

MINISTRY OF EARTH SCIENCES

DEMAND NO. 29

Ministry of Earth Sciences

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

(In crores of Rupees)

Major Head	Actual 2010-2011			Budget 2011-2012			Revised 2011-2012			Budget 2012-2013			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
Revenue	639.68	326.52	966.20	936.90	345.90	1282.80	737.10	367.76	1104.86	1073.50	386.66	1460.16	
Capital	128.14	0.19	128.33	283.10	1.10	284.20	117.90	0.24	118.14	207.50	0.34	207.84	
Total	767.82	326.71	1094.53	1220.00	347.00	1567.00	855.00	368.00	1223.00	1281.00	387.00	1668.00	
1. Secretariat - Economic Services	3451	...	20.82	20.82	...	24.00	24.00	...	24.52	24.52	...	25.54	25.54
Oceanographic Research													
2. Oceanographic Research													
2.01 Oceanographic Survey(ORV and FORV) and Marine Living Resources(MLR)	3403	1.97	39.65	41.62	...	39.88	39.88	...	60.88	60.88	...	56.70	56.70
2.02 Polar Science	3403	155.14	...	155.14	260.00	...	260.00	242.00	...	242.00	...	...	...
2.03 Coastal Research Vessels & Other Research Vessels	3403	6.00	...	6.00	7.00	...	7.00	6.00	...	6.00	...	...	...
2.04 Polymetallic Nodules (PMN) Programme	3403	12.46	...	12.46	18.00	...	18.00	2.00	...	2.00	...	...	...
2.05 Other Programmes													
2.05.01 Information Technology	3403	7.26	...	7.26	7.00	...	7.00	1.00	...	1.00	...	...	...
2.05.02 Ocean Observation and Information System (OOIS)	3403	27.15	...	27.15	30.00	...	30.00	16.00	...	16.00	...	...	...
2.05.03 Data Buoy Programme / Integrated Sustain Ocean Observation	3403	15.00	...	15.00	18.00	...	18.00	34.00	...	34.00	...	...	...
2.05.04 National Institute of Ocean Technology (NIOT)	3403	45.00	...	45.00	45.00	...	45.00	22.00	...	22.00	...	...	...
2.05.05 Delineation of Outer Limits of Continental Shelf	3403	0.90	...	0.90	1.00	...	1.00	0.50	...	0.50	...	...	...
2.05.06 Comprehensive Topography Survey	3403	5.54	...	5.54	5.00	...	5.00	1.00	...	1.00	...	...	...
2.05.07 Gas Hydrates	3403	11.95	...	11.95	18.00	...	18.00	11.00	...	11.00	...	...	...
2.05.08 Acquisition of Research Vessels - Sagar Nidhi	3403	24.00	...	24.00	18.00	...	18.00	26.00	...	26.00	...	...	...
2.05.09 Tsunami and Storm Surge Warning System	3403	9.26	...	9.26	12.00	...	12.00	28.00	...	28.00	...	...	...

(In crores of Rupees)

