



सत्यमेव जयते

Ministry Of Earth Sciences
Government of India



A YEAR OF PHENOMENAL ACHIEVEMENTS

DR. HARSH VARDHAN

**MINISTRY OF
EARTH SCIENCES**
ACHIEVEMENTS 2019-20



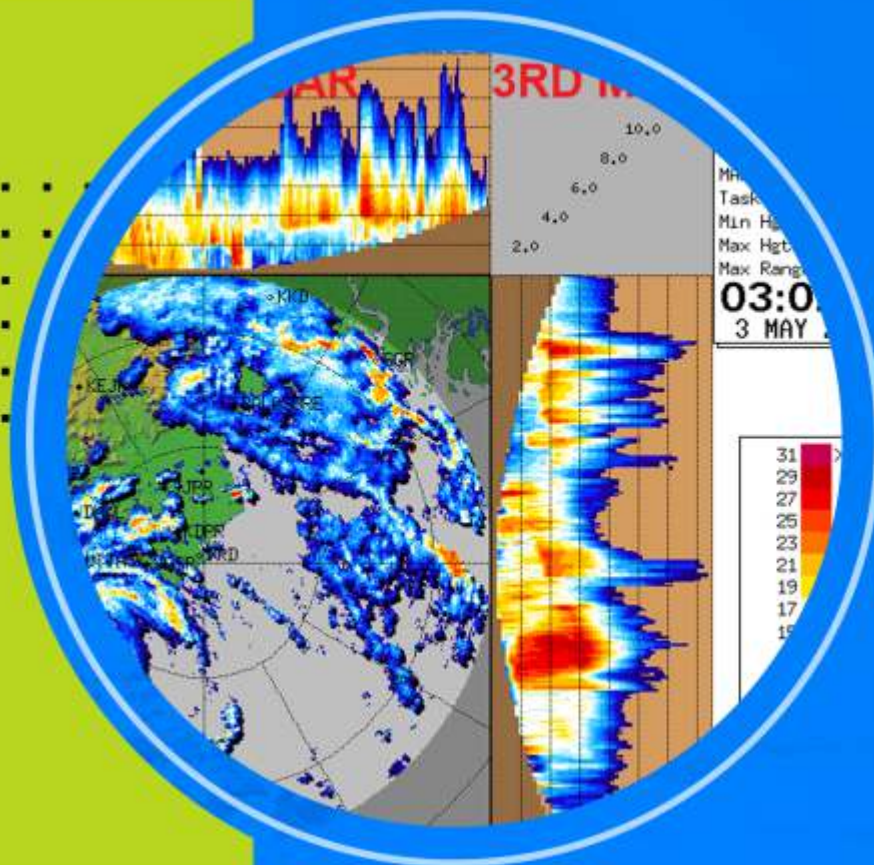
सत्यमेव जयते

Ministry Of Earth Sciences
Government of India

The Ministry of Earth Sciences (MoES) is mandated to provide services for weather, climate, ocean and coastal state, hydrology, seismology, and natural hazards; to explore and harness marine living and non-living resources in a sustainable way and to explore the three poles-Arctic, Antarctic and Himalayas.



Ministry Of Earth Sciences
Government of India



Improved Weather & Cyclone Predictions-1



- ▶ **The quality of weather services has shown remarkable improvement as the loss of lives due to tropical cyclones has been reduced to less than a hundred compared to thousands in the past decade.**



- ▶ **IMD has started issuing city forecasts for Gilgit, Baltistan, Muzaffarabad, & Mirpur which is being sent to Doordarshan & AIR on a daily basis.**



- ▶ **IMD's accurate prediction of FANI, Bulbul & Amphan cyclones has largely reduced the casualties which shows the improvement in our capability in the prediction & monitoring of tropical cyclones.**



- ▶ **The annual average errors in forecasting the track of Tropical Cyclones have drastically reduced in 2019.**



Ministry Of Earth Sciences
Government of India



Improved Weather & Cyclone Predictions-2



- ▶ **Thunderstorm warnings for 832 stations covered all over the country as a nowcast basis (3hrs forecast).**



- ▶ **Coastal flood warning system for Chennai (CFLOWS-Chennai) developed on 03rd November 2019 as a dedicated multi-institutional project for the Nation by the Hon'ble Vice President of India.**



