

# जलवायु अनुप्रयोग Climate Applications

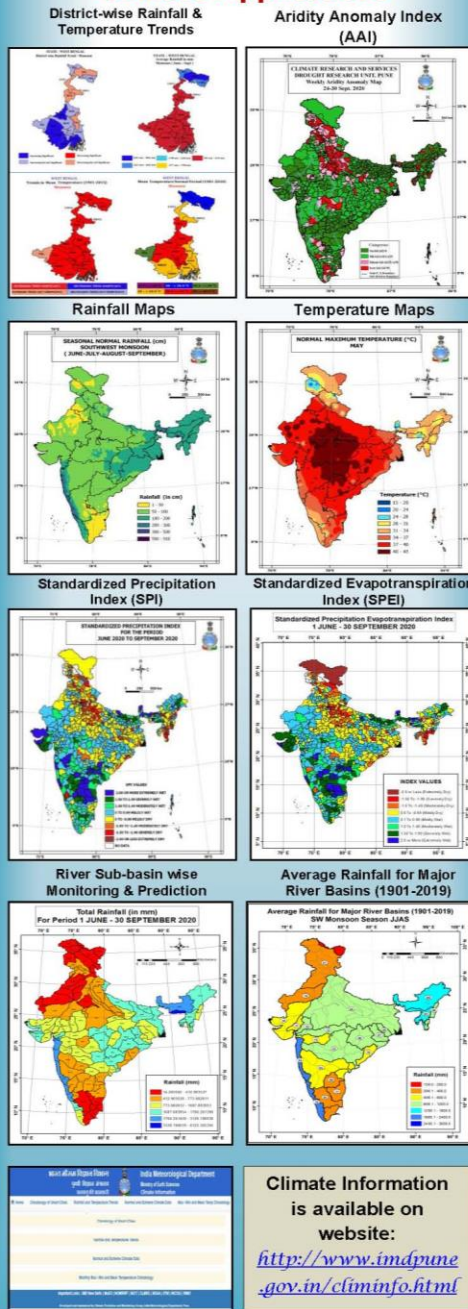
- The daily rainfall/ snowfall data received from rain gauge stations (departmental and non-departmental) are scrutinized, processed for archival at National Data Centre.
- Daily, monthly, seasonal and annual rainfall normals for stations, districts, subdivision, states, four homogeneous region and whole country for operational use and updated every decade.
- Publication of State-wise Climate summaries.
- Hydrology and Agricultural sectors:
  - Drought Monitoring and prediction on a weekly, biweekly, monthly and seasonal time scales in the districts over the country based on Aridity Anomaly Index (AAI), Standardized Precipitation Index (SPI) and Standardized Precipitation Evapotranspiration Index (SPEI). Weekly Drought conditions prediction maps are generated based on GFS and ERF forecast indicating the impending drought scenario in the districts of the country in the subsequent weeks.
  - Weekly Rainfall and volume of water monitoring and weekly prediction of 101 river basins of India.
  - Dedicated web page on Climate information (climatology, rainfall and temperature trends, normal and extreme climate data etc.) of important cities of India on a separate webpage of CRS Pune.
  - Rainfall data products like long term daily and monthly rainfall data series for the districts, states, met subdivision, homogeneous regions and all India.
  - Climate change impact studies on rainfall and extremes.
- Weekly Climate outlook for vector borne diseases like Malaria, Dengue.

## Climate Publications

<http://www.imdpune.gov.in/library/publication.html>



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## महत्वपूर्ण संपर्क/Important Contact Links

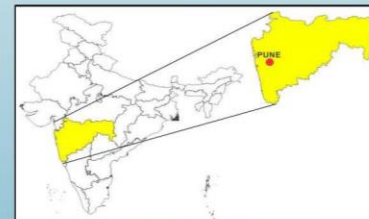
**Address:** O/o Climate Research & Services,  
India Meteorological Department,  
Shivaji Nagar, Pune-411 005.  
**E mail :** crs.pune@imd.gov.in  
**TELEPHONE :** 020-25535877  
**FAX :** 020- 25535435

- IMD HQrs website: <https://mausam.imd.gov.in/>
- IMD Pune website: [www.imdpune.gov.in](http://www.imdpune.gov.in)
- IMD Data Supply Portal: <http://dsp.imdpune.gov.in/>
- IMD Climate Data Products: [http://www.imdpune.gov.in/Clim\\_Pred\\_ERF\\_New/Gridded\\_Data\\_Download.html](http://www.imdpune.gov.in/Clim_Pred_ERF_New/Gridded_Data_Download.html)

## संक्षिप्त इतिहास / Brief History

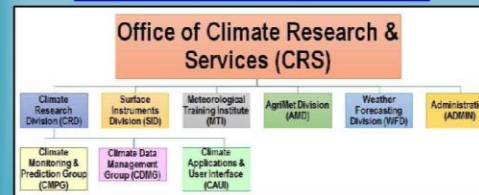
The main building (popularly known as "Simla Office") of the O/o CRS was completed in June 1928 and was inaugurated by the then Governor-of Bombay, Sir Leslie Orme Wilson, on 20th July, 1928, in the presence of the Hon'ble Sir Cecil McWatters, then acting Member of the Governor General's Executive council, who reviewed the work of the Department from its commencement.

