

## YEAREND REVIEW 2023 - Major Achievements of Ministry of Earth Sciences

India's maiden Arctic Winter Expedition launched by  
Union Minister of Earth Sciences, Shri Kiren Rijiju on  
18th December

40-50% improvement in Severe Weather forecast  
with lead period of five days

Four Doppler Weather Radars (DWR) commissioned  
during the year, taking the total number of DWRs to  
39

With inauguration of four new Met Centres, total  
number of meteorological centres rises to 26

Website released for alerts on block-level weather  
forecasts and advisories for farmers, fisherfolk and  
livestock rearers; <https://www.greenalerts.in/>  
available in English and Hindi and nine regional  
languages

IITM, Pune released report on cloud seeding; cloud  
seeding project contributed to 867 million litres of  
water over the rain shadow region of Solapur,

Maharashtra, yielding a positive cost-benefit ratio

A very high-resolution (400 metre) Air Quality Early Warning System integrated with a Decision Support System for air quality developed, showing an accuracy of 88% for predicting extreme pollution events, which is much higher than similar systems across the globe

Mobile application SAMUDRA launched to provide fishing zone advisories, ocean state forecasts and alerts on tsunamis, cyclones, storm surges, high waves, swell surges, etc

2 desalination plants inaugurated in Lakshadweep Islands

Posted On: 28 DEC 2023 7:07PM by PIB Delhi

1. India's maiden Arctic Winter Expedition was launched by Union Minister of Earth Sciences, Shri Kiren Rijiju on December 18, 2023 [details at <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1987724>.]
2. The 43<sup>rd</sup> Indian Scientific Expedition to Antarctica was launched with the first batch of 19 members travelling to Antarctica in October 2023.
3. There has been 40-50% improvement in Severe Weather (cyclone, heavy rainfall, heat wave, cold wave, thunderstorms, fog) forecast with lead period of five days during last five years.
4. Impact Based Forecasting (IBF) is being issued for all severe weather events at district and city levels with inclusion of exposure and vulnerability parameters and suggested response actions.
5. Four Doppler Weather Radars (DWR) were commissioned at Landsdowne, Banihal, Murari Devi, Jot and Surkanda Devi taking the total number of DWRs to 39.
6. Four new Meteorological Centres were inaugurated at Port Blair, Imphal, Kohima and Aizawl. The new meteorological centres will make weather-related services better and more useful in these regions. With these new four additions, the country's total number of meteorological centres has risen to 26.
7. The number of Nowcast stations has increased from 1124 (2022) to 1200 and the number of city forecast stations has increased from 1181 (2022) to 1300.
8. A new website for disseminating information was released, including alerts for block-level weather forecasts and advisories to benefit our agricultural community, including farmers, fisherfolk, and

livestock rearers. The website is accessible at <https://www.greenalerts.in/>. The weather-related information is being disseminated in English and Hindi and in nine regional languages at present. The India Meteorological Department (IMD) will be collaborating with the Ministry of Panchayati Raj to share the real-time weather forecasts disseminated through this website with Heads and Members of the Gram Panchayats through SMS or WhatsApp. This is being done to ensure that weather-related services of the MoES effectively reach the last-mile user.

9. India secured the prestigious role of hosting the World Meteorological Organization (WMO), the United Nations Economic and Social Commission for Asia and the Pacific Panel on Tropical Cyclones Secretariat for 2024-2027.
10. NCMRWF was recognized as the Indian Technical and Economic Cooperation Training Center by the Ministry of External Affairs for 2023.
11. A detailed report of the CAIPEEX IV (Cloud Aerosol Interaction and Precipitation Enhancement Experiment) by the Indian Institute of Tropical Meteorology (IITM), Pune, an autonomous institute of the MoES, was released. The report elaborates results and recommendations of a scientific experiment strategy called cloud seeding used for enhancing rainfall and managing drought. It finds that rainfall can be enhanced by up to  $46\pm 13$  per cent at some locations and on average, and  $18\pm 2.6$  per cent in 100 square kilometres (km<sup>2</sup>) area in the downwind of seeding location over the rain shadow region of Solapur, Maharashtra. The cloud seeding project contributed to 867 million litres of water, yielding a positive cost-benefit ratio. The report will soon be freely available for download on the IITM website. It aims to benefit a variety of stakeholders, especially academia and policy-makers.
12. The NCMRWF Data Assimilation (DA) system makes continuous efforts to include new observations for improving its forecast quality. In this direction ATOVS satellite observations, Meteosat-10 Spinning Enhanced Visible and InfraRed Imager (SEVIRI) and Atmospheric Motion Vectors (AMV) observations, more Ground GPS observations, ISRO's Oceansat-3 and Microsat-2B observations and Reflectivity and radial velocity observations from more IMD Doppler Weather Radar observations have been used in assimilation from this year.
13. A very high-resolution (400 metre) Air Quality Early Warning System (AQEWS) integrated with a Decision Support System (DSS) for air quality has been developed, showing an accuracy of 88% for predicting extreme pollution events, which is much higher than the estimates available for a similar system across the globe. This early warning system provides: (1) near real-time observations of air quality and visibility over the Delhi region and details about natural aerosols like dust (from dust storms), fire information, and satellite AOD; (2) predictions of air pollutants based on the state-of-the-art atmospheric chemistry transport models; (3) warning messages, alerts, and bulletins; and (4) forecast of the contribution of non-local fire emissions to the air quality in Delhi. The statutory body, Commission for Air Quality Management (CAQM) in the National Capital Region and the Adjoining Regions, has used AQEWS and DSS extensively.
14. INCOIS was designated as World Meteorological Organization-Regional Specialized Meteorological Centres (WMO-RSMC) for Numerical Ocean Wave Prediction and Global Numerical Ocean Prediction.
15. A new mobile application launched to provide comprehensive information on all ocean-related services of the Indian National Centre for Ocean Information Services (INCOIS). The mobile app named SAMUDRA (Smart Access to Marine Users for Data Resources and ocean Advisories) provides information on ocean-related services of INCOIS, including (but not limited to) potential fishing zone advisories, ocean state forecasts, and alerts on tsunamis, cyclones, storm surges, high waves, swell surges, etc. The app is designed using the latest technologies and will help disseminate information directly to users, especially coastal communities.
16. A new web portal featuring the biodiversity of our Indian Ocean EEZ (Exclusive Economic Zone) was

