

**INDIA METEOROLOGICAL DEPARTMENT
MINISTRY OF EARTH SCIENCES**

**Long Range Forecast Outlook for the Rainfall
During the Second Half (August –September) of
2011 Southwest Monsoon**

1. Background

India Meteorological Department (IMD) issues operational long range forecasts for the southwest monsoon Season (June to September) rainfall over the country as a whole in two stages; in April and in June. Along with update forecast for the season rainfall over the country as a whole issued in June, forecast for monthly rainfall (for July and August) over the country as a whole and season (June to September) rainfall over the four geographical regions (Northwest India, Central India, Northeast India and South Peninsula) are also issued. From 2009, IMD issues also forecast outlook for the rainfall during the second half (August-September) of the monsoon season. IMD has now prepared a forecast outlook for the second half of the 2011 monsoon season. For this, a new Principal Component Regression (PCR) Model based on 5 predictors is used

2. First & Second Stage Forecasts issued respectively in April and June, 2011

This year, the first stage forecast was issued on 19th April and Second stage forecast was issued on 21st June. Summary of IMD's long range forecasts for the 2011 south-west monsoon season (June to September) issued in two stages are given in the table below. In the last column, the actual rainfall received so far is also given.

Region	Period	Forecast (% of LPA)		Actual Rainfall Received so far (1 June-31 July) % of LPA
		1 st Stage	2 nd Stage	
All India	June to September	98 ± 5	95 ± 4	95
Northwest India	June to September	-	97 ± 8	99
Central India	June to September	-	95 ± 8	99
East & Northeast India	June to September	-	95 ± 8	84
South Peninsula	June to September	-	94 ± 8	98
All India	July	-	93 ± 9	86
All India	August	-	94 ± 9	-

3. 5-Parameter Model for the rainfall during second half of monsoon season (August- September) for the country as a whole

During the second half of the monsoon season (August to September) the long period average (LPA) of the rainfall over the country as whole is 43.5cm based on the 1951-2000 climatology. The coefficient of variation (C.V) of the rainfall time series is 15%. For the forecast of August - September rainfall over the country as a whole, a new Principal Component Regression (PCR) Model based on 5 predictors has been used. The model error of 5-parameter PCR model is 8% of LPA.

The 5-parameter PCR model was also used to prepare probability forecasts for five pre-defined categories of rainfall during the second half of the monsoon season. These are deficient (less than 85% of LPA), below normal (86-94% of LPA), near normal (95-105% of LPA), above normal (106-115% of LPA) and excess (above 115% of LPA). The forecasted probabilities for the rainfall during the second half of 2011 southwest monsoon season in percentage for the above 5 categories are 27%, 46%, 24%, 3% and 0% respectively. It may be noted that the above mentioned 5 pre-defined rainfall categories are different from the 5 rainfall categories used for the probability forecast of seasons (June – September) rainfall over the country as a whole.

4. ENSO Neutral conditions over Equatorial Pacific

After the dissipation of the moderate to strong La Nina event around mid-May 2011, ENSO neutral conditions are prevailing over equatorial Pacific. The latest forecasts from a majority of the dynamical and statistical models indicate high probability (about 80%) for the present ENSO-neutral conditions to continue during the remaining part of the 2011 southwest monsoon season. However, the probability for re-emergence of La Nina or that for development of El Nino (10% each) is relatively less.

5. Summary of the Forecast outlook for the Rainfall During the Second Half of the 2011 Southwest Monsoon Rainfall

Rainfall over the country as a whole for the second half (August to September) of the 2011 southwest monsoon season is likely to be below normal (86 to 94% of long period average (LPA)). Quantitatively, rainfall for the country as a whole during the period August to September, 2011 is likely to be 90% of LPA with a model error of $\pm 8\%$.

The outlook for the 2011 Southwest Monsoon Season Rainfall is that the monsoon season (June to September) rainfall for the country as a whole is likely to be below normal (90-96% of LPA) as forecasted by IMD in June. The season (June to September) rainfall over the 3 geographical regions (Northwest India, Central India and South Peninsula) is also likely to be within the limits of forecasts (i.e. 97% of LPA, 95% of LPA and 94% of LPA respectively all with model errors of $\pm 8\%$ of LPA) issued by IMD in June. However, the season rainfall over Northeast India is likely to be less than lower limit of the IMD forecast (95 $\pm 8\%$ of LPA) issued in June.