

Weather in India

MONSOON SEASON (June to September 2007)†

1. Characteristic features of southwest monsoon 2007

1.1. The seasonal rainfall over the country as a whole was 106% of its Long Period Average (LPA).

1.2. However, it was not well distributed in time.

1.3. June and September received above average rainfall (120% & 118% respectively) while rainfall in July and August was slightly below average (98% each).

1.4. South peninsula received *excess** seasonal rainfall, (126% of LPA), while northwest India received 85%, central India 108% and NE India 104%.

1.5. The seasonal rainfall was *excess* in 13 Met. sub-divisions, *normal* in 17 and *deficient* in the remaining 6.

1.6. Five sub-divisions (*viz.*, west Uttar Pradesh, Haryana, Chandigarh & Delhi, Punjab, Himachal Pradesh and east Madhya Pradesh) experienced moderate drought conditions (rainfall deficiency of 26% to 50%) at the end of the season.

1.7. Fifteen percent of the meteorological districts of India experienced moderate drought and 6% experienced severe drought conditions.

2. Various aspects of southwest monsoon - 2007

2.1. Advance of southwest monsoon

SW monsoon arrived over the south Andaman Sea, Nicobar islands and parts of southeast Bay on 10 May, nearly a week ahead of normal (as in 1988). This was associated with the strengthening of the cross equatorial flow, subsequent to the formation of a Depression over the north Andaman Sea (3-5 May) and its dissipation over Myanmar. However, the subsequent advance was delayed by the formation of a cyclonic storm, 'Akash' (13 – 15 May) which had an unusual origin in the mid latitude westerlies. It formed over the eastcentral Bay and crossed Bangla Desh coast. It disrupted the monsoon flow by prolonging the mid-latitude westerly intrusion over the Bay of Bengal.

* Definitions of terms in '*Italics*' other than sub-titles are given in Appendix A.

Subsequent to a gradual revival, monsoon onset took place over Kerala on 28 May, 4 days prior to the normal date. This was followed by a rather prolonged (9 days) hiatus in the northern limit of monsoon as the monsoon flow pattern was disrupted by the formation of a super cyclonic storm, 'Gonu' over the east central Arabian Sea (1 – 7 June). Further advance started from 8 June. It advanced over the northeastern states by 10 June and covered the peninsular and central India by 25 June. The entire country was covered on 4 July, nearly 11 days ahead of normal.

The progress of monsoon over the country is given chronologically in Table 1 and Fig. 1.

2.2. Weekly rainfall distribution

2.2.1. Week by week rainfall

Meteorological sub-divisionwise week-by-week rainfall departures (percentage departure from normal) during the period from 1 June 2007 to 3 October 2007 comprising of 18 weeks are given in Fig. 2(a).

The northeastern sub-divisions, including West Bengal & Sikkim received *excess/normal* rainfall during the weeks ending on 13 & 20 June, 25 July, 1 August and 5 & 12 September except Orissa received deficient rainfall for the week ending on 13 June. The weeks ending on 6 June, 11 July, 8 August and 19 & 26 September had been *excess/normal* rainfall weeks for these sub-divisions in general & only week ending on 11th July only Sikkim is *deficient*. For the *deficient* sub-divisions over northwest India, *viz.*, west Uttar Pradesh, Haryana, Chandigarh & Delhi, Punjab and Himachal Pradesh, the rainfall remained *deficient* or *scanty* during most of the weeks except for the weeks ending on 20 June which is *excess*. For the week ending on 1st August the above region received *excess* rainfall in West U.P. and rest region *scanty*. The central parts received either *deficient* or *scanty* rainfall for a comparatively longer period from 12 July to 5 September. The peninsular India received *excess/normal* rainfall almost all through the season and there was persistent *excess* rainfall during the period 23 August – 19 September (4 weeks).

2.2.2. Weekly cumulative rainfall distribution

Meteorological sub-divisionwise cumulative rainfall departures (percentage departure from normal) during the season from 1 June to 30 September, comprising of 18 weeks are given in Fig. 2 (b).

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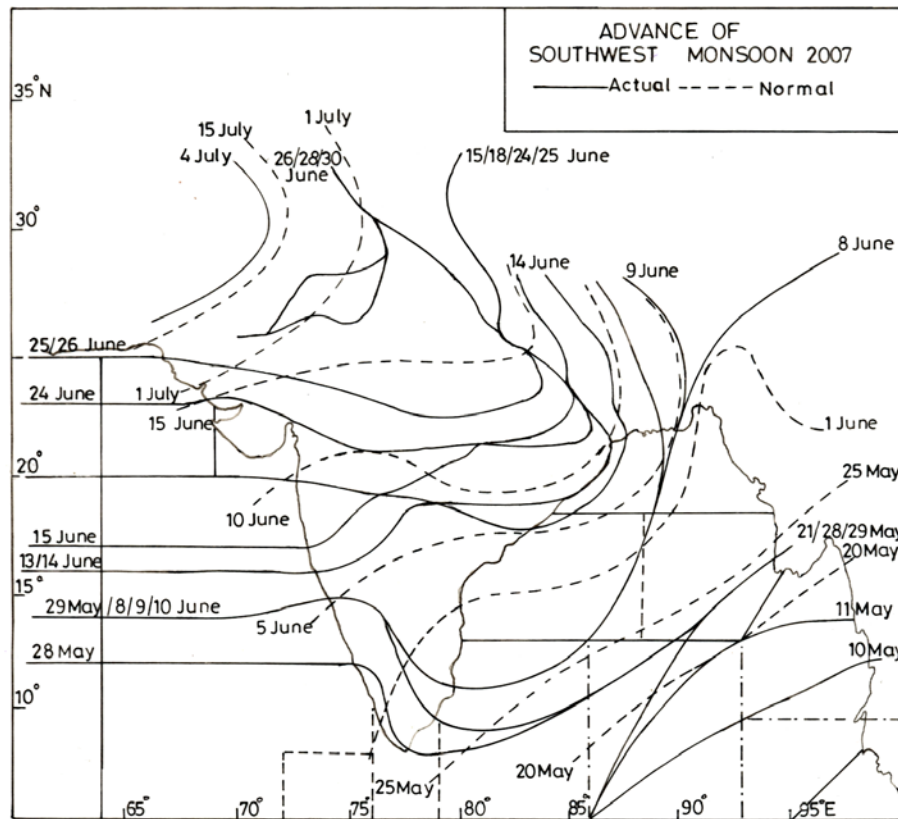


Fig. 1. Isochrones of advance of southwest monsoon 2007

The cumulative rainfall remained *normal* in general over almost all the sub-divisions over Northeast India after 25 July. Over Gangetic West Bengal and Orissa, it was *excess/normal* from the second fortnight of June. The sub-divisions Orissa and Jharkhand became *normal/excess* from 18 July onwards. All the 5 *deficient* sub-divisions fell in that category in the later half of the season. The entire peninsular India, including Gujarat region² and Saurashtra & Kutch remained *excess/normal* all through the season, from the 3rd week of June. Marathwada had been exceptions, which experienced a normal period for the week ending on 11 July & 18 July & *deficient* period from week ending on 25 July to 29 August. Telangana experienced a normal period for the week ending on 11 July to 29 August except 16 to 22 August *deficient* period.

2.3. Monthly rainfall distribution

Figs. 3 – 6 show monthwise distribution of monsoon rainfall. Sub-divisionwise rainfall figures and departures for each month and season as a whole, are given in Table 2.

2.4. Seasonal rainfall distribution

Meteorological sub-divisionwise seasonal rainfall distribution in terms of percentage departures from normal is given in Fig. 7 as well as in Table 2. These rainfall figures are based on updated data. The seasonal rainfall was *excess* in 13, *normal* in 18 and *deficient* in the remaining 5 met. sub-divisions. No sub-division was *scanty* in the seasonal domain.

2.5. Districtwise distribution of monsoon rainfall

Out of the 533 meteorological districts of India, 72% received *excess/normal* rainfall and the remaining 28% received *deficient scanty* rainfall during the period 1 June – 30 September 2007. Out of this, 77 districts (15%) experienced moderate drought and 30 districts (6%) experienced severe drought at the end of the season.

Percentage of districts with *excess/normal* and *deficient/scanty* rainfall for the years 2002- 2007 is given in Table 3.

² The Subdivision Gujarat Region, Daman, Diu & Nagar Haveli is shortened as Gujarat Region throughout the article.

TABLE 1
Advance of Southwest Monsoon 2007

S. No.	Date	SW monsoon advanced over	Remarks
1.	10 May	Parts of the Andaman Sea, Nicobar Islands and some parts of southeast Bay	Nearly a week ahead. Also the earliest arrival as 1988
2.	11 May	Some more parts of southeast Bay and Andaman Sea	10 days ahead of normal
3.	21 May	Some more parts of southeast Bay, some parts of east central Bay and entire Andaman Sea	Near normal time
4.	28 May	Entire south Arabian Sea, Kerala, extreme south Tamil Nadu, some parts of southwest Bay and some more parts of southeast Bay	Onset took place over Kerala 4 days ahead of normal
5.	29 May	Some parts of central Arabian Sea, entire coastal Karnataka, some parts of south interior Karnataka and some more parts of Tamil Nadu and of southwest Bay	A few days ahead of normal
<i>Hiatus in the northern limit due to Super Cyclone 'Gonu' – 9 days</i>			
6.	8 June	Some more parts of south interior Karnataka, Tamil Nadu, southwest Bay, entire east central & northeast Bay, some parts of west central and northwest Bay, entire Nagaland-Manipur-Mizoram-Tripura, some parts of Assam & Meghalaya and Arunachal Pradesh	Delay of nearly 5 days
7.	9 June	Some more parts of southwest and west central Bay, remaining parts of Assam & Meghalaya, Arunachal Pradesh and some parts of Sikkim	Do
8.	10 June	Some more parts of northwest Bay, entire Sub-Himalayan West Bengal & Sikkim and some parts of Bihar	A week's delay in Sub-Himalayan West Bengal & Sikkim, near normal in Bihar
9.	13 June	Some more parts of Central Arabian Sea, some parts of Konkan – Goa, entire Karnataka, Tamil Nadu, Rayalaseema, most parts of Telangana and coastal Andhra Pradesh, entire southwest and west central Bay, some more parts of northwest Bay, some parts of Gangetic West Bengal and some more parts of Bihar	Nearly 5 days delay in most of the regions
10.	14 June	Some more parts of Telangana, some parts of Chattisgarh and of Orissa, entire coastal Andhra Pradesh, northwest Bay and Gangetic West Bengal, some parts of Jharkhand, most parts of Bihar and some parts of east Uttar Pradesh	Nearly a week's delay in the southern parts and near normal in the north
11.	15 June	Some more parts of central Arabian Sea, Konkan & Goa, some parts of south Madhya Maharashtra and of Marathwada, some more parts of Jharkhand, entire Bihar, some more parts of east Uttar Pradesh and some parts of Uttarakhand	5 days delay in the western parts and near normal over the northern parts
12.	18 June	Entire central Arabian Sea, Konkan & Goa, some more parts of Madhya Maharashtra, Marathwada, entire Telangana, some parts of Vidarbha, some more parts of Chattisgarh, most parts of Orissa and some more parts of Jharkhand	More than a week's delay
13.	24 June	Some parts of north Arabian Sea, Saurashtra & Kutch and Gujarat region, entire Madhya Maharashtra, most parts of Vidarbha, some more parts of Chattisgarh and Jharkhand and entire Orissa	With a delay of 9 to 12 days
14.	25 June	Entire Arabian Sea, Gujarat state, some parts of southeast Rajasthan, entire Vidarbha, some parts of Madhya Pradesh, most parts of Chattisgarh and entire Jharkhand	Do
15.	26 June	Some more parts of east Uttar Pradesh, some parts of west Uttar Pradesh, Haryana and Punjab, entire Uttarakhand, Himachal Pradesh and Jammu & Kashmir	A week's delay over the eastern parts and near normal over the hilly regions
16.	28 June	Some parts of west Rajasthan, most parts of east Rajasthan, entire west Madhya Pradesh, east Madhya Pradesh, Chattisgarh, east Uttar Pradesh, west Uttar Pradesh and some more parts of Haryana and Punjab	2 week's delay over the central parts and a week's delay over north India
17.	30 June	Some parts of west Rajasthan, Haryana and entire east Rajasthan	Near normal time
18.	4 July	Remaining parts of west Rajasthan, Haryana and Punjab and thus the entire country	4 to 11 days ahead of normal

Week by week rainfall during SW monsoon

1 June – 30 October 2007

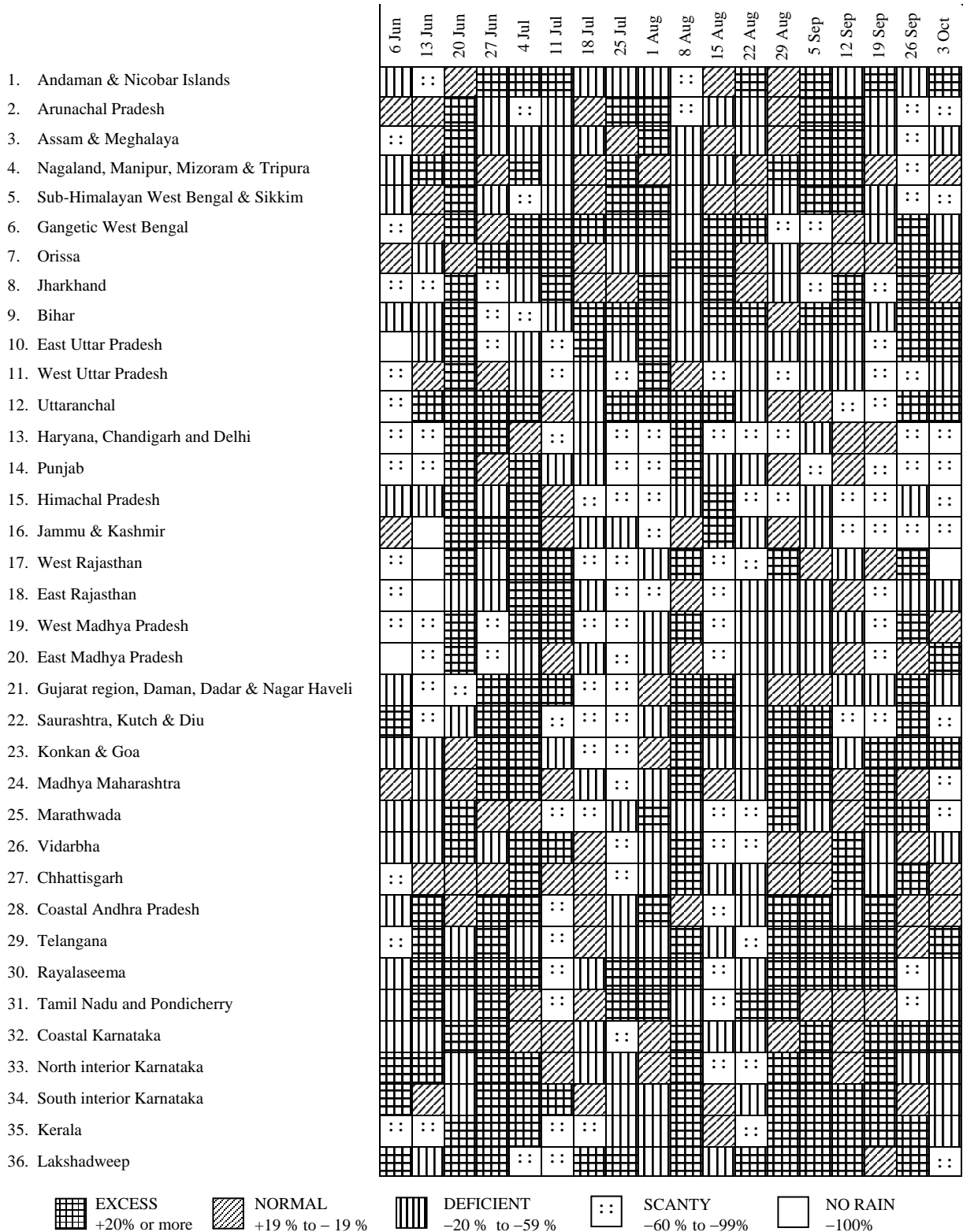


Fig. 2(a). Week by week rainfall during SW Monsoon 2007

**Week by week cumulative rainfall
1 June – 30 September 2007**

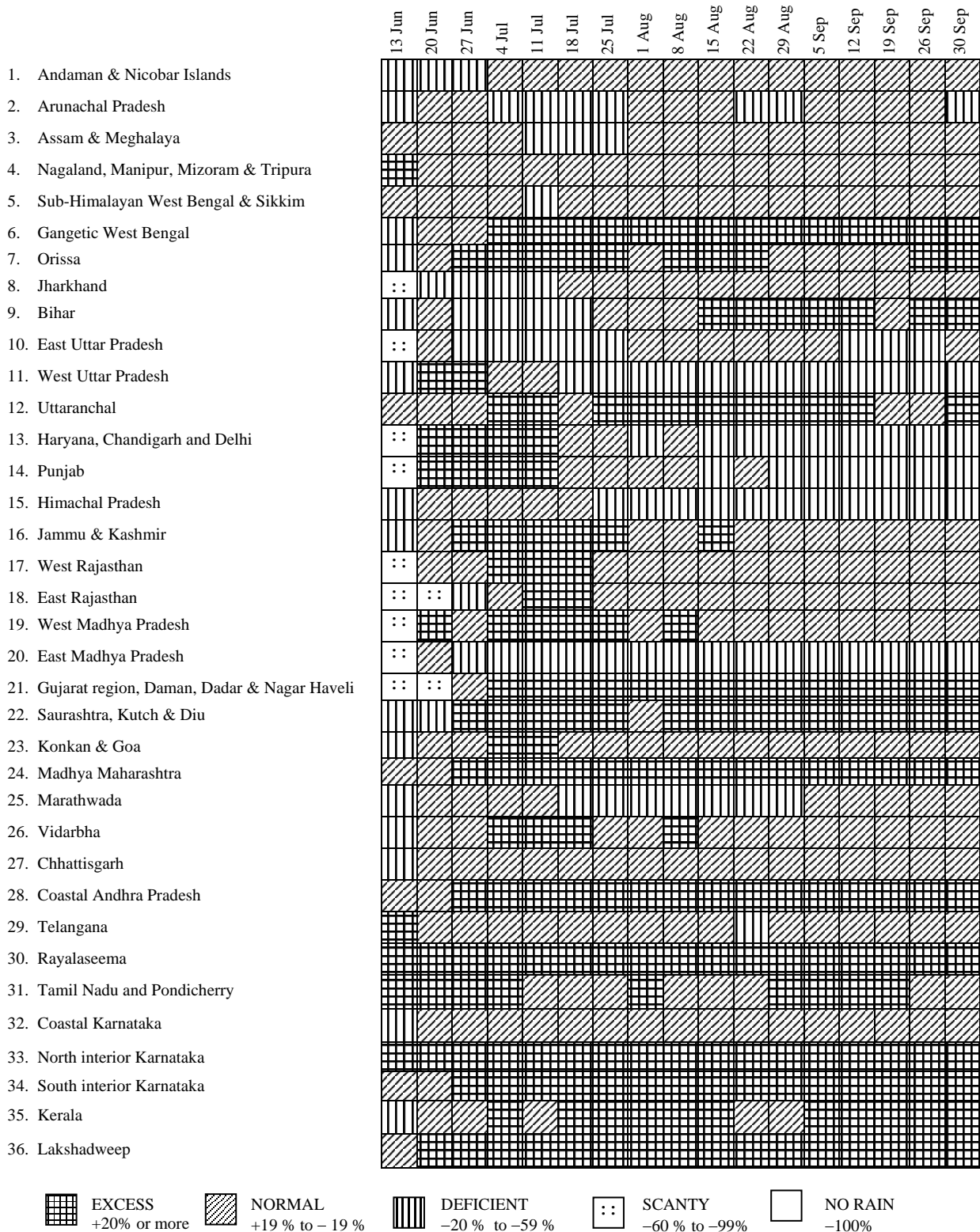


Fig. 2(b). Week by week cumulative rainfall during SW monsoon 2007 (1 June to 30 September 2007)

TABLE 2
Rainfall figures (mm) for each month and season as a whole (June – September 2007)

S. No.	Meteorological sub – divisions	June			July			August			September			Season		
		Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)
1.	A. & N. Islands	380	482	-21	405	419	-3	431	416	4	487	438	11	1703	1755	-3
2.	Arunachal Pradesh	424	494	-14	588	596	-1	208	388	-46	447	358	25	1667	1835	-9
3.	Assam & Meghalaya	462	567	-19	535	564	-5	303	434	-30	389	321	21	1688	1885	-10
4.	Naga., Mani., Mizo. and Tripura	386	361	7	418	345	21	287	308	-7	349	226	54	1440	1241	16
5.	S. H. W. B. & Sikkim	469	496	-6	701	602	16	426	470	-9	464	388	20	2060	1955	5
6.	Gangetic West Bengal	247	240	3	614	315	95	330	312	6	438	270	62	1629	1136	43
7.	Orissa	334	206	62	293	345	-15	422	365	16	393	249	58	1442	1165	24
8.	Jharkhand	116	192	-40	484	336	44	340	324	5	313	241	30	1254	1093	15
9.	Bihar	130	173	-25	504	345	46	372	295	26	337	226	49	1343	1039	29
10.	East Uttar Pradesh	76	105	-28	305	309	-1	211	301	-30	155	198	-22	748	914	-18
11.	West Uttar Pradesh	88	69	29	163	268	-39	158	286	-45	60	150	-60	470	773	-39
12.	Uttaranchal	216	164	32	502	425	18	576	426	35	271	208	30	1564	1223	28
13.	Haryana, Chandigarh & Delhi	96	43	123	73	171	-57	94	168	-44	51	89	-43	315	470	-33
14.	Punjab	81	42	94	87	189	-54	132	169	-22	41	102	-60	340	502	-32
15.	Himachal Pradesh	85	90	-6	156	288	-46	196	262	-25	60	134	-55	497	774	-36
16.	Jammu & Kashmir	135	59	130	127	186	-32	202	174	16	34	95	-65	498	514	-3
17.	West Rajasthan	33	27	23	84	102	-17	74	94	-21	41	40	1	232	263	-12
18.	East Rajasthan	59	61	-4	229	224	2	160	233	-31	79	105	-25	527	624	-16
19.	West Madhya Pradesh	109	108	1	368	305	21	247	315	-22	136	177	-23	860	904	-5
20.	East Madhya Pradesh	111	144	-23	258	371	-31	231	382	-39	186	201	-7	786	1097	-28
21.	Gujarat region	92	123	-25	542	361	50	350	291	20	173	160	9	1157	934	24
22.	Saurashtra & Kutch	112	81	38	205	195	5	421	138	205	151	72	110	889	486	83
23.	Konkan & Goa	920	675	36	815	1069	-24	1007	712	42	585	347	69	3327	2802	19
24.	Madhya Maharashtra	259	134	93	240	238	1	225	176	28	182	151	20	907	700	29
25.	Marathwada	143	144	-1	125	192	-35	146	194	-25	204	174	17	619	704	-12
26.	Vidarbha	228	167	36	331	329	1	283	300	-6	235	180	31	1077	976	10
27.	Chattisgarh	246	189	30	283	394	-28	322	391	-18	254	232	10	1105	1206	-8
28.	Coastal Andhra Pradesh	258	100	159	117	160	-27	169	154	10	217	162	34	761	575	32
29.	Telangana	171	136	26	136	242	-44	213	218	-2	281	171	64	801	767	4
30.	Rayalaseema	232	60	285	81	91	-11	171	97	75	186	132	41	669	381	76
31.	Tamil Nadu	56	42	34	75	71	6	132	90	46	76	113	-33	338	316	7
32.	Coastal Karnataka	1048	901	16	914	1188	-23	944	767	23	676	318	113	3582	3174	13
33.	North interior Karnataka	225	98	129	107	126	-15	138	113	22	217	153	42	687	491	40
34.	South interior Karnataka	217	132	64	255	226	13	250	164	52	197	137	43	919	659	39
35.	Kerala	737	678	9	996	758	31	503	447	12	550	260	112	2786	2143	30
36.	Lakshadweep	556	326	71	298	282	6	267	213	26	346	164	110	1467	985	49

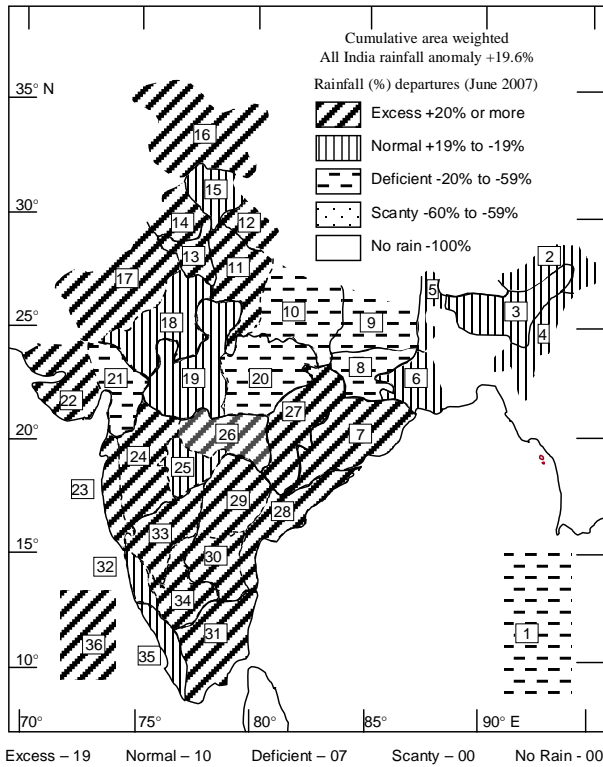


Fig. 3. Sub-divisionwise seasonal rainfall departure from normal (%) for the period (June 2007). 36 Sub-divisions are indicated by numbers on the map & bold letters in legend below. The rainfall anomaly values for these sub-divisions are indicated below :

1	-21	7	62	13	123	19	01	25	-01	31	34
2	-14	8	-40	14	94	20	-23	26	36	32	16
3	-19	9	-25	15	-06	21	-25	27	30	33	129
4	07	10	-28	16	130	22	38	28	159	34	64
5	-06	11	29	17	23	23	36	29	26	35	9
6	03	12	32	18	-04	24	93	30	285	36	71

2.6. Withdrawal of southwest monsoon

An unusual delay occurred in the withdrawal of monsoon from the extreme west Rajasthan, due to the prevalence of cyclonic circulations, availability of moisture and sporadic rainfall over the region.

The monsoon started withdrawing from west Rajasthan and parts of Punjab and Haryana on 30 September, with a delay of 2-4 weeks. During the period 1960 – 2006, the most delayed date of monsoon withdrawal from extreme west Rajasthan was 28 September, which occurred in 1964 & 1970. In the year 1990 also, the withdrawal started as late as on 27

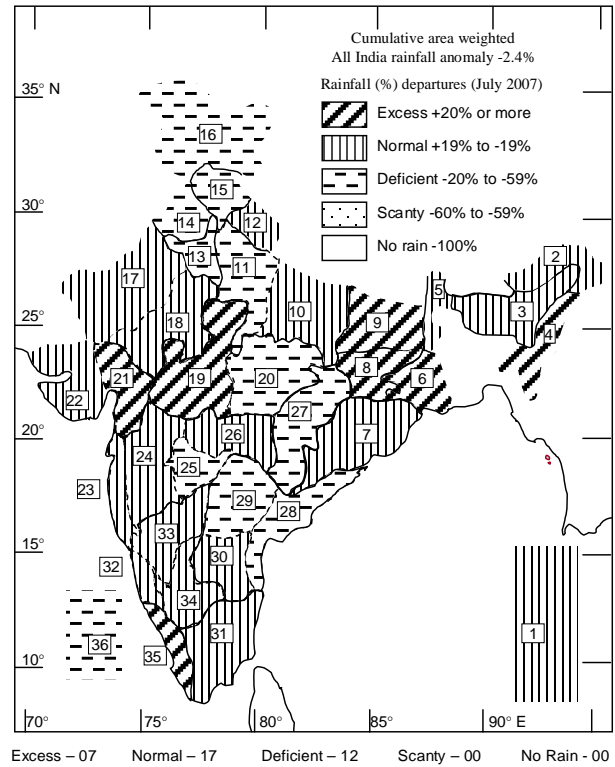


Fig. 4. Sub-divisionwise seasonal rainfall departure from normal (%) for the period (July 2007). 36 Sub-divisions are indicated by numbers on the map & bold letters in legend below. The rainfall anomaly values for these sub-divisions are indicated below :

1	-3	7	-15	13	-57	19	21	25	-35	31	6
2	-1	8	44	14	-54	20	-31	26	1	32	-23
3	-5	9	46	15	-46	21	50	27	-28	33	-15
4	21	10	-1	16	-32	22	5	28	-27	34	13
5	16	11	-39	17	-17	23	-24	29	-44	35	31
6	95	12	18	18	2	24	1	30	-11	36	6

September. The subsequent withdrawal was rather rapid from the regions outside NE India. The monsoon withdrew from the entire country, Bay of Bengal and Arabian Sea on 22 October. Simultaneously, the NE monsoon rains commenced over Tamil Nadu³, Kerala and adjoining areas of Karnataka and Andhra Pradesh on 22 October.

