



**Ministry of Earth Sciences (MoES)
India Meteorological Department**

Press Release

Dated: 13th January, 2022

**Subject: Celebration of 147th Foundation Day of India Meteorological Department (IMD)
at Mahika Hall, Ministry of Earth Sciences (MoES), Prithvi Bhawan, Lodi
Road, New Delhi -110003**

IMD is celebrating 147th Foundation Day on 14th January 2022 and the function will be organized **virtually at Mahika Hall, Ministry of Earth Sciences (MoES), Prithvi Bhawan, Lodi Road, New Delhi-110003** during **1130 to 1300 hrs IST**. It is requested to participate in this function through virtual platform. Link for the same is given below:

Webcast Video Link: <https://webcast.gov.in/moes/imd/>

With a humble beginning in 1875, IMD has marched forward with various milestones and paradigms to serve the society. A brief on the initiatives and achievements of IMD during 2021 are given below.

RECENT ACHIEVEMENTS

(a) Enhancement in Meteorological Observations:

- 33 Doppler Weather Radars (DWRs) are operational across the country with 4 DWRs being commissioned in January 2022 at New Delhi, Leh, Mumbai and Chennai.
- Operationalization of Multi Mission Data Receiving and Processing System (MMDRPS) for utilization of Satellite based observations in 2021.
- Number of Automatic Weather Stations (AWS) and Automatic Rain Gauges (ARG) increased to 925 and 1383 respectively with installation of 71 and 36 respectively during 2021.
- Total Number of High Wind Speed Recorders (HWSR) is increased to 34 with installation of 12 HWSR in 2021 along the coast to provide every second data using state-of-the-art Ultrasonic wind sensor.

- Indigenously developed Automated Weather Observing System (AWOS) along with ICAO compliant software and installed the same at 10 airports, thus increasing the number of airport with digital current weather information system (DCWIS) to 39
- 200 Agro-AWS have been installed at Krishi Vigyan Kendras (KVKs) in 2021.

(b) Enhancement in numerical weather prediction (NWP) Modeling :

- Significant enhancement in NWP modeling in collaboration with IITM, NCMRWF and INCOIS.
- Multi-Model Ensemble(MME) based on various models like IMD-GFS, IMD-GEFS, NCEP-GFS, NCUM and JMA is developed for daily forecast at City, District and Meteorological Sub-division level.
- Customization of NWP products for improving Cyclone and Marine Weather Services of Wind, rain, Visibility, wave based on Multi-Model Ensemble(MME) products for high shipping, coastal shipping, Indian Naval Fleets and Global Maritime Distress Safety System Bulletins.
- MME based on all available numerical models has been developed for tropical cyclone track, intensity and structure forecast.
- The High Resolution Rapid Refresh (HRRR) model is implemented in collaboration with SAC-ISRO for entire country with Radar Data assimilation & forecast products updated at every two hours and valid upto next 12 hrs.
- E-WRF has been developed for Cloud to Ground Lighting forecasts.
- IMD in collaboration with NCMRWF & IITM implemented Thunderstorm and Lightning Modelling and Warning System with installation of lightning detectors at 82 locations to provide location specific lightning warning.
- A very high resolution city scale air quality model “ENvironmental information FUsion SERvice (ENFUSER)” has been operationalized for Delhi. Hourly air quality forecast for 72 hours of all criteria pollutants (PM₁₀, PM_{2.5}, O₃, CO, NO₂, SO₂) is generated for the domain (28.362°N-28.86°N,76.901°E-77.56°E) at 30 metre spatial resolution.

(c) Enhancement in Weather forecasting Services:

- Standard Operation Procedure (SOP) updated and published for all type of forecasting services and all types of severe weather warnings.
- Impact Based multi hazard Forecast (IBF) and Risk based Warnings valid for next five days extended to whole country for all types of severe weather at city, district & meteorological sub-division levels.
- Web GIS Portal has been developed for all types of severe weather hazards including Heat Wave, Cold Wave, Heavy Rainfall, Cyclone, and various sectorial applications like Marine Weather,

Urban weather, Nowcast Services, NWP model Guidance, Agro-meteorological advisory Services, Aviation Weather services, Transport Services (Railways/Highways) etc.

