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Regional Climate Service Activities for South Asia: Status and Future Plans

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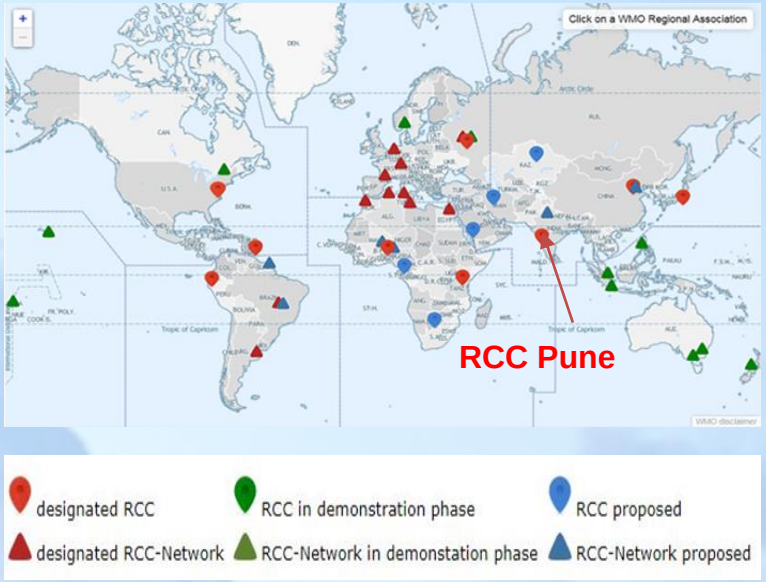
INDIA METEOROLOGICAL DEPARTMENT

Regional Climate Services Activities:
RCC, Pune: Background

- India Meteorological Department (IMD) established National Climate Centre (NCC), Pune in 1995 with an objective to provide various climate related services to the country (India).
- NCC has started to work as WMO recognized RCC (Pilot Phase) for the south Asia. RCC, Pune fully recognised in 2016. In this regard, efforts were made to build capacity to perform the mandatory RCC functions.
- RCC Pune is single (multifunctional) RCC. RCC products are updated monthly.
- At present, RCC Pune is part of the office of Climate Research & Services (CRS) of India Meteorological Department, Pune. Under CRS there are dedicated divisions for providing various climate services to the south Asia.
- RCC, Pune is equipped with all the computing and internet facilities required for carrying out the mandatory RCC functions.
- RCC products are made available through IMD, Pune website (http://rcc.imdpune.gov.in/).
- RCC, Pune coordinates the South Asia Seasonal Climate Outlook Forum (SASCOF) and associated training workshops & user forums. RCC, Pune also takes lead role in the preparation of consensus forecast issued during the SASCOF forums.