The monsoon withdrawal over the country is given chronologically in Table 4. Fig. 8 gives the isochrones of withdrawal of southwest monsoon.

3. Chief synoptic features of southwest monsoon 2007

The synoptic disturbances which affected the Indian monsoon region in June, July, August and September are given in Tables 5 to 8.

³ The sub-division Tamil Nadu & Puducherry is shortened as Tamil Nadu throughout the article

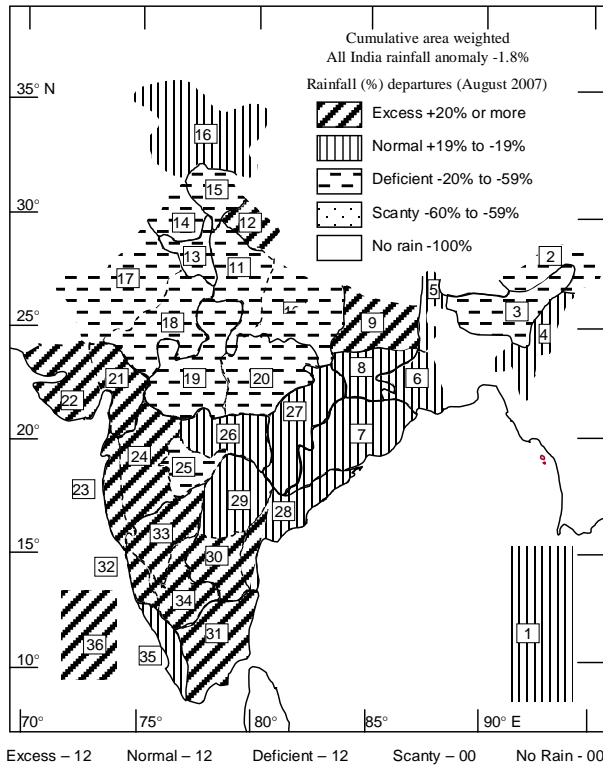


Fig. 5. Sub-divisionwise seasonal rainfall departure from normal (%) for the period (August 2007). 36 Sub-divisions are indicated by numbers on the map & bold letters in legend below. The rainfall anomaly values for these sub-divisions are indicated below :

1	04	7	16	13	-44	19	-22	25	-25	31	46
2	-46	8	05	14	-22	20	-39	26	-06	32	23
3	-30	9	26	15	-25	21	20	27	-18	33	22
4	-07	10	-30	16	16	22	205	28	10	34	52
5	-09	11	-45	17	-21	23	42	29	-02	35	12
6	06	12	35	18	-31	24	28	30	75	36	26

3.1. Cyclonic storms/depressions

Like last two years, this season was also cyclogenetically quite active. Two cyclonic storms formed over the Arabian Sea in the month of June. This has been a rare phenomenon, which has happened only during the years 1948, 1930, 1925 & 1907 during the recorded history of cyclonic storms. Also, 'Gonu' is the first ever 'super cyclone' formed over the Arabian Sea. The cyclonic storm 'Yemyin' (25 – 26 June) formed from the remnant of a Deep Depression which formed over the Bay of Bengal and emerged into the Arabian Sea as a low pressure area, after traversing the peninsula.

Apart from this, there had been five Depressions/ Deep Depressions formed during the season. All of them formed over the Bay of Bengal.

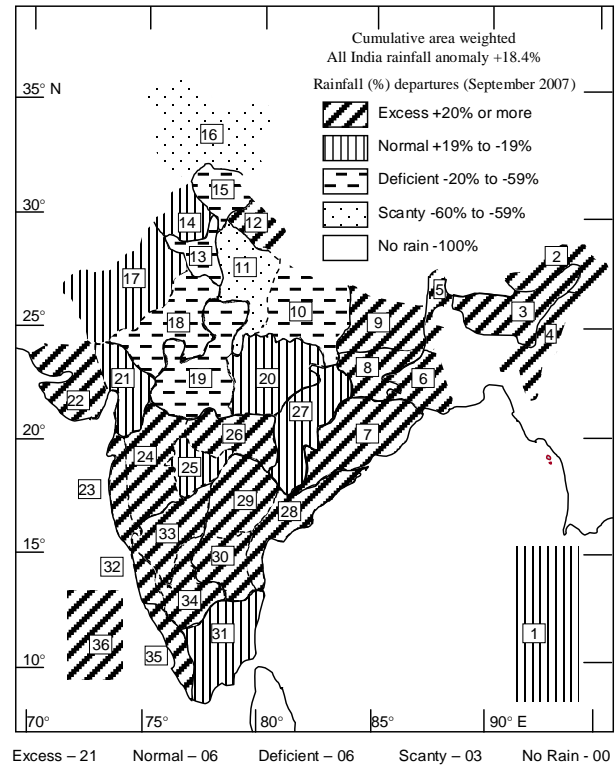


Fig. 6. Sub-divisionwise seasonal rainfall departure from normal (%) for the period (September 2007). 36 Sub-divisions are indicated by numbers on the map & bold letters in legend below. The rainfall anomaly values for these sub-divisions are indicated below :

1	11	7	58	13	-43	19	-23	25	17	31	-33
2	25	8	30	14	-60	20	-7	26	31	32	113
3	21	9	49	15	-55	21	9	27	10	33	42
4	54	10	-22	16	-65	22	110	28	34	34	43
5	20	11	-60	17	1	23	69	29	64	35	112
6	62	12	30	18	-25	24	20	30	41	36	110

The tracks of the systems are shown in Fig. 9. The details are given below :

3.1.1. Super Cyclonic storm (Gonu) over the east central Arabian Sea (1-7 June 2007)

Under the influence of an upper air cyclonic circulation over the east central Arabian Sea off south Maharashtra – Goa coasts, a low pressure area formed over the east central Arabian Sea on 1 morning. It became well marked in the evening and concentrated into a Depression during the night of 1. Moving westwards, it intensified into a Deep Depression in the morning of 2 and into a Cyclonic Storm (Gonu) in the afternoon. It remained practically stationary in the same afternoon. Subsequently, moving northwards, it further intensified into a Severe Cyclonic Storm in the early morning of 3.

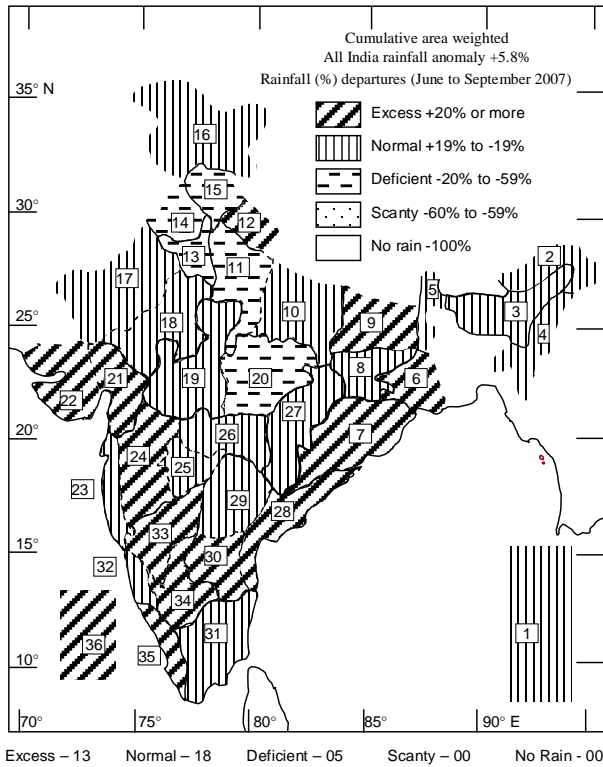


Fig. 7. Sub-divisionwise seasonal rainfall departure from normal (%) for the period (June - September 2007). 36 Sub-divisions are indicated by numbers on the map & bold letters in legend below. The rainfall anomaly values for these sub-divisions are indicated below :

1	-3	7	24	13	-33	19	-5	25	-12	31	7
2	-9	8	15	14	-32	20	-28	26	10	32	13
3	-10	9	29	15	-36	21	24	27	-8	33	40
4	16	10	-18	16	-3	22	83	28	32	34	39
5	5	11	-39	17	-12	23	19	29	4	35	30
6	43	12	28	18	-16	24	29	30	76	36	49

Thereafter, it moved northwards and then northwestwards and intensified into a Very Severe Cyclonic Storm during the night of 3. Subsequently moving westnorthwestwards, it lay over the central parts of Arabian Sea on 4 morning. Remaining practically stationary over there, it further intensified into a Super Cyclonic Storm in the late evening of 4. Further moving northwestwards, it weakened into a Very Severe Cyclonic Storm during the night 4. It crossed the Oman coast in the morning hours of 6. It emerged into Gulf of Oman in the evening. Subsequently, it weakened into a Severe Cyclonic Storm and further into a Cyclonic Storm and crossed Mekran coast, along Long. 58.5° E in the morning hours of 7.

3.1.2. The Cyclonic Storm (Yemyin) over the north Arabian Sea (25 – 26 June 2007)

The remnant low pressure area of a Deep Depression formed over the west central Bay, emerged into north

TABLE 3
Districtwise distribution of monsoon rainfall for the years 2002 – 2007

Year	Excess/Normal	Deficient/Scanty
2002	39	61
2003	75	25
2004	56	44
2005	72	28
2006	59	41
2007	72	28

east Arabian Sea on 24 evening. It became well marked during the night and concentrated into a Depression over the northeast Arabian Sea on the morning of 25. Slowly moving westwards, it intensified into a Deep Depression in the evening. Subsequently, it moved northwestwards and it further intensified into a Cyclonic Storm ‘Yemyin’ during the night of 25. Further moving northwestwards, it crossed the west coast of Pakistan in their morning hours of 26 and weakened thereafter.

3.1.3. Deep Depression over the west central Bay (21 – 23 June 2007)

A low pressure area formed over the west central Bay on 19 and became well marked over the central parts of Bay on 20. It concentrated into a Depression on 21 morning over the west central Bay. Moving westnorthwestwards, it intensified into a Deep Depression in the evening of 21 and crossed Andhra coast close to north of MPT in the early hrs of 22nd June. Further moving westnorthwestwards, it lay over coastal Andhra Pradesh, near Gannavaram on 22 morning and over Telangana, about 50 km southeast of Hyderabad in the evening. It continued to move in a westnorthwesterly direction and weakened into a Depression which lay centred over Marathwada, near ‘Osmanabad’ on 23 morning and lay close to Ahmednagar in the afternoon of 23. It weakened into a well marked low pressure area over north Konkan and neighbourhood on 23 evening and emerged into the Arabian Sea and lay over the northeast Arabian Sea and adjoining Saurashtra & Kutch in the morning of 24.

3.1.4. Deep Depression over the northwest Bay (28 – 30 June 2007)

A low pressure area formed over the northwest Bay off Orissa coast on 26. It became well marked over the northwest and adjoining central Bay on 27. Subsequently it concentrated into a Depression in the early morning of 28 and intensified into a Deep Depression in the morning of 28. Moving northwestwards, it crossed Orissa coast, close to Puri in the early morning of 29. It lay over

TABLE 4
Withdrawal of southwest monsoon 2007

S. No.	Date	Southwest monsoon withdrew from	Remarks
1.	30 Sep	Most parts of west Rajasthan, some parts of Punjab, Haryana, east Rajasthan and north Arabian Sea	Delayed by more than 2 weeks due to the presence of cyclonic circulations and moisture
2.	2 Oct	Remaining parts of west Rajasthan, east Rajasthan, Punjab, Haryana (including Delhi), entire Jammu & Kashmir, Himachal Pradesh, Uttarakhand, west Uttar Pradesh, some parts of east Uttar Pradesh, some parts of west Madhya Pradesh, most parts of Gujarat state and some more parts of north Arabian Sea	Delay of nearly 2 weeks in the western parts and near normal over the rest
3.	8 Oct	Most parts of east Uttar Pradesh, some parts of east Madhya Pradesh, some more parts of west Madhya Pradesh, entire Gujarat state, some parts of north Maharashtra and entire north Arabian Sea	Nearly a weeks delay
4.	10 Oct	Entire east Uttar Pradesh, some parts of Bihar, Jharkhand, north Chattisgarh and most parts of Madhya Pradesh	Do
5.	12 Oct	Most parts of Bihar, entire Jharkhand, some parts of Gangetic West Bengal, Orissa, most parts of Chattisgarh, Vidarbha, some parts of Marathwada and some more parts of Maharashtra	Do
6.	15 Oct	Some more parts of Chattisgarh, entire Vidarbha, Marathwada, Madhya Maharashtra, some parts of Telangana, north interior Karnataka, most parts of Konkan & Goa and parts of central Arabian Sea	Nearly a week's delay over most of the regions
7.	22 Oct	From the entire country, Bay of Bengal and Arabian Sea	Simultaneously northeast monsoon rains commenced over Tamil Nadu, Kerala and adjoining areas of Karnataka and Andhra Pradesh

coastal Orissa, close to Bhubaneswar, at 0300 UTC of 29. Further moving westnorthwestwards, it lay centred about 50 km east of Sambalpur in the evening of 29. Subsequently weakened into a Depression and lay centred over east Madhya Pradesh, about 150 km southeast of Jabalpur on 30 morning and about 50 km southwest of Jabalpur in the evening. Moving further westnorthwestwards, it weakened into a well marked low pressure area and lay over west Madhya Pradesh and adjoining east Rajasthan on the morning of 1 July and over southwest Madhya Pradesh and adjoining southeast Rajasthan and Gujarat region in the evening. It lay as a low pressure area over southeast Rajasthan and adjoining Gujarat and west Madhya Pradesh on 2 & 3 July and became less marked on 4 July.

3.1.5. *Deep Depression over Bangla Desh coast (4 – 9 July 2007)*

Under the influence of an upper air cyclonic circulation, a low pressure area formed over the northeast Bay on 3 morning. It became well marked on 3 evening and concentrated into a Depression over Bangla Desh coast on 4 morning. It moved slightly northwestwards and intensified into a Deep Depression in the evening of 5.

Moving slowly westwards, it lay centred close to Bankura in the morning of 6, near Jamshedpur in the evening. Further moving westnorthwestwards, it weakened into a Depression and lay centred close to Ambikapur on 7 morning and about 50 km north of Pendra in the evening. Subsequently it lay centred about 50 km southeast of Sagar on 8 morning and about 50 km northwest of Sagar in the evening. It lay over northwest Madhya Pradesh and neighbourhood, close to Shivpuri in the morning of 9 and weakened into a well marked low pressure area over northwest Madhya Pradesh and adjoining east Rajasthan in the evening. It further weakened into a low pressure area over southeast Rajasthan and neighbourhood on 10 and became less marked on 11.

3.1.6. *Deep Depression over the northwest Bay (5 – 7 August 2007)*

Under the influence of an upper air cyclonic circulation, a low pressure area formed over the northwest Bay off West Bengal – Orissa coasts on 4 morning. It concentrated into a Depression in the early morning of 5. Moving slightly westwards, it intensified into a Deep Depression in the night. Moving further westwards, it crossed Orissa coast between Paradip and Chandbali in

TABLE 5

Details of low pressure systems for the month of June 2007

S. No.	System	Duration	Place of first location	Direction of movement	Final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) Cyclonic storms/Depressions						
1.	Super Cyclonic Storm 'Gonu'	1 – 7	East central Arabian Sea	Northwest	Iran	Crossed Oman coast on 6 morning and Mekran coast on 7 morning. Details are given in the text
2.	Deep Depression	21 – 23	West central Bay	Westnorthwest	North Konkan and neighbourhood	Emerged into Arabian Sea, re-intensified to form the following system
3.	Cyclonic Storm 'Yemyin'	25 – 26	Northeast Arabian Sea	Northwest	Southwest Pakistan	It intensified into a Cyclonic Storm just before the land fall. Details are given in the text
4.	Deep Depression	28 – 30	Northwest Bay	Northwest	West Madhya Pradesh and adjoining east Rajasthan	Crossed Orissa coast close to Puri. Details are given in the text
(B) Upper air cyclonic circulations						
1.	Upto mid tropospheric levels	5 – 6	Gangetic West Bengal and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 7
2.	Upto 2.1 km a.s.l.	6	East Uttar Pradesh and adjoining Bihar	Do	Do	Became less marked on 7
3.	Upto mid tropospheric levels	8 – 19	Southeast Arabian Sea and adjoining Lakshadweep area	Northnorthwest	North Arabian Sea off north Gujarat coast	Became less marked on 20
4.	Between 3.1 & 5.8 km a.s.l.	14 – 19	South Tamil Nadu and adjoining Sri Lanka	Northnortheast	South Andhra – north Tamil Nadu coasts	Merged with the circulation associated with the well marked low pressure area on 20
5.	Upto lower tropospheric levels	14 – 16	West Uttar Pradesh and neighbourhood	East	East Uttar Pradesh	Became less marked on 17
(C) Eastward moving upper air cyclonic circulations						
1.	Upto mid tropospheric levels	6 – 10	North Pakistan and adjoining Jammu & Kashmir	Northeast	Northern parts of Jammu & Kashmir	Moved away on 11
2.	Upto 1.5 km a.s.l.	15 – 19	Northwest Rajasthan and adjoining Punjab	Eastnortheast	Uttarakhand and neighbourhood	Moved away on 20
3.	Upto mid tropospheric levels	15 – 19	North Pakistan and adjoining Jammu & Kashmir	Northeast	Jammu & Kashmir	Moved away on 20
(D) Troughs						
1.	At 0.9 km a.s.l.	7 – 8	East Uttar Pradesh to Telangana	Quasi Stationary	East Uttar Pradesh to Tamil Nadu	Became less marked on 9
2.	In the lower levels	11 – 13	Uttarakhand to Nagaland-Manipur-Mizoram-Tripura	Do	-	Was seen as the heat trough at sea level from northwest Rajasthan to north Bay on 14, 15 & 20
3.	At sea level	26 June – 3 July	Northwest India to north Bay	Do	-	Got established as the monsoon trough, once the monsoon covered the entire country on 4 July

TABLE 6
Details of low pressure systems for the month of July 2007

S. No.	System	Duration	Place of first location	Direction of movement	Final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) Depressions						
1.	Deep Depression	4 – 9	Bangla Desh coast	Westnorthwest	Northwest Madhya Pradesh and adjoining east Rajasthan	Formed over the land. Details are given in the text
(B) Low pressure areas						
1.	Well marked low pressure area	13 – 18	Northwest Bay off Orissa – West Bengal coasts	Northwest	East Uttar Pradesh and adjoining Bihar	It formed under the influence of an upper air cyclonic circulation. The low pressure area became less marked on 19
(C) Upper air cyclonic circulations						
1.	Between 3.1 & 4.5 km a.s.l.	13 – 14	North Gujarat region and neighbourhood	Quasi-stationary	<i>In situ</i>	Became less marked on 15
2.	Do	17 – 19	Gujarat region	Do	Saurashtra & Kutch and neighbourhood	Became less marked on 20
3.	Upto mid tropospheric levels	25 – 27	Lakshadweep and neighbourhood	Northnorthwest	East central Arabian Sea off south Maharashtra – Goa – Karnataka coasts	Became less marked on 28
4.	Do	21 – 22	Assam & Meghalaya and neighbourhood	Quasi-stationary	<i>In situ</i>	Became less marked on 23
5.	Between 3.6 & 5.8 km a.s.l.	31 Jul - 7 Aug	East central Arabian Sea off Maharashtra – Goa –Karnataka coasts	North	Gujarat and neighbourhood	Merged with the circulation associated with the well marked low pressure area on 8 August
6.	Upto mid tropospheric levels	28 – 30	South Gujarat region and neighbourhood	Quasi-stationary	North Gujarat region and neighbourhood	Became less marked on 31 July
(D) Eastward moving upper air cyclonic circulations						
1.	Upto mid tropospheric levels	13 – 15	North Pakistan and adjoining Jammu & Kashmir	Northeast	Northern parts of Jammu & Kashmir	Moved away on 16
2.	Upto 1.5 km a.s.l.	13 – 15	Punjab and neighbourhood	Eastnortheast	Uttarakhand	Moved away on 16
3.	Upto mid tropospheric levels	17 evening – 18	North Pakistan and adjoining Jammu & Kashmir	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 19
4.	Upto lower tropospheric levels	19 – 24	Central Pakistan and adjoining Punjab	Do	Punjab and neighbourhood	Moved away on 25
5.	Upto mid tropospheric levels	22 – 24	Jammu & Kashmir and adjoining north Pakistan	Do	Jammu & Kashmir	Moved away on 25
6.	Do	25 – 28	North Pakistan and adjoining Jammu & Kashmir	Do	Northern parts of Jammu & Kashmir	Moved away on 29
7.	Do	29 – 31	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 1 August
8.	Upto lower tropospheric levels	28 Jul – 4 Aug	Central Pakistan and adjoining Punjab	Eastnortheast	Central Pakistan and adjoining Punjab and north Rajasthan	Became less marked on 5 August

TABLE 7

Details of low pressure systems for the month of August 2007

S. No.	Systems	Duration	Place of first location	Direction of movement	Final Location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) Depressions						
1.	Deep Depression	5 – 7	Northwest Bay	Westnorthwest	Central parts of Madhya Pradesh	It crossed Orissa coast north of Paradip. Details are given in the text
(B) Low pressure areas						
1.	Well marked low pressure area	10 – 14	Northwest Bay off West Bengal – Orissa coasts	Northwest	Bihar and neighbourhood	Became less marked on 15
2.	Do	18 – 21	North Bay and adjoining areas of West Bengal and Bangla Desh	Westnorthwest	Northeast Madhya Pradesh and neighbourhood	The remnant of it moved as an upper air cyclonic circulation upto west Rajasthan
(C) Upper air cyclonic circulations						
1.	Upto mid tropospheric levels	4 – 5	East Rajasthan and adjoining west Madhya Pradesh	Quasi-stationary	<i>In situ</i>	Merged with the monsoon trough on 6
2.	Do	22 – 24	Gujarat region and adjoining northeast Arabian Sea	Do	Do	Became less marked on 25
3.	Do	23 – 28	West central Bay off Andhra coast	Westnorthwest and northwest	-	Merged with the following system on 29
4.	Do	28 – 29	Central parts of Uttar Pradesh and neighbourhood	Quasi-stationary	Central parts of Uttar Pradesh and adjoining west Madhya Pradesh	Became less marked on 30
5.	Do	24 – 29	Jharkhand and adjoining Gangetic West Bengal	Westnorthwest	Jharkhand and adjoining Bihar	Became less marked on 30
6.	Do	27 – 31	East central Arabian Sea off Maharashtra – Goa coasts	Quasi-stationary	East central Arabian Sea off south Gujarat – north Maharashtra coasts	Became less marked on 1 September
7.	Lower levels	31 Aug – 1 Sep	Jharkhand and adjoining Bihar	Do	Bihar and neighbourhood	Became less marked on 2 September
(D) Eastward moving upper air cyclonic circulations						
1.	Upto mid tropospheric levels	1 – 3	North Pakistan and adjoining Jammu & Kashmir	Northeast	Northern parts of Jammu & Kashmir	Moved away on 4
2.	Do	3 – 7	Do	Do	Do	Moved away on 8
3.	Do	8 – 15	Do	Do	Do	Moved away on 16
4.	Do	16 – 19	North Pakistan and neighbourhood	Do	Do	Moved away on 20
5.	Do	18 – 22	Do	Do	Do	Moved away on 23
6.	Do	23 – 28	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 29
7.	Do	25 – 28	Central Pakistan, adjoining west Rajasthan and Punjab	Eastnortheast	Punjab and adjoining northwest Rajasthan	Became less marked on 29
8.	Do	28 Aug – 1 Sep	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 2 September
(E) Troughs						
1.	Lower level westerlies	2 – 6	North Pakistan to north Arabian Sea	Quasi-stationary	<i>In situ</i>	Became less marked on 7

TABLE 8
Details of low pressure systems for the month of September 2007

S. No. (1)	System (2)	Duration (3)	Place of first location (4)	Direction of movement (5)	Final location (6)	Remarks (7)
(A) Depressions						
1.	Depression	21 – 24	West central and adjoining northwest Bay off north Andhra – south Orissa coasts	Northwest	North Chattisgarh and adjoining east Madhya Pradesh	It crossed Orissa coast close to Puri. Details are given in the text
(B) Low pressure areas						
1.	Low pressure area	1 – 3	West central and adjoining northwest Bay off North Andhra coast	Westnorthwest	South Orissa and adjoining north coastal Andhra Pradesh	It formed under the influence of an upper air cyclonic circulation, which persisted over the area during 28 – 31 August
2.	Do	13 – 15	North Bay and adjoining coastal areas of Orissa and Gangetic West Bengal	Quasi-stationary	<i>In situ</i>	The associated upper air cyclonic circulation persisted and caused the formation of the Depression under I (1)
3.	Well marked low pressure area	23 – 26	Off coasts of south Gujarat – north Maharashtra	North	South Guajrat region and neighbourhood	It formed under the influence of an upper air cyclonic circulation which persisted over the east central Arabian Sea off south Gujarat – north Maharashtra coasts during 19 – 22
(C) Upper air cyclonic circulations						
1.	Upto mid tropospheric levels	3 – 5	East central Arabian Sea off north Maharashtra coast	North	South Gujarat region and neighbourhood	Became less marked on 6
2.	Do	5 – 7	Gangetic West Bengal and neighbourhood	Northwest	East Uttar Pradesh and adjoining Jharkhand	Became less marked on 8
3.	Upto 3.1 km a.s.l.	10 – 13	South Tamil Nadu and adjoining Kerala	West	Lakshadweep area and neighbourhood	Became less marked on 14
4.	Between 2.1 & 4.5 km a.s.l.	11 – 13	South Tamil Nadu and adjoining Sri Lanka	Westnorthwest	Tamil Nadu and neighbourhood	Became less marked on 14
5.	Upto mid tropospheric levels	27 Sep – 1 Oct	Gangetic West Bengal and adjoining Jharkhand	Northwest	Bihar and neighbourhood	Became less marked on 2 October
(D) Eastward moving upper air cyclonic circulations						
1.	Upto mid tropospheric levels	1 – 2	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 3
2.	Do	5 – 9	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 10
3.	Do	9 – 13	Do	Do	Do	Moved away on 14
4.	Upto 3.1 km a.s.l.	7 – 10	Northwest Rajasthan and adjoining Punjab	Do	Punjab and neighbourhood	Became less marked on 11
5.	Between 1.5 & 5.8 km a.s.l.	13 – 19	Northwest Rajasthan and neighbourhood	Do	Haryana and neighbourhood	Became less marked on 20
6.	Upto lower tropospheric levels	19 – 23	Central Pakistan and adjoining Punjab	Do	Punjab and neighbourhood	Became less marked on 24
7.	Upto mid tropospheric levels	14 – 16	North Pakistan and neighbourhood	Do	Jammu & Kashmir and neighbourhood	Moved away on 17
8.	Do	16 – 20	Do	Do	Do	Moved away on 21
9.	Do	21 – 29	Do	Do	Do	Moved away on 30
(E) Troughs in westerlies						
1.	Lower levels	9 – 10	Sub-Himalayan West Bengal & Sikkim to Orissa	Quasi-stationary	<i>In situ</i>	Became less marked on 11
2.	Mid & upper tropospheric levels	20 – 30	Northeast Afghanistan to north Arabian Sea	Do	Along Long. 72° E to the north of Lat. 25° N	Became less marked on 1 October
3.	Lower & mid tropospheric levels	28 – 30	West Madhya Pradesh to south Konkan & Goa	Eastnortheast	Bihar to Telangana	Became less marked on 1 October

TABLE 9(a)

Positions of off-shore trough during period of southwest monsoon - 2007

Date	Location
28 – 29 May	South Maharashtra to Kerala coasts
30 May	Karnataka – Kerala coasts
31 May	South Maharashtra to Kerala coasts
1 June	East central Arabian Sea to Lakshadweep area
2 – 3 June	Karnataka – Kerala coasts
8 June	Kerala coast (feeble)
9 June	Karnataka – Kerala coasts (feeble)
12 June	Karnataka – Kerala coasts
13 June	South Maharashtra to Kerala coasts
14 – 18 June	South Gujarat to Kerala coasts
19 June	South Gujarat to Karnataka coasts
20 – 22 June	South Gujarat to Lakshadweep area
23 June	Gujarat to Kerala coasts
24 June	North Konkan to Kerala coasts
25 June	North Maharashtra to Karnataka coasts
26 – 27 June	Off Karnataka coast
28 June – 1 July	Maharashtra to Kerala coasts
2 – 10 July	Gujarat to Kerala coasts
11 – 27 July	Maharashtra to Kerala coasts (feeble during 19 – 22)
28 – 30 July	South Gujarat to Kerala coasts

TABLE 9(b)

Details of off-shore trough for the years 2002-2007

Year	Details of off – shore trough
2007	Present along various parts of the west coast from 28 May to 30 September except during 4 – 7 June, 10 – 11 June and 10 – 13 September. It was feeble during many days in June and a few days during the rest of the months.
2006	Extended along different parts of the west coast from 27 May to 25 September except during 19 – 20 June, 30 – 31 August and 3 – 11 September. Had been quite feeble in June except during the first week but active in July & August.
2005	Off-shore trough observed between 5 Jun to 24 Sep except during 7 & 10 Aug, 22 Aug–5 Sep, 8–9 Sep & 20–22 Sep.
2004	Off-shore trough along different parts of west coast (surface and lower levels) upto 16 September from 19 May except 27 May – 3 June, 8-11 June, 23-24 June and 29 August – 7 September.
2003	Off-shore trough along different parts of west coast (surface and lower levels) observed upto 17 September from 6 June except during 18-21 August, 24-26 August, 4 September, 9-10 September and 12-15 September.
2002	Off-shore trough along different parts of west coast (surface and lower levels) observed upto 17 September except during 4-11 June, 25-31 July, 28-31 August and 14-16 September.

the early morning of 6 and lay centred close to Cuttack in the morning of 7. Continuing the westward movement, it lay close to Phulbani in the evening of 6. Subsequently moving in a westnorthwesterly direction, it weakened into a Depression over Chattisgarh and lay centred close to Raipur in the morning of 7. It further weakened into a well marked low pressure area over central parts of Madhya Pradesh and neighbourhood in the evening of 7; lay over northwest Madhya Pradesh and neighbourhood on 8 morning; as a low pressure area over north Gujarat and neighbourhood on 9; Saurashtra & Kutch and neighbourhood on 10 and moved away northwestwards on 11.

