



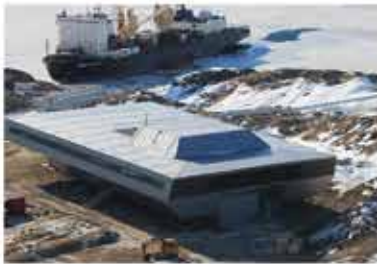
सत्यमेव जयते

GOVERNMENT OF INDIA

# MINISTRY OF EARTH SCIENCES

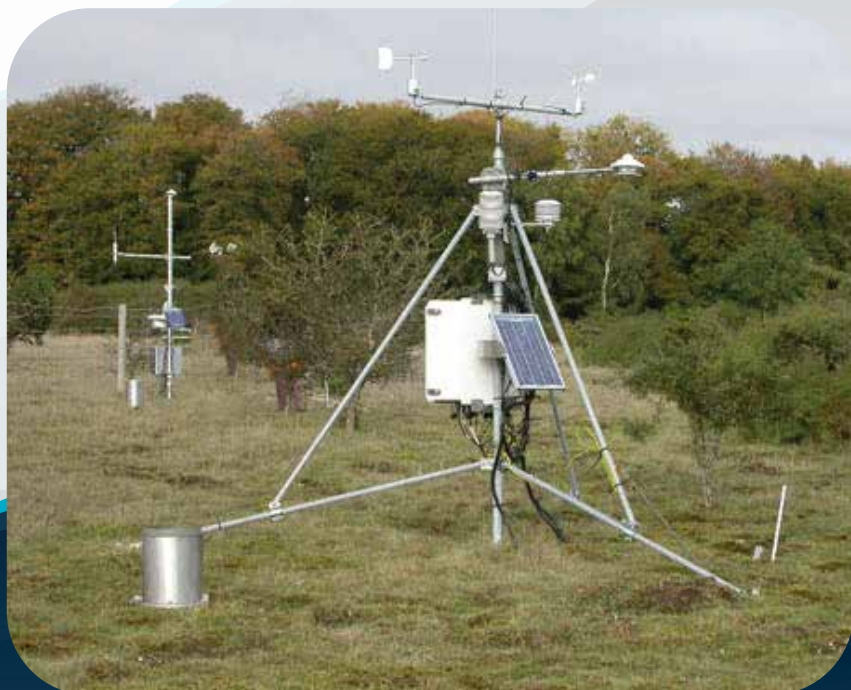
## Major Achievements

2014-2026



# MANDATE

- ❖ The Ministry of Earth Sciences (MoES) serves as India's nodal agency for delivering comprehensive services across weather, climate, ocean and coastal state management, hydrology, seismology, and natural hazard risk reduction.
- ❖ The Ministry's mandate further encompasses the development of indigenous technologies for the sustainable exploration and utilisation of marine living and non-living resources, alongside advancing research and long-term monitoring of the Earth's cryosphere – spanning the Arctic, Antarctic, and Himalayan regions.
- ❖ The Ministry's key flagship programmes – Mission Mausam, Deep Ocean Mission (DOM), and PRITHVI—collectively advance India's capabilities in Earth system science and translate scientific research into tangible societal outcomes.

