



PARLIAMENT QUESTION: IMPROVING CLIMATE AND WEATHER SERVICES

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India Meteorological Department (IMD) has been providing various climate-related services to the country since 1985, through its Pune Office. The National Climate Centre was created within this Office in 2005, which gained international responsibilities of a Regional Climate Centre for RA II (region South Asia) in 2010. The formal establishment of a specialized climate service by IMD was however started in 2017, when the Pune office was again re-designated as the Office of Climate Research and Services (CRS). Currently, the CRS office has been carrying out many India-specific climate-related activities like Climate Monitoring and Analysis, Climate Data Management, Climate Research, and Climate Prediction (Seasonal Forecasts). The CRS Office is bringing out climate diagnostic bulletins regularly, and different climate data products are prepared for the user community. Operational Seasonal forecasts for the country as well as South Asia is another important activity of this Office. CRS Office is also working as the World Meteorological Organization (WMO) recognised Regional Climate Centre (RCC) for Pune since 2016 and the Global Production Centre (GPC) of Long-Range Forecasting since 2023.

Recently, the IMD has also initiated the establishment of the National Framework for Climate Services (NFCS) in alignment with the Global Framework for Climate Services (GFCS) of the World Meteorological Organization. A stakeholder consultation workshop on the NFCS was organised by IMD on 5–6 October 2023 as a part of the implementation of the National Framework of Climate Services, which is supported by a broad network of collaborating institutions, including the Indian Council of Agricultural Research (ICAR), National Disaster Management Authority (NDMA)/State Disaster Management Authority (SDMA), State Governments, urban local bodies, and various research and academic organizations. During the workshop, participants from several ministries and user sectors unanimously agreed to establish a formal mechanism based on the NFCS concept, suitably adapted for the Indian context. This will strengthen responsibility-sharing and operational coordination among agencies serving climate-sensitive sectors. NFCS aims to develop and deliver tailored climate information and services to support decision-making in key climate-sensitive sectors.

To further advance weather and climate services in India, IMD has also conducted multiple state-level stakeholder consultation workshops with various State Government departments. These engagements included users from agriculture, water resources, energy, disaster management, transport, aviation, media, health, urban planning, and local communities. The discussions helped identify practical gaps, emerging needs, and opportunities to improve the usability, accessibility, and reach of weather and climate services across the country.

The weather and climate modelling systems implemented under the Ministry of Earth Sciences (MoES) significantly contribute to improving forecasting capabilities across different time scales. Numerical Weather Prediction (NWP) models, high-resolution regional models, and coupled ocean–atmosphere climate models enhance short-range to seasonal forecasting of rainfall, monsoon variability, cyclones, heatwaves, cold waves, and extreme weather events. Advanced data assimilation systems, supported by

satellite and ground-based observations, improve the initial conditions of models, thereby enhancing forecast accuracy. The use of high-performance computing systems, ensemble prediction techniques, and impact-based forecasting frameworks has strengthened the country's ability to provide more reliable and actionable weather and climate forecasts to various sectors and user groups.

There has been tremendous progress in modernising IMD's observational system with the installation of new Doppler Weather Radars (DWRs), lightning alert systems, and automated weather stations across the country. Presently, a total of 47 DWRs are installed and operational in India compared to 14 DWRs in 2014. There are 104 locations having a Lightning detection System across India, which are fully operational with lightning alert dissemination through the Damini App. Under the Mission Mausam, the Bharat Forecast System (BharatFS), an advanced computer simulation model, has already been developed, and it has been operational at a very high spatial resolution of 6 km. It also has the capability to provide predictions of rainfall events up to 10 days, covering the short and medium-range forecasts. Due to its higher resolution and improved dynamics, it generates weather forecasts at the panchayat or cluster of panchayats level. To further support the operations of high-resolution model simulations in real-time, the computing facilities (Arunika and Arka) have been substantially increased to integrate voluminous data and run meso-scale, regional, and global models.

The India Meteorological Department has taken significant steps to enhance training, strengthen international cooperation, and expand awareness activities for improved climate and weather services. IMD actively collaborates with global and regional agencies—including WMO, WHO, UKMO, RIMES, UNESCAP, and all South Asian countries—to advance climate services in India and contribute to the regional climate services framework. IMD experts participate in several high-level international committees such as the WMO Task Team on the National Framework for Climate Services (TT-NFCS), the Climate Services Working Group of the South Asian Hydromet Forum (SAHF), and CLIVAR scientific panels, ensuring India's strong presence in global climate service development and international cooperation. Capacity building is further strengthened through numerous international training programmes conducted by IMD's Meteorological Training Institute (MTI), which regularly hosts participants from developing and neighbouring countries. These combined efforts are substantially contributing to more robust climate services, improved early warning capabilities, and better-informed decision-making across sectors in India.

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