3.1.7. *Depression over the west central and adjoining northwest Bay (21 – 24 September 2007)*

Under the influence of an upper air cyclonic circulation, a low pressure area formed over the west central Bay off Andhra coast on 17. Subsequently it became well marked and persisted there on 18 & 19, lay over west central and adjoining northwest Bay off north Andhra-south Orissa coasts on 20 & 21. Subsequently it concentrated into a Depression in the evening of 21. It crossed Orissa coast close to Puri in the afternoon of 22 and lay centred close to Angul on 23 morning, near Jharsuguda in the evening over Chattisgarh, close to Ambikapur on 24 morning. Moving further northwestwards, it weakened into a well marked low pressure area over north Chattisgarh and adjoining east Madhya Pradesh on 24 evening and lay as a low pressure area over east Uttar Pradesh and neighbourhood on 25 and became less marked on 26.

3.2. *Low pressure areas/well-marked low pressure areas (LPA/WMLPA)*

Altogether 6 low pressure areas/well marked low pressure areas formed during the season. Most of them originated as upper air cyclonic circulations. Five of them formed over the Bay of Bengal and one over the Arabian Sea. All of them moved in land, except one, which dissipated *in situ*, but caused the formation of a Depression later. Monthwise breakup of the systems are 1 in July, 2 in August and 3 in September. The total number of low pressure areas during the past 5 years *viz.*, 2001 to 2006 are 10, 10, 12, 8, 6 & 7 respectively.

3.3. *Upper Air Cyclonic Circulations (CYCIR)*

There were 23 upper air cyclonic circulations (in lower and middle tropospheric levels) formed during the season.

The monthwise break up of these are 5 in June, 6 in July, 7 in August and 5 in September.

3.4. *Off-shore Trough*

Off-shore trough along different parts of the west coast (surface and lower levels) persisted on most of the days from 28 May to 30 September except during 4 – 7 June, 10 – 11 June & 10 – 13 September. It was feeble during the period 1 – 3 June, 8 – 9 June, 27 – 28 June, 19 – 22 July, 10 – 22 August and 9 September.

The details of the positions of the off-shore trough are given in Table 9(a) and that for the years 2002 to 2007 are given in Table 9(b).

3.5. *Eastward moving cyclonic circulations/western disturbances*

There were 28 eastward moving systems as upper air cyclonic circulations. The monthwise break-up is 3 in June, 8 in July, 8 in August and 9 in September.

4. **Extra Indian features**

4.1. *Cross equatorial flow*

4.1.1. *Over the Bay of Bengal*

The cross equatorial flow along the equatorial belt (equator to 5° N / 5° S) was stronger than normal by more than 5 kts, during the first week of July and last week of September. It was weaker by about 5 kts in last week of August. Except these, the cross equatorial flow along the equatorial belt was close to the normal during the entire monsoon period, June – September 2007.

The surface winds over Arabian Sea to the north of 5° N were stronger than normal by 15 kts during the first and last week of September, about 10-15 kts during first three weeks of the month of July, about 10 kts in the last week of June, second and third week of September and 5/10 kts in the first two weeks of August. It was weaker by about 5 kts in the last week of the month of July and August. They were almost normal in the first three weeks of June and third week of August.

4.1.2. *Over the Bay of Bengal*

The cross equatorial flow along the equatorial belt (equator to 5° N / 5° S) over Bay of Bengal was stronger than normal by 7-10 kts during first and third week of June, and during first, third and fourth week of July, it was stronger than normal by 2-5 kts in the last week of June,

TABLE 10

Statistics of mid-latitude troughs

Atmospheric Level	Jun	Jul	Aug	Sep	Total
300 hPa	2	0	4	9	15
500 hPa	0	1	2	11	14

first and second week of August and first week of September. It was normal during the remaining weeks of the monsoon period June to September 2007.

The surface winds over the Bay of Bengal to the north of 5° N were stronger by 20 to 25 kts in the first and second week of August, last week of September, by 10-15 kts during first three weeks of July and by 5 kts during the first two weeks in the month of June and September. During the rest of the monsoon period they were normal. Thus they were stronger than normal during most of the period of the monsoon season except for few weeks during which they were normal.

4.2. *Mid-Latitude troughs*

Monthwise break-up of troughs in westerlies found between 60° E - 90° E, reaching upto or south of 30° N is given in Table 10.

4.3. *Systems in West Pacific Ocean/South China Sea*

There were in all 14 low pressure systems (reaching the intensity of Tropical depression and above) in the northwest Pacific Ocean / South China Sea during June – September 2007. The month wise break-up is given in Table 11.

4.4. *Systems in southern hemisphere*4.4.1. *Tropical storms/ depressions*

No low pressure system (Tropical Depression, Tropical Storm or Typhoon) was reported in the Southern Hemisphere during June- September 2007.

4.4.2. *Mid and upper tropospheric westerly troughs over the Indian Ocean*

There were 18 troughs in upper air westerlies which moved across the Indian Ocean from west to east, to the north of Lat. 30° S in the Southern Hemisphere. The monthwise break-up is 5 each in June & September and 4 each in July & August.

TABLE 11

Statistics of systems in northwest Pacific Ocean/south China Sea during June – September 2007

Low Pressure Systems	Jun	Jul	Aug	Sep	Total
Tropical Depression (T.D.)	0	0	0	1	1
Tropical Storm (T.S.)	0	1	2	2	5
Typhoon	0	2	3	3	8
Total	0	3	5	6	14

4.4.3. *Mascarene HIGH*

The intensity of Mascarene HIGH centred at 30° S / 60° E was below normal by 2.9 hPa during the monsoon period June to September 2007. It was below normal by 4.4 hPa in the month of August and it was below normal by 1.2 hPa in the month of June. The intensity of Mascarene HIGH along with that for the past five years are given in Table 12.

(Source : Climate Diagnostic Bulletin, NOAA, June to September 2007. Normal based on the means for the base period of 1979-1995)

4.4.4. *Australian HIGH*

The intensity of Australian HIGH centred at 30° S / 140° E was above normal by an average of about 2.5 hPa during the entire monsoon period June – September 2007. It was above normal by 3.7 hPa in the month of August and above normal by 1.4 hPa in the month of September. Summary of the intensity of Australian High for the past 5 years is given in Table 13.

(Source : Climate Diagnostic Bulletin, NOAA, June to September 2007. Normal based on the means for the base period of 1979-1995)

4.5. *ENSO Phenomenon*

The combined oceanographic and atmospheric phenomena, ENSO, resultant of El-Nino and Southern Oscillation, has shown an inverse relationship with the Indian Summer monsoon rainfall during some years. The phase and magnitude of ENSO can be indicated either by the Sea Surface Temperature (SST) anomalies over the Pacific or by Southern Oscillation Index, SOI, expressed as the difference in the atmospheric surface pressure between Tahiti, an island station in the Southeast Pacific ocean and Darwin, Australia. In general, an inverse relationship between ENSO and Indian summer monsoon rainfall has been observed. However, there is no one - to - one correspondence between the two and in recent years, the relationship is seen to be weakening.

TABLE 12

Intensity of Mascarene High during monsoon season for the years 2002-2007

Year	June		July		August		September	
	Pressure (hPa)	Departure (%)	Pressure (hPa)	Departure (%)	Pressure (hPa)	Departure (%)	Pressure (hPa)	Departure (%)
2002	1024	2	1027	1.5	1030	4	1024	0.5
2003	1023	-1.5	1025.5	-1	1026	-1	1023.5	3
2004	1028	5	1026	0.5	1026	0	1023	-0.5
2005	1024	1	1024	-1.5	1026	0	1026	2.5
2006	1020.6	-2.4	1025.2	-0.3	1021.8	-4.2	1023.5	0.0
2007	1021.8	-1.2	1022.0	-3.5	1021.6	-4.4	1021.0	-2.5

TABLE 13

Intensity of Australian High during Southwest monsoon season for the years 2002-2007

Year	June		July		August		September	
	Pressure (hPa)	Departure (%)	Pressure (hPa)	Departure (%)	Pressure (hPa)	Departure (%)	Pressure (hPa)	Departure (%)
2002	1022	0	1022	0	1022	1.5	1017	-1
2003	1022	-1	1022	1	1020.5	-1.5	1018	-2
2004	1022	0	1022	0	1017	-3.5	1020	2
2005	1018	-4	1022	0	1022	1.5	1015.5	-2.5
2006	1027.2	5.2	1024.5	2.5	1025.2	4.7	1023.6	5.6
2007	1024.1	2.1	1024.3	2.3	1024.2	3.7	1019.4	1.4

Table 14 depicts the monthly values of Sea Surface Temperature Anomaly indices (SSTA) for Nino 4, Nino 3 and Nino 1+2 regions and SOI for the period from October 2006 to September 2007. The Nino 1+2 index showed slight cooling from October 2006 till May 2007, then slight warming for June and then steady cooling from July to September 2007.

The SST over Nino 3 region remained warmer from October 2006 till Feb 2007 and was cooler till September 2007; SST over Nino 4 region was warm from October 2006 to August 2007 and then was marginally cooler in September 2007. SOI has been -1.1 in January 2007, -1.7 in October 2006, +0.2 in June and September 2007.

4.6. Indian Ocean Dipole (IOD) Event

Indian Ocean Dipole (IOD) phenomenon is one of the manifestations of the tropical air-sea interaction, which is characterized by the anomalous cooling of the

sea surface temperature (SST) in the southeastern equatorial Indian Ocean and anomalous warming of SST over the western equatorial Indian Ocean. The Dipole Mode Index (DMI) is defined as the SST anomaly difference between tropical western Indian Ocean (50-70° E, 10° S - 10° N) and the southeastern Indian Ocean (90 - 110° E, 10° S - Equator). Whenever DMI is positive, the phenomenon is referred as positive IOD and whenever DMI is negative, it is known as negative IOD. Many studies have shown that IOD events have impact on rainfall of the Indian Summer Monsoon.

The time series of SST anomalies over the equatorial east Indian Ocean showed an abrupt development of persistent cold SST anomalies over the east equatorial Indian Ocean indicating the positive phase of IOD. Some recent literature indicated a positive relationship between the positive phase of the dipole event and the Indian monsoon rainfall. It was also shown that the relationship is strongest during the month of September.

TABLE 14

SST anomaly indices (ENSO)

Month	Pacific SSTA (°C)			SOI
	Nino 1+2 0°-10°S 90°-80°W	Nino 3 5°N-5°S 150°-90° W	Nino 4 5°N-5°S 160°E-150°W	
Oct 2006	1.3	1.0	1.0	-1.7
Nov 2006	1.0	1.1	1.3	0.1
Dec 2006	0.6	1.3	1.2	-0.5
Jan 2007	0.5	0.9	0.8	-1.1
Feb 2007	0.2	0.1	0.6	-0.5
Mar 2007	-0.7	-0.3	0.5	-0.4
Apr 2007	-1.2	-0.3	0.3	-0.4
May 2007	-1.6	-0.7	0.2	-0.4
Jun 2007	-1.4	-0.6	0.3	0.2
Jul 2007	-1.6	-0.8	0.2	-0.5
Aug 2007	-1.6	-1.1	0.1	0.1
Sep 2007	-1.9	-1.3	-0.3	0.2

TABLE 15

Details of lowest isobaric values (hPa) of the heat low during past 5 years

Month	Year				
	2001	2002	2003	2004	2005
June	988.0(21 st & 22 nd)	986.0 (7 th , 8 th & 27 th)	990.0(17 th)	988.0(26 th)	988 (26) & 990 (18 th & 19 th)
July	988.0(2 nd)	990.0(4 th , 9 th & 30 th)	992.0(7 th)	988 (1 st & 2 nd)	988 (1 st & 2 nd) & 990 (11 th)
August	998.0(11 th)	991.0(9 th)	991.0(2 nd)	990.0 (1 st & 2 nd)	990 (1 st & 2 nd) & 992 (16 th)
September	997.0(4 th)	993.0(2 nd)	998.0(9 th & 10 th)	996.0(1 st)	996 (1 st) & 997 (4 th , 5 th & 6 th)

5. Semi-permanent systems

5.1. Heat low

The Heat low made its appearance in its near normal position by 13 June and remained more or less over there (though diffused, on many days in July & August) until 24 September.

The lowest and the second lowest pressure values of the heat low were:

Jun : 987 hPa (on 15) and 990 hPa (on 25)

Jul : 988 hPa (on 14) and 989 hPa (on 2)

Aug : 991 hPa (on 13) and 993 hPa (on 12 & 14)

Sep : 997 hPa (on 1 & 4) and 999 hPa (on 3 & 18)

Details of the lowest observed isobaric values of the Heat Low during past five years are given in Table 15.

5.2. Axis of the monsoon trough

An east-west trough in the lower levels was seen over the Gangetic plains during 11 – 13 June. Subsequently, a heat trough could be demarcated at sea level from NW India to north Bay on 14, 15 & 20 June and 26 June – 3 July. It got established as the monsoon trough, subsequent to the monsoon covering the entire country on 4 July.

Quite often in the month of July, the western end of the monsoon trough remained to the north of the normal position. The entire trough shifted to the foot hills of the

Himalayas during the period 19 – 22 July & 26 – 27 July. For a shorter period *viz.*, 19-24 July, a secondary trough was seen over the NE India.

It remained more or less in the normal position during the first fortnight of August. But subsequent to the dissipation of the well marked low pressure area (10 – 14 August), the trough shifted to the foot hills of the Himalayas and remained there during 16-17 August. Though the eastern end gradually shifted southwards, the western end oscillated north-south towards the end of August.

In the beginning of September, the eastern end remained south of normal, but gradually the entire trough shifted northwards and the western part remained close to the foot hills till 15 September. Thereafter, it started shifting southwards and remained slightly to the south of normal till 23. It became less marked thereafter, with the formation of a low pressure area over the northeast Arabian Sea.

For ready comparison, a brief data on monsoon trough in the past five years are given below:

<i>Year</i>	<i>Axis of monsoon trough</i>
2002	Established on 15 August. Less marked on 16 September.
2003	Established on 5 July. Less marked on 16 September.
2004	Established on 18 July. Less marked on 22 September.
2005	Established on 30 June. Less marked on 2 September.
2006	Established on 24 July. Less marked on 14 September.

5.3. *Tibetan anticyclone/high*

The Tibetan Anticyclone (TA) was established in its near normal position at 500, 300 & 200 hPa on 21 June. It was absent at 500 & 300 hPa on many days during the second half of July. It remained to the northeast of its normal position during most of August and slightly to the west during September. Though it was noticed upto 30 September, on many days it was absent at various levels from 3 September onwards.

The details of Tibetan Anticyclone for the past five years are given below.

Year Tibetan Anticyclone

2002	Established on 11 July. Not seen in July at 500 hPa. Less marked on 12 September.
2003	Established on 15 June. Not seen at 500 hPa during June & first half of July. Less marked on 14 September.
2004	Established on 13 June. Not seen at 500 hPa during June & first half of July. Less marked on 18 September.
2005	Established on 26 June. Remained more or less at normal position in June, slightly to the south in August and north of its normal position till 27 September.
2006	Established on 7 June. Not seen at 500 and 300 hPa on most of the days during June and July. Less marked from 10 September onwards.

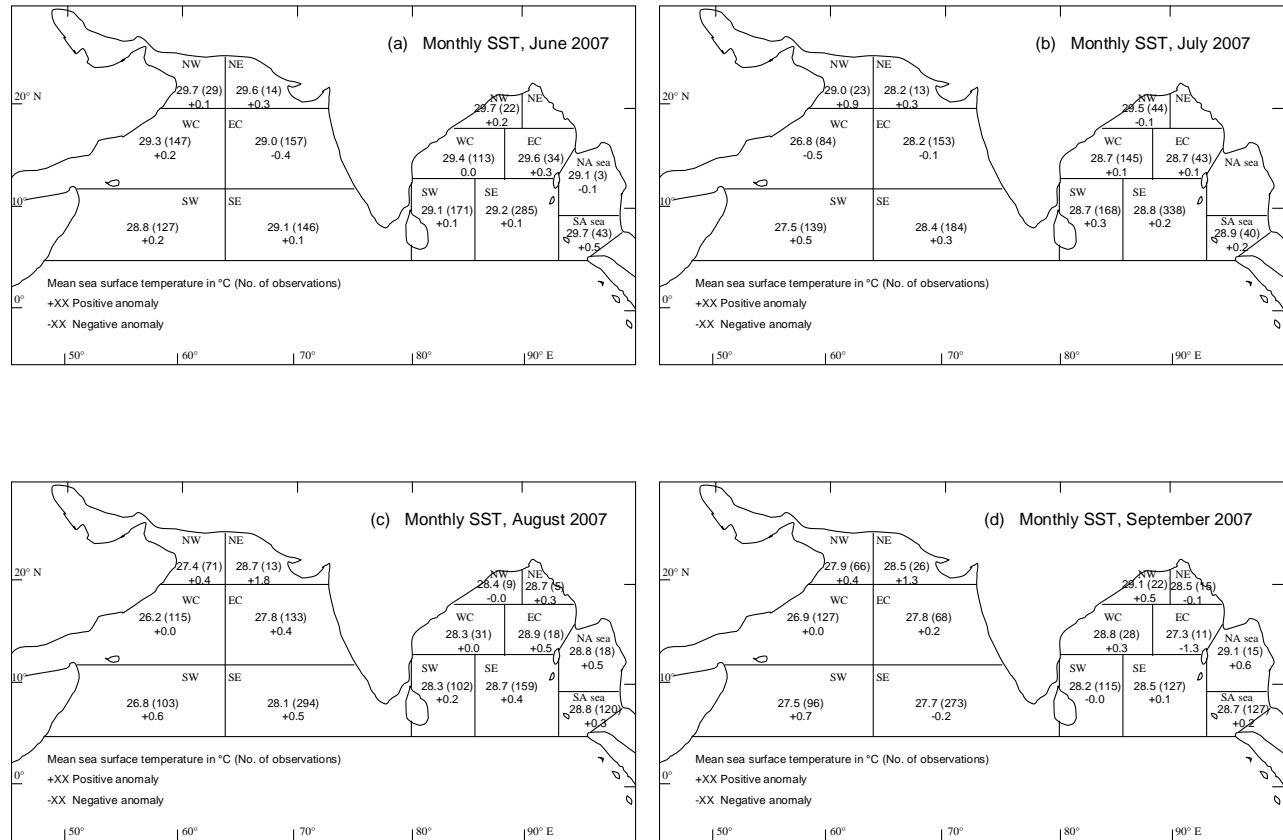
5.4. *Sub-Tropical Westerly Jet (STWJ)*

STWJ was seen over Srinagar and Ranchi latitudes upto 27 June. By the end of the season, it re-appeared over Srinagar on 3 October and over Delhi on 7 October.

The days during which the Sub-tropical Westerly Jet was observed in the past five years are given below:

Year Sub-Tropical Westerly Jet (STWJ)

2002	Seen over north India during first week of June and reappeared in the last week of September.
2003	Seen over Srinagar on 5 June. Reappeared on 1 October.
2004	Seen over Srinagar upto 23 June, over Ranchi until 20 June and reappeared in the first week of October.
2005	Seen over Srinagar upto 22 June, over many stations like Delhi, Lucknow, Srinagar and Lucknow during second half of July and August and over Delhi, Srinagar & Lucknow on 15, 23 and 30 September respectively.
2006	Seen over Srinagar and Delhi Latitudes upto 11 June, shifted northwards thereafter and made casual re-appearances. It was seen over Delhi and Srinagar from 29 September.



Figs. 10(a-d). Mean SST and SST anomaly in (°C) for (a) June, (b) July, (c) August and (d) September 2007

5.5. Tropical Easterly Jet (TEJ)

Southern most stations viz., Thiruvananthapuram, Minicoy and Port Blair started reporting jet speed winds from mid May. It was found to cover a wider latitudinal belt often in July & August and was present upto 9 October. A core wind speed of 100 kts was noted over Thiruvananthapuram, Minicoy, Port Blair and Visakhapatnam on a few days in June, July and August.

Jet speed winds were observed at Thiruvananthapuram from 19 May to 6 October. The maximum wind speed reported was 100 kts (at 135 hPa on 0000 UTC of 28 June and at 139 hPa on 1200 UTC of 16 August). It was seen over Chennai from 11 June to 9 October. Maximum wind speed noticed was 90 kts at 146 hPa on 1200 UTC of 8 June. Over Minicoy, it

appeared from 17 May to 21 September. Over here, a maximum wind speed of 100 kts was reported on 17 July (1200 UTC), 2 August (1200 UTC) & 10 September (0000) UTC at 102, 144 & 138 hPa respectively. Over Port Blair, it appeared on 16 May and was noticed till 7 October. Maximum wind speed of 100 kts was reported on 13 July (1200 UTC), 7 August (0000 UTC) & 12 (0000) UTC at 157, 156 & 120 hPa respectively It appeared over Mumbai on 30 May and was present until 9 September. The maximum wind noticed was 90 kts (at 100 hPa at 1200 UTC of 30 June and at 129 hPa at 1200 UTC of 13 August).

Apart from these, quite often in the months of June & July, Jet speed winds were reported over Kolkata, Visakhapatnam, Hyderabad, Nagpur, Bhubaneswar, Ranchi etc.

Also, Jet speed winds were also reported over Hyderabad, Visakhapatnam, Bhubaneswar, Kolkata, Nagpur and Ranchi during various parts of the season.

Details of TEJ in the past five years are as follows.

Year Tropical Easterly Jet (TEJ)

- 2002 Seen from 7 June, till the end of September. Maximum wind speed 105 knots at 137 hPa over Chennai on 18 June.
- 2003 Seen from 9 May to 25 September. Maximum wind speed 125 knots at 116 hPa over Minicoy on 25 July.
- 2004 Seen from 10 May to 30 September. Maximum wind speed 180 knots at 118 hPa over Minicoy on 22 June.
- 2005 Seen from 6 June to 28 September. Maximum wind speed 110 kts at 198 hPa over Thiruvananthapuram on 31 July and over Chennai at 100 hPa on 8 July
- 2006 Seen from 11 May to 4 October. Maximum wind speed 100 kts at 128 hPa on 1 July over Thiruvananthapuram and over Minicoy on 25 July and 31 August at 202 and 200 hPa respectively.

6. Sea Surface Temperature (SST)

Monthly mean Sea Surface Temperature values for June, July, August and September 2007 for the Arabian Sea, Bay of Bengal as well as Andaman Seas are discussed below:

In the Figs. 10(a-d), the monthly mean Sea Surface Temperature values along with the anomalies over the Northwest Northeast, Westcentral, Southwest, Southeast blocks of both the seas and also for North and South Andaman seas for the months of June, July, August and September are shown. The normal values for each block for calculating the anomalies have been estimated from the isopleths of normal values given in the publication "Climatic Atlas of Indian Ocean, Part-I" by Stephen Hastenrath and Peter J.Lamb.

6.1. June

The NW, NE, WC, SW and SE sectors of the Arabian Sea and EC Bay were warmer than normal with NE Arabian Sea having positive anomaly of 0.3° C and EC Arabian Sea being cooler than normal by 0.4° C.

Over the Bay of Bengal, north Andaman Sea SST was near normal and the SST over all other sectors were above normal with maximum anomaly of +0.5° C observed over the South Andaman Sea.

6.2. July

The NW, NE, EC, SW and SE sectors of the Arabian Sea were warmer than normal with NW Arabian Sea having positive anomaly of +0.9° C. The WC Arabian Sea was cooler than normal by 0.5° C. The WC, EC, SW, SE and South Andaman Sea were warmer than normal with positive anomaly of 0.3° C observed in the SW Bay of Bengal. The NW sector of Bay of Bengal was cooler than normal by 0.1° C.

6.3. August

All sectors of the Arabian Sea were warmer than normal and NE sector showed positive anomaly of +1.8° C. All sectors in the Bay of Bengal were warmer than normal and north Andaman Sea showed a maximum positive anomaly of +0.5° C.

6.4. September

The NW, NE, WC, EC & SW sectors of the Arabian Sea were warmer than normal and SE sector was cooler than normal. NE Sector of Arabian Sea had higher positive anomaly of +1.3° C.

In the Bay of Bengal, NW, WC, SE sectors of the Bay and north & south Andaman Sea were warmer than normal. The remaining sectors were cooler than normal. The highest positive anomaly of +0.6° C was observed over the North Andaman Sea.

7. Other features

7.1. Weekly upper wind anomalies in southwest monsoon 2007

The circulation anomaly features during SW Monsoon Season 2007 are discussed below monthwise at lower, middle and upper tropospheric levels (850, 700 & 200 hPa). Also the zonal wind anomalies observed at 4 different stations over the peninsula are given in Table 16.

7.1.1. June wind anomaly features

At 850 hPa, anomalous cyclonic circulations over the south Arabian Sea, northeast Arabian Sea and adjoining Gujarat region were observed. An anomalous anticyclone over the northeast Bay of Bengal and neighborhood was observed.