The transfer of Headquarters from Shimla to Poona (now Pune) was officially proposed by Sir. Gilbert Walker in 1924. The shifting of staff from Shimla to Poona was also completed by the middle of 1928. Poona (now Pune) continued to be the headquarters of the Organization till the outbreak of the Second World War in September, 1939.



Location of CRS, IMD, Pune

## Organization Structure of CRS, IMD, Pune



## जलवायु सेवाएँ Climate Services

भारत मौसम विज्ञान विभाग  
INDIA METEOROLOGICAL DEPARTMENT  
पृथ्वी विज्ञान मंत्रालय (एम.ओ.ई.एस.)  
Ministry of Earth Sciences (MoES)

भारत सरकार  
Government of India



India Meteorological Department (IMD) is the official agency responsible for providing operational weather and climate services required for the country. IMD has a long history of working with a range of user communities within the countries in provision of weather, climate and hydrological information and products to improve decision making within the country and key development sectors.

IMD provides Climate Services through Climate Research & Services (CRS) division situated in Pune. CRS carries out following activities:

- Climate Monitoring and Analysis
- Climate Prediction (Seasonal Forecasts)
- Climate Data Management
- Climate Research and Climate Applications.
- International support/cooperation like Regional Climate Centre (RCC), South Asia Seasonal Climate Outlook Forum (SASCOF) and Capacity Building

With an objective to expand climate service activity across south Asia, since May 2013, CRS has also taken up additional responsibility to work as WMO recognized Regional Climate Centre (RCC) for the South Asia.



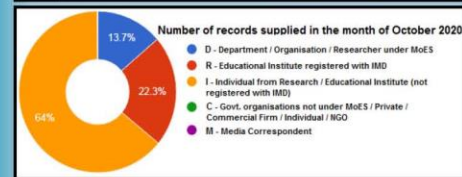
# जलवायु डेटा सेवाएँ Climate Data Services

CRS, Pune is the sole custodian of preserving the meteorological data collected from various field stations situated all over the country. After standard validation and quality control procedures these data are archived. These data are shared to researchers, modellers, users of climate sensitive sectors for various applications like climate variability, trends and prediction studies, model verification, preparation of sector specific climate products like normal, drought monitoring indices, heat indices etc.

India Meteorological Department supplies meteorological data to various Government and non-government organisations, research Institutes, educational universities, departments, students, private firms from all the sectors, media, etc.

The data is supplied on payment basis as per IMD's data charging policy. However, it is discounted or almost free for the research and educational purpose.

The method of supply till 2019 was manual and traditional causing delay for the users to obtain data but now 'Climate Data Supply Portal' has been launched for online management of all activities for supply of Meteorological Data.



# जलवायु निगरानी Climate Monitoring

Carries out country specific climate related activities like preparation and publication of monthly, seasonal and annual climate summaries for the Indian region.

Quality controlled high resolution daily gridded rainfall and temperature products (at 25 km and 100 km resolutions) are also prepared by this unit for user community.

Normal maximum, minimum & mean temperature (based on 1981-2010 period) observed over 700+ districts of the country and trends in these temperatures (based on 1901-2015 period) are displayed on IMD, Pune website, state wise.

Gridded rainfall for 1901-till date ( $1^\circ \times 1^\circ$  &  $0.25^\circ \times 0.25^\circ$ ) and temperature data for 1951-till date ( $1^\circ \times 1^\circ$ ) sets, Merged Satellite and IMD Gauge rainfall data over the Indian region and neighbourhood are freely available for download from CRS, IMD Pune website.

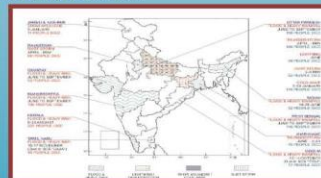
Climatological Normals (1981-2010) and Pentad Normals (1981-2010) (Pressure, Max. & Min. Temperature (Max. & Min.), Relative Humidity) are also available.



Climate Diagnostic Bulletin of India - Highlights of main meteorological features observed during the month/season viz. temperature, pressure, wind, rainfall, monthly area-average mean temperature, time series for the country as a whole.

Annual Climate Summary - Time series of annual mean temperature and rainfall anomalies, temperature and rainfall special maps for all months of the year, intense low-pressure systems formed during the year, station wise temperature and rainfall extremes, and significant weather events during the year.

