Ministry of Earth Sciences (MoES)
India Meteorological Department
Welcomes You All for the Press Release
of
Salient Features of Southwest Monsoon 2021

30th September 2021

भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT
Salient Features of Monsoon 2021

- **Southwest monsoon season rainfall for the country as a whole during (Jun-Sep) 2021 has been normal (96 -104% of LPA).**

- **Quantitatively the 2021 all India monsoon seasonal rainfall during 1 June to 30 September 2021 has been 87.0 cm against long period average of 88.0 cm based on data of 1961-2010 (99% of its Long Period Average (LPA)).**

- **Southwest monsoon seasonal (June-September) rainfall over four homogeneous rainfall is Normal over Northwest India(96%) and central India(104%). Seasonal rainfall is below normal over East and Northeast India (88%) and above normal over South Peninsula India (111%).**

- **Considering month to month rainfall variation over India as a whole, the season is very uniquely placed in the historical record for its distinct and contrasting month to month variation. The rainfall over country as a whole was 110%, 93%, 76% and 135% of LPA during June, July, August and September respectively.**
Rainfall Time series (% Departure) for the southwest monsoon season

ALL INDIA (JUNE-SEP) RAINFALL %DEP

YEAR


RAINFALL

%DEP

-30.0 -20.0 -10.0 0.0 10.0 20.0 30.0

भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT
Monsoon onset 2021

Southwest Monsoon Covered the Entire Country on 13 July, 2021

Rainfall Anomaly over Core Monsoon Zone

INDIA METEOROLOGICAL DEPARTMENT
Southwest Monsoon Rainfall, 2021

### Rainfall Statistics - Monsoon 2021

<table>
<thead>
<tr>
<th></th>
<th>JUNE 2021</th>
<th>JULY 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-Jun TO 30-Jun</td>
<td>1-Jul TO 31-Jul</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td><strong>Actual</strong></td>
<td><strong>Normal</strong></td>
</tr>
<tr>
<td>Country As A Whole</td>
<td>182.9</td>
<td>166.9</td>
</tr>
<tr>
<td>Northwest India</td>
<td>85.7</td>
<td>75.3</td>
</tr>
<tr>
<td>East &amp; Northeast India</td>
<td>357.3</td>
<td>347.1</td>
</tr>
<tr>
<td>Central India</td>
<td>198.8</td>
<td>169.2</td>
</tr>
<tr>
<td>South Peninsula</td>
<td>166.2</td>
<td>160.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>AUGUST 2021</th>
<th>SEPTEMBER 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-Aug TO 31-Aug</td>
<td>1-Sep TO 30-Sep</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td><strong>Actual</strong></td>
<td><strong>Normal</strong></td>
</tr>
<tr>
<td>Country As A Whole</td>
<td>196.2</td>
<td>258.2</td>
</tr>
<tr>
<td>Northwest India</td>
<td>140.5</td>
<td>202.7</td>
</tr>
<tr>
<td>East &amp; Northeast India</td>
<td>354.6</td>
<td>346.0</td>
</tr>
<tr>
<td>Central India</td>
<td>188.3</td>
<td>367.3</td>
</tr>
<tr>
<td>South Peninsula</td>
<td>168.2</td>
<td>189.2</td>
</tr>
</tbody>
</table>

### Cumulative Seasonal Rainfall

<table>
<thead>
<tr>
<th></th>
<th>1-Jun TO 30-Sep</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region</strong></td>
<td><strong>Actual</strong></td>
</tr>
<tr>
<td>Country As A Whole</td>
<td>874.6</td>
</tr>
<tr>
<td>Northwest India</td>
<td>575.9</td>
</tr>
<tr>
<td>East &amp; Northeast India</td>
<td>1246.2</td>
</tr>
<tr>
<td>Central India</td>
<td>1012.5</td>
</tr>
<tr>
<td>South Peninsula</td>
<td>804.2</td>
</tr>
</tbody>
</table>

*(Based on real-time data)*
Monthly Rainfall during Southwest Monsoon Season 2021

June

July

August

September
Heavy Rainfall Events occurred during Monsoon Season 2021

Location of Heavy Rainfall events

Location of Extremely Heavy Rainfall events
Synoptic Scale systems (Lows, Depression and Cyclonic Storm)
Depression and Cyclonic Storm

Table: Number of Low pressure System (LPS) including Low (L), Well Marked Low (WML), Depression (D), Deep Depression (DD), Cyclonic Storm (CS) and number of LPS days in monsoon 2021 and their normal

<table>
<thead>
<tr>
<th>Category</th>
<th>CS</th>
<th>DD</th>
<th>D</th>
<th>WML</th>
<th>L</th>
<th>Total LPS systems</th>
<th>Total PLS Days</th>
<th>Long period Average of Total no of LPS Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>July</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>August</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Sept.</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>29</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>13</td>
<td>62</td>
<td>13</td>
</tr>
</tbody>
</table>
Map Significant Weather Events

JAMMU & KASHMIR
LIGHTNING: 1 PERSON DIED (25 JUNE)

BHARAT
LIGHTNING: 47 PEOPLE DIED (23, 24, 26, 28 JUNE)

RAJASTHAN
LIGHTNING: 24 PEOPLE DIED (11, 13, 14 JULY)

MADHYA PRADESH
LIGHTNING: 25 PEOPLE DIED (11, 12, 13, 23, 24)

GUJARAT
LIGHTNING: 4 PEOPLE DIED (10 JULY)

MAHARASHTRA
HEAVY RAIN: 131 PEOPLE DIED (9, 11-26 JULY)
LIGHTNING: 4 PEOPLE DIED (7, 11 JULY)