	Major Head	Actual 2010-2011			Budget 2011-2012			Revised 2011-2012			Budget 2012-2013			
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
2.05.10	National Center for Antarctic and Ocean Research (NCAOR)	3403	4.92	...	4.92	15.00	...	15.00	8.00	...	8.00	...	...	...
2.05.11	Indian National Center for Ocean Information Services (INCOIS)	3403	28.03	...	28.03	25.00	...	25.00	25.65	...	25.65	...	...	...
2.05.12	Sea front facilities	3403	...	...	...	1.00	...	1.00	0.01	...	0.01	...	...	...
2.05.13	Development of Manned Submersible	3403	...	...	...	5.00	...	5.00	0.01	...	0.01	...	...	...
2.05.14	Expedition to Arctic Region	3403	1.94	...	1.94	15.00	...	15.00	8.80	...	8.80	...	...	...
2.05.15	Desalination Plant	3403	...	...	...	10.00	...	10.00	10.00	...	10.00	...	...	...
2.05.16	National Oceanarium	3403	...	...	...	2.00	...	2.00	0.01	...	0.01	...	...	...
2.05.17	Demonstration of Shore Protection Measure	3403	5.00	...	5.00	5.00	...	5.00	0.01	...	0.01	...	...	...
2.05.18	Integrated Ocean Drilling Programme & Geotechnoic Studies (IODP)	3403	4.34	...	4.34	6.00	...	6.00	5.00	...	5.00	...	...	...
2.05.19	Ice Class Research Vessel	3403	5.00	...	5.00	69.00	...	69.00	40.00	...	40.00	...	...	...
2.05.20	Head Quarter Building	5403	10.00	...	10.00	5.00	...	5.00	5.00	...	5.00	...	...	...
2.05.21	Marine Research and Technology Development (MRTD)	3403	46.21	...	46.21	66.00	...	66.00	36.50	...	36.50	...	...	...
		3601	0.89	...	0.89	0.50	...	0.50	0.50	...	0.50	...	...	...
		5403	3.16	...	3.16	11.50	...	11.50	5.00	...	5.00	...	...	...
		<i>Total</i>	<i>50.26</i>	...	<i>50.26</i>	<i>78.00</i>	...	<i>78.00</i>	<i>42.00</i>	...	<i>42.00</i>	...	...	...
2.05.22	R & D in Earth and Atmospheric Sciences	3403	59.22	...	59.22	86.00	...	86.00	67.00	...	67.00	...	...	...
2.05.23	Centre for Climate Change	3403	39.07	...	39.07	50.00	...	50.00	38.00	...	38.00	...	...	...
2.05.24	Multi-hazards Early Warning Support System	3403	...	...	...	5.00	...	5.00	0.01	...	0.01	...	...	...
	<i>Total- Other Programmes</i>		<i>353.84</i>	...	<i>353.84</i>	<i>531.00</i>	...	<i>531.00</i>	<i>389.00</i>	...	<i>389.00</i>	...	...	...
2.06	Ocean Observations	3403	...	...	...	...	...	...	...	...	...	50.00	...	50.00
2.07	Ocean Science Services	3403	...	...	...	...	...	...	...	...	...	83.00	...	83.00
		5403	...	...	...	...	...	...	...	...	...	8.00	...	8.00
		<i>Total</i>	...	...	...	...	...	...	...	...	...	<i>91.00</i>	...	<i>91.00</i>
2.08	Ocean Survey and Mineral Resources	3403	...	...	...	...	...	...	...	...	...	68.00	...	68.00
2.09	Ocean Technology	3403	89.00	...	89.00
2.10	Ocean Research Vessels	3403	68.00	...	68.00

(In Crores of Rupees)