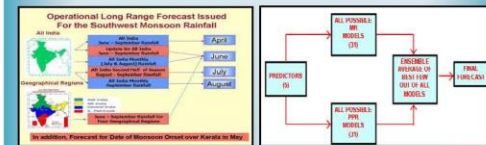
Monsoon Report - Discusses the operational monitoring and forecasting aspects of the southwest monsoon, various observed global and regional climate patterns associated with the south west monsoon every year, Verification of forecasts.



# जलवायु प्रागुक्ति Climate Prediction

The first operational Long Range Forecast (LRF) of Indian summer monsoon rainfall for the region covering whole India and Burma (now Myanmar) based on subjective method was issued on June 4th, 1886 by H.F. Blandford who established IMD in 1875 and was the first Chief Reporter of IMD.

Sir Gilbert Walker used first objective method based on regression for Operational LRF in 1909. The models developed by Walker formed basis for the operational LRF in India till 1987. In 1988, 16- parameter power regression and parametric models were introduced. The statistical Ensemble Forecasting system (developed through in-house research and introduced in 2007) currently used for issuing seasonal monsoon rainfall forecast over country as a whole along with coupled forecasting system (CFS) developed under MoES's Monsoon Mission project.



Performance of LRF (1988-2020) : During 1995-2007, the forecast within the  $\pm 8\%$  of actual values during 7 years. Within these 7 years, forecast was within  $\pm 4\%$  during 3 years. On the other hand, during 2008-2020, the forecast was within the  $\pm 8\%$  of actual values during 9 years with forecast within  $\pm 4\%$  during 5 years. These clearly indicate improvement made in the operational forecast system in the recent 13 years period compared to earlier 13 years period.

Sl. No.	Forecast for	Region for which forecast issued	Issued in	Model
1	Winter Season (Jan- March) Precipitation	Northwest India	December	Statistical
2	Hot Weather Season Temperature (March to May) & (April to June)	Subdivisions wise	February & March	Dynamical
3	SW Monsoon Season (June to September) Rainfall	Country as a whole	April	Statistical
4	SW Monsoon Season (June to September) Rainfall	Country as a whole	June	Dynamical
5	South-West Monsoon Onset	Kerala	May	Statistical
6	SW Monsoon Season (June to September) Rainfall	Four broad geographical regions: Northwest India, Northeast India, Central India and South Peninsula	June	Statistical, Dynamical
7	SW Monsoon Monthly Rainfall for July and August	Country as a whole	June	Statistical, Dynamical
8	SW Monsoon Second half of the Season (August- September) Rainfall	Country as a whole	July	Statistical, Dynamical
9	SW Monsoon Season (October to December) Rainfall	Country as a whole	August	Statistical, Dynamical
10	NE Monsoon Season (October to February) Temperature	South Peninsula	September	Statistical, Dynamical
11	Cold Weather Season (December to February) Temperature	Subdivision wise	November	Dynamical

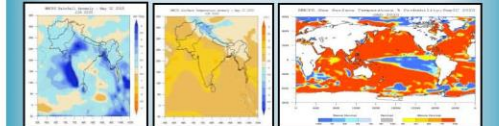
# क्षेत्रीय जलवायु केंद्र Regional Climate Centre

The CRS office of IMD, Pune is recognized as the World Meteorological Organization (WMO) Regional Climate Centre (RCC) for South Asia.

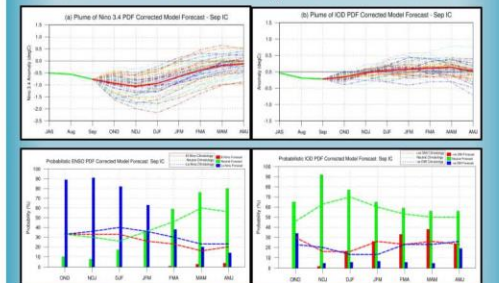
Presently, the following activities are carried out under RCC, Pune:

- Generating Seasonal Climate Outlook for rainfall and temperatures over South Asia with monthly update.
- Preparing monthly and seasonal ENSO & IOD bulletins with monthly update.
- Conducting of South Asia Seasonal Climate Outlook Forum (SASCOF) and preparation of consensus forecast outlook for SW monsoon, NE monsoon and winter seasons over South Asia.
- Generating Rainfall, Temperature and Sea Surface Temperature Forecasts (Anomaly & Probability Maps) for South Asian Region as well as Global Region.
- Monsoon Mission CFS (MMCFS) Regional Forecast Products are available online on Website: <http://rcc.imdpune.gov.in>

## Anomaly & Probability Forecasts from MMCFS



## ENSO & IOD Plume & Probability Forecasts from MMCFS



## South Asian Climate Outlook Forum Activities (SASCOF)

