

DEPARTMENT OF OCEAN DEVELOPMENT

DEMAND NO.65

Department of Ocean Development

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

		<i>(In crores of Rupees)</i>								
Major Head	Budget 2002-2003			Revised 2002-2003			Budget 2003-2004			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
Revenue	174.00	24.28	198.28	149.10	24.28	173.38	175.00	24.33	199.33	
Capital	1.00	...	1.00	0.90	...	0.90	...	...	...
Total	175.00	24.28	199.28	150.00	24.28	174.28	175.00	24.33	199.33	
1. Secretariat - Economic Services	3451	...	1.89	1.89	...	1.89	1.89	...	4.77	4.77
2. <i>Oceanographic Research</i>										
2.1 Oceanographic Survey(ORV and FORV) and Marine Living Resources(MLR)	3403	7.35	21.41	28.76	6.10	21.41	27.51	2.50	19.56	22.06
2.2 Marine Living Resource and (FORV)	5403	...	...	...	...	...	...	...	...	...
<i>Total</i>	<i>Total</i>	<i>7.35</i>	<i>21.41</i>	<i>28.76</i>	<i>6.10</i>	<i>21.41</i>	<i>27.51</i>	<i>2.50</i>	<i>19.56</i>	<i>22.06</i>
3. Antarctic Research/Polar Science	3403	25.50	...	25.50	20.00	...	20.00	24.00	...	24.00
	5403	1.00	...	1.00	0.90	...	0.90	...	...	...
<i>Total</i>	<i>Total</i>	<i>26.50</i>	<i>...</i>	<i>26.50</i>	<i>20.90</i>	<i>...</i>	<i>20.90</i>	<i>24.00</i>	<i>...</i>	<i>24.00</i>
4. Coastal Research Vessel	3403	5.00	...	5.00	5.00	...	5.00	5.00	...	5.00
<i>Total</i>	<i>Total</i>	<i>5.00</i>	<i>...</i>	<i>5.00</i>	<i>5.00</i>	<i>...</i>	<i>5.00</i>	<i>5.00</i>	<i>...</i>	<i>5.00</i>
5. Drugs from Sea	3403	2.00	...	2.00	2.00	...	2.00	2.50	...	2.50
6. Polymetallic Nodules Programme	3403	20.00	...	20.00	20.00	...	20.00	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	5.00	...	5.00
7.2 Coastal Ocean Monitoring & Prediction System	3403	2.00	...	2.00	2.00	...	2.00	2.00	...	2.00
7.3 Exhibition and Fairs	3403	0.55	...	0.55	0.55	...	0.55	0.55	...	0.55
7.4 National Institute of Ocean Technology	3403	23.40	...	23.40	23.40	...	23.40	25.00	...	25.00
7.5 Direction & Administration	3403	...	0.98	0.98	...	0.98	0.98	...	...	...
7.6 Island Development Programmes	3403	0.75	...	0.75	0.75	...	0.75	...	...	...
<i>Total</i>	<i>Total</i>	<i>0.75</i>	<i>...</i>	<i>0.75</i>	<i>0.75</i>	<i>...</i>	<i>0.75</i>	<i>...</i>	<i>...</i>	<i>...</i>
7.7 Manpower Training	3403	0.30	...	0.30	0.30	...	0.30	0.50	...	0.50
7.8 Continental Shelf	3403	18.00	...	18.00	18.00	...	18.00	8.00	...	8.00
7.9 Integrated Coastal & Marine Area Management (ICMAM)	3403	5.00	...	5.00	5.00	...	5.00	5.50	...	5.50
<i>Total</i>	<i>Total</i>	<i>5.00</i>	<i>...</i>	<i>5.00</i>	<i>5.00</i>	<i>...</i>	<i>5.00</i>	<i>5.50</i>	<i>...</i>	<i>5.50</i>
7.10 Ocean Observation & Information Service.	3403	25.00	...	25.00	24.00	...	24.00	35.00	...	35.00
<i>Total</i>	<i>Total</i>	<i>25.00</i>	<i>...</i>	<i>25.00</i>	<i>24.00</i>	<i>...</i>	<i>24.00</i>	<i>35.00</i>	<i>...</i>	<i>35.00</i>
7.11 Marine Non-Living Resources Programme(MNLR)	3403	4.00	...	4.00	1.50	...	1.50	2.50	...	2.50
7.12 Assistance for Research Seminar Symposia	3403	0.15	...	0.15	0.15	...	0.15	0.20	...	0.20
7.13 Information Technology & Computers	3403	...	...	...	...	...	...	0.25	...	0.25
7.14 Comprehensive Swath Bathymetric Suery	3403	14.00	...	14.00	5.25	...	5.25	12.00	...	12.00
7.15 Gas Hydrates	3403	8.50	...	8.50	4.50	...	4.50	18.00	...	18.00
7.16 New Research Vassel	3403	2.00	...	2.00	0.10	...	0.10	2.00	...	2.00
7.17 Geophysical Study of Laxmi Basin	3403	7.00	...	7.00	7.00	...	7.00	2.50	...	2.50
<i>Total</i>	<i>Total</i>	<i>114.15</i>	<i>0.98</i>	<i>115.13</i>	<i>96.00</i>	<i>0.98</i>	<i>96.98</i>	<i>119.00</i>	<i>...</i>	<i>119.00</i>
Total - Oceanographic Research		175.00	22.39	197.39	150.00	22.39	172.39	175.00	19.56	194.56
Grand Total		175.00	24.28	199.28	150.00	24.28	174.28	175.00	24.33	199.33
C. Plan Outlay	Head of Dev	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total
1. Oceanographic Research	13403	175.00	...	175.00	150.00	...	150.00	175.00	...	175.00

