

MINISTRY OF EARTH SCIENCES

DEMAND NO. 26

Ministry of Earth Sciences

A. The Budget allocations, net of recoveries, are given below:

Major Head	Actual 2014-2015			Budget 2015-2016			Revised 2015-2016			<i>(In crores of Rupees)</i> Budget 2016-2017		
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
Revenue	832.08	393.58	1225.66	1054.00	440.68	1494.68	900.00	404.98	1304.98	1025.00	472.45	1497.45
Capital	68.20	0.01	68.21	125.00	0.02	125.02	113.00	0.02	113.02	175.00	...	175.00
Total	900.28	393.59	1293.87	1179.00	440.70	1619.70	1013.00	405.00	1418.00	1200.00	472.45	1672.45
BE 2016-2017												
1. Secretariat - Economic Services	3451	...	...	...	...	...	...	...	...	...	30.78	30.78
2. Ocean Services, Technology, Observations, Resources Modelling and Science (O-STORMS)	3403	...	...	...	...	...	...	...	...	340.00	...	340.00
	5403	...	...	...	...	...	...	...	...	15.00	...	15.00
	<i>Total</i>	...	...	...	...	...	...	...	...	355.00	...	355.00
3. Polar Sciences and Cryosphere Research (PACER)	3403	...	...	...	...	...	...	...	...	156.00	...	156.00
4. Research, Education and Training Outreach (REACHOUT)	3425	...	...	...	...	...	...	...	...	49.90	...	49.90
5. Atmosphere & Climate Research - Modelling Observing Systems & Services (ACROSS)	3455	...	...	...	...	...	...	...	...	220.00	...	220.00
	5455	...	...	...	...	...	...	...	...	140.00	...	140.00
	<i>Total</i>	...	...	...	...	...	...	...	...	360.00	...	360.00
6. Seismological and Geoscience (SAGE)	3455	...	...	...	...	...	...	...	...	130.00	...	130.00
	5455	...	...	...	...	...	...	...	...	20.00	...	20.00
	<i>Total</i>	...	...	...	...	...	...	...	...	150.00	...	150.00
7. Assistance to Autonomous Bodies	3403	...	...	...	...	...	...	...	...	77.90	...	77.90
	3455	...	...	...	...	...	...	...	...	51.20	33.76	84.96
	<i>Total</i>	...	...	...	...	...	...	...	...	129.10	33.76	162.86
8. Oceanographic Survey (ORV and FORV) and Marine Living Resources (MLR)	3403	...	...	...	...	...	...	...	...	...	50.72	50.72
9. National Centre for Medium Range Weather Forecasting (NCMRWF)	3425	...	...	...	...	...	...	...	...	...	7.98	7.98
10. Meteorology	3455	...	...	...	...	...	...	...	...	...	349.21	349.21

(In crores of Rupees)