- ▶ **The network of automatic rain gauges (ARG) in Mumbai has been augmented with the addition of 30 ARGs in the Navi Mumbai & Thane region.**



- ▶ **A web-based data portal (mumbairain.tropmet.res.in) & a mobile app (Mumbai Weather Live) were developed for archiving & disseminating rainfall data over Mumbai.**



Ministry Of Earth Sciences
Government of India



Agro-Meteorological Advisory Services (AAS)



- ▶ During the year, **151 new District Agro-Meteorological Field Units (DAMU)** were established.



- ▶ Currently, **42.0 million farmers** are receiving crop-specific agro-meteorological advisories in vernacular languages through experimental block-level Agromet Advisory bulletins which are being published for 2212 blocks on each Tuesday & Friday.



- ▶ **1453 Farmer Awareness Programs (FAPs)** organized by AMFUs and DAMUs (58 by AMFUs and 1395 by 118 DAMUs) during 2019-20.



सत्यमेव जयते

Ministry Of Earth Sciences
Government of India



Early Warning System for Air Quality



- ▶ **A very high-resolution Air Quality Early Warning System for Delhi has been developed to predict extreme air pollution events & give warnings as per the Graded Response Action Plan (GRAP).**



- ▶ **A very high-resolution (400 meters) operational air quality forecast has been developed using both satellite (3 km resolution) & surface (at city scale with 43 monitoring stations) chemical data assimilation integrated with dynamical downscaling.**







- ▶ **A dedicated website on Air Quality Early Warning System (<https://ews.tropmet.res.in>) was launched in October 2019 to efficiently disseminate air quality forecasts to the public & decision-makers in Delhi NCR.**



Ministry Of Earth Sciences
Government of India

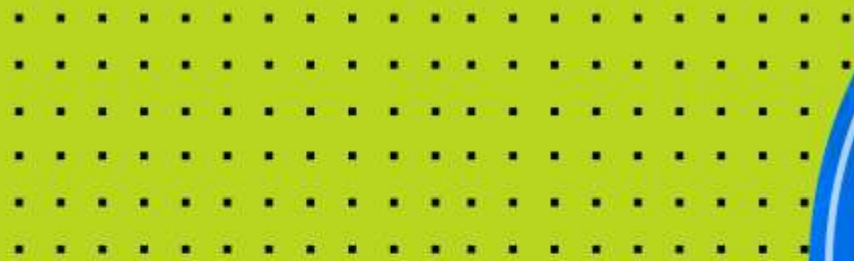


Improvements in the Observational Network

-  **Two Doppler Weather Radars (DWRs) were commissioned at Sonmarg, J&K & Mukteshwar under the Integrated Himalayan Meteorology Programme (IHMP).**
-  **New sensors integrated with the central processor of lightning detectors at IITM, Pune for Lightning Location Network have been installed at Vellore, Nellore, Bengaluru, Vijayawada, Hyderabad, Ananthapuramu, Shrivardhan, Ratnagiri, Vengurla, Ranchi, Raipur, Goa, Puducherry, Nainital, and Madhubani.**
-  **Intensive Observational Periods (IOPs) as part of CAIPEEX Phase-IV 2019 started on 1st April 2019 with ground facility established at Solapur & Tuljapur stations.**
-  **A 240 hours airborne experiment at Solapur was initiated on 29th July 2019, with an instrumented research (Beechcraft B200) & a seeder (Beechcraft C90) aircraft for cloud seeding & its scientific evaluation whose report is under preparation.**



Ministry Of Earth Sciences
Government of India



Enhancement of Global & Regional Modeling



- ▶ **A modeling framework has been set-up for thunderstorm/lightning prediction using Dynamical Lightning Parameterization (DLP) in the WRF model.**



- ▶ **Developed a Land Data Assimilation system for providing high-resolution regional analyses of soil moisture & temperature for the Unified Model.**



- ▶ **Developed data assimilation modules for the ingestion of new satellite data (COSMIC-2 & Hy-2B Scatterometer).**



- ▶ **Ensemble prediction system (NEPS-R) with 12 members has been developed for accurate & reliable probabilistic prediction.**

