

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOKSABHA
UNSTARRED QUESTION NO. 1942
TO BE ANSWERED ON FRIDAY, 30TH JULY, 2021**

NATURAL CALAMITIES IN INDIAN SUB-CONTINENT

1942. SHRI ASHOK KUMAR RAWAT:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether the Indian sub continent is considered most prone to natural calamities;
- (b) if so, the details thereof along with the reasons therefor; and
- (c) the remedial steps being taken by the Government in this regard?

ANSWER

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

- (a)-(b) Yes Sir. Indian Sub-continent is considered as one of the most natural disaster prone areas. India being a tropical country and surrounded by sea areas on three sides (peninsula) and the northern mainland being bordered by the Himalayas, it experiences almost all types of weather phenomena such as Severe Heat and Cold waves, Fog, Heavy rainfall, floods, droughts, Thunderstorms, Landslides, Hailstorms, Dust storms, tropical cyclones, storm surges etc. Owing to the large latitudinal extent, it is subjected to both tropical and mid latitude weather systems and their extremes. Also earthquakes and Tsunamis are other major natural calamities that affect Indian subcontinent. Indian subcontinent is also prone for cyclone activity as it lies close to North Indian Ocean. In general, about 5 cyclones (7% of total cyclones in the world) develop over the North Indian Ocean. Out of these, four storms develop over Bay of Bengal (BoB) and one over Arabian Sea. Most of the cyclones over BoB over southeast/east central Bay move northwestwards. As a result, east coast of India experiences maximum cyclones (about 70%). However, some of these may move northeastwards towards Bangladesh also. A few cyclones over the Arabian Sea also move northeast wards and hence affect the west coast of India especially the Gujarat coast.
- (c) For more than a century, to minimize the adverse effect of the hazardous weather events, India Meteorological Department (IMD) is effectively functioning in the country maintaining accurate weather forecasting services along with monitoring services for early detection of natural disasters. IMD is dedicated for monitoring, detection and forecasting of weather and climate including early warning for severe weather events such as, heavy rainfall, extreme temperature, thunderstorms, cyclones etc. During the past few years, IMD has been continuously improving weather prediction services in terms of accuracy, lead time and associated impact.

The forecasts and warnings are issued by IMD at the national, State and district levels. It has a network of State Meteorological Centres for better coordination with State and district level agencies. With the upgradation of observations and prediction system, noticeable improvements have been made in the recent past in the skill of prediction, especially with respect to heavy-rainfall, heat-wave, thunderstorm and cyclones.

IMD issues forecast & warnings for the weather elements for five days with an outlook for another two days as per usual practice. From National Weather Forecasting Centre (NWFC), IMD forecasts are given in sub-divisional scale whereas the Regional Weather Forecasting Centre (RWFC) and State Weather Forecasting Centre (SWFC) issue forecast and warning in district level and station level.

The initiatives taken by IMD for the improvement of forecast of different disastrous weather phenomena are given below:

- (i) Though the flood and drought warning are not the responsibilities of IMD, flood warning services of Central Water Commission (CWC) is supported by IMD, by providing observed and predicted rainfall. 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 Water Resources. In order to meet specific requirements of flood forecasting, IMD operates Flood Meteorological Offices (FMOs) at fourteen locations viz., Agra, Ahmedabad, Asansol, Bhubaneswar, Guwahati, Hyderabad, Jalpaiguri, Lucknow, New Delhi, Patna, Srinagar, Bengaluru, Thiruvananthapuram 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. FMOs operated by IMD provide meteorological support to the CWC for issuing flood warnings well in advance in respect of 153 river basins. CWC issues flood forecasts 6 hrs. to 30 hrs. in advance using QPF received from FMOs of IMD and in-situ hydrometeorological data.

In order to cater the services of hydro-meteorological events occurring in short duration of time, IMD is issuing Flash Flood Guidance (FFG) by which a diagnostic value within a watershed required to produce flooding at the outlet of the catchment is estimated, to support the flood warning services. Similarly IMD provides actual and forecast rainfall information in different spatial and temporal scale like districts, States & meteorological subdivisions level and daily, weekly & seasonal scale to the Ministry of Agriculture for drought monitoring.