	Major Head	Actual 2014-2015			Budget 2015-2016			Revised 2015-2016			Budget 2016-2017		
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
RE 2015-2016													
11. Secretariat - Economic Services	3451	...	25.04	25.04	...	29.70	29.70	...	26.06	26.06	...	...	...
Oceanographic Research													
12. Oceanographic Research													
12.01 Oceanographic Survey (ORV and FORV) and Marine Living Resources (MLR)	3403	...	43.74	43.74	...	50.00	50.00	...	42.46	42.46	...	...	...
12.02 Ocean Observations	3403	44.49	...	44.49	...	...	...	...	...	...	...	...	...
12.03 Ocean Science Services	3403	68.24	...	68.24	...	...	...	...	...	...	...	...	...
	5403	0.26	...	0.26	...	...	...	...	...	...	...	...	...
	<i>Total</i>	<i>68.50</i>	...	<i>68.50</i>	...	...	...	...	...	...	...	...	...
12.04 Ocean Survey and Mineral Resources	3403	60.42	...	60.42	...	...	...	...	...	...	...	...	...
12.05 Ocean Technology	3403	51.00	...	51.00	...	...	...	...	...	...	...	...	...
12.06 Ocean Research Vessels	3403	36.04	...	36.04	...	...	...	...	...	...	...	...	...
12.07 Polar Sciences and Cryosphere	3403	163.65	...	163.65	294.00	...	294.00	123.50	...	123.50	...	...	...
12.08 Ocean Services, Technology, Observations, Resources Modelling and Science (O-STORMS)	3403	...	...	...	290.00	...	290.00	290.00	...	290.00	...	...	...
	5403	...	...	...	10.00	...	10.00	5.50	...	5.50	...	...	...
	<i>Total</i>	...	...	...	<i>300.00</i>	...	<i>300.00</i>	<i>295.50</i>	...	<i>295.50</i>	...	...	...
12.09 Airborne Platforms for Insitu Observations-Ocean Research Vessels (APOORV)	3403	...	...	...	75.00	...	75.00	80.00	...	80.00	...	...	...
<i>Total- Oceanographic Research</i>		<i>424.10</i>	<i>43.74</i>	<i>467.84</i>	<i>669.00</i>	<i>50.00</i>	<i>719.00</i>	<i>499.00</i>	<i>42.46</i>	<i>541.46</i>	...	...	...
Meteorology													
13. Meteorology													
13.01 Direction & Administration	3455	...	31.69	31.69	...	35.20	35.20	...	32.32	32.32	...	...	...
13.02 Training	3455	...	2.95	2.95	...	3.28	3.28	...	2.92	2.92	...	...	...
13.03 Research & Development Programme	3455	...	23.89	23.89	...	26.48	26.48	...	17.82	17.82	...	...	...
13.04 Satellite Services	3455	...	14.86	14.86	...	16.65	16.65	...	12.53	12.53	...	...	...
13.05 Observatory and Weather Stations	3455	...	145.13	145.13	...	161.89	161.89	...	159.39	159.39	...	...	...
	5455	...	0.01	0.01	...	0.02	0.02	...	0.02	0.02	...	...	...
	<i>Total</i>	...	<i>145.14</i>	<i>145.14</i>	...	<i>161.91</i>	<i>161.91</i>	...	<i>159.41</i>	<i>159.41</i>	...	...	...
13.06 Other Meteorological Services	3455	...	74.76	74.76	...	80.36	80.36	...	72.08	72.08	...	...	...
13.07 Other Programmes	3455	...	3.86	3.86	...	2.55	2.55	...	3.45	3.45	...	...	...

(In crores of Rupees)

	Major Head	Actual 2014-2015			Budget 2015-2016			Revised 2015-2016			Budget 2016-2017			
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
13.08	Atmospheric Observation Systems Network	3455	60.38	...	60.38	...	...	...	...	...	...	...	...
		5455	43.54	...	43.54	...	...	...	...	...	...	...	...
	<i>Total</i>		103.92	...	103.92	...	...	...	...	...	...	...	...
13.09	Atmospheric Processes and Modeling and Services	3455	56.22	...	56.22	...	...	...	...	...	...	...	...
		5455	8.17	...	8.17	...	...	...	...	...	...	...	...
	<i>Total</i>		64.39	...	64.39	...	...	...	...	...	...	...	...
13.10	Climate Change Research	3455	32.56	...	32.56	...	...	...	...	...	...	...	...
13.11	Airborne Platforms	3455	10.00	...	10.00	...	...	...	...	...	...	...	...
13.12	Atmosphere & Climate Research - Modelling Observing Systems & Services (ACROSS)	3455	...	...	...	160.00	...	160.00	220.00	...	220.00	...	...
		5455	...	...	...	90.00	...	90.00	92.00	...	92.00	...	...
	<i>Total</i>		...	...	...	250.00	...	250.00	312.00	...	312.00	...	...
13.13	Seismological and Geoscience (SAGE)	3455	...	...	...	150.00	...	150.00	116.00	...	116.00	...	...
		5455	...	...	...	25.00	...	25.00	15.50	...	15.50	...	...
	<i>Total</i>		...	...	...	175.00	...	175.00	131.50	...	131.50	...	...
<i>Total- Meteorology</i>			210.87	297.15	508.02	425.00	326.43	751.43	443.50	300.53	744.03	...	...
Other Scientific Research														
14. Other Scientific Research														
14.01	National Centre for Medium Range Weather Forecasting (NCMRWF)	3425	-1.63	5.92	4.29	...	6.75	6.75	...	6.85	6.85	...	...
14.02	Indian Institute of Tropical Meteorology, Pune	3425	...	21.74	21.74	...	27.82	27.82	...	29.10	29.10	...	...
14.03	Seismological Research	3425	58.90	...	58.90	...	...	...	...	...	...	...	...
		5425	15.66	...	15.66	...	...	...	...	...	...	...	...
	<i>Total</i>		74.56	...	74.56	...	...	...	...	...	...	...	...
14.04	Geosciences	3425	53.50	...	53.50	...	...	...	...	...	...	...	...
14.05	High Performance Computing System	3425	68.53	...	68.53	10.00	...	10.00	0.50	...	0.50	...	...
14.06	Research, Education and Training Outreach	3425	69.78	...	69.78	75.00	...	75.00	70.00	...	70.00	...	...
		5425	0.57	...	0.57	...	...	...	...	...	...	...	...
	<i>Total</i>		70.35	...	70.35	75.00	...	75.00	70.00	...	70.00	...	...
<i>Total- Other Scientific Research</i>			265.31	27.66	292.97	85.00	34.57	119.57	70.50	35.95	106.45	...	...
Grand Total			900.28	393.59	1293.87	1179.00	440.70	1619.70	1013.00	405.00	1418.00	1200.00	472.45	1672.45