- Dynamical web based decision support system for impact based forecast of cyclones has been developed by NDMA in collaboration with IMD and the system is installed in IMD.
- Automation of Generation of Cyclone warning Bulletins for Aviation, Ports etc.
- Automatic generation and display of Coastal weather Observations, Coastal weather forecast for next five days, coastal weather bulletin and location specific coastal forecast for 325 locations and nowcast for 138 stations.
- Urban Metrological Services for Delhi NCR Region through dedicated Web portal.
- Location specific forecast valid for next seven days within the capital cities have been extended from 526 to 1089 stations in 2021.
- Nowcast stations increased to 1085 with addition of 194 new stations in 2021.
- Also three hourly nowcast warnings are now issued for severe weather for all 732 districts.
- A decision support system (DSS) has been developed for quantitative precipitation forecast (QPF) for an overall 153 river catchments to enable flood forecasting.
- Establishment of new FMO at Thiruvananthapuram for west flowing rivers in Kerala.
- GIS based products generated for QPE over all 153 River catchments.
- Generation of bias corrected sub-basin-wise GFS rainfall forecast for issue of operational QPF.
- Generation of sub-basin-wise Probabilistic QPF based on the GEFS and NEPS.
- Validity of operational sub-basin wise QPF increased from 3 days to 5 days.
- Accuracy of sub-basin-wise QPF for the last year as compared to average of previous 5 years has improved by 7 percent. Value added operational forecast is better than model forecast by 9 percent.
- IMD, NDRF and CWC together generated daily Impact based flood guidance for all river basins of India.
- Generation and issue of operational Flash flood Guidance for all watersheds of the country and Flash flood Guidance to Nepal, Bhutan, Bangladesh, Sri Lanka every 6 hours for Monsoon and post monsoon season 2021.
- Resolution of watersheds for issue of flash flood guidance bulletin increased from 30000 to 1 lac numbers.
- Integration of Radar data & high-resolution numerical models in the flash flood guidance system.

- Design storm studies for various projects carried out during the year as per requirement of stakeholders.
- Real-time dissemination of Agrometeorological advisory services through 10,448 WhatsApp groups covering 90,865 villages of 3,301 blocks in addition to conventional means of dissemination.
- Weather information provided to National Agriculture Market (eNAM) for 500 districts (Markets Yards/ Mandies) and API have been shared.
- An 'Interactive map for Agromet Information' through Integration of Agro Advisory with GIS portal have been added to the 'Agromet Advisory Services' section of the main website of IMD.
- Block level forecast operational for all 7000 blocks.
- Development of 12 no. of new APIs for delivery of weather services to State Governments, stakeholders and disaster managers.
- Automation in verification of weather forecasts like nowcast and Terminal Aerodrome Forecast.

(d) Enhancement in Climate Services:

- Introduction of multi-model ensemble forecast scheme for monthly/seasonal rainfall & temperature commencing from April 2021 along with probabilistic prediction of spatial distribution of rainfall & temperature.
- Enhanced Climate monitoring and prediction services for south Asia based on above scheme.
- Implementation of Climate Data Service Portal (CDSP) at IMD, Pune leading to enhancement of service delivery with
 - a) Real-time weather information of the stations along with fortnightly trends
 - b) Daily reports of extreme events
 - c) Climatological information for any station
 - d) Statistical information on Seasons and Cyclones and
 - e) Facility to download gridded data, etc.
- For procurement of meteorological data from IMD, the Data Supply Portal ver. 4.0 was upgraded in August 2021 with
 - (i) Introduction of 'Enrolment-Login Authentication' procedure
 - (ii) Introduction of automated messaging and
 - (iii) Implementation of downloads through state-of-the-art design technology
- This automation of the data supply service has

- a) Significantly improved the data-delivery time to 'Less Than an Hour' against about one-day in January 2021 and about 1-2 weeks in Jan 2020.
- b) About Ten-Fold increase in the users, mainly researchers and students.
- State-wise Report on observed rainfall changes and variability of 28 states and one UT based on recent 30 years of data (1989 – 2018) as desired by Parliamentary Standing committee.
- Climate information of about 150 Smart and other important Cities including major airports for the use of urban planning and management.
- Aeronautical Climate Summary has been published for about 45 airports including 19 in 2021
- New climate application products introduced using extended range forecasting system with weekly update on
 - Weekly cumulative rainfall and volume of water for the next four weeks for 101 river basins of India to support flood forecasting and management activities
 - Weekly Bulletin for Climate Outlook for Health for all the districts of the country for possible outbreaks of vector-borne diseases like Malaria and Dengue for subsequent two weeks

(e) Outreach:

- Farmers' Awareness Programme (FAPs) has been organized at 1210 locations by the Agro-Meteorological Field Units (AMFUs) and District Agro-Meteorological Units (DAMUs).
- Launched 'Public Observation' under Crowd-sourcing mechanism to gather and archive observed weather phenomena
- Launched "Pune Live weather App"
- Social media outreach has been enhanced significantly with the presence in Facebook, Twitter, Instagram, You Tube and WhatsApp groups established at different offices of IMD. At National level, IMD has 239.8K followers in Twitter and 40K in Face Book (<https://twitter.com/Indiametdept>, <https://www.facebook.com/India.Meteorological.department>)
- **Common Alert Protocol (CAP)** feeds automatically aggregated to the WMO Alert Hub at <https://alert-hub.org>,
- **Warnings are** updated in Google, AccuWeather, the Weather Company, Global Multi-Hazard Alert System (GMAS) portal (<https://gmas.asia/>).
- NDMA's CAP project was implemented for Tamilnadu on experimental basis and during the cyclone 'YAAS', 6.66 cr messages were disseminated through this CAP platform.
- PAN India implementation of NDMA CAP based Integrated Alert System has been included for India@75 (Azadi ka Amrit Mahotsav) by Hon'ble MOC.

- In-house development of Uniform Websites for all Regional Meteorological Centres and Meteorological Centers.
- 80 research papers were published by IMD scientist in national and international journals
- Implementation of Online Web Portal of IMD International Journal MAUSAM.

(f) Improvement in Weather Forecast Accuracy:

- Probability of Detection (POD) for heavy rainfall warning with 24 hr lead period is 74% in 2021, which has improved by 51% in year 2021 as compared to their skill between 2002-20. False Alarm Rate (FAR) and Missing Rate (MR) are 26% in 2021, which has improved by 21% & 53% respectively in year 2021 as compared to their skill between 2002-20.
- Probability of Detection (POD) for heat wave warning with 24 hr lead period is 97% in 2021, which has improved by 15% as compared to their skill between 2014-20. False Alarm Rate (FAR) and Missing Rate (MR) are 2% & 3% respectively in 2021, which has improved by 63% & 82% respectively as compared to their skill between 2014-20.
- The annual average landfall point forecast errors in 2021 have been 16.4 km, 10.6 km and 19.8 km respectively for 24, 36 and 48 hrs against the past five year (2016-2020) average error of 31.9 km, 43.7 km and 61.5 km based on data of 2016-2020.
- The annual average track forecast errors in 2021 have been 63 km, 92 km and 164 km respectively for 24, 48 and 72hrs lead period against the past five year (2016-2020) average error of 77, 117 and 159 km based on data of 2016-2020.
- The track forecast skills compared to climatology and persistence forecast have been 75%, 82% and 68% respectively for the 24, 48 and 72 hrs lead against the long period average (2016-2020) skill of 64%, 76% & 78% respectively.
- The annual average absolute error(AE) in intensity forecast has been 6.2 knots, 9.5 knots and 10.8 knots respectively for 24, 48 and 72 hrs lead period of forecast against the past five year(2016-2020) average error of 7.9, 11.4 and 14.1 knots. The skill in intensity forecast as compared to persistence forecast was 63.2%, 78.4% and 85.6% against the long period average (2016-20) skill of 52.2, 72.1 and 75.1 for 24, 48 and 72 hours lead period.
- Probability of Detection (POD) for thunderstorm warning with 24 hr lead period is 86% in 2021 against 31% in 2016.
- Probability of Detection (POD) for thunderstorm warning with 3 hourly nowcast during March to June 2021 has been 79%.