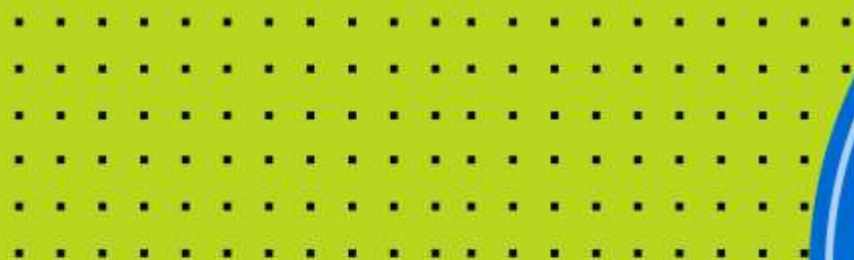


- ▶ **A high-resolution regional reanalysis using forty years of data has been generated under the Indian Monsoon Data Assimilation & Analysis (IMDAA) project in collaboration with Met Office, UK.**

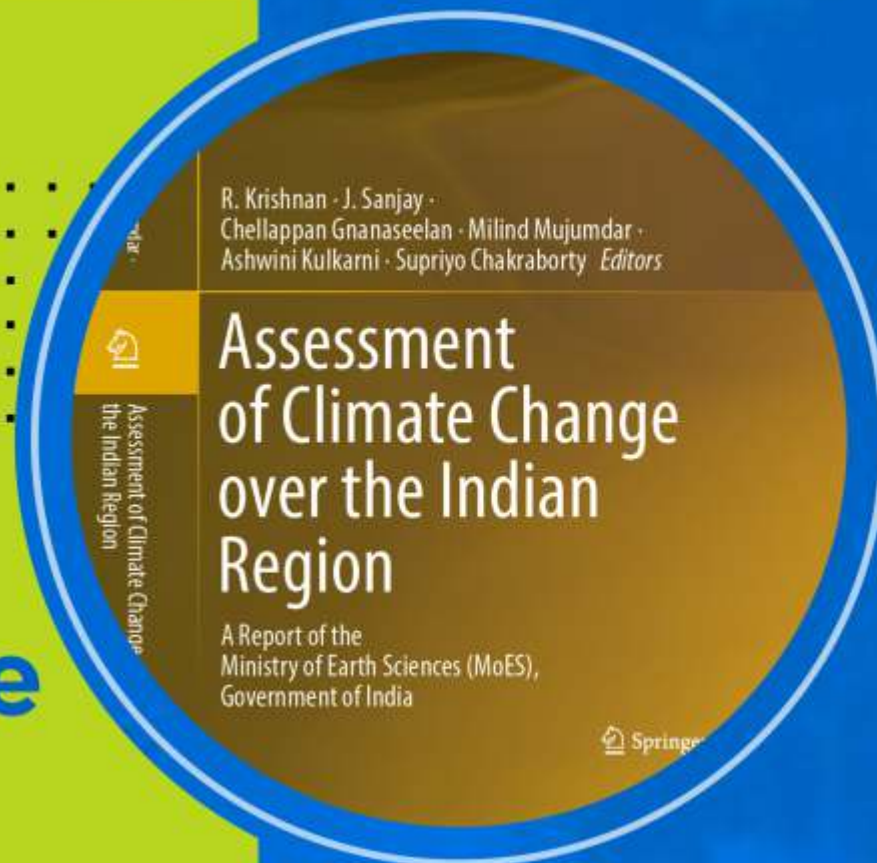


सत्यमेव जयते

Ministry Of Earth Sciences
Government of India



Strengthening of Climate Services



- ▶ **State-wise reports have been prepared on rainfall changes & variability based on the recent 30 years of data (1989-2018) uploaded on the IMD Pune website.**

