Verification of Shortrange Forecasts Monsoon 2015

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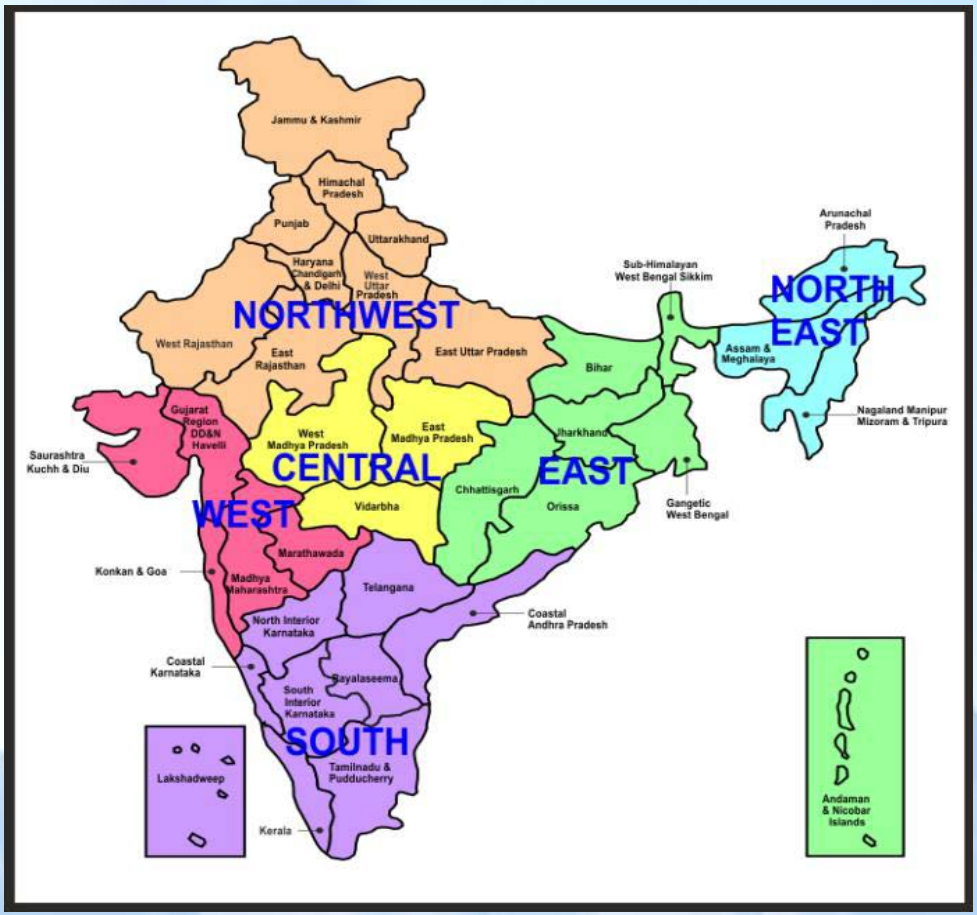

Jammu & Kashmir
Himachal Pradesh
Punjab
Uttarakhand
Haryana Chandigarh & Delhi
West Uttar Pradesh
NORTHWEST
West Rajasthan
East Rajasthan
East Uttar Pradesh
Bihar
Sub-Himalayan West Bengal Sikkim
Arunachal Pradesh
NORTH EAST
Assam & Meghalaya
Nagaland Manipur Mizoram & Tripura
Gujarat Region DD&N Haveli
West Madhya Pradesh
East Madhya Pradesh
Jharkhand
Saurashtra Kuchh & Diu
CENTRAL
EAST
WEST
Vidarbha
Chhattisgarh
Orissa
Gangetic West Bengal
Marathawada
Konkan & Goa
Madhya Maharashtra
Telangana
Coastal Andhra Pradesh
North Interior Karnataka
Coastal Karnataka
Rayalaseema
South Interior Karnataka
SOUTH
Tamilnadu & Pudducherry
Lakshadweep
Kerala
Andaman & Nicobar Islands

Event forecast	Event observed		
	Yes	No	Marginal total
Yes	a	b	a + b
No	c	d	c + d
Marginal total	a + c	b + d	a + b + c + d = n

Probability of Detection, $PoD = \frac{a}{(a+c)}$, Range: 0 to 1, Perfect score = 1

Miss Rate, $MR = \frac{c}{(a+c)}$, Range: 0 to 1, Perfect score = 0

Percentage Correct, $PC = \frac{(a+d)}{n}$, Range: 0 to 1, Perfect score = 1

False Alarm Rate, $F = \frac{b}{(b+d)}$, Range: 0 to 1, Perfect score = 0

Critical Success Index, $CSI = \frac{a}{(a+b+c)}$, Range: 0 to 1, Perfect score = 1

Heidke Skill Score, $HSS = \frac{2(ad-bc)}{[(a+c)(c+d)+(a+b)(b+d)]}$, Range: $-\infty$ to 1

Perfect score = 1

Correct Non-Occurrence, $C-NON = \frac{d}{(b+d)}$, Range: 0 to 1, Perfect score= 1

Rainfall over the Region	Spatial Distribution
No rain or <2.5mm	Dry
1 – 25%	Isolated (isol)
26 -50 %	Scattered (sct)
51 – 75 %	Fairly Widespread (FWS)
76 – 100 %	Widespread (WS)

OBSERVED RANGE	FORECAST RANGE					
	DRY	ISOL	SCT	FWS	WS	TOTAL
DRY	a	b	c	d	e	J
ISOL	f	g	h	i	j	K
SCT	k	l	m	n	o	L
FWS	p	q	r	s	t	M
WS	u	v	w	x	y	N
TOTAL	O	P	Q	R	S	T

$$PC = \frac{(a+g+m+s+y)}{T} X100$$

$$HSS = \frac{\left(a+g+m+s+y-\frac{(JO+KP+LQ+MR+NS)}{T}\right)}{\left(T-\frac{(JO+KP+LQ+MR+NS)}{T}\right)}$$