1. **Secretariat Economic Services:** Under this expenditure on account of the Secretariat of the Department of Ocean Development is provided for.

2. **Oceanographic Research:** Two research ships 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. This was a programme initiated during 1998-99. A scheme on Assessment of marine living resources beyond 50 meters depth in the India EEZ and ecological correlation has been initiated to have a realistic estimates on the potential marine living resources in the EEZ, Studies on benthic biodiversity, toxic algal blooms and fishery modelling also form part of this programme. This programme is being merged with the activities of FORV Sagar Sampada.

3. **Antarctic Research/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. The 22nd scientific expedition with 48 members was launched successfully from Cape Town, South Africa on the 10th January 2003. The launching of the expedition from South Africa has obvious scientific, logistic and economic benefits. This expedition will carry out research in the fields of atmospheric, geological, biological, environmental, medical and engineering sciences and global change.

National Centre for Antarctic and Ocean Research (NCAOR), which was established in 1998 as a Society under the administrative control of Department of Ocean Development with a view to coordinate Antarctic Research in the country as also to undertake ocean studies, would emerge as the first Polar Research Laboratory in the region.

4. **Coastal Research Vessel (CRV):** The two indigenously built coastal vessels namely 'Sagar Purvi' and 'Sagar Paschimi' of Department of Ocean Development will continue to be operated by National Institute of Ocean Technology (NIOT) for monitoring pollution in the coastal areas for which they have been equipped with appropriate and modern technological equipment. During 2003-04, these vessels would undertake cruises for this purpose.

5. **Drugs from Sea:** The project would be restructured to cover exploratory and product development phase with the possible participation of pharmaceutical industries. Pharmacological, toxicological and clinical trials for anti-

diarrhoeal, anti-diabetic and anti-cholesterol leads would be continued further. The exploratory phase would be need based under which bulk/repeated collection of marine organisms and bio evaluation would be carried out to obtain more potential leads.

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 shallow bed mining system developed was tested at a depth of 410 m off Tuticorin.

A joint collaborative programme between NIOT and EDBOE, Russia for design and development of unmanned submersibles capable of operation up to 6,000 m is likely to be taken up soon 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.

An EIA monitoring cruise is proposed during 2003-04 as a part of continuing studies in the pioneer area for assessing the impact of the simulated mining at deep seabed at the site of nodules occurrence.

7. Other programmes

7.1 **Assistance for Research Projects, Seminars, Symposia:** 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 90 projects are presently continuing to be funded through OSTCs which are expected to receive funding during the year 2003-04. In addition, projects outside the OSTC system are expected to be taken up on case to case basis. Further, Department would continue to support fellowships to develop specialised manpower.

7.2 **Coastal Ocean Monitoring and Prediction System (COMAPS):** One of the basic requirement for controlling pollution is generation of data on levels of the pollutants over a period of time so as to obtain the status of pollution. The main objective is to constantly assess the health of India's marine environment and indicate areas that need immediate and long-term remedial action. Data on 25 environmental parameters are being collected at 82 locations with the help of 9 R&D institutions. The Programme along with the modelling component will be continued during 2003-2004.

7.3 **Exhibition & Fairs: Assistance for Seminar & Symposia and Information Technology and Computer.** 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 also provide funds for organizing seminar, conferences, workshops etc. for creating of public awareness on oceans. The department would also enhance its existing IT infrastructure.