made open to the public. The web portal is called IndOBIS and can be accessed at <https://indobis.in/>. The portal has been developed by the Centre for Marine Living Resources and Ecology (CMLRE), Kochi. IndOBIS provides information on marine species of the Indian Ocean, including their occurrence and scientific classification. It serves as one of the 30 regional nodes of the OBIS (Ocean Biodiversity Information System). OBIS is an international open-access web platform for data and information on biodiversity and biogeography of global marine life. OBIS is a project under the Intergovernmental Oceanographic Commission (IOC)-UNESCO [International Oceanographic Data and Information](#) programme.

17. A detailed scientific catalogue entitled 'Systematic account of Indian deep-water Brachyuran crabs collected during the expeditions of FORV Sagar Sampada' was released. It provides in-depth information on deep-sea crab diversity in the Indian EEZ (Exclusive Economic Zone) with pictures and maps of sampling locations.
18. A new dromiid crab species from the south-eastern Arabian Sea and southwestern Bay of Bengal, India, found at depths of 107–113 m. This is the second new species of *Epigodromia* McLay 1993 discovered in Indian waters. One new species of the pelagic basslet fish, namely *Bathysphyraenops radhae*, by taxonomic studies of archived samples in the Central Indian Ocean.
19. The National Glider Operations Facility, e-Classroom Facility at the International Training Centre for Operational Oceanography (ITCOO), Oceansat-3 Data Acquisition and Processing Facility, and marine heat wave service for the Indian Ocean were launched in February 2023.
20. Inauguration of desalination plants at Kalpeni and Amini islands of UT of Lakshadweep by the President Smt Droupadi Murmu on March 18, 2023.
21. NIOT handed MDART (Mooed Buoy Data Analysis and Representation Tool) to the Indian Navy.
22. NIOT exchanged two technology transfer licensing agreements for Met Ocean Buoy System-I & II Mechanical Components with M/s Next Eng Enviro Pvt Ltd, Ahmedabad.
23. NIOT transferred indigenous Acoustic Sub Bottom Profiler technology to M/s Bharat Electronics Limited, Bangalore, through the National Research Development Corporation (NRDC).
24. The 42<sup>nd</sup> Indian Scientific Expedition to Antarctica deployed ice-tethered oceanographic mooring at Prydz Bay, East Antarctica, to collect data on the physical parameters of the under-ice water column.
25. Inauguration of the ship tracking system for scientific data management system that facilitates the real-time monitoring of the ship's scientific data and movements, aligning with global maritime requirements.
26. Mega citizen-led beach clean-up drives were conducted at 79 locations in 8 coastal states and 4 UTs of the country on September 16, 2023, that continued on September 17, 2023, to mark International Coastal Clean-up Day as part of Swachh Sagar Surakshit Sagar campaign.
27. About 56 cruises were taken on Indian Ocean Research Vessels (06): Sagar Nidhi, Sagar Manjusha, Sagar Tara, Sagar Anveshika, Sagar Kanya, and Sagar Sampada.
28. The Seismological Observational Network includes 158 stations. Around 1411 earthquakes were monitored in the Indian region, out of which ~55 events ( $M > 5$ ) and ~31 seabed earthquakes ( $M > 6$ ) with a potential to generate tsunami occurred in 2023. The information was disseminated in less than 12 minutes of occurrence of the events.
29. A geochronology facility at the Inter-University Accelerator Centre (IUAC), New Delhi, is being developed to cater to the needs of the country's geoscientists. The geochronology facility is mandated to create an internationally competitive centre for geochronology and isotope geochemistry that will facilitate the generation of quality isotopic data for geochronological and isotopic fingerprinting. IUAC will have two major machines: an Accelerator Mass Spectrometry (AMS) and a High-Resolution Secondary Ionization Mass Spectrometry (HR-SIMS). HR-SIMS has been recently established and operational at IUAC, New Delhi, and will aid scientists in deciphering complex growth histories in processes that led to Earth's crust formation and continental dynamics.
30. Seismic microzonation of major Indian cities for earthquake hazard assessment and risk reduction

measures is in progress. It provides the deliverables to minimise the loss of lives and property in an earthquake. Seismic microzonation has been completed for Jabalpur, Guwahati, Bengaluru, Sikkim, Ahmedabad, Gandhidham-Kandla, Kolkata and Delhi. The field studies are nearing completion for Bhubaneswar, Chennai, Coimbatore and Mangalore.

31. The International Training Centre for Operational Oceanography (ITCOOcean) conducted 15 training programs and one seminar. A total of 850 persons were trained of which 680 (Male: 436, Female: 244) are from India and 170 (Male: 116, Female: 54) are from other Indian Ocean RIM countries.
32. The Development of Skilled Manpower in Earth System Sciences and Climate (DESK) conducted 3 training programs for about 200 scientists.
33. A number of outreach and awareness programs about the services being provided by MoES were organized throughout the country

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