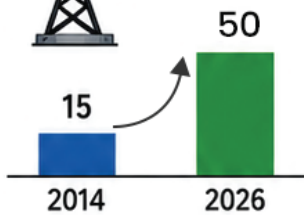


# SIGNIFICANT ACHIEVEMENT IN INDIA'S EARTH SYSTEM SCIENCES

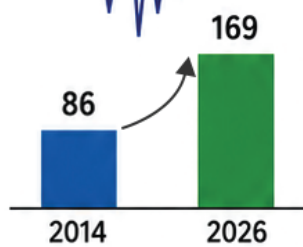


2014 2026

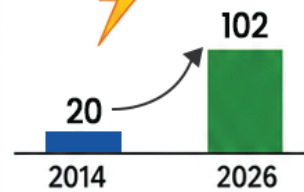
## DOPPLER WEATHER RADARS



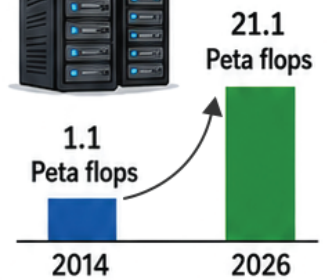
## NATIONAL SEISMOLOGICAL NETWORK OBSERVATORIES



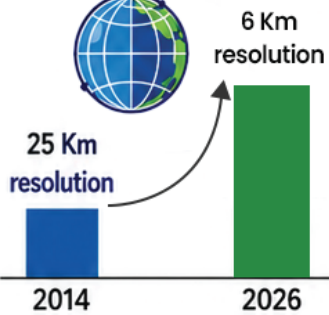
## LIGHTING LOCATION NETWORK



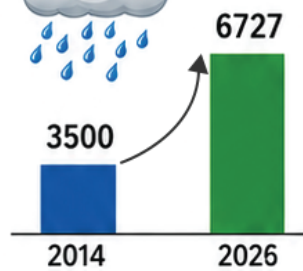
## HIGH PERFORMANCE COMPUTING CAPACITY



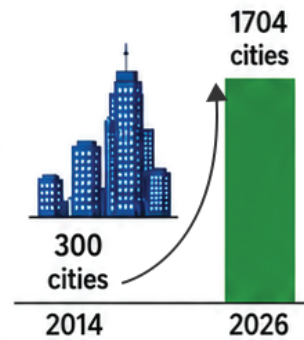
## MEDIUM RANGE FORECAST GLOBAL FORECASTING SYSTEM



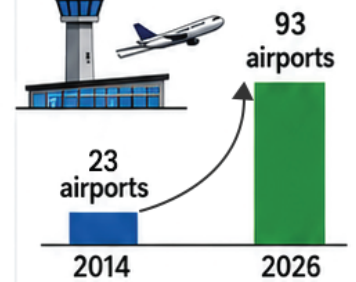
## RAIN GAUGE STATIONS



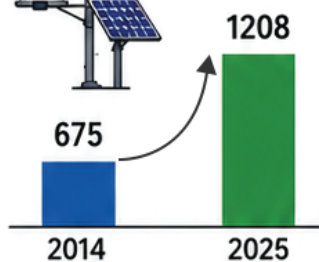
## CITY FORECAST STATIONS



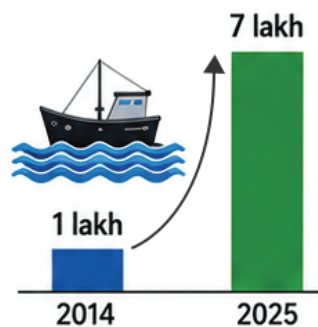
## CURRENT WEATHER INDICATING SYSTEMS



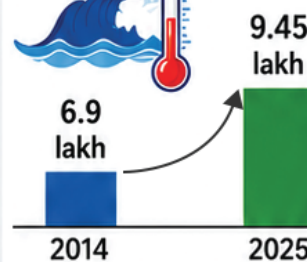
## AUTOMATIC WEATHER STATIONS



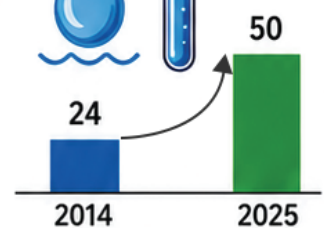
## POTENTIAL FISHING ZONE ADVISORIES STAKEHOLDER REACH



## OCEAN STATE FORECAST STAKEHOLDER REACH



## COASTAL WATER QUALITY MONITORING STATIONS



# MISSION MAUSAM

Launched by the Honourable  
Prime Minister Shri Narendra Modi  
at the 150<sup>th</sup> Foundation Day of IMD in 2025



**Dr. Jitendra Singh**  
Hon'ble MoS (I/C), MoES

**Shri Narendra Modi**  
Hon'ble Prime Minister

**Ms. Celeste Saulo**  
Secretary General of  
World Meteorological Organization

# Mission Mausam

- ❖ Mission Mausam was launched in 2025 with the strategic objective of making India weather-ready and climate-smart Bharat, integrating real-time weather and climate data to strengthen national planning frameworks and disaster risk management.
- ❖ India's Atmospheric Observational Infrastructure has been expanded by more than 200% since 2014, substantially enhancing the density and reach of the national weather monitoring network.
- ❖ Investment in High-Performance Computing (HPC) infrastructure has increased 6-fold over the past 12 years, with overall computing capacity scaling 20-fold, enabling significantly more powerful and accurate modelling of weather and climate systems.
- ❖ Atmospheric Research Testbeds (ART) have been established at strategic locations across the country, complemented by dedicated Urban Meteorology Testbeds in the National Capital Region, Chennai, Mumbai, and Visakhapatnam, enabling high-resolution monitoring of urban weather and climate dynamics.
- ❖ A new low-cost, 3D-printed Automatic Weather Station (PAWS) has been developed which is a scalable, indigenously designed solution for real-time urban weather monitoring, incorporating multi-parameter sensing and cloud-based data management systems.
- ❖ An independent third-party audit has validated that a Government investment of approximately ₹1,000 crore in the Monsoon Mission and High-Performance Computing has generated economic returns of ₹50,000 crore – a 50-fold return on public investment. These gains have directly benefited approximately 11 million families below the poverty line, including small-scale farmers and fishing communities who depend on the Ministry's daily weather and ocean advisories to safeguard their livelihoods.