$$CSI(D) = \frac{a}{(J+O-a)}$$

$$CSI(I) = \frac{g}{(K+P-g)}$$

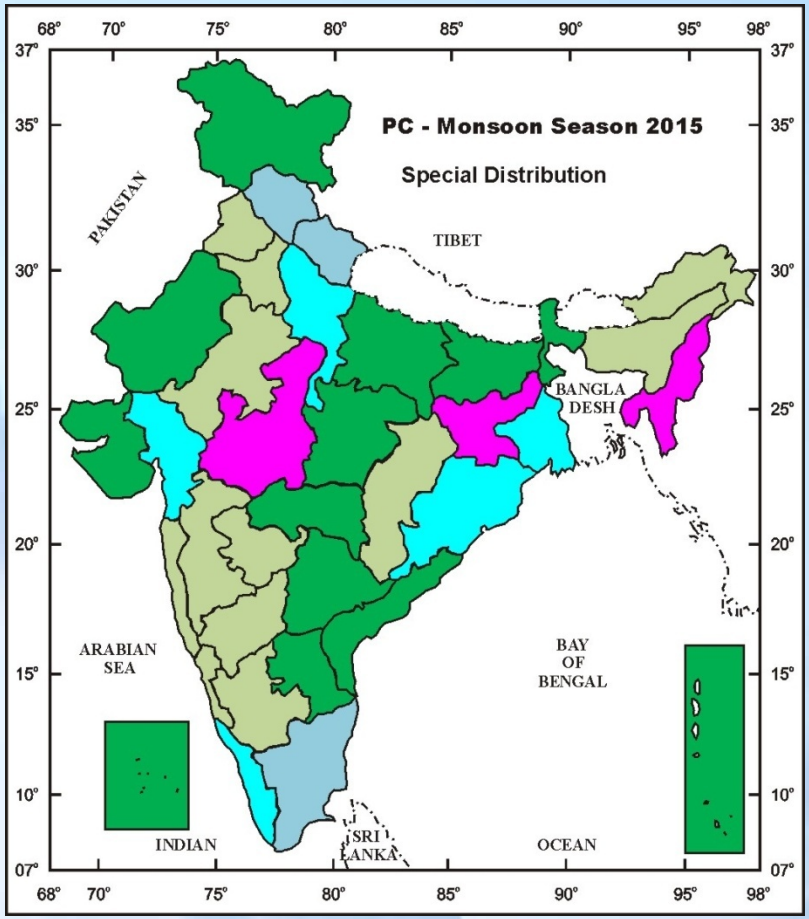
$$CSI(S) = \frac{m}{(L+Q-m)}$$

$$CSI(F) = \frac{S}{(M+R-s)}$$

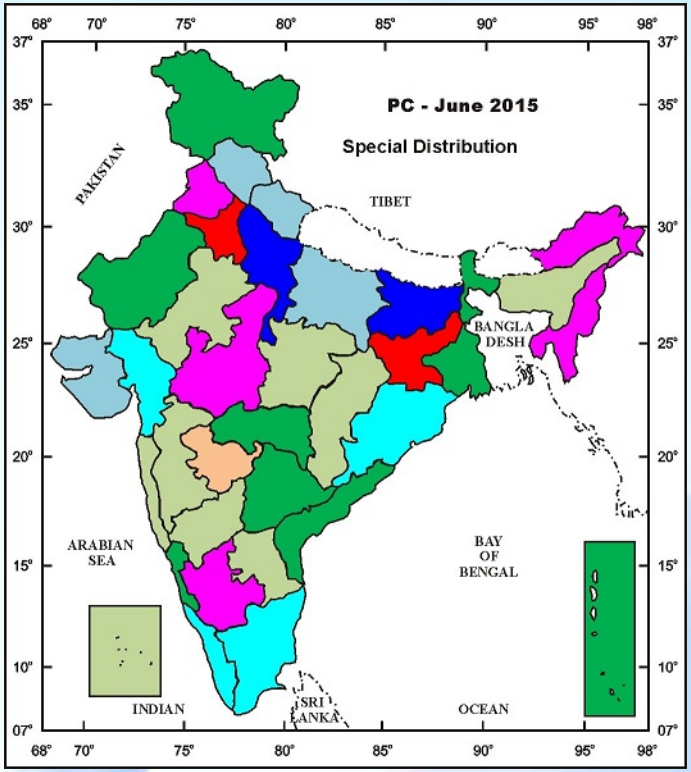
$$CSI(W) = \frac{y}{(N+S-y)}$$

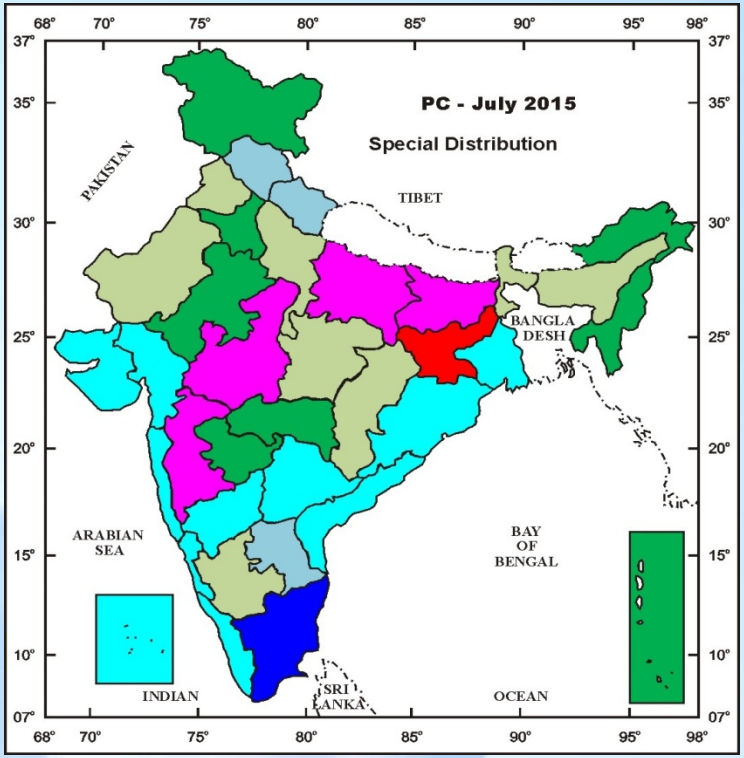
Higher Percentage correct were seen over HP,Uttaranchal and TamilNadu, followed by Orissa, Kerala, Gujarat ,GWB and West UP

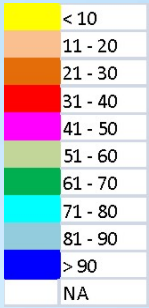
Lower over Jharkhand, NMMT and West MP



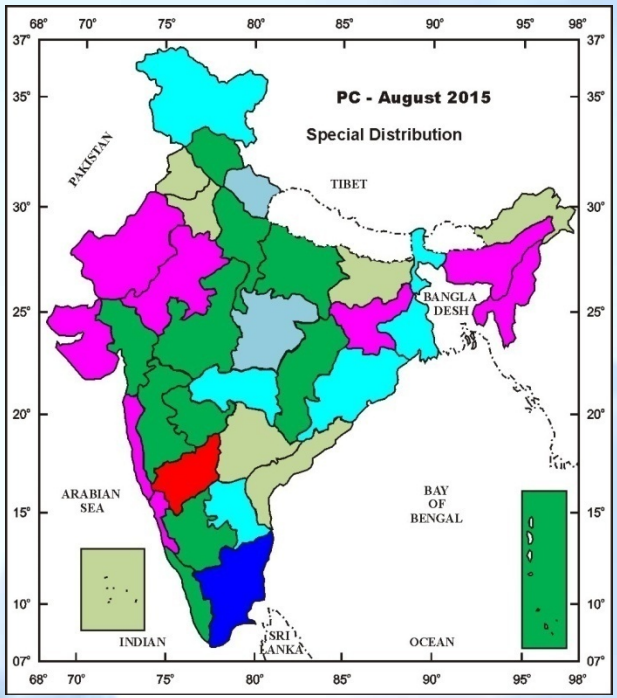
	< 10
	11 - 20
	21 - 30
	31 - 40
	41 - 50
	51 - 60
	61 - 70
	71 - 80
	81 - 90
	> 90
	NA

