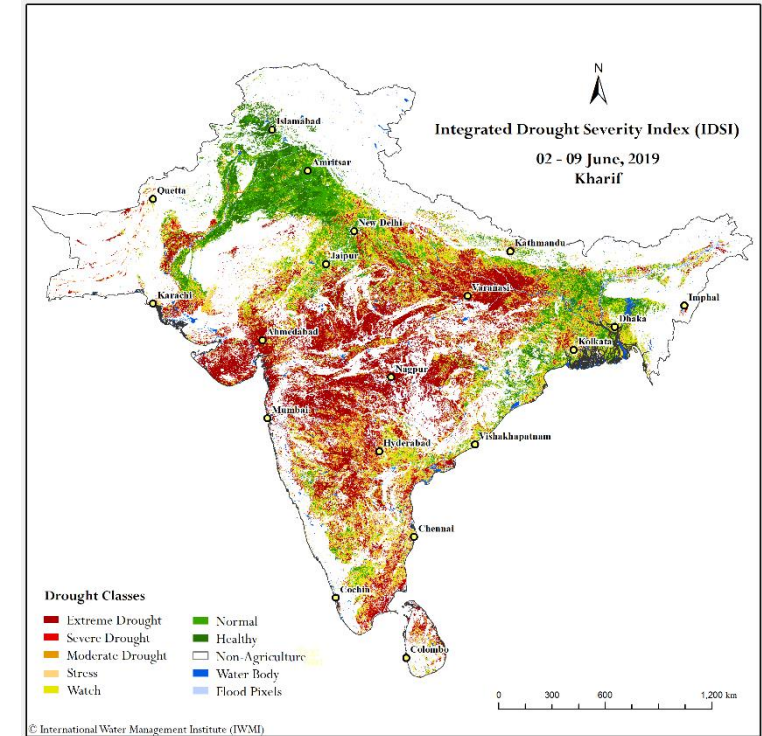
SA-DEWS



SWADI

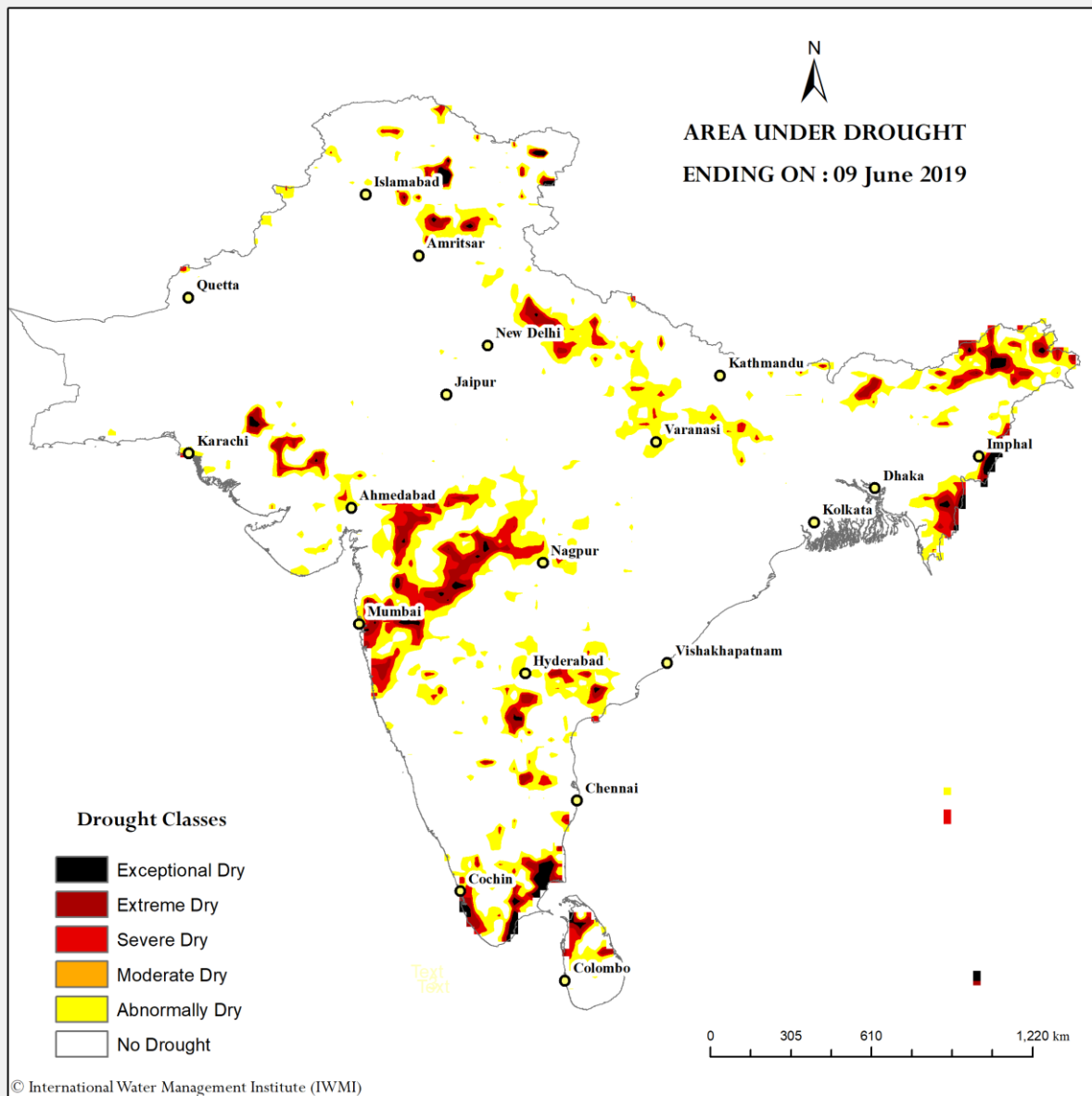


IDS



- 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 (IDS) 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 relation with each other. The peninsular India is reviving from the drought situation, except Haryana, Punjab, Odisha, south of Jharkhand and North AP.

South Asia Drought Forecast



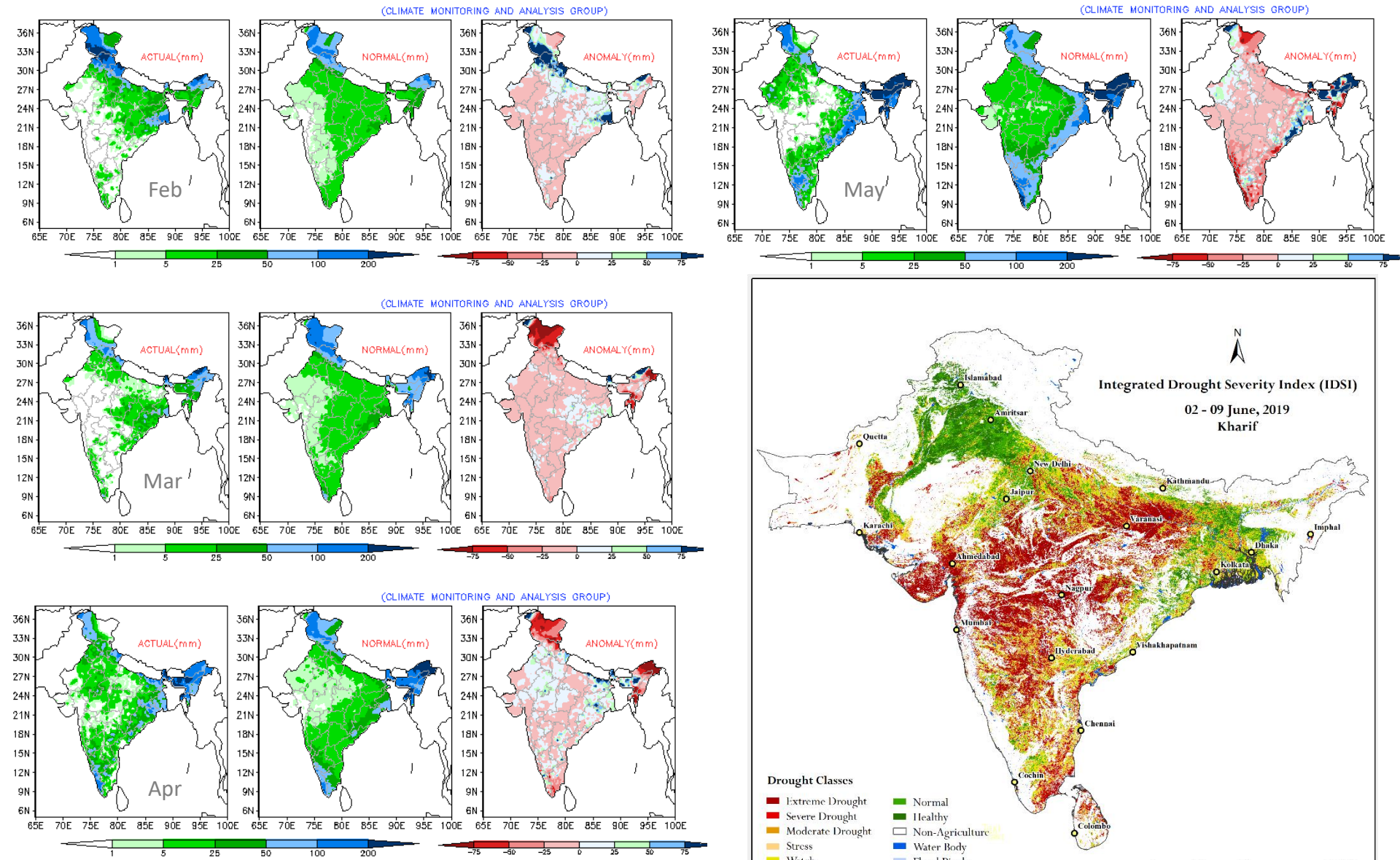
Summary:

- Using the initial condition i.e. 09th June 2019 based on satellite rainfall estimates of 3B42RT daily time-step integrates in the VIC model and the derived outputs namely Standardized Precipitation Index (3-Month), Standardized Soil Moisture Index (SSI) and Standardized Runoff Index (SRI)
- The extreme values of all three conditions are statistically combined to generated areas under drought for entire South Asia
- Extreme dry condition of Maharashtra, Telangana, Gujarat, Arunachala Pradesh, Manipur, Nagaland and few patches of Tamil Nadu have increased to Severe to Extreme/Exceptional dry condition.
- Part of Jammu & Kashmir, and parts of northeastern belt are observed to have increasing dry condition. Also, Bhutan, Pakistan, Nepal and north and north central of Sri Lanka are under extremely/exceptionally severe drought condition.
- *Reference to IMD SPI data is well correlated to the area under drought predicted by drought algorithm.*

India – State wise analysis



India Monthly Rainfall Comparison & Assessment

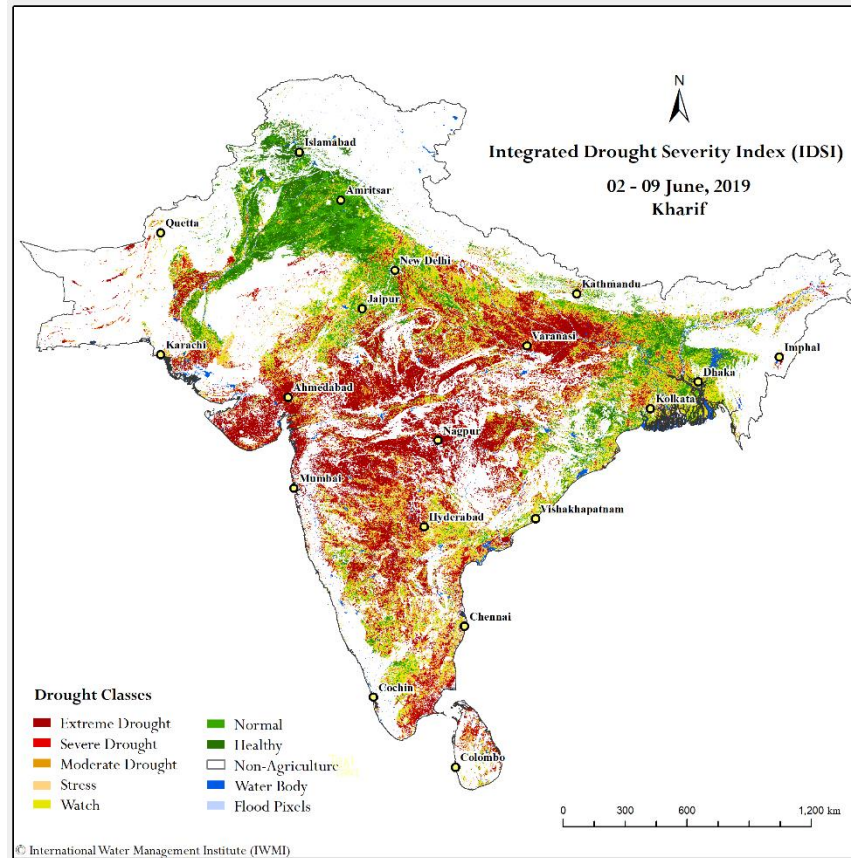


Summary:

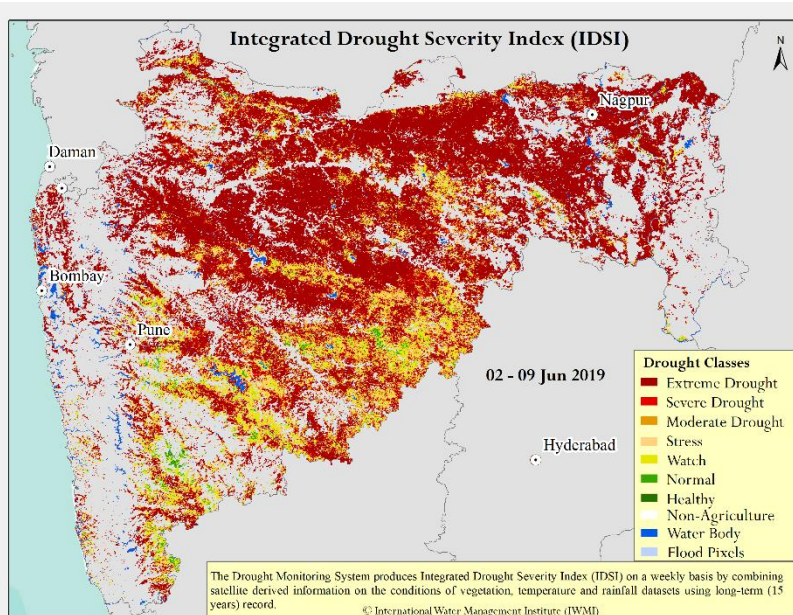
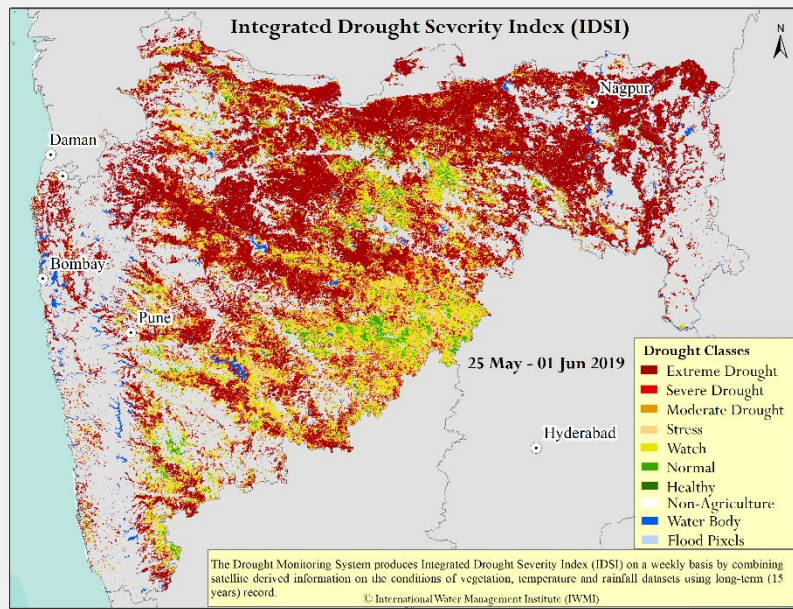
Rainfall deficit in whole India has increased, except April month more than 80% of the country under negative rainfall anomaly which is trigger the vegetation stress in the agricultural land, which is clearly reflected in the IDSI.

Extreme to severe drought condition has most of the State in India except Punjab, Haryana and Odisha.

Similar pattern has been revealed by monthly rainfall anomaly report from IMD.