TABLE 16
Zonal wind anomalies

Pressure level (hPa)	Week ending																
	0706	1406	2106	2806	0507	1207	1907	2607	0908	1608	2308	3008	0609	1309	2009	2709	0410
TRV																	
850	-4.2	-6.8	6.0	-1.0	-0.3	6.1	-1.9	-4.1	-5.1	-0.6	-4.3	-6.6	-2.2	2.7	-5.2	10.7	13.9
500	-8.7	-11.5	-9.6	-3.1	-0.1	-2.3	1.0	-10.3	4.9	4.7	-6.0	-7.5	-0.7	1.3	-15.5	10.9	8.0
200	1.9	-2.1	-	0.3	-7.3	-11.9	-12.2	-12.5	-0.5	6.2	19.1	-2.2	-0.6	2.0	-9.2	-4.5	-15.5
MDS																	
850	-7.8	-10.2	-10.2	6.5	8.0	7.5	3.0	-17.3	-9.7	10.7	-2.8	-7.7	-8.1	4.2	-7.2	10.0	16.0
500	-7.3	-14.5	-17.9	-	-	2.9	-	-	-	-	-	-	-	-8.6	-12.5	-	8.9
200	-2.1	-14.9	-	-	-	-	-	-	-	-	-	-	-	-	-11.3	-	-
BMB																	
850	-8.6	-2.8	-6.3	-3.4	11.1	14.3	-2.8	-12.3	-4.6	3.8	5.7	1.1	-9.7	-0.9	-7.8	-0.8	9.2
500	-1.2	-14.7	-2.9	-6.3	12.1	8.0	2.6	-1.0	-6.9	4.2	-4.3	-0.1	-4.6	-2.3	5.4	-0.7	6.2
200	10.7	-20.9	-12.7	12.8	29.4	-6.2	-4.9	-1.2	-5.8	-1.0	-9.4	-6.0	-0.7	-4.5	-4.3	-3.2	5.4
NGP																	
850	-1.9	0.9	-2.1	-3.0	-	10.9	-3.8	-5.7	-3.3	-2.4	7.5	-1.0	-11.9	-1.6	5.9	-7.3	0.6
500	2.3	-7.9	-2.6	-13.6	-	4.2	-6.7	7.3	7.0	5.5	5.8	3.5	-10.6	-11.3	6.9	-9.7	1.9
200	11.4	-	-11.7	-	-	-	-7.0	-	12.4	9.8	-17.2	-11.8	-3.3	-8.8	1.4	-0.4	2.7

Note : 1. Easterly anomalies (-ve) at 850 hPa means that westerlies are weaker than normal.
2. Westerly anomalies (+ve) at 200 hPa means that easterlies are weaker than normal.
3. A station reporting '-' means no data.

At 500 hPa, anomalous cyclonic circulation was observed over northern parts of India. Anomalous weak easterlies were observed over peninsular India.

At 200 hPa, an anomalous anticyclone over Madhya Pradesh was observed. Anomalous northerlies were observed over northern parts of India where as anomalous easterlies prevailed over Peninsular India.

In the weekly pattern, the anomalous cyclonic circulation was seen in the first week over the West Central Arabian sea and adjoining East Central Arabian sea due to the presence of the super cyclonic storm 'Gonu'. The anomaly ridge was seen at 850 and 700 hPa between Lat. 20° to 22° N from the second week till third week and in the fourth week it is replaced by anomalous cyclonic circulation over Konkan and Madhya Maharashtra at 850 hPa.

Anomalous easterlies/South easterlies were seen at 850 hPa till the third week over the Peninsula. It was replaced by westerlies over the peninsula in the fourth week.

7.1.2. July wind anomaly features

At 850 hPa level, an anomalous cyclonic circulation over the southwest Arabian Sea and anomalous anticyclone over the east central Bay of Bengal were observed. Anomalous cyclonic circulations were observed over Gujarat, Himachal Pradesh & northeastern region. Anomalous southeasterlies indicating subdued monsoon activity was seen over the peninsula.

At 500 hPa, anomalous anticyclone was observed over central parts of India. A few anomalous cyclonic circulations were also observed over peninsular India.

At 200 hPa, an anomalous anticyclone was observed over northwestern and northeastern parts of the country and the anomalous ridge was observed at about Lat. 27° N.

In the weekly pattern, three anomalous cyclonic circulations were seen, first over west Madhya Pradesh and neighborhood, second over West Bengal and neighborhood and the third over the NE Bay and adjoining NW Bay between 850-500 hPa in the first week of July.

In the second week, an anomalous cyclonic circulation was seen over Central India extending upto 500 hPa. In the third week, anomalous cyclonic circulation was seen over the NE Arabian Sea off Saurashtra & Kutch, extending upto 700 hPa and cyclonic circulation over the NE Bay and adjoining NW Bay off Bangladesh coast extending upto 500 hPa. An anomalous anticyclone over East Rajasthan and neighbourhood extending up to 500 hPa was observed. In the last week, anomalous ridge line was seen running from Gujarat to Orissa.

7.1.3. August wind anomaly features

At 850 hPa level, an anomalous anticyclone was seen over the west central Bay of Bengal. An anomalous cyclonic circulation over the northern parts of west coast and adjoining Arabian Sea was also observed. Easterly anomalies were observed over the peninsular India suggesting weaker monsoon circulation and subdued cross equatorial flow.

At 500 hPa, anomalous anticyclone was observed over central & northern parts of India. The anomalous ridge was observed at 25° N.

At 200 hPa level anomalous easterlies prevailed over the south Arabian Sea. An anomalous anticyclonic flow was observed over practically all over India, with the ridge line located along 32° N latitude.

During the first week, two cyclonic circulations, one over Gujarat and neighborhood and the other over Orissa and neighborhood were seen at 850 hPa. In the second week anomalous anticyclone over Karnataka and Andhra Pradesh at 850 hPa and in the third week a cyclonic circulation was seen over Gangetic West Bengal and neighborhood between 850-500 hPa. Anomalous ridge line was seen from 15° - 17° N at 850-500 hPa.

During the last week of August, a ridge line was seen over 25° - 28° N between 850- 500 hPa and over Lat. 31° N at 200 hPa.

7.1.4. September wind anomaly features

Two anomalous cyclonic circulations were observed at 850 & 700 hPa over northeastern states and over Gujarat, Saurashtra and off Maharashtra coast. At 500 hPa, an anomalous cyclonic circulation was observed over Andhra, Orissa and Chattisgarh and neighborhood.

The ridge line was located at Lat. 28° N at 500 hPa. At 200 hPa, anomalous anticyclone was seen over northern and eastern parts of the country.

During the first week, anomalous cyclonic circulations were seen over the EC Arabian sea off

Maharashtra coast, over Telangana and neighborhood and over north Andhra coast and neighborhood at 700 hPa. A ridge line is seen between Lat. 24°- 26° N at 700 hPa and at Lat. 34° N at 200 hPa.

During the second week, anticyclone was seen over the WC Bay extending from 850 hPa till 500 hPa. A ridge line was seen along Lat. 17° N over 500 hPa and along Lat. 22° N over 200 hPa.

During the third week, anomalous cyclonic circulation was seen over the WC Bay extending upto 500 hPa. The ridge line was seen along Lat. 28° N at 200 hPa.

During the fourth week, anomalous cyclonic circulation was seen over Gujarat coast and neighborhood upto 700 hPa. A cyclonic circulation was seen upto 500 hPa over Orissa and neighborhood. In the last week, the anomalous cyclonic circulation was seen over north Maharashtra and neighborhood, second one over the NW Bay off Orissa coast extending upto 500 hPa.

7.2. Aridity conditions during southwest monsoon 2007

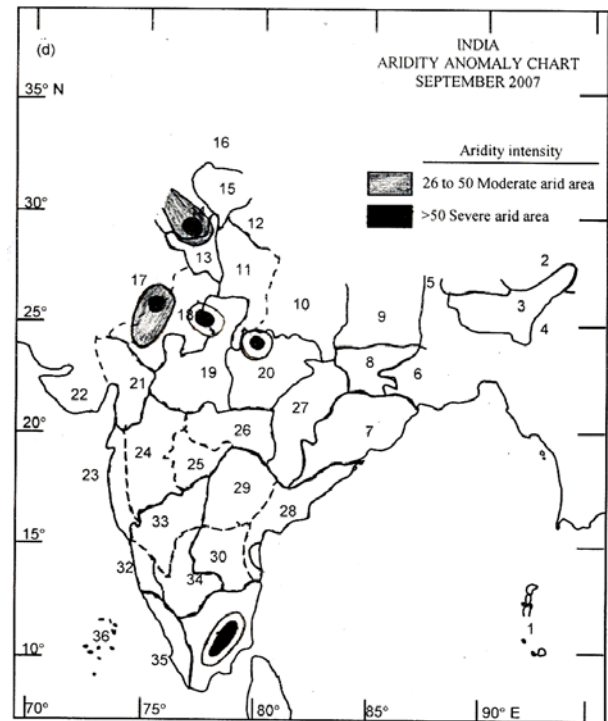
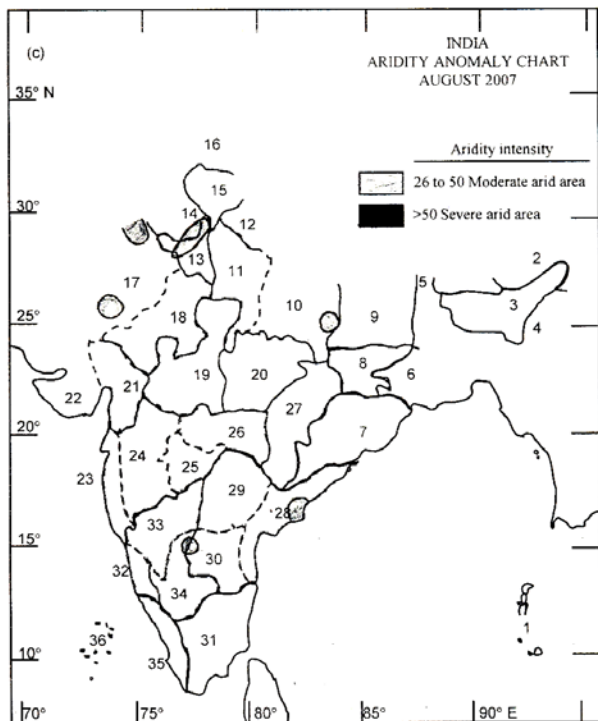
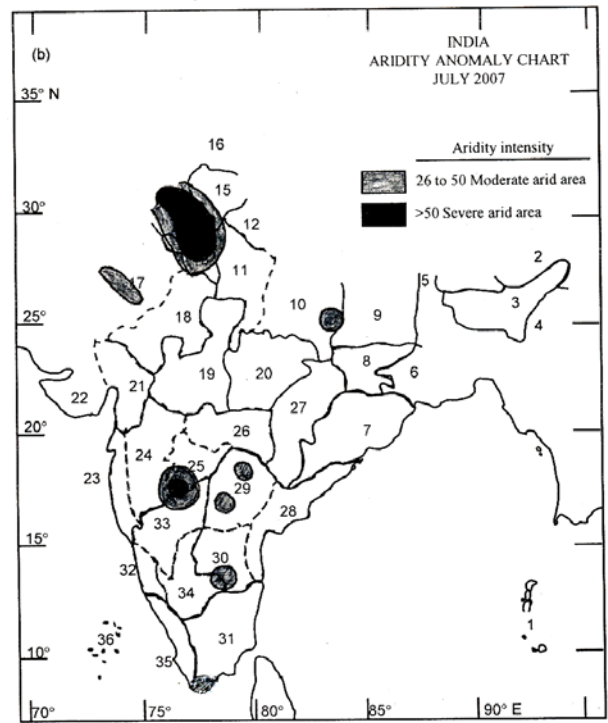
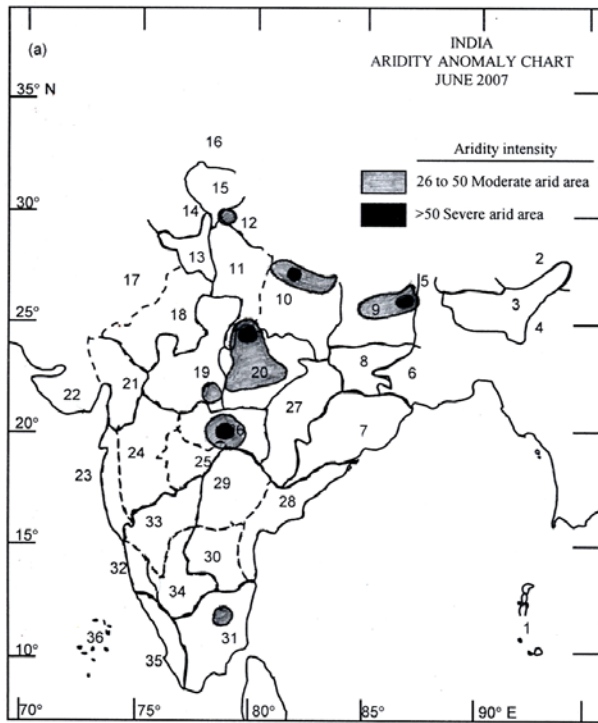
Aridity Index (AI) is computed based on Thornthwaite's formula :

$$AI = \frac{PE - AE}{PE} \times 100$$

Where, PE is potential evapotranspiration, which is nothing but the loss of water vapour to atmosphere in the form of evaporation from soil and transpiration from the plants, when the supply of water is unlimited. This is the water need of the plants. AE denotes the Actual Evapotranspiration and PE - AE denotes the water deficiency. PE is computed by Penman's modified equation and AE is obtained from the water balance procedure, which takes into account the water holding capacity of the soil.

The aridity anomaly is worked out by considering the difference between actual aridity and normal aridity for the month. Aridity of a particular region is decided based on the aridity anomalies, which have been classified as follows:

<i>Aridity Anomaly</i>	<i>Class</i>
0 or less	non-arid
1 to 25	mild arid
26 to 50	moderate arid
more than 50	severe arid



Figs. 11(a-d). Aridity anomaly chart for the month (a) June, (b) July (c) August and (d) September 2007

Aridity Anomaly maps for June, July August and September are given in Figs. 11(a-d).

Moderate to severe arid conditions were noticed in the eastern and central parts of the country, with some isolated pockets in northern, central and peninsular regions in June.

In July, moderate and severe arid conditions disappeared from eastern parts of the country and were found over northwestern parts. Only moderate arid conditions were found in eastern, northwestern and peninsular region.

In August, severe arid conditions disappeared from northwestern and western parts of the country. Moderate arid conditions were found in northwestern, eastern and peninsular region.

In September, moderate to severe arid conditions were noticed in some northwestern, west central and peninsular parts of the country.

The details of severe and moderate arid conditions which prevailed over the country during Southwest monsoon season are given below monthwise :

7.2.1. June

(a) *Severe Arid Areas*

(i) Isolated areas around Bahraich (East Uttar Pradesh), Sabour (Bihar), Nowgong (East Madhya Pradesh) and Yeotmal (Vidarbha).

(b) *Moderate Arid Areas*

(i) *Large areas of East Madhya Pradesh*

(ii) Small areas of northern parts of East Uttar Pradesh; southern and southeastern parts of Bihar and adjoining northern part of Jharkhand and adjoining western part of Sub Himalayan West Bengal; southcentral parts of Vidarbha.

(iii) Isolated areas around Dehradun (Uttaranchal), Betul (West Madhya Pradesh) and Salem(Tamil Nadu).

7.2.2. July

(a) *Severe Arid Areas*

(i) Large areas of Punjab.

(ii) Small areas of northweswestern parts of Haryana.

(iii) Isolated area around Solapur (Madhya Maharashtra).

(b) *Moderate Arid Areas*

(i) Small areas of western and southern parts of Punjab, central parts of Haryana and adjoining northwestern part of West Uttar Pradesh and adjoining western part of Himachal Pradesh; central parts of West Rajasthan; southeastern parts of Madhya Maharashtra; northwestern parts of North Interior Karnataka and southern parts of Marathwada.

(ii) Isolated areas around Varanasi (East Uttar Pradesh); Puri (Orissa), Ramagundam and Hyderabad (Telangana); Arogyavaram (Rayalaseema) and Kanyakumari (Tamil Nadu).

7.2.3. August

(a) *Severe Arid Areas* NIL

(b) *Moderate Arid Areas*

(i) Small areas of central parts of Haryana.

(ii) Isolated areas around Varanasi (East Uttar Pradesh); Ganganagar and Jodhpur (West Rajasthan); Kakinada (Coastal Andhra Pradesh) and Bellary (South Interior Karnataka).

7.2.4. September

(a) *Severe Arid Areas*

(i) Small areas of southcentral parts of Tamil Nadu.

(ii) Isolated areas around Patiala (Punjab), Ajmer (East Rajasthan), Sheopur (West Madhya Pradesh) and Nowgong (East Madhya Pradesh).

(b) *Moderate Arid Areas*

(i) Large areas of Punjab.

(ii) Small areas of northwestern parts of Haryana; western parts of East Rajasthan and adjoining eastern part of West Rajasthan and eastern parts of East Rajasthan and adjoining northwestern part of West Madhya Pradesh; northern parts of East Madhya Pradesh and adjoining small southern part of West Uttar Pradesh and East Uttar Pradesh; southeastern parts of Tamil Nadu.

(iii) Isolated area around Nellore (Coastal Andhra Pradesh).

TABLE 17

Representative rainfall amounts (>7 cm) during June – September 2007

Date (1)	June (2)	July (3)	August (4)	September (5)
1	Pen 10, Basar & Passighat 9 each, Amini Divi 8,	Vasai 47, Bhagamandala 43, Thane 33, Ponampet 32, Mumbai & Kottigehara 26 each, Palghar, Bhira & Khargaon 24 each, Medikeri 21, Khandwa 19, Humchadakatte 18, Betul, Harnai, Kammardi & Hinganghat 17 each, Dahanu, Mahabaleshwar, Sulya & Valparai 16 each, Selu, Jat, Jayapura & Sringeri 15 each, Kameshwar, Morshi, Siddapura, Naduvattam & Kollur 14 each, Anand, Sawantwadi & Asthi 13 each, Jambugoda, Bramhapuri, Nagpur & Talaguppa 12 each, Kadi, Subramany & Gudalur Bazar 11 each, Varamgam, Dehra Dun, Mahuba & Madapura 10 each, Dhar, Ranpur, Gorsad, Tarapur, Nadiad, Thasra, Alibag, Baroda, Wardha, Dharmasthala & Sakaleshpura 9 each, Thrissur, Petlad, Vallabh Vidyannagar, Bhiwandi, Vengurla, Yeotmal, Somwarpet & Kasargode 8 each, Uttarkashi, Pachmarhi, Dholka, Cambay, Kalol, Halol, Matar, Kalyan, Kankavli, Vaibhavwadi, Valpoi, Igatpuri, Amraoti, Puttur, Yellapura, Koppa & Kuppady 7 each	Boson 23, Matizuri 18, Dehra Dun 17, Bhalukpong & Panagarh 15 each, Sevoke & Durgapur 13 each, Beki Mathanguri, Gheropara, Dharamsala, Atmakur, Lalgudi & Red Hills 11 each, Kaimganj & Orathanadu 10 each, Karimganj, Banbasa, Nandyal, Thiruvapur & Haripad 9 each, Kalwakurthy, Srisailam, Chengalpattu & Nagapattinam 8 each, Phulbani 7, Chouldhowaghat, Neora, Tilpara Barrage, Katerniaghat, Ludhiana, Morvi, Bhimavaram, Yerragondapalem, Vedaranniyam, Marungapuri, Alapuzha & Kayamkulam 7 each	Jamnagar 20, Gaganbavada 18, Kotkasim, Maliya, Panjim & Dabolim 15 each, Margaon, Pernem & Quepem 14 each, Sanguem, Ponda, Lava, Chargharia, Lanjha & Karwar 12 each, Valpoi 11, Baghdogra, Triveni, Kakardharighat, Gandevis, Dwarka & Mapusa 10 each, Balrampur, Chandradeepghat, Nainital, Neemrana, Keshod, Ranavav, Gandhidham, Vengurla, Malvan & Ankola 9 each, Khadda, Hardwar, Kishangarhvas, Veraval, Sawarkundla, Vasai, Bhira, Sindkhararaja & Kunkuri 8 each, Lakhipur, Margherita, Hasimara, Uttarkashi, Bansda, Kodinar, Mangrol, Botad, Joida, Kalyanpur, Ratnagiri, Kankavli, Sawantwadi, Dodamarg, Visakhapatnam, Mudibidre & Agumbe 7 each
2	Cumbum & Mahabubabad 7 each	Broach 49, Limdi 44, Dediapada 40, Babra 37, Padra 34, Mansot & Mahabaleshwar 33 each, Kottigehara 32, Ranpur 30, Chuda 26, Jhagadia & Pardi 25 each, Talaguppat, Poorampet, Bulsar, Silvasa, Vagra & Valsad 24 each, Vallabhipur 23, Mudigere 22, Barwala, Karjan, Botad, Lathi & Bhira 21 each, Gandevis, Madhuban, Nandod & Amreli 20 each, Bodeli, Dhanduka, Ukai, Waghodia, Palitana, Bagsra & Sayla 19 each, Bansda, Songadh, Vapi, Gondal & Umarala 18 each, Chhotaudaipur, Matar, Tarapur & Wadahvan 17 each, Anand, Baroda, Borsad, Dabhoi, Dharampur, Kamrej, Sihor, Valparai & Bhagamandala 16 each, Daman, Jambusar, Mangrol, Umargaon, Valod, Jasdan & Peint 15 each, Cambay, Khed, Nanipalsan, Igatpuri, Surgana, Trimbak, Hosanagara, Agumbe & CIAL Cochi 14 each, Ankleshwar, Olpad, Petlad, Sagbara, Sankheda, Sinor, Vallabh Vidyannagar, Linganamakki & Thirthahalli 13 each, Jobat, Ahwa, Anklav,	New Delhi 17, Bareilly 14, Kashipur 13, Maharajganj 11, Karwar & Churu 10 each, Aroya, Rohtak, Kotdwar, Devgad & Vapi 9 each, Chidambaram, Valpal, Anantpur, Rajghat & Dabolim 8 each, Jalpaiguri, Sriniketan, Lucknow, Jabalpur, Nandyal, Alibag, Mumbai & Ratnagiri 7 each	Amraghat 13, Gharmura, Dabolim & Gaganbavada 12 each, Bhalukpong, Pottangi & Honavar 11 each, Todaraisingh, Jamnagar, Dhanora & Etapalli 10 each, Chouldhowaghat, Vapi, Silvasa, Murud, Rajapur, Panjim, Marmugoa, Sangrampur, Sukma & Ankola 9 each, Lakhipur, Sonbarsa, Ladpura, Daman, Lathi, Shrivardhan, Mandasa & Karwar 8 each, North Lakhimpur, Dholai, Sevoke, Lalbegiaghat, Amet, Umargaon, Surat, Vyara, Roha, Mhasala, Guhagar, Dapoli, Khed, Sangamneswar, Lanja & Ratnagiri 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
		<p>Gandhinagar, Mandevi, Gogha, Rajkot, Sholapur, Barshi & Akkalkot 12 each, Kottayam, Belonia, Sabroom, Dadahu, Renuka, Chikhli, Mahuva, Chotila, Dhrol, Mumbai, Siddapura, Kalasa, Kammardi, Thrissur & Vaikom 11 each, Jategaon Barrage, Dhar, Dahegam, Kapadvanj, Khagaria, Guler, Hoshangabad, Jalalpur, Jambugoda, Navsari, Palsana, Savli, Karkala, Humchadakatte, Medikeri, Kanjirapally, Kozha & Paravur 9 each, Patna, Dehra Dun, Tilakwada, Kumta, Sringeri, Kollengode, Perinthalmanna & Shenkottai 8 each, Nainital, Amod, Bardoli, Nadiad, Prantij, Surat, Valia, Lakhatar, Lilia, Mahuva, Thane Belapur, Alibag, Pune, Naduvattam, Bhatkal, Sirsi, Virajpet, Koppa & Karipur 7 each</p>		
3	Tikrikilla & Raichur 7 each	<p>Jamnagar 41, Lalpur 36, Sidhpur 33, Kotri, Kadana & Trimbak 32 each, Bodeli 31, Bhira 29, Santrampur & Kutiana 27 each, Patan & Lodhika 26 each, Meghraj, Muli & Igatpuri 25 each, Bhanvad 24, Unjha, Dhrol, Junagarh & Manavadar 23 each, Radhanpur & Sami 22 each, Karipur, Harij, Prantij, Vadgam, Visnagar, Amreli, Sayla, Hosanagara, Kozhikode & Pattambi 21 each, Himmatnagar, Idar, Mokhada, Mahabaleshwar & Thrithala 20 each, Uttarkashi, Becharaji, Kheralu, Mehsana, Modasa, Chotila, Jetpur, Kalawad, Rajula & Jawahar 19 each, Diamond Harbour, Kolkata, Jambugoda, Savarkunda & Linganamakki 17 each, Kankrej, Vijapur, Kalyanpur & Wadahvan 16 each, Ahwa, Dharoi, Palanpur, Songadh, Vadnagar & Agadipuram 15 each, Nandurbar, Bansda, Dhansura, Mangrol, Nanipalsan, Okha, Ranavav & Perinthalmanna 14 each, Bhagamandala, Caning town, Sallopat, Mansa, Viramgam, Gondal, Maliya, Mangrol, Talasari, Nasik, Kollur & Kammardi 13 each, Chansma, Mandal, Satlasana, Jodia, Wada, Niphad, Surgana & Kunnamkulam 12 each, Rajkot, Uluberia, Ghumarwin, Kotda, Chikli, Nimbahera, Sagbara, Ukai, Jasdan, Keshod, Peint, Mannarkad & Thrissur 11 each, Caning town, Tiuni, Bayad, Bhiloda, Wanakbori, Khambha, Lakhatar, Rajkot, Talala, Vanthali, Wankaner, Ulhasnagar, Sinner, Siddapura,</p>	<p>Bhatkal 39, Shrivardhan 22, Gaganbavada 21, Sawantwadi 18, Bhira, Valpoi & Shirali 16 each, Sapotra, Saharanpur, Nahan, Paonta & Honavar 13 each, Panjim 12, Dehra Dun 11, Umerkote, Churu, Mumbai, Agumbe & Karwar 10 each, Baragaon & Ratnagiri 9 each, Kothagudam 8, Bareilly & Panambur 7 each</p>	<p>Daporijo & Kumta 13 each, Shirali & Bhagamandala 12 each, Bhalukpong, Pottangi, Bosan, Nalagarh, Patan, Kota, Ankola & Agumbe 11 each, Cherrapunji, Tadong, Navrangpur, Valpoi, Bhatkal, Honavar & Kannur 10 each, Gaganbavda, Jalpaiguri, Koraput & Aheri 9 each, Chepan, Panjim, Quepem, Durg, Puttur, Subramanya & Karwar 8 each, Sibsagar, Gangtok, Sevoke, Diana, Gajoldoba, Nagrakata, Malkangiri, Kandapada, Palampur, Rajapur, Dabolim, Canacona, Saoli, Gadchiroli, Athagarh, Arakonam, Poondi, Mudibidre, Dharmasthala, Karkala, Kollur & Virajpet 7 each</p>