- (ii) Heat wave is one of the severe weather phenomena for which IMD issues early warnings. In the country, appreciable rise in maximum temperatures as well as heat waves are found to be more in the months of April, May & June. As an initiative, IMD is issuing Seasonal Outlook for temperatures for the months of April, May & June in the last week of March for planning purpose, since 2016. This outlook bring out the expected scenario of heat waves also during the period.

As an adaptive measure, IMD in collaboration with local health departments have started heat action plan in many parts of the country to forewarn about the heat waves and also advising action to be taken during such occasions. Heat action plan became operational since 2013.

The Heat Action Plan is a comprehensive early warning system and preparedness plan for extreme heat events. The Plan presents immediate as well as longer-term actions to increase preparedness, information-sharing, and response coordination to reduce the health impacts of extreme heat on vulnerable populations. NDMA and IMD are working with 23 states prone to high temperatures leading to heat-wave conditions to develop heat action plans.

IMD has started Forecast Demonstration Project (FDP) on heat waves from April 2017 for the hot weather season under which a detailed daily report including realized data of heat waves, weather systems leading to the occurrence of heat waves, diagnosis on the basis of Numerical Model outputs and forecast and warnings for five days is prepared. This bulletin is disseminated to all concerned including health departments.

- (iii) During the cold season, associated with the passage of Western Disturbances, the north & northwest India and adjoining central India are frequently affected by adverse weather elements like fog, Cold Wave to Severe Cold Wave and Cold Day to Severe Cold Day conditions.

By the end of November, IMD issues Press-Release regarding Seasonal Outlook for the Temperatures during December to February which brings out the temperature scenario with respect to mean temperature, mean minimum & maximum temperatures during the cold weather season. During the cold weather season, IMD also issues Press-Releases whenever any place or region is likely to experience cold/severe cold waves.

In addition to these, a Forecast Demonstration Project (FDP) for winter weather systems has been initiated from 2016 and it has brought together several institutes other than IMD also to enhance the monitoring and forecast of weather elements during cold weather season. Accordingly a FDP bulletin is prepared and issued during November to February on daily basis.

From November 2020 onwards, IMD started issuing a special bulletin related to winter weather systems (All India Multi-hazard Winter Warning Bulletin) which provide the details of colour coded warning for five days for the adverse weather elements, along with present weather scenario related to cold wave, cold day etc.

- (iv) To mitigate the casualties due to thunderstorm and associated severe weather phenomena, IMD issues three hourly nowcasts for severe weather including thunderstorm and associated weather phenomena for about 1084 stations and all districts in India on regular basis utilizing Radar and satellite data as well as ground based observations. These nowcasts are provided in real time to the users through the Website of India Meteorological Department. Additionally, in case of possibility of severe thunderstorms and associated severe weather phenomena, warnings are issued through SMS and e-mail to the Disaster Management authorities.

- (v) In order to cater to the needs of Cyclone Warning Services and Marine weather services, there are seven established Warning Centers covering the east & west coasts of our country. Among these, three are Area Cyclone Warning Centres (ACWCs) located at Chennai, Mumbai and Kolkata and remaining four are Cyclone Warning Centres (CWCs) located at Ahmedabad, Thiruvananthapuram, Visakhapatnam and Bhubaneswar. Area of responsibility of ACWCs and CWCs is shown in the Table below.

Centre	Coastal area*	Maritime State/UT
ACWC Kolkata	State: West Bengal UT: Andaman & Nicobar Islands	State: West Bengal UT: Andaman & Nicobar Islands
ACWC Chennai	State: Tamil Nadu UT: Puducherry	State: Tamil Nadu UT: Puducherry
ACWC Mumbai	State: Maharashtra & Goa	State: Maharashtra & Goa
CWC Thiruvananthapuram	State: Kerala & Karnataka UT: Lakshadweep	State: Kerala & Karnataka UT: Lakshadweep
CWC Ahmedabad	State: Gujarat UT: Dadra-Nagar Haveli-Daman-Diu	State: Gujarat UT: Dadra-Nagar Haveli-Daman-Diu
CWC Visakhapatnam	State: Andhra Pradesh	State: Andhra Pradesh
CWC Bhubaneswar	State: Odisha	State: Odisha

*Coastal strip of responsibility extends upto 75 km from the coast line.

