

GOVERNMENT OF INDIA  
MINISTRY OF EARTH SCIENCES  
**RAJYA SABHA**  
**UNSTARRED QUESTION NO. 684**  
ANSWERED ON 05/02/2026

**PRITHVI SCHEME**

684. # SHRI MADAN RATHORE:  
SHRI KESRIDEVSINH JHALA:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) the objectives and key features of the PRITHvi VIgyan (PRITHVI) Scheme;
- (b) the sub-scheme-wise physical and financial progress under the PRITHvi VIgyan (PRITHVI) Scheme during the year 2024-25;
- (c) the extent to which the observation networks, modelling systems and early warning services have been strengthened under the scheme; and
- (d) the measurable improvements recorded in the weather, climate, ocean, seismic and disaster forecast services being provided to States including Rajasthan and the concerned Ministries?

**ANSWER**

THE MINISTER OF STATE (INDEPENDENT CHARGE) FOR  
MINISTRY OF SCIENCE AND TECHNOLOGY  
AND EARTH SCIENCES  
(DR. JITENDRA SINGH)

- (a) The main objectives of PRITHvi VIgyan (PRITHVI) Scheme are:
  - i. To augment and sustain long-term observations of the atmosphere, ocean, geosphere, cryosphere and solid earth to record the vital signs of the Earth System and change.
  - ii. To undertake R&D in the field of atmosphere, ocean, geosphere, cryosphere and solid earth and set up the required infrastructure.
  - iii. To develop modelling systems for predicting weather, ocean and climate hazards and understanding the science of climate change.
  - iv. To monitor earthquake activity and undertake seismic hazard assessment.
  - v. To explore polar and high seas regions of the Earth towards discovery of new phenomena and resources.
  - vi. To develop technology for exploration and sustainable harnessing of oceanic resources for societal applications.
  - vii. To translate knowledge and insights from Earth systems science into services for societal, environmental and economic benefits.
  - viii. Support various R &D activities in the thrust areas of different components of Earth System Sciences.
  - ix. Develop skilled and trained manpower in Earth Sciences.

The key feature of the PRITHVI scheme is to holistically address all the five components of earth system namely atmosphere, hydrosphere, geosphere, cryosphere and biosphere to improve the understanding of the Earth System Sciences and to provide reliable services for the country. These services include weather forecasts (both on land and in the Oceans) and warnings for various natural disasters like tropical cyclones, storm surge, floods, heat waves, thunderstorm and lightning; alerts for Tsunamis and monitoring of earthquakes, etc.

- (b) The sub-scheme-wise physical and financial progress under the PRITHVI VIgyan (PRITHVI) Scheme during the year 2024-25 is tabulated in Annexure I.
- (c) Under the PRITHVI scheme, significant progress has been achieved in strengthening observation networks, modelling systems, and early warning services across diverse geographies and domains.

#### i. Observational Networks

- Doppler Weather Radar (DWR) network has been expanded to 47 DWRs with the commissioning of 10 X-Band Doppler Weather Radars and 02 C-Band DWRs. Global Climate Observing System (GCOS) Upper Air Network (GUAN) RS/RW stations increased from 6 to 12. Out of 62 stations, 25 Pilot Balloon (PB) stations were upgraded to GPS based PB stations. 400 Automatic Weather Stations (AWS) were added to the existing AWS network. In addition, 200 Agro-AWS were commissioned across the country. The High Wind Speed Recorder network along the East and West Coast of India has been expanded to 37 stations.
- The in-situ Ocean Observation Network have been enhanced with the deployment of 31 Argo floats, 5 surface drifters, maintenance of 17 coastal Acoustic Doppler Current Profiler (ADCP) moorings, 3 equatorial current meter moorings, and 3 XBT (Expendable Bathythermographs) transects, alongside commissioning 15 GNSS (Global Navigation Satellite Systems) receivers at tide gauge sites and establishing 14 new tide stations. The Wave-rider network has been expanded to 17 platforms, including a new buoy in Mauritius, while the GNSS– (Strong Motion Accelerometers) SMA network in the Andaman & Nicobar Islands has been strengthened with an additional GNSS station at East Island.
- In the Himalayas, integrated glacio-hydrological monitoring systems with AWS and WLRs (Water Level Recorders) have been established in the Chandra Basin and extended to Arunachal Pradesh, supported by advanced remote sensing and xDEM-based tools for glacier mass balance estimation.
- Seismic networks have expanded to 165 operational stations nationwide, including extensive coverage in Rajasthan.

