

DEPARTMENT OF OCEAN DEVELOPMENT**DEMAND NO.68****Department of Ocean Development**

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

		<i>(In crores of Rupees)</i>								
		Budget 2004-2005			Revised 2004-2005			Budget 2005-2006		
Major Head		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
	Revenue	199.00	30.08	229.08	200.00	30.00	230.00	340.00	37.00	377.00
	Capital	1.00	...	1.00	...	...	...	...	...	...
	Total	200.00	30.08	230.08	200.00	30.00	230.00	340.00	37.00	377.00
1.	Secretariat - Economic Services	3451	...	5.45	5.45	...	5.20	5.20	...	6.27
2.	<i>Oceanographic Research</i>									
2.1	Oceanographic Survey(ORV and FORV) and Marine Living Resources(MLR)	3403	4.00	24.63	28.63	4.00	24.80	28.80	5.45	30.73
3.	Antarctic Research/Polar Science	3403	23.00	...	23.00	24.00	...	24.00	41.00	...
		5403	1.00	...	1.00	...	...	...	...	...
	<i>Total</i>		<i>24.00</i>	<i>...</i>	<i>24.00</i>	<i>24.00</i>	<i>...</i>	<i>24.00</i>	<i>41.00</i>	<i>...</i>
4.	Coastal Research Vessel	3403	5.00	...	5.00	5.00	...	5.00	5.00	...
5.	Drugs from Sea	3403	4.00	...	4.00	4.00	...	4.00	4.50	...
6.	Polymetallic Nodules Programme	3403	22.00	...	22.00	22.00	...	22.00	...	22.00
7.	<i>Other Programmes</i>									
7.1	Assistance for Research Proj,Seminars,Symposia, etc.	3403	3.50	...	3.50	3.50	...	3.50	4.00	...
7.2	Coastal Ocean Monitoring & Prediction System	3403	2.00	...	2.00	2.00	...	2.00	2.50	...
7.3	Exhibition and Fairs	3403	1.55	...	1.55	1.55	...	1.55	0.75	...
7.4	National Institute of Ocean Technology	3403	25.00	...	25.00	25.00	...	25.00	42.00	...
7.5	Manpower Training	3403	0.30	...	0.30	0.30	...	0.30	0.30	...
7.6	Continental Shelf	3403	2.43	...	2.43	2.43	...	2.43	1.00	...
7.7	Integrated Coastal & Marine Area Management (ICMAM)	3403	4.00	...	4.00	4.00	...	4.00	5.00	...
7.8	Ocean Observation & Information Service	3403	26.00	...	26.00	26.00	...	26.00	17.00	...
7.9	Marine Non-Living Resources Programme(MNLR)	3403	2.50	...	2.50	2.50	...	2.50	2.00	...
7.10	Assistance for Research Seminar Symposia	3403	0.20	...	0.20	0.20	...	0.20	0.50	...
7.11	Information Technology & Computers	3403	4.27	...	4.27	4.27	...	4.27	7.00	...
7.12	Comprehansive Swath Bathymetric Survey	3403	10.00	...	10.00	10.00	...	10.00	24.00	...
7.13	Gas Hydrates	3403	18.00	...	18.00	18.00	...	18.00	30.00	...
7.14	New Research Vessel	3403	40.00	...	40.00	40.00	...	40.00	80.00	...
7.15	Geophysical Study of Laxmi Basin	3403	1.25	...	1.25	1.25	...	1.25	1.00	...
7.16	Ocean Data Buoy Programme	3403	...	...	...	...	...	...	25.00	...
7.17	Tsunami and Storm Surge Warning System	3403	...	...	...	...	...	...	20.00	...
	<i>Total</i>		<i>141.00</i>	<i>...</i>	<i>141.00</i>	<i>141.00</i>	<i>...</i>	<i>141.00</i>	<i>262.05</i>	<i>...</i>
	Total - Oceanographic Research		200.00	24.63	224.63	200.00	24.80	224.80	340.00	30.73
	Grand Total		200.00	30.08	230.08	200.00	30.00	230.00	340.00	37.00
C.	Plan Outlay	Head of Dev	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR
1.	Oceanographic Research	13403	200.00	...	200.00	200.00	...	200.00	340.00	...

1. **Secretariat Economic Services:** Provision is for secretariat expenditure of the Department of Ocean Development.

