

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 5365
TO BE ANSWERED ON WEDNESDAY, 5TH APRIL, 2023**

SEAMLESS MODELING SYSTEMS

5365. SHRI BALASHOWRY VALLABHANENI:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) the seamless modeling systems being adopted by the Ministry;
- (b) the extent to which these systems help in weather forecasting; and
- (c) the manner in which these are different and efficient when compared to similar systems being adopted in other advanced countries?

ANSWER
THE MINISTER OF STATE (INDEPENDENT CHARGE) FOR
MINISTRY OF SCIENCE AND TECHNOLOGY
AND EARTH SCIENCES
(DR. JITENDRA SINGH)

- (a) India Meteorological Department (IMD) issues various outlook/forecast/warning at various time and spatial scales for Public as well as Disaster Management Authorities for the preparedness of extreme weather events. India is now having one of the best dynamical prediction systems for supporting early warning. IMD has developed capability for generating real time forecasts and warnings in all spatial scales from a location to Block, district, meteorological subdivisions and homogeneous regions and temporal scales of a few hours (nowcast), 3 days (short range forecast), 4-7 days (medium range forecast) 1-4 weeks (extended range forecast) and one month to a season (long range forecast).

IMD follows a seamless forecasting strategy. The long-range forecasts (for the whole season) issued are being followed with extended range forecast issued on every Thursday with a validity period of four weeks. To follow up the extended range forecast, IMD issues short to medium range forecast and warnings at 36 meteorological sub-divisions levels daily four times valid up to next five days with an outlook for subsequent two days. The short to medium range forecast and warning at district and station level are issued by state level Meteorological Centres (MCs)/Regional Meteorological Centres (RMCs) with a validity of next five days and are updated twice a day. The short to medium range forecast is followed by very short range forecast of severe weather up to three hours (nowcast) for all the districts and 1089 cities and towns. These nowcasts are updated every three hours.

A suite of numerical weather prediction (NWP) models of different temporal and spatial scales are run routinely to support operational forecast activities.

- (b) NWP model guidance is one of the most important inputs utilized in weather forecasting. The deterministic as well as probabilistic guidance from various NWP modeling systems implemented at National Centre for Medium Range Weather Forecasting (NCMRWF) and Indian Institute of Tropical Meteorology (IITM) facilitate IMD forecasters to provide efficient weather and climate services including sectoral application.
- (c) Many advanced countries in the world are using a combination of different Numerical models for operational weather forecasting. These numerical models are based on seamless/unified modelling techniques as well as on different models at individual level. The unified seamless modelling system has its own advantages and disadvantages. The seamless modelling system removes all boundaries between meso-scale prediction (short range), synoptic scale prediction (medium range), extended range prediction, seasonal prediction and/or climate studies. However, this also reduces the flexibility with respect to practical considerations in terms of development, inherent complexity of the modelling system, computing resource requirement, performance variability with space (regions) and time scale and targeting a specific sector. Although the predictions on different temporal scales are interlinked and weather events across different time scales interact seamlessly, a lot of advancement and initiatives have taken place for the transition towards a unified seamless framework.