#### ii. Modelling Systems

The Ministry has developed several high-resolution models targeting various spatial and time scales including indigenously developed Bharat FS (Bharat Forecasting System) Global model at a highest resolution ~6 KM, Highest resolution short-range (forecast upto 10 days) ensemble prediction system, seasonal coupled dynamical Prediction model (with highest resolution of 38 km) for predicting seasonal mean monsoon rainfall over India. Modelling capabilities have been advanced through the development of high-resolution blended topography and bathymetry datasets, successful demonstration of the Indian Ocean Land Atmosphere (IOLA) coupled system during Cyclone Dana, and machine learning frameworks for sea level anomaly forecasts and regional alkalinity products. A regional climate model Weather Research

and Forecasting with Chemistry (WRF-CHEM) model has been set up for the Arctic and Antarctic regions to understand the impact of natural and anthropogenic influences on weather/ meteorology and climate of the polar regions. A Regional Ocean Model (ROMS) has been set up, and to understand the ecosystem, an ecosystem model is set up by coupling the physical ROMS model with the Nutrients, Phytoplankton, Zooplankton, Detritus (NPZD) model for Arctic Ocean. Also, a high-resolution coupled ocean–sea ice–ice shelf model has been developed in collaboration with Old Dominion University for the Southern Ocean.

iii. Early Warning Services

Advanced warning services related to Tsunami, High Wave Alerts, Storm Surges, Oil Spills, Hilsa Fishery Advisory Service (HiFA), Harmful Algal Blooms, Coral Bleach Alerts, Small Vessel Advisory etc. are provided to all coastal population living along vast coastline of India. The coastal flood monitoring and flash-flood forecasting capabilities have been enhanced through integration of sensors and tide-gauge observations. Impact-based forecasts and risk-based warnings are being disseminated at the district level, empowering authorities to take timely preventive actions against cyclones, heavy rainfall, thunderstorms, heatwaves, and cold waves.

- (d) Measurable improvements have been achieved across weather, climate, ocean, seismic, and disaster forecast services provided to states including Rajasthan and the concerned ministries. Forecast accuracy for severe weather events has improved by 40% in recent decades, with one-day-ahead heavy rainfall warnings during the 2025 monsoon reaching 85% accuracy compared to 77% in 2020. Cold wave forecasts showed up to 65% gains in accuracy, while thunderstorm and lightning predictions improved by 53%. Cyclone forecasts demonstrated better track, intensity, and landfall predictions, and heatwave forecasts gained two extra days of lead time with the same accuracy as earlier shorter forecasts. Ocean services strengthened through the optimal ocean observing network, unified ocean modelling framework for operational ocean prediction, sea level projection, and ocean re-analysis to build a Digital Twin of the Ocean that can be effectively used for disaster prediction. The sea level rise, extreme sea levels and tidal inundations generated from climate change scenarios are used to assess the impact along the coastal zones. Seismology services advanced with a denser national network, enabling detection of earthquakes of magnitude 3.0 and above, and completion of seismic microzonation for 12 cities, for risk mitigation.

## Annexure I

Total revised allocation of the PRITHVI scheme for FY 2024-25 was Rs. 685.00 Crores out of which actual expenditure has been Rs. 663.82 Crores. The sub-scheme wise physical progress is given in the tables below:

### I. Atmosphere & Climate Research - Modelling Observing Systems & Services (ACROSS) (CS)

Physical and Financial target 2024-25								
OUTPUT 2024-25				OUTCOME 2024-25				
Output	Indicators	Annual Target	Achievement	Outcome	Indicators	Annual Target	Achievement	
1. Augmentation of the atmospheric observation network in India	1.1. Installation & commissioning of various atmosphere observation systems including Doppler Weather Radars (DWR), Automatic Weather Stations (AWS), New Digital Weather Instrument System (DCWIS) and New visibility sensors	Total- 292	Total - 247	1.1 Improved weather services for aviation safety & protection of life and property from extreme weather events	1.1 Aviation Weather services - current weather & horizontal visibility information - provided to airports and heliports.	25	15	
		DWRs-4	DWRs - 1			1.2 Increase in no. of cities/towns covered for rainfall monitoring & local forecasting services	300	210
		AWOS-18	AWOS -7				1.3 Increase in nowcast stations due to Radar coverage	50
		AWS-225	AWS-225					
2. Climate services	2.1 Increase in number of stations generating climate data (AWS, Agro AWS, Aviation stations, DRMS)	400	233	2. Climate diagnostics for sectoral applications	2.1 Accessing climate data through the data portal (increase in no. of users)	2500	2500	
	2.2 Generation of climate data records (increase in number in lakhs)	6	6					