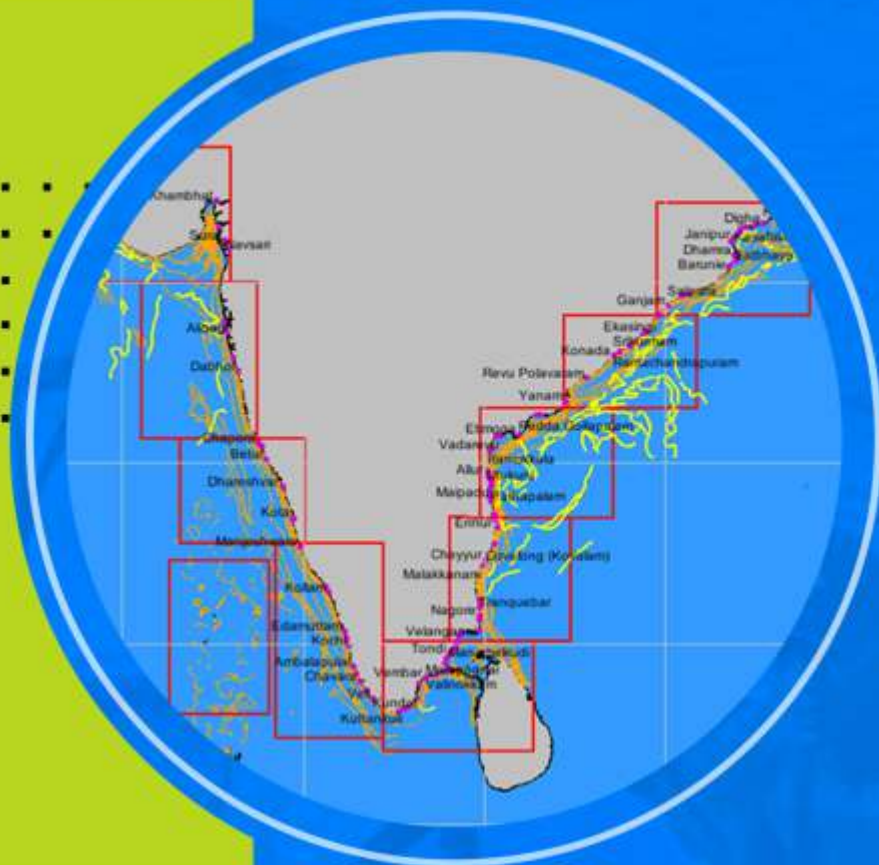


- ▶ **The National Climate Change Assessment Report of MoES on Assessment of Climate Change over the Indian Region has been prepared & will be released soon.**



सत्यमेव जयते

Ministry Of Earth Sciences
Government of India



Improved Ocean Services-1



- ▶ **The Indian National Centre for Ocean Information Services (INCOIS) provides Potential Fishery Zone (PFZ) advisories to 6.80 lakh fishermen on daily basis to help them locate the areas of abundant fish in the ocean which was 1 lakh fishermen in 2014.**



- ▶ **Potential Fishing Zone (PFZ) forecasts to Gujarat & North Andhra Pradesh was started by INCOIS.**



- ▶ **INCOIS collaborated with the Airports Authority of India (AAI) to utilize the GAGAN (GPS Aided Geo Augmented Navigation) satellite system to transmit disaster warnings to fishermen.**



- ▶ **Hon'ble Union Minister Dr. Harsh Vardhan inaugurated a low-cost GAGAN system-enabled GEMINI (GAGAN Enabled Mariner's Instrument for Navigation & Information) device on 09th October 2019 which is electronically designed & manufactured in India.**



Ministry Of Earth Sciences
Government of India



Improved Ocean Services-2



- ▶ **INCOIS deployed a Flux Buoy Mooring in the Bay of Bengal to improve the accuracies of the ocean & atmospheric forecast models.**



- ▶ **On International Coastal Cleanup Day, a coastal clean-up campaign with 6,984 volunteers was organized at 34 locations wherein a total of 35 tons of waste & 2,39,095 individual pieces of litter were collected within 2 hours of activities along with Indian coastal states & UTs.**