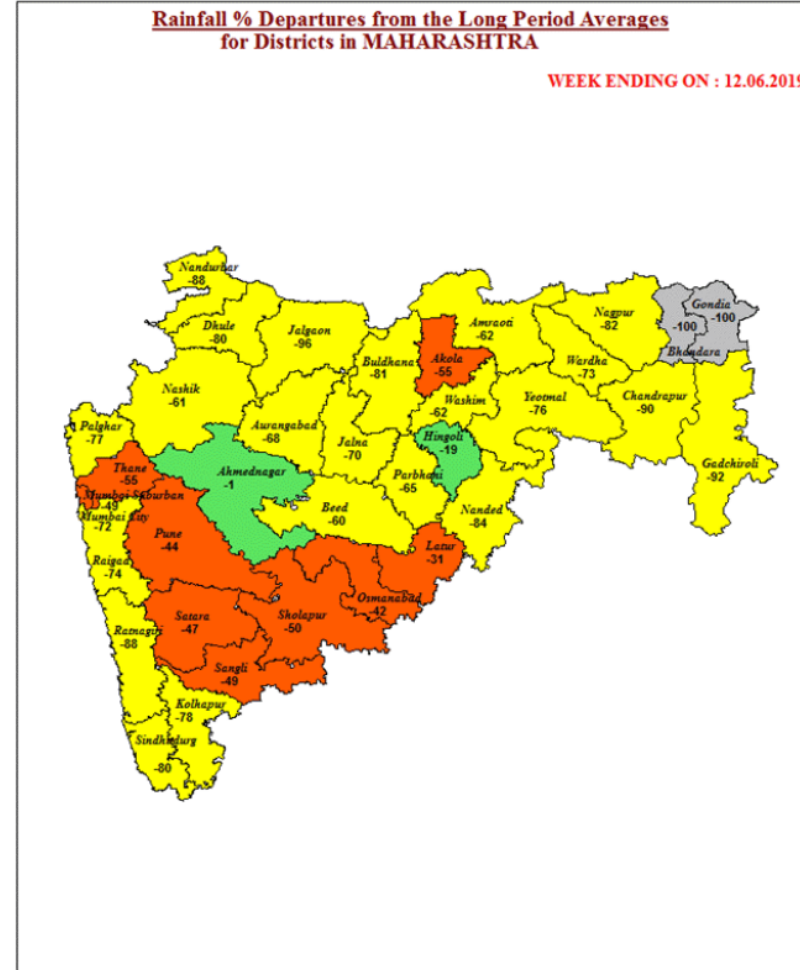
South Asia Drought Monitoring System (SADMS) – Agriculture Assessment (Maharashtra)



INDIA METEOROLOGICAL DEPARTMENT RMC MUMBAI

Rainfall % Departures from the Long Period Averages for Districts in MAHARASHTRA

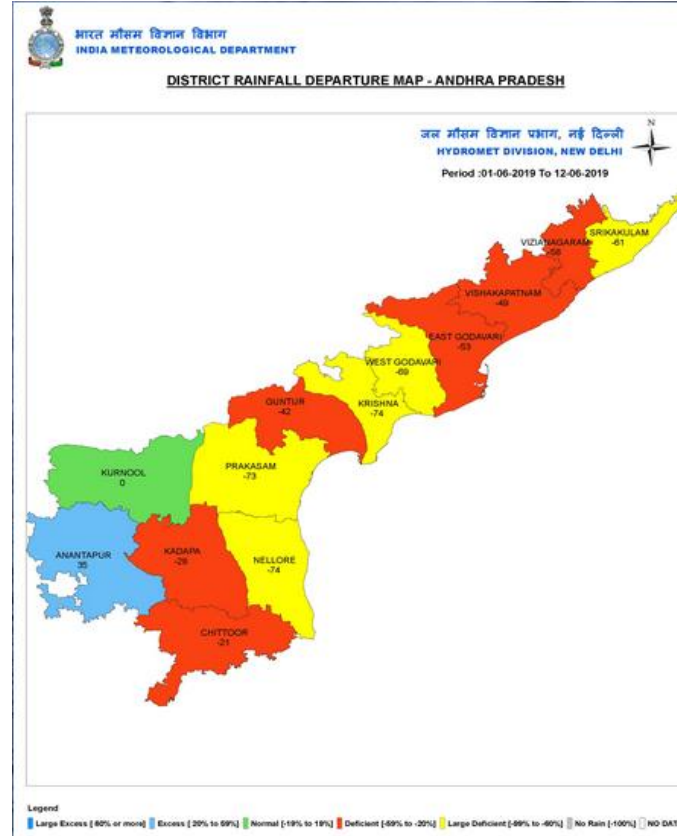
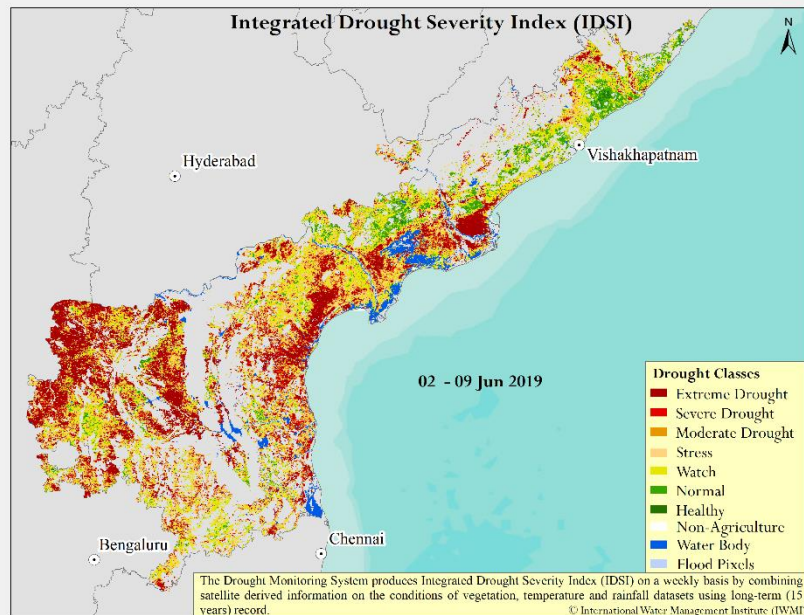
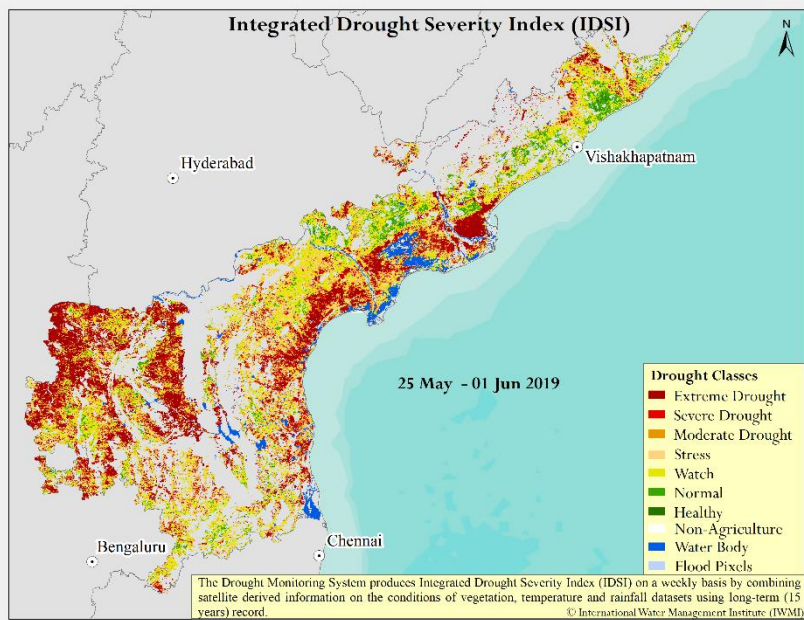
WEEK ENDING ON : 12.06.2019



Summary:

- SADMS framework was applied for the agriculture drought monitoring in Maharashtra for current obtained mainly from satellite remote sensing data. The index (Integrated Drought Severity Index – IDSI), Indian Meteorological Rainfall maps were analysed to understand rainfall deficit which could help in validating the drought maps with the absence of in-situ observations.
- Except Ahmednagar and Hingli district all the district are under 20-99% rainfall deficient in month of June 2019. Also from Jan to May 2019 indicates the negative rainfall anomaly through out the state (**refer slide 8**).
- Rainfall deficit in whole state has increased the vegetation stress in the agricultural land, which is clearly reflected in the IDSI. Extreme to severe drought condition has most of the State. Similar pattern has been revealed by seasonal rainfall report from IMD.