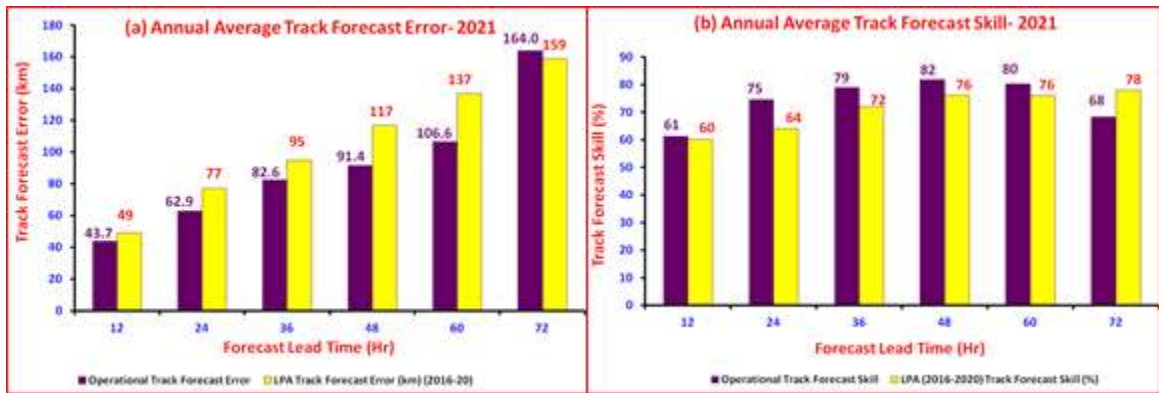


Fig 1: Annual average (a) track forecast errors (km) and (b) track forecast skill (%) during 2021 compared to long period average errors during 2016-20.

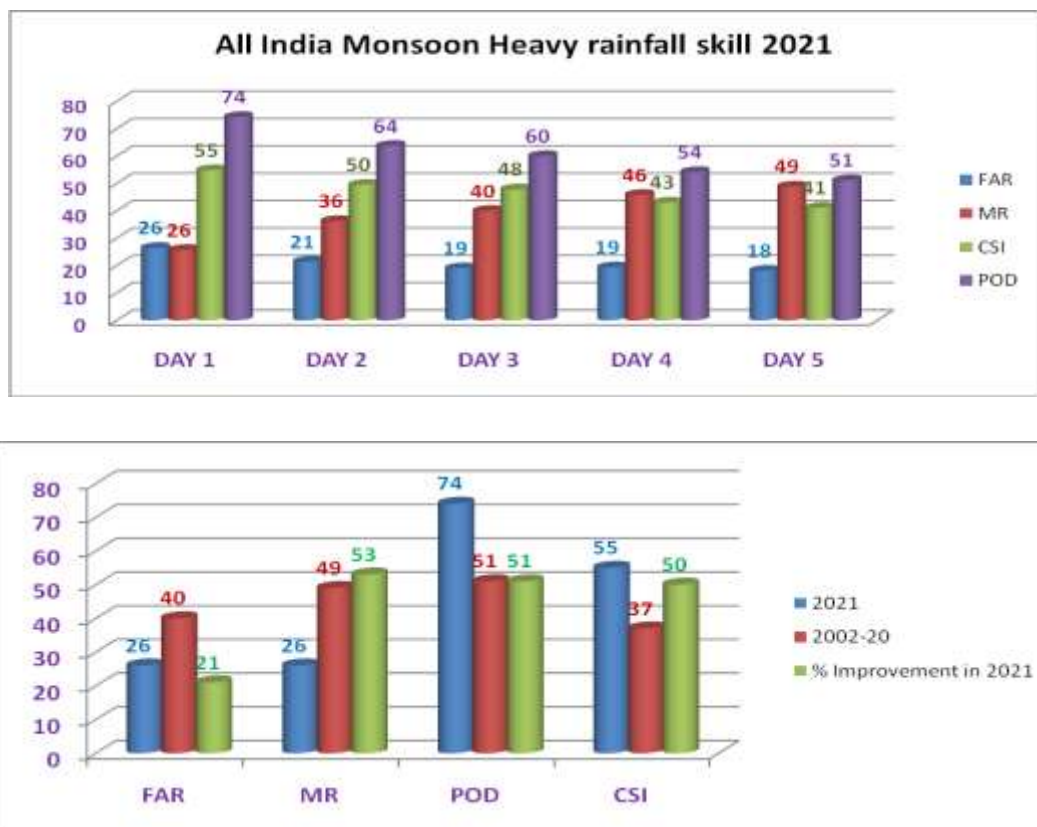


Fig 2: Heavy rainfall warning skill during 2021(FAR (False Alarm Rate), MR(Missing Rate), PoD (Probability of Detection) and CSI (Critical Success Index).IMD has high skill for heavy rainfall warning upto Day 5 as POD for Day 5 is more than 50%.