2. **Oceanographic Research:**

2.1 **ORV and FORV:** Two research vessels ORV Sagar Kanya and FORV Sagar Sampada have been carrying out oceanographic surveys and surveys for the exploration of non-living and living resources in the Exclusive Economic Zone (EEZ) and beyond that around Indian Ocean region since 1984. These vessels will continue to be utilized for multi-disciplinary research on the physical, chemical, geological and biological aspects of the Indian Ocean. The vessels will also be utilized in campaigns for validating satellite oceanographic data, assessment of marine living resources and for various technology demonstration activities.

Marine Living Resource : Marine Living Resource (MLR) programme was initiated during IX Plan towards assessment of the Fishery resources and explaining the physical and biological interactions that regulate productivity, tropic structure of Indian continental slope area and international waters, with a view to understand and predict the inter-annual, decadal and long-term fluctuations in the marine fishery. These survey and monitoring activities under the programme are very essential to undertake exploratory and harvest exploitable resources from the Indian EEZ.

3. **Antarctic/ Polar Science:** - Antarctic Research Programme has been designed to take advantage of the unique location and environment of the icy continent for understanding the key global processes which are manifested and controlled by this polar cap. Antarctic is a pristine and natural laboratory, which enables the scientists to study, detect and monitor global phenomena, such as the atmospheric patterns and ocean circulation's Glaciological and geophysical research provides clue to the geological history and evolution of the earth. In addition, Antarctica provides a singular platform for conducting studies on solar terrestrial interaction, adaptation of organisms, including human beings in the cold land isolated conditions. Antarctic/ Polar research and Antarctic scientific expeditions to Antarctica will continue during the year 2005-06 also.

4. **Coastal Research vessel (CRV):** The two indigenously built coastal vessels 'Sagar Purvi' and 'Sagar Paschimi' of Department of Ocean Development will continue to monitor pollution in the coastal areas for which they are equipped with appropriate and modern technological equipment. During 2005-06, these vessels would undertake cruises for this purpose. National Institute of Ocean Technology (NIOT) is operating these vessels

5. **Drugs from Sea:** The programme has been revamped to cover exploratory and product development phases. After successful completion of clinical trial possible participation of pharmaceutical industries would be incorporated. Pharmacological and toxicological studies were completed for anti-diabetic compound and clinical trial is in progress. The anti-cholesterol compound is awaiting the clearance of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) for its toxicity studies in monkey. The systematic collection, extraction and biological evaluation of 150 species, and evaluation of biologically potential organisms,

leading to possible development of new drug(s) would be carried out along with development of suitable models for biological activity in certain priority areas. A new element has been incorporated into the programme, keeping in mind the need to initiate preliminary studies on mass culture of some prospective marine organisms capable of yielding potent bioactive compounds.

6. **Polymetallic Nodules Programme:** The work of Survey and Exploration is mainly directed towards assessing relative concentration and quality characteristics of nodules as well as seabed topography. Demarcating of grade of nodule deposits in the Central India Ocean Basin is one of the main objectives. Design and development of mining system has been reoriented so that the intermediate applications of the technology could be achieved before developing the ultimate system for a depth of 6,000m. A joint collaborative programme between NIOT and EDBOE, Russia for design and development of unmanned submersibles capable of operation up to 6,000 m has been taken up under a MOU between DOD and Russian Academy of Sciences. A Continuous demonstration pilot plant of 500 Kg/day capacities for extraction of copper, Nickel and Cobalt from nodules was set up at HZL, Udaipur and campaigns are continuing. EIA monitoring studies in the pioneer area for assessing the impact of the simulated mining at deep seabed is continuing at the site of nodules occurrence.

7. **Other programmes**

7.1 **Assistance for Research Projects:** The objectives of this programme are to strengthen the infrastructure facilities in selected universities/institutions to carry out basic research in marine science to create centres for excellence on ocean science & technology. Nine Ocean Science & Technology and Cells in priority areas of Ocean Science and Technology were set up in universities/IIT. More than 80 projects are presently continuing to be funded through OSTCs, which are expected to receive funding during the year 2005-06. In addition, projects outside the OSTC system are expected to be taken up on case-to-case basis.

7.2 **Coastal Ocean Monitoring and Prediction System (COMAPS):** The national COMAPS programme has been in operation at 82 locations for collection and analysis of data with respect to 25 parameters relating to physical, chemical and biological characteristics of water and sediments. Based on the data collected through this project the areas of concern have been identified and steps are being taken to prevent and control the causes of pollution. The State Pollution Control Boards under the administrative control of respective State Governments are regulatory agencies for enforcement and implementation of various provisions of the environmental statutes. The need for strengthening this long term programme arises in wake of the expanding areas of work relating to environmental concern, for example, hazardous substances, management of the marine environment including the risk assessment and environmental impact assessment etc. and emerging areas like mitigation strategies, regulatory toxicology, eutrophication and hypoxia, organics, etc.

