MINISTRY OF EARTH SCIENCES

DEMAND NO. 31

Ministry of Earth Sciences

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

(In crores of Rupees)

	Major Head	Actual 2013-2014			Budget 2014-2015			Revised 2014-2015			Budget 2015-2016		
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
	Revenue	785.91	367.24	1153.15	1094.00	417.94	1511.94	872.64	408.62	1281.26	1054.00	440.68	1494.68
	Capital	*90.10*	*0.05*	*90.15*	*187.00*	*0.06*	*187.06*	*52.36*	*0.03*	*52.39*	*125.00*	*0.02*	*125.02*
	Total	**876.01**	**367.29**	**1243.30**	**1281.00**	**418.00**	**1699.00**	**925.00**	**408.65**	**1333.65**	**1179.00**	**440.70**	**1619.70**
1. Secretariat - Economic Services	3451	...	23.53	23.53	...	26.67	26.67	...	27.09	27.09	...	29.70	29.70
Oceanographic Research													
2. Oceanographic Research													
2.01 Oceanographic Survey(ORV and FORV) and Marine Living Resources(MLR)	3403	...	46.71	46.71	...	54.75	54.75	...	45.10	45.10	...	50.00	50.00
2.02 Ocean Observations	3403	38.57	...	38.57	45.00	...	45.00	45.00	...	45.00	...	...	...
2.03 Ocean Science Services	3403	63.07	...	63.07	75.00	...	75.00	70.08	...	70.08	...	...	...
	5403	5.24	...	5.24	15.00	...	15.00	1.00	...	1.00	...	...	...
	Total	*68.31*	*...*	*68.31*	*90.00*	*...*	*90.00*	*71.08*	*...*	*71.08*	*...*	*...*	*...*
2.04 Ocean Survey and Mineral Resources	3403	41.03	...	41.03	80.00	...	80.00	60.43	...	60.43	...	...	...
2.05 Ocean Technology	3403	83.52	...	83.52	100.00	...	100.00	51.00	...	51.00	...	...	...
2.06 Ocean Research Vessels	3403	56.47	...	56.47	60.00	...	60.00	36.04	...	36.04	...	...	...
2.07 Polar Sciences and Cryosphere	3403	155.98	...	155.98	200.00	...	200.00	200.00	...	200.00	294.00	...	294.00
2.08 Ocean Services, Technology, Observations, Resources Modelling and Science (O-STORMS)	3403	...	...	...	...	...	...	...	...	...	290.00	...	290.00
	5403	...	...	...	...	...	...	...	...	...	10.00	...	10.00
	Total	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*300.00*	*...*	*300.00*
2.09 Airborne Platforms for Insitu Observations-Ocean Research Vessels (APOORV)	3403	...	...	...	...	...	...	...	...	...	75.00	...	75.00
Total- Oceanographic Research		*443.88*	*46.71*	*490.59*	*575.00*	*54.75*	*629.75*	*463.55*	*45.10*	*508.65*	*669.00*	*50.00*	*719.00*
Meteorology													
3. Meteorology													
3.01 Direction & Administration	3455	...	28.38	28.38	...	33.15	33.15	...	33.02	33.02	...	35.20	35.20

(In crores of Rupees)