South Asia Drought Monitoring System (SADMS) – Agriculture Assessment (Andhra Pradesh)



Rainfall Status (Avg from 01-06-2019 to till date)
Actual **18.5mm**, Deviation **-51.9%**

District-Wise, Month-Wise Rainfall Status from 01/06/2019

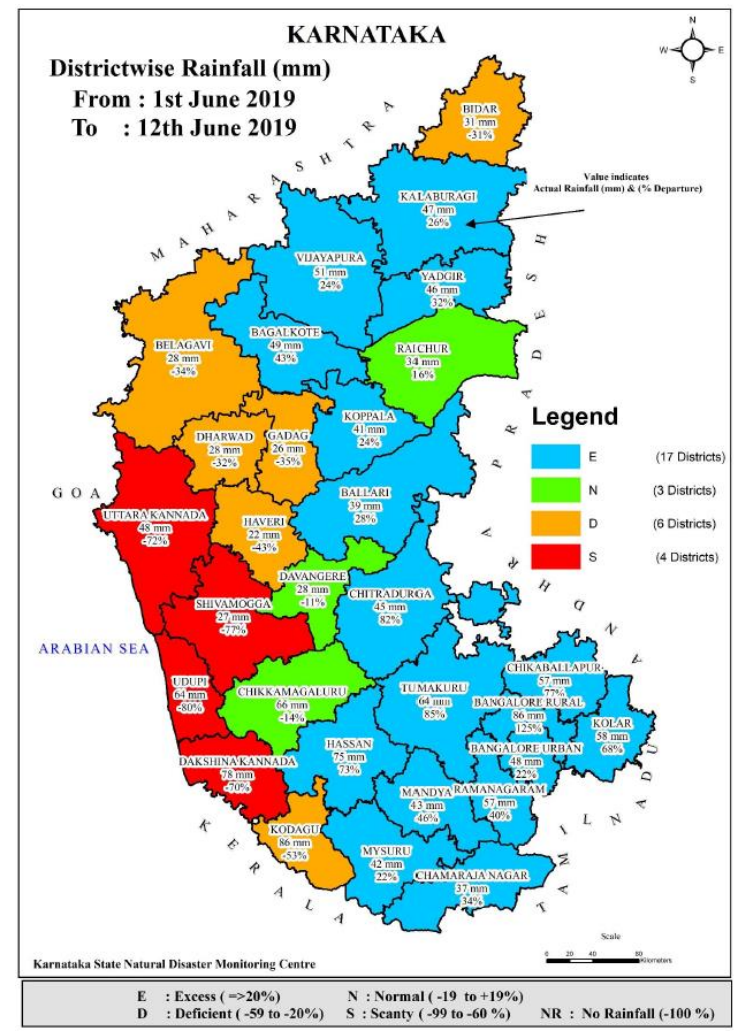
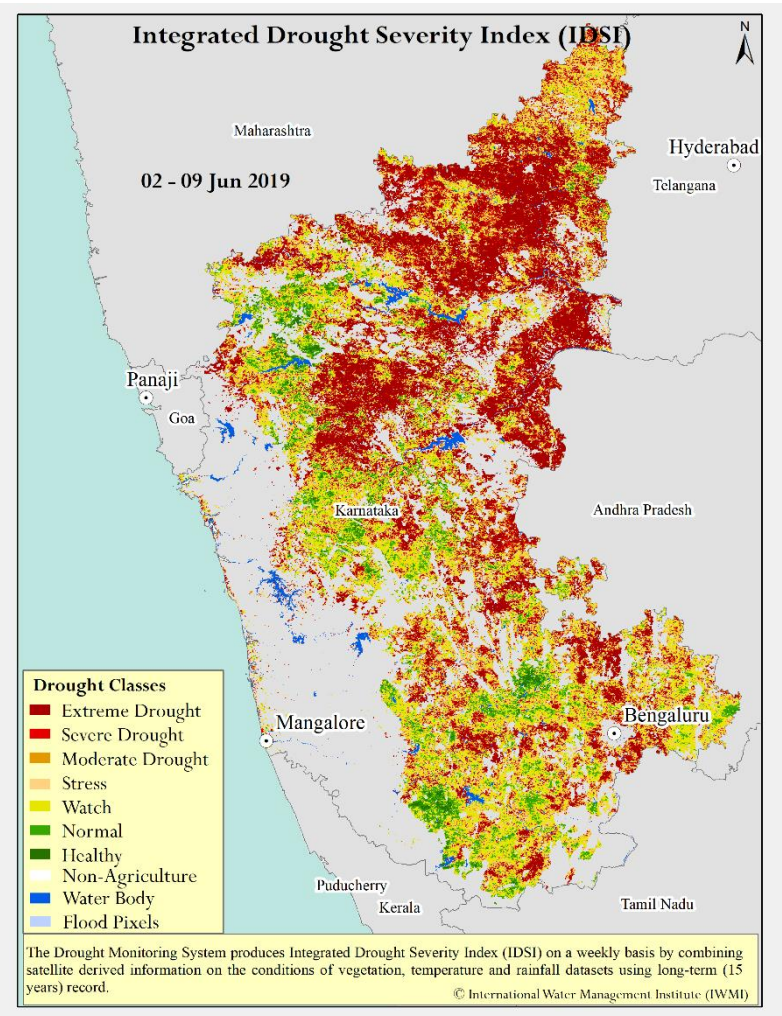
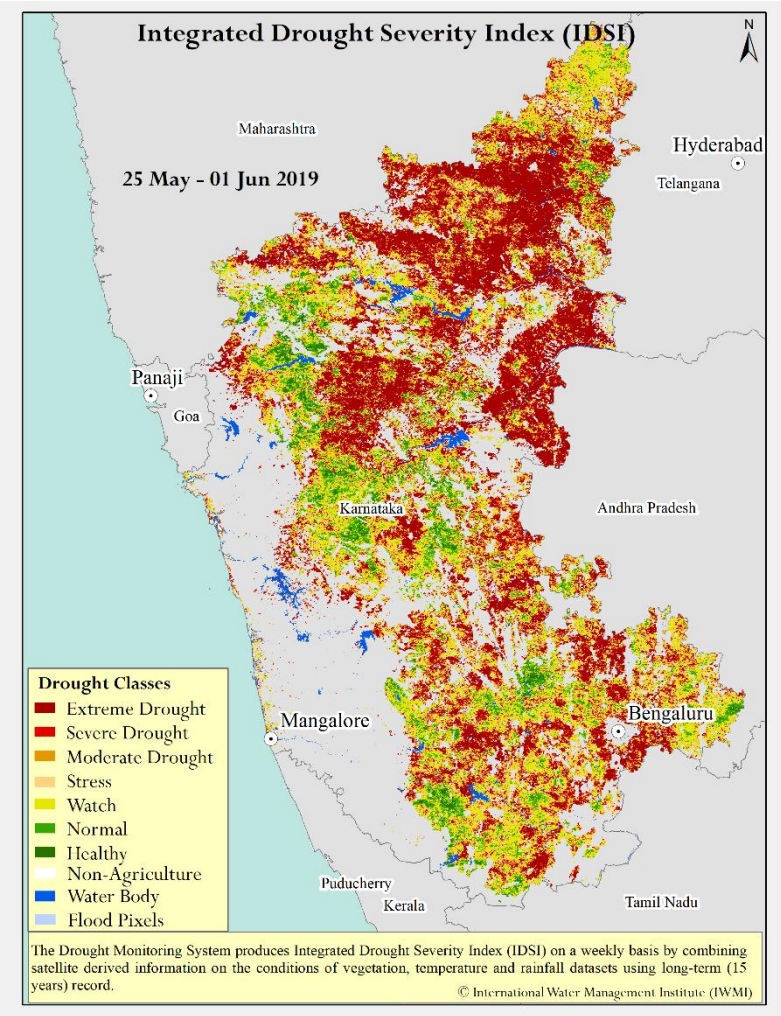
District	Actual	Normal	Deviation(%)	Status
Srikakulam	8.6	55.2	-84.4	Scanty
Vizianagaram	17.0	57.6	-70.5	Scanty
Vishakapatnam	27.1	48.5	-44.1	Deficient
East Godavari	25.3	37.1	-31.8	Deficient
West Godavari	12.7	35.6	-64.3	Scanty
Krishna	4.9	30.1	-83.7	Scanty
Guntur	21.2	33.5	-36.7	Deficient
Prakasham	8.4	26.6	-68.4	Scanty
Nellore	2.2	25.1	-91.2	Scanty
Chittoor	25.7	40.3	-36.2	Deficient
Kadapa	19.5	33.9	-42.5	Deficient
Anantapur	35.9	37.1	-3.2	Normal
Kurnool	21.0	39.3	-46.6	Deficient
State	18.5	38.5	-51.9	Deficient