7.3 **Exhibition & Fairs, Seminar & Symposia and Information & Technology:** With a view to enhancing the knowledge of the general public regarding the oceans around India and to highlight India's effort in the endeavour to explore and exploit these resources for sustainable growth, the

Department would continue to participate in variety of fairs/exhibitions. The Department would continue to provide funds for organizing seminar, conferences, workshops etc. for creating public awareness on oceans. The department would also enhance its existing IT infrastructure as per Government's e-governance policy.

7.4 National Institute of Ocean Technology (NIOT): The NIOT, a society of the Department of Ocean Development, was established in November, 1993 with a view to develop technology in ocean sector. In addition to the four core mission activities of Ocean Energy, Deep Sea Mining, Coastal and Environmental engineering and Marine Instrumentation, NIOT would also continue to undertake Hi-Tech consultancy service in ocean related activities, Ocean Science & Technology and enhancement of marine living resources, development for breeding, rearing and fattening of lobsters to begin with for the Andaman & Nicobar Islands.

7.5 Manpower Training: Provisions include to meet the objectives of the programme relating to the manpower training in Ocean Sciences. Department would continue to support fellowships to develop specialised manpower.

7.6 Continental Shelf: In accordance with the provision of the Convention on the Law of the Sea, India is entitled to delineate the outer limits of the continental shelf beyond 200 nautical miles Exclusive Economic Zone (EEZ) and submit the data for a claim to the Commission of Continental Shelf. The delineation of the Continental margin in case of India is likely to give a large continental margin extending beyond EEZ. The continental margin is rich in non-living resources and the minerals, including the hydrocarbon resources. The resources of the continental shelf also include the sedentary organisms. The work on data analysis would continue upon completion of the surveys.

7.7 Integrated Coastal and Marine Area Management (ICMAM): The programme has two components, namely i) Capacity building and ii) Development of Infrastructure for R&D, Survey and Training for ICMAM. The component has four activities, namely i) Development of GIS based information system for 11 critical habitats in the coastal and Marine Areas in India ii) Determination of Waste Assimilation Capacity at selected estuaries along coastal areas of India, iii) Development of Guidelines for Environmental Impact Assessment, iv) Preparation of Model Integrated Coastal and Marine Area Management Plans. Under the component on infrastructure, training, laboratory and other facilities have been established in the NIOT Campus, Chennai.

7.8 Ocean Observation and Information Services (OOS): The OOS is designed to acquire time-series data using Argo profiling floats, moored data buoys, etc. The data acquired from the sea around India are being used for various operational and research purposes including forecasting of cyclones and understanding the climate variability. Besides 31 ARGO profiling floats have also been deployed in the Indian Ocean for real-time measurements of temperature and salinity profiles up to a depth of 2000m with a view to improve understanding the monsoon variability.

The OIS envisages generation and dissemination of ocean data/data products on an operational basis. Data products in the

Website: <http://indiabudget.nic.in>

form of Sea Surface Temperature maps, Potential Fishing Zone maps, wind vector maps, mixed layer depth-maps, at least on heat-budget are being proposed to be made available. Information infrastructure and manpower are being created at Indian National Centre for Ocean Information Services (INCOIS), Hyderabad to achieve the objectives.

During the X Plan, INDOMOD and SATCORE components have been integrated to development of a wide range of ocean atmosphere models for operation use at INCOIS. These include development of regional algorithms, data assimilation techniques and operational models, which would be transferred to the OIS Centre for operational use. The ocean modelling and dynamics projects address basic issues on the ocean dynamic, climate variability, ocean state forecast, sea level variations, ocean flux studies etc. Some the models generated under the programme have already been made operational at INCOIS.

7.9 Marine Non-Living Resource Programme: Palaeo-oceanographic studies are being carried out in the Bay of Bengal Fan (BENFAN). A cruise was undertaken and investigations of cobalt rich seamount crust deep-sea mineral exploration were carried out. A cruise will be undertaken during 2005-06 for sampling.

7.10 Assistance for Research Seminar & Symposia: Provision for expenditure on providing assistance for Seminar & Symposia would be continued during 2005-06.

7.11 Information Technology and Computers: Provision for expenditure is made to strengthen the Information Technology, computerisation and e-governance activities of the Department.