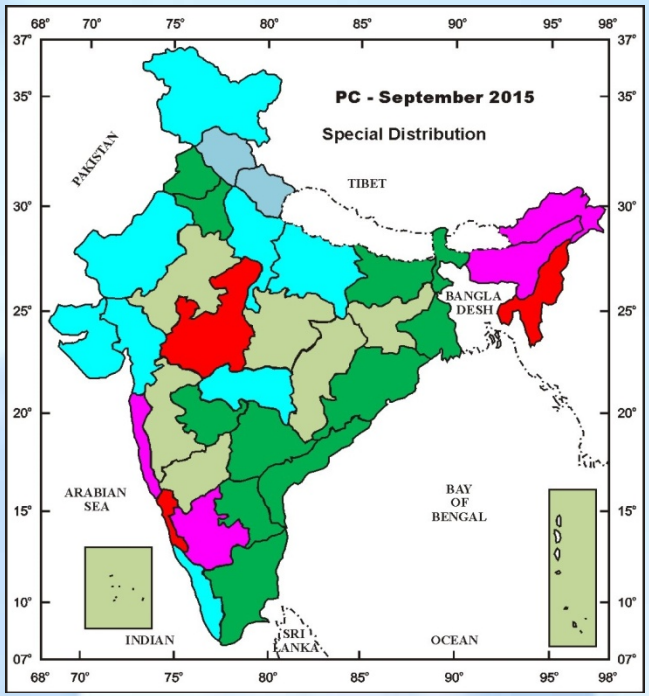


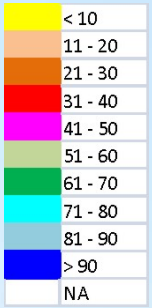




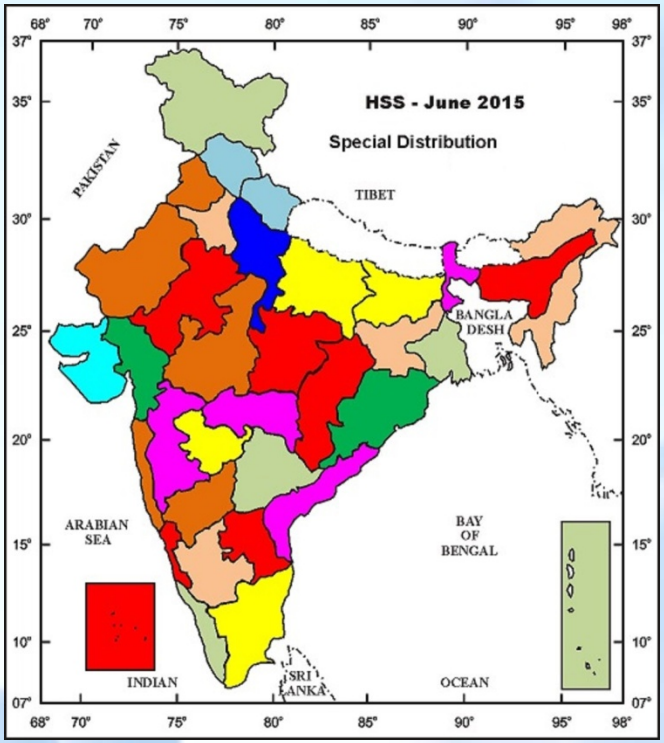
Higher Percentages over West UP and Bihar followed by East UP, HP ,Uttaranchal and Surashtra-Kutch in June and in July over TN, Rayalaseema Uttaranchal and HP
Lower over Marathwada, Haryana, Jharkhand in June
and in July over Jharkhand West MP Madhya Maharashtra East UP and Bihar

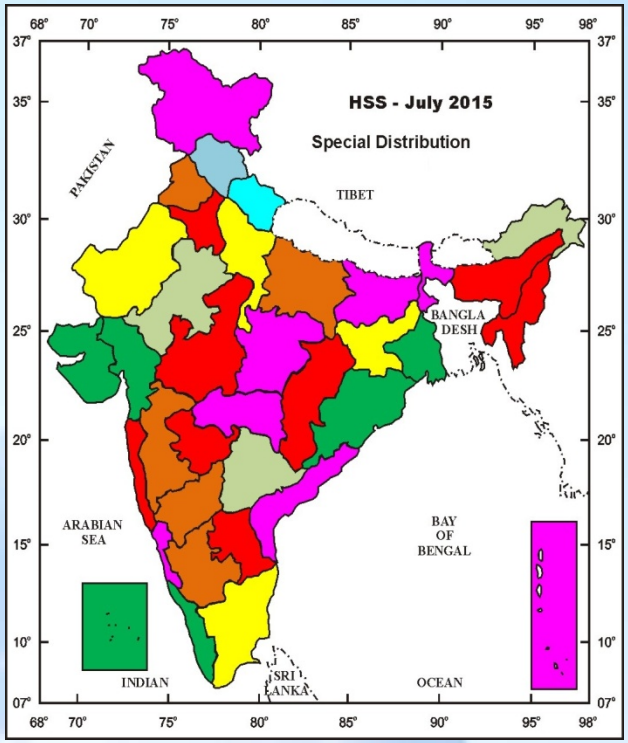


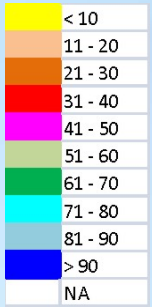




August : Higher :TN, West MP,HP, Rayalaseema, Vidarbha Orissa
Lower : NIK , Rajasthan, Kutch, Konkan, Jharkhand, Assam
September : Higher HP, Uttaranchal
Lower West MP, NMMT and CK



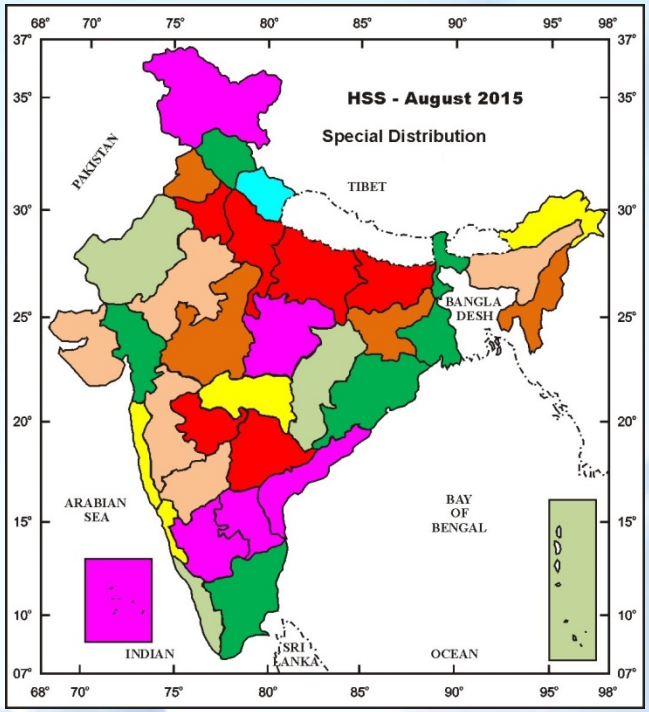


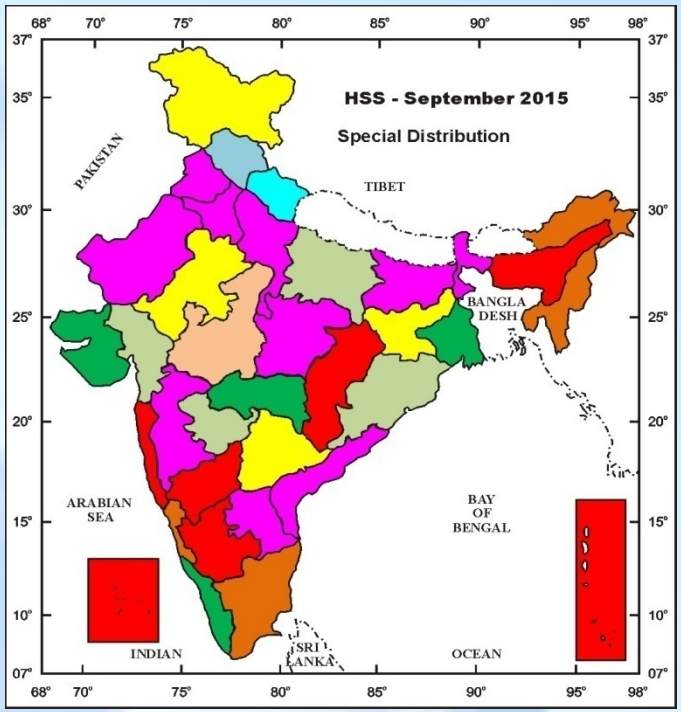


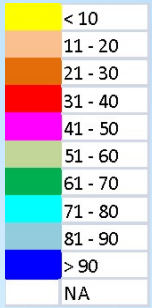
Higher values over West UP followed by HP and Uttaranchal in June and HP, Uttanchal in July