Data Source: APSDPS

Summary:

- Out of the 13 districts in A.P., 11 districts had low rainfall from June 1 to 12 June 2019;
- 'Stress to extreme drought' category is still continue same as previous map all over the district.
- Due to low rainfall negative rainfall anomalous condition experience till 12 June from January 2019. it is the good indication for increasing drought condition (**refer slide 8**)

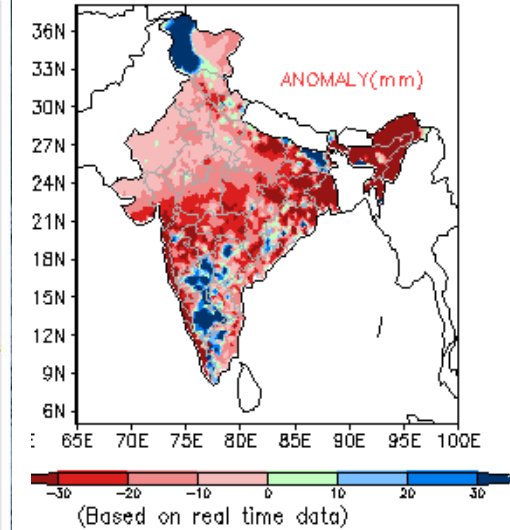
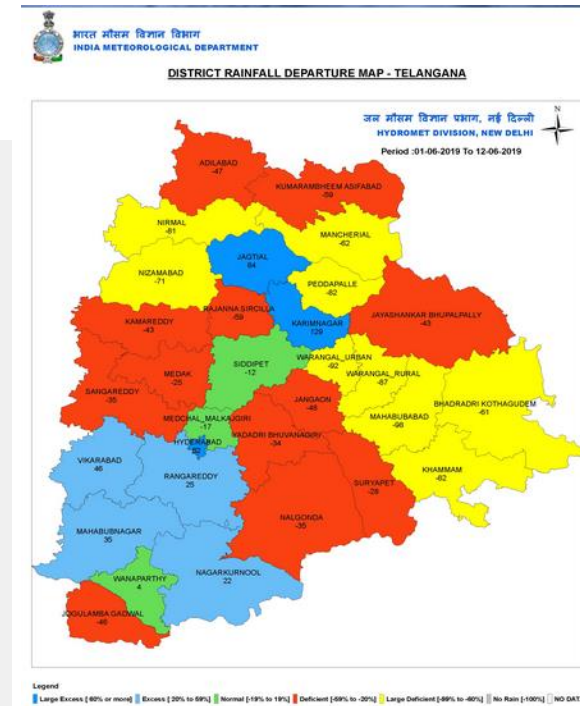
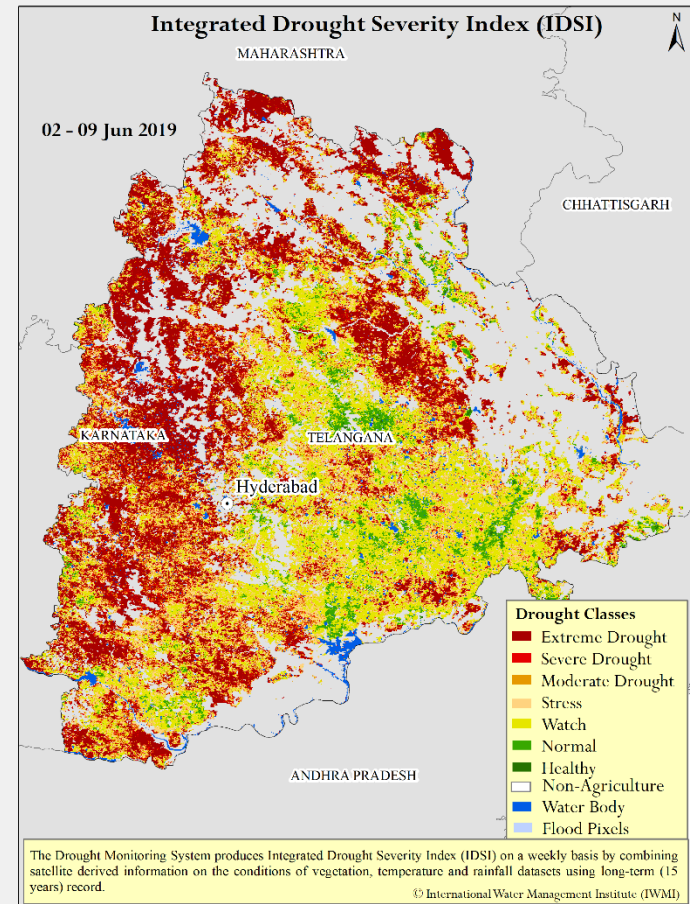
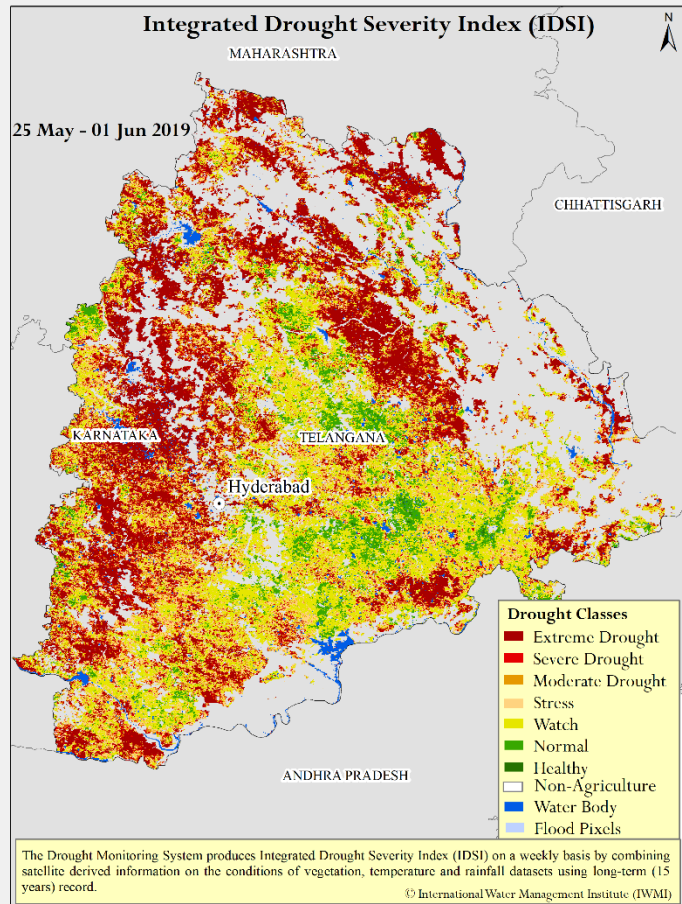
South Asia Drought Monitoring System (SADMS) – Agriculture Assessment (Karnataka)



The Integrated Drought Severity Index (IDSI) for Karnataka were assessed at district level. The condition of vegetation has been slightly affected along northern, southern and eastern areas of the State, except normal category for a few patches at the southern region. Extreme drought condition in the central eastern districts has not changed drastically from last week of May to First week of June. But 'Extreme' category has slightly change to 'Severe to Moderate only in southern districts. Also southern district got noticeable rainfall according to rainfall map.