India's Weather Supercomputers, ARKA & ARUNIKA

# Forecasting Systems & Models

- ❖ The Bharat Forecasting System (BharatFS), with a resolution of approximately 6.5 km, has been operationalised as one of the world's highest-resolution indigenously developed global operational weather models. This represents a transformational improvement in spatial resolution, from 25 km in 2014 to 6.5 km in 2026.
- ❖ The Extended Range Prediction System now delivers rainfall and temperature forecasts up to three weeks in advance at a resolution of 25 km, compared to 100 km in 2019, enabling significantly more localised and actionable early warnings.
- ❖ Since 2016, MoES has transitioned from a deterministic to a 21-member ensemble probabilistic weather forecasting system, marking a fundamental shift in India's forecasting methodology. Monthly and seasonal forecasts have been operationalised for the Indian region since 2021, with sub-division-level seasonal forecasts introduced in 2025. The reliability of the seasonal prediction system has improved markedly, with absolute error reducing from 7.8% of the Long Period Average (LPA) during 2016–2020 to 2.2% during 2021–2025.
- ❖ MoES has developed "Mithuna," an indigenously built Land-Ocean-Atmosphere coupled model for medium-range weather forecasting, further advancing India's self-reliance in Earth system modelling.
- ❖ India's first Earth System Model (IITM-ESM) has been developed, enabling long-term climate projections and process-level studies. The model's outputs contribute to the Intergovernmental Panel on Climate Change (IPCC) assessment reports, placing India among the select group of nations with an independent Earth System Modelling capability.
- ❖ Since 2017, MoES has contributed ensemble forecasts to the TIGGE (THORPEX Interactive Grand Global Ensemble) project, enabling systematic benchmarking against leading global centres such as the ECMWF and the UK Met Office, and driving continuous improvement in high-impact weather forecasting.



Hon'ble MoS (I/C), Dr. Jitendra Singh,  
launching Bharat Forecast System alongside  
Dr. M Ravichandran, Secretary MoES & Ministry Officials

## Forecast Accuracy Enhancement

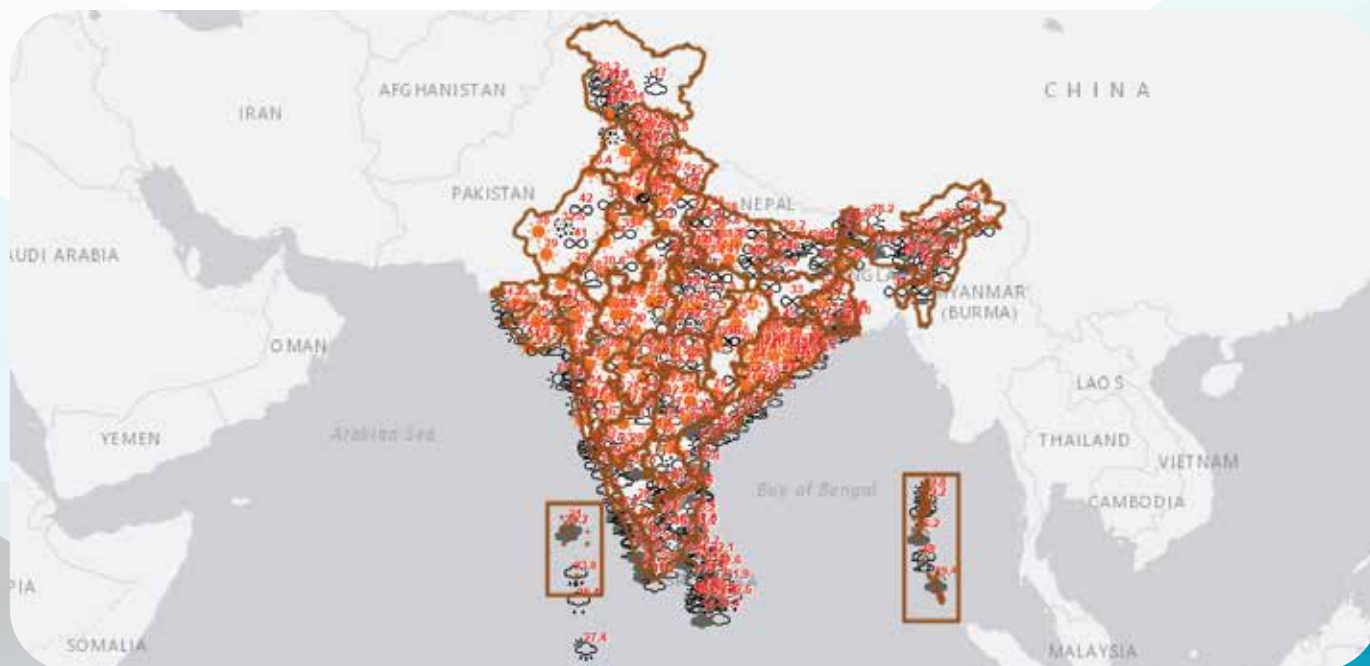
- ❖ City-level weather forecast coverage has expanded from 300 cities in 2014 to 1,704 cities in 2026, representing a 468% increase and ensuring that a significantly larger share of India's urban population has access to localised weather information.
- ❖ Overall forecast accuracy for high-impact severe weather events – including cyclones, rainfall, heat waves, and cold waves – has improved by 40–50% between 2014 and 2026.
- ❖ Heatwave forecast accuracy at the sub-divisional level has improved from 67% in 2014 to 100% at the 24-hour lead period and to 90% at the 72-hour lead period in 2026, substantially improving early warning capabilities for this critical public health hazard.
- ❖ Cyclone forecast accuracy has improved markedly, with track, intensity, and landfall point predictions improving by 35–40%, 15–30%, and 45–65% respectively, for forecasts issued up to 48 hours in advance.
- ❖ The probability of detection for monsoon rainfall events has improved from 50% in 2014 to 85% in 2026 at the 24-hour lead period, markedly enhancing the reliability of monsoon advisories.
- ❖ A high-resolution ensemble fog forecasting system (WiFEX), with 72% forecast accuracy, has been established for airports across Northern India, contributing directly to aviation safety. Current Weather Indicating Systems (CWIS) now cover 93 airports, compared to 29 in 2014.