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
		Agumbe, Kottigehara, Aluva & Chittur 10 each, Silvasa, Valod Maya Bandar, Ahmedabad, Bardoli, Dabhoi, Detroj, Dharampur, Gandevi, Madhuban, Nadiad, Anjar, Dhoraji, Jafrabad, Mahuva, Nakhtrana, Upleta, Mumbai, Pune, Jayapura & Paravur 9 each, Long Island, Harinkhola, Suri, Kasol, Kelwara, Shergarh, Daman, Dholka, Gandhinagar, Kalol, Khanpur, Khed, Matar, Sanad, Sinor, Thasra, Babra, Bhuj, Dhari, Dwarka, Kodinar, Kalyan, Sirsi, Sringeri, CIAL, Cochi, Mananthavady & Vadakara 8 each, Dholai, Durgachak, Bahaich, Malakpur, Chikhli, Dediapada, Dhanpur, Mahuva, Palsana, Pardi, Vapi, Dhrangdhra, Lilia, New Kandla, Palghar, Thane, Murbad, Bhatkal, Dharmasthala, Koppa & Sagar 7 each		
4	Diana & Mangalvedha 10 each, Domohani 9, Beki Road Bridge, Barpeta, Gajoldoba & Gangtok 8 each, Murti, Nagrakata & Tadong 7 each	Palanpur 45, Mount Abu 35, Pindwara 28, Deesa 27, Kotda 25, Sirohi 24, Durgachak & Haldia 22 each, Patan 21, Vijaynagar, Vadgam & Mahabaleshwar 20 each, Diamond Harbour & Sidhpur 19 each, Canning Town & Abu Road 18 each, Sami & Contai 16 each, Dhanera & Murbad 15 each, Kolkata, Becharaji, Kankrej, Harili, Idar & Kozhikode 14 each, Dhansura, Kelwara, Digha, Bhograi, Jaleshwar, Railmogra, Rajasmand, Reodar, Dantiwada & Bhagamandala 13 each, Jaswantpura, Bhainsroadgarh, Hurda, Nathdwara, Mandal, Modasa & Ulhasnagar 12 each, Desuri, Sedwa, Dabla, Unjha, Visnagar, Mansa, Prantij, Ahwa, Bardoli & Ukai 11 each, Bali, Chittorgarh, Danta, Himmatnagar, Bhiwandi, Thane Belapur, Kamardi & Irikkur 10 each, Phoolberia, Mussoorie, Bhopalgarh, Sanchore, Sojat, Arnod, Gyangarh, Jhalod, Kotri, Mandalgarh, Mehsana, Vijapur, Kadana, Vallabhipur, Kalyan, Thane, Sulya, Linganamakki, Enamackel, Kunnamkulam & Manjeri 9 each, Dengraparaghat, Marwar Junction, Sumerpur, Aria, Ladpura, Roopaheli, Sheoganj, Kadi, Kheralu, Chansma, Meghraj, Sahapur, Sirsi, Sringeri, Karipur & Vadakara 8 each, Long Islands, Tikrikilla, Bankura, Bashirhat, Rajghat, Ranchi, New Tehri, Pantnagar, Sundernagar, Bilara, Amet, Begu, Bhungra, Bijoliya,	Mahabaleshwar 22, Mhasai & Murud 20 each, Taliparamba 19, Dahanu 18, Dapoli, Mangaon & Bhira 17 each, Surat 15, Harnai 13, Katra, Gaganbavada 12, Honavar, Kottigehara, Upleta, Vallabh Vidyanagar & Kamrej 11 each, Namaul, Ujjain & Khandwa 10 each, Umargaon & Vanthali 9 each, Manavadar 8, Dhansura & Agumbe 7 each	Passighat 18, Idar 17, Neora, Pali 14, Cherrapunji 13, Basar, Jalpaiguri & Rajkot 12 each, Namsai & Hasimara 11 each, NH-31 & Bareilly 10 each, Lalbegiaghat, Domohani, Junagarh & Valpoi 9 each, AIE NH Xing, Margherita, Rairangpur, Uskabazar, Dharoi, Dodamarg, Korba & Pawni 8 each, Gajoldoba, Champua, Moradabad, Mehsana, Devgad, Kudal, Kankanjli, Panjim, Dabolim, Mapusa & Agumbe 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
		Kota, Mavli, Rashmi, Wav, Kedbrahma, Vijaynagar, Sagbara, Vapi, Mandvi, Mokhada, Mumbai, Harnai, Yellapura, Siddapura, Somwarpet, Sagar, Aluva, Kannur, Thalasserry & Thrissur 7 each		
5		Mokhada 14, Sikadia, Harinkhola, Panchet, Karera, Mangliyawas, Wada, Shahapur, Vasai & Linganamakki 13 each, Suri, Mohanpur, Mython, Mohanpur, Desuri, Karoikalan, Jawahar, Mython & Kottigehara 12 each, Gheropara, Kansabati Dam, Kolkata, Midnapore, Jamshedpur, Sumerpur, Bagore, Merta, Dhambola, Gyangarh, Bhiwandi, Surgana & Mahabaleshwar 11 each, Sriniketan, Simulia, Tusuma, Barrackpur, Pali, Mount Abu, Ajmer, Hamirgarh, Palghar, Ratnagiri & Agumbe 10 each, Kotdwar, Abu Road, Sheoganj, Dabla, Kelwara, Rashmi, Mandalgarh, Rajasmand, Ambernath, Ulhasnagar, Belthangadi & Talaguppa 9 each, Amet, Canning Town, Durgachak, Haldia, Rajghat, Rairangpur, Siddapura, Sinderi & Sringeri 8 each, Sayla, Krishnanagar, Jaleswar, Nagaur, Garhi, Veja, Mavli, Railmogra, Rawatbhata, Sawai Madhopur, Sawar, Shahpura, Dantiwada, Meghraj, Daman, Talasari, Murbad, Karkala, Hosanagara, Mudiger & Kammardi 7 each	Veraval 12, Umargaon, Jalalpur & Dahanu 11 each, Mahuva, Vapi, Jamnagar, Dabolim & Karwar 10 each, Bardoli, Bhira, Dwarka & Mahabaleshwar 9 each, Sanand, Madhuban, Silvasa, Navsari & Porbandar 8 each, Balasinor, Idar, Nanipalsan & Idar 7 each	Cherthala, Sukiapokhri, Domohani, Telkoi & Hrishikesh 8 each, Miao, Dibrugarh, Chouldhowaghat, Kokrajhar, Baghdogra, Sawai Madhopur, Kalyanpur & Cannur 7 each
6	Hut Bay, Agumbe & Alapuzha 8 each, Neora 7	Kharagpur & Jamsolaghat 27 each, Mohanpur 26, Purihansa, Midnapore & Kalaikunda 23 each, Jhumpura, Joshipur & Rairangpur 21 each, Rajghat & Tiring 20 each, Baripada & Jamshedpur 19 each, Thakurmunda & Jatrai 18 each, Phoolberia & Ghatgaon 17 each, AIE NH Xing, Simulia, Kharidwar, Dengraparaghat & Keonjharagarh 16 each, Diamond Harbour, Champua, Swampatna, Chandanpur & Udala 15 each, Goalpara, Haldia, Tusuma, Durgachak & Bangirposhi 14 each, Kansabati Dam 13, Contai, Bhograi, Jaipur, Ramanujanj & Ramgarh 12 each, Kalimpong, Pedong, Balimundali, NH-5 Govindpur & Pampukini 11 each, Munsong, Bankura, Uluberia, Balasore, Jaleswar, Telkoi, Pallahara, Karanjia, Tilaiya, Magliyawas & Thodupuzha 10 each, Manas N H Xing, Diana, Digha, Anandpur, Barkisurya,	Okha 38, Humchakdakatte 36, Agumbe 31, Kottigehara 29, Siddapura 25, Puri 22, Vythiri 21, Ahwa, Bansda 20, Veraval & Bhubaneswar 19 each, Nimapara 18, Pardi, Gandevi 16, Paradip 15, Mahabaleshwar 14, Dharampur, Porbandar & Honavar 13 each, Mahuva & Cannur 12 each, Navsari, Gopalpur & Bhira 11 each, Jalalpur & Valod 10 each, Karwar & Panjim 9 each, Padra, Mandvi & Mandvi 8 each, Chikhli & Bardoli 7 each	Triveni 32, Cherrapunji 18, Darjeeling 17, Jena-pur 16, Kalimpong 15, Colgaon, Uskabazar, Bhokar, Umrer & Prathipadu 13 each, Jharsuguda, Jagraon, Matheran & Mohol 12 each, Kokrajhar, Suki-apokhri, Sukinda, Banbasa, Nagode, Karjat, Nagpur, Kuhi, Adilabad & Bhadrachalam 11 each, Ne-ora, Gheropara, Khadda, Didihat, Tanakpur, Mahabaleshwar, Armori & Dhamdha 10 each, Sevoke, Bijanbari, Bhubaneshwar, Pawni, Bhadravati, Varora, Chimur, Kurkheda, Arvi, Arang & Durg 9 each, Murti, Swampatna, Hindol, Balimundali, Allahabad, Multai, Bhopal, Bhira, Pali, Polad-pur, Nanded, Kinvat, Billoli, Basmal, Mul, Saoli, Bramhapuri, Gadchiroli, Chamorshi, Hinganghat, Karanja, Kampatti, Surajpur, Konta, Peddapuram, Tuni, Koida, Sriramsagar & Dharmasthala 8 each, Itanagar,

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
		Tenughat & Mahabaleshwar 9 each, Kokrajhar, Lahuni para, Konner & Pisagan 8 each, Khanitar, Singlabazar, Kolkata, Nilgiri, Soro, Sukinda, Panposh, Ranchi, Bansi, Uskabazar, Karanprayag, Jammu, Bali, Bhopalgarh, Pokhran, Jawaj, Khinvensar & Merta 7 each		AIE NH Xing, Mati-zuri, Karimganj, Imphal, Champasari, Hasimara, Gajoldoba, Ghatgaon, Jhumpura, Thakurmunda, Dunguripalli, Bhagalpur, Munger, Gorakhpur, Mandla, Kamrej, Sawarkundla, Gondal, Mahad, Mhasala, Gangakhed, Purna, Amraoti, Chandra-pur, Wardha, Sarangarh, Dantewada, Machilipatnam, Polavaram, Kunavaram, Chennai, Subramanya, Sulya, Kanjirappally & Cannur 7 each
7	Kadiri & Mangalvedha 12 each, Rayampet & Vempalli 9 each, Murti, Jamkhandi, Sindhanur, Kunigal, Neora & Kasargod 8 each, Kundapura & Chepan 7 each	Deogarh 22, Jamankira & Bhagamandala 20 each, Narsingharh 18, Sakshipura, Katghora & Sakaleshpura 17 each, Mandiram Dam, Lahuni para, Rajgangapur & Kollur 16 each, Kammardi 15, Kuchinda, Jharsuguda, Laikera & Pali 14 each, Deogaon, Baragaon, Karanjia, Mahasamund, Sulya & Kottigehara 13 each, Rengali, Arang, Gharghoda, Sringeri & Munnar 12 each, Swamapatna, Pallahara, Bijepur, Paikmal, Panposh, Sundergarh, Biora, Rajgarh, Raigarh & Ballupet 11 each, Jhumpura, Hirakud, Mungeli, Dharmasthala, Jayapura & Medikeri 10 each, Champua, Rairakhhol, Barkot, Reamal, Sonapur, Atru, Pachmarhi, Khandwa, Narsingpur, Deori, Saraipali, Basua, Champa, Sakti, Valparai & Somwarpet 9 each, Dillighat, Keonjhar, Khairamal, Ambabhona, Harabhanga, Kantamal, Navrangpur, Jabalpur, Thakurmunda, Binika, Dunguripalli, Choth Ka Barwara, Betul, Jabalpur, Bilaspur, Korba, Kunkuri & Madapura 8 each, Sukinda, Ghatagaon, Telkoi, Sambalpur, Rajkishorenagar, Bargarh, Padampur, Sohela, Bolangir, Patnagarh, Phulbani, Bundi, Sawai Madhopur, Jhabua, Janjgir, Akaltara, Jaijaipur & Kondagaon 7 each	Porbandar 39, Armori 37, Manavadar 36, Umerkote & Bramhapuri 35 each, Porbandar 29, Humchadakatte 27, Daringibadi, Olpad & Mangrol 25 each, Bhanjanagar 24, Dongargaon 23, Rajkot 21, Surat 20, Barwala 19, Radhanagari 17, Jamnagar 15, Jagdalpur & Betul 14 each, Chandrapur 13, Mahabaleshwar 12, Deesa 10, Wardha, Raipur, Medikeri & Panjim 9 each, Nagpur 8, Karwar 7	Cherrapunji 37, Lava & Chepan 25 each, Diana 22, Darjeeling & Kalimpong 18 each, Tikrikilla, Dhubri, Sevoke, Cooch Behar, Alipurduar, Hasimara, Nagrakata & Neora 17 each, Mahudha 16, Kokrajhar & Murti 15 each, Bhalukpong, NH-31 & Asnawar 13 each, Karauli 12, Belonia, Baghdogra, Bijanbari, Mathabhanga & Gajoldoba 11 each, Khanitar, Amod & Mangrol 10 each, Singlabazar, Kannod & Olpad 9 each, Barpeta, Dharamtul, Jai Bharali NT X-ing, Champasarai, Sukiapokhri, Baghpat, Kamrej, Kalamb, Kurkheda, Honavar & Agumbe 8 each, Itanagar, Shillong, Goalpara, Ghatagaon, Koraput, Ganaur, Pipalkhunte, Palanpur, Dabhoi, Aheri, Chandrapur, Etapalli, Pandharkawada, Ambikapur & Shirali 7 each
8	Cherrapunji 13, North Lakhimpur, Agartala & Tiruppuvanam 11 each, Aravakrichi & Quilandy 10 each, Sivaganga & Khanapur 9 each, Nirmal, Thirthala, Hasimara & Dharapuram 8 each, Kokrajhar, Kangeyam & Chitampatti 7 each	Harda 40, Betul 37, Ramganjmandi 25, Agar 22, Rawatbhata 21, Bhasdehi, Narsullaganj 19, Multai 17, Narsighpur, Bhopal, Hoshangabad & Bareli 16 each, Bakni, Begamganj & Ashta 15 each, Amrawara, Askot, Amarwada, Bhainsroadgarh, Pachpahar & Udaipura 14 each, Asthi, Sangod, Anther & Khirkiya 13 each, Selu, Katol, Srinagar, Khanpur &	Talala 47, Kodinar & Maliya 31 each, Karjat 28, Dhar & Veraval 24 each, Becharaji & Kadi 23 each, Bhatkal & Matheran 21 each, Amreli 20, Jamnagar & Mahabaleshwar 18 each, Kapadvanj 17, Brahmapuri 14, Ratlam 13, Betul, Mumbai 12, Rajkot 11, Amraoti, Dahanu & Bhira 9 each	Cherrapunji 36, Sabroom 21, Sevoke 17, Hayaghat, Sikandarpur & Shillong 15 each, Lengpui, Kalimpong, Diana & Minicoy 11 each, Benibad, Samastipur, Goalpara & Passighat 10 each, Baghdogra, Chepan, Jamankira & Kotputli 9 each, Khadda & Panagarh 8 each, Kokrajhar, Gharmura & NH-31 each, Deogarh, Munger, Dasua, Lalsot, Nainwa & Buldhana 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
		Dug 12 each, Amraoti, Budhni & Shajapur 11 each, Patti, Chanderi, Khandwa, Sehore, Malanjkhanda & Bichhia 10 each Puthimari, Joida, Pirawa, Sujalpur, Lanjhi, Mahabaleshwar, Nagpur & Pali 9 each, Jia Bharali N T Xing, Nawarangpur, Aklera, Gangdhar, Raisen, Katghora & Baloda Bazar 8 each, Khowang, Dharamtul, Degod, Pipalda, Atru, Sakargarh, Kotputli, Neemrana, Buhana, Jhalawar, Jhalarpatan, Sambher, Chachora, Ganjbasoda, Sironj, Sagar, Gaganbavada & Korba 7 each		
9	Dhubri 31, Tikrikilla 28, Barpeta 26, Beki Road Bridge 18, Cherrapunji 17, Manas N H Xing 15, Dhollabazar 12, Namsai, AIE N H Xing, Goalpara, Chepan, Thalassery & Vadakara 8 each, Kota & Vaibhavwadi 7 each	Garhi 49, Danpur 39, Sagwara 35, Kesarpura 33, Banswara 32, Bagidora & Ratlam 31 each, Ghatol & Kushalgarh 25 each, Arnod, Bhungra & Bhiloda 24 each, Sajjangarh 23, Khanapur, Loharia, Pipalkhunt & Sallopat 22 each Santarampuram, Galiakot & Sabla 21 each, Kadana 20, Arthuna, Agar & Ujjain 19 each, Shergarh, Dhar & Mahabaleshwar 18 each Nithuwa & Raisen 17 each, Jogindernagar, Aspur & Kottigehara 16 each, Dharamshala, Kotda, Susner, Idar & Siddapura 15 each, Dhambola, Indore & Kammardi 14 each, Sirsi, Belthangady & Indore 13 each, Ghamroor, Dariabad, Ganeshpur, Mandasaur, Vidisha, Yellapura & Kiravatti 12 each, Ghumarwin, Sujapur Tira, Begu, Chikhli, Dug, Biora, Linganamakki & Sringeri 11 each, Bhuntar, Bharwain, Mandargarh, Dodamarg, Valpoi, Bhagamandala, Humchadakatte, Sakaleshpura & Valapari 10 each, Ranjit Sagar Dam, Nadaun, Theog, Kasauli, Pirawa, Veza, Sarangpur, Shajapur, Santrampur, Modasa, Dabhoi, Dharamasthala, Banavasi & Jayapura 9 each, Shahapur Kandi, Berthin, Gohar, Dariabad Salumber, Jhalod, Lunawada, Sawantwadi, Dabolim, Pernem, Sanguem, Satara, Karkala, Belgaum, Dharwad & Ballupet 8 each, Baghdogra, Palampur, Sundernagar, Bangana, Sirohi, Khilchipur, Rajgarh, Sujalpur, Dhansura, Himmatnagar, Meghraj, Po nda, Mudibidre, Mani, Kollur, Shiralkoppa, Koppa, Kannur & Vadakara 7 each	Joida 27, Becharaji 26, Ranavav 25, Jamnagar 23, Nanipalsan Bhanvad 22, Lalpur 21, Mandal, Mehsana, Radhanpur & Madhuban 20 each, Kalyanpur, Maliya Miyana, Peint, Trimbak & Bhagamandala 19 each, Porbandar, Mundra, Surgana & Agumbe 18 each, Dwarka, Talasari, Murbad & Kottigehara 17 each, Dhrangdhra, Kharaghoda, Dahanu, Jawahar & Subramanya 15 each, Aspur, Kalol, Kapadvanj, Harij & Daman 14 each, Banswara, Visnagar, Santrampur, Sidhpur, Dediapada, Dharampur, Pardi, Ukai, Bhuj, Ambernath, Radhanagari & Kammardi 13 each, Bhoond, Kedbrahma, Umargaon, Silvasa, Okha & Mahabaleshwar 12 each, Saulighat, Dehra Dun, Katra, Shergarh, Sallopat, Fatepura, Limkheda, Lunawada, Kathalal, Valsad, Bansda, Chikhli, Navsari, Ahwa, Mahuva, Dhrol, Mokhada, Ulhasnagar & Vasai 11 each, Shahpur Kandi, Dholka, Kadi, Vijapur, Khanpur, Bayad, Sagbara, Gandevi, Songadh, Kodinar, Kalyan, Humchadakatte & Jayapura 10 each, Bagidora, Sabla, Satlasana, Anklav, Mansa, Vadgam, Wav, Balasinor, Mahemdabad, Chansma, Patan, Sami, Meghraj, Prantij, Vapi, Jalalpur, Keshod, Manavadar, Sutrapada, Veraval, Kutiana, Morvi, Anjar, Bachhau, Kutch Mandvi, Naliya, Bhiwandi, Igatpuri, Thirthahalli, Koppa, Guddalur Bazar & Naduvattam 9 each, Athagarh, Didihat, Sajjangarh, Detroj, Dharoi, Godhara, Kadana, Idar, Modasa, Mangrol, Nakhtrana, Panhala, Ajra, Dharamasthala & Sringeri 8 each, Dharamsala, Kesarpura, Jagpura, Loharia, Dungarpur, Veja, Nithuwa, Garbada, Petlad, Nadiad,	Cherrapunji 42, Agathi & Kavaratti 15 each, Chikballapur & Sabroom 11 each, Chintamani & Birpur 9 each, Galgalia, Lengpui & Saoner 8 each, Chargharia, Baghdogra, Manas NH Xing, Karimganj, Tikrikilla, Rewa, Eluru, Minicoy & Khonsa 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
			Himmatnagar, Mandvi, Surat, Mangrol, Vanthali, Halvad, Lakhatar, Kalawad, Rajkot, Upleta, Abdasa, Valpoi, Shahapur, Chandgad, Shahuwadi, Mani, Karkala, Belthangadi, Medikeri, Talaguppa, Somwarpet, Hosanagara, Mudigere, CIAL Cochi & Munnar 7 each	
10	Cherrapunji 29, Chepan 16, Belonia 14, Barpeta 13, Alipurduar 11, Dhubri, Shillong & Cooch Behar 9 each, Kuchinda, Koikuntalam, Murud, Koppal, Motunga, Goalpara, Mahad & Kasargode 7 each	Dhansura 47, Bayad 41, Prantij 37, Vijapur 33, Himmatnagar 30, Idar 24, Long Island & Dantiwada 20 each, Kheralu & Modasa 18 each, Balasinor, Wanakbori & Kollur 17 each, Jhalod 16, Palanpur 15, Visnagar, Khedbrahma & Yellapura 14 each, Maya Bandar, Dharoi, Vadnagar, Kadana, Shehra, Khanapur & Kochi 13 each, Galgalia, Mount Abu, Kushalgarh, Sallopat, Mahabaleshwar, Cherthala & Vaikom 12 each, Santrampur, Vadgam, Wav, Bhiloda & Meghraj 11 each, Kotda, Fatepura, Dahegam, Joida, Kottigehara & Kumarakom 10 each, Bagidora, Mavli, Pindwara, Rajasmand, Reodar, Kapadvanj, Siddapura, Thirthahalli, Hosanagara & Aluva 9 each, Sajjangarh, Veja, Subsera, Dohad, Limkheda, Mansa, Tharad, Patan, Karipur, Kottayam, Kozhikode, Kunnamkulam & Manjeri 8 each, Passighat, Aspur, Badnore, Kelwara, Loharia, Nithuwa, Sabla, Shergarh, Devgandhararia, Godhara, Danta, Dhanera, Kathalal, Margaon, Sirsi, Bhagamandala, Humchadakatte, Sakaleshpura, CIAL Kochi, Kozha, Nedumbassery, Mancompu, Paravur & Thrissur 7 each	Keshod 23, Maliya 22, Maya Bandar & Talala 18 each, Chalakudy, Okha & Bhagamandala 16 each, Quilandy & Bachhau 15 each, Lakhapat, Sirgaon & Thrissur 14 each, Dwarka, Medikeri, Enmackel & Vadakara 13 each, Radhanagari, Kutiana, Nakhtrana, Madapura & Agumbe 12 each, Manavadar, Mangrol, Vanthali, Rahpar, Valparai & Irikkur 11 each, Abdasa, Mahad, Mahabaleshwar, Subramanya, Dharmasthala, Jayapura, Sringeri, Kozha & Thrithala 10 each, Joida, Anjar, Gandhidham, Kutch Mandvi, Belthangadi, Somwarpet, Kottigehara, CIAL Cochi, Kozhikode & Paravur 9 each, Long Island, Jamnagar, Upleta, Bhuj, Bhira, Kannur & Cochi 8 each, Junagarh, Veraval, Bhanvad, Gudalur Bazar, Bantwal, Mudibidre, Kammardi, Virajpet & M udigere 7 each	Beki Mathanguri 17, Cherrapunji 15, Simga 13, Kuzhithurai 12, Karimganj 10, Kunigal, Hasimara, Kailashahar, Dhone, Belthangadi & Tarikere 9 each, Sevoke, Diamond Harbour, Dharmanagar & Molkalmuru 8 each, Bissam, Cuttack, Kurkheda, Khairagarh, Jaijaipur, Saundatti, Ranebennur, Kottigehara, Ajjampura, Davanagere, Konni & Punalur 7 each
11	Belonia 17, Cherrapunji 16, Ziro 14, Bijapur 12, Kailashahar 11, Matizuri, Sabroom & Dharamnagar 10 each, Eluru & Chitaguppa 9 each, Gariaband 9, Silchar, Mangalore & Agartala 8 each, Mal a 7	Bayad 26, Gajoldoba, Kapadvanj 19, Sanad 18, Dahegam & Hosanagar 17 each, Maya Bandar 16, Balasinor 15, Long Island, Kathalal & Galgalia, 14 each, Mathabhanga & Wanakabori 13 each, Baghdogra, Wav & Mansot 12 each, Nangal Dam, Bhinay, Devgandhararia & Sami 11 each, Limkheda, Dediapada, Linganamakki & Sringeri 10 each, Champasarai, Sajjangarh, Dhanpur, Jambugoda, Lunawada, Baroda, Padra, Talaguppa, Thrithahalli & Vaikom 9 each, Lava, Gudamalani, Mahudha & Thasra 8 each, Silchar, Dholai, Alipurduar, Kasol, Atru, Garbada, Jhalod, Anklav, Gandhinagar, Dhansura, Modasa, Bodeli, Dabhoi, Sankheda & Dharmasthala 7 each	Agumbe 18, Champa 16, Balod 15, Uttarkashi 14, Jayapura 13, Margherita, Kutiana & Jhanjgir 12 each, Dungurupalli & Sringeri 11 each, Radhanagari 10, Bokajan, Bihubar, Junagarh, Puri & Didihat 9 each, Bargarh, Sohela, Kotraguda, Daltonganj, Upleta, Kollur & Medikeri 8 each, Chouldhowaghat, Hirakud, Bijepur, Siddapura & Thrissur 7 each	Barki & Nagrakata 17 each, Chepan 15, Beki Mathanguri & Alipurduar 11 each, Neora 10, AIE N H Xing, Karimganj, Hasimara, Asansol & Kochi 9 each, Cherrapunji, Suri & Thodupuzha 8 each, Chouldhowaghat, Murti & Tilpara Barrage 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
12	Sonamura 20, Cherrapunji 18, Arani 16, Kailashahar, Mapusa & Kozhikode 13 each, Dharamnagar, Arundhutinagar & Udipi 11 each, Kotdwar & Hosdurg 10 each, Belonia, Vengurla, Cochi, Paravur & Thrissur 9 each, Gharmura, Pantnagar & Mangalore 8 each, Amarapur, Agartala, Sabroom, Bhoranj, Balurghat, Chinyalisaur, Devgad, Ketti, Pernem & Kasargode 7 each	Basar & Kokrajhar 15 each, Kaman 13, Kollur 12, Hirakud & Mancompu 11 each, Piplu 7 Kalol 10 each, Athagarh, Chouldhowaghat & Uttarkashi 9 each, Tadong, Cherrapunji, Agumbe, Dhenkanal, Peermedu & Gandhinagar 8 each, Thozhudur, Mehsana, Gangtok, Dehra Dun & Vadakara 7 each	Junagarh 33, Nadaun 23, Guler 21, Sundernagar & Lanjigarh 19 each, Bhavanipatna 18, Sikandarpur, Shahpur Kandi & Katra 17 each, Ghatgaon 16, Kashipur 15, Kotraguda, Naktideul & Madhopur 14 each, Sujanpur Tera & Ghamroor 13 each, Digha, Bissam Cuttack & Shimla 12 each, Nagrakata, Akhuapada, Chandbali, Agumbe, Kasol, Kundapura & Sharanpur 11 each, Shringeri 10, Umerkote, Haridwar, Uttarkashi, Nangaldam, Mahabaleshwar, Sunni & Nagrota Surian 9 each, Motunga, Baliguda, Dantewada & Karkala 8 each, Sukiapokhri Soro, Telkoi, Jaipatna, Kotagarh, Chatia, Benibad, Patna, Rewaghat, Chandigarh, Medikeri, Somwarpet Bhadrachalam, Berthin & Pandoh 7 each	Sevoke 14, Galgalia 12, Jalpaiguri 11, Champasarai & Kochi 10 each, Domohani 9, Bagdogra, Gajoldoba & Pirvom 8 each, Perumbavatur, Sabroom, Bansur, Valparai, Jagalur & Madhgiri 7 each
13	Agumbe & Manki 18 each, Marmugoa 14, Alipurduar & Kolkata 13 each, Thaliparamba & Kasargod 12 each, Mulki, Shirali & Amini Divi 11 each, Mahad, Honavar, Kannur & Piravom 10 each, Nizamabad & Chinoor 9 each, Singlabazar, Mapusa, Latur, Karwar, Thalasserry, Aluva, Darjeeling, Bijanbari, Nahan, Dharampur, Canacona, Medak, Mangalore, Kundapur & Mundargi 7 each	Mudigere 22, Pakanjur 15, Navrangpur, Agumbe & Kaman 13 each, Khowang, Sakti, Mani & Sakti 11 each, Sevoke, Konni & Peermade 10 each, Belthangadi, Bhagamandala, Dantewara & Subramanya 9 each, Meja, Deeg, Pahari, Korba, Valaparai & Vadakara 8 each, Agra, Faridabad, Jahajpur, Baloda Bazar, Devbhog, Junagarh, Jaijaipur & Belthangadi 7 each	Dharamsala 33, Nadaun 28, Bhograi 24, Sagar Island, Thakurmunda 23, Jaleswar 22, Mandiradam & Joshipur 21 each, Nainital 20, Digha & Rairangpur 19 each, Jamshedpur 18, Kasol & Mandi 17 each, Rajghat, Didihat & Kandaghat 16 each, Soro, Contai, Pandoh, Haridwar & Guler 15 each, Kharagpur, Sujanpur Tira, Barsar, Bhoranj, Kasauli & Kahu 14 each, Cherrapunji & Banbasa 13 each, Baripada, Hrishikesh & Sundernagar 12 each, Diamond Harbour, Uluberia, Durgachak, Balasore, Nilgiri, Panposh, Udala, Munger, Bosan, Marora & Una 11 each, Goalpara, Kolkata, Kalaikunda, Rajgangapur, Dehra Dun & Ramanujanj 10 each, Jaipur, Jhumpura, Swamptana, Chandanpur, Karanjia, Govindpur, Japla, Galgalia, Uttarkashi, Kalagarh, Shimla, Sunnibhaji & Paonta 9 each, Ghatagaon, Junagarh, Berthin & Nagrotasurrian 8 each, Bhalukpong, Midnapore, Sukinda, Keonjharagarh, Rajkanika, Bhavanipatna, Lanjigarh, Bangirposhi, Kosani, Mukteswar, Pantnagar & Jaten Barrage 7 each	Rawatsar 16, Nelamangala, Kunigal 11, Hut Bay, Dhenkanikottai, Rabkavi & Koratagere 10 each, Palacode & Mangalore 9 each, Sholapur, Indi & Bangalore 8 each, Alipurduar, Birpur, Sangli & Belthangadi 7 each
14	Ranpur 23, Baghdogra 14, Khowang & Phoolpur 13 each, Chouldhowaghat & Kalpa 12 each, Umerkote, Kotagarh & Sultanpur 11 each, Mahuva 10, Ranchi, Baloda Bazar, Barwaha, Bageshwar & Mulki 9 each, Passighat, Dibrugarh, Ukai & Mangalvedha 8 each, Sundergarh,	Arang 16, Mahasamund, Junagarh & M. Rampur 12 each, Khagaria, Bareilly & Khanitar 10 each, Kollur & Fursatganj 9 each, Singlabazar, Mahad & Humchadakatte 8 each, Mungeli Yellapura, Rewaghat, Galgalia, Gangtok, Chittorgarh, Ateli, Devbhog, CIAL Kochi,	Cherrapunji 21, Banbasa 18, Palmernganj, Patna & Nainital 17 each, Bankura 14, Sikandarpur & Tanakpur 13 each, Barpeta, Mukhlispur & Kashipur 12 each, Phoolbagh, Belonia, Panagarh, Rosera, Pantnagar & Naraingarh 11 each, Tilpara Barrage, Bankura, Basua & Indrapuri 10 each,	Athagarh 12, Bangalore 11, Chikballapur & Vellore 10 each, Aluva, Devanahalli 9, Ambejogai, Thali, Kudligi & Nilgiri 8 each, Hirakud, Sambalpur, Chengalpet, Nashik, Quepem, Malegaon, Addanki & CIAL Cochi 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
	Jaipatna, Dunguripalli, Patna, Didihat, Baijnath, Nahan, Bharwain & Alapuzha 7 each	Perinthalmanna, Nedumbassery & Kottayam 7 each	Sharahpur, Beki Road Bridge, Goalpara, Cooch Behar, Hatidah, Sripalpur & Dehra Dun 9 each, AIE N H Xing, Chouldhowaghat, Jia Bharali NT Xing, Kolkata, Didihat, Katra & Kurkheda 8 each, Dhubri, Manas N H Xing, Darjeeling, Sevoke, Sukiapokhri, Chepan, Tantloi, Asansol, Kamtaul, Saulighat, Kalagarh, Devprayag & Dharamsala 7 each	
15	Sevoke 31, Champasarai 17, Berhampur & Ghatgaon 13 each, Sankalan 12, Hosdurg 11, Durgapur, Swampatna, Kosani, Mahur & Kashipur 10 each, Itanagar, North Lakhimpur, Naharkatia, Jia Bharali N T Xing, Dharamsala, Gohar, Hingoli & Kozhikode 9 each, Passighat, Bankura, Mokhada & Patoda 8 each, Khowang, Lava, Baripada, Mustuffabad, Raisen, Rajgarh, Wada, Canacona, Adilabad, Panambur, Mangalore, Ankola, Karipur & Vadakara 7 each	Komna & Malda 12 each, Kottigehara, Udala, Junagarh & Panna 11 each, Balimundali 10, Mahabaleshwar, Umaria & Sangrampur 9 each, Mirzapur & Rajghat 8 each, Vijayawada, Gondia, Champasarai, Alipurduar & Khairi 7 each	Jalpaiguri 35, Domohani 25, Hardwar 24, Turtipar 21, Alipurduar, Chepan & Katerniaghat 19 each, Bhinga 18, Regoli & Uskabazar 17 each, NH-31, Lalbegiaghat & Basti 16 each, Gorakhpur & Birdghat 15 each, Rewaghat & Kakrahi 13 each, Cherrapunji 12, Kakardharighat 11, Cooch Behar, Galgalia, Gazipur & Matheran 10 each, Hasimara, Buxar, Bansi, Sultanpur, Nainital, Kalagarh & Hrishikesh 9 each, Sikandarpur, Mukhlispur & Banbasa 8 each, Chargharia, Chatia, Dengraghat, Gomatia & Poladpur 7 each	Agumbe 14, Amraghat 12, Lengpui, Ponnani & Enamackal 11 each, Kosagumda & Nimapara 10 each, Bihubar & Allagadda 9 each, Jayapura & Vaikom 8 each, Aizwal, Barpeta, Lakhipur, Bawal, Kotkasim, Kota, Sringeri & Davanagere 7 each
16	Baltara 23, Bhatkal 20, Cherrapunji & Islampur 19 each, Taibpur 16, Shirali 15, Kumta & Marmugoa 14 each, Sikandarpur, Honavar & Karwar 13 each, Agartala, Ponda & Mulki 12 each, Chouldhowaghat, Arundhutinagar, Gajoldoba, Kursela & Manki 11 each, Karimganj, Jalpaiguri, Panagarh, Udupi & Kundapur 10 each, Kokrajhar, Dabolim, Mangalore & Kavaratti 9 each, Margherita, Belonia, Diana, Jainagar, Muzaffarpur, Hoshangabad, Panambur & Perumbavur 8 each, Amraghat, Amarapur, Kailashahar, NH-31, Khagaria, Bareilly, New Delhi, Sonapat, Panjim, Quepem, Kollur, Ankola, Kottigehara & Agathi 7 each	Diamond Harbour 17, Bankura 16, Mananthawady 15, Bhagamandala 14, Contai 13, Khariar, Dillighat, Karauli, Bankura & Kalaikunda 12 each, Khesiary, Bhalukpong, Virajpet, Durgachak, Kharagpur & Haldia 11 each, Joshipur, Mythan, Chouldhowaghat, Mythan & Thalassery 10 each, Matunga, Kolkata, Bhograi, Rairangpur, Tilaiya, F. P. Zirka, Mahuva & Kollur 9 each, Naharkatia, Darjeeling, D. P. Ghat, Jamshedpur, Bemetara & Subramanya 8 each, Tendukheda, Gwalior, Ziro, Itanagar, Khowang, Harinkhola, Digha, Mohanpur, Padampur, Junagarh, Komna, Chanpatia, Saoner, Beria, Saja, Akaltara, Raijgarh, Mudibidre, Humchadkate, Kamardi, Kasargode & Mancompu 7 each	Chanpatia 26, Lalbegiaghat & Khadda 21 each, Ahirwalia & Sikandarpur 17 each, Lalganj 13, Rewaghat, North Lakhimpur & Triveni 11 each, Beki Road Bridge, Nalbari, Goalpara, Hatidah & Jalandhar 10 each, Dhubri & Cherrapunji 9 each, Suri & Saulighat 8 each, Nancowry, Sevoke, Hayaghat, Sonbarsa & Lalgudi 7 each	Miao & Kunnamkulam 9 each, Galgalia & Kannara 8 each, Chalakudy, Enamackel, Lengpui, Cooch Behar & Raighat 7 each
17	Matizuri 19, Chepan 16, Karimganj 15, Badarpurghat & Kollam 14 each, Passighat, Kokrajhar & Cooch Behar 13 each, Annapurnaghat 12, Mulki 11, Puthimari & Kailashahar 10 each, Dabolim, Vengurla, Nandigama & Agathi 9 each, Bhalukpong, Guhla, Kudal, Panjim, Mangalore, Panambur & Udupi 8 each, Tezu, Lakhipur, Goalpara, Ekmighat, Rosera, New Delhi, Safidon,	Agadippuram 27, Agumbe 23, Perinthalmanna 21, Valparai 20, Subramanya, Bhagamandala, Palamerganj & Darjeeling 19 each, Konni 18, Sukhiapokhri, Medikeri & Munnar 17 each, Gazipur, Lava & Puttur 16 each, Bantwal, Purnea, Cherrapunji, Kalimpong, Haripad & Karipur 15 each, Kollur & Koppa 14 each, Singlabazar, Dharmasthala, Sringeri, Kamardi, Irikkur, Kozha,	Lalbegiaghat & Khadda 19 each, Birpur 18, Chanpatia & Sonbarsa 17 each, Arani 12, Jhanjharpur 11, Barpeta & Kamtaul 10 each, Lalganj & Saulighat 9 each, Miao 8, Jai Bharali NT X-ing, Darjeeling, Bijanbari, Cooch Behar, Jalpaiguri, Krishnanagar & Didihat 7 each	Huzurabad 13, Car Nicobar 11, Badami, Muddebihal, Vadakara & Nalgonda 10 each, Gadag & Bagalkote 9 each, Shirahatti, Mundargi, Kayamkulam Alapuzha 8, Muthupet, Koyyalagudem & Udupi 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
	Marmugoa, Devgad, Sankalan, Aryanagar & Minicoy 7 each	Mavelikara, Thirthahala & Vaikom 13 each, Mani 12, Dehri, Indrapuri, Belthangaddy, Linganamakki & Aluva 11 each, Pedong, Shahadanagar, Varanasi, Sulya, Hosanagara, Kalaguppa, Chengannur, Kollam, Kottayam & Varthala 10 each, Katghora, Sevoke, Kamptee, Kataghora, Naduvattam, Mangalore, Siddapura, Somwarpet, Jayapura, Manjeri & Paravur 9 each, Itanagar, Buxar, Lalganj, Balmikinagar, Katerniaghat, Pali, Panambur, Thirthahalli, Madapura, CIAL Kochi, Kayamkulam & Mancompu 8 each, Tadong, Deogarh, Colgaon, Dengraghat, Jhawa, Kamtaul, Saulighat, Dheng Bridge, Kanpur, Phaphamau, Karauli, Vijayawada, Mudibidre & Kottigehara 7 each		
18	Lanji 18, Karimganj, Cooch Behar, Mathabhanga & Shrivardhan 13 each, Murud, Kuchinda, Neora & Bantwal 12 each, Tikarpada, Mhasala & Mancompu 11 each, Panambur & Athamalik 10 each, Passighat, Hasimara, Jharsuguda, Laikera, Mangaon & Panjim 9 each, Matizuri, Annapurnaghat, Arundhatinagar, Jalpaiguri, Khariar, Chiplun, Shirali & Thiruvananthapuram 8 each, Kailashahar, Sankalan, Chepan, Domohani, Mohanpur, Rania, Sri Ganganagar, Margoa, Marmugoa, Karwar & Kumta 7 each	Cherrapunji (RKM) 44, Cherrapunji 37, Basti 33, Ayodhya 31, Bhagamandala 28, Gonda 34, Balarampur & Kakrahi 21 each, Irikkur 14, Talaguppa, Sulya, Kollur, Sultanpur & Udupi 13 each, Kozhikode, Passighat & Mukhlispur 12 each, Khesiary, Karipur, Cannur, Kanpur, Linganamakki, Sringeri & Kannur 11 each, Pedong & Haripur 10 each, Dholla Bazar, Triveni, Regoli, Mani, Medikeri & Mancompu 9 each, Bird Ghat, Kammardi, Alapuza & Kochi 8 each, Tezu, Sabroom, Lava, Chatia, Sikandarpur, Gorakhpur, Siddapura, Puttur, Agumbe & Kottayam 7 each	Simulia 32, Dengraparaghat 23, Tusuma 22, Kansabati Dam & Phoolberia 20 each, Purihansa 19, Kharidwar & Rajghat 17 each, Kalaikunda 13, Mohanpur 12, Passighat, Bhograi, Jaleswar, Rairangpur, Kallakurichi & Rewaghat 11 each, Harinkhola, Midnapore, Digha & Panchet 10 each, Durgachak, Basti, Needamangalam & Gonda 9 each, Daporijo, Chouldhowaghat, Barkisurya, Basti & Melur 8 each, Baripada, Chandanpur, Pupunki, Gorakhpur & Mettupatti 7 each	Bhatkal 19, Belthangadi 16, Nandigama 12, Dhone, Pathikonda & Hanumansagar 11 each, Koppal, Kuknoor, Tavaregere & Bhimavaram 10 each, Khadda, Narsapur, Kamalapuram, Tanuku, Kundapur, Owk, Proddatur, Rajampet, Vempalli & Gadag 9 each, Chandrapur, Bapatla, Dummagudem, Karimnagar, Adirampattinam, Shirali, Munirabad & Rampura 8 each, Dholai, Neora, Komna, Canacona, Degloor, Chakur, Kalamb, Atmakur, Hanamkonda, Metapalli, Sultanabad, Anantpur, Pulivendala, Bellary, Karipur & Thrissur 7 each
19	Chepan 25, Bhatkal 24, Kota 17, Pernem 16, Alipurduar 14, Mulki, Mudibidra, Udupi & Kundapur 13 each, Jalpaiguri, Hosdurg, Siddapura & Honavar 12 each, Manas N H Xing, AIE N H Xing, Gajoldoba, Koraput, Panambur, Bajpe, Mani, Kollur, Agumbe, Kozhikode & Piravom 11 each, Hasimara, Ratnagiri, Rajapur, Kukal, Ponda, Mangalore & Bantwal 10 each, Kokrajhar, Binika, Vengurla, Raigarh & Shirali 9 each, Ambabhona, Bijepur, Pottangi, Kankavali, Sawantwadi, Madgoan, Karkala, Kasargode & Thalasserry 8 each, Athamalik, Sohela, Tibbi, Malvan, Palakonda, Kumta, Kannur & Thrissur 7 each	Cherrapunji (RKM) 59, Cherrapunji 48, Passighat 15, Shillong, Ramakrishnarajpet, Agumbe & Udupi 13 each, Murti 12, Barpeta, Belonia, Sabroom, Bagdoghra, Sevoke, Gajoldoba & Uskabazar 11 each, Neora, Chandradeepghat, Regoli, Subramanya & Kozha 10 each, Agartala, Champasarai, Mathabhanga, Hasimara, Khalilabad & Sholinghur 9 each, Tezu, Beki Road Bridge, Sonamura, Panagarh & Gaya 8 each, Harinkhola, Dharmasthala & Siddapura 7 each	Bhograi 14, Rajghat 13, Contai 12, Sukinda, Mahabaleshwar & Kashipur 11 each, Diamond Harbour, Digha, Jaleswar, Chandbali & Bhira 10 each, Anandpur, Ghatagaon, Mython & Sikandarpur 9 each, Swamptna 8, Pattamundai, Baripada, Jamshedpur, Kalpi, Sankheda, Aligarh, Alirajpu & Kotdwar 7 each	Dapoli 35, Alibag 33, Silvassa 23, Murud 21, Madhuban 20, Kamrej & Wada 19 each, Shahapur 18, Matheran 17, Daman 16, Nanipalsan, Mokhada, Mhasala & Shrivardhan 15 each, Roha, Pali 13, Idukki 14, Vapi & Ron 12 each, Nashik, Telhara & Ottapalam 11 each, Jawahar, Vasai, Pen, Tala, Valparai, Badami & Arynkvu 10 each, Gandevi, Mahuva, Karjat, Mahad, Igatpuri, Peint, Beglan & Senkottai 9 each, Bhainsdehi, Umergaon, Poladpur, Surgana, Sinner, Trimbak, Gaganavada, Belawadi, Soundatti, Navalgund, Nargund & Gadag 8 each, Didighat, Dharampur, Pardi, Valsad, Chikhli, Vyara, Dahanu, Ulhasnagar, Mumbai, Uran, Vengurla, Kankavali, Panhala, Pune, Gudalur Bazar, Bailhongal, Yelburga, Madhugiri, Thrissur & Kollengode 7 each, Upleta 19,