In the present scenario, India is second to none, in early warning services as well as in managing the disasters associated with Cyclones. India Meteorological Department has demonstrated its capability to provide early warning for Cyclones with high precision. With the help of such early warnings, the Government is able to mobilise evacuation operations in a timely manner, thereby saving lives & livelihood. The cyclone forecast accuracy has significantly improved in recent years as has been demonstrated during cyclones Phailin (2013), Hudhud (2014), Vardah (2016), Titli (2018), Fani & Bulbul (2019), Amphan, Nisarga & Nivar (2020) and Tauktae & Yaas (2021). During recent years, the loss of life has been drastically reduced being limited to double digit figure in the recent years.

Further, the Government of India has initiated the National Cyclone Risk Mitigation Project (NCRMP) with a view to address cyclone risks in the country. The overall objective of the Project is to undertake suitable structural and non-structural measures to mitigate the effects of cyclones in the coastal states and UTs of India. National Disaster Management Authority (NDMA) under the aegis of Ministry of Home Affairs (MHA) will implement the Project in coordination with participating State Governments and the National Institute for Disaster Management (NIDM). The Project has identified 13 cyclone prone States and Union Territories (UTs), with varying levels of vulnerability.

- (vi) Along with early detection of impending hazardous weathers, early and fast dissemination is also very necessary for taking mitigation action. Regarding well in advance broadcasting / dissemination of weather forecasts and warnings, IMD is always in a continuous process of improvement through implementation of latest tools and technology. At present the forecasts and warnings are broadcasted or disseminated to users including disaster managers by e-mail on regular basis. In addition to this, WhatsApp groups are created including disaster managers and IMD officials through which these forecasts & warnings are disseminated. The forecasts & warnings are uploaded in social media & website for reference by all concerned. The nowcasts related to Severe Weathers are also disseminated through SMS to the registered users.

IMD has taken various initiatives in recent years for improvement in dissemination of weather forecast and warning services based on latest tools and technologies. In 2020, IMD has launched seven of its services (Current Weather, Nowcast, City Forecast, Rainfall Information, Tourism Forecast, Warnings and Cyclone) with 'UMANG' mobile App for use by public.

Moreover, in 2020, IMD had developed mobile App 'MAUSAM' for weather forecasting, 'Meghdoot' for Agromet advisory dissemination and 'Damini' for lightning alert.

- (vii) IMD started issuing Impact Based Forecast (IBF) in the recent past. Impact Based Warning contains guidelines to the general public while getting exposed to the severe weather. These guidelines are finalized by NDMA (National Disaster Management Authority) in coordination with IMD and the same is being issued for the adverse weather elements during different seasons.
- (viii) Moreover, various new initiatives, as mentioned below, have been undertaken by IMD, MoES for betterment of prediction and dissemination of warnings of extreme weather events that may cause natural disasters.
1. The observational network of the department is being enhanced with installation of more number of Automatic Weather Stations (AWSs) and Automatic Raingauges (ARGs) across the country.
 2. 27 Doppler Weather Radars are operational across the country to provide adequate warning in the event of approach of Cyclonic Storms, Monsoon Depressions, Thunderstorms etc. DWR network also provides vital information for nowcasting purposes on mesoscale convective weather developments anywhere in the country.
 3. Multi-Mission Meteorological Data Receiving & Processing System has been established and dedicated to the nation for augmentation of satellite derived products.
 4. 203 new raingauge stations have been added in the District-wise Rainfall Monitoring Scheme taking the total number of stations to 4940.

5. Location specific forecast for 7 days within the capital cities and nowcast for next 3 hours have been extended to 526 and more than 1000 stations respectively covering 739 districts in the country.
6. NWP Model based gridded rainfall data are provided to Central Water Commission for their flood forecasting model for all 153 river catchments and Extended Range model products for 10 river basins.
7. With operationalization of Flash Flood Guidance system, generation and issue of Flash Flood Guidance has commenced for all watersheds of the country.
8. Impact based forecast is already in practice for cyclone. The same is extended to heavy rainfall and heatwaves. Efforts are on to extend the same to all types of severe weather.
9. Common Alert Protocol (CAP) has been implemented as per WMO standard for severe weather warning. It is being utilized for Global Multi-Hazard Alert System of WMO.