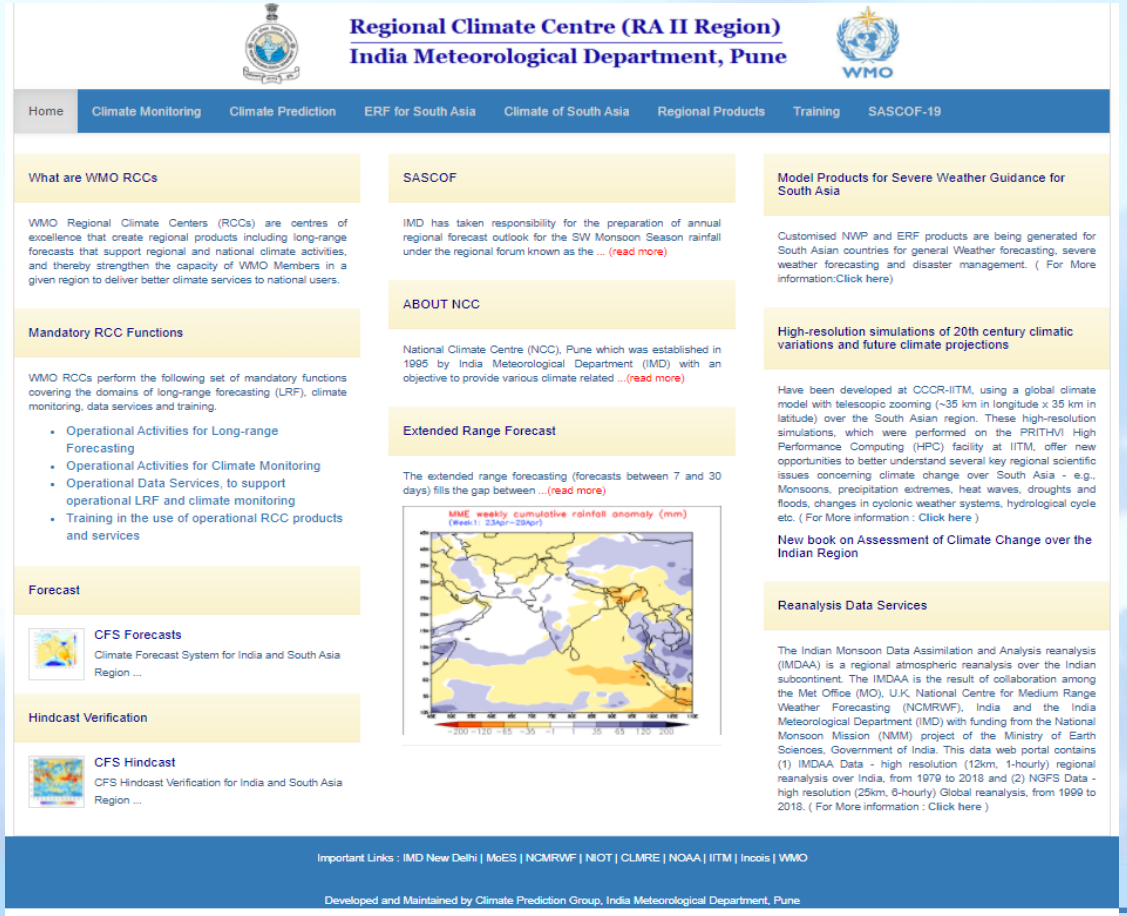


Regional Climate Centre (RCC) Activities for South Asia

RCC, Pune performs the following set of mandatory functions covering the domains of long-range forecasting (LRF), climate monitoring, data services and training.

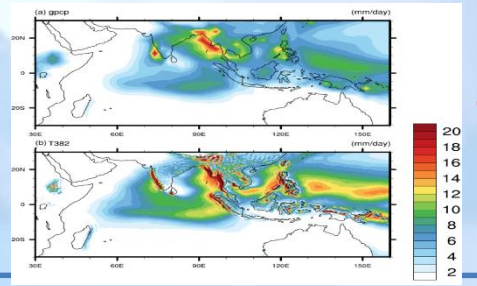
- Operational Activities for Long-range Forecasting Operational Activities for Climate Monitoring
- Operational Data Services, to support operational LRF and climate monitoring
- Training in the use of operational RCC products and services

https://rcc.imdpune.gov.in



Important Products

- **Global monthly and seasonal forecast anomaly maps of Rainfall and Temperature (Updated Every month)**
- **ENSO & IOD Forecast Bulletins (Every month)**
- **Seasonal Forecast Outlook of Rainfall and Temperatures over South Asia (updated every month)**
- **Consensus forecast for South Asia under SASCOF**
- **Extended range forecasts of rainfall and temperatures for the next four weeks**
- **A regional atmospheric reanalysis data over the Indian subcontinent called Indian Monsoon Data Assimilation and Analysis reanalysis (IMDAA) prepared by NCMRWF, Noida**
- **High-resolution simulations of 20th century climatic variations and future climate projections over south Asia**



The long range forecasting products are prepared using the Monsoon Mission Climate Forecasting System (MMCFS)

South Asia Seasonal Climate Outlook Form (SASCOF)

Target Region: South Asia (9 countries)

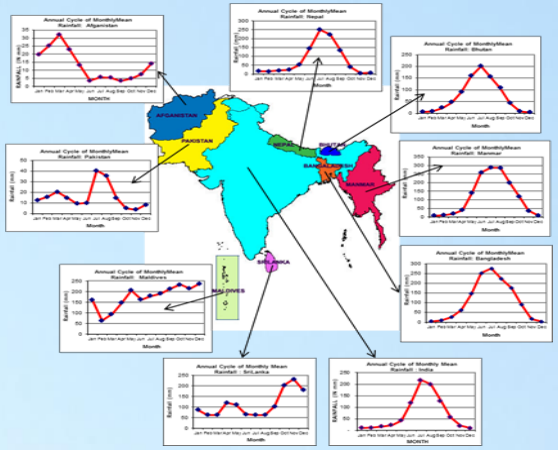
Co-ordinating Institution: RCC, Pune, India Meteorological Department (IMD)

Target Seasons: SW Monsoon (JJAS), NE Monsoon (OND), winter (DJF)

Parameters: Rainfall for all seasons. Temperature for OND and DJF

Major forcings on the regional climate: ENSO, IOD, Winter and spring Eurasian Snow Cover, Northern Hemisphere surface air temperature during spring season, sea surface temperature patterns over Atlantic Ocean, mid latitude flow pattern north of Asia etc.

Potential applications of seasonal outlooks: Agriculture (selection crops, crop yield forecast), Disaster preparedness and risk reduction (impact of floods and droughts), Public health (disease outbreaks like Malaria, cholera etc.), Energy sector (expected energy demand scenarios), water management (reservoir) etc.



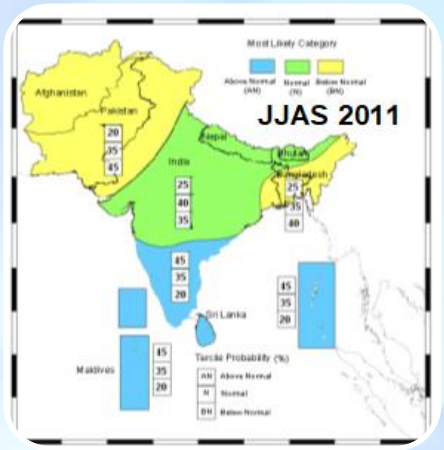
Annual cycle of monthly mean rainfall over eight south Asian countries. The mean was computed using data for the period 1951-2000

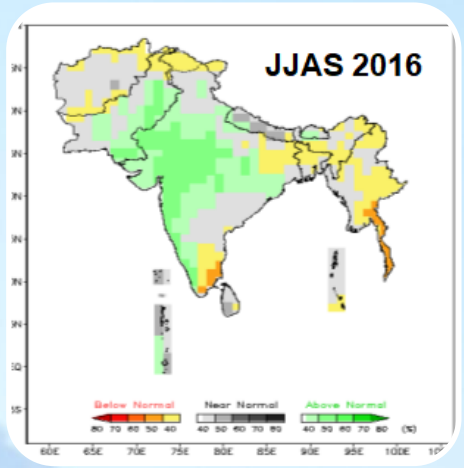
RCOF frequency: Physical sessions in April for SW Monsoon & in September for NE Monsoon. online session in November for winter season (December to February):

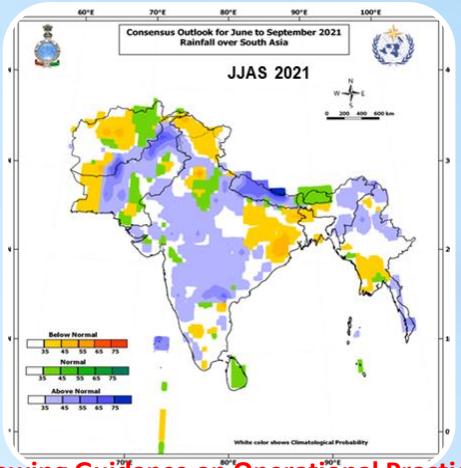
Sources of funding: Financial support for conducting SASCOF activities mainly come from WMO through its various funding agencies like The United States Agency for International Development (USAID), Department of the Environment, Government of Canada etc. Participation of the experts from IMD and IITM, Pune is funded by the respective institutions. **From SASCO-13, funding support is also received from the UK Met Office under UK aid-funded Asia – Regional Resilience to Changing Climate (ARRCC) programme which is co-sponsored by World Bank and the UK's Department for International Development (DFID). In recent years RIMES, Bangkok also plays important role in the co-ordination of the SASCOF activities.**

S. No.	Country	Main rainfall periods
1	Afghanistan	Winter (DJF), Spring (MAM)
2	Bangladesh	Pre-monsoon (MAM), Summer Monsoon (JJAS)
3	Bhutan	Winter (DJF), JJAS (summer monsoon)
4	India	Winter (JF) for north India, pre-monsoon (MAM) for south peninsula and northeast India, SW Monsoon (JJAS) for most parts of the country and post monsoon (OND) for south Peninsula.
5	Maldives	May to September (summer Monsoon), October to January (winter monsoon)
6	Myanmar	Pre-monsoon (AM), Summer Monsoon (JJAS), post monsoon (ON).
7	Nepal	Winter (DJF), JJAS (summer monsoon)
8	Pakistan	Winter (DJF), JAS (summer monsoon)
9	Sri Lanka	First inter-monsoon (MA), SW Monsoon (MJJAS), second inter-monsoon (ON)

Evolution in the Method used for Preparing the Regional Forecast Outlook for the SW Monsoon Season







Following Guidance on Operational Practices for Objective Seasonal Forecasting, WMO 2019

In the first year (2010), forecast outlook consisted of only rainfall forecast for the south Asia as a whole.

No forecast map and no mention about the spatial distribution of season rainfall.

2011-2015

Forecast map depicted areas of most likely tercile categories (using yellow, green and blue shades) over the region, and probabilities for each tercile categories over broad areas of same color shade.

2016 - 2020

Grid wise(1^o lat. x 1^o lon.) most likely tercile category and its probability.

Derived from an initial set of gridded objective forecasts based on blending the grid point forecasts prepared by individual NMHS using various dynamical, statistical and hybrid methodsand modified through a consensus process

2021 onwards

Objective method based on MME of a set of CGCMs .Grid wise most likely tercile category as well as its probability for each of the 1^o latitude x 1^o longitude grid boxes .

Showed better performance then earlier methods during recent years

Seasonal Outlook to Economic Impact Based Forecasting based on on SASCOF outlooks for 2020

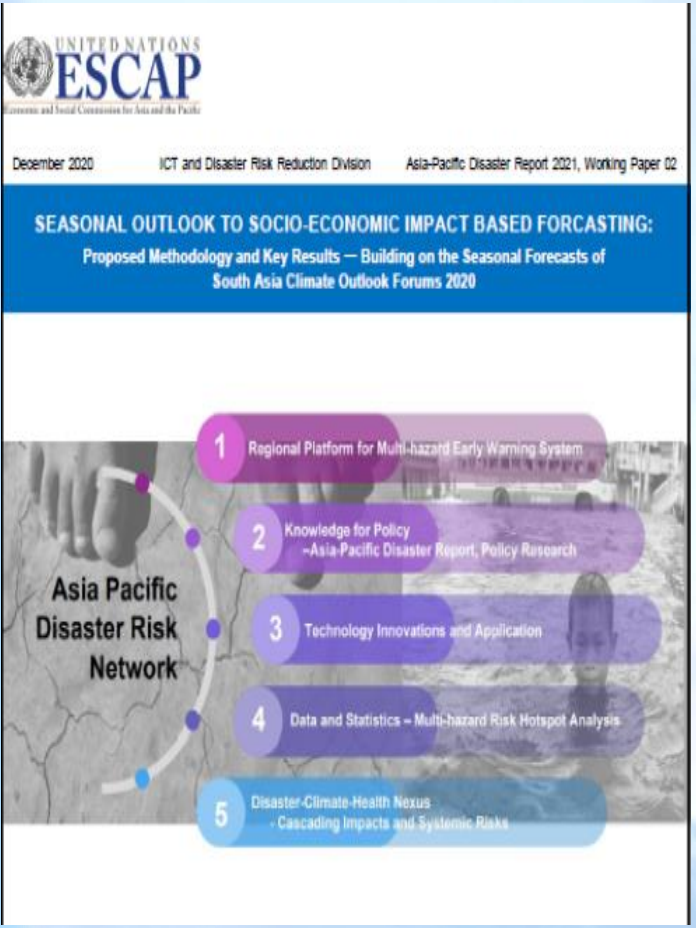


Figure6. Major agricultural system with seasonal outlook for rainfall

(June to September) (October to December)

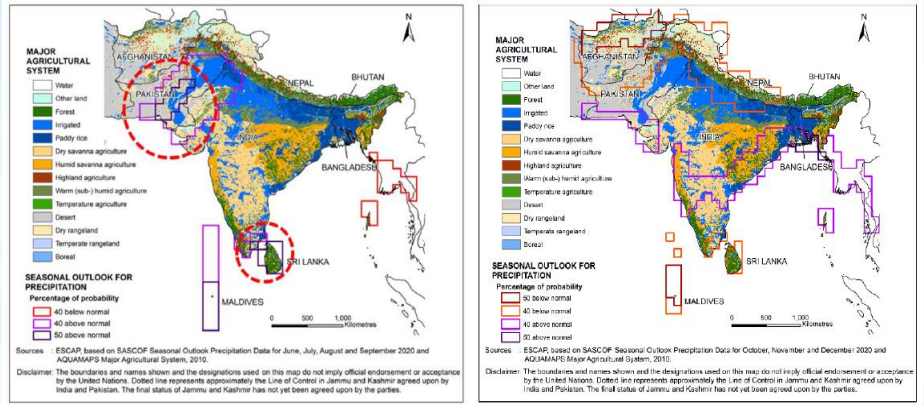


Figure14. Water stress and seasonal forecast

(June to September) (October to December)

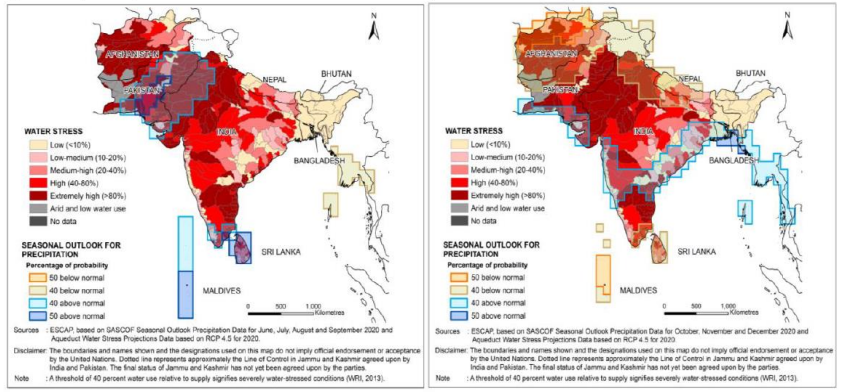


Figure12. Malaria incidence rates/cases exposed to potential flood

(June to September) (October to December)

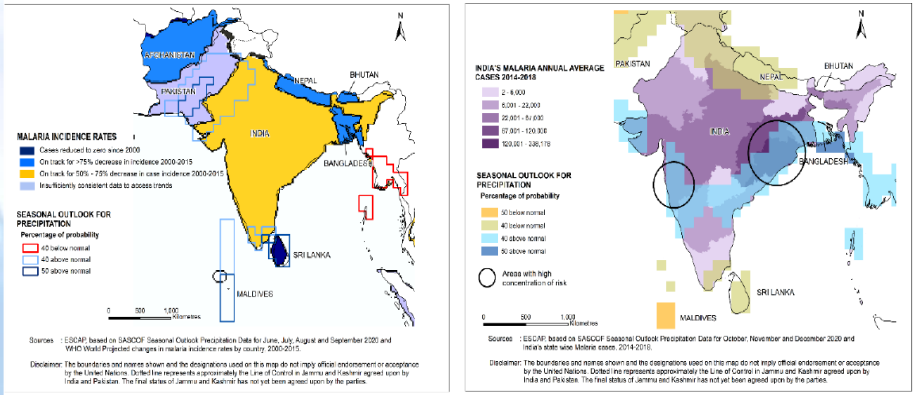
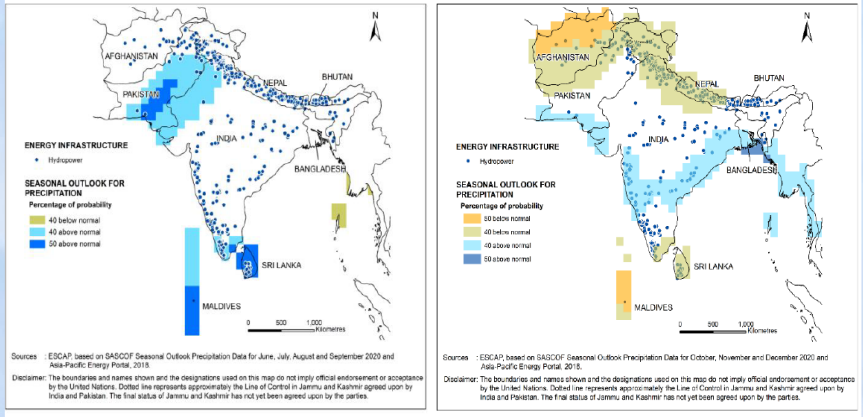


Figure11. Hydropower plants and seasonal forecast for precipitation

(June to September) (October to December)



Future Plans

- **Improvement in the seasonal forecasting over smaller regions**
- **Development of MME tools for generating LRF products (for both rainfall and temperatures) for India and Other south Asian countries for all seasons of the calendar year with monthly update**
- **Supplement seasonal forecast with extended range forecasts**
- **Co-production of sector specific tailor made climate prediction products including impact based forecasts with help of various stakeholders**

Thank you