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		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
2.11 Polar Sciences and Cryosphere	3403	...	...	...	...	...	...	...	...	...	290.00	...	290.00
<i>Total- Oceanographic Research</i>		<i>529.41</i>	<i>39.65</i>	<i>569.06</i>	<i>816.00</i>	<i>39.88</i>	<i>855.88</i>	<i>639.00</i>	<i>60.88</i>	<i>699.88</i>	<i>656.00</i>	<i>56.70</i>	<i>712.70</i>
Meteorology													
3. <i>Meteorology</i>													
3.01 Direction & Administration	3455	...	23.52	23.52	...	26.25	26.25	...	26.25	26.25	...	29.30	29.30
3.02 Training	3455	0.38	2.65	3.03	...	2.86	2.86	...	2.96	2.96	...	3.26	3.26
3.03 Research & Development Programme	3455	...	20.99	20.99	...	22.41	22.41	...	22.41	22.41	...	24.91	24.91
3.04 Satellite Services	3455	4.89	13.43	18.32	...	15.00	15.00	...	15.00	15.00	...	16.50	16.50
3.05 Observatory and Weather Stations	3455	20.99	124.44	145.43	...	119.02	119.02	...	119.11	119.11	...	127.14	127.14
	5455	...	...	...	...	1.10	1.10	...	0.24	0.24	...	0.34	0.34
<i>Total</i>		<i>20.99</i>	<i>124.44</i>	<i>145.43</i>	...	<i>120.12</i>	<i>120.12</i>	...	<i>119.35</i>	<i>119.35</i>	...	<i>127.48</i>	<i>127.48</i>
3.06 Other Meteorological Services	3455	0.01	58.17	58.18	...	68.20	68.20	...	67.46	67.46	...	71.55	71.55
3.07 Other Programmes	3455	...	1.81	1.81	...	2.00	2.00	...	2.44	2.44	...	2.44	2.44
3.08 India Meteorological Department (IMD)													
3.08.01 Modernisation of IMD	3455	13.10	...	13.10	23.00	...	23.00	21.60	...	21.60	...	...	...
	5455	67.98	...	67.98	89.00	...	89.00	65.50	...	65.50	...	...	...
<i>Total</i>		<i>81.08</i>	...	<i>81.08</i>	<i>112.00</i>	...	<i>112.00</i>	<i>87.10</i>	...	<i>87.10</i>	...	...	...
3.08.02 Other Schemes in IMD	3455	11.69	...	11.69	65.80	...	65.80	34.40	...	34.40	...	...	...
	5455	47.00	0.19	47.19	174.20	...	174.20	39.50	...	39.50	...	...	...
<i>Total</i>		<i>58.69</i>	<i>0.19</i>	<i>58.88</i>	<i>240.00</i>	...	<i>240.00</i>	<i>73.90</i>	...	<i>73.90</i>	...	...	...
<i>Total- India Meteorological Department (IMD)</i>		<i>139.77</i>	<i>0.19</i>	<i>139.96</i>	<i>352.00</i>	...	<i>352.00</i>	<i>161.00</i>	...	<i>161.00</i>	...	...	...
3.09 Atmospheric Observation Systems Network	3455	...	...	...	...	...	...	...	...	...	71.00	...	71.00
	5455	...	...	...	...	...	...	...	...	...	135.00	...	135.00
<i>Total</i>		...	...	...	...	...	...	...	...	...	<i>206.00</i>	...	<i>206.00</i>
3.10 Atmospheric Processes and Modeling and Services	3455	...	...	...	...	...	...	...	...	...	27.00	...	27.00
	5455	...	...	...	...	...	...	...	...	...	52.00	...	52.00
<i>Total</i>		...	...	...	...	...	...	...	...	...	<i>79.00</i>	...	<i>79.00</i>
3.11 Climate Change Research	3455	...	...	...	...	...	...	...	...	...	66.00	...	66.00
3.12 Airborne Platforms	3455	...	...	...	...	...	...	...	...	...	50.00	...	50.00
<i>Total- Meteorology</i>		<i>166.04</i>	<i>245.20</i>	<i>411.24</i>	<i>352.00</i>	<i>256.84</i>	<i>608.84</i>	<i>161.00</i>	<i>255.87</i>	<i>416.87</i>	<i>401.00</i>	<i>275.44</i>	<i>676.44</i>

(In crores of Rupees)