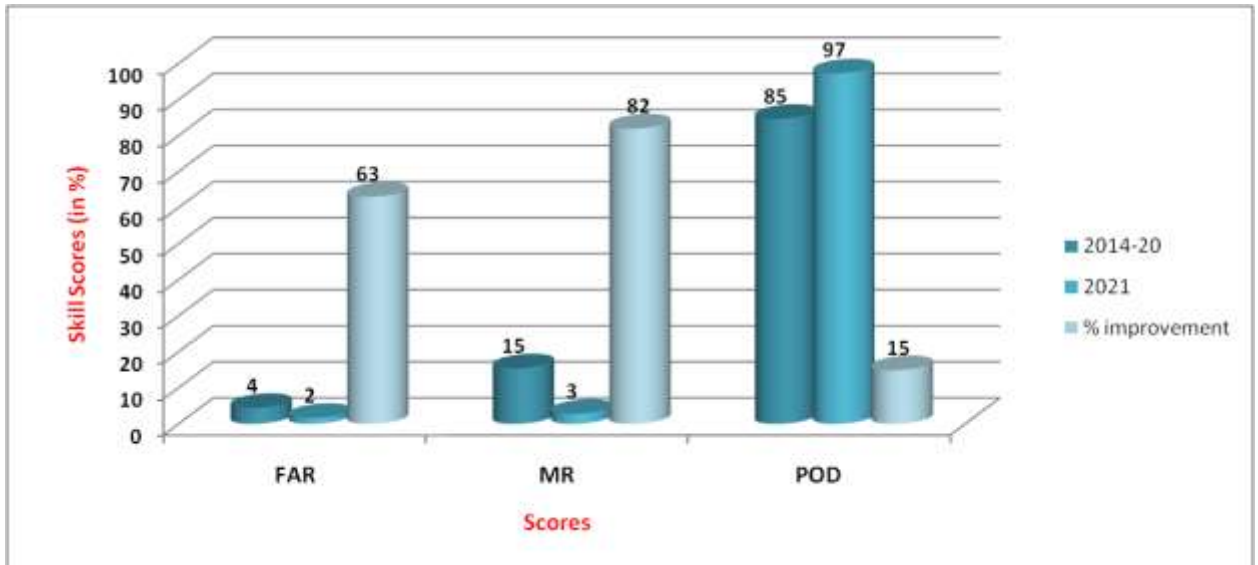


Fig 3: All India Summer months (April to June) 2021vs 2014-20 heat wave skill scores

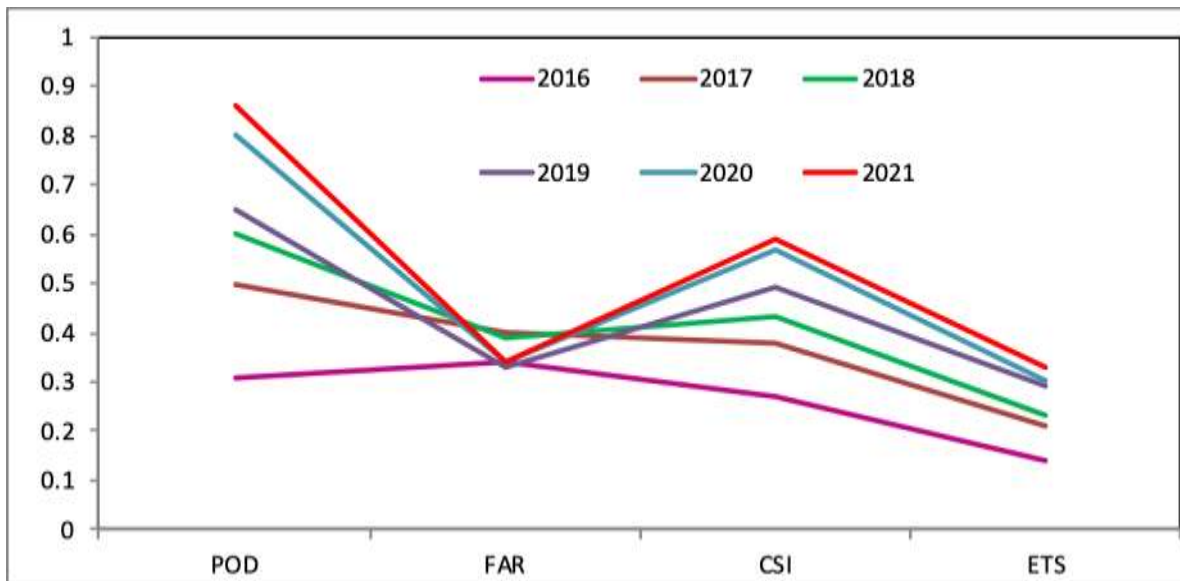


Fig.4. Skill Scores for 24 hr Thunderstorm forecast by IMD during past 6 years (2016 to 2021)