

Seasonal Climate Forecasts Mechanism in the Region

Gujrat, India, 06-08 December 2017

**An overview of Seasonal Weather Forecasting over
South Asian Region**

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Status of Seasonal Weather Forecasting among South Asian countries

1. Bhutan

Department of Hydro Met Services, Ministry of Economic Affairs, Thimphu, Bhutan

Based on the SASCOF (winter and summer) Seasonal Weather Forecasting has been formulated and translated for sectoral use through stakeholder's consultation.

The screenshot shows the website of the National Center for Hydrology and Meteorology, Royal Government of Bhutan. The page title is 'www.hydromet.gov.bt/?q=about'. The header includes the organization's name in Dzongkha and English, along with the tagline 'The National Center for Weather, Climate & Water Resources'. The navigation menu includes Home, About Us, Meteorology, Hydrology, Early Warning, Snow and Glaciers, Downloads, Projects, Contact Us, and Links. The main content area is titled 'About DHMS' and contains the following text:

About Us
Vision, Mission and Mandate
Organogram
Who is who
Functions of DHMS
Links

About DHMS
There were no central tendency for responsible for hydro-meteorological data collection prior to 1990. The hydro-meteorological data were collected by the respective line agencies to fulfill their own requirement along with the implementation of projects.

It was only during the implementation of the Bhutan Power System Master Plan (PSPMP) project by the erstwhile Department of Power (DoP) under the Ministry of Trade and Industry (MTI) in 1990-1993, the national hydro-meteorological network covering whole country was established. A central agency for hydrology and meteorology was established and mandated with national responsibility for hydro-meteorological data collection, archiving, analysis and dissemination. The meteorology functions were also taken over by DoP from the Ministry of Agriculture (MoA). The Hydro-met Unit under the Department of Telecom (DoT) was handed over to the Department of Power and was renamed as the Flood Warning Section, when DoT was corporatized in January 2002. The Flood Warning Section is responsible for transmitting rainfall and river level data to India for flood forecasting and warning purposes to the Indian States of Assam and West Bengal. Flood warning activity is undertaken by the Royal Government of Bhutan in collaboration between the Central Water Commission (CWC) of India.

When the Department of Power under the Ministry of Trade and Industry (MTI) was restructured and bifurcated into the Department of Energy (DoE), Bhutan Power Corporation (BPC) and Bhutan Electricity Authority (BEA) in July 2002. The Hydromet Services Division (HMSD) was one of the three newly created divisions under the Department of Energy with following functions and responsibilities:

- Planning and designing of hydro-meteorological network for data

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3 DAYS FORECAST		
DEC 04	DEC 05	DEC 06
Min: -1 °C	Min: -1 °C	Min: 4 °C
Tsiring Max: 18 °C Min: 7 °C	Wangdue Max: 21 °C Min: 9 °C	Punakha Max: 22 °C Min: 11 °C
Dagana Max: 22 °C Min: 7 °C	Zhemgang Max: 18 °C Min: 6 °C	Chhukha Max: 16 °C Min: 5 °C
Trashigang Max: 21 °C	Monggar Max: 18 °C	Trashi Yangtse Max: 16 °C

The page also includes sections for 'ABOUT DHMS', 'NOTICES', 'NEWS AND EVENTS', 'REAL TIME WATER LEVEL', and 'AUTOMATIC STATIONS IN THE COUNTRY'. The 'REAL TIME WATER LEVEL' section lists several stations with their respective water levels and update times. The 'AUTOMATIC STATIONS IN THE COUNTRY' section shows a map of Bhutan with various stations marked.