South Asia Drought Monitoring System (SADMS) – Agriculture Assessment (Telangana)

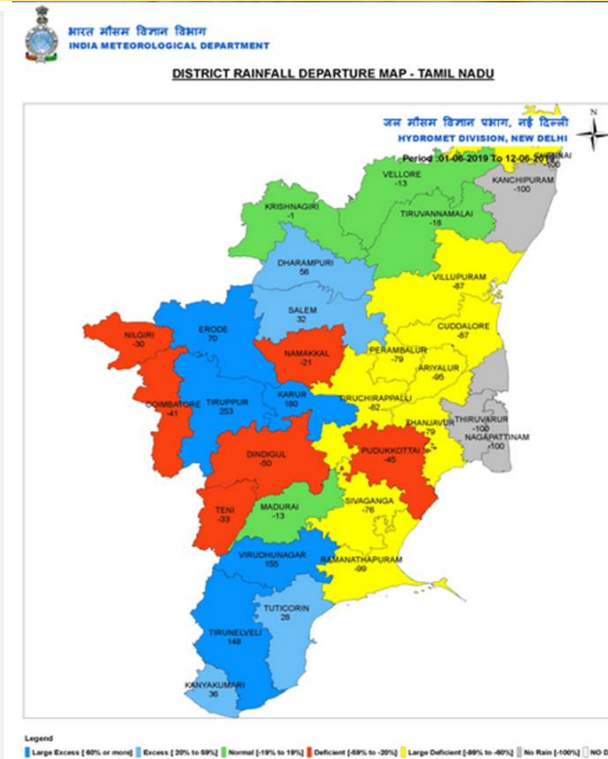
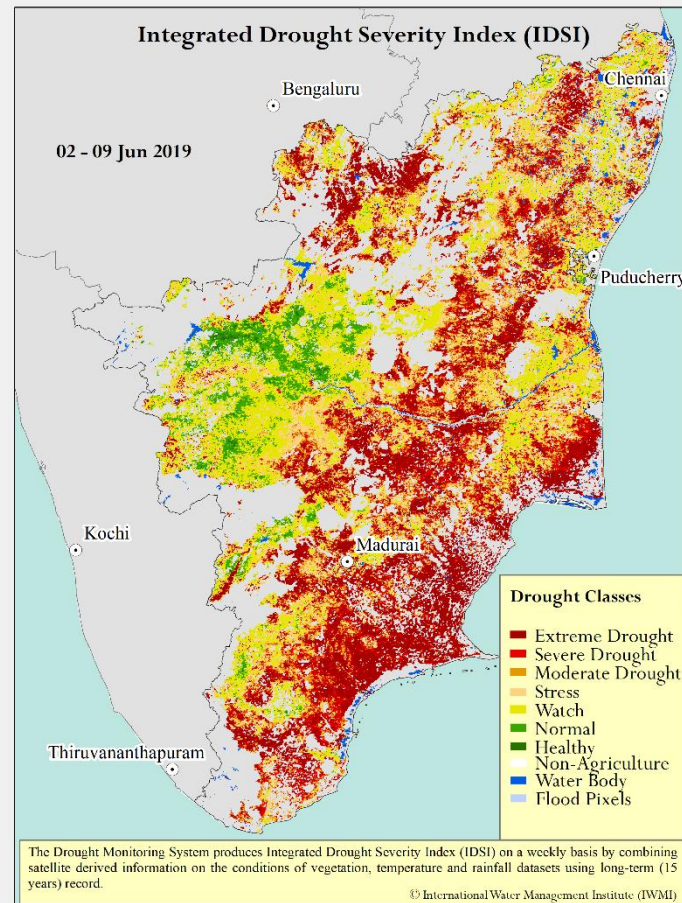
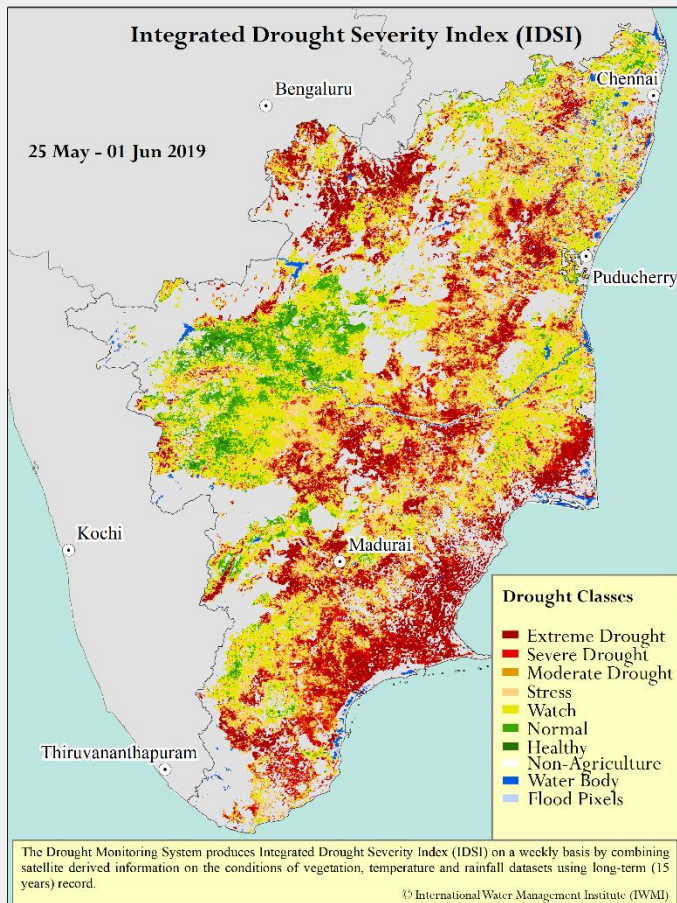
01 June – 12 Jun 2019



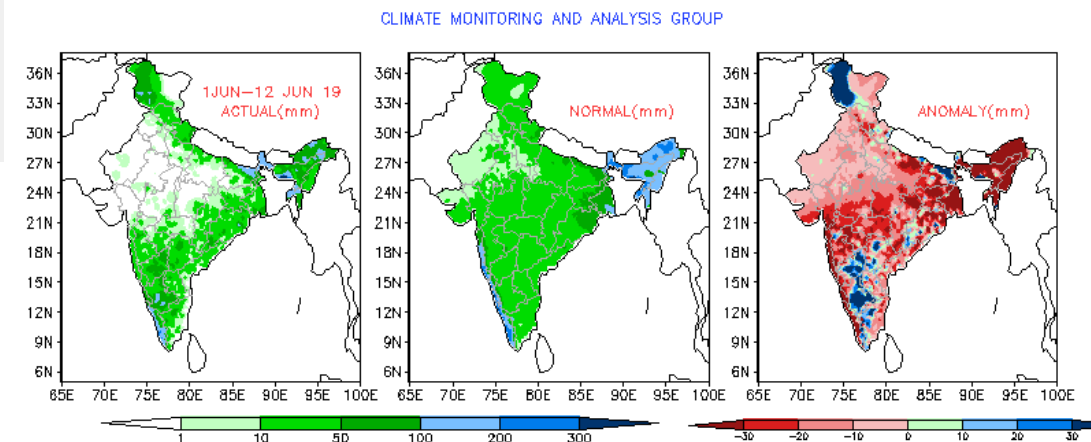
Summary:

The Integrated Drought Severity Index (IDSI) for Telangana was assessed at district level. There seems to be continuation of same drought condition from previous week. More than 50 % of the state is under extreme to severe drought condition. South East district of the States are observed to have watch to normal category while some patches are represent the severe category.

South Asia Drought Monitoring System (SADMS) – Agriculture Assessment (Tamil Nadu)



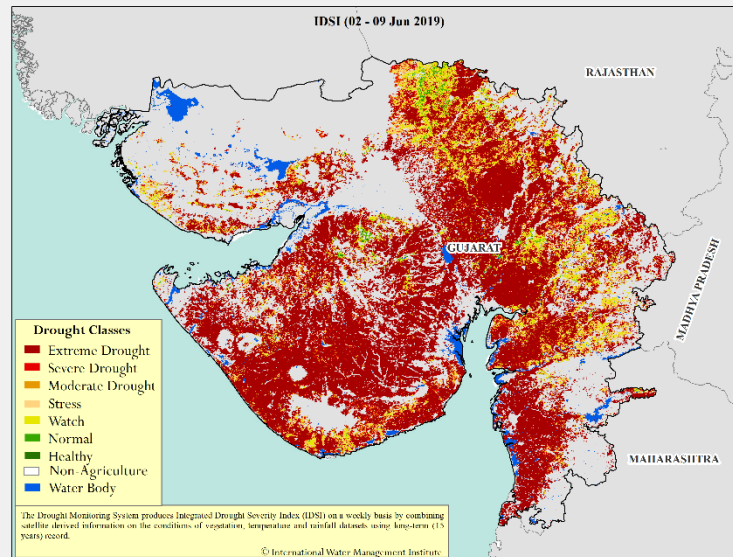
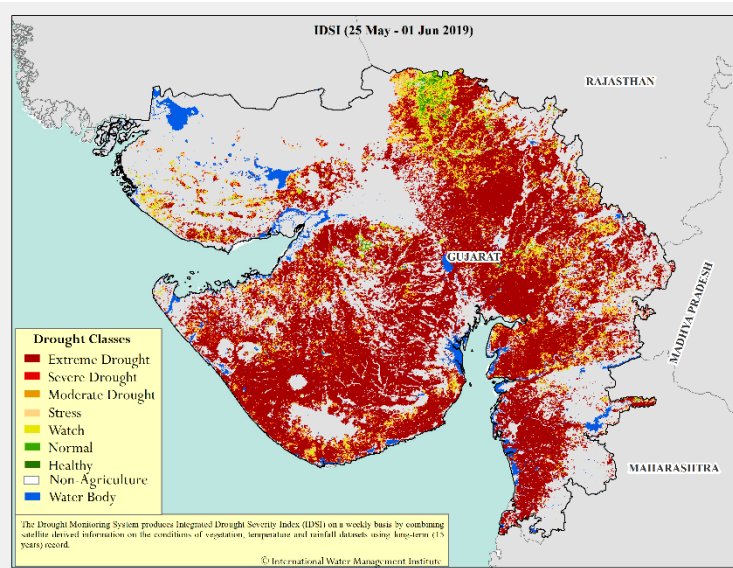
01 June – 12 June 2019