	Head of Dev	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total
C. Plan Outlay													
1. Oceanographic Research	13403	424.10	...	424.10	669.00	...	669.00	499.00	...	499.00	588.90	...	588.90
2. Other Scientific Research	13425	265.31	...	265.31	85.00	...	85.00	70.50	...	70.50	49.90	...	49.90
3. Meteorology	13455	210.87	...	210.87	425.00	...	425.00	443.50	...	443.50	561.20	...	561.20
Total		900.28	...	900.28	1179.00	...	1179.00	1013.00	...	1013.00	1200.00	...	1200.00

1. **Secretariat Economic Services:** The provision is for Secretariat Expenditure of the Ministry of Earth Sciences including Departmental Accounting Organization of Ministry of Earth Sciences.

2. **Ocean Services, Technology, Observations, Resources Modeling and Science (O-STORMS):** The programmes relating to Ocean Sector encompass (i) Sustaining and Strengthening a suite of Ocean Observational Networks for acquisition of time-series data from the seas around India. This is useful for regular monitoring, validating satellite data and important input for Ocean Atmospheric Models. They help in improved understanding of ocean dynamic, climate variability, ocean state forecast, sea level variations, ocean flux studies, etc. (ii) provide a suite of Ocean Information Services, assessment of Marine Living Resources, periodical monitoring of health of the coastal water of India, Management of Coastal Marine Area, Operational Tsunami Warning System on 24X7 basis for issue of bulletins for India and to the countries of the Indian Ocean Region, (iii) conducting surveys for harnessing the marine non-living resources in a sustainable way, available in EEZ and deep sea region of the Indian Ocean. These include gas hydrates, poly metallic nodules, hydrothermal sulfide minerals, cobalt crusts which contain valuable noble metals available along the mid oceanic regions of the Indian Ocean (iv) Acquisition and operation and maintenance of Ocean Research Vessels for undertaking all activities (v) development of Ocean technology for Ocean Energy, Deep Sea Mining, Coastal Environmental Engineering and Marine Instrumentation , sea front facility, offshore numerical tank, development of unmanned submersible. The Remotely Operable Subsea In-situ Soil Tester (ROSIS) and Submersible had been developed.

3. **Polar Sciences and Cryosphere and Research (PACER):** The program is designed to study various aspects relating to Polar and Cryosphere with special emphasis on the Antarctic, Arctic and Glaciers of Himalayas (i) establishment, sustenance and augmentation of observing system (ii) Expeditions and related activities to the Arctic, Antarctic, Himalayas and Southern Ocean (iii) Establishment/maintenance of Indian stations in the Arctic, Antarctic and Himalayas and (iv) Acquisition/maintenance of Polar Research vessels.

4. **Research, Education and Training Outreach (REACHOUT):** Extends extra mural support to academic/research organizations in various sectors of Earth System Sciences including technology development (ii) Promoting focused research in areas of national importance through integration of multi institutional and multi-disciplinary scientific expertise (iii) supporting establishment of national facilities (iv) Capacity building including chair professors, M. Tech courses, setting up ESTC cells, knowledge information system , economic benefits, promoting indigenous capability (iv) Advanced school of training for Earth System Science and climate, oceanography, operational meteorology, training for BIMSTEC countries etc. (v) International cooperation and related joint activities (vi)

Awareness and Outreach programs through participation in fairs/exhibitions, celebrating specific days, promoting /supporting workshops/seminar/symposia in Earth System Science related areas.