7.12 Comprehensive Swath Bathymetric Survey of entire Indian EEZ: The area of our Exclusive Economic Zone is over 2 million sq. km. having various living and non-living resources. This programme entails scientific mapping of this area to have an inventory of potential resources and to identify the causes of hazards. This study would help to develop innovative concepts on Submarine fans -and the role on accumulation of hydrocarbons, Submarine canyons- and the role in transport and distribution of pollutants, Islands- understanding of submarine landslides and stability of coastlines, Sedimentary processes-effect on fisheries and biogeochemical cycling, Sediment failure along slopes- and the effects on communication cable links across the seafloor, Tectonics of margins. The programme has been taken up for implementation upon obtaining requisite approvals.

7.13 Gas hydrates: With ever increasing gap between demand and indigenous production of natural gas and the huge import bill incurred by India, it is necessary to look for alternative resources. Gas hydrates have the potentiality of providing total energy security to our nation. The programme consists of both scientific & technology development for gas hydrates. The Department, in association with CSIR and other laboratories, would focus on scientific research with special emphasis on resource extent evaluation and environmental impacts and development of technology for detection and qualification of gas hydrates in sediments. Thereafter, exploratory drilling will be advised. The steps in this programme will be to understand the generation and accumulation of hydrates in sediments, estimate impact of gas dissolution on geological environment and climate, develop or adopt environmentally safe technology for production

and transportation of gas from hydrates, draw up plans to monitor and manage environmental perturbation during hydrate harvesting. The programme has been taken up for implementation upon obtaining requisite approvals.

7.14 Acquisition of new Vessel: The Department's focus in the next 5 years will be to develop sustainable technology for the exploitation of various non-living resources. Under Vessel for technology services and demonstration programme, suitable platform is required to replace the vessels and crafts chartered by the DOD at present, which caters to the above demand. Without such a facility, the implementation of the technology development programmes would be delayed. For initial expenditure on design etc the proposed sum of funds are essential and programme is expected to be initiated upon obtaining requisite approvals.

7.15 Geophysical Study of Laxmi basin: The ongoing academic debate is continuing about the nature of the basement in the Laxmi basin from a point of view of crustal geology, if the Laxmi ridge is but a continental sliver between oceanic crusts on either side then the foot of the western continental slope may not really call for any "relocation". If on the other hand, the continent-ocean boundary can be established near the western flank of the Laxmi Ridge or that the Laxmi Basin is continental in nature, then from a purely geological point of view, the foot of the slope (FOS) may be off the western flank of the Ridge, near the place where the crust changes from continental to oceanic. Based on gravity modeling across the Laxmi ridge and adjacent margin using ship and satellite data, some experts also corroborate the existence of underplated crust beneath the ridge and the Laxmi Basin and the location of the ocean-continent transition at the southern edge of the ridge. To establish conclusively the nature of basement the Laxmi basin as well as in the area to its north and south, detailed geophysical surveys along the entire west coast margin upwards of the northern extremity of the Chagos - Laccadive ridge have been taken up to be followed by data analysis and interpretation.

7.16 Data Buoy Programme: The programme is designed for strengthening the Data buoy network in the Indian Ocean to acquire real-time data on surface meteorological and upper ocean parameters for various operational purposes viz., weather forecast, improve monsoon predication capability, coastal and offshore developmental activities. The programme is expected to deploy 80 moored buoys in selected locations in the seas around India by end of 10th Plan. Under the programme, the buoys would be produced indigenously by NIOT with possible private partnership. The work includes deployment; operation and maintenance of buoy network including dissemination of data in near real time to the potential users.

7.17 Tsunami and Storm Surge Warning System: The objective of the project is to establish a warning system for the oceanogenic disasters caused by tsunami, and storm surges, which is one of the worst natural calamities in the recent past. Currently, Department is formulating a proposal for mitigation of oceanographic disasters such as tsunami storm surge in the Indian Ocean Region. The project would be implemented with active participation of other concerned departments such as DST, CSIR, DOS over a period of 30 months. The project is expected to strengthen the 7 seismic observation stations of DST, establishment of 8 - 10 DART Observation Network, instillation of real time tide gauge monitoring stations etc., 24 hours monitoring of the systems for generation of timely warning.

International Cooperation/Obligation: Department would continue to represent India in various International & Intergovernmental organizations / bodies such as Antarctic Treaty System, Scientific committee on Antarctic Research (SCAR), Council of Mangers of National Antarctic programme (COMNAP), Standing Committee on Antarctic Logistic Operations (SCALOP), Commission for Conservation of Antarctic Marine Living Resources (CCAMLR), Intergovernmental Oceanography Commission (IOC), Regional Seas Programme, International Sea Bed Authority and International Tribunal on Law of the Sea and Indian Data Buoy Programme etc.. Expenditure for this purpose would be met from the respective schemes.