Summary:

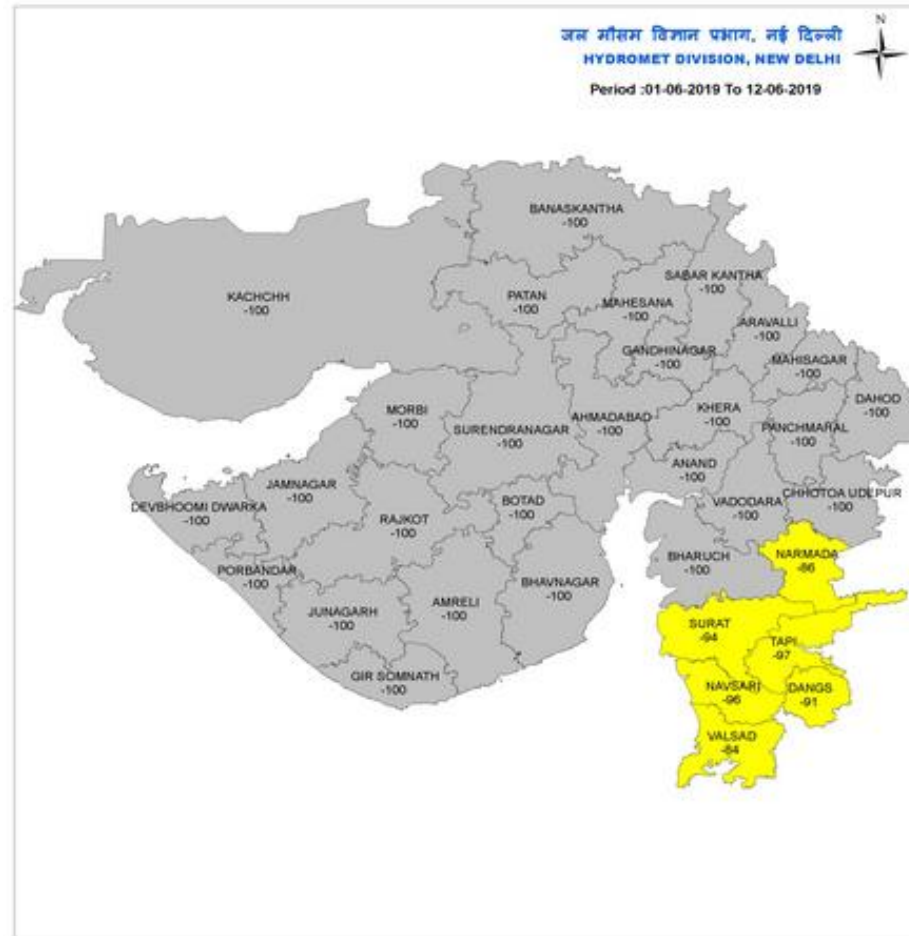
- Overall drought condition is continued from previous analysis cycle. Also south, South-East, North and of Tamil Nadu seem to have 'extreme' to 'severe' drought at the week ending on 09th of June 2019. Only western districts are under the 'watch' to 'Normal' category in IDSI which is giving the good correlation with rainfall anomaly as well .
- Overall, it can be observed that 50-60% area of the state have 'extreme' to 'stress' drought classes and same spatial pattern is continue from previous week.

South Asia Drought Monitoring System (SADMS) – Agriculture Assessment (Gujarat)



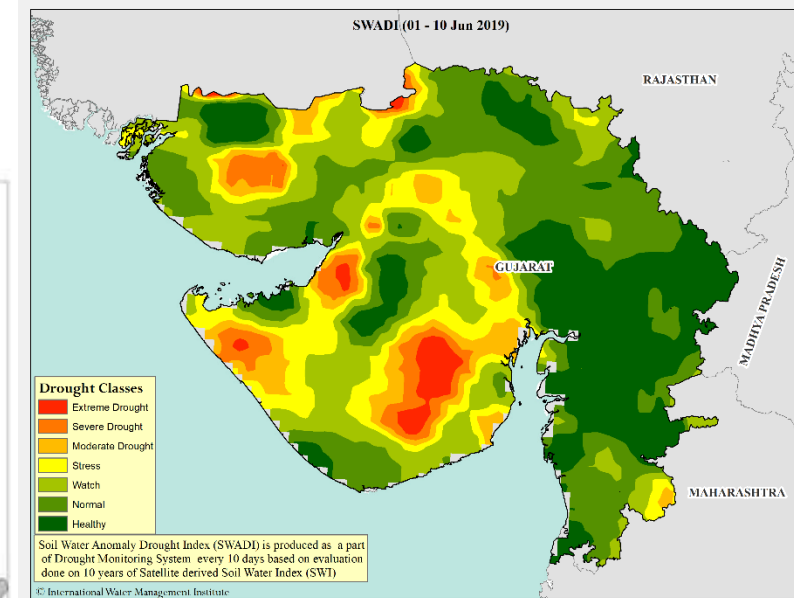
भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

DISTRICT RAINFALL DEPARTURE MAP - GUJARAT



Legend

- Large Excess [40% or more]
- Excess [20% to 39%]
- Normal [19% to 19%]
- Deficient [-49% to -20%]
- Large Deficient [-49% to -60%]
- No Rain [-100%]
- NO DATA



Summary:

- Overall the state is under extreme to severe drought condition for both previous and present week.
- There is no recorded rainfall for 90% of the state and all the district are under 20-100% rainfall deficient from 1 to 12 June
- Overall, it can be observed that all districts are under drought.