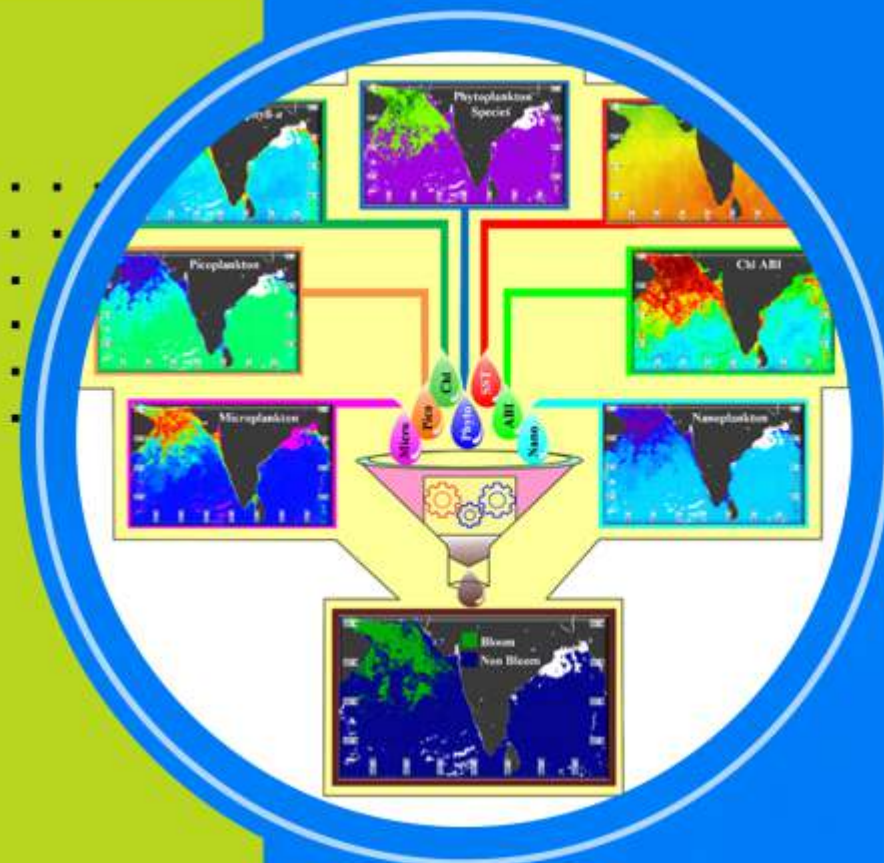
- ▶ **A dynamic & interactive tool, Sound Velocity Atlas (SoVeAT) was developed & commissioned on 2nd Aug 2019 for use by the Indian Navy.**



- ▶ **INCOIS developed & commissioned Small Vessel Advisory & Forecast Services System (SVAS) which is an innovative impact-based advisory & forecast service system for small vessels that warns users 10 days in advance against potential zones where vessel overturning can take place.**



Ministry Of Earth Sciences
Government of India



Improved Ocean Services-3



- ▶ **INCOIS launched the Swell Surge Forecast System** which will provide forewarnings about the high period swell waves originating from the distant southern Indian Ocean.



- ▶ **INCOIS introduced Algal Bloom Information Service (ABIS)** which provides timely information on harmful algal blooms which is disastrous to coastal fisheries & tends to induce respiratory problems within the coastal population.



- ▶ **7 cruises were onboarded on FORV Sagar Sampada** in the Eastern Arabian & Andaman Sea during the year to explore & make inventories of the marine biodiversity of Indian seas.



- ▶ **Hon'ble Union Minister Dr. Harsh Vardhan dedicated the new campus of CMLRE at Puthuvypu, Kochi to the Nation on 23rd Feb 2019. Dr. M. Rajeevan, Secretary, MoES inaugurated the transit hostel with 10 rooms & canteen facilities on 1st Nov 2019.**



सत्यमेव जयते

Ministry Of Earth Sciences
Government of India



Strengthened the Ocean Technology-1



- ▶ The new Coastal Research Vessel (CRV) Sagar Tara joined the MoES fleet of research vessels on 16th August 2019 after victorious harbor & sea trials. The NIO-Vizag team successfully sailed out CRV for a maiden scientific cruise & completed contemplation for the program of NCCR - Sea Water Quality Monitoring (SWQM).



- ▶ A new Coastal Research Vessel Sagar Anveshika has been successfully delivered to the National Institute of Ocean Technology (NIOT) which will enhance capacity in terms of coastal surveys, pollution monitoring, & coastal research.



- ▶ The In-situ soil tester was stationed for seabed soil assessment in the CIOB's PMN mining area at a depth of 5418m in which the newly procured deep-sea winch & 7000m hybrid aramid umbilical cable was used during April 2019.



