Summary Proceedings of the IOGOOS Workshop & Second Annual Meeting (IOGOOS II)

Colombo, Sri Lanka

IOGOOS

GLOBAL OCEAN OBSERVING SYSTEM FOR INDIAN OCEAN

IOGOOS:AR:2004(1)

April 26-29, 2004

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Annexes

1.0 Preparatory Sessions of the Working Groups and Panels

On the forenoon of April 26, 2004, preparatory sessions of the 7 Working Groups and Panels were held in a plenary to (i) update all the participants on the progress made since the First Annual meeting of IOGOOS and (ii) elicit inputs from the participants for the future course of actions These Sessions were coordinated by Dr. Gary Meyers (Indian Ocean Panel on Climate), Dr Nasser H. Zaker (Data Management), Dr. K. Radhakrishnan on behalf of Johannes Guddal (MILAC), Prof. Merv Lynch (Strategy for Capacity building in Remote Sensing), Prof. A.T. Forbes (Penaeid Prawn Pilot Project), Dr. Greg Wagner (Coastal Ecosystems), Mr. Santharam Mooloo along with Dr. Nalin Wikramanayake (Coastal Erosion).

Dr. K. Radhakrishnan, Chair IOGOOS and Dr. Neville Smith, Officer IOGOOS conducted these Sessions.

2.0 IOGOOS Officers' Meeting

On the afternoon of April 26, 2004, the IOGOOS Officers met and

a) considered and approved the Agenda for April 27-29, 2004,
b) assigned specific responsibilities to the Officers to conduct the sessions during the three days,
c) appointed Mr William Erb as Returning Officer for conducting the Election of Chairman and Officers for the term 2004-06,
d) appointed Dr. Neville Smith, an Officer IOGOOS to scrutinize the accounts and financial statements of IOGOOS for the period up to March 31, 2004,
e) evolved guidelines for preparation of the action plan 2004-05,
f) took note of the need for guidelines on administering funding support for the needy members and resource persons to participate in the IOGOOS meetings,
g) agreed to the induction of the two new members i.e. Indian Space Research Organisation and the University of Dar-es-Salaam of Tanzania,
h) took note of the encouraging responses from Bangladesh, Comoros, Malaysia, Maldives, Myanmar, Oman, Seychelles and Thailand by participating in the IOGOOS activities, with a few of them expressing willingness to become members,
i) decided to place on record the competent and proactive role played by Mr. Srinivasa Kumar T, Secretary IOGOOS during the past 18 months for the development of IOGOOS,
j) took note that Mr. Satyanarayana, B.V, Head of Computational facilities and Data Management Group of INCOIS has been drafted for coordination of data and information management,
k) endorsed the need for enhancing the manpower at the Secretariat at Hyderabad with two full time persons to assist Secretary to effectively discharge its enhanced roles for coordination and 'clearing house' and noted the gracious gesture of the host agency to provide the same.

3.0 Opening of IOGOOS II

Opening IOGOOS II, Dr. Lalith Weeratunga, Secretary to the Honourable Prime Minister of the Government of the Democratic Socialist Republic of Sri Lanka underscored the significant role of IOGOOS for ensuring synergy and regional cooperation for oceanographic studies and ocean observations under globally accepted standards as many countries in the region especially the island nations have only limited scientific and engineering capability to undertake oceanographic research and tackle problems related to resources and environment

in the ocean. Applauding IOGOOS for the marvelous job done so far he stated that the consolidation of IOGOOS is vital to promote peaceful uses of ocean space and its vast resources, their management and regulation as well as the protection and conservation of the marine environment, guided by the principles of Common Heritage of Mankind. Dr. Lalith Weeratunga later opened the IOGOOS Exhibition.

Mr A.R.N. Amaratunga, Additional Secretary, Ministry of Fisheries and Ocean Resources, Government of the Democratic Socialist Republic of Sri Lanka welcomed the participants.

In his opening remarks, Dr. K. Radhakrishnan, Chairman IOGOOS and Vice Chairman IOC stated that the Global Ocean Observing System (GOOS) envisages (i) an internationally accepted global design to address the broad realms of Oceans & Climate and Coastal Ocean, (ii) a set of regional alliances of countries that will focus on issues of common concerns and interests of the region and (iii) national contributions for implementation of the observational systems. He reiterated that systematic ocean observation is essential for understanding the structure and dynamics of ocean as well as for improving predictability of ocean and climate, especially for the Indian Ocean that is quite complex and unique but still under-observed. After giving an overview of the progress accomplished by IOGOOS since its formal launch in November 2002, he stated that the focus of this meeting is to come up with concrete action plans and proposals as IOGOOS is entering the phase of implementation.