Physical and Financial target 2024-25							
OUTPUT 2024-25				OUTCOME 2024-25			
Output	Indicators	Annual Target	Achievement	Outcome	Indicators	Annual Target	Achievement
3. Training/ Capacity Building in operational Meteorology & Allied Sciences	3.1 No. of Trainings/ courses/ capacity building programs conducted as a Regional Training Centre of WMO	15	9	3. Skill development in meteorology & allied sciences	3.1 Number of people trained	600	451
4. Improve ments in the seasonal and extended range forecasts	4.1 Implementation of the next generation model with weekly coupled Data assimilation after thorough testing with different initial conditions (in %)	100%	100%	4. Utilization of coupled model forecasts at Extended (up to 4 weeks) and Seasonal (next 3 months) time scales by IMD for various sectors	4.1 Number of homogenous regions for which Seasonal forecasts will be provided with next generation model	4	4
					4.2 Issue the experimental extended range forecasts of rainfall and temperature at subdivision level from the second-generation ERP system (No. of subdivisions)	34	34
5. Improve ment of medium range weather prediction system	5.1 Use of coupled global NWP system for medium range deterministic weather prediction (in %)	100 %	10%	5. Generating medium range weather forecast using coupled NWP	5.1 Preparation of 10 days forecast products from the coupled medium range forecast (in %)	100 %	10

Physical and Financial target 2024-25							
OUTPUT 2024-25				OUTCOME 2024-25			
Output	Indicators	Annual Target	Achievement	Outcome	Indicators	Annual Target	Achievement
6. Operational use of 18PF High Performance Computing system – V3.0	6.1 Porting of the end-to-end Numerical Weather Prediction (NWP) system to the new HPC for enabling high resolution (6 km) forecasts. (in %)	100%	100%	6.High resolution numerical weather and climate prediction	6.1 Operationalization of the Numerical Weather/ climate Prediction system at higher (6 km) resolution. (in %)	100%	100
7. Atmospheric Research Data Center	7.1 Populating the Atmospheric Research Data center with atmospheric data sets (in Tera Bytes)	10	10	7. Easier Accessibility of observed and modeling data to researchers on a single platform	7.1 Percentage of the data populated to be released to general public after extensive QC/QA (in %)	75%	75%
8. Atmospheric Research Testbeds (ART) in India	8.1 No. of instruments/observational facilities Commissioned in ARTs in the 2nd phase of instrumentation to conduct monsoon observational campaigns	8	4	8. Improving the understanding of Climate and Monsoon related processes over core monsoon zone and orographic regions	8.1 Data processing, quality control and preparation of first level of campaign data (in %)	60%	60%
					8.2 Number of publications in SCI journals	10	10

Physical and Financial target 2024-25							
OUTPUT 2024-25				OUTCOME 2024-25			
Output	Indicators	Annual Target	Achievement	Outcome	Indicators	Annual Target	Achievement
9. Research and Development in weather modification	9.1 Establish a laboratory cloud chamber and convection setup infrastructure with measurement systems (in %)	30%	14 %	9. Fundamental understanding of boundary layer dynamics, clouds, convection and rainfall processes in the tropical conditions	9.1 Number of publications in SCI journals	10	25
	9.2 Develop cloud and precipitation physics research collaboration with several universities. (no. of universities)	5	5		9.2 Number of Research collaborations	5	5
10. Expansion and strengthening Air Quality Early Warning System	10.1 Development of high resolution air quality forecasting system (2km) equipped with chemical data assimilation capabilities (in %)	100%	100%	10. Providing high resolution air quality forecasting services to non-attainment cities in India	10.1 Non-attainment cities (new) to receive city-specific air quality forecasts which would help in effective management of local air quality. (no. of cities)	10	10