Status of Seasonal Weather Forecasting among South Asian countries

2. Nepal

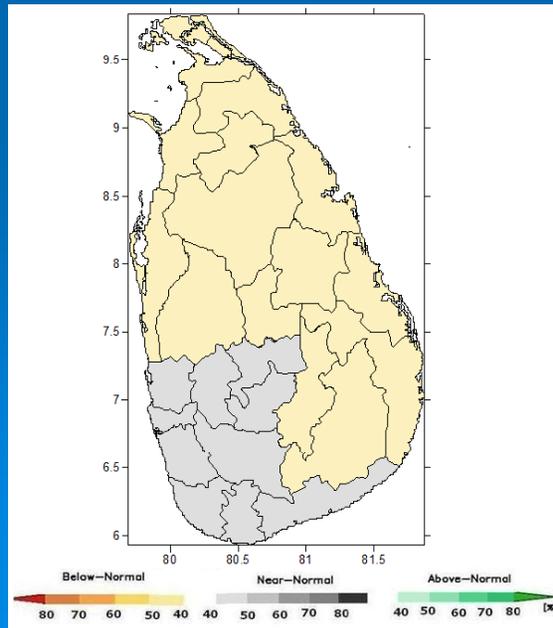
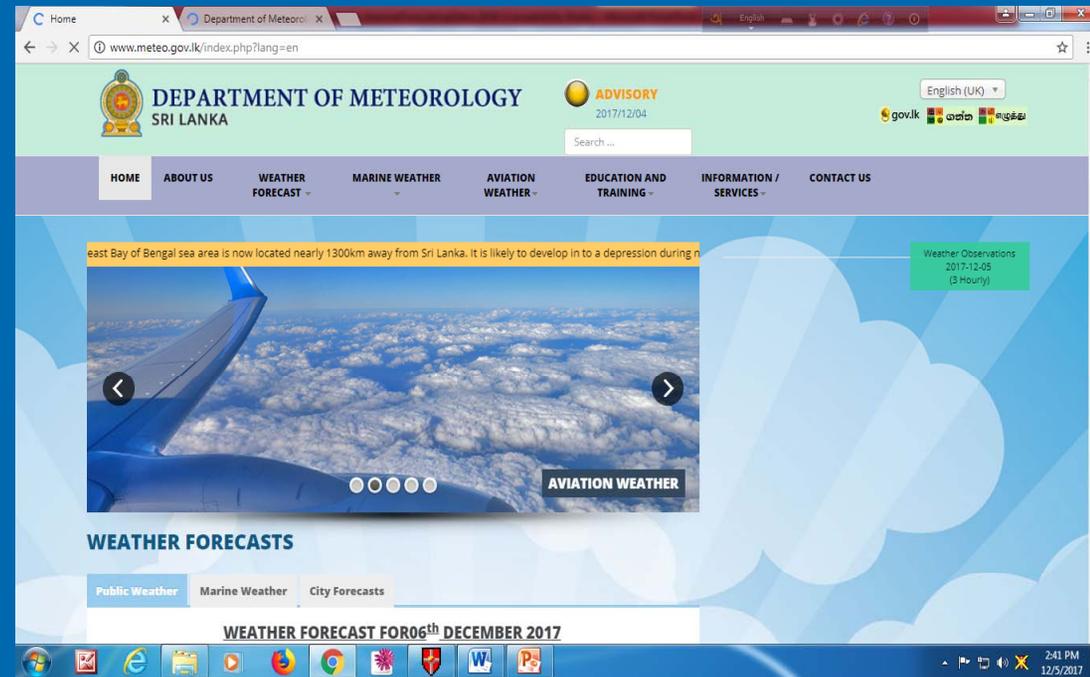
- ❑ Department of Hydrology and Meteorology, Nepal, Nepal
- ❑ Weekly, monthly and Quarterly forecast
- ❑ ENSO based climatology-to detect expected rainfall and temperature during different phases including expected anomalies in rainfall & temperatures.
- ❑ Seasonal climate projections
- ❑ Seasonal climate outlooks- highlighting expected climate for the season & potential impacts on crops.

The image shows two screenshots of the website for the Department of Hydrology and Meteorology, Government of Nepal. The top screenshot is the homepage, featuring the department's logo, navigation menu (Home, Citizen Charter, Organizational Structure, Station Network, Project Websites, Events, Publications, News, Contact), and a main banner for the 'Concensus Climate Outlook for 2014'. Below the banner are logos for various partners like UN, ADB, and AID. The bottom screenshot shows a page titled 'Concensus Climate Outlook for 2016 Monsoon (SASCOF)', which includes a navigation menu on the left and a main content area with a link to the outlook document. The website footer contains copyright information and contact details.

Status of Seasonal Weather Forecasting among South Asian countries

3. Sri Lanka

- ❑ Department of Meteorology, Sri Lanka
- ❑ Monthly and Seasonal forecast
- ❑ District and nation wise probabilistic monthly and seasonal forecast using- CPT and GPCs.



Status of Seasonal Weather Forecasting among South Asian countries

4. Maldives

- ❑ Maldives Meteorological Service
 - ❑ MMS issued seasonal forecast 3 times:
 - Just before SASCOF
 - After SASCOF and
 - During monsoon season
- using ENSO influence, CPT and LRF from lead centres.

The image shows two screenshots of the Maldives Meteorological Service website. The top screenshot displays the homepage with a weather forecast for Male, showing a temperature of 30°C and a 'fine' condition. Below the forecast, there is a warning about heavy rain and thunderstorms with gust winds of 40 mph expected. The bottom screenshot shows a news article titled 'South Asian Climate Outlook : Consensus Statement on Southwest monsoon rainfall probability' dated Monday, 08 May. The article includes a map of South Asia showing rainfall probability.

Status of Seasonal Weather Forecasting among South Asian countries

5. Myanmar

- ❑ Department of Meteorology and Hydrology, Myanmar
- ❑ Basis: Analogue method, Tokyo Climate Centre (TCC) Products, CPT, APEC, NCEP, ECMWF products
- ❑ Monthly: Every month of 28
- ❑ Monsoon (NE/SW): April 28 and October 28
- ❑ Seasonal Weather Forecast: April 28, June 28, and August 28.

The image displays two screenshots of the Department of Meteorology and Hydrology (DMH) website in Myanmar. The top screenshot shows the '12:30 M.S.T Current Weather Condition of Cities (5.12.2017)' page, featuring a map of Myanmar and a weather forecast for NayPyiTaw (31.0°C). The bottom screenshot shows the 'Monthly Weather Forecast' page for November 2017, issued on 28-10-2017, detailing the Bay of Bengal condition and rain conditions.

Status of Seasonal Weather Forecasting among South Asian countries

6. Pakistan

❑ Pakistan Meteorological Department, PMD

- ❑ Real time long periodic (30 years) observational data;
- ❑ Time series of precipitation data correlated with the large scale variables.
- ❑ Large scale meteorological fields from Global Atmosphere-Ocean Coupled Model (CGCM) which developed by BCC, CMA, China.
- ❑ Forecast format: Monthly, Three monthly and seasonal.

The screenshot displays the Pakistan Meteorological Department (PMD) website. The header includes the PMD logo and the text "Pakistan Meteorological Department, Government of Pakistan, ISO 9001:2008 Certified Provider of Aviation Meteorological Services View Certificate". A banner at the top right states "Mainly cold and dry weather is expected in most". The main content area is divided into several sections:

- About PMD**: A vertical menu on the left lists various services and information, including "Leaders", "Services", "Address Book", "Met Observatories", "PMD Projects", "Climate & Astronomical Data", "Historical Events", "Numerical Weather Products", "Seasonal Forecast", "Academic Strength", "Events Pictures/Videos", "Training and Courses", "Publication/Reports", "Quarterly News Bulletin", "AWS Data", "Conferences and Seminars", "Official Forms", and "Circulars".
- Three Days Rainfall Forecast**: A map of Pakistan showing rainfall patterns for the period 08-10-2017 to 11-12-2017.
- Pakistan Weather**: A section with links for "National Forecast", "Cities Forecast", and "Weekly Seasonal Outlook".
- Satellite/Radar Images**: A section with links for "Pakistan, Asia, Global Satellite Images, Radar Network".
- Aviation Products**: A section with links for "Aviation Weather Charts, NMCC Charts, Metars, Tafors".
- Flood Update**: A section with links for "Flood Forecasts, Dams Flows, Lal Nullah, GIS Maps, Rainfall, Temp".
- Drought Monitoring**: A section with links for "Current Drought Situation/Monitoring, Soil Moisture Analyses/Advisory".
- Farmer's Weather**: A section with links for "Farmers Forecasts, Agromet Bulletins, Crop Vegetation Index, Crop Report".
- Tropical Cyclone/Marine Weather**: A section with links for "Tides, Wave Height, Wind speed, Coastal Areas Forecast, SST".
- Earthquake Information**: A section with links for "Recent Earthquakes, Seismic Reports, Seismic Monitoring Network".
- Research Activities**: A section with links for "R&D, NWP Products, Publications, Climate Data, Pollen Count, Pak Jm of Meteorology".
- Synoptic Data**: A section with links for "Daily Synoptic Data Browsing, Surface/Upper Air Met Data".

At the bottom of the page, there is a section for "Today's Lowest Minimum Temperature" and a table of "Current Weather at 02 PM (PST) Dated: Tuesday, December 5, 2017". The table shows:

Location	Temperature	Condition
Okara	22 °C	Partly Cloudy

Below this, there is a section for "Maximum Temp. Dated: Monday, December 4, 2017" showing:

Location	Temperature
Jhang	24.3 °C

The bottom of the page features a "Daily Weather Report" and "Seasonal Forecast" section, including links for "Weather Advisory/ Press Release", "Farmers Advisory", "Fog Update", "DG PMD Meeting with Secretary General WMO", "Co-Ordinates and Chance for Sighting of the New Moon of Rabi-ul-Awwal, 1439 AH on 19-11-2017", and "Media Upscaled Reporting Of Climate Outlook".

Status of Seasonal Weather Forecasting among South Asian countries

7. India

India Meteorological Department, IMD

Basis:

- The Sea Surface Temperature (SST) Gradient between North Atlantic and North Pacific
- Equatorial South Indian Ocean SST
- East Asia Mean Sea Level Pressure
- Northwest Europe Land Surface Air Temperature
- ❑ **Model:** 16 Parametric model
- ❑ **Forecast format:** Probabilistic

The image displays two screenshots of the India Meteorological Department (IMD) website. The top screenshot shows the main website (www.imd.gov.in) with a navigation menu and a 'Products Quick View' section featuring satellite images, radar images, monsoon withdrawal maps, warnings, airport METARs, NWP products, RSMC bulletins, NAAS bulletins, and earthquake reports. The bottom screenshot shows the Shivajinagar Pune office page (www.imdpune.gov.in) with a 'Quick Links' section listing various services and reports, and a 'Sunrise/Sunset' section for December 5, 2017.

SASCOF- South Asian Climate Outlook Forum

- ❑ SASCOF was established in 2010 coordinated by the India Meteorological Department (IMD).
- ❑ It covers- Afghanistan, Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan and Sri Lanka.
- ❑ IMD has taken responsibility for the preparation of annual regional forecast outlook for the SW Monsoon Season rainfall under the regional forum known as the South Asian Climate Outlook Forum (SASCOF).
- ❑ The first three (during 2010-2012) and fifth (during 2014) meetings of SASCOF was hosted by India Meteorological Department and held at Pune. The fourth session (in 2013) of the SASCOF was held at Kathmandu, Nepal and sixth session (in 2015) was held at Dhaka, Bangladesh.
- ❑ SASCOFs are generally conducted in the 3rd week of the April in each year.
- ❑ The main activity during all the SASCOFs was the preparation and issuing of a consensus outlook for the Southwest monsoon rainfall over South Asia.
- ❑ Associated with last 5 SASCOFs, Training workshops on seasonal prediction were also held.
- ❑ Winter SASCOF is being conducted.

Consensus Outlook for the Winter Season (Dec 2017-Feb 2018)

- ❑ During the 2017-2018 Winter Season, some areas of northeastern part of south Asia including northeast India, Nepal, Bhutan and north Myanmar are likely to experience below normal precipitation.
- ❑ Some southeastern parts of the region are likely to experience above normal precipitation.
- ❑ Remaining parts of the region is likely to experience normal precipitation.
- ❑ During the season, normal to slightly above normal temperatures are likely over most parts of the region.

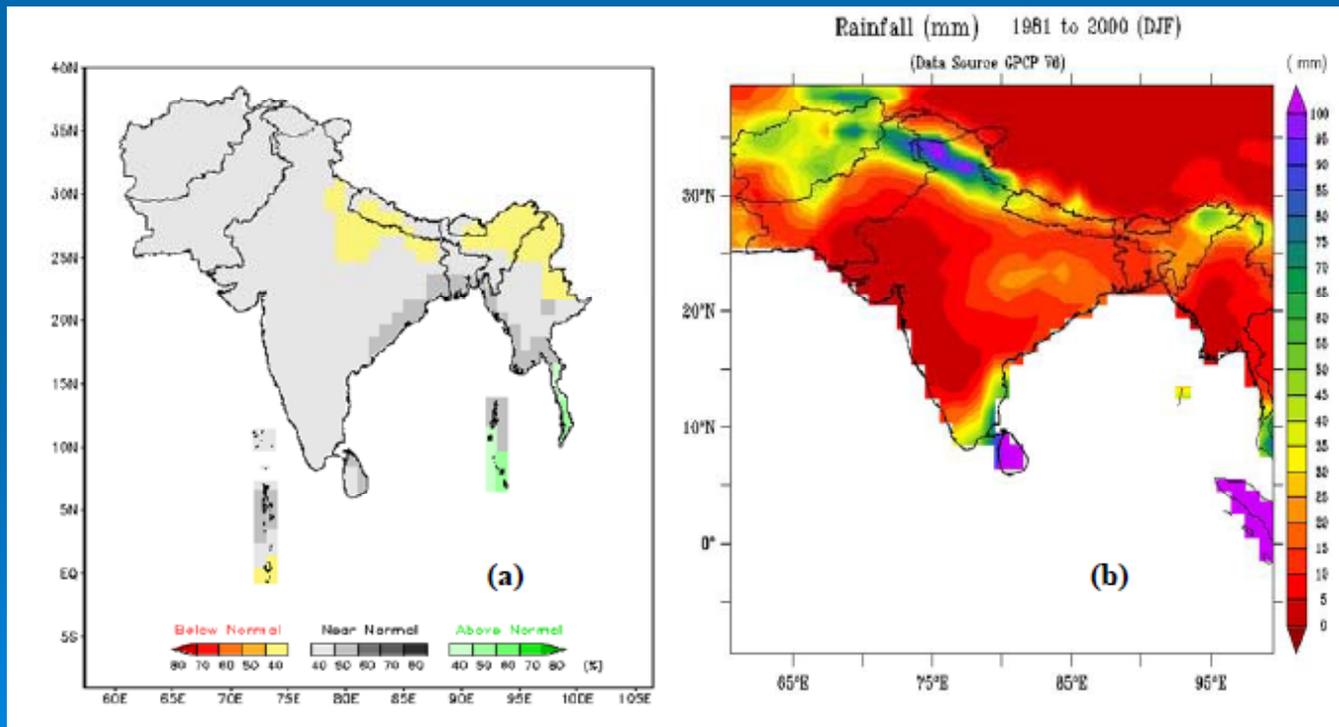


Fig.: (a) Consensus outlook for the winter season precipitation and (b) mean GPCP precipitation (in mm) during the period 1981-2000.

Verification of the Consensus Forecast for the 2016/17 Winter Season Precipitation

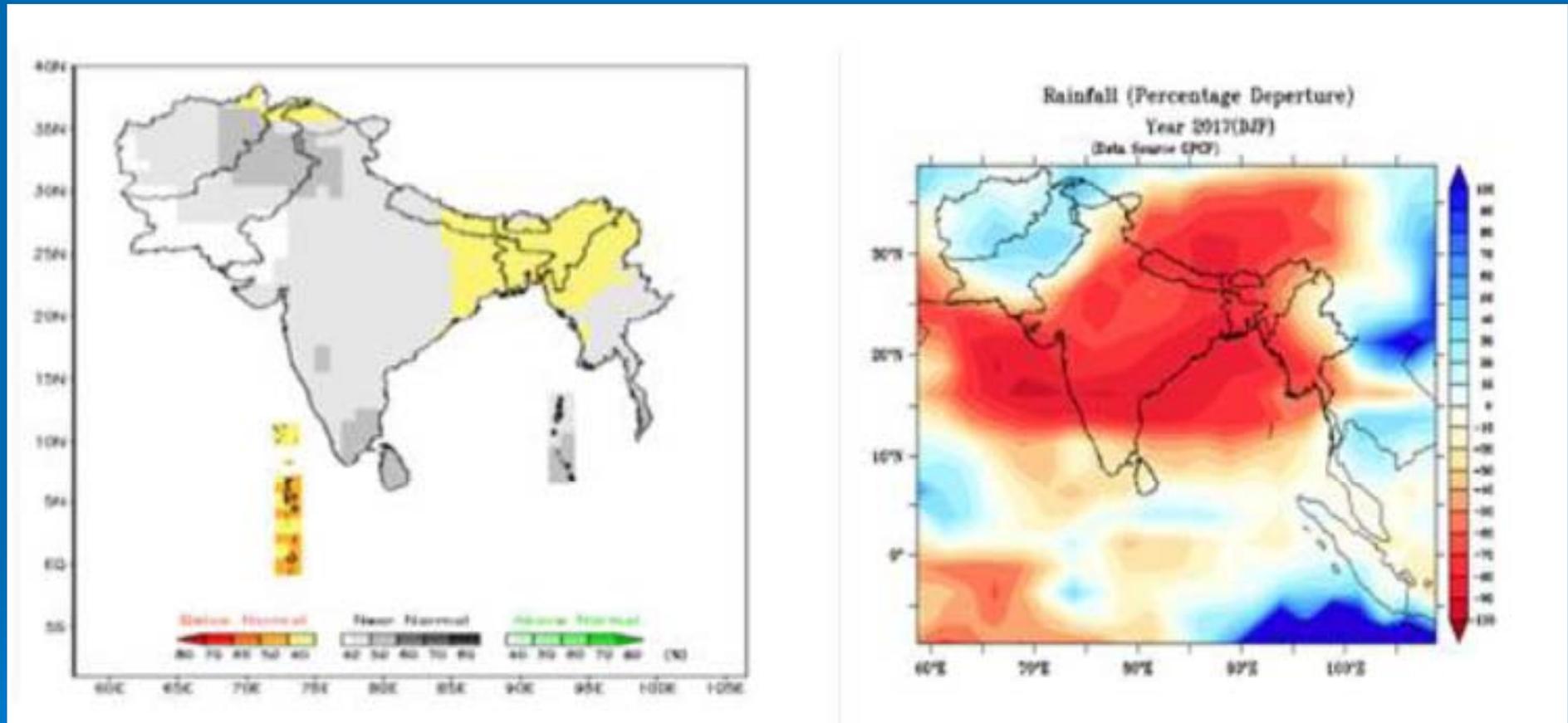


Fig.: Consensus forecast map of the 2016/17 winter precipitation over South Asia.

Fig.: The observed GPCP precipitation anomaly during the 2016/17 Winter Season

Mandate of Bangladesh Meteorological Department (BMD)

- BMD is mandated for issuance of-
 - ❑ Short range weather forecast : 1-3 days lead time
 - ❑ Medium range weather forecast: 7 days lead time
 - ❑ Long range forecast: Monthly and three monthly

Besides day to day weather forecasting BMD has been providing the forecasting and Warnings for the hazardous weather-

- Tropical cyclones and storm surge
- Severe thunderstorm/ nor'weter
- Heavy rainfall
- Squall Warning

Status of Seasonal Weather Forecasting in Bangladesh

- Seasonal weather prediction has been started since long.
 - BMD is mandated for Seasonal Weather prediction in Bangladesh
 - Seasonal Weather Prediction format:
 - Month long and
 - Season long (3 month together)
 - Forecast Parameters:
 - Rainfall,
 - Temperature
 - Weather events like cyclones or depressions, thunderstorms, Fog and heavy rainfall etc.
- 

Evolution of Seasonal Weather Forecasting in Bangladesh

Past status: Based on object analysis of-

- ❑ Climate time series (historical data)
- ❑ Near past and Present weather situation
- ❑ Current and past seasonal behaviour (in meteorological point of view)
- ❑ Upper Atmospheric Condition

Evolution of Seasonal Weather Forecasting in Bangladesh

Present status: Both objective and numerical analysis of -

- ❑ Climate time series (historical data)
- ❑ Present and past seasonal behaviour (in meteorological point of view)
- ❑ Weather map pattern
- ❑ Sea Surface temperature of Pacific and Indian Ocean
- ❑ El Nino and La Nina condition
- ❑ Climate Predictability Tool (CPT)
- ❑ Upper Atmospheric Condition
- ❑ Global and regional Climate model output

Evolution of Seasonal Weather Forecasting in Bangladesh

❑ Utilization of the Products of Global Producing Centres for Long-Range Forecasts:

❑ In 2006, World Meteorological Organization (WMO) began a process to designate centres making global seasonal forecasts as WMO Global Producing Centres for Long-Range Forecasts (GPCLRFs).

❑ Through this designation process, GPCLRFs adhere to certain well-defined standards for:

- fixed forecast production cycles
- standard sets of forecast products
- WMO-defined verification standards (for retrospective forecasts).

WMO Lead Centres

WMO has officially designated 13 GPCLRFs:

- ❑ **Beijing:** China Meteorological Administration (CMA) / Beijing Climate Center (BCC)
- ❑ **Center for Weather Forecasts and Climate Studies (CPTEC) / National Institute for Space Research (INPE), Brazil**
- ❑ **European Centre for Medium-Range Weather Forecasts (ECMWF)**
- ❑ **Exeter:** Met Office, United Kingdom
- ❑ **Melbourne:** Bureau of Meteorology (BOM), Australia
- ❑ **Montreal:** Meteorological Service of Canada (MSC)
- ❑ **Moscow:** Hydrometeorological Centre of Russia
- ❑ **Offenbach:** Deutscher Wetterdienst (DWD)
- ❑ **Pretoria:** South African Weather Services (SAWS)
- ❑ **Seoul:** Korea Meteorological Administration (KMA)
- ❑ **Tokyo:** Japan Meteorological Agency / Tokyo Climate Centre (TCC)
- ❑ **Toulouse:** Météo-France
- ❑ **Washington:** Climate Prediction Center (CPC) / National Oceanic and Atmospheric Administration (NOAA), United States of America

Evolution of Seasonal Weather Forecasting in Bangladesh

Global Producing Centres of Long-Range Forecasts (GPCLRFs) | WMO - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IMD - All India Weather War... SMS & WEB BASED GOVT. S... Global Producing Centres of ... Bangladesh Meteorological ...

www.wmo.int/pages/prog/wcp/wcasp/gpc/gpc.php

Most Visited Centos Wiki Documentation Forums

- Long-term forecast skill assessments, using measures defined by the SVSLRF.

WMO Global Producing Centres for Long-Range Forecasts

Locations: WMO Lead Centres

WMO has officially designated 13 GPCLRFs:

- Beijing: China Meteorological Administration (CMA) / Beijing Climate Center (BCC)
- Center for Weather Forecasts and Climate Studies (CPTEC) / National Institute for Space Research (INPE), Brazil
- European Centre for Medium-Range Weather Forecasts (ECMWF)
- Exeter: Met Office, United Kingdom
- Melbourne: Bureau of Meteorology (BOM), Australia

WMO has also designated the following Lead Centres:

❑ WMO Lead Center for Long-Range Forecast Multi-Model Ensemble (LC-LRFMME)-jointly coordinated by KMA and CPC/NOAA [Download WMO LC-LRFMME flyer]

❑ WMO Lead Center for Standard Verification System of Long-Range Forecasts (LC-SVSLRF) - jointly coordinated by BOM and MSC

Other Major Centres Providing Global Seasonal Forecasts

❑ International Research Institute for Climate and Society (IRI), USA

❑ Asia-Pacific Economic Cooperation (APEC) Climate Center (APCC), Republic of Korea

The screenshot shows the IRI website page for seasonal climate forecasts. The URL is <https://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/>. The page features a navigation menu with links for 'About Us', 'Our Projects', 'Our Expertise', 'Resources', 'News', and 'Contact'. Below the navigation, there is a breadcrumb trail: 'HOME > OUR EXPERTISE > CLIMATE > CLIMATE AND FORECAST PRODUCTS > SEASONAL CLIMATE FORECASTS'. A search bar is located in the top right corner. The main content area includes a disclaimer: 'Please refer to our [licensing agreement](#) for permission to use any IRI forecast material.' Below this, there is a 'Seasonal Climate Forecast' section with a form to select 'Region' (Global), 'Type' (Precip), 'Issue Year' (2017), 'Issue Month' (November), and 'Leads' (DJF18). The main heading is 'IRI Multi-Model Probability Forecast for Precipitation for December-January-February 2018, Issued November 2017'. Below the heading is a world map showing precipitation probability forecasts. To the right of the map is an 'Overview' section with text: 'Starting in April 2017, the IRI probabilistic seasonal climate forecast product is based on a re-calibration of model output from the U.S. National Oceanographic and Atmospheric Administration (NOAA)'s North American Multi-Model Ensemble Project (NMME). This includes the ensemble seasonal prediction systems of NOAA's National Centers for Environmental Prediction, Environment and Climate Change Canada, NOAA/Geophysical Fluid Dynamics Laboratory, NASA, NCAR and COLA/University of Miami. The output from each NMME model is re-calibrated prior to multi-model ensembling to form reliable probability forecasts. The forecasts are now presented on a 1-degree latitude-longitude grid.' A disclaimer at the bottom right states: 'Disclaimer: The IRI seasonal forecast is a'.

The screenshot shows the APCC website page for a climate outlook. The URL is www.apcc2.org/ser/outlook.do?lang=en. The page features a navigation menu with links for 'Research', 'Climate Information Services', 'International Cooperation', 'Media', 'Notices', and 'About us'. Below the navigation, there is a breadcrumb trail: 'Home > Climate Information Service > Seasonal Forecast > Outlook'. The main heading is 'Climate Outlook for December 2017 - May 2018'. Below the heading is a search bar with '2017' and 'DJFMAM' selected. Below the search bar is a table with columns for 'Outlook', 'Deterministic MME Forecast', 'Probabilistic MME Forecast', and 'Deterministic Forecast'. Below the table is a section titled 'Climate Outlook for December 2017 - May 2018' with text: 'BUSAN, 24 November 2017 – The synthesis of the latest model forecasts for December 2017 to May 2018 (DJFMAM) from the APEC Climate Center (APCC), located in Busan, South Korea, indicates a below normal temperature anomaly across the tropical Pacific with a weak negative El Niño-Southern Oscillation (ENSO) phase. The forecasts show positive temperature anomalies to prevail over the globe, with highly probable above normal temperatures over the Arctic, subtropical North Pacific and North Atlantic, and Arabian Sea for the first forecast period. The forecasts for DJF 2017/18, however, show an above-normal rainfall over the equatorial Indian Ocean'.

Thanks for your kind attention