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
20	Bhatkal 21, Udupi 16, Shirali 15, Karkala 14, Kumta 13, Kollur & Honavar 12 each, Hosadurg, Siddapura & Chincholi 11 each, Thane Belapur, Devgad, Kundapur, Agumbe & Thalasserry 10 each, Bantwal, Sukiapokhri, Panjim, Chakur, Deoni, Mulki, Mangalore, Kota, Karwar, Ankola, Kannur & Kozhikode 9 each, Hut Bay, Sawantwadi, Kudal, Vaibhavwadi, Canacona, Mapusa, Hosanagara & Kasargode 8 each, Car Nicobar, Malvan, Panambur, Subramanya, Belthangadi, Aurad, Bhalki, Quilandy, Thrithala & Vadakara 7 each	Cherrapunji 21, Darauli 17, Sripalpur 15, Koilwar & Agathi 14 each, Bhalukpong & Masrakh 13 each, Gaya, Patna & Mulbagal 12 each, Tantloi, Goplapur & Dharamsala 11 each, Polur & Amini Divi 10 each, Suri, Sikandarpur, Venkatagirikota & Kavarithi 9 each, Passighat, Tilpara Barrage, Bashirhat, Sukinda, Dehri, Rosera, Ballia, Bangalore & Alapuzha 8 each, Barrackpur, Umerkote, Kursela, Khadda, Kuppam, Ambur & Omalur 7 each	Mandiradam & Rajgangapur 27 each, Panposh & Long Island 23 each, Hirakud 18, Bhogari, Sambalpur & Baragaon 16 each, Rajghat & Sundergarh 14 each, Deogaon 13, Kuchinda 12, Jamankira, Pallahara & Deogarh 11 each, Jaipur & Rengali 10 each, Champua & Balimundali 9 each, Reamal, Jharsuguda & Malanjkhanda 8 each, Jaleswar, Anandpur, Telkoi, Naktideul, Kudal, Khalapur, Gaganbavda, Sawantwadi, Mangaon, Laikera, Ponda & Gaganbavada 7 each	Kamalapur 18, Talasari & Vasai 17 each, Ambernath & Barsi 16 each, Kalwakurthy 15, Chhatrapur, Pardi & Madhuban 13 each, Uran & Bhalki 12 each, Silvasa, Amreli, Vanthali, Thane, Panvel & Khed 11 each, Gopalpur, Vapi, Bhavnagar & Deulgaonraja 10 each, Kukshi, Manavara, Maheshwar, Ankalav, Savli, Valsad, Kamrej, Vyara & Kakinada 9 each, Daman, Gondal, Vengurla & Koida 8 each, Berhampur, Bagsra, Dhari, Manavadar, Umarala, Dhora, Chandwad, Manjalegaon, Sindkhedraja, Khairagarh & Sedam 7 each
21	Mulki 18, Khargone 12, Mangalore, Kathumer, Harnai, Barui, Hoshiarpur, Wadahvan & Kozhikode 10 each, Harnai & Bhatkal 9 each, Nandurbar, Pindwara, Itanagar & Surgana 8 each, Buldhana, Chikhali, Moradabad, Anklav, Padra, Sojitra, Tilakwada, Lilia, Morvi, Mahad, Shirali & Bijapur 7 each	Munger 28, Khagaria 19, Rosera 16, Samastipur 13, Belonia 12, Dharamsala, Cherrapunji, Sonamura, Khushiary, Benibad, Ahirwalia & Bhinga 11 each, Bijnore 9, Krishnanagar, Bhagalpur, Dharmasthala, Yellandur & Numalighat 8 each, Agartala, Narayanpur, Kashinagar, Trithala, Thirukattupalli, CIAL Cochi & Nedumbassery 7 each	Arnold 21, Bilaspur 19, Umariya 18, Pali 14, Car Nicobar, Pratapgarh, Champa & Akaltara 13 each, Kishanganj & Durg 12 each, Port Blair, Khonsa, Pipalkhunte, Janjgir, Sarangarh, Mushari, Baloda, Sompeta & Agathi 11 each, Bidha & Agumbe 10 each, Jharsuguda, Hemgiri, Korba, Sakti, Gharaghoda & Kasdol 9 each, Kolkata, Sundergarh, Ghatol, Mandsaur, Dindori, Jabalpur, Shivarinarayan, Bhatapara, Kota, Malkharoda, Dabhra, Gingee & Bantwal 8 each, Khonsa, Deogaon, Baran, Atru, Sapotra, Alwar, Sagbara, Vaibhavwadi, Baloda, Bazar, Simga, Kartala, Champa, Jajjaipur, Marwahi, Takhatpur, Tiruvidaimaruthur, Udupi, Honavar & Kumta 7 each	Maliya 14, Mundali, Umergaon, Malegaon & Arakuvalley 11 each, Jalapur 10, Vasai 9, Cuttack, Mominabad, Balasinor, Valsad & Kamrej 8 each, Naraj, Kapadvanj, Mahuva, Dharai, Khambha, Kodinar, Dahanu, Gangapur, Palghar, Murbad, Nandgaon & Tekkali 7 each
22	Barpeta, Avani-gadda & Koderu 32 each, Nagayalanka 31, Bapatla 25, Martur 23, Repalle, Chirala & Bhatkal 20 each, Vetapalem 19, Chimakurthy, S. N. Padu & Kumta 18 each, Ongole 17, Kothapatnam & Darsi 16 each, Domohani, Challapalli & Udupi 15 each, Pottangi, Tangutur & Karwar 14 each, Pammaru, Aaddanki & Kottayam 13 each, Donakonda, Machilipatnam, Korisapadu & Marrapur 12 each, Daringibadi, Narnaul, Ponda, Korchedu, Kota, Karkala, Shirali, CIAL Cochi & Nedumbassery 11 each, Baghdogra, Gudur, Yaddanapudi, S. Magalur, Mangalore, Bhalki & Punalur 10 each, Belonia, Mohana, Gudivada, Ballikurava, Ghantasala, Ibrahimpatnam, Nandiwada, Unguturu & Maripudi 9 each, Ausa, Vuyyuru, Pedaparupudi, Mani, Bantwal & Mudibidre 8 each, Mathabhanga,	Sonamura & Belonia 13 each, Malda, Banbasa & Dehra Dun 12 each, Cherrapunji & Katghora 10 each, Kalimpong, Baltara, Kotdwar, Kashipur & Sonbarsa 9 each, Passighat, North Lakhimpur, Polur, Kahu & Bhoond 8 each, Arundhatinagar, Bhagalpur, Jhanjharpur, Munger & Karwar 7 each	Pipalkhant 19, Bhungra, Sagwara & Mangalore 13 each, Banswara, Garhi, Gudalur Bazar & Kasargode 11 each, Sawai Madhopur, Loharia, Bhimavaram, Sakaleshpura & Udupi 10 each, Hosdurg, Nagarfort, Arnod, Ghatol, Narsapur, Kunnavaram, Bhagamandala & Kannur 9 each, Jorhat, Badisadri, Danpur, Sabla, Galiakot, Damoh, Gandhinagar, Kapadvanj, Bayad & Valparai 8 each, Ranganj Mandi, Dungla, Balasinor, Peddapuram, Rajampet, Naduvattam, Mudibidre, Kota & Karkala 7 each	Chandbali 19, Alipangal 18, Patamundai 15, Akhuapada 14, Kendrapada & Kakatpur 13 each, Balasore, Soro, Jenapur, Mundali & Udala 12 each, Gohar, Digha, Durgachak, Nilgiri, Paradeep, Athagarh, Rajkanika & Kakinada 11 each, Bhogra, Jajpur & Dhenkanal 10 each, Rajghat, Bonth, Naraj, Bhubaneswar, Sujanpur Tira, Peddapuram & Kapadvanj, Bayad & Valparai 9 each, Sakri, Mominabad, Sukinda, Hindol, Nimapara, Khndapada, Tikabali, Vyara, Ambejogai & Kunavaram 8 each, Jeypore, Baripada, Madhuban, Silvasa, Bardoli, Mandvi, Valod, Junagarh, Konta & Prathipadu 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
	Jalpaiguri, Ukai, Babra, Poladpur, Kavali, Pendana, Gudlavalleru, Thotlavalluru, Panambur, Kundapur, Honavar, Alapuzha, Thiruvananthapuram, Agathi & Amini 7 each			
23	Agumbe 42, Srisailam 40, Bhagamandala 39, Kottigehara 35, Kollur 33, Amlapur 32, Kurnool & Yemmiganur 29 each, Gaganbavada & Siddapura 28 each, Rajapur 27, Medikeri 26, Dhone 25, Mantralayam & Subramanya 24 each, Dharmasthala 23, Linganamakki 22, Ratnagiri, Sanguem, Karwar, Shahapur, Sringeri & Kammardi 21 each, Margaon, Mani & Jayapura 20 each, Quepem, Atmakur, Mudibidre, Sindhanur, Somwarpet, Kalasa, Koppa & Munnar 19 each, Mahad, Kumbum, Yerragondapalem, Karkala, Shirali, Manki, Ankola, Bijapur, Sakaleshpura, Karipur & Konni 18 each, Canacona & Humchadakatte 17 each, Jat, Balaganur, Sirugappa & Talaguppa 16 each, Jurala Project, Koilkuntla, Porumamilla, Honavar, Hanumansagar, Madapura, Ponampet & Gudalur Bazar 15 each, Allagadda, Holagunda, Pathikonda, Puttur, Tavaregere, Kushtagi, Raichur, Deodurg, Kannur, Ketti & Naduvattam 14 each, Pottangi, Mhasala, Shrivardhan, Murud, Shirol, Sangli, Vita, Alur, Gooty, Mangalore, Bhatkal, Siddapura & Sindagi 13 each, Valpoi, Atapadi, Aaddanki, Owk, Tadpatri, Kumta, Yadgir & Irikkur 12 each, Kalyanpur, Ponda, Tasgaon, Lohogaon, Darsi, Panambur, Nagathan, Ballupet, Tyagarthi, Manjeri & Thrithala 11 each, Kashinagar, Pune, Mahabaleshwar, Chodavaram, Palakonda, Vanaparthi, Pamidi, Kota, Kundapur, Bagewadi, Jamakhandi, CIAL Cochi, Kollengode, Kasargode, Kozha & Nedumbassery 10 each, NH-5, Govindpur, Mangaon, Roha, Tala, Dabolim, Ranasthalam, Veeranghattam, Jammalamadugu, Prodattur, Mulki, Yellapura, Sholapur, Manvi, Rabkavi, Enmackel, Kozhikode & Vaikom 9 each, Pali, Mapusa, Chandgad, Satara, Palasa, Badvel, Athani, Biligi, Muddebihal, Hungund, Aluva, Mancompu & Kundha Bridge 8 each, Bhanjanagar,	Lalganj 15, Samastipur & Kalaghat 13 each, Banbasa 12, Baghdogra, Nawapara & Benibad 11 each, Nimapara, Chanpatia, Hayaghat & Mosani Barrage 10 each, Champasarai, Saulighat & Uskabazar 8 each, Chouldhowaghat, Gajoldoba, Kansabati Dam, Bolangir, Sikandarapur, Bilaspur, Miryalguda & Kundapur 7 each	Beki Mathanguri 13, Perungalur 10, Chandbali, Nangaldam & Nokha 9 each, Tangla & Vallabhnagar 8 each, Red Hills, Avinashi, Kodavasal, Needamangalam, Nagapattinam, Kokrajhar, Bausan, Baijnath, Sanganer, Canacona & Pratappur 7 each	Athagarh 27, Udala 23, Nilgiri 24, Ghatagaon 22, NH-5, Govindpur & Soro 17 each, Canning Town 16, Baudhgarh & Tikabali 15 each, Balasore & Naraj 14 each, Harabhanga & Kolkata 13 each, Jenapur, Baripada & Phulbani 12 each, Rajghat, Anandpur, Angul, Bangirposhi, Thakurmunda & Bolangir 11 each, Barrackpur, Digha, Cuttack, Chhendipada & Rajkishorenagar 10 each, Diamond Harbour, Durgachak, Kalaikunda, Jhumpura, Swampatna, Dhenkanal, Mundali, Narsingpur, Rengali, Kosagumda, Barmul, Bhubaneswar, Baliguda & Harnai 9 each, Midnapore, Bhograi, Jaleshwar, Paradeep, Keonjhar, Khairamal, Kantamal, Rairangpur, Khandapada, Nashik, Bhagamandala, Agumbe & Kottigehara 8 each, Kansabati Dam, Tusuma, Mohanpur, Mohana, Bonth, Chandbali, Mohana, Sorada, Tiring & Ichapuram 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
	Kotagarh, Harnai, Pernem, Mandasa, Tuni, Tekkali, Podili, Kamalapuram, Madanpur, Mangalore, Haliyal, Badami, Ganagavarhy, Kukanoor, Lingasugur, Balehonnur, H D Kote, Bellary, Hospet & Sandur 7 each			
24	Bhira 47, Mhasala 30, Hosangara 29, Mumbai 28, Koyna 27, Vaibhavwadi & Kollur 25 each, Alibag, Pali & Mahabaleshwar 23 each, Poladpur 22, Kottigehara 21, Thane Belapur 20, Roha & Tala 19 each, Dharavi & Talaguppa 18 each, Matheran, Sawantwadi, Dodamarg & Sirsi 17 each, Shrivardhan, Panjim & Yellapura 16 each, Mangaon, Pen, Murud, Kolhapur & Bhagamandala 15 each, Bhandup, Harnai & Kankavli 14 each, Bhiwandi, Devgad, Siddapura, Bhatkal, Sringeri & Sakaleshpura 13 each, Kalyan, Khalapur, Ratnagiri, Margaon & Kalingapatnam 12 each, Marmugoa, Mudibidre, Shirali & Honavar 11 each, Veraval, Karjat, Subramanya, Belgaum & Kasargode 10 each, Palghar, Vasai, Ambernath, Sanguem, Mani, Puttur, Karkala, Medikeri, Humchadakatte, Jayapura, Koppa & Kundha Bridge 9 each, Lakhimpur, Panvel, Dharamasthala, Karwar, Haliyal, Banavasi, Kiravati & Ketti 8 each, Seppa, Kampur, Mangrol, Ranavav, Shahapur, Ulhasnagar, Uran, Malvan, Kudal, Dabolim, Sangli, Visakhapatnam, Kota, Udupi, Kundapur, Madanpura, Poonampet, Somwarpet, Chickmagalur & Kannur 7 each	Bhalukpong 15, Cherrapunji & Arundhutinagar 12 each, Chouldhowaghat & Haripur 11 each, Bosan 10, Amini Divi 9, Diana, Didihat, Kosani, Pantnagar, Pilukhera, Basra, Gohar, Kartala & Polur 8 each, Sabroom, Murti, Kamtaul, Sonbarsa, Bageshwar, Uttarkashi, Jogindernagar, Kasauli, Nagaur, Umaria & Kavaratti 7 each	Simga 14, Kosagumda 12, Sevoke & Bolangir 11 each, Jhanjharpur, Madhubani & Bhatkal 10 each, Neora, Manthani, Sonbarsa & Kasdol 9 each, Port Blair, Ramanujganj, Baliagarh, Bhimadole & Malakpur 8 each, Bolangir, Anandpur, Lalbegiaghat, Hrishikesh, Bharwain, Jaisalmer, Baloda Bazar, Pakanjur & Malavalli 7 each	Bankura 20, Canning Town & Jamankira 19 each, Bankura, Basirhat & Sambalpur 18 each, Binika 17, Durgapur & Kolkata 16 each, Mohanpur, Dengraparaghat, Hirakud, Rajkishorenagar & Putki 15 each, Rairakhol & Panchet 14 each, Kalaikunda, Rajghat, Chhendipada, Ambabhona, Baudhgarh & Messanjore 13 each, Kansabati Dam, Harinkhola, Harabhanga, Mython, Kollur & Kottigehara 12 each, Suri, Tantloi, Midnapore & Dodamarg 11 each, Gheropara, Tipara Barrage, Asansol, Kharagpur, Kantamal, Barkisurya, Ranchi, Khamba, Kodinar, Pernem & Shirali 10 each, Sriniketan, Purihansa, Panagarh, Jalswar, Ghatagaon, Kuchinda, Naktideul, Athamalik, Deogarh, Bargarh, Baripada, Jamsolaghat, Jamtara, Maharo, Nadadih, Khambha, Athanagar, Siddapura & Bhatkal 9 each, Krishnanagar, Balasore, Nilgiri, Soro, Thakurmunda, Sikadia, Bhagamandala, Mudigere & Kota 8 each, Munger, Berhampur, Pallahara, Talcher, Tikarpada, Reamal, Panposh, Bangiriposhi, Chandanpur, Sonepur, Khesiari, Konner, Tilaiya, Talala, Marmugoa, Linganamakki, Hosanagar, Kundapura & Kumta 7 each
25	Nainital 18, Alibag 17, Igatpuri 15, Mahabaleshwar 14, Thane 13, Bhandup & Mangaon 12 each, Manavadar, Mhasala & Hosanagara 11 each, Roha, Mahad & Trimbak 10 each, Talaja, Khalapur, Pali, Quepem & Mudibidre 9 each, Paikmal, Ranavav, Pen, Shrivardhan, Murud & Mumbai 8 each, Midnapore, Nawapara, Umargaon, Navsari, Olpad, Keshod, Karjat, Poladpur, Panvel, Matheran, Tala, Murud, Puttur, Honavar, Talaguppa, Paikmal, Surat & Kurud 7 each	Cherrapunji 36, Tezu, Sabroom & Kalaikunda 15 each, Passighat & Mathabhanga 14 each, Neora 13, Shillong, Nagrakata & Aravakurichi 11 each, Kalakada 10, Diana, Sriniketan, Durgapur, Fatehgarh, Sujalpur & Kunnamkulam 9 each, Patti, Peermade & Vadakara 8 each, Chepan, Mohanpur, Barmul, Sripalpur, Bilaspur, Bhoond, Sujalpur, Susner, Mangalore, Deodurg, CIAL Cochi & Paravur 7 each	Anantpur 18, Attur & Pennagaram 14 each, Sendamangalam & Munnar 13 each, Lumding 12, Khonsa, Pathankot & Perur 10 each, Hakimpet, Karimnagar, Mayanur, Ircal & Chikkanahalli 9 each, Deogaon, Ranjit Sagar Dam, Dharamjaigarh, Kadavur, Nilakottai & Yercaud 8 each, Belonia, Reamal, Pottangi, Messenjore, Dabolim, Samart, Bilha, Jashpurnagar, Hyderabad, Andipatti, Aranthangi, Krishnagiri, Omalur, Salem, Tiruvidaimaruthur, Bandipura & Malavalli 7 each	Kollur 28, Rajula & Agumbe 24 each, Gheropara, Khambha & Karkala 22 each, Dhari, Sawarkundla, Kodinar & Umarala 21 each, Barrackpur 19, Sriniketan, Mahuva & Shihor 18 each, Kolkata, Munger & Kottigehara 17 each, Berhampur & Mudibidre 16 each, Krishnanagar, Diamond Harbour, Durgachak, Sikandarpur, Lilia, Palitana, Talaja, Vallabhipur & Bhagamandala 15 each, Uluberia, Jafrabad, Hayaghat, Pernem & Mani 14 each, Tilpara Barrage, Baltara, Bhavnagar, Mangalore, Belthangdy & Siddapura 13 each, Harinkhola, Bhagalpur, Colgaon, Darauli, Patna, Gari Yadhar & Sukma 12 each, Suri, Asansol, Pupunki,