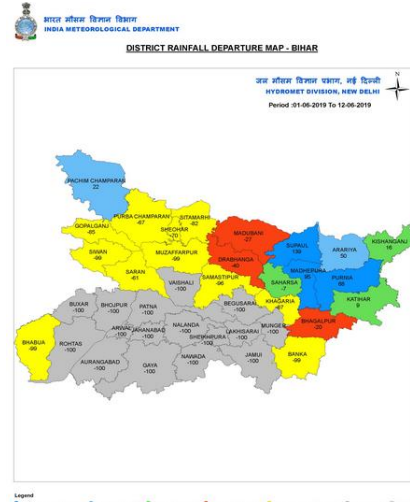
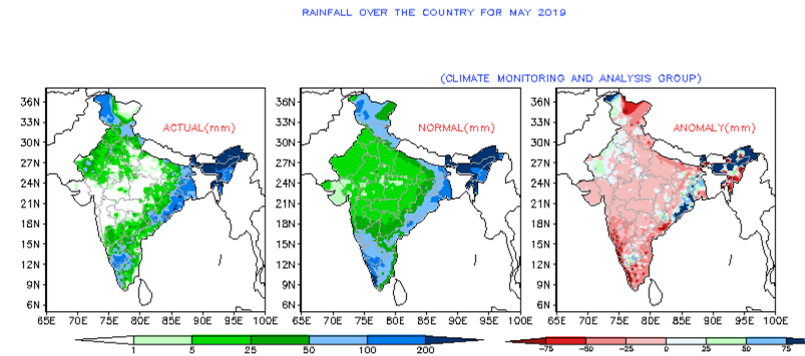
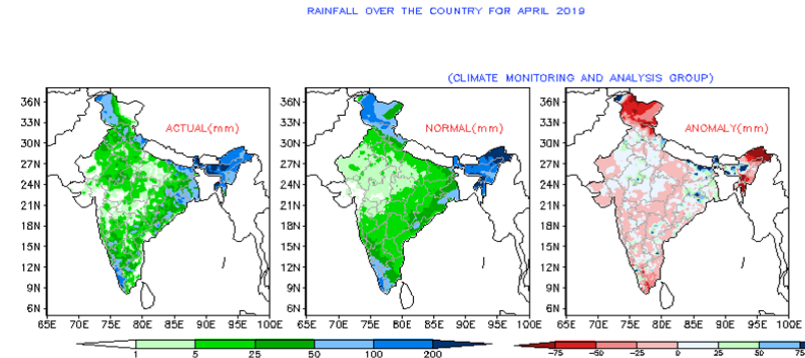
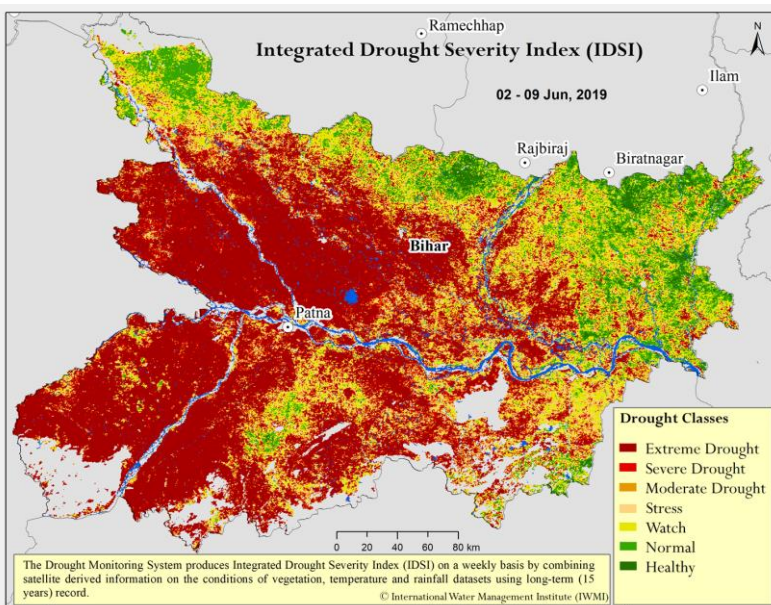
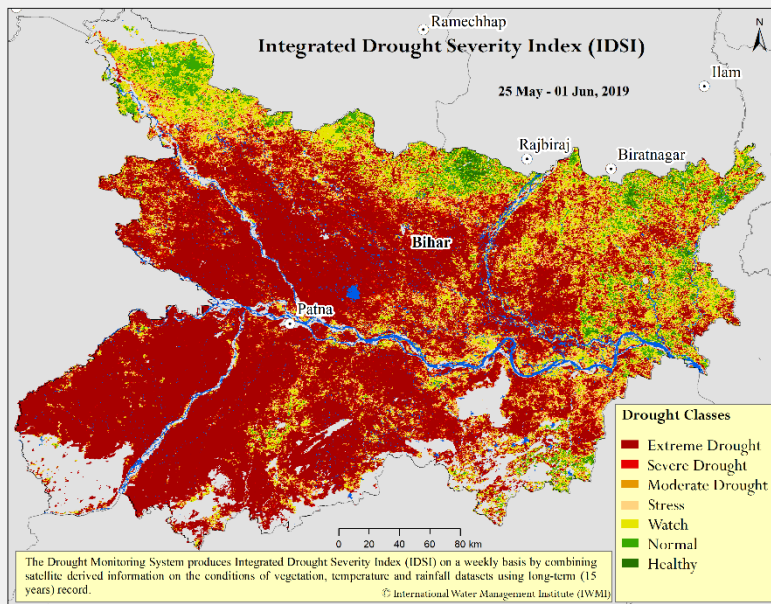
South Asia Drought Monitoring System (SADMS) – Agriculture Assessment (Bihar)



India Meteorological Department
Hydromet Division, New Delhi

DISTRICT-WISE RAINFALL DISTRIBUTION

S NO	MET. SUBDIVISION/UT/STATE/DISTRICT	Day -12-06-2019				Period 01-06-2019 To 12-06-2019			
		ACTUAL (mm)	NORMAL (mm)	%DEP.	CAT.	ACTUAL (mm)	NORMAL (mm)	% DEP.	CAT.
	SUBDIVISION : BIHAR	0.8	4.0	-81%	LD	28.0	41.3	-32%	D
1	ARARIYA	0.0	5.9	-100%	NR	111.6	74.3	50%	E
2	ARWAL	0.0	2.6	-100%	NR	0.0	21.0	-100%	NR
3	AURANGABAD	0.0	4.6	-100%	NR	0.0	23.3	-100%	NR
4	BANKA	0.0	3.9	-100%	NR	0.4	33.9	-99%	LD
5	BEGUSARAI	0.0	2.4	-100%	NR	0.0	33.2	-100%	NR
6	BHABUA	0.0	3.2	-100%	NR	0.3	22.1	-99%	LD
7	BHAGALPUR	0.0	4.3	-100%	NR	35.1	43.8	-20%	D
8	BHOJUPUR	0.0	2.6	-100%	NR	0.0	21.8	-100%	NR
9	BUXAR	0.0	4.3	-100%	NR	0.0	21.2	-100%	NR
10	DRABHANGA	0.0	4.3	-100%	NR	23.5	39.0	-40%	D
11	GAYA	0.0	4.5	-100%	NR	0.0	29.3	-100%	NR
12	GOPALGANJ	0.0	3.4	-100%	NR	5.8	38.4	-85%	LD
13	JAHANABAD	0.0	4.8	-100%	NR	0.0	30.9	-100%	NR
14	JAMUI	0.0	3.3	-100%	NR	0.0	29.3	-100%	NR
15	KATIHAR	3.7	6.4	-42%	D	64.4	59.3	9%	N
16	KHAGARIA	0.0	2.5	-100%	NR	5.9	45.8	-87%	LD
17	KISHANGANJ	2.1	9.9	-79%	LD	109.2	94.1	16%	N
18	LAKHISARAI	0.0	0.9	-100%	NR	0.0	23.6	-100%	NR
19	MADHEPURA	0.0	8.1	-100%	NR	120.6	61.9	95%	LE
20	MADUBANI	0.0	2.8	-100%	NR	36.6	50.1	-27%	D
21	MUNGER	0.0	3.3	-100%	NR	0.0	41.5	-100%	NR
22	MUZAFFARPUR	0.0	2.9	-100%	NR	0.4	40.0	-99%	LD
23	NALANDA	0.0	3.1	-100%	NR	0.0	26.5	-100%	NR
24	NAWADA	0.0	3.1	-100%	NR	0.0	29.4	-100%	NR
25	PACHIM CHAMPARAN	7.3	3.3	121%	LE	74.0	60.7	22%	E
26	PATNA	0.0	3.8	-100%	NR	0.0	30.5	-100%	NR
27	PURBA CHAMPARAN	0.1	3.1	-98%	LD	15.6	47.6	-67%	LD
28	PURNIA	5.2	6.7	-22%	D	131.9	78.6	68%	LE
29	ROHTAS	0.0	2.2	-100%	NR	0.0	20.4	-100%	NR
30	SAHARSA	0.0	6.5	-100%	NR	59.6	64.0	-7%	N
31	SAMASTIPUR	0.0	3.2	-100%	NR	1.0	28.6	-96%	LD
32	SARAN	0.0	2.5	-100%	NR	11.3	29.2	-61%	LD
33	SHEIKHPURA	0.0	2.6	-100%	NR	0.0	28.4	-100%	NR
34	SHEOHAR	0.0	3.8	-100%	NR	10.6	34.9	-70%	LD
35	SITAMARHI	0.0	3.7	-100%	NR	10.0	56.9	-82%	LD
36	SIWAN	0.0	3.8	-100%	NR	0.4	33.1	-99%	LD
37	SUPAUL	1.0	5.5	-82%	LD	156.8	65.6	139%	LE
38	VAISHALI	0.0	3.0	-100%	NR	0.0	28.4	-100%	NR



Summary:

- The drought severity in all parts of Bihar seems to be extreme to severe in the weeks are ending on 1st and 9th of June. Only north eastern districts has recover slightly from drought compare to previous week.
- This has happened because of all the district shows deficit rainfall compared to normal for beginning of 2019 monsoon season. 30 Districts out of the 38 districts are experiencing 50-100% deficient in rainfall this season which is largely to affect the rainfed agricultural system of Bihar.

Thanks.....

Disclaimer

All content within this bulletin is based upon the most current available data. As the drought is a dynamic situation, the current realities may differ from what is depicted in this document. The product has not been validated and used only the weather forecast and remote sensing observation. We welcome the feedback from the end-users and request you to provide field observations and any other details which can improve the product quality and prediction skills in the near future.

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