5. **Atmosphere & Climate Research - Modelling Observing Systems & Services (ACROSS):** The programme deals with (i) sustaining and strengthening of atmospheric observation systems to meet the needs of monitoring as well as providing wide range of services viz. Agriculture, Aviation, city forecasts, mountain regions, defence and sports, disasters in the country including setting up of a dedicated forecasting system for the entire Himalayan region with a much focused objective of integrating and improving the weather related services and climate services (ii) development of a suite of atmospheric models required for prediction of monsoon weather and climate in India on different time and space scales ranging from short and medium range to seasonal mean including specific forecast of severe weather, such as cyclones, heavy rains, storms, floods, heat-waves, fog and air-quality, micro physical characteristics of aerosols and clouds and associated environmental conditions. (iii) conduct climate change research to generate a number of regional scenarios of water and other climate services due to climate Long-term (multi-decadal) simulations, conducting research to enhance understanding of the changing water cycle and paleoclimatic studies (iv) Continuous augmentation of high performance computation facilities and its operation and maintenance on 24X7 basis for undertaking all modelling activities, forecast generation, data centre and data analytics , air borne platform facilities for environmental observations.

6. **Seismological and Geoscience (SAGE):** This programme deals with (i) sustaining and strengthening of seismological observation systems to monitor and provide information on earthquake and all related seismological information, microzonation (ii) research related to solid-earth and geoscience (iii) earthquakes inputs for earthquake disasters mitigation (iii) Deep bore holes investigation in Koyna, Warna region (iv) Marine Geo scientific studies, study of largest Geoid low , Deep-sea drilling in the Arabian Sea basin through the Integrated Ocean Drilling Programme and related study for reconstruction of history and climate variations , rate of erosion (v) crustal processes, natural resource management, coastal processes etc.

7. **Assistance to Autonomous Bodies:** There are five Autonomous Bodies under the Ministry of Earth Sciences

Indian National Centre for Ocean Information Service (INCOIS) Hyderabad (INCOIS), Hyderabad-It provides ocean information and advisory services to the society, industry, government and scientific community through sustained ocean observations and constant improvements through systematic and focused research

National Institute of Ocean Technology (NIOT), Chennai- The major aim of starting NIOT under the Ministry of Earth Sciences is to develop reliable indigenous technology to solve the various engineering problems associated with harvesting of living and non-living resources in the Indian Exclusive Economic Zone (EEZ).

National Centre for Antarctic & Ocean Research (NCAOR), Goa-NCAOR is the premier R&D institution responsible for the country research activities in the polar and Southern Ocean realms. The main objectives of the Institute are Polar and Ocean Sciences, Geoscientific surveys, extended continental shelf and Deep Sea Drilling in the Arabian Sea, etc.

Indian Institute of Tropical Meteorology (IITM), Pune- IITM undertakes basic Research on the Ocean-Atmosphere Climate System required for improvement of Weather and Climate Forecasts and development of earth system model for long term prediction and projecting climate change scenarios. These are achieved through advancement of Research in Ocean-Atmosphere by undertaking relevant scientific programmes (involving observations and modelling) and collaborating at National and International level along with continuous process of human resource development of outstanding research talent.

National Centre for Earth Science Studies (NCESS), Thiruvananthapuram-NCESS fosters multidisciplinary research in emerging areas of solid earth science, provide services by utilizing this knowledge for earth science applications and generate leadership capabilities in the selected areas

8. **Oceanographic Survey (ORV and FORV) and Marine Living Resources (MLR):** The Oceanographic Research Vessel (ORV) - Sagarkanya and Fisheries Oceanographic Research Vessel (FORV) - SagarSampada have been primary platforms for conducting multi-disciplinary Oceanographic Research and Surveys for the exploration of both living and non-living resources under the Exclusive Economic Zone (EEZ) including Central Indian Ocean Basin and Southern Ocean. The Marine Living Resources (MLR) programme was initiated during IX plan towards assessment of the fishery resources and explaining the physical and biological interactions. The assessment surveys and monitoring activities under the programmes are essential to harvest exploitable resources from the Indian EES.

9. **National Centre for Medium Range Weather Forecasting (NCMRWF):** The National Centre for Medium Range Weather Forecasting is continuously developing advanced numerical weather prediction systems, with increased reliability and accuracy over India and neighbouring regions through research, development and demonstrates new and novel applications, maintaining highest level of knowledge, skills and technical bases.

10. **Meteorology:** India Meteorology Department (IMD) is the Principal Government agency in all matters relating to Meteorology, Seismology and allied subjects. The primary objectives are to undertake (i) meteorological observations and to provide current and forecast meteorological information for optimum operation of weather-sensitive activities like agriculture, irrigation, aviation, pilgrimage etc. (ii) warn against severe weather phenomena like tropical cyclones, dust storms, heavy rains and snow, cold & heat waves etc. which cause destruction of life and property, and iv) maintain liaison with other scientific organizations in the country in the fields of agriculture, hydrology, oceanography, air pollution monitoring and forecasting, to provide customized meteorological services for specific purposes.