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
				Tilaiya, Sripalpur, Turtipar, Amreli, Bantwal, Kota & Udupi 11 each, Rampurhat, Khagaria, Rewaghat, Gogha, Dharmasthala, Shirali, Sringeri, Thirthahalli & Kozhikode 10 each, Contai, Messanjore, Mython, Sikadia, Basua, Hatidah, Samastipur, Jaunpur, Kundapur, Karipur & Perinthalmanna 9 each, Canning Town, Barikisurya, Jamshedpur, Nandadih, Lathi, Hosnagara, Kalasa & Virajpet 8 each, Narayanpur, Midnapore, Champura, Jhanjharpur, Kursela, Lalganj, Babra, Bagsra, Sutrapada, Mulki, Bhatkal, Koppa & Napoklu 7 each
26	Uttarkashi 17, Umerkote 16, Dabhoi 12, Hut Bay, Harabhanga, Phulbani, Naraingarh & Gariaband 11 each, Baliguda & Nawarangpur 10 each, Binika, Kandapada, Chandigarh & Mahabaleshwar 9 each, Baudhgarh, Jeypore, Kantamal, Khairamal, Kuchinda, Patnagarh, Sonapur, Kota, Bhatkal & Darabassi 8 each, Maya Bandar, Junagarh, Dharamsala, Bangana, Sadul Sahar, Sangaria & Kotkasim 7 each	Sevoke 23, Neora, Triveni & Balmikinagar 20 each, Bhalukpong 17, North Lakhimpur & Mellabazar 16 each, Motunga & Nagrakata 15 each, Shillong, Chouldhowaghat & Murti 14 each, Champasari, Gajoldoba, Sonbarsa & Pathankot 13 each, Kotdwar, Baghdogra, Khadda & Katerniaghat 12 each, Beki Mathanguri, Sankalan, Lava, Diana, Suri, Galgalia, Jainagar & Palliakalan 11 each, Barpeta & Nalbari 10 each, Passighat 9, Miao, Dibrugarh, Khowang, Belonia, Sibsagar, Basti, Kakardharighat, Mukhlisipur, Hrishikesh & Ladpura 8 each, Khonsa, Seppa, Jorhat, Jai Bharali NT X-xing, Sikandarpur, Pantnagar, Joshimath, Kakri, Siddapura & Joida 7 each	Atapadi 15, Tiptur 14, Kotdwar & Srinivaspura 13 each, Alampur 12, Nagrakata, Broach & Palammer 11 each, Miao, Annapurnaghat, Kurnool, Owk & Deverahippargi 9 each, Ambagarh Cowki & Sattur 8 each, Margherita, Agra, Dharamsala, Amraghat, Dillighat, Margherita, Sevoke, Alipurduar, Kalagarh, Beglan, Allagadda, Nagathan, Chintamani & Kavaratti 7 each	Sikandarpur 45, Benibad 21, Saulighat & Uskabazar 20 each, Hayaghat 19, Nainital 18, Jhanjharpur 17, Munger & Samastipur 16 each, Gorakhpur 15, Chanpatia & Mukteshwar 13 each, Triveni 12, Ahirwalia, Chatia, Kamtaul, Lalbegiaghat, Birdghat & Almora 11 each, Gaya 10, Srinagar & Pathalgaon 9 each, Marora 8, Rewaghat, Rosera Car Nicobar, Nilgiri, Khagaria, Kakrahi, Basti, Kosani, Pithoragarh, Ambala, Palitana & Sihor 7 each
27	Koraput 24, Jeypore & Nawarangpur 14 each, Gangtok 13, Tadong & Koshagumda 11 each, Pottangi, Umerkote & Malkangiri 10 each, Bhavanipatna, Jaipatna, Junagarh, Lanjigarh & Kathumer 9 each, Dabolim, Charashi, Udampur, Jammu & Katra 8 each, Madanpur Rampur, Komna, Gunupur, Jagdalpur & Ambabhona 7 each	Cherrapunji 32, Sevoke 22, Agartala 20, Kanpur 19, Safipur 16, Arundhatinagar, Podili & Hasimara 15 each, Bilaspur & Champasari 14 each, Shirali 12, Baghdogra, Diana, Nagrakata, Murti, NH-5 Govindpur, Kakardharighat & Shahajahanpur 11 each, Passighat, Beki Mathanguri, Kalimpong, Pedong, Neora, Fatehgarh, Chidambaram & Honavar 10 each, Bhalukpong, Sankalan, Mython, Colgaon, Munger, Saulighat, Bhingra, Gaganbavada & Chandrapur 9 each, Barpeta, Gajoldoba, Galgalia, Jhanjharpur, Kamtaul & Lalganj 8 each, Tezpur, Tikrikilla, Darjeeling, Sukiapokhri, Boudhgarh, Muzaffarpur, Basua, Birpur, Neemsar, Khadda, Bahraich, Ankinghat, Gomatia, Sarangarh, Siddapura & Bhatkal 7 each	Ratnagiri 23, Nighasan & Dillighat 15 each, Chiplun & Harnai 13 each, Karimganj, Billoli & Parbhani 11 each, Deomali, Guhagar, Dapoli, Rajapur, Aurangabad, Degloor & Lodhika 10 each, Chachoda, Osmanabad, Khonsa, Naharkatia, Lanja, Chitaguppa Gangakhed & Bhimadole 9 each, Dibrugarh, Putki, Chipabarod, Pernem, Beglan & Sattur 8 each, Belonia, Tikabali, Jabalpur, Bhira, Sawantwadi, Ahmednagar, Peint & Rayachoty 7 each,	Sajjangarh 26, Kushalgarh 21, Sikandarpur, Kesarpura, Danpur, Bagidora & Shergarh 15 each, Nainital & Sallopat 14 each, Basna, Kotdwar & Agumbe 12 each, Purushottampur, Pithoragarh, Bhungra & Santrampur 11 each, Aska, Banpur, Didighat, Banbasa, Mukteswar, Ranjitsagar Dam & Thasra 10 each, Altuma, Kamakhyanager, Kendrapada, Pipili, Bissam Cuttack, Kotraguda, Marora, Balasinor & Mahasamund 9 each, Bijepur, Thakurmunda, Indrapuri, Almora, Kosani, Srinagar, Banswara, Guna, Maihar, Seoni & Wanakabori 8 each, Tusuma, Ghatgaon, Bargarh, Krishnaprasad, Phulbani, Kamtaul, Rosera, Joshimath, Pantnagar, Bikani, Jalora, Lunawada, Karjan, Surat & Bhatpada 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
28	Jeypore 27, Talera 17, K Patan, Baran & Degod 15 each, Guler, Nagrota Surian & Mandana 14 each, Ladpura, Sangod, Kurkheda & Chiplun 13 each, Katra & Koida 12 each, Chhabra, Nilanga, Agumbe & Udaipura 11 each, Varanasi & Anta 10 each, Koraput, Pantnagar, Mahabaleshwar & Naduvattam 9 each, Khandapara, Bhinga, Kakardharighat, Nagarfort, Aklera, Khanpur, Shahbad, Pipalda, Karauli, Hindon, Ambah, Kakinada, Prathipadu & Ranasthalam 8 each, Jaipatna, Bangana, Asnawar, Mangrol, Atru, Kota, Nadauti, Buhana, Rewa, Koyyalagudem, Peddapuram, Polavaram, Manthani, Sringeri & Jayapura 7 each	Cherrapunji 38, Neora 26, Thane 21, Diana, Kakardharighat 18, Tezu, Sevoke, Murti, Sikandarpur & Alibag 17 each, Hasimara 16, Sonbarsa, Murud & Podili 15 each, Champasari, Nagrakata, Bhinga, Hansot & Panvel 14 each, Passighat, Gajoldoba, Kasganj, Chatia & Uran 13 each, Munsong, Malkapur & Hasanpur 12 each, Fatehgarh, Mount Abu, Mumbai, Roha & Pen 11 each, Pedong, Narora, Karjan, Pardi, Matheran & Srikalahasti 10 each, Dhollabazar, Tikrikilla, Khanitar, Hayaghat, Jainagar, Tendukheda, Gandevi, Jalalpur, Olpad, Tala, Sholinghur & Walajpet 9 each, Dabri, Gomatia, Ahore, Narsingpur, Broach, Navsari, Raipur, Pakala, Arkonam, NH-31 8, Barpeta, Baghdogra, Harinkhola, Hindigir, Saulighat, Ankinghat, Vapi, Mangrol, Pali, Sakoli, Bapatla & Chennai 7 each	Chiplun 21, Munger 16, Bosan 13, Naktideul, Dehra Dun, Prantij & Kodinar 11 each, Haripur 10, Diana, Songadh 9, Mython, Shergarh, Gandhinagar, Dhanbad, Veraval, Alib, Pernem 8 each, Rairakhol, Athagarh, Deogarh, Nainital, Pushkar, Bhinay, Parvatsar, Dhambola, Mangrol, Gondal, Shrivardhan, Tehri, Tada & Tandil 7 each	Katerniaghat & Dodamarg 23 each, Sangameshwar 22, Pernem 18, Devgad 15, Rajapur & Gaganbavada 14 each, Sripalpur, Ratnagiri, Chiplun, Guhagar & Sanguem 12 each, Ghazipur, Khanapur, Tala, Mapusa & Ponda 11 each, Sukinda, Birdghat, Nannilam, Bahraich & Sawantwadi 10 each, Neamatighat, Dashpalla, Kakardharighat, Mahad, Murud & Lanja 9 each, Athagarh, Gonda, Mangaon, Harnai, Mandangad & Vaibhavwadi 8 each, Long Island, Narsinghpur, Triveni, Palliakalan, Shardanagar, Mandsaur, Dapoli & Vengurla 7 each
29	Mahad 51, Mhasala 36, Poladpur 34, Mahabaleshwar 31, Tala 29, Gaganbavada & Kottigehara 25 each, Mangaon & Murud 24 each, Bhira 23, Koraput & Roha 22 each, Jeypore 21, Nawarangpur & Alibag 20 each, Pottangi & Nagar Fort 19 each, Umerkote 18, Krishnaprasad, Nainwa, Harnai, Pali, Nainwa & Kalsa 17 each, Kosagumda, Mumbai, Panvel, Shrivardhan & Khanapur 16 each, Pen, Yellapura & Sakaleshpura 15 each, Sirsi, Bhagamandala & Humchadakatte 14 each, Jaleswar, zGovindgarh, Khalapur, Kammardi & Kathua 13 each, Jaipatna, Sawai Madhopur, Matheran, Hosanagara & Thirthahalli 12 each, Tikabali, Dharamsala, Jogindernagar, Lalsot, Ratnagiri, Uran, Raipur, Paderu & Linganamakki 11 each, Zirka, Katra, Mul & Siddapura 10 each, Ghatagaon, Tangi, Bharatpur, Kumbet, Piplu, Uniara, Rajkot, Valpoi, Saoli, Ranasthalam, Joida, Agumbe, Lakkavalli, Somwarpet & Sringeri 9 each, Kandapada, R. Udayagiri, Chokabarbad, Tadaraisingh, Shirala, Jagdalpur, Araku Vally, Banavasi & Poonampet 8 each, Guwahati, Lakhipur, Banpur, Hindol, Nayagarh, Nilgiri, Nimapara, Balachaur, Gurudaspur, Khairi, Basholi, Bundi, Kishangarh, Nagar, Karjat, Thane, Kolhapur, Rajura, Karwar, Kollur, Hassan,	Wav 20, Kadi 18, Kamrej 17, Unjha, Tharad, Idar & Bhira 16 each, Tezu, Satlasana & Panvel 15 each, Vijapur, Mangaon & Roha 14 each, Kalaikunda, Mansa, Mahad, Mhasala, Tala & Devgad 13 each, Halol, Himmatnagar, Prantij, Madhuban, Matheran & Ratnagiri 12 each, Anklav & Gaganbavada 11 each, Miao, Dharoi, Savli, Dahanu & Vaibhavwadi 10 each, Passighat, Murti, Triveni, Kedbrahma, Kukanoor, Kumta, Shrivardhan, Vengurla, Kankavli, Sawantwadi, Kudal, Pernem & Bhatkal 9 each, Neora, Pedong, Danta, Bayad, Gandevi, Karjat, Khalapur, Pali & Shirali 8 each, Chepan, Cooch Behar, Diana, Domohani, Bareilly, Ayanagar, Jind, Ahmedabad, Detroj, Kheralu, Jalalpur, Silvasa, Pen, Poladpur, Uran, Panjim, Ankola & Guttal 7 each	Bareilly, Jabalpur & Palsana 14 each, Kalagarh 13, Ranavav 12, Car Nicobar 11, Srinagar, Kalyanpur & Kurnool 10 each, Hut Bay, Sevoke, Nagrakata, Khilchipur, Nandod, Rajpipla, Navsari, Daman, Bardoli, Murbad, Srikalahasti & Adirampattinam 9 each, Dhanbad, Namsai, Diana, Pipalkhunte, Dharampur, Silvasa, Babra, Talasari, Ashti, Alapuzha, Haripad, Konni, Kottayam & Thodupuzha 8 each, Khonsa, Annapurnaghat, Palmerganj, Bahraich, Gomatia, Kamrej, Lakhatar, Kalawad, Lalpur, Gondal, Matheran, Igatpuri, Khammam, Kollengode & Varkala 7 each	Bahraich 11, Birpur, Didihat, Srinagar & Karkala 10 each, Triveni, Pithoragarh, Armoor & Kollur 9 each, Maya Bandar, Delhi Bridge & Ambala 8 each, Mussoorie & Alibag 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
	Madanpura, Peermade & Kundha Bridge 7 each			
30	Mahad 42, Chiplun 39, Poladpur & Poonampet 35 each, Murud, Agumbe 33, Mahabaleshwar 32, Mhasala & Raipur 30 each, Mangaon & Mana 27 each, Paikmal, Roha, Bhagamandala & Hosanagara 25 each, Tikabali, Paikmal & Mudibidre 24 each, Baloda Bazar, Karkala & Linganamakki 22 each, Khairamal, Bhira, Shrivardhan, Siddapura & Sringeri 21 each, Selu 20, Kantamal, Sonapur, Tala, Vaibhavwadi, Virajpet & Jayapura 19 each, Bramhapuri, Shimoga & Charama 18 each, Pantnagar, Binika, Phulbani, Mumbai, Pali, Ratnagiri, Harnai, Kankavli, Durg, Kollur & Koppa 17 each, Padampur, Narsingpur, Tikarpada, Junagarh, Alibag, Pen, Uran & Kammardi 16 each, Baudhgarh, Silvasa, Gariaband, Sirsi & Khanapur 15 each, Harabhanga, Barmul, Vapi, Dodamarg, Dharamasthala, Medikeri & Sakaleshpura 14 each, Bijepur, Umerkote, Wardha, Dhamdha & Pakhanjur 13 each, Nawapara, Baliguda, Sawantwadi, Berla, Kanker, Kota, Thirthahalli, Soraba & Irikkur 12 each, Rairakhol, Khariar, Belgaon, Bolangir, Devgad, Pernem, Rajim, Antagarh, Humchadakatte & Ududpi 11 each, Bhanjanagar, Lanjigarh, Titlagarh, Malvan, Chandrapur, Palari, Saja, Bhanupratappur, Madhabarida, Kundapur & Balehonnur 10 each, Ambabhona, Bargarh, Dunguripalli, Shergarh, Madhuban, Panvel, Kolhapur, Jajpur, Sarangarh, Keshkal, Mudibidre, Sulya, Siddapura, Talaguppa, Sagar, Ballupet, Nilambur, Kudalur Bazar & Naduvattam 9 each, Bhavanipatna, Khandapara, Loharia, Valsad, Karjat, Matheran, Satara, Balod, Bametara, Pandaria, Mani, Banavasi, Kiravati, Belgaum, Tyagarthi & Mananthavady 8 each, Harinkhola, Rajkishorenagar, Madanpur Rampur, Nawarangpur, Daspalla, Nokh, Desuri, Arthuna, Khalapur, Vengurla, Shirala, Amraoti, Nagaur, Dondilohara, Nagari, Janjgir, Champa, Akaltara, Shivarinarayan, Kondagaon, Narayanpur, Puttur, Bhatkal, Honavar, Yellapura, Ankola, Nippani & N. R. Pura 7 each	Devgad 24, Bhatkal 22, Mapusa 21, Vengurla & Panjim 20 each, Valsad, Malvan & Ponda 19 each, Pardi & Vasai 17 each, Alibag & Pernem 16 each, Uran, Ratnagiri, Kudal & Machilipatnam 15 each, Quepem 14, Mhasala, Tala & Dodamarg 13 each, Manas NH-Xing & NH-31 12 each, Beki Mathanguri, Beki Road Bridge, Domohani, Regoli, Jalalpur, Sawantwadi, Sanguem & Honavar 11 each, AIE NH Xing, Jalpaiguri, Dehra Dun, Mumbai, Valpoi & Canacona 10 each, Kathalal, Murud, Harnai, Margaon, Marmugoa, Bapatla, Peddapuram, Karkala & Shirali 9 each, Chepan, Neora, Mahemdabad, Gandevi, Shrivardhan & Dabolim 8 each, Nancowry, Kokrajhar, Cooch Behar, Hasimara, Nahan, Udaipura, Dahanu, Talasari, Thane, Mangaon, Roha, Kankavli & Mulki 7 each	NH-31 31, Mahad 23, Hasimara 22, Chargharia 20, Alipurduar & Domohani 19 each, Jalpaiguri, Guhagar, Mahabaleshwar & Bhatkal 17 each, Khalapur 15, Sevoke & Panvel 14 each, Baghdogra, Champasari, Chepan, Gajoldoba, Galagalia, Taibpur, Banbasa, Poladpur, Shrivardhan, Ratnagiri & Mandang 13 each, Tiruvallur 12, Neora, Paota, Bhira, Mangaon, Karjat, Tala, Harnai, Dapoli & Khed 11 each, Diana, Roha, Matheran, Chiplun, Rapur & Agumbe 10 each, Kekri, Olpad, Mhasala, Sangamneshwar, Manjalegaon, Purna, Armoor & Jagitiyal 9 each, Cambay, Alibag, Gaganbavada & Bapatla 8 each, Singlabazar, Murti, Basua, Jaipur, Dhansura, Lumbdi, Ranavav, Pen, Pali, Lanja, Vaibhavwadi, Satyavedu, Shirali & Irikkur 7 each	Triveni 25, Khanapur 17, Kalwakurthy 12, Rabkavi 11, Long Islands, Gondia, Mulki & Honavar 10 each, Asifabad & Devarakonda 9 each, Amalapuram, Tadepalligudem, Rayachoty & Shirali 8 each, Kotraguda, Uskabazar, Bapatla, Patapatnam & Nagarjunsagar Dam 7 each

TABLE 17 (Contd.)

(1)	(2)	(3)	(4)	(5)
31	-	Savli 15, Pathri 14, Cherrapunji & Kashipur 13 each, 13, Palliakalan & Moradabad 12 each, Annapurnaghat, Phaphamau & Balasinor 11 each, Silchar & Jawahar 10 each, Banbasa & Malvan 9 each, Katerniaghat, Bareilly & Kalagarh 8 each, Beki Road Bridge, Basua, Galgalia, Khadda, Hrishikesh, Mehsana, Himmatnagar, Mokhada, Wada, Sahapur, Devgad & Gadag 7 each	Valsad, Amreli, Kodinar, Kalyanpur & Bulsar 13 each, Quepem 12, Bahadurpur, Valpoi, Kunavaram & Siddapura 11 each, Shardanagar, Gaganavada & Agumbe 10 each, BHINGA, Nilokheri, Nahan, Surat, Margaon, Ankola, Polavaram & Chengalpattu 9 each, Bahraich, Basholi, Wav, Pardi, Kutiana, Ratnagiri, Lanja, Sanguem, Patur, Buldhana, Shivarinarayan, Mahendragarh, Prathipadu, Sulya, Honavar, Kumta & Yadwad 8 each, Koraput, Neemsar, Naraingarh, Renuka, Dadahu, Patti, Ramgarh, Balasinor, Sami, Bagsra, Botad, Kalawad, Talasari, Sahapur, Rajura & Kammardi 7 each.	-

8. Significant spells of heavy rains

Amounts of *heavy, very heavy and extremely heavy rainfall* are given in Table 17. The number of *vigorous* and *active* days on a sub-divisional scale along with the number of days on which *extremely heavy, very heavy and heavy* rainfall occurred is given in Table 18.