## II. Ocean Services, Modelling, Applications, Resources and Technology (OSMART)

Physical target and achievements 2024-25							
Output 2024-25				Outcome 2024-25			
Output	Indicators	Annual Target	Achievement as on 31 Dec 2024	Outcome	Indicators	Annual Target	Achievement
1. Establishment of ocean observing network in the Indian Ocean.	1.1 Deployment of ocean observing platforms. (in numbers)	60	134	1. Effective monitoring and understanding of the Indian Ocean.	1.1 New ocean data records generated. (numbers in thousands)	100	14.835
					1.2 Scientific/technical publications.	8	55
2. Generation and dissemination of ocean information, and early warning services.	2.1 No of potential fishing zone advisories issued (in days).	300	349	2. Enhanced livelihoods and safety of coastal and maritime communities.	2.1 Reduction in search time of fishermen (in %)	30%	30%
	2.2 Number of oceanogenic multi hazard early warnings issued (in % of events)	100%	100%		2.2 No of users enabled with maritime safety information. (in lakh)	4	3.457
3. Desalination plant commissioning implementation.	3.1 Chetlat and Kadamath funded by MHA and implemented by NIOT (% of work)	100%	100%	3. Technology development for deaerated water.	3.1 Freshwater generated per day per plant for the benefit of Lakshadweep islanders (in litres).	150000	150000
	3.2 OTEC plant at Kavaratti. (% of work)	50%	50%		3.2 Self powered desalination system (Yes/No)	Yes	No

4. Harnessing of marine biological resources.	4.1 Number of microbes identified for biotech application.	2	2	4. Development of technology for industrial, environmental and societal application.	4.1 Technology developed for the production of nutraceuticals, biochemicals from marine microbes and algae. (Yes/No)	Yes	Yes
	4.2 Number of algal/seaweed species identified and cultured.	2	2				
	4.3 Number of open sea cage deployed/tested.	1	1				
5. Exploration of marine Non-living resources	5.1.1 Area covered under bathymetric data acquisition in exclusive economic zone of India (in sq. km.)	5000	500	5.1(a) Enhancement of knowledge and new information about seabed morphology along East Coast of India	5.1.1 (a) Augmentation of the bathymetry charts (Yes/No)	Yes	Yes
	5.1.2 Number of cruises undertaken	2	2				
					5.1(b) Exploration of polymetallic nodules and sulfides	5.1.1(b) Continuation of work as per the contract with International Seabed Authority (Yes/ No)	Yes
5.2. Exploration of marine living resources	5.2.1 No. of cruises for the assessment of ocean acidification, fish eggs & larval abundance	5	5	5.2 Identifying the hot spots for marine biodiversity, spawning and breeding grounds of selected fishes, ocean acidification, and augmentation of Indian Ocean Biogeographic Information System (IndOBIS)	5.2.1 Area covered in the Indian coastal seas (in %)	30%	-
	5.2.2 Generation of Barcodes of deep sea organisms	250	160		5.2.2 Development of genetic data base of marine organisms (Number of Groups)	4	4
					5.2.3 Augmentation of number of voucher specimens	100	100

6. Coastal monitoring and services	6.1 Number of locations for monitoring coastal pollution	50	50	6. Status of Monitoring the marine pollution and erosion	6.1 No. of status reports/publications on marine pollution monitoring as part of SDG-14.	4	4
	6.2 No of states where coastal erosion is being monitored	4	4		6.2 Shoreline change atlas/publication indicating erosion hotspots	4	4
	6.3 No of studies conducted on performance of coastal structures.	2	2		6.3 Maps/publications indicating status of coastal structures (in numbers)	2	2

### III. Polar Sciences Cryosphere (PACER)

Physical target and achievements 2024-25							
Output 2024-25				Outcome 2024-25			
Output	Indicators	Annual Target	Achievement as on 31 Dec 2024	Outcome	Indicators	Annual Target	Achievement
1. Expeditions to the Antarctic, Arctic and Himalayas	1.1 No of atmospheric observatories in polar regions	3	7	1. Improved understanding of polar and ocean regions and its global and regional impact	1.1 No of publications on better understanding of Antarctica, Arctic, Southern Ocean and Himalayas	50	50
	1.2 No of glaciers for continuous monitoring in the Himalayas	6	10		1.2 Generation of new geological/cryospheric/atmospheric/biological/	10	24
	1.3 No of hydro-meteorolo	5	10				