Hon'ble MoS (I/C), Dr. Jitendra Singh  
launching Indradhanush Booklet at MoES Campus alongside,  
Dr. M Ravichandran, Secretary MoES and Ministry Officials

# Early Warning & Alert Services

- ❖ An Integrated Multi-Hazard Early Warning System has been operationalised, a capability that was entirely absent in 2014, significantly strengthening national preparedness against concurrent and cascading weather-related disasters.
- ❖ Five-day Impact Based Forecasts and risk-based warnings have been operationalised, enabling decision-makers and emergency responders to move from event-based to impact-focused preparedness.
- ❖ Pre-genesis forecasts of cyclone track and intensity, along with early warnings for tropical cyclones, are routinely issued to support timely disaster preparedness well in advance.
- ❖ Quantitative Precipitation Forecasts issued by Flood Meteorological Offices to the Central Water Commission have been extended from a 2-day validity with 3-day outlook in 2014 to a 7-day validity, with forecast accuracy improving by 10–15% since 2016.
- ❖ A Flash Flood Guidance System providing daily advisories for more than 30,000 watersheds has been operationalised across India and the South Asian partner nations of Nepal, Bhutan, Bangladesh, and Sri Lanka, reinforcing regional disaster risk reduction cooperation.
- ❖ Thunderstorm Nowcast coverage, previously available for only 141 stations in 2014, has been extended to any location across India through the sustained expansion of the Doppler Weather Radar network.
- ❖ A very high-resolution (330-metre) urban atmospheric model (DM-Chem) has been developed, capable of generating accurate visibility and fog forecasts for Delhi and its surrounding region. Complementing this, India's first indigenous high-resolution Air Quality Early Warning System (AQEWS-DSS, AIRWISE), with over 80% accuracy, has been deployed and is now the primary operational tool for determining Graded Response Action Plan (GRAP) phases.



# Sectoral & Citizen-Centric Services

- ❖ A comprehensive Web-GIS Portal has been developed to provide hazard-specific information covering heatwaves, cold waves, heavy rainfall, and cyclones, alongside integrated sectoral applications spanning marine weather, urban weather, nowcast services, NWP model guidance, agro-meteorological advisories, aviation weather services, and transport-sector support for railways and highways.
- ❖ To strengthen last-mile delivery of weather and environmental services, 16 APIs and a suite of citizen-facing digital applications have been developed and deployed, including Mausam, Meghdoot (Weather & Agriculture), Damini (Lightning), SAFAR AIR (Air Quality), SAMUDRA (Ocean), SARAT (Oil Slick), Bhookamp (Earthquake), Thoondil (Fishermen), and the Earth System Science Data Portal (ESSDP) – supplementing existing SMS and web-based dissemination channels.
- ❖ Two AI-enabled advanced weather forecast systems have been operationalised. The first delivers seasonal rainfall progress and localised weather information up to four weeks in advance, supporting farming communities across 16 states and 3,000 sub-districts. The second, tailored specifically for Uttar Pradesh, provides high-resolution spatial rainfall forecasts at 1 km resolution for up to 10 days in advance.



