Bharat Forecast System

***Prelims**: Current events of national and international importance.*

Why in News?

Recently India Meteorological Department (IMD) is set to operationalise the Bharat Forecast System (BFS) during the 2025 monsoon season.

- **Bharat Forecast System** - It is India's first indigenously built high-resolution deterministic weather model**.**

  Deterministic models provide a single forecast for a given set of initial conditions, for a specific location and time.

- **Developed By** - The Indian Institute of Tropical Meteorology (IITM), Pune under Ministry of Earth Sciences (MoES).
- It is in development and testing since **2002.**
- It is now officially adopted for operational use by IMD in 2025.

Current IMD models
• **Coupled Forecast System (CFS)** – It is developed initially by the National Centers for Environmental Prediction (NCEP) in the US. • It was modified under the Monsoon Mission to create a model specifically for seasonal monsoon prediction over the Indian region. • **Global Forecast System (GFS)** – It is also a coupled model, includes ocean-atmosphere interactions. • Both models operate at **12 km × 12 km resolution** (i.e., one forecast per 144 sq. km).

Key Features

- **Forecast resolution -** 6 km × 6 km (from earlier 12 km × 12 km).
- **Forecast levels -** Now accurate to **panchayat level** (a few villages), vs earlier **block level.**
- **Forecast range:**
  - **Short-term -** 3 days ahead
  - **Medium-term -** 7 days ahead
  - **Long-term** forecasts remain largely unchanged as with previous model.
- **Technological advancements –** It uses **Triangular-Cubic Octahedral (TCO)** grid structure which,
  - Focuses higher resolution over **tropical regions** like India.
  - More accurate in **volatile weather zones.**

TCO grid, divides the globe into triangular cells, resulting in a higher resolution over tropical regions compared to the poles.

- **Supercomputing support -** To increase accuracy of prediction the **High-Performance Computing (HPC)** systems such as **Arka, Arunika**, and **AI/ML unit** were used.

Significance

- BFS significantly improves early warnings for,
  - **Heavy rainfall**
  - **Cyclones**
  - **Localized climate variations**
- It empowers farmers, administrators, and local bodies with **precise weather alerts**.
- It is aligned with **Atmanirbhar Bharat** with fully **indigenous technology and effort.**
- **Limitation -** BFS does not improve forecasts for sudden severe thunderstorms.

India is the only country to provide operational weather forecasts at 6 km × 6 km resolution.

Reference

[The Hindu| IMD to receive high resolution Bharat Forecast System]