Physical target and achievements 2024-25							
Output 2024-25				Outcome 2024-25			
Output	Indicators	Annual Target	Achievement as on 31 Dec 2024	Outcome	Indicators	Annual Target	Achievement
	gical stations in Himalaya glacier basins				environmental/ climate/ oceanographic data records in the Antarctic, Arctic and Himalayas (in numbers)		
	1.4 Expedition days at two stations each in Antarctica	365	365				
	1.5 Expedition days in Arctic	300	311				
	1.6 Expedition days in Himalaya	120	140				
2. Indian contribution to international polar science and policy domains	2.1 No. of new collaborative scientific projects launched in polar regions	15	9	2. Increased activities in scientific, strategic and policy domains in polar regions	2.1 No. of scientific publications from the collaborative projects in polar regions	20	23
					2.2 No of international scientific committees/ bodies where India has representation in polar domain	15	14

#### IV. Seismological & Geosciences (SAGE)

Physical target and achievements 2024-25							
Output 2024-25				Outcome 2024-25			
Output	Indicators	Annual Target	Achievement as on 31 Dec 2024	Outcome	Indicators	Annual Target	Achievement
1.National Seismological Network (NSN)	1.1 Installation of new seismic systems (in numbers)	10	6	1. Improvement in the earthquake detection capabilities with increased accuracy in earthquake parameters.	1.1 Maintaining the minimum threshold magnitude of 3.0 (within 3 minutes) earthquake in most part of the country through the existing Network (Yes/No)	Yes	Yes
2. Seismic Microzonation reports	2.1 Four (4) cities- Bhubaneswar, Chennai, Coimbatore, and Mangalore . (in %)	80%	100%	2. Generation of large scale multi thematic risk index maps to help in planning risk resilient infrastructure.	2.1 Four (4) cities- Bhubaneswar, Chennai, Coimbatore, and Mangalore (Yes/No)	Yes	Yes
	2.2 Eight (8) cities- Agra, Amritsar, Dhanbad, Kanpur, Lucknow, Meerut, Patna and Varanasi. (Prelimina	50%	95%		2.2 Eight (8) cities- Agra, Amritsar, Dhanbad, Kanpur, Lucknow, Meerut, Patna and Varanasi. (Prelimina	Yes	Yes

Physical target and achievements 2024-25							
Output 2024-25				Outcome 2024-25			
Output	Indicators	Annual Target	Achievement as on 31 Dec 2024	Outcome	Indicators	Annual Target	Achievement
	ry Multi-disciplinary investigations) (in %)				ry multi-disciplinary investigations) (Yes/No)		
	2.3 Three (3) new cities in Uttarakhand and five (5) in Arunachal Pradesh (Multi-disciplinary investigations like Geophysical and Geo Technical completed in all 8 cities. (in %)	30%	-		2.3 Three (3) new cities in Uttarakhand and five (5) in Arunachal Pradesh (Yes/No)	No	No

#### V. Research Education & Training Outreach (REACHOUT)

Physical and Financial target 2024-25							
OUTPUT 2024-25				OUTCOME 2024-25			
Output	Indicators	Annual Target	Achievement	Outcome	Indicators	Annual Target	Achievement
1. Extramural funding	1.1 Number of ongoing projects supported for carrying	75	54	1. Promoting R&D in Earth Sciences through various academic	1.1 Number of publications based on research conducted	50	77

	out R&D activities in various academic and research institutes of the country			and research institutes	through extramural funding		
2. Outreach and awareness	2.1 Number of schools /colleges/ universities where the outreach and awareness events are held.	40	122	2. Spreading awareness and scientific temperament in Earth Sciences among students.	2.1 Number of students participating in the outreach and awareness events.	600	2300
	2.2 International Earth Science Olympiad (IESO) conducted annually.	1	1		2.2 Number of students appearing for the all India Test for IESO.	4000	3556
3. Training and capacity building in Earth Sciences.	3.1 Courses conducted in various disciplines of Earth Sciences in 3 training centres of MoES.	12	36	3. Develop skilled and trained manpower in Earth Sciences	3.1 Number of people who attended the training programmes	450	1757
	3.2 Create learning resources by internal and external faculty (in numbers)	10	158				

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