## Research & Innovation

- ❖ Cloud Aerosol Interactions and Precipitation Enhancement Experiment (CAIPEEX) trials conducted across India have demonstrated the possibilities of an estimated 18% increase in rainfall through cloud seeding interventions. The programme has also established scientifically validated protocols for rainfall enhancement over rain-shadow regions.



Artificial Rain Seeding: Cloud Aerosol Interactions and Precipitation Enhancement Experiment (CAIPEEX)

# DEEP OCEAN MISSION

India's very own human submersible  
**MATSYA-6000**



VEHICLE

## Deep Ocean Mission (DOM)

- ❖ Deep Ocean Mission (DOM) is a flagship, ambitious initiative approved by the Union Cabinet in 2021, with an overall budget outlay of Rs 4,077 Crores, over a five-year period to be implemented chiefly by the Ministry of Earth Sciences.

## Deep-Sea Exploration and Mining Technologies

- ❖ Design, integration and model testing of India's first ever human submersible (named MATSYA-6000) are completed. Wet harbour trials of 500m shallow-water human submersible under the Samudrayaan mission were successfully conducted, and pilot training on board the French submersible NAUTILE was successfully completed in 2025.
- ❖ Specialised facilities for welding and testing, life support, and ballast facilities for human submersible have been successfully set up.
- ❖ Locomotion Trials of India's Underwater Mining Machine (named VARAHA) for mining of polymetallic nodules (known to contain valuable minerals such as Cobalt, Nickel, etc.) at a depth of 5270m have been conducted.

## Advancing Ocean Climate Change Advisory Services

- ❖ Advanced models for global sea-level projection and prediction of cyclone and storm-surge have been developed, and coastal vulnerability maps have been prepared for the benefit of ocean stakeholders.
- ❖ Deep Ocean Observing System in the Arabian Sea and Bay of Bengal has been expanded with deployment of over 122 Argo floats, 72 wave drifters, and 15 successful Gilder missions.
- ❖ To expand ocean observations, setting up of an Underwater Cable Observatory in the Andaman Islands has been initiated.



Samudrayaan Wet Test Conducted in 2025

# Innovations for Exploration and Conservation of Deep-Sea Biodiversity

- ❖ Biodiversity surveys of 31 unique biodiversity hotspots (called seamounts) in the Arabian Sea and Bay of Bengal have been conducted with the collection of over 1000 samples representing 183 species, of which nearly 43 species are new to science.
- ❖ From deep-sea water and sediment samples, more than 1800 unique microbes have been isolated, leading to the generation of 15,560 Clones that are being screened/bio-prospected for industrially useful molecules.
- ❖ For isolation and culture of the deep-water microbes, a specialized sampler and culture system has been designed and developed.
- ❖ More surveys are being conducted for biodiversity assessment and inventorisation of deep-sea organisms and microbes, along with the setup of a microbial referral facility.

## Deep Ocean Survey and Exploration

- ❖ High-resolution geophysical surveys to search for deep-sea sites of polymetallic sulphides have been conducted at 14 locations, resulting in the discovery of two active and two inactive hydrothermal vents (potential sites of valuable multi-metal deposits/crusts in the ocean).
- ❖ Contract for the construction of an all-weather multi-purpose ship has been awarded to GRSE, under the Ministry of Defense. The keel laying of the vessel was held in April 2026. The vessel is expected to be commissioned in early 2028.



## Energy and Freshwater from the Ocean

- ❖ The detailed engineering design for a high-capacity offshore OTEC-powered desalination plant has been prepared, including moorings, pipelines, a subsea power cable, and a freshwater transport system.
- ❖ A hybrid renewable energy (floating solar with offshore wind) and freshwater generation from deep water, and the demonstration of suitable pilot-scale plants in the Lakshadweep Islands, are planned to benefit island communities.

## Advanced Marine Station for Ocean Biology

- ❖ The land for setting up the Marine Station has been acquired in Nemmeli, Chennai, and preliminary layout and drawings are finalised. A hub-and-spoke model with a network of biological institutions has been established, and specialised courses and conference programs, as well as collaboration with France and Germany, PhD and Post-Doc programs have been initiated.
- ❖ As part of Deep Ocean Mission, enhancement in capacity building and transnational research/industry-oriented incubators is being done through an identified network of biological institutions.