Ministry Of Earth Sciences
Government of India



Strengthened the Ocean Technology-2



- ▶ **NRDC signed Transfer of Technology agreements for commercialization of Wave-Powered Navigational Buoy & E.faecalis Multiplex PCR Detection Kit. The design & development of Remotely Operable Vehicle was successfully completed by Engineers of Bharat Electronics Limited (BEL).**



- ▶ **NIOT jointly with NOAA/PMEL undertook a cruise onboard ORV Sagar Nidhi from 18th October to 13th November 2019.**



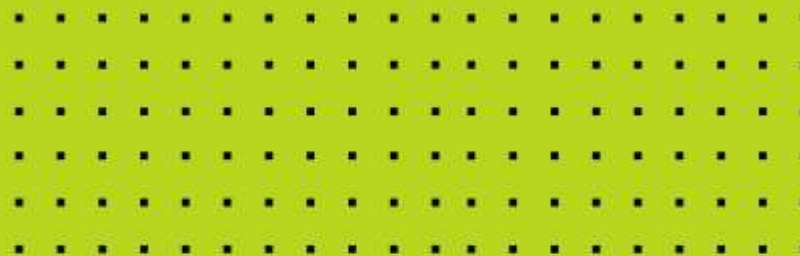
- ▶ **NIOT successfully carried out drilling below the seafloor using an Autonomous coring system in Gas hydrate site in Krishna Godavari Basin, the Bay of Bengal in both shallow & deep water depths.**



- ▶ **A Solar Thermal Distillation Plant of 10 m³/day capacity has been commissioned by IIT Madras with the funding of MoES at Kanyakumari.**



Ministry Of Earth Sciences
Government of India



Strengthened the Ocean Technology-3



- **NIOT is installing 6 new water desalination plants in Lakshadweep islands, each with a capacity to produce 1.5 lakh liters of water every day, with the help of the Ministry of Drinking Water & Sanitation & Lakshadweep administration. The first of these 6 plants started generating potable water on 09th Janury2020 installed at Kalpeni.**



Ministry Of Earth Sciences
Government of India



Breakthroughs in Polar Science Projects



- ▶ **The 39th Indian expedition to Antarctica was successfully completed with 105 members cooperatively with Japan & drilled 8m sediment core from the Antarctic lake to reconstruct the past climate.**



- ▶ **Indian research station Himadri was manned for over 150 days during 2019. Gruvebadet Atmospheric Laboratory, Ny-Alesund has been operational for continuous monitoring of precipitation, clouds & aerosols.**



- ▶ **The Himalayan expedition was successfully completed from the Himansh station in Chandra basin, Himachal Pradesh to monitor Glaciers with observations of AWS, GPS survey, etc.**



सत्यमेव जयते
Ministry Of Earth Sciences
Government of India



Seismological Services-1



- ▶ **National Centre for Seismology (NCS) launched a GIS-based new website on 27th July 2019 which provides earthquake information.**



- ▶ **RISEQ, a mobile app was launched for earthquake information for both Android & IOS Users which provide the latest earthquake information.**



