



PARLIAMET QUESTION: EARLY WARNINGS BY IMD

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The Government has evaluated the accuracy and timeliness of the early warnings issued by the India Meteorological Department (IMD) during Cyclone Ditwah in Tamil Nadu State. From extended-range forecast (2 weeks ahead of genesis) to nowcast (up to 3 hrs in advance), IMD issued forecasts/nowcasts, along with multi-hazard early warnings, to the State of Tamil Nadu in a timely manner.

First information about likely cyclogenesis, i.e., about the likelihood of formation of Depression on 26th November (which later intensified into a cyclone Ditwah over the Bay of Bengal (BoB) on 27th November), was issued on 13th November in the weekly extended range outlook, about 13 days ahead of the formation of depression. Subsequently, the extended range outlook issued on 20th November (about 6 days ahead) indicated a high (67-100%) probability of cyclogenesis (formation of Depression) over the south BoB around 26th November.

With the formation of upper air cyclonic circulation over the Comorin area & neighbourhood on 23rd November 2025, IMD issued special bulletins & warnings continuously during the whole lifetime of the cyclone. The warnings were issued by the Cyclone Warning Division (CWD), New Delhi, and the Area Cyclone Warning Center (ACWC) in Chennai. The warnings consisted of a four-stage warning to the State and Central Governments and to stakeholders in the State. IMD issued Pre-cyclone watch (0945 hrs IST of 27th November 2025), Cyclone Alert (2245 hrs IST of 27th November 2025) & Cyclone warning (1300 hrs IST of 29th November 2025) for the coasts of Tamil Nadu & Puducherry.

The Cyclone Warning Division (CWD), IMD New Delhi issued a total of 51 National Bulletins (every 6 hours in case of depression and every 3 hours in case of cyclone) during the period of cyclone "Ditwah". These bulletins, including the current and forecast location, intensity, and warning in textual and graphical formats, were sent by email and Fax to the Chief Secretary to the Government of Tamil Nadu, Puducherry, among others. District-level heavy rainfall warnings in textual and graphical formats, strong surface wind warnings, coastal and sea area warnings, fishermen warnings, port warnings & impacts expected. Special bulletins and updates were issued to the Tamil Nadu & Puducherry Government disaster management authorities and various stakeholders, including ports, fishermen, ships, print & electronic media.

The warnings were also disseminated through Common Alerting Protocol (CAP) to the State of Tamil Nadu. One Crore Twenty-Nine Lakh Sixty-Eight Thousand (12968000) CAP messages were delivered during the period of "Ditwah".

IMD accurately predicted the track of Cyclone Ditwah during its whole lifetime. Initial north-northwestward movement after cyclogenesis and the crossing of the Sri Lanka coast around noon time of 27th November 2025, thereafter its slow north-northwestward movement across coastal Sri Lanka and southwest Bay of Bengal (BoB) till the morning of 29th November 2025 was predicted with greater accuracy with a lead time of more than 3-4 days. The south-southwestward recurving track of the system at the time of its weakening stage was also predicted accurately. As a result, the operational track forecast errors for 24, 48, 72, and 96 hours lead period were 49, 62, 60, and 100 km against the long period average (2020-24) of 72, 111, 154, and 183 km, respectively. The operational track forecast skill compared to climatological & persistence (CLIPER) based forecast for 24, 48, 72, and 96 hours lead period was 79, 88, 92, and 91% against long period average (2020-24) of 65, 74, 77, and 78 % respectively. For all lead periods, the track forecast errors were markedly less than the long-period average errors.

IMD issued the correct warnings for squally winds reaching speeds of 40-50 kmph gusting to 60 kmph on 25th & 26th November 2025, 50-60 kmph gusting to 70 kmph on 27th November 2025 morning, gale wind speed reaching 60-70 kmph gusting to 80 kmph on 28th November 2025, and 70-80 kmph gusting to 90 kmph during 29th & 30th November 2025 over the Southwest Bay of Bengal and along & off north Tamil Nadu & Puducherry Coasts. Accordingly, the operational intensity forecast root mean square errors (RMSE) for 24, 48, 72, and 96 hours lead period were 8.1, 8.3, 10.7, and 0.0 kmph against the long period average (2020-24) of 14.6, 24.6, 23.3, and 32.8 kmph, respectively. For all lead periods, the intensity forecast errors were markedly less than the long-period average errors. The operational intensity forecast skill based on RMSE for 24, 48, 72, and 96 hours lead period was 81, 84, 86, and 100% against the long period average (2020-24) of 60, 71, 79, and 79%, respectively. For all lead periods, the intensity forecast skills were markedly above the long-period average skill. IMD also reasonably predicted well in advance the occurrence of heavy to very heavy rainfall over Tamil Nadu due to Cyclone Ditwah.

As the improvement in the forecast accuracy is a never-ending process, IMD is working constantly on every aspect of early warning services to find gap areas and the ways to fill them. The IMD is continuously following all necessary steps methodically, catering for all available state-of-the-art scientific and technological advancements taking place in the weather & climate sciences, as well as practical utilisation of indigenous development within the department. The cyclone warning services of the India Meteorological Department are widely regarded as among the best in the world, with consistent recognition at both national and international levels.

IMD's cyclone forecasting and warning system is distinguished by its high accuracy in track and intensity prediction, achieved through the use of state-of-the-art numerical weather prediction models, multi-model ensemble, advanced data assimilation techniques, and continuous monitoring using satellites, Doppler Weather Radars, ocean buoys, coastal observational networks and finally the in-house developed Decision Support System (DSS) for the generation forecasts and warnings.

There is an improvement in track forecast accuracy by 20 to 25%, landfall and intensity (Maximum Sustained Wind) forecast accuracy by 35 to 45% in the recent five years (2021-2025) compared to the previous five years (2016-2020). As a result, the timely action taken by the Government (Central & State) has enabled a significant reduction in the loss of life due to cyclones in recent times, with zero deaths reported during the Very Severe Cyclonic Storm "Biporjoy" in 2023 and Severe Cyclonic Storm "Dana" in 2024.

In order to enhance the monitoring, forecasting, and dissemination of warning infrastructure, the Government of India has launched Mission Mausam in early 2025. The mission focuses on expanding and modernising India's weather observation network and forecasting systems. It includes increasing the number of weather stations, upgrading radar networks, and utilising machine learning and modern forecasting models, along with support from High Performance Computing Systems (HPCSs) and intelligent Decision Support Systems (DSSs).

This information was submitted by Union Minister of State (Independent Charge) for Earth Sciences and Science & Technology, Dr. Jitendra Singh in Rajya Sabha on 19 March 2026.

NKR/JKP

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