# PRITHVI

PRITHVI is an umbrella scheme integrating five component of Earth systems into one



## PRITHVI

- ❖ The PRITHVI scheme takes a comprehensive approach by encompassing all five major components of the Earth system – atmosphere, hydrosphere, geosphere, cryosphere, and biosphere – with the aim of deepening knowledge in Earth System Sciences and delivering dependable services to the nation. The research, development, and operational activities under this scheme are executed in a coordinated and unified manner through the collective efforts of the relevant institutes under the Ministry of Earth Sciences (MoES).

## Polar Science and Cryosphere Research (PACER)

- ❖ India maintains a permanent, year-round scientific presence at its Antarctic stations (Maitri and Bharati), Arctic station (Himadri), and the high-altitude Himalayan station Himansh (4,080 m above sea level, inaugurated in 2016). Over 100 Indian scientists undertake annual research expeditions to these strategic locations.
- ❖ The Indian Antarctic Act, 2022 has been enacted, establishing a robust legal and governance framework for India's Antarctic expeditions and fulfilling India's obligations under the Antarctic Treaty System.
- ❖ India has conducted scientific expeditions to the interior of Antarctica, progressively expanding its research presence in this strategic region. India conducted its first active seismic survey in Antarctica in 2025, mapping ice thickness and sub-glacial bathymetry beneath the Nivlisen Ice Shelf.
- ❖ A sediment coring expedition under the STAPLES Lake project, undertaken in multinational collaboration with Japan and Belgium, was successfully conducted at Larsemann Hills in Antarctica – the first such expedition of its kind in the region.



Bharti station located in Antarctica between Thala Fjord and Quilty Bay

- ❖ India released its Arctic Policy in 2022, titled “India and the Arctic: Building a Partnership for Sustainable Development,” articulating India’s strategic objectives for sustained Arctic engagement. In line with this policy, India contributes to multilateral polar governance as a signatory to the Antarctic Treaty and as an Observer State in the Arctic Council.
- ❖ India launched its inaugural Arctic Winter Expedition in 2023 to Svalbard, marking a significant milestone in polar research and international scientific collaboration. The expedition addressed critical knowledge gaps in winter Arctic science and introduced new research themes to India’s Arctic programme, including astronomical observations and lightning studies. A first-of-its-kind dedicated expedition to the East Greenland Sea in the Arctic was also undertaken.
- ❖ MoES has established India’s first dedicated Oceanic Observation System (IndARC mooring) and an Atmospheric Observation Laboratory in the Arctic, enabling continuous monitoring of oceanic and atmospheric characteristics. This infrastructure supports the study of Arctic climate change and its teleconnections with the Indian Monsoon.
- ❖ An indigenously developed passive acoustic system has been deployed alongside the Indian Arctic Moored Observatory (IndARC) in Kongsfjorden since 2015, enabling systematic and continuous acoustic data collection to advance understanding of climate change impacts on the Arctic environment.
- ❖ An indigenously developed Remotely Operated Vehicle (ROV) has been deployed for systematic monitoring of under-ice ecosystems in polar regions, contributing to a deeper understanding of cryospheric biodiversity.



The Himadri Station in the Arctic: India's Marquee Research Station

# Himalayan Cryosphere

- ❖ India maintains a research station at Lahaul & Spiti, Himachal Pradesh for better understanding of glacier –climate inter-relationship and quantify the Himalayan glacier responses towards the climate change.
- ❖ The Himalayan Cryospheric Observation and Modelling (HiCOM) initiative has been launched, with glacier mass balance and hydrological studies actively underway on six or more benchmark glaciers. India's first dedicated glaciological expedition to the Khangri Glacier in Arunachal Pradesh was successfully conducted in 2024.
- ❖ India has conducted scientific expeditions to the eastern Himalayas, contributing new data on high-altitude glacial dynamics and expanding the geographic scope of India's cryospheric research portfolio.



