

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION No. 2698
TO BE ANSWERED ON MARCH 06, 2020**

NATURAL DISASTERS

2698. SHRIMATI NUSRAT JAHAN RUHI:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether there has been an unexpected increase in natural disasters like cyclones and floods during the last three years and if so, the details thereof;**
- (b) the details of major cyclones occurring in the country during the said period, State/UT-wise;**
- (c) the action taken by the Government to rehabilitate the people affected by those cyclones along with funds sanctioned and utilised for the purpose; and**
- (d) the steps that have been taken by the Government to make its forecasting systems more accurate in wake of increasing climate disasters?**

ANSWER

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

- (a) Yes Sir. The country has witnessed increase in extreme weather events like extremely heavy rainfall leading to floods, severe heat waves, cyclones etc. in the recent past.**

In the changing climate scenario, Central & Northern India and Western Himalayas have become more prone to extreme rainfall events, whereas North, Northwest and neighbouring Central India are prone to heat waves.

Regarding tropical Cyclones, based on the statistics during 1891-2017, on an average 5 cyclones develop over the North Indian Ocean (NIO) in a year with 4 developing over the Bay of Bengal (BoB) and 1 over Arabian Sea (AS). The study shows increase in frequency of severe cyclones over Arabian Sea in recent years. During 2017, only 3 systems formed, 2 over the BoB and one over the AS. During 2018, there were 7 cyclones over NIO, with 4 over BoB and 3 over AS. During the year 2019, 8 cyclonic storms formed over the Indian Seas; 5 over Arabian Sea and 3 over Bay of Bengal. The occurrence of 5 cyclones over Arabian Sea in 2019 against the normal of 1 per year equals the previous record of 1902 for the highest annual cyclone frequency over the Arabian Sea. Also 2019 witnessed development of more severe cyclones over the Arabian Sea.

- (b) Following Table gives the number of Cyclones formed over the Indian Seas viz., The Bay of Bengal and the Arabian Sea during the last 3 years (year-wise).

Year	Number of Cyclones	Landfall & Flooding details NAME(TYPE)[Duration]
2017	3	<p>1. MAARUTHA (CS) [15-17 April 2017] 2. MORA (SCS) [28-31 May 2017] 3. OCKHI (VSCS) [29 Nov-05 Dec 2017]</p> <p>No cyclone crossed Indian coast</p>
2018	7	<p>1. SAGAR (CS) [16-20 May 2018] 2. MEKUNU (ESCS) [21-27 May 2018] 3. DAYE (CS) [19-22 Sep 2018] 4. LUBAN (VSCS) [6-15 Oct 2018] 5. TITLI (VSCS) [8-12 Oct 2018] 6. GAJA (VSCS) [10-20 Nov 2018] 7. PHETAI (SCS) [13-18 Dec 2018]</p> <p>Four of the above, crossed the Indian coast;</p> <p>a. DAYE – South Odisha – North Andhra Pradesh, Flooding in Odisha due to heavy rainfall b. TITLI – North Andhra Pradesh – south Odisha coasts c. GAJA – crossed Tamil Nadu coast d. PHETHAI – crossed Andhra Pradesh coast</p>
2019	8	<p>1. PABUK (CS) [4-7 Jan 2019] 2. FANI (ESCS) [26 Apr-4 May 2019] 3. VAYU (VSCS) [10-17 Jun 2019] 4. HIKAA (VSCS) [22-25 Sep 2019] 5. KYARR (SCS) [24 Oct-1 Nov 2019] 6. MAHA (ESCS) [30 Oct-7 Nov 2019] 7. BULBUL (VSCS) [6-11 Nov 2019] 8. PAWAN (CS) [2-7 Nov 2019]</p> <p>Only two of the above crossed the Indian coast;</p> <p>a. 'FANI' made landfall & caused Floods due to Sea water inundation over coastal areas of Puri b. BULBUL crossed west Bengal coast, but no flood reports.</p>

CS – Cyclonic Storm

SCS – Super Cyclonic Storm

VSCS – Very Severe Cyclonic Storm

ESCS – Extremely Severe Cyclonic Storm

- (c) **Responsibility of rehabilitation of the people affected by these cyclones is with the respective State Governments.**
- (d) **India Meteorological Department (IMD) is dedicated for monitoring, detection and forecasting of weather and climate including early warning for severe weather events such as cyclones, heavy rainfall etc. The weather forecasting and early warning systems in the country are comparable to most of the developed countries in the world in terms of accuracy, lead time and associated impact. IMD continuously expands its infrastructure for meteorological observations, data exchange, monitoring and analysis, forecasting and warning services using contemporary technology. IMD uses a suite of quality observations from satellites, radars and conventional and automatic weather stations for monitoring of cyclones and prediction of weather. It includes INSAT 3D, 3DR and SCATSAT satellites, Doppler Weather Radars (DWRs) along the coast and coastal automated weather stations (AWS), automatic rain gauges (ARGs), meteorological buoys and ships. The High Performance Computing (HPC) system has been upgraded by 6.8 petaflops so as to support the ongoing efforts on modelling. Operational implementation of improved suite of prediction models has enhanced the weather forecasting capability through assimilation of all available global satellite radiance and Radar data for the generation of forecast products at 12 km grid globally and 3 km grid over India/regional domains.**

Heavy rainfall events lead to floods over different river basins of the country. River basin floods are dealt by the Central Water Commission (CWC), Ministry of Jal Shakti. In order to meet specific requirements of flood forecasting, which is provided by CWC, Ministry of Jal Shakti, IMD operates Flood Meteorological Offices (FMOs) at thirteen locations viz., Agra, Ahmedabad, Asansol, Bhubaneshwar, Guwahati, Hyderabad, Jalpaiguri, Lucknow, New Delhi, Patna, Srinagar, Bengaluru and Chennai. Apart from this, IMD also supports Damodar Valley Corporation (DVC) by providing Quantitative Precipitation Forecast (QPF) for Damodar river basin areas for their flood forecasting activities. CWC is working in close association with IMD and State Governments for timely flood forecast whenever the river water level rises above warning level. FMOs operated by the IMD provide meteorological support to the CWC for issuing flood warnings well in advance in respect of the 43 rivers of India covering 146 river basins. CWC issues flood forecasts 6 hrs. to 30 hrs. in advance for 176 stations using QPF received from FMOs and in-situ hydrometeorological data.

During recent years, IMD has consistently given accurate prediction for cyclones like Phailin (2013), Hudhud (2014), Vardha (2016), Mekunu (2018), Sagar (2018), Titli (2018), Luban (2018), Fani (2019), Hikaa (2019) and Bulbul (2019) thereby helping disaster managers to minimise loss of lives to less than 100 due to tropical cyclones. IMD has also earned worldwide accolades in the field of cyclone forecasting.

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 utilizes an array of weather prediction models including global, regional and cyclone specific models for forecasting cyclone track, intensity and associated adverse weather like heavy rainfall, gale wind and storm surge.