Mr William Erb (Head of IOC Perth Office), Dr Neville Smith (IOGOOS Officer), Dr Johnson Kazungu, (IOGOOS Officer), Prof. A.T. Forbes(IOGOOS Officer), Dr. Nasser Zaker (Chair IOCINDIO) and Mr Mika Odido (Head, IOCWIO project Office) made brief opening statements (i) acknowledging the vision and leadership of IOGOOS as well as the strong support from the institutions and national governments in the region for facilitating the progress achieved so far and (ii) highlighting the challenges ahead for the coming years to realize the objectives of IOGOOS.

Dr. Kamal Tenakoon, Director General, National Aquatic Resources Research Agency of Sri Lanka extended the vote of thanks.

4.0 Plenary Session-1: Invited Presentations

Chair: Prof. A.T Forbes, IOGOOS Officer

4.1 Dr. Satish R. Shetye, Director of the National Institute of Oceanography at Goa, India elucidated the effect of salinity on sea surface temperature drawing from a case study of the Arabian Sea Monsoon Experiment being conducted by Indian scientific community. He stated that (i) upwelling Kelvin Waves propagate from Bay of Bengal into Arabian Sea and lead to remote surface freshening, (ii) a barrier layer exists in the SE Arabian Sea due to remote effects–propagation of low salinity water, (iii) to understand any region, must consider remote effects from all of the region, because of the rapid remote propagation of signals and (iv) a big intellectual challenge still exists to understand onset of monsoons.

4.2 Dr. Shailesh R. Nayak of Indian Space Research Organisation (ISRO) gave an overview of the ocean remote sensing programme of ISRO and highlighted the potential of Oceansat series of Satellites for the region. He provided salient features of the Oceansat-II mission planned for 2006-07 by ISRO with an 8-band Ocean

Colour Monitor and a Ku band Scatterometer. Resourcesat I having AwiFs (60 m, 5 day Repetivity), LISS IV (5.8 m multispectral) and LISS III (23 m multispectral) for fisheries, coastal erosion and coastal ecosystem studies. Highlighting the potential applications for the region, he encouraged IOGOOS members to come forward and gear up for utilization of the Oceansat-II and Resourcesat data.

4.3 Dr. Neville Smith, Australia made a brief presentation of the activities being undertaken under GODAE that is an international collaboration to jointly develop ocean prediction systems for global oceans. He presented an overview of the various products being generated as part of GODAE and informed that progress is on track on many exciting prototypes and projects including BLUELINK, Mersea, MERCATOR, J-GODAE, TOPAZ, FOAM, HYCOM and ECCO.

4.4 Dr. Andreas Schiller, Australia presented an overview of Ocean Modelling for Monsoon Applications. He highlighted the accomplishments in understanding the role and dynamics of Indian Ocean in monsoon system over the last decade and informed that recent focus is on understanding the influences of ENSO and IOD/IOZM on Indian Ocean Circulation as well as Intra seasonal variability. He reiterated that sub-surface observations such as SOOP sections, moorings and Argo floats are needed to complement and assess model results in full detail and concluded that coupled ocean-atmosphere (-land) models are also playing a key role in monsoon applications.

4.5 Dr. Martin Le Tissier, UK made a presentation on the New LOICZ & Draft science plan for the next 10 years. He informed that LOICZ & IOGOOS could work jointly for effective management and sustainable of coastal resources.

4.6 Mr. William Erb, IOC gave an overview of the Coastal Ocean Observation Panel.

5.0 Second Annual Meeting of IOGOOS

Chair: Dr. K. Radhakrishnan

On the afternoons of April 28th and 29th, 2004, the IOGOOS Members met and discussed the following items:

(i) Secretary of IOGOOS made brief presentation of the activities of the IOGOOS Secretariat since the past 18 months.

(ii) Chairman, IOGOOS welcomed all the members to the meeting including the new members viz. Indian Space Research Organisation, India as well as University of Dar-Es-Salaam, Tanzania

(iii) Annual subscription of Members: It was decided that all Members should send intimation to the Secretariat as soon as the money is remitted so that it could be easy for the Secretariat to trace the transfer and acknowledge the members.

(iv) Dr. Neville Smith scrutinized and approved the financial statement that was prepared and submitted by the IOGOS Secretariat up to March 31, 2004.

(v) Funding for Annual Meetings: Since, in future, limited funds would be available from IOC for supporting the Annual Meetings, it was decided that, in principle, members should be prepared to fund themselves. The available funds for supporting the participation of important participants should be regulated by the Secretariat following a set of guidelines to be

worked out by a team. Mr. William Erb, Dr. Sidney Thurston & Dr. Neville Smith volunteered to be part of this team.

(vi) Appointment of Officers: Mr. William Erb, Returning Officer announced that the following persons have been elected unanimously as officers of IOGOOS for the period November 2004 to November 2006

Dr. K. Radhakrishnan, India	Chairman
Dr. Johnson Kazungu, Kenya	Officer
Dr. Neville Smith, Australia	Officer
Prof. A. T. Forbes, South Africa	Officer
Dr. Mitrasen Bhikajee, Mauritius	Officer