	Major Head	Actual 2010-2011			Budget 2011-2012			Revised 2011-2012			Budget 2012-2013			
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
Other Scientific Research														
4. Other Scientific Research														
4.01	National Centre for Medium Range Weather Forecasting (NCMRWF)	3425	7.38	4.04	11.42	11.60	4.88	16.48	5.10	5.33	10.43	...	5.78	5.78
		5425	...	...	...	3.40	...	3.40	2.90	...	2.90	...	...	...
	<i>Total</i>		7.38	4.04	11.42	15.00	4.88	19.88	8.00	5.33	13.33	...	5.78	5.78
4.02	Indian Institute of Tropical Meteorology, Pune	3425	64.99	17.00	81.99	37.00	21.40	58.40	47.00	21.40	68.40	...	23.54	23.54
4.03	Seismological Research	3425	...	...	...	...	...	...	...	...	...	43.00	...	43.00
		5425	...	...	...	...	...	...	...	...	...	12.00	...	12.00
	<i>Total</i>		...	...	...	...	...	...	...	...	...	55.00	...	55.00
4.04	Geosciences	3425	...	...	...	...	...	...	...	...	...	8.00	...	8.00
4.05	High Performance Computing System	3425	...	...	...	...	...	...	...	...	...	100.00	...	100.00
4.06	Research, Education and Training Outreach	3425	...	...	...	...	...	...	...	...	...	60.00	...	60.00
4.07	National Geographical Information System (NGIS)	3425	...	...	...	...	...	...	...	...	...	0.50	...	0.50
		5425	...	...	...	...	...	...	...	...	...	0.50	...	0.50
	<i>Total</i>		...	...	...	...	...	...	...	...	...	1.00	...	1.00
<i>Total- Other Scientific Research</i>			72.37	21.04	93.41	52.00	26.28	78.28	55.00	26.73	81.73	224.00	29.32	253.32
Grand Total			767.82	326.71	1094.53	1220.00	347.00	1567.00	855.00	368.00	1223.00	1281.00	387.00	1668.00
(in crores of Rupees)														
	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	529.41	...	529.41	816.00	...	816.00	639.00	...	639.00	656.00	...	656.00
2.	Other Scientific Research	13425	72.37	...	72.37	52.00	...	52.00	55.00	...	55.00	224.00	...	224.00
3.	Meteorology	13455	166.04	...	166.04	352.00	...	352.00	161.00	...	161.00	401.00	...	401.00
Total			767.82	...	767.82	1220.00	...	1220.00	855.00	...	855.00	1281.00	...	1281.00

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 & FORV):** 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.

Marine Living Resources - 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 for the first time fish potential in the Indian EEZ of 4.32 MTA, using satellite and in-situ data.

2.06. **Ocean Observation System(OOS):** The OOS has been recast in 12th Plan for implementation in a focused way by integrating all the observation networks under one umbrella. The objective is to acquire time-series data from the seas around India and to develop a wide range of ocean atmospheric models towards augmentation of services. Besides real-time dissemination of data to various users, a set of 12 Argo data products are being made available through INCOIS website.

2.07. **Ocean Science and Services (OSS):** The Ocean Science and Services (OSS) has been reoriented into a major programme during 12th Plan by integrating all the service oriented ocean related projects under one umbrella. These are providing 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 on 24x7 basis for issue of bulletins for India and to the countries of the Indian Ocean region. The centres of the Ministry viz., INCOIS, ICMAM, CMLRE are primarily responsible for providing the information. The facility for dissemination of PFZ information has been extended to island territories of India through installation of Electronic Display Boards in Lakshadweep Islands as part of Integrated Islands Development project. In 12th Plan an International Centre for Operational Oceanography has been planned.

2.08. **Ocean Survey and Mineral Resources:** This program is primarily aimed at conducting surveys for harnessing the marine non living resources in a sustainable way available in EEZ and deep sea region of the Indian Ocean. All ongoing projects of the ministry and new initiatives of 12th Plan have been integrated into the major programme. Besides continuing some of the activities of ongoing schemes like gas hydrate, PMN the major emphasis would be taken for the research activities relating to Hydrothermal sulfides containing valuable noble metals available along the mid oceanic regions of the Indian Ocean.

2.09. **Ocean Technology:** The ocean technology programme of India encompass four core missions as Ocean Energy, Deep Sea Mining, Coastal and Environmental Engineering and Marine Instrumentation. National Institute of Ocean Technology (NIOT) plays a key role in undertaking the activities. Under ocean technology, a set of 8 in house R& D programmes like Energy, Ocean Acoustics, Marine Sensor, offshore structures, Inter institutional R&D of NIOT would be carried out.

2.10. **Ocean Research Vessels:** FORV Sagar Sampada and ORV Sagar Kanya were commissioned in 1984 and have been the major platform for marine living resources and oceanographic studies. With the increasing demand for coverage of vast areas of oceans, it is necessary to plan for new vessels. Proposed new vessels greater than 100m, Ice class, with speed of 20 knots and fitted with winches and systems for exploration of deep sea living resources, will be acquired.