Himansh: India's Himalayan Research Station

# Ocean Services, Modelling Application, Resources and Technology (O-SMART)

- ❖ An Integrated Ocean Energy Atlas has been prepared for the first time, estimating India's ocean energy potential – encompassing offshore wind, floating solar, Ocean Thermal Energy Conversion (OTEC), ocean current energy, tidal, and wave energy – at approximately 9.2 lakh TWh per annum from within the Exclusive Economic Zone (EEZ), in alignment with the Government's Gati Shakti National Master Plan for infrastructure development.
- ❖ MoES has developed and deployed Low Temperature Thermal Desalination (LTTD) plants – an innovative, ocean-energy-based technology – at six locations across the Union Territory of Lakshadweep, with a total freshwater generation capacity of 1.5 lakh litres per day, addressing the potable water needs of remote island communities.
- ❖ An open-sea fish cage with a multipoint mooring system has been indigenously designed, developed, and field-demonstrated, offering a scalable solution to promote offshore aquaculture and enhance fish farming productivity.
- ❖ India has become the first country in the world to sign two Polymetallic Sulphides (PMS) exploration contracts with the International Seabed Authority (ISA), and is formally recognised as a Pioneer Investor, underscoring India's leadership in responsible deep-sea resource governance.



India's LTTD Plant in Lakshadweep

# Coastal Management & Planning

- ❖ Marine Spatial Planning (MSP) frameworks have been developed for the Lakshadweep Islands and Puducherry. Additionally, 'SAHAV' – a digital public good and geospatial decision-support platform – has been developed to support coastal monitoring, shoreline management, hazard assessment, and the dissemination of actionable coastal data and services to policymakers and stakeholders.
- ❖ Shoreline Management Plans (SMPs) have been prepared for Andhra Pradesh, Kerala, Puducherry, and Tamil Nadu, collectively covering nearly 46% of India's coastline. These plans provide State Governments with a scientifically grounded basis for coastal planning, infrastructure protection, and sustainable coastal development.



India's Marine Portal Sahav

# Marine Biodiversity & Biotechnology

- ❖ Twenty-five seamounts have been surveyed as part of biodiversity mapping within India's Exclusive Economic Zone (EEZ). The surveys have yielded the discovery of 48 new species and 95 new biogeographic records, including approximately 23 species new to science, significantly expanding global knowledge of deep-sea biodiversity.
- ❖ One hundred comprehensive species profiles – incorporating classical taxonomic descriptions and DNA barcodes of marine organisms – have been generated, serving as a national reference library for marine biodiversity and ecological research.
- ❖ BioNET, a high-performance AI/ML computing facility for biodiversity research, has been established. Advanced AI tools have been developed, including a ResNet152-based otolith identification model achieving 99.84% accuracy in species identification, as well as TAXObot, an LLM-based chatbot for taxonomic support.
- ❖ Molecular and biotechnological research infrastructure has been significantly strengthened through the establishment of a pilot-scale biobank, a centralised marine cell culture facility, and state-of-the-art sequencing laboratories. This infrastructure has enabled the generation of 24 eDNA-based metagenomic profiles and approximately 100 DNA barcodes, along with genetic characterisation of seamount ecosystems.
- ❖ Microbial diversity profiling conducted in the deep seamounts of the Arabian Sea has identified 814 microbes spanning 129 species, 69 genera, 38 families, and 26 orders, with isolates screened for novel enzymes and bioactive pigments of potential biotechnological value.



Coral Reefs in the Indian Ocean

## International Cooperation

- ◆ India established the Sustainable Coastal and Oceanographic Research Institute (SCORI) at the University of the South Pacific, Fiji, in 2023, dedicated to Pacific Island nations by Hon. Prime Minister Narendra Modi at the Third Forum for India–Pacific Islands Cooperation (FIPIC) meeting, reinforcing India’s commitment to South–South scientific cooperation.



Hon'ble Prime Minister Shri Narendra Modi  
at the third India - Pacific Islands Cooperation (FIPIC)  
with Delegates on May 22, 2023

- ❖ A two-fold increase in the capacity of India's Ocean Observing System has been achieved, substantially improving the data inputs and accuracy of ocean state forecasts.
- ❖ The Synergistic Ocean Observation and Prediction Services (SynOPS) facility, featuring an advanced network operations centre, was launched in 2024 to deliver enhanced, integrated ocean monitoring and forecasting services.
- ❖ MoES has mapped approximately 8,850 sq. km of deepwater areas (deeper than 500 m) within India's Exclusive Economic Zone (EEZ) and collected approximately 2.4 lakh km of track-line geophysical data. The resulting high-resolution bathymetric data enhances navigation safety, supports marine resource exploration, and improves geohazard identification.
- ❖ Comprehensive coastal bathymetric surveys have been conducted along India's East Coast, covering water depths from 0 to 30 m across the states of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu, generating foundational data for coastal infrastructure planning and hazard management.
- ❖ Two new coastal research vessels – Sagar Tara and Sagar Anveshika – have been commissioned under the Government's Make in India initiative, strengthening India's operational capacity for coastal ocean monitoring and marine research.