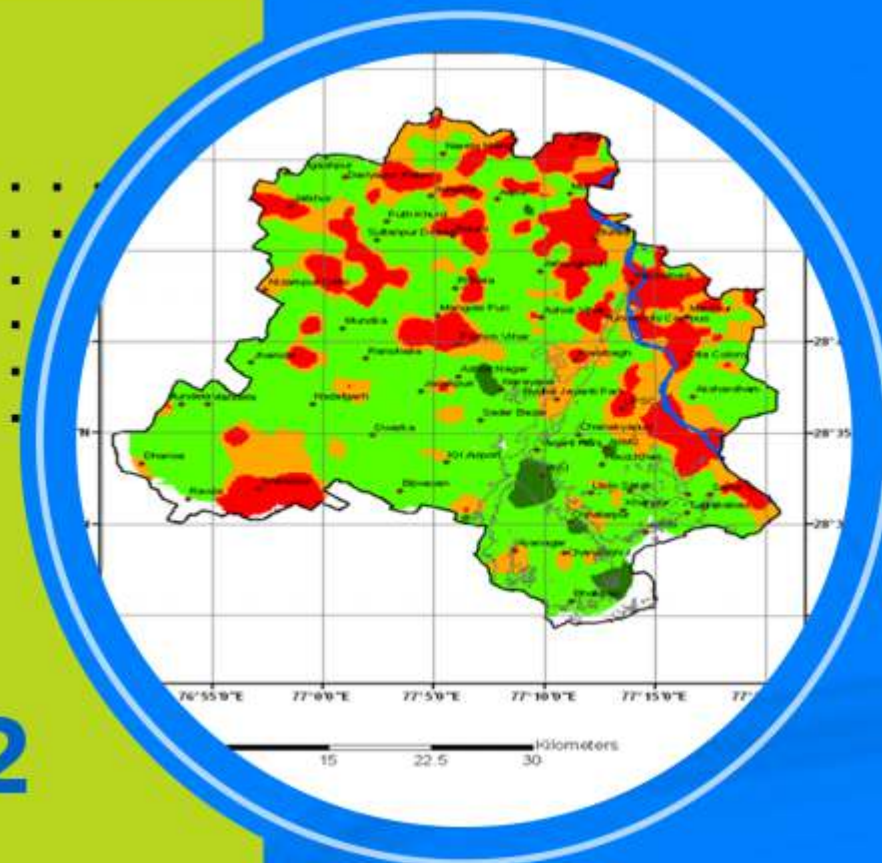
- ▶ **The Seismic Microzonation work for Geophysical investigations has been taken up for 4 cities - Chennai, Bhubaneswar, Coimbatore & Mangalore.**



- ▶ **A revolutionary Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS) facility was established at the NCESS, Thiruvananthapuram for in-situ trace element geochemistry & geochronology.**



Ministry Of Earth Sciences
Government of India



Seismological Services-2



- ▶ **NCESS has taken up a national project for the SGD (Submarine Groundwater Discharge) Flux Determination in which 14 institutes are participating.**



- ▶ **New insights from scientific drilling investigation to understand the recurrent reservoir triggered seismicity have been obtained down to a depth of 3 km in the Koyna seismogenic Zone, Maharashtra.**



Ministry Of Earth Sciences
Government of India

Accomplishments in Research, Education, Training & Outreach (REACHOUT)



- ▶ **DEvelopment of SKilled manpower in Earth System Sciences (DESK) at IITM is coordinating with MoES & its Institutions for Recruitment of Research Fellowship under the MoES Research Fellow Program (MRFP) in which 18 students introduced in 2019 batch successfully completed their training.**



- ▶ **The Ministry's Pavilion at India International Trade Fair 2019 has been adjudged First for Excellence in Display & was awarded the Gold Medal.**



- ▶ **MoES sponsored the participation of Indian contingent where Children from 41 countries participated in the 13th International Earth Science Olympiad, organized during 26th Aug - 3rd Sept. 2019 at Daegu, Korea. Indian team won 10 medals.**



Ministry Of Earth Sciences
Government of India



International Cooperation-1



- ▶ **MoES & UK Met Office sign an implementation agreement on WCSSP India on 7 February 2019 to reduce exposure of damaging weather & climate impacts.**



- ▶ **MoES elected as a steering committee member of the Belmont Forum for a 3-year term starting 1st January 2020.**



- ▶ **MoU on Antarctic co-operation between MoES, the Ministry of Foreign Affairs & Worship of the Argentine Republic signed on 4th April 2019.**



- ▶ **MoU on Polar Science between the NCPOR/MoES, CHARS & Polar knowledge Canada signed on 27th Feb 2020.**



सत्यमेव जयते

Ministry Of Earth Sciences
Government of India



International Cooperation-2



- ▶ ***The First Workshop of Experts on Himalayan Science Council (HSC) held during 05-06 December, 2019 in Goa, India at the invitation of the Government of India. The delegations from various countries like Bangladesh, Korea attended the workshop.***



सत्यमेव जयते

Ministry Of Earth Sciences
Government of India

Ministry Of Earth Sciences
Prithvi Bhavan, Lodhi Road, opp.
India Habitat Centre, New Delhi, Delhi 110003

follow us on    @moesgoi