2.11. **Polar Sciences and Cryosphere:** The Polar Science and cryosphere programme entails the study of the Antarctic, Arctic and Glaciers of Himalayas that are important to understand the climate change and climate variability in the Indian region. The third Antarctic Station, Bharati is in advanced stage of commission. It is expected to be ready for operation during the 2012-13, which will give significant boost to India's research in the Antarctic sector.

3.01. **Direction & 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 & processing of high resolution data and also to establish of more 50 GPS & 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 consist 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.

3.09. **Atmospheric Observation Systems Network:** The modernization plan aims in commissioning of state-of-the-art observing systems throughout the country. An Atmospheric Technology Institute is also planned to coordinate development of instruments, calibrate instruments including satellite-based, and provide overall technology support to atmospheric sciences, besides validation of satellite data. It is proposed to set up a dedicated forecasting system for the entire Himalayan region with a much focused objective of integrating and improving the weather related services.

3.10. **Atmospheric Processes and Modeling and Service:** The sole purpose of the program is to develop a wide range of atmospheric models for providing weather and climate forecasting services to various sectors by integrating all the process studies and models. The major sectors would be Agriculture, Aviation, Metro-cities, mountain regions, defence, and sports, disasters. District-level agromet advisory is provided to about 550 districts of the country. The main objective is to improvise the existing District level Agromet Advisory Services (AAS) to deliver crop and location specific AAS to farmers at block level with village level advisory. The upgradation of facilities of about 100 airports in the country is to be taken up.

3.11. **Climate Change Research:** The Ministry has set up a dedicated centre for Climate Change Research at Pune to address various scientific issues relating to climate change including impacts on sectors like health, agriculture and water. The development of seasonal and intra-seasonal prediction of monsoon through coupled model is to be taken up. The research projects would be taken up to enhance our understanding of the changing water cycle, paleoclimatic studies to understand the past variations of climate for possible projections of climate scenarios.

3.12. **Airborne Platforms:** Aircraft observations are required to observe upper air phenomena, especially cloud and aerosol. There is a need for simultaneous measurements of aerosols

and cloud microphysics for studying the cloud aerosol interaction through airborne platform. A wealth of atmospheric, aerosol and cloud microphysics data will be generated which will be useful to validate the convection and cloud schemes, and for improving the model physics. The proposed programme will be useful in air pollution assessment and associated impacts over India (health, visibility, climate), hydrological and water resources studies, and enhancement of research infrastructure (human resources and technology).

4.03. **Seismological Research:** The aim of the programme is to provide thrust to the earthquake related studies and to generate inputs for earthquake disasters mitigation. Efforts are also being made towards generation of long term, comprehensive multi parametric geophysical observations in seismically active areas. Besides, this program also envisages reconciling the constraints from available geophysical and geological data along a series of transects across the Indian peninsula into a consistent model of the Indian lithosphere to conduct studies on Deep bore holes investigations in Koyana, Warna region, and Marine Geo scientific Studies, study of largest Geoid low.

4.04. **Geoscience:** 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.

4.05. **High Performance Computing System:** With the increasing scope of research activities, the computational demand has increased manifold over the years for understanding various climate related problems. The major activities that involve a large number crunching capability will be carried out at Centre for Climate Change Research (CCCR). It is proposed to augment computing power from existing 124 Tflops to 1500 to 2000 Tflops during Twelfth Five year plan.

4.06. **Research Education, Training and Outreach:** Considering the advantage 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. Focused research in areas of National importance through integration of multi institutional and multi disciplinary scientific expertise will be encouraged. The programme also includes outreach activities and Information Technology project of the Ministry.

4.07. **National Geographical Information System (NGIS):** To meet the rapid growth of the country and developmental activities, it is proposed to establish a robust information and decision support systems as envisaged under the programme NGIS. The process would give a boost to various developmental activities for government, industry, academia, citizens in sectors like education and research