Science on Sphere showcase of the Ministry of Earth Sciences at the India International Science Festival 2025

# Fisheries, Coastal & Maritime Services

- ❖ Potential Fishing Zone (PFZ) advisories, including ocean state forecasts, now reach 7 lakh fishermen daily, compared to 1 lakh in 2014, representing a 600% increase in outreach. State-of-the-ocean forecasts have been extended to 9.45 lakh stakeholders and six Indian Ocean countries, and the Hilsa Fishery Advisory Service (HiFA) has been newly launched to support this economically critical fishery. The advisory includes ocean state forecast.
- ❖ The spawning grounds and breeding periods of approximately 25 economically important fish species have been mapped in the Arabian Sea, supporting evidence-based sustainable fisheries management. The IndOBIS (Indian Ocean Biodiversity Information System) portal has been launched as the regional node for the United Nations Ocean Biodiversity Information System (OBIS).
- ❖ India's Tsunami Early Warning System is fully operational for India and 25 Indian Ocean Rim countries. India is the first nation in the Indian Ocean region to implement the Tsunami Ready Community Recognition Programme, and the NAVAREA bulletin dissemination service for tsunami warnings has been newly launched, strengthening regional maritime safety.
- ❖ Coastal Water Quality Monitoring Stations have increased from 24 in 2014 to 50 in 2026, a 108% expansion, to meet the UN Sustainable Development Goal 14 (SDG-14). A Marine Litter Policy for India and a Regional Action Plan for South Asian Seas have been developed in 2024, addressing marine pollution through a policy-driven, regional governance framework.



Potential Fishing Zone, Indian Ocean

# Digital Observations & Data Infrastructure

- ❖ The Digital Ocean web-based application and the Earth System Science Data Portal (ESSDP) have been launched to provide integrated, open access to geospatial datasets spanning the atmosphere, oceans, polar regions, and geosciences, fostering data-driven policymaking and research.



## Earth System Science Data Portal

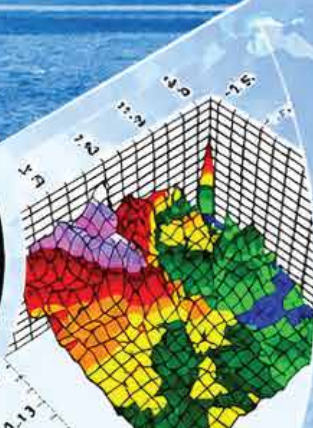
Ministry of Earth Sciences (MoES), Govt. of India

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# EARTH SYSTEM SCIENCE DATA PORTAL



Earth System Science Data Portal

# Seismology and Geosciences (SAGE)

- ❖ The National Seismological Network has been strengthened from 84 stations in 2014 to 169 stations in 2026, a 97% increase in monitoring density. The network is now capable of detecting any earthquake of magnitude 3.0 or above within 3 minutes of its occurrence.
- ❖ Seismic microzonation studies have been completed for 14 major Indian cities, providing granular earthquake hazard assessments to inform evidence-based urban planning and building regulation.
- ❖ Scientific deep drilling operations in the Koyna Intraplate Seismic Zone – the 3 km pilot phase – have been completed, advancing the study of water reservoir-triggered seismicity and contributing to global seismological knowledge.
- ❖ Eighty-two potential Submarine Groundwater Discharge zones have been identified along both the east and west coasts of India. A novel SGD assessment technique, integrating sea surface temperature data, remote sensing, and hydrological modelling, has been developed, advancing the understanding of freshwater-marine interactions.
- ❖ India's tectonic history has been updated through palaeomagnetic pole tracing and geochemical analysis. A revised tectonic model of East Gondwana has been developed, and robust palaeomagnetic results have been obtained from Laxmi Basin samples collected during the IODP-355 Expedition, contributing to the understanding of the Indian subcontinent's geological evolution.



Koyna Borehole Geophysics Research Laboratory (BGRL), Karad

## Expanding International Cooperation

- ❖ India has secured the establishment of two landmark international institutions under the aegis of MoES: a UNESCO Category 2 International Training Centre for Operational Oceanography (ITCOcean), at the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad; and a dedicated BIMSTEC Centre for Weather and Climate (BCWC), at the National Centre for Medium Range Weather Forecasting (NCMRWF), Noida, Uttar Pradesh, serving member states Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand. Together, these centres institutionalise India's role as a regional leader and capacity-building hub in Earth system science, operational oceanography, and hydro-meteorological services across South and Southeast Asia.



BCWC (BIMSTEC Centre For Weather & Climate)  
General Body Meeting In Bhutan , April 2026.



पृथ्वी विज्ञान मंत्रालय  
Ministry of Earth Sciences