		Major Head	Actual 2013-2014			Budget 2014-2015			Revised 2014-2015			Budget 2015-2016		
			Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
3.02	Training	3455	...	3.12	3.12	...	3.23	3.23	...	3.18	3.18	...	3.28	3.28
3.03	Research & Development Programme	3455	...	19.69	19.69	...	26.14	26.14	...	25.89	25.89	...	26.48	26.48
3.04	Satellite Services	3455	...	12.92	12.92	...	16.30	16.30	...	16.11	16.11	...	16.65	16.65
3.05	Observatory and Weather Stations	3455	...	142.05	142.05	...	146.41	146.41	...	145.43	145.43	...	161.89	161.89
		5455	...	0.05	0.05	...	0.06	0.06	...	0.03	0.03	...	0.02	0.02
		Total	*...*	*142.10*	*142.10*	*...*	*146.47*	*146.47*	*...*	*145.46*	*145.46*	*...*	*161.91*	*161.91*
3.06	Other Meteorological Services	3455	...	65.96	65.96	...	76.79	76.79	...	76.19	76.19	...	80.36	80.36
3.07	Other Programmes	3455	...	2.49	2.49	...	2.55	2.55	...	4.51	4.51	...	2.55	2.55
3.08	Atmospheric Observation Systems Network	3455	61.43	...	61.43	75.00	...	75.00	60.00	...	60.00	...	...	...
		5455	55.82	...	55.82	115.00	...	115.00	27.00	...	27.00	...	...	...
		Total	*117.25*	*...*	*117.25*	*190.00*	*...*	*190.00*	*87.00*	*...*	*87.00*	*...*	*...*	*...*
3.09	Atmospheric Processes and Modeling and Services	3455	28.88	...	28.88	78.00	...	78.00	56.44	...	56.44	...	...	...
		5455	21.20	...	21.20	22.00	...	22.00	8.19	...	8.19	...	...	...
		Total	*50.08*	*...*	*50.08*	*100.00*	*...*	*100.00*	*64.63*	*...*	*64.63*	*...*	*...*	*...*
3.10	Climate Change Research	3455	29.82	...	29.82	47.00	...	47.00	32.59	...	32.59	...	...	...
3.11	Airborne Platforms	3455	...	...	...	20.00	...	20.00	10.00	...	10.00	...	...	...
3.12	Atmosphere & Climate Research - Modelling Observing Systems & Services (ACROSS)	3455	...	...	...	...	...	...	...	...	...	160.00	...	160.00
		5455	...	...	...	...	...	...	...	...	...	90.00	...	90.00
		Total	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*250.00*	*...*	*250.00*
3.13	Seismological and Geoscience (SAGE)	3455	...	...	...	...	...	...	...	...	...	150.00	...	150.00
		5455	...	...	...	...	...	...	...	...	...	25.00	...	25.00
		Total	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*175.00*	*...*	*175.00*
Total- Meteorology			*197.15*	*274.66*	*471.81*	*357.00*	*304.63*	*661.63*	*194.22*	*304.36*	*498.58*	*425.00*	*326.43*	*751.43*
Other Scientific Research														
4.	*Other Scientific Research*													
4.01	National Centre for Medium Range Weather Forecasting (NCMRWF)	3425	...	4.84	4.84	...	5.95	5.95	...	6.10	6.10	...	6.75	6.75
4.02	Indian Institute of Tropical Meteorology, Pune	3425	...	17.55	17.55	...	26.00	26.00	...	26.00	26.00	...	27.82	27.82
4.03	Seismological Research	3425	39.13	...	39.13	70.00	...	70.00	59.18	...	59.18	...	...	...
		5425	7.84	...	7.84	30.00	...	30.00	15.17	...	15.17	...	...	...
		Total	*46.97*	*...*	*46.97*	*100.00*	*...*	*100.00*	*74.35*	*...*	*74.35*	*...*	*...*	*...*

(In crores of Rupees)

	Major Head	Actual 2013-2014 Plan	Non-Plan	Total	Budget 2014-2015 Plan	Non-Plan	Total	Revised 2014-2015 Plan	Non-Plan	Total	Budget 2015-2016 Plan	Non-Plan	Total
4.04 Geosciences	3425	8.11	...	8.11	54.00	...	54.00	53.51	...	53.51	...	...	...
4.05 High Performance Computing System	3425	103.02	...	103.02	90.00	...	90.00	68.54	...	68.54	10.00	...	10.00
4.06 Research, Education and Training Outreach	3425	76.88	...	76.88	100.00	...	100.00	69.83	...	69.83	75.00	...	75.00
	5425	...	...	...	5.00	...	5.00	1.00	...	1.00	...	...	...
	Total	*76.88*	*...*	*76.88*	*105.00*	*...*	*105.00*	*70.83*	*...*	*70.83*	*75.00*	*...*	*75.00*
Total- Other Scientific Research		*234.98*	*22.39*	*257.37*	*349.00*	*31.95*	*380.95*	*267.23*	*32.10*	*299.33*	*85.00*	*34.57*	*119.57*
Grand Total		***876.01***	***367.29***	***1243.30***	***1281.00***	***418.00***	***1699.00***	***925.00***	***408.65***	***1333.65***	***1179.00***	***440.70***	***1619.70***

	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	443.88	...	443.88	575.00	...	575.00	463.55	...	463.55	669.00	...	669.00
2. Other Scientific Research	13425	234.98	...	234.98	349.00	...	349.00	267.23	...	267.23	85.00	...	85.00
3. Meteorology	13455	197.15	...	197.15	357.00	...	357.00	194.22	...	194.22	425.00	...	425.00
Total		**876.01**	**...**	**876.01**	**1281.00**	**...**	**1281.00**	**925.00**	**...**	**925.00**	**1179.00**	**...**	**1179.00**

1. **Secretariat Economic Services:** The budget provision is for secretariat expenditure of the Ministry of Earth Sciences including Departmental Accounting organisation of Ministry of Earth Sciences.

2.01. **Oceanographic Survey (ORV and FORV) and Marine Living Resources (MLR):** The Oceanographic Research Vessel (ORV) - Sagar Kanya and Fisheries Oceanographic Research Vessel (FORV) - Sagar Sampada have been primary platforms for conducting multi-disciplinary oceanographic research and surveys for the exploration of both non-living and 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 EEZ. The centre for Marine Living Resources and Ecology (CMLRE) has estimated systematically firsh potential in the India EEZ of 4.32 MTA, using satellite and in-situ data.

2.07. **Polar Sciences and Cryosphere:** The research work includes study of the Antarctic, Arctic and Glaciers of Himalayas that are important to understand the climate change and climate variability in the Indian region. During 2015-16, the important activity is to take the construction work of Polar Research Vessel approved by the Cabinet in 2014. The operation maintenance of third Antarctic Station, Bharati to conduct front ranking research in the Antarctic sector.