7.4 National Institute of Ocean Technology (NIOT): The National Institute of Ocean Technology was established in November, 1993 as a registered society under the administrative control of the Department of Ocean Development with a view to developing technology in ocean sector. It was envisaged that in addition to the four core mission activities of Ocean Energy, Deep Sea Mining, Coastal and Environmental engineering and Marine Instrumentation, NIOT would also undertake Hi-Tech consultancy service in ocean related activities. Subsequently, in the year 1998-99, one more project on "Island Development" was added to the activities of NIOT. The major activities, ongoing and new, that will be undertaken by NIOT during 2003-04 are testing of 1 MW OTEC Plant, design of mining system for depth up to 6000 m, preparation of EIA guidelines for Coastal Ocean management, development of Under Water Marine Instruments and calibration of the same and continuing the project on enhancement of Marine Living Resources.

7.5 Direction & Administration: Expenditure meant for this scheme earlier has been included in the budget estimates of Secretariat Economic Services during the year 2003-04.

7.6 Island Development Programme: This programme has been merged with NIOT's activities from 1998-99 onwards by amalgamating all the programmes implemented by the Department in the Andaman & Nicobar Islands and renamed as Ocean Science & Technology for Islands. NIOT, which has been identified as the nodal Institute for implementation of this multi-institutional and multi-disciplinary programme, has already made a headway in enhancement of marine living resources in the island groups by taking up technology development for breeding, rearing and fattening of lobsters to begin with. The facilities both at the island groups and at the mainland have been augmented for this purpose. It is proposed to expand the activities under this programme to other marine organisms on selective basis and also to coordinate the implementation of all the programmes of the Department in the Island groups for the benefit of the Island community.

7.7 Manpower Training: Provision has been made to meet the objectives of the programme relating to the manpower training in Ocean Sciences.

7.8 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 necessary surveys and work on data processing would continue.

7.9 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. Determination of Use Classification for Coastal Waters and No Impact Zone for selected habitats like coastal lakes and mangroves has been carried out.

7.10 Ocean Observation and Information Services (OOIS): Recognizing the need to operationalised the oceanographic services in the new areas of Science & Technology, the Department has implemented the Ocean Observation and Information Services (OOIS) programme from the beginning of the 9th Plan. The objective of the Programme is to provide ocean information services for various applications in the ocean section. OOIS is structured around four major themes namely, Ocean Observing Systems, Ocean Information Services, Satellite Coastal and Oceanographic Research (SATCORE) and Indian Ocean Modelling & Ocean Dynamic (INDOMOD).

The Ocean Observing Systems envisage collection of sea truth data using moored data buoys, drifting buoys, expandable bathythermographs (XBT), current meter arrays and tide gauges, and designed particularly for acquisition of real-time sea surface, meteorological and upper oceanographic parameters from the coastal and deep waters. Validation of the satellite sensors has also been undertaken using the sea truth data generated under this programme. The Data Buoy Programme was initiated in 1996 with partial financial assistance from Norwegian Agency for Development (NORAD) and National Institute of Ocean Technology (NIOT) has been entrusted with the responsibilities for deployment, operation and maintenance of the data buoys.

The Ocean information service envisages generation and dissemination of ocean data/data products on an operational basis. Data products in the 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. It is also planned to develop and ocean state forecasting system; initially on an experimental basis. Services will be offered in the form of coastal wetland maps, shoreline change maps, close contour coastal area maps etc. which are needed for coastal zone management activities. The 14 National Marine Data Centres will be continued under the Ocean Information & Services. A dedicated Indian National Centre for Ocean Information and Services started functioning (w.e.f. 3.2.99) at Hyderabad as an autonomous society for efficient development and dissemination of Data products.

The Satellite Coastal and Oceanographic Research (SATCORE) component envisage development of regional algorithms, data assimilation techniques and operational models which would be transferred to the Ocean Information and Service Centre for operational use. The ocean modelling and dynamics projects addresses basic issues on the ocean dynamic, climate variability, ocean state forecast, sea level variations, ocean flux studies etc. These R&D projects are expected to provide basic models that could explain the dynamics of the India Ocean and form an essential input in designing system for ocean state forecast.

7.11 Marine Non-Living Resource Programme (MNLR):

Palaeoceanographic studies are being carried out in the Bay of Bengal Fan (BENFAN). A cruise onboard AA Sidorenko has been undertaken. Further, investigation of cobalt rich seamount crust deep-sea mineral exploration are also being taken up.

7.12 Assistance for Research Seminar Symposia:

Provision for expenditure on providing assistance for Seminar & Symposia would be continued during 2003-04.

7.13 Information Technology and Computers:

Provision for expenditure is made to strengthen the Information and Technology and e-governance activities of the Department.

7.14 Comprehensive Swath Bathymetric Survey:

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 on 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 would be taken up for implementation upon obtaining requisite approvals.

7.15 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 would be taken up for implementation upon obtaining requisite approvals.

7.16 Geophysical Study of Laxmi basin - New Programme:

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 would be necessary which are being taken up.

7.17 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.