Lower HSS over Marathwada, TN, East UP, Bihar in June

West Rajasthan, West UP, Jharkhand and TN in July



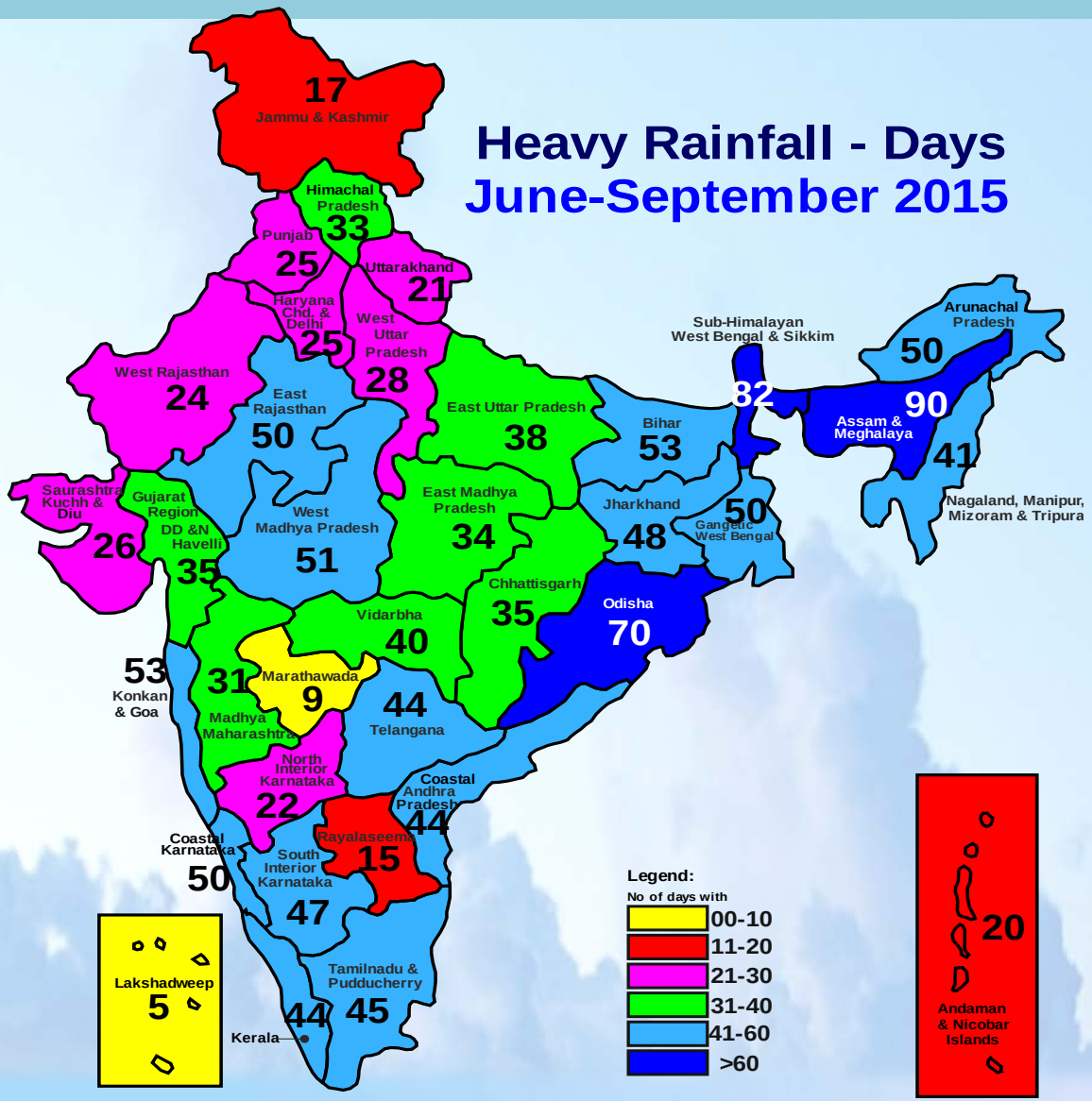




Higher HSS over Uttaranchal, HP,TN,Gujarat, Orissa and West Bengal in August ; and in Sept, HP Uttaranchal
Lower over Konakan Goa, Vidarbha, Arunachal Pradesh in Aug and Telangana East Rajasthan, Jharkhand and J&K in September

Errata……..'Special Distribution' in previous slides may kindly be read as 'spatial distribution'

Heavy rainfall days during Monsoon 2015



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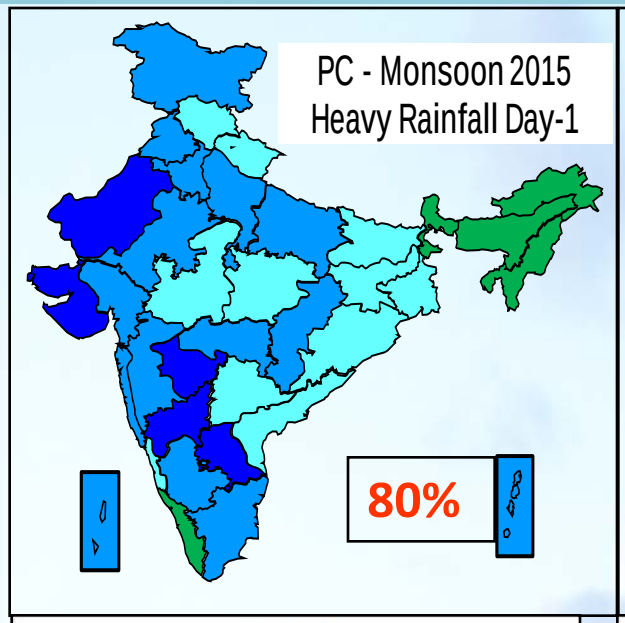
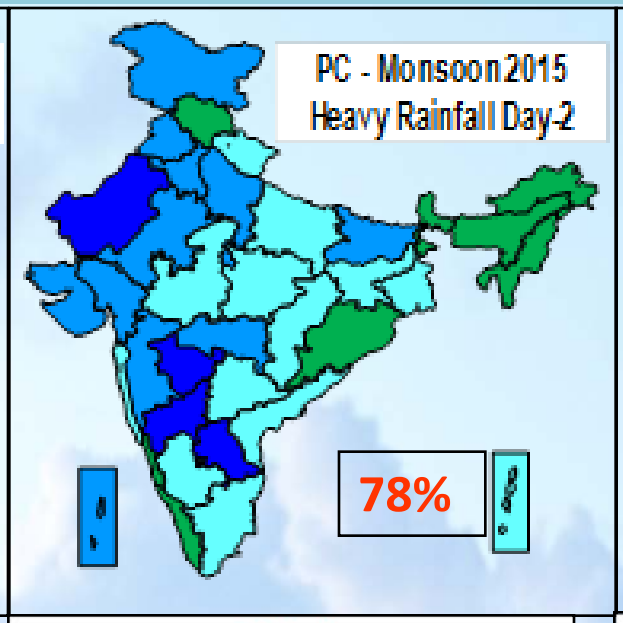
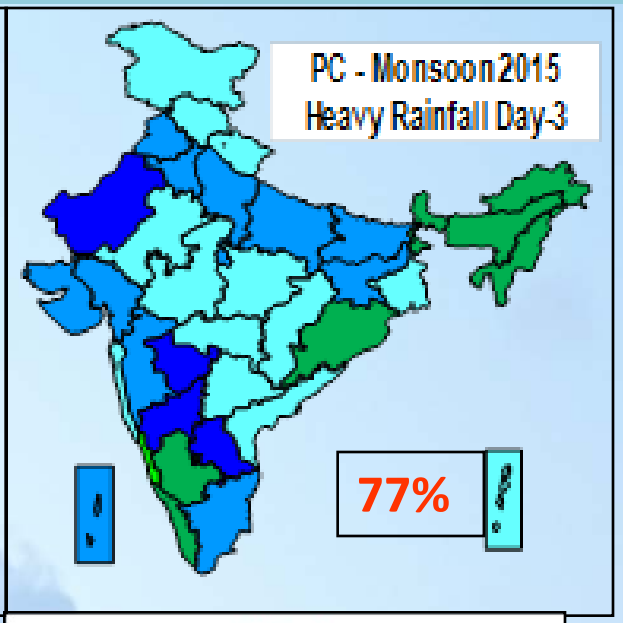
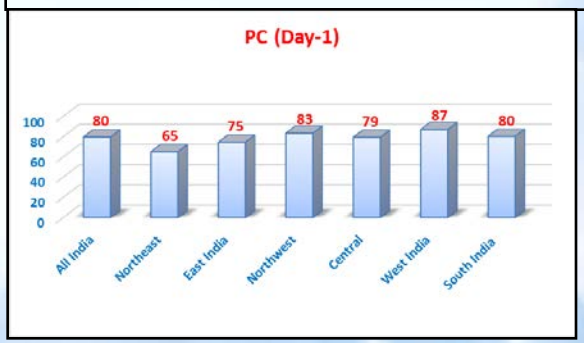
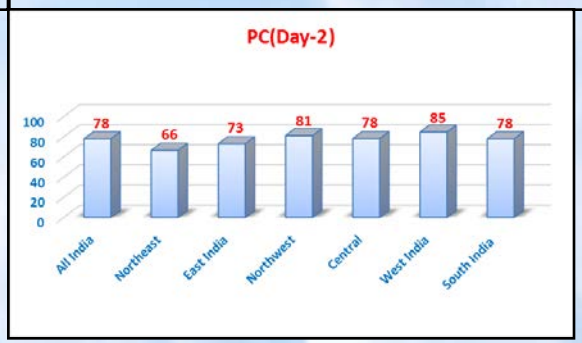
Heavy rainfall 2015