2.08. **OCEAN SERVICES, TECHNOLOGY, OBSERVATIONS, RESOURCES MODELLING AND SCIENCE (O-STORMS):** The programs relating to ocean sector encompass (i) strengthen a suite of ocean observational networks for acquisition of time-series data from the seas around India useful for validating satellite data and ocean atmospheric models besides improve understanding 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 waters of India, Management of Coastal Marine Area, operational of Tsunami Warning system by 24x7 basis for issue of bullents for India and to the countries of the Indian Ocean region, recognized as a Regional Tsunami Service Provider for 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) development of technology for Ocean Energy, Deep Sea Mining, Coastal Environmental Engineering and Marine Instrumentation including development of unmanned submersible. The Remotely Operable Subsea In situ Soil Tester (ROSIS) and Submersible had been developed.

2.09. **AIRBORNE PLATFORMS FOR INSITU OBSERVATIONS - OCEAN RESEARCH VESSELS (APOORV):** This is basically infrastructure development program to support both ocean and atmospheric research and services, which mainly envisages (a) operation and maintenance of fleet of ocean research vessels (Sagar Nidhi, Sagar Manjusha, Coastal Resarch vessels) to support ocean survey and research including preparation of detailed project report for acquisition of new vessels (b) Acquisition of airborne platform would help in collecting a wealth of atmospheric, aerosol and cloud microphysics data.

3.01. **Direction and Administration:** It provides expenditure for administration of India Meteorological Department (IMD).

3.02. **Training:** The training sections at Pune, New Delhi and Kolkata impart training in meteorology and in operation, maintenance and servicing of radio meteorological instruments and telecommunications.

3.03. **Research and Development Programme:** The Research and Development activities of the department cover experimental work and research on basic and applied meteorology and seismology including design and development of the instruments.

3.04. **Satellite Services (Space Meteorology):** IMD participated in space programme since the launching of the first Indian National Geo - stationary Satellite IA by ISRO in 1982. Valuable data and cloud imageries are being received since then. Ground receiver for INSAT - 3D to be commissioned for receiving and processing of high resolution data and also to establish of more 50 GPS and periphers.

3.05. **Observatory and weather stations:** The activities consist of recording of observations and equipping ships, maintenance of inland and overseas meteorological telecommunication network for quick exchange of weather information.

3.06. **Other Meteorological Services:** The activities consists of manufacture, supply and maintenance of meteorological instruments and production of hydrogen gas at Departmental workshops and supply of these to the upper air observations. Provision also includes expenditure for agro meteorological units and facilities.

3.07. **Other Programmes:** It contains contribution to World Meteorological Organization (WMO) and International Seismological Centre (ISC).

3.12. **ATMOSPHERE & CLIMATE RESEARCH - MODELLING OBSERVING SYSTEMS & SERVICES (ACROSS):** The program envisages (i) strengthening of atmospheric observation systems to meet the needs of a wide range of services, Agriculture, Aviation, Metrocities, mountain regions, defense, 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 (ii) development of a suite of atmospheric models required for prediction of monsoon weather and climate in India on different time 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 (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 besides, conducting research to enhance understanding of the changing water cycle and paleoclimatic studies.

3.13. **SEISMOLOGICAL AND GEOSCIENCE (SAGE):** This programs aims to under research relating to solid-earth and geoscience including study of earthquakes and to generate inputs for earthquake disasters mitigation. This program also supports the National Centre for Earth Science Studies acquired by the ministry in 2014. Setting up of dedicated centre on Seismology, works on Deep bore holes investigations in Koyna, Warna region, and Marine Geo scientific Studies, study of largest Geoid low would be continued. Deep-sea drilling in the Arabian Sea basin through the Integrated Ocean Drilling Program is the main activity under this program. The integrated Ocean Drilling Programme provides the opportunity to explore these sediment records and reconstruct the history of climatic variations and rate of erosion. The Sedimentation records from the Indus and Bengal Fans, both of which can be obtained from IODP cores, should present erosional histories of different parts of the Himalaya.

4.05. **High Performance Computing System:** The computational demand has increased manifold over the years for undertaking various climate related problems that involve running of coupled models for hundreds of years and utilizing data from the global land, ocean and atmosphere. It is proposed to augment computing power from existing 900 Tflops to 1500 to 2000 Tflops.

4.06. **Research Education, Training and Outreach:** Recognizing the importance of hands on training in capacity building of trained manpower, the ministry has set up Centre for Advanced Training (CAT) with world class teaching courses and good hostel facilities to serve for the region. The other main activities would be setting up an Institute for Operational Oceanography for training and capacity building in operational oceanography, training centre in operational oceanography. Support focused research in areas of National importance through integration of multi institutional and multi disciplinary scientific expertise through research and academic institutions and foster bilateral, regional and global partnership in relevant fields of earth science.