

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION No. 1146
TO BE ANSWERED ON FRIDAY, NOVEMBER 22, 2019**

TECHNOLOGICAL ADVANCEMENT IN CYCLONE FORECASTING SYSTEM

**1146. SHRI SUDHEER GUPTA:
SHRI BIDYUT BARAN MAHATO:
SHRI PRATAPRAO JADHAV:
SHRI GAJANAN KIRTIKAR:
SHRI SANJAY SADASHIV RAO MANDLIK:**

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether the number of cyclone occurrences is increasing and the Government is unable to make correct forecast regarding cyclones;**
- (b) if so, the details thereof and the reasons for the same;**
- (c) whether the Government has taken any new initiatives to bring in technological advancement in cyclone forecasting system;**
- (d) if so, the details thereof including international cooperation/agreement signed in this regard; and**
- (e) whether the Government proposes to implement projects to mitigate the risk of cyclones in coastal areas of the country so that the suffering of the people living in such areas may be ameliorated and if so, the details thereof and the steps taken by the Government to develop cyclone forecasting and management system in the country?**

**ANSWER
MINISTER FOR SCIENCE AND TECHNOLOGY AND
MINISTRY OF EARTH SCIENCES
(DR. HARSH VARDHAN)**

(a) & (b) No Sir. No significant increasing trend is established in the frequency of Cyclone occurrences over the Bay of Bengal and Arabian Sea when we consider the long term data. However, the recent 2 years, viz., 2018 & 2019 have witnessed above normal cyclogenesis over these ocean basins.

The cyclone forecast accuracy has significantly improved in recent years as has been demonstrated during recent cyclones, which helped disaster managers and public to minimise loss of lives and properties. IMD's cyclone forecast and warning services have been appreciated worldwide including United Nations Disaster Risk Reduction (UNDRR) in recent years.

(c) Yes Sir. IMD continuously expands its infrastructure for meteorological observations, data exchange, monitoring & analysis, forecasting and warning services using latest technology. IMD uses a suite of quality observations from Satellites, Radars and conventional & automatic weather stations, buoys and ships for monitoring of cyclones developing over the Bay of Bengal and Arabian Sea.

IMD has one of the best forecasting systems for predicting tropical cyclones using high resolution advanced mathematical models (including global, regional and cyclone specific models) for predicting tropical cyclones crossing both west and east coast of India and associated adverse weather over India.

IMD has a very effective Decision Support System for analysing various observations at a single platform and predicting track and intensity of cyclones as well as the adverse weather like heavy rain and wind. IMD also utilises storm surge and coastal inundation models and wave models output from Indian National Centre for Ocean Information Services (INCOIS), Hyderabad for issuing storm surge warning. IMD has well defined Standard Operating Procedure (SOP) for monitoring & forecasting the cyclones and for dissemination of warnings.

The Cyclone Warning Division (CWD) at India Meteorological Department (IMD), New Delhi acts as a Regional Specialised Meteorological Centre for monitoring, predicting and issuing warning services on tropical cyclones developing over north Indian Ocean. IMD has three Area Cyclone Warning Centres at Chennai, Kolkata & Mumbai and four Cyclone Warning Centres at Ahmedabad, Bhubaneswar, Thiruvananthapuram and Visakhapatnam for carrying out operational warning activities for their area of responsibility and to carry out related research & development activities. There is a Cyclone Warning Research Centre at IMD Chennai to carry out the research on tropical cyclones.

(d) A few notable initiatives taken up in recent years for bilateral and multilateral collaboration with Academic and R&D Institutes to improve cyclone warning services are listed below:

- Bilateral agreement with National Oceanic Administration (NOAA), USA and UK Met. Office for improvement in Numerical Weather Prediction (NWP) modeling w.r.t. global forecast system and Unified Model, respectively. This collaboration also aims to improve and operationalise the ensemble prediction system (EPS) for probabilistic forecast based on Global Ensemble Forecast System (GEFS). Ministry of Earth Sciences (MoES) has adapted global models from USA and UK under the bilateral cooperation for forecasting of cyclones.**

- Similarly, the regional models like Weather Research Forecast (WRF) and Unified Model (Regional Model) have been implemented in IMD with this collaboration.
- A bilateral collaboration between India and United States involving National Centre for Environment Prediction (NCEP), USA, India Meteorological Department (IMD), Indian National Centre for Information Services (INCOIS), Indian Institute of Technology (IIT) Bhubaneswar has resulted in experimental implementation of high resolution of Ocean Atmosphere Coupled Model viz. Hurricane Weather Research & Forecast (HWRF) Model for north Indian Ocean with a resolution of 2,6,18 km.
- The collaborative research & development has been taken up between IMD, IIT Delhi and INCOIS for development of storm surge and coastal inundation model for operational forecasting by IMD.
- IMD and Indian Space Research Organisation (ISRO) continuously collaborate with each other to develop various satellite based observational products to improve the early warning services. It includes development of cyclone specific images and products, analytical tools like Advanced Dvorak Technique and RAPID software etc.
- IMD is also leading WMO's Severe Weather Forecasting Demonstration Project (SWFDP)-Bay of Bengal (BOB). Regional Specialised Meteorological Centre (RSMC), New Delhi is the regional centre to provide daily Regional Severe Weather Guidance to the 10 member countries including Bangladesh, India, Bhutan, Nepal, Pakistan, Afghanistan, Sri Lanka, Maldives, Myanmar and Thailand. Under this project 5 days forecast is issued by RSMC, New Delhi daily for heavy rainfall, strong wind, storm surge, high waves in addition to cyclones
- World Meteorological Organisation (WMO) has recognised Cyclone Warning Division (CWD) of IMD as one of the six Regional Specialised Meteorological Centres (RSMC) –Tropical Cyclones to provide tropical cyclone advisories to 13 WMO/ Economic and Social Commission for Asia and the Pacific (ESCAP) Panel Member countries including Bangladesh, Myanmar, Maldives, Oman, Pakistan, Sri Lanka, Thailand, Yemen, Saudi Arabia, United Arab Emirates, Qatar and Iran for the cyclones developing over the North Indian Ocean.
- IMD, also acts as Tropical Cyclone Advisory Centre for International Civil Aviation and provides cyclone forecast to all the Meteorological Watch Offices in the Asia Pacific Region as well as in the Middle East for issue of significant meteorological information as per the requirement of International Civil Aviation Organisation (ICAO).

(e) **National Disaster Management Authority (NDMA) in coordination with IMD has taken up the National Cyclone Risk Mitigation Project (NCRMP) to enhance cyclone mitigation related work for the coastal areas of the country.**