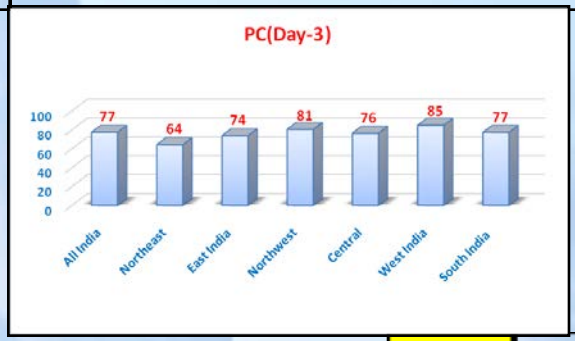




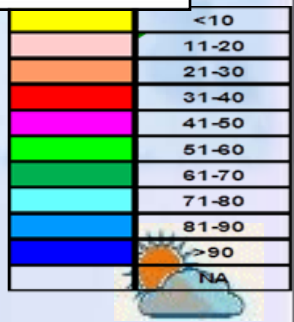




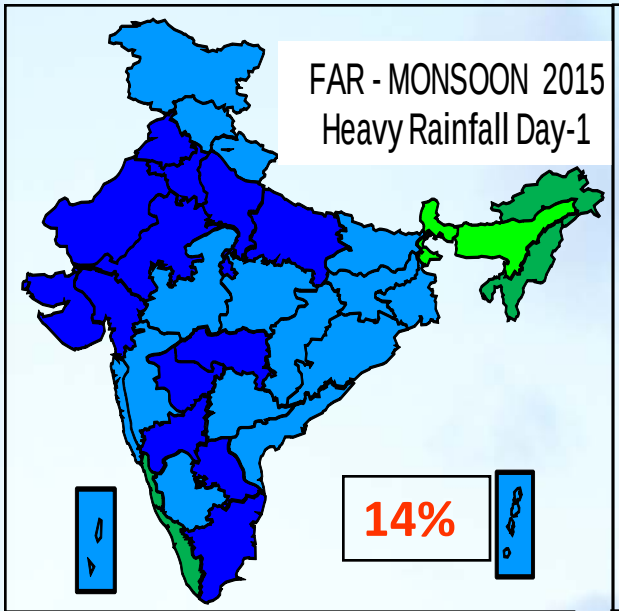


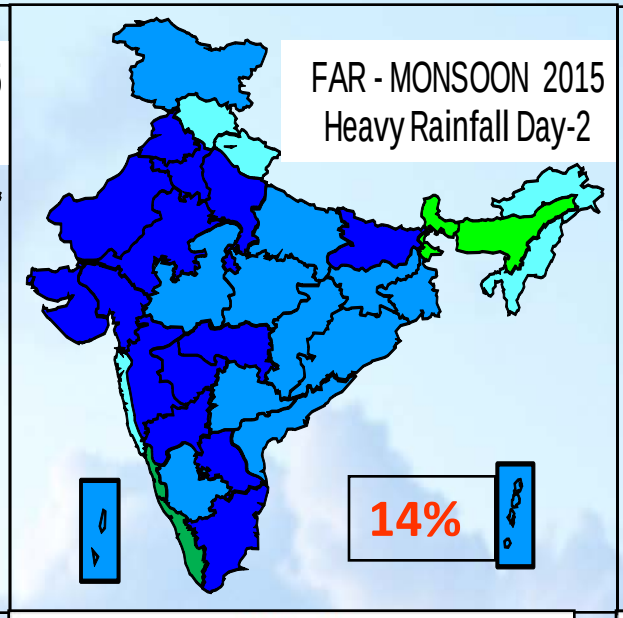


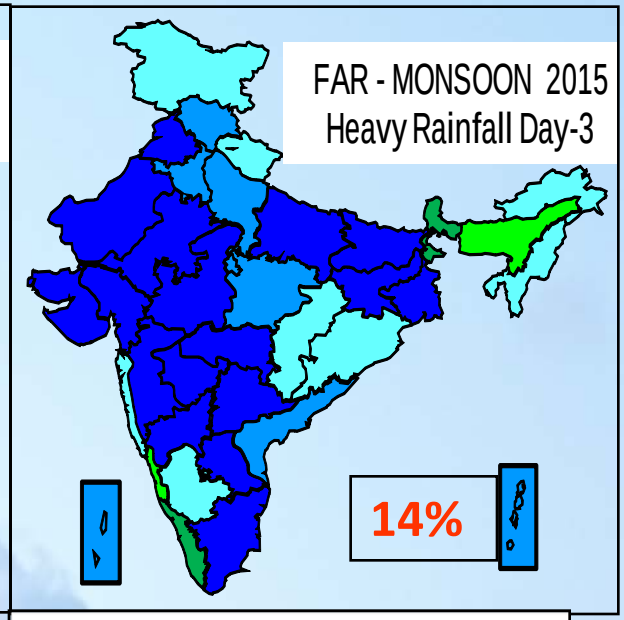
- Scores are more than 90% in West Rajasthan, Marthawada, NIK and Royalaseema.
- Scores are comparatively poor northeastern states, Odisha and Kerala.

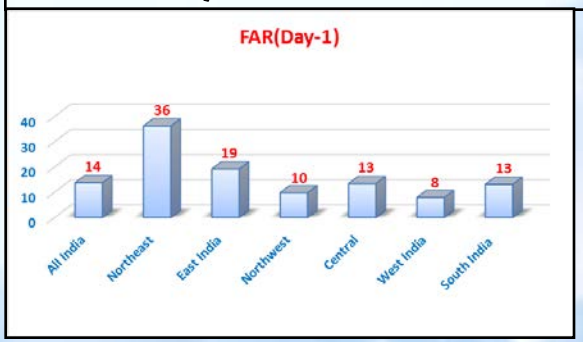


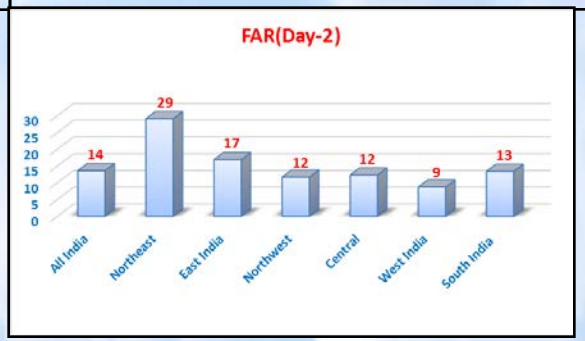
Heavy rainfall 2015

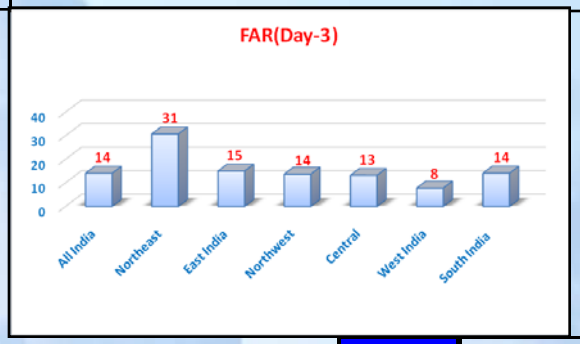




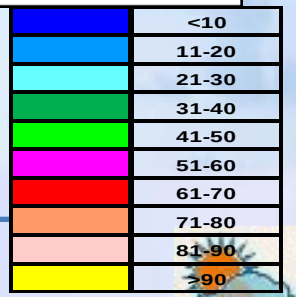








- FAR are highest over northeastern states and Kerala.
- Less than 10% over most parts of India



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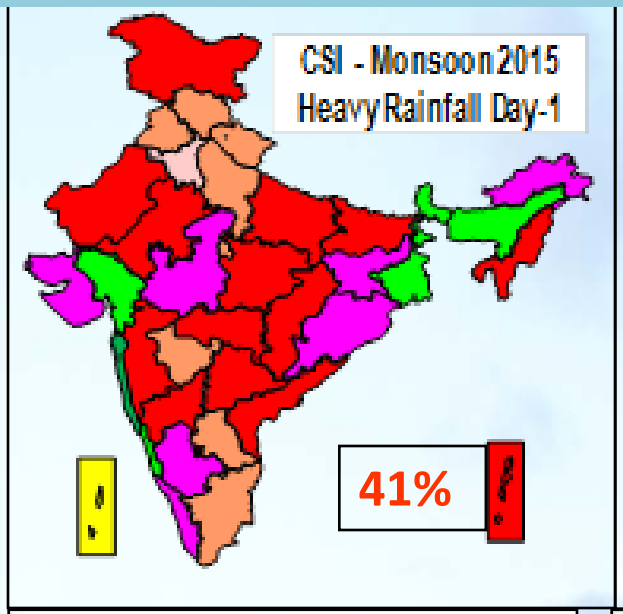
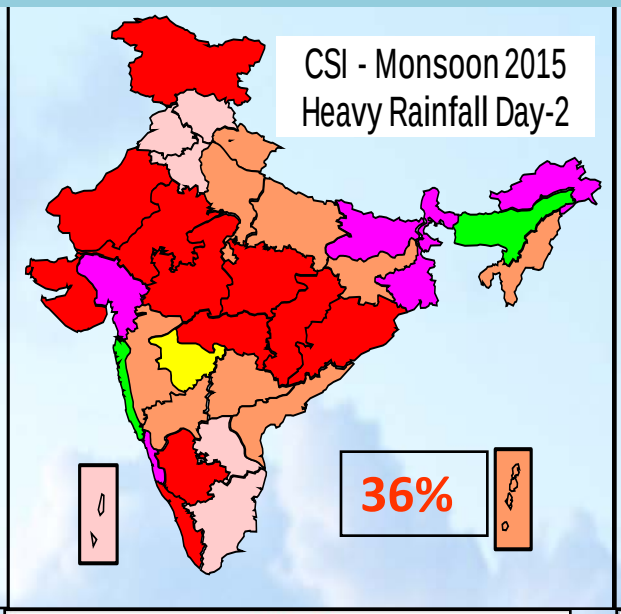
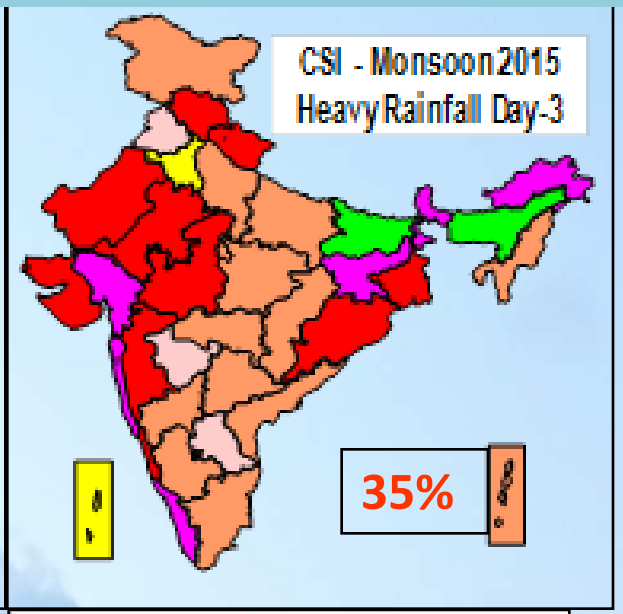
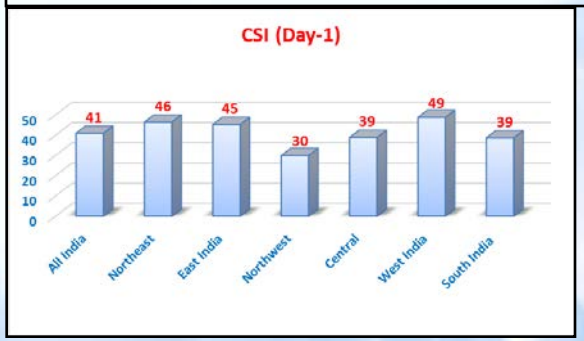
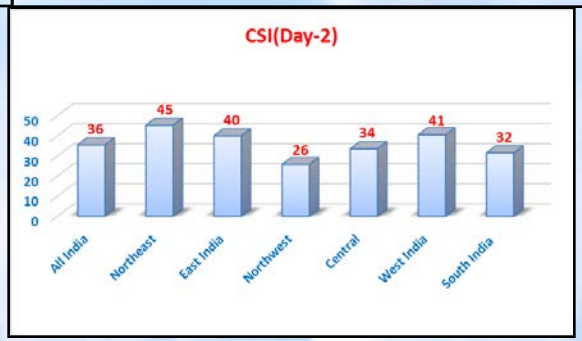
Heavy rainfall 2015

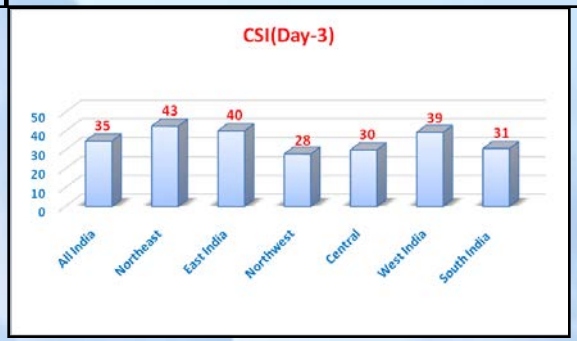












- Scores are more than 50% in Gujarat region, Konkan & Goa, GWB, Assam & Meghalaya
- Scores are poor LKD, TN, parts of NW India

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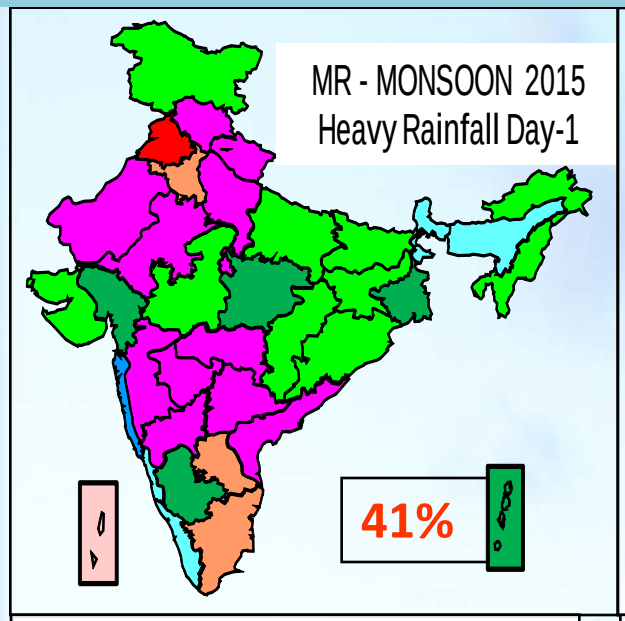

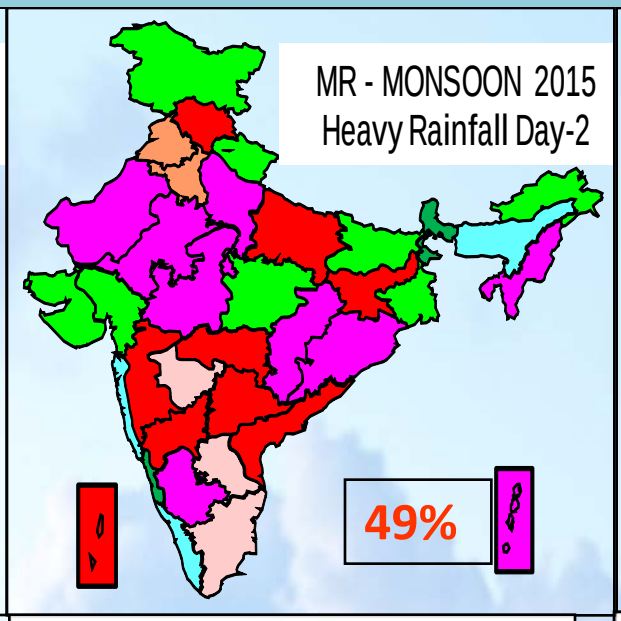

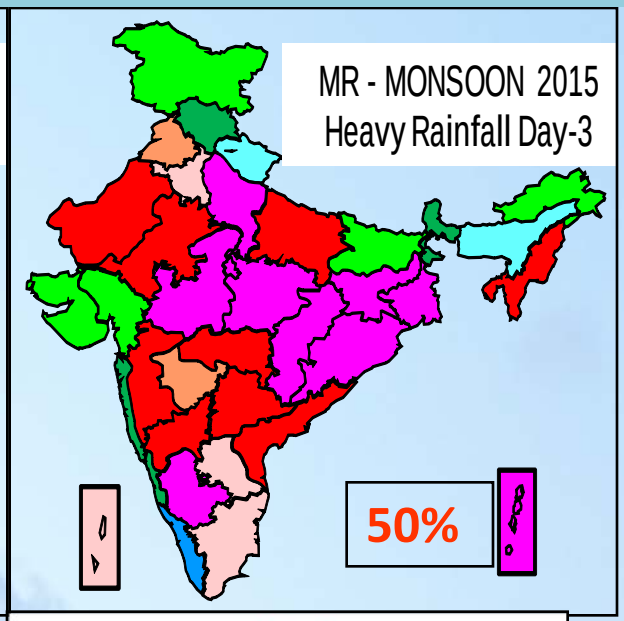

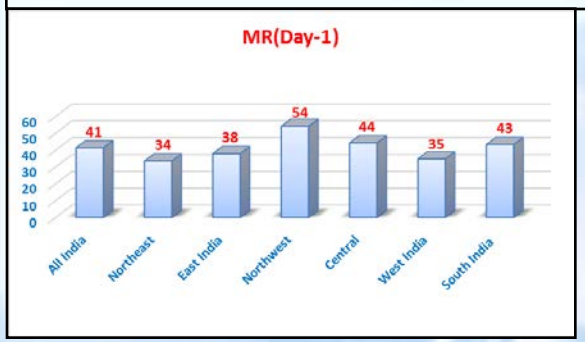

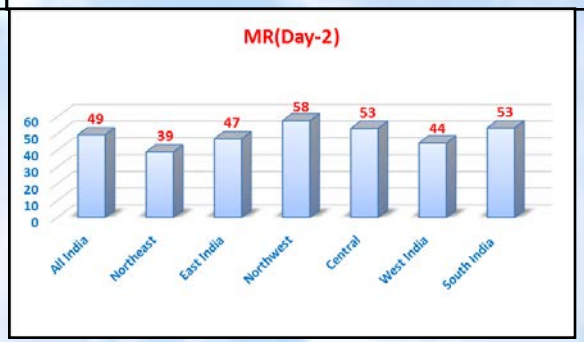

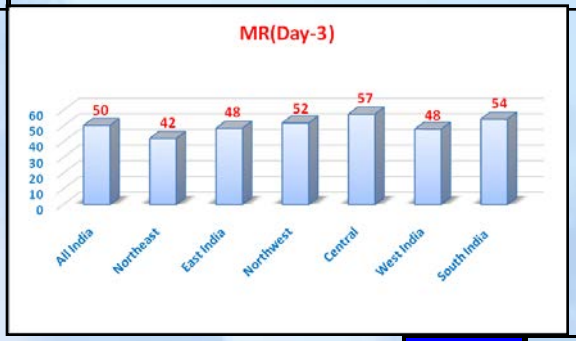

- MR are highest over TN, Rayalaseema and Haryana
- Less than 30% over Assam & Meghalaya