KARNATAKA
HEAVY RAIN: 9 PEOPLE DIED (22-24 JULY)

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Map Significant Weather Events

- **HIMACHAL PRADESH**
  - HEAVY RAIN
  - 25 PERSONS DIED (11 AUG)

- **MADHYA PRADESH**
  - HEAVY RAIN
  - 30 PERSONS DIED (1-7 AUG)

- **UTTAR PRADESH**
  - HEAVY RAIN
  - 9 PERSONS DIED (19 AUG)

- **BIHAR**
  - HEAVY RAIN
  - 12 PERSONS DIED (7-17 AUG)
  - LIGHTNING
  - 7 PERSONS DIED (7 AUG)

- **WEST BENGAL**
  - HEAVY RAIN
  - 15 PERSONS DIED (2, 3 AUG)
  - LIGHTNING
  - 7 PERSONS DIED (2, 7 AUG)

- **JHARKHAND**
  - LIGHTNING
  - 10 PERSONS DIED (2, 7 AUG)

- **ODISHA**
  - LIGHTNING
  - 5 PERSONS DIED (7 AUG)

- **TAMU NADU**
  - LIGHTNING
  - 1 PERSON DIED (20 AUG)
# Verification of LRF

<table>
<thead>
<tr>
<th>Region</th>
<th>Period</th>
<th>Forecast (% of LPA)</th>
<th>Actual Rainfall (% of LPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(issued on 16th April)</td>
<td></td>
<td>(issued on 1st June)</td>
<td></td>
</tr>
<tr>
<td>All India</td>
<td>June to September</td>
<td>Normal (96-104% of LPA) 98±5 of LPA</td>
<td>99</td>
</tr>
<tr>
<td>North West India</td>
<td>June to September</td>
<td>Normal (92-108% of LPA)</td>
<td>96</td>
</tr>
<tr>
<td>Central India</td>
<td>June to September</td>
<td>Above Normal (&gt;106% of LPA)</td>
<td>104</td>
</tr>
<tr>
<td>Northeast India</td>
<td>June to September</td>
<td>Below Normal (&lt;95% of LPA)</td>
<td>88</td>
</tr>
<tr>
<td>South Peninsula</td>
<td>June to September</td>
<td>Normal (93-107% of LPA)</td>
<td>111</td>
</tr>
<tr>
<td>Monsoon Core Zone</td>
<td>June to September</td>
<td>Above Normal (&gt;106% of LPA)</td>
<td>107</td>
</tr>
<tr>
<td>(issued on 1st July)</td>
<td></td>
<td>(issued on 2nd Aug)</td>
<td></td>
</tr>
<tr>
<td>All India</td>
<td>July</td>
<td>July: Normal (94-106% of LPA)</td>
<td>93</td>
</tr>
<tr>
<td>All India</td>
<td>August &amp; Aug-Sept (issued on 2nd Aug)</td>
<td>August: Normal (94-106% of LPA)</td>
<td>76</td>
</tr>
<tr>
<td>All India</td>
<td>September</td>
<td>Aug+Sept: Normal (95-105% of LPA)</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Above Normal (&gt;110% of LPA)</td>
<td>135</td>
</tr>
</tbody>
</table>
Above normal rainfall over many parts of central India, West and eastern coastal India and normal to above normal rainfall over many parts of southeast India, eastern central India, Below normal rainfall over the extreme north India and some parts of north-east India were correctly predicted. However, the below normal rainfall observed over some parts of central peninsular India could not be predicted.
Above normal rainfall observed over many parts of North India, Central India and Eastern coastal India were very much matching with the forecast. Similarly, below normal rainfall observed over the extreme north India, some parts of North East India also as per the issued forecast. However, the observed below normal rainfall over some parts of north-west India and central and adjoining east India could not be predicted.
Other factors responsible for August Rainfall Deficiency

- Negative Indian Ocean Dipole unfavorable for Indian monsoon prevailed
- Absence of formation of monsoon depression. Normally two monsoon depression forms in the month of August.
- Less number of low pressure area formed over Bay of Bengal. Two against 4 formed during (16-18 & 28-30 Aug.)
- Unfavorable MJO conditions over Indian Ocean: During most of the days MJO was in the phase 8, 1 and 2 which are unfavorable for monsoon rainfall activity.
- Less West Pacific Typhoon activity. Remnants of westward moving typhoons help to form LPS over Bay of Bengal.
Factors responsible for Excess September Rainfall

- Sept 2021 had 2nd Highest for 1994-2021 (28 years) after 2019 (+52%)
- Weakening of Negative Indian Ocean Dipole during September
- Formation of monsoon depression and one system intensified into Cyclonic Storm.
- Favorable MJO conditions over Indian Ocean: During most of the days MJO was in the phase 3, 4 and 5 which are favorable for monsoon rainfall activity.
- More West Pacific Typhoon activity and the Remnants of westward moving typhoons help to form LPS over Bay of Bengal.
Probabilistic forecast of rainfall for October and (Oct-Dec. 2021)

30-Sep-21

INDIA METEOROLOGICAL DEPARTMENT
Extended Range Forecast of rainfall during 1-28 October 2021

NCMRWF CNCUM Extended Range Forecasts-20210930

Precipitation Anomaly (mm/day)

(Week1: 01Oct-07Oct)  (Week2: 08Oct-14Oct)


Forecast Rainfall Anomaly (mm/day)

INDIA METEOROLOGICAL DEPARTMENT
Multi-Hazard Early Warning for 30 Sep. to 4 Oct. 2021
Thank you