8.1. Exceptionally heavy rainfall

Raipur (Chattisgarh) reported an *exceptionally heavy rainfall* of 29.7 cm. on 30 June, which is an all time record for the station. Also, the rainfall of 62.6 cm. occurred at Kurkheda (Vidarbha) on 7 August is another *exceptionally heavy amount*. Monthwise description is given below:

8.2. Heavy rainfall during June

Extremely heavy rainfall occurred on 1 day each in Assam & Meghalaya, Orissa and Rayalaseema. *Very Heavy rain* occurred on 2 to 3 days in Arunachal Pradesh, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Orissa, east Rajasthan, Konkan & Goa, Tamil Nadu and Kerala and on 1 day each in Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Bihar, east Uttar Pradesh, Uttarakhand, Himachal Pradesh, east Madhya Pradesh, Vidarbha and Karnataka. *Heavy rain* occurred on 8 to 11 days in Sub-Himalayan West Bengal & Sikkim, Orissa, Konkan & Goa, Karnataka and Kerala; 4 to 7 days in Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Uttarakhand, Haryana, Chandigarh & Delhi, Himachal Pradesh, Jammu & Kashmir. East Rajasthan, west Madhya Pradesh, Madhya Maharashtra, Vidarbha, Telangana, Tamil Nadu and Lakshadweep and on 1 to 3

days in Andaman & Nicobar Islands, Jharkhand, Bihar, Uttar Pradesh, Punjab, west Rajasthan, east Madhya Pradesh, Gujarat State, Chattisgarh, coastal Andhra Pradesh, and Rayalaseema.

8.3. Heavy rainfall during July

Extremely heavy rainfall occurred on 2 days each in Assam & Meghalaya and Gujarat Region and south interior Karnataka and on 1 day each in east Uttar Pradesh and Konkan & Goa. *Very Heavy rain* occurred on 7 days each in coastal and south interior Karnataka; on 2 to 5 days in Andaman & Nicobar Islands, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Orissa, Bihar, Uttar Pradesh, Uttarakhand, Gujarat Region, Madhya Maharashtra and Vidarbha and on 1 day each in Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Himachal Pradesh, east Rajasthan, Konkan & Goa, Chattisgarh, Tamil Nadu, north interior Karnataka and Lakshadweep. *Heavy rain* occurred on 23 days in coastal Karnataka; on 16 days each in Assam & Meghalaya and south interior Karnataka; 10 to 12 days in Sub-Himalayan West Bengal & Sikkim, Orissa, east Uttar Pradesh, Uttarakhand and Tamil Nadu; on 6 to 9 days in Arunachal Pradesh, Bihar, west Uttar Pradesh, Himachal Pradesh, east Rajasthan east Madhya Pradesh, Gujarat region, Konkan & Goa, Madhya Maharashtra, Vidarbha and Chattisgarh; on 3 to 5 days in Andaman & Nicobar Islands, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Jharkhand, Haryana, Chandigarh & Delhi, west Madhya Pradesh and north interior Karnataka and on 1 to 2 days in Punjab, Jammu & Kashmir, Saurashtra & Kutch, Marathwada, coastal Andhra Pradesh, Rayalaseema and Lakshadweep.

TABLE 18
Characteristics of monsoon 2007 rainfall

S. No.	Sub – division	(No. of days)				
		Vigorous	Active	Extr. Heavy	V. Heavy	Heavy
1.	Andaman & Nicobar Islands	0	0	0	5	18
2.	Arunachal Pradesh	3	20	0	3	20
3.	Assam & Meghalaya	1	21	3	9	41
4.	Naga., Mani., Mizo. & Trip.	7	13	0	3	15
5.	S.H.W.B. & Sikkim	2	16	0	4	28
6.	Gangetic West Bengal	5	14	0	7	14
7.	Orissa	9	17	1	8	46
8.	Jharkhand	4	15	0	1	6
9.	Bihar	7	14	0	5	24
10.	East Uttar Pradesh	0	1	1	8	25
11.	West Uttar Pradesh	0	1	0	5	17
12.	Uttaranchal	0	2	0	13	33
13.	Haryana	0	0	0	1	18
14.	Punjab	1	0	0	1	14
15.	Himachal Pradesh	0	1	0	4	25
16.	Jammu & Kashmir	0	0	0	0	8
17.	West Rajasthan	1	0	0	0	9
18.	East Rajasthan	1	4	0	7	19
19.	West Madhya Pradesh	3	9	0	0	16
20.	East Madhya Pradesh	1	6	0	1	16
21.	Gujarat Region	6	14	3	9	20
22.	Saurashtra & Kutch	9	10	1	0	13
23.	Konkan & Goa	7	28	3	4	31
24.	Madhya Maharashtra	6	8	0	8	38
25.	Marathwada	2	10	0	0	3
26.	Vidarbha	0	1	0	6	25
27.	Chattisgarh	2	13	0	3	16
28.	Coastal Andhra Pradesh	5	16	0	0	7
29.	Telangana	3	12	0	0	12
30.	Rayalaseema	8	6	1	0	7
31.	Tamil Nadu & Pondicherry	2	0	0	4	40
32.	Coastal Karnataka	3	32	0	9	43
33.	North interior Karnataka	6	11	0	3	22
34.	South interior Karnataka	11	12	2	11	45
35.	Kerala	9	25	0	4	25
36.	Lakshadweep	0	0	0	2	10
Total		139	124	352	15	148

TABLE 19

Dates of occurrence of heat wave/severe heat wave and various categories of maximum temperatures - JUNE 2007

Sub-division No Name	Dates (Number of days)						
	Severe Heat wave	Heat wave	Hot day	Appreciably to markedly above normal	Above normal	Appreciably to markedly below normal	Below normal
2. Arunachal Pradesh		1 (1)					
3. Assam & Meghalaya				1, 3, 6, 7 (4)			
4. Naga., Mani, Mizo and Tri.				1, 2, 3 (3)	4 (1)	6 (1)	4 (1)
5. S. H. W. B. & Sikkim	2, (1)			1, 3 (2)	13 (1)		6 (1)
6. Gangetic West Bengal				2 (1)	4 (1)		9 (1)
7. Orissa	2, (1)	8, 9, 13 (3)		1, 4 (2)	2 (1)	10, 11, 12 (3)	6, 10 (2)
8. Jharkhand		3, 4, 7, 9 (4)		1, 2, 3, 8, 13 (5)	4, 9 (2)	12 (1),	
9. Bihar	2 (1)	3, 4 (2)		1, 8 (2)		10, 11 (2)	13 (1)
10. East Uttar Pradesh		3, 4, 8, 9 (4)		2, 4, 7, 8, 9 (5)	6, 9 (2)	11, 13, 14, 15, 17 (5)	12, 24 (2)
11. West Uttar Pradesh		3, 11 (2)		3, 4, 10 (3)		14, 15, 17, 18, 22, 23 (6)	12, 21, 24 (3)
12. Uttarakhand				3, 4, 7, 8, 9, 10, 11 (7)	2, 9 (2)	13, 14, 15, 16 (4)	24, 26 (2)
13. Haryana, Chandigarh & Delhi	10 (1)	3, 4, 9, 10, 11, 12, 13, 14, 15 (9)	8 (1)	4 (1)	2, 8, 9 (3)	13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29, 30 (16)	24, 25 (2)
14. Punjab	10 (1)	9, 10, 11 (3)		3, 4 (2)	8, 9 (2)	13, 16, 17, 19, 20, 21, 22, 23, 24, 29, 30 (11)	1, 14, 15, 25, 26, 28 (6)
15. Himachal Pradesh		9, 10 (2)		3, 7, 8, 12 (4)	6 (1)	16, 20, 21 (3)	14, 22, 24, 27 (4)
16. Jammu & Kashmir	11 (1)	10, 12, 14 (3)		9, 13, 15 (3)	1, 8, 9, 23, 25, 26 (6)	3, 4, , 6, 16, 17, 18, 19, 20, 23, 24 (10)	24, 25 (2)
17. West Rajasthan	10 (1)	3, 8, 9, 10, 11, 12, 13, 14, 15 (9)	8 (1)	3, 12, 15, 24 (4)	1, 2, 11, 21, 23 (5)	18, 19, 20, 21, 26, 27, 28, 29, 30 (9)	6, 13, 17, 19, 25 (5)
18. East Rajasthan		3, 4, 10, 11 (4)		3, 9, 12, 13, 15, 16, 24 (7)	1, 2, 4, 8, 9, 11, 22, 23 (8)	18, 19, 20, 21 (4)	19, 25, 27 (3)
19. West Madhya Pradesh		8, 9, 10, 11, 12, 13 (6)		1, 2, 3, 7, 8, 9, 10, 13, 14, 23 (10)	4, 6, 7, 15, 22 (5)	16, 17, 24, 26 (4)	16, 17, 20, 22, 26, 27 (6)
20. East Madhya Pradesh		3, 8, 9, 10, 11, 13 (6)		1, 7, 8, 9, 10, 12, 13, 23 (8)	1, 4, 6, 7, 22 (5)	17 (1)	16, 17, 20 (3)
21. Gujarat Region		12, 23 (2)		1, 2, 11, 12, 13, 23, 24 (7)	3, 9, 10, 14, 15, 21, 22 (7)	4, (1)	
22. Saurashtra & Kutch		23 (1)		1, 2, 3, 9, 11, 12, 13, 14, 16, 17, 18, 19, 21, 22, 23, 24 (16)	4, 6, 7, 10, 15, 19, 20 (7)		
23. Konkan & Goa				4, 6, 7, 9, 11, 12, 13, 14 (8)	1, 2, 3, 8, 9, 10 (6)		
24. Madhya Maharashtra				4, 6, 7, 8, 9, 13, 14 (7)	1, 2, 12, 15 (4)	8 (1)	15, 16, 18, 19 (4)
25. Marathawada					2, 6, 13 (3)		9, 15 (2)
26. Vidarbha		4, 7, 8, 11, 12 (5)		3, 6, 8, 12, 14 (5)	1, 2, 4, 9 (4)	16, 20 (2)	15 (1)
27. Chattisgarh	10 (1)	3, 4, 5, 7, 8, 9 (6)	6 (1)	1, 3, 4, 6, 9, 10, 15 (7)	11 (1)	10, 12 (2)	8, 12 (2)
28. Coastal Andhra Pradesh		7 (1)	3 (1)	1, 2, 3, 10, 11, 12 (6)	2, 4, 6, 9 (4)	6, 8 (2)	
29. Telangana				2, 6, 7, 12 (4)	4, 6, 11 (3)	8, 10 (2)	9 (1)
30. Rayalaseema					2, 4 (2)	8 (1)	
31. Tamil Nadu		11 (1)		3, 4, 6 (3)	2, 6, 7, 8 (4)		
32. Coastal Karnataka			7 (1)		4 (1)		
33. North Interior Karnataka				6 (1)	4 (1)		
34. South Interior Karnataka				6 (1)			
35. Kerala							

8.4. Heavy rainfall during August

Extremely heavy rainfall occurred on 2 days in Konkan & Goa and on 1 day in Gujarat State. *Very Heavy rain* occurred on 9 days in Uttarakhand; 4 days in Madhya Maharashtra and on 1 to 3 days in Andaman & Nicobar Islands, Assam & Meghalaya, Gangetic West Bengal, Orissa, Jharkhand, Bihar, Uttar Pradesh, Haryana, Chandigarh & Delhi, Punjab, Himachal Pradesh, east Rajasthan, Gujarat region, Vidarbha, Tamil Nadu, coastal & south interior Karnataka and Kerala. *Heavy rain* occurred on 14 days in Assam & Meghalaya, 11 to 13 days in Orissa, Uttarakhand, Madhya Maharashtra and Tamil Nadu; 7 to 10 days in east Uttar Pradesh, Punjab, Himachal Pradesh, west Rajasthan, Vidarbha, coastal & south interior Karnataka and Kerala; on 3 to 6 days in Andaman & Nicobar Islands, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Bihar, west Uttar Pradesh, Haryana, Chandigarh & Delhi, east Rajasthan, Madhya Pradesh, Gujarat State, Konkan & Goa, Chattisgarh, coastal Andhra Pradesh, Telangana and on 1 to 2 days in Sub-Himalayan West Bengal & Sikkim, Jharkhand, Jammu & Kashmir, Tamil Nadu and Lakshadweep.

8.5. Heavy rainfall during September

Very Heavy rain occurred on 1 to 3 days in Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Bihar, Uttar Pradesh, Uttarakhand, east Rajasthan, Gujarat Region, Konkan & Goa, Madhya Maharashtra, Vidarbha, Chattisgarh, Interior Karnataka and Lakshadweep. *Heavy rain* occurred on 14 days in south interior Karnataka; 13 days in Orissa; 11 days in Madhya Maharashtra; on 6 to 9 days in Andaman & Nicobar Islands, Sub-Himalayan West Bengal & Sikkim, Bihar, east Uttar Pradesh, Gujarat Region, Konkan & Goa, Tamil Nadu and north interior Karnataka; on 4 to 5 days in Assam & Meghalaya, Uttarakhand, Saurashtra & Kutch, Vidarbha and coastal Karnataka and on 1 to 3 days in Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, west Uttar Pradesh, Haryana, Chandigarh & Delhi, Himachal Pradesh, Jammu & Kashmir, Rajasthan, Madhya Pradesh, Marathwada, Chattisgarh, Andhra Pradesh, Kerala and Lakshadweep.

9. Significant temperature during the season

Severe Heat Wave conditions prevailed over the northern parts of the country for a day in the first half of the month. *Heat Wave conditions* also prevailed over the north and central parts of country outside northeast India.

The dates of occurrence of heat waves and dates on which the maximum temperature remained appreciably to markedly above/below normal and above/below normal

are given in Table 19. A same date appearing in two different columns of a sub-division may be reckoned as occurrence of that category over parts of the sub-divisions. Maximum temperatures were normal for the rest of the days.

The highest maximum temperature of 49° C was recorded in Jhalawar on 9 June 2007.

10. Disastrous weather events and damage during monsoon months

10.1. June

According to media and other disaster weather reports, *Heat Wave* took a toll of 53 persons in Madhya Pradesh, 23 in Uttar Pradesh, 20 in Maharashtra, 4 in Punjab and 1 in Haryana. Heavy rain, thunderstorm, squally winds and lightning claimed 102 lives in Kerala, 98 in Bihar, 73 in Gujarat, 64 in Karnataka, 63 in Maharashtra, 54 lives in Andhra Pradesh, 47 in West Bengal, 41 in Assam, 6 in Jharkhand, 4 in Madhya Pradesh and 1 in Tripura. Also, 13 crew members died in a ship wreck caused by strong winds and high seas off the west coast. In Maharashtra, Andhra Pradesh, Karnataka and Kerala, low lying villages were cut-off due to disruption of power supply and road traffic.

10.2. July

According to media and other disaster weather reports, Heavy rain, thunderstorm, squally winds and lightning claimed 101 lives in Gujarat, 63 in West Bengal, 48 in Maharashtra, 42 in Madhya Pradesh, 30 in Bihar, 36 in Jharkhand, 27 in Assam, 23 in Kerala, 22 in Rajasthan, 18 in Orissa, 12 in Karnataka and 1 in Andhra Pradesh. Heavy rain caused severe damage to many houses, low lying areas were submerged in water, trees uprooted, traffic disrupted and also extensive damage occurred to agriculture in Assam, west Bengal, Bihar, Jharkhand, Orissa, Jammu & Kashmir, Madhya Pradesh, Gujarat, Maharashtra, Karnataka and Kerala.

10.3. August

According to media and other disaster weather reports, Heavy rain, thunderstorm, squally winds and lightning claimed 120 lives in Uttar Pradesh, 60 in Andhra Pradesh, 46 in Bihar, 40 in Northeastern states, 33 in Jharkhand, 25 in Karnataka, 24 in Maharashtra, 18 in Orissa, 9 in West Bengal, 5 in Chattisgarh, 3 in Madhya Pradesh, and 1 in Tamil Nadu. In Uttar Pradesh 1100 villages were marooned due to flash floods. Many villages were inundated due to flood waters and 1000 crores worth loss of property and damage to crops occurred in Karnataka.

TABLE 20
The meteorological aspects of severe floods during southwest monsoon 2007

S. No.	Region affected	Period	Cause	Damage	Synoptic features prevailed
1.	<i>Assam</i> Brahmaputra and its tributaries flooded many districts of Assam	18-26 Jun	Incessant rains in the catchment areas in upper Assam and Arunachal Pradesh	More than 15 people died and lakhs of people from 240 villages were displaced	Southwest monsoon had advanced over the northeastern states and was quite active
2.	<i>Andhra Pradesh, Kerala, Karnataka and Maharashtra</i> The rivers Krishna, Godavari and their tributaries Kundu and Tungabhadra were flooded	22 Jun – 4 Jul	Torrential rain, landslides, sea water inundation etc	The death toll had been 52 in Kerala, 39 in Karnataka and 38 in Andhra Pradesh. More than 200 villages were inundated in Andhra Pradesh and flashfloods and heavy rain created devastation in all the other states. Low lying villages were cut off due to disruption of power supply and road traffic	A Deep Depression formed over the west central Bay and moved westnorthwestwards across the peninsular India
3.	<i>Orissa and Chattisgarh</i> River Mahanadi and its tributaries flooded	30 Jun – 13 Jul	Incessant heavy rains	Twenty one people died in Orissa and 8 in Chattisgarh. Fifty thousand people were rendered homeless in Orissa and a similar number got marooned in Chattisgarh. Eighty thousand hectares of farm land were affected and 400 villages were flooded	Active monsoon conditions, due to the consecutive formation of two Depressions over the head Bay and their westnorthwestward movement
4.	<i>Maharashtra</i> Rivers Chandrabhaga, Pedhi, Purna and Bhuleswar were flooded	1-6 Jul	Incessant heavy rains	More than 62 people died. Over 200 villages were submerged and 13,000 hectares of farmland were destroyed	A monsoon Depression which moved westnorthwestwards across central India
5.	<i>Gujarat, Rajasthan and Madhya Pradesh</i> Poorna, Narmada, Mahi and Sabarmati rivers were flooded in Gujarat, Luni and Gadhad in Rajasthan and Kalisindh & Denva in Madhya Pradesh	1 – 13 Jul	Extremely heavy rains	More than 163 people died in Gujarat, 22 in Rajasthan and 40 in Madhya Pradesh. Thousands of people were evacuated and a dam was breached in Jodhpur district	A monsoon Depression which moved across Madhya Pradesh and later weakened into a low pressure area over Rajasthan
6.	<i>West Bengal, Jharkhand, Bihar and Uttar Pradesh</i> A group of rivers named Dwarkeswar, Damodar, Subarnarekha, Kelaghai, Jarua, Punpoon, Rato, Mahananda, Bagmati, Koshi, Kankai and Adhwara and Ganga in West Bengal and Bihar and the rivers Rapti, Burhi, Ghagra, Rohini, Sarayu, Badi, Gankak Canal, Kuano etc. in Uttar Pradesh	3 July – 22 Sep	Incessant heavy rains	Eighty three people died in West Bengal, a million people were marooned in 3,000 villages, and more than 30,000 rendered homeless. Six people died in Jharkhand and 122 in Bihar. Sixteen out of the 38 districts of Bihar were under water, 6,30,000 hectares of crops were destroyed and it is reported as the worst flooding in the past 30 years. In Uttar Pradesh, hundreds of people died, 1,400 villages inundated in 11 districts and thousands of acres of crops, submerged	(i) A Deep Depression formed over Bangla Desh coast (4-9 July) and moved westnorthwestwards. (ii) A well marked low pressure area formed over the northwest Bay (13-18 July) and moved upto east Uttar Pradesh. (iii) Another Deep Depression formed over the northwest Bay (5-7 August) and moved across central India. (iv) Two more well marked low pressure areas over the north Bay which moved over to Bihar and Madhya Pradesh. (v) Two low pressure areas, one over the northwest Bay off Andhra coast and the other over the north Bay and adjoining Orissa – Gangetic West Bengal coasts
7.	<i>Assam, Arunachal Pradesh, Meghalaya, Manipur and Tripura</i> River Brahmaputra and its tributaries flooded almost all the districts of these northeastern states	12 Jul – 10 Oct	Extremely heavy rain and the eastern boundary states flooded as a consequence of the flooding in Bangladesh	Nearly 100 people died in Assam and 9 in Meghalaya. Millions of people were displaced and more then 1.1 million hectares of crops were destroyed	Occasional shifting of the monsoon trough towards the foothills during the period and also the presence of a secondary monsoon trough and a low level trough in the westerlies over the region during short periods

TABLE 20 (Contd.)

S. No.	Region affected	Period	Cause	Damage	Synoptic features prevailed
8.	<i>Kerala</i> Almost all the districts were affected by flood	16-20 Jul	Heavy rains	Floods and landslides claimed the lives of 44 people in Kerala. Also it led to heavy loss of property and crops	In general, subdued rainfall activity prevailed over the country, outside south peninsula. The formation of a well marked low pressure area over the northwest Bay had activated the off shore trough along the west coast, temporarily
9.	<i>Orissa</i> Rivers Bansadhara, Subarnarekha, Jalaka, Kharasrota, Brahmani, Genguti and Birupa were flooded	3-27 Aug	Heavy rains	More than 15 people died. Hundreds of villages were inundated	(i) A Deep Depression over the northwest Bay (5-7 August) crossed Orissa coast, north of Paradip and moved westwards. (ii) A well marked low pressure area formed over the northwest Bay (10-14 August) off West Bengal – Orissa coasts and moved over to Bihar subsequently. (iii) Another well marked low pressure area over the north Bay (18-21 August) and moved inland
10.	<i>Gujarat</i> Many districts in Saurashtra & Kutch viz., Rajkot, Jamnagar, Junagadh, Porbandar and Veraval were flooded	8-15 Aug	Extremely heavy rains	Several villages submerged under water and were cut off by flooding	Southwest monsoon revived with the formation of a Deep Depression over the head Bay
11.	<i>Himachal Pradesh, Punjab, Haryana, Jammu & Kashmir and Uttarakhand</i> Rivers Tavi, Sutlej and Basantar flooded	12-17 Aug	Heavy rains triggering landslides	In Himachal Pradesh, 26 people died and 40 people died in Uttarakhand	Monsoon trough remained close to the foothills
12.	<i>Andhra Pradesh</i> Rivers Tungabhadra, Pennar, Hundri, Kundu, Krishna, Pennar and Chitravathi flooded	16 Sep – 7 Oct	Heavy rains	More than 58 people lost their lives. About 40,000 acres of crops submerged and 8,000 houses were damaged	A Depression formed over the west central and adjoining northwest Bay (21-24 September)
13.	<i>Orissa and West Bengal</i> The rivers Brahmani, Baitarani, Burhabalang, Subarnarekha, Kalo, Sunei, Jalaka in Orissa and Hugli, Kangsabati, Keleghai, Silabati, Dulung, Bhagirathi etc. of West Bengal were flooded	22 Sep – 8 Oct	Heavy rain	Thirty one people died in Orissa and 51 in West Bengal. Millions of people were affected and 1,50,000 hectares of crops were destroyed	A Depression formed over the west central and adjoining northwest Bay (21-24 September), crossed Orissa coast close to Puri and moved westwards subsequently

10.4. September

According to media and other disaster weather reports, Heavy rain, thunderstorm, squally winds and lightning claimed 49 in Northeastern states, 47 in Andhra Pradesh, 19 each in West Bengal and Karnataka, 15 in Uttarakhand, 9 in Bihar, 5 in Orissa and 3 in Tamil Nadu. In Karnataka, several hundreds of houses collapsed due to heavy rain. Sea erosion, heavy rain and strong winds caused damage to houses, trees and several boats in Kerala.

11. The meteorological aspects of severe floods during southwest monsoon – 2007

During the southwest Monsoon (June-September 2007), many states viz., Assam, Meghalaya, Arunachal Pradesh, Manipur, Tripura, Andhra Pradesh, Kerala, Karnataka, Maharashtra, Orissa, Chattisgarh, Gujarat,

Rajasthan, Madhya Pradesh, West Bengal, Jharkhand, Bihar, Uttar Pradesh, Himachal Pradesh, Uttarakhand, Jammu & Kashmir, Punjab and Haryana experienced flood situations during various parts of the season. The uneven distribution of rainfall in space and time, leading to extremely heavy rainfall had been the major cause of flood over these regions. Monsoon Depressions, offshore troughs and low pressure areas were the major synoptic situations, which caused these heavy rainfall events.

Floods, heavy rain and lightning were the major causes of death toll. Floods, heavy rains, landslides, squally winds, lightning etc. took a toll of more than 1720 human lives in various parts of the country. Bihar was the worst affected state, where 253 people lost their lives due to floods and heavy rain. Gujarat (174), Assam and adjacent states (160), West Bengal (159), Maharashtra (155), Karnataka (134), Andhra Pradesh (128), Kerala

(125), Uttar Pradesh (120), Himachal Pradesh (98), Jharkhand (75) Madhya Pradesh (51), Orissa (42), Rajasthan (22), Uttarakhand (15), Chattisgarh (5) and Tamil Nadu (4) were the other affected states.

Details are given in the Table 20. The source of the flood data provided in this section is mainly from the website maintained by the Dartmouth flood observatory, supplemented with other media reports and damage reports provided by various RMCs & MCs. Hence, the death toll in this section and that of section 10 may not tally, as those given below are not official figures.

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Appendix

Definitions of the terms given in '*Italics*'

Rainfall

<i>Excess</i>	- Percentage departure from normal rainfall is + 20% or more.
<i>Normal</i>	- Percentage departure from normal rainfall is between – 19 % to + 19 %.
<i>Deficient</i>	- Percentage departure from normal rainfall is between – 20 % to – 59 %.
<i>Scanty</i>	- Percentage departure from normal rainfall is between – 60 % to – 99 %.
<i>Widespread (Most places)</i>	- 75% or more stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
<i>Fairly widespread (Many places)</i>	- 51% to 74% stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
<i>Heavy rain</i>	- Rainfall amount from 6.5 cm to 12.4 cm.
<i>Very heavy rain</i>	- Rainfall amount more than 12.5 cm to 24.4 cm.
<i>Extremely heavy rainfall</i>	- Rainfall amount more than 24.5 cm.
<i>Exceptionally heavy</i>	- When the amount is a value near about the highest recorded rainfall at or near the station for the month or season. The highest ever recorded should be more than 12 cm.

Monsoon activity

<i>Active</i>	- Average rainfall of a sub-division is more than 1½ to 4 times the normal with minimum 5 cm along the west coast and 3 cm elsewhere in at least two stations in the sub-division.
<i>Vigorous</i>	- Average rainfall of a sub-division is more than 4 times or more than the normal with minimum 7 cm along the west coast and 5 cm elsewhere in at least two stations in the sub-division.

LRF Terminology

<i>Normal monsoon</i>	- 90 to 110 percent of long period average seasonal rainfall.
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Maximum/day temperatures

According to the new criteria, since 1st March 2002, Heat Wave is declared only when the maximum temperature of a station reaches at least 40° C for plains and at least 30° C for Hilly regions.

<i>Severe heat wave conditions</i>	- Departure of maximum temperature from normal is +6° C or more for the regions where the normal maximum temperature is more than 40° C and +7° C or more for regions where the normal maximum temperature is 40° C or less.
<i>Heat wave conditions</i>	- Departure of maximum temperature from normal is + 4° C to + 5° C or more for the regions where the normal maximum temperature is more than 40° C and departure of maximum temperature from normal is + 5° C to + 6° C for regions where the normal maximum temperature is 40° C or less
<i>Markedly above normal</i>	- Departure of maximum temperature from normal is between +5° C to +6° C for the regions where the normal maximum temperature is 40° C or less.
<i>Appreciably above normal</i>	- +3° C to +4° C for the regions where the normal maximum temperature is 40° C or less.
<i>Appreciably below normal</i>	- Departure of maximum temperature from normal is – 3° C to – 4° C.
<i>Markedly below normal</i>	- Departure of maximum temperature from normal is – 5° C or less.