	<10
	11-20
	21-30
	31-40
	41-50
	51-60
	61-70
	71-80
	81-90
	>90

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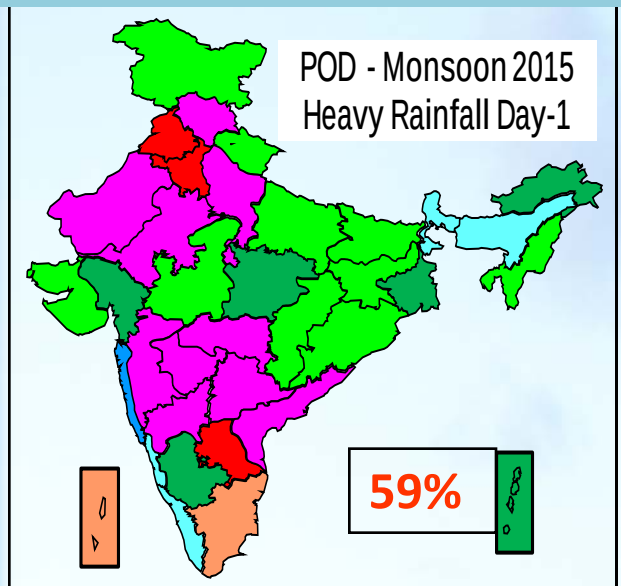
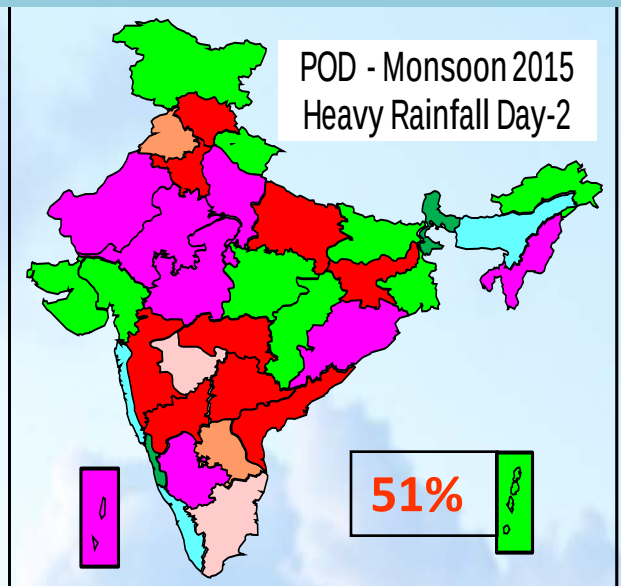
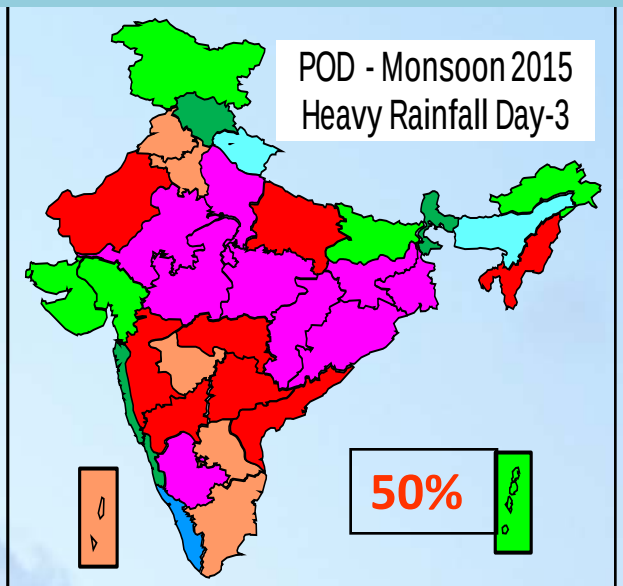
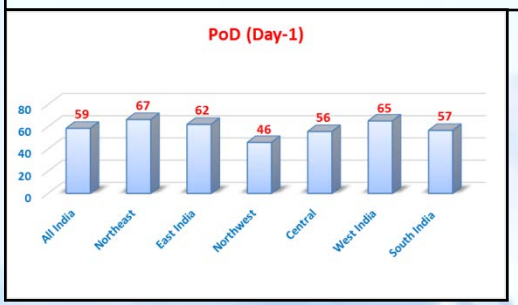
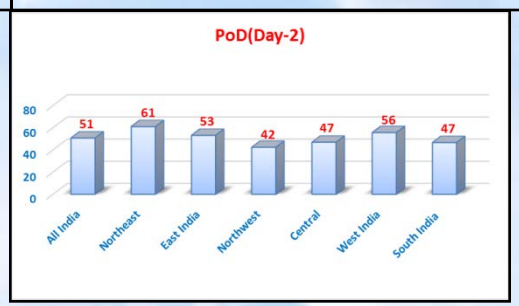
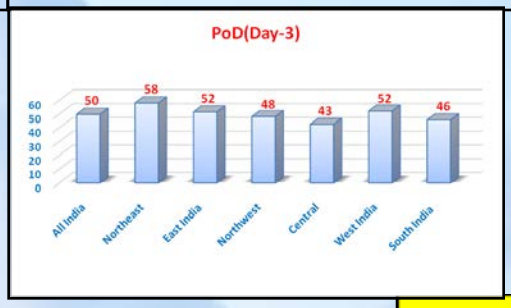




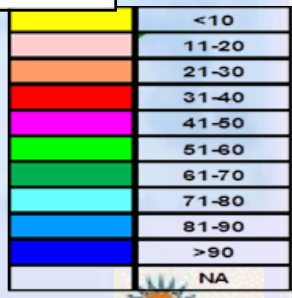






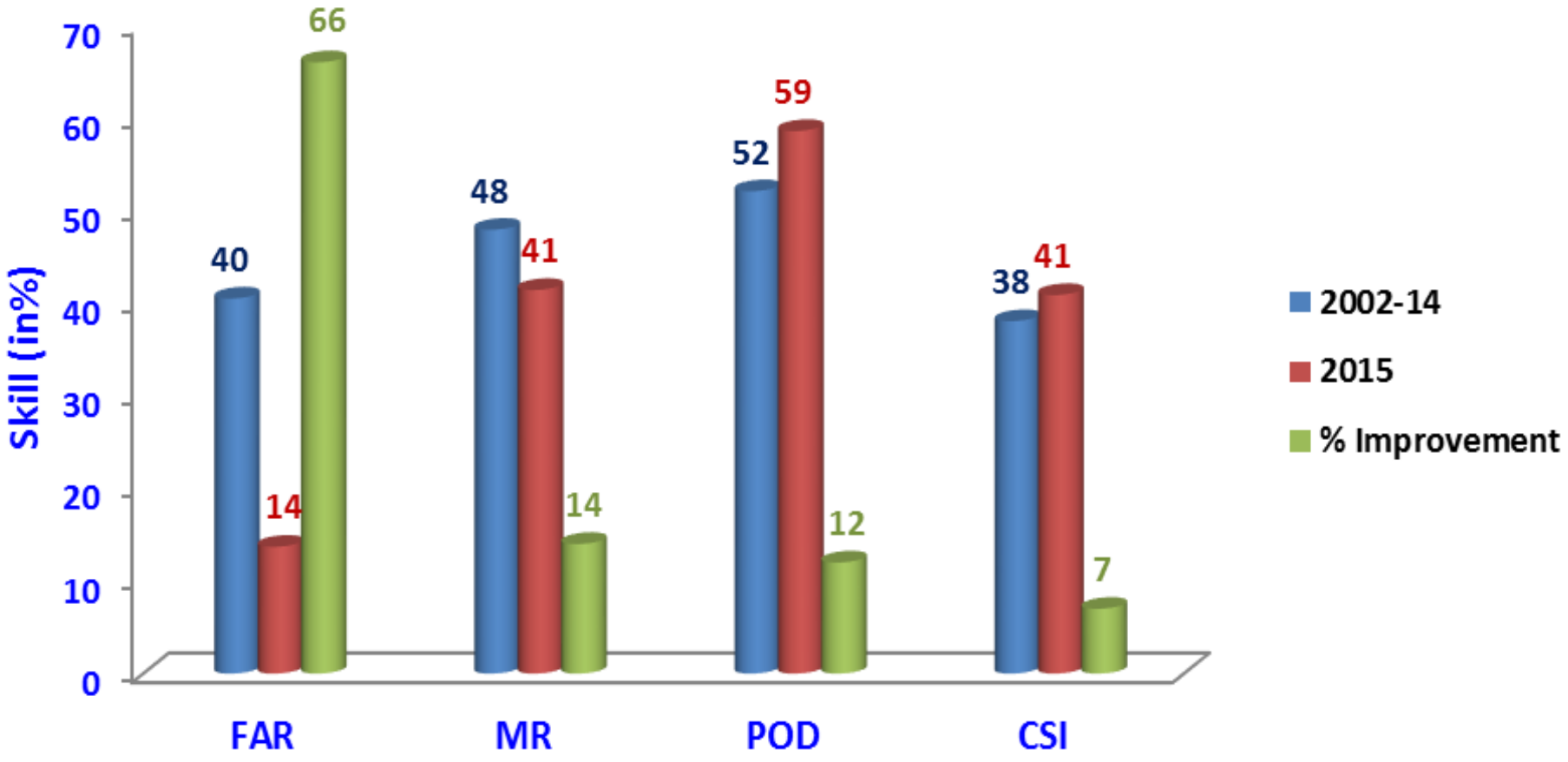


- Scores are more than 70% in Konkan & Goa, Coastal Karnataka, Keral and Assam & Meghalaya
- Scores are poor LKD and TN



भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

Heavy rainfall warning (2002-15)



…thanks