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Bharat Forecast System: India's High-Resolution Leap for Climate Resilience in the Global South

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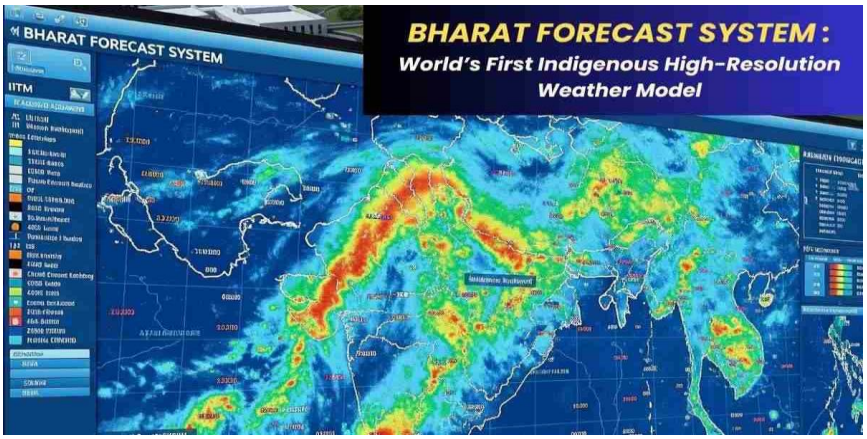

In a landmark development with implications well beyond its borders, India has launched the Bharat Forecast System (BFS), one of the world's first indigenously developed, ultra-high-resolution numerical weather prediction systems. Developed by the Indian Institute of Tropical Meteorology (IITM), Pune, and inaugurated by the Union Minister of Earth Sciences, Dr. Jitendra Singh, this system sets a new benchmark in regional climate forecasting. With a spatial resolution of 6 km among the highest globally, the BFS is a transformative tool for real-time, village-scale weather prediction, particularly across tropical regions.

The Bharat Forecast System leverages India's advanced computing infrastructure, including the 'Arka' supercomputer with 11.77 petaflops processing power, to deliver faster and more granular forecasts. The system integrates real-time inputs from Doppler Weather Radars, expanding rapidly across the country, and employs the Triangular Cubic Octahedral Grid model to process dynamic atmospheric data. Its geographic coverage spanning 30° South to 30° North latitude makes it highly relevant for tropical countries where climate volatility presents mounting challenges to agriculture, public health, disaster preparedness, and economic planning.

What distinguishes BFS is not only its technical sophistication but also its emphasis on public service and last-mile delivery. Forecasts generated by the system are tailored for practical use by

farmers, coastal communities, and disaster management agencies supporting decisions on crop planning, irrigation scheduling, early evacuation, and public health alerts. In recent evaluations, BFS has demonstrated up to 30% improvement in predicting extreme rainfall events and a 64% accuracy gain in high-risk zones, enhancing the potential to reduce agricultural losses and improve food system stability. From an applied perspective, BFS enables short-range forecasts at village and block level, supporting now casting (0-2 hour) as well as high-resolution daily forecasts for agriculture, disaster risk reduction, and hydrological management. The model has demonstrated up to 30% improvement in predicting heavy rainfall and 64% accuracy enhancement in core high-impact zones, providing a critical lead time for early warning systems and decision-making at multiple governance levels. Importantly, this system exemplifies the integration of science, governance, and societal need. The BFS is a product of collaborative effort between research institutions, national meteorological services, space agencies, and multiple line ministries. It also represents inclusive leadership, with women scientists leading the initiative, reinforcing the importance of gender-responsive approaches in scientific innovation.

A key feature of the Bharat Forecast System is its pan-tropical domain (30°S to 30°N), making it highly applicable for countries across the Global South, where convective processes and mesoscale phenomena dominate weather variability. This regional calibration allows for more accurate forecasting of tropical disturbances, including monsoons, cyclones, and extreme rainfall events hazards that disproportionately impact low- and middle-income countries. For countries in the Global South confronting similar climate and developmental vulnerabilities, the Bharat Forecast System offers a policy and technical template. It underscores the value of investing in indigenous forecasting infrastructure, building local capacity, and ensuring that climate information is actionable at the community level. The BFS aligns with broader efforts to build climate-resilient agriculture, improve natural resource governance, and manage disaster risk in data-scarce environments. As nations seek to adapt to intensifying climate extremes, India’s experience with the Bharat Forecast System offers a pathway toward self-reliant, technologically robust, and community-oriented weather forecasting. Its relevance across tropical geographies makes it a valuable model for replication and South-South collaboration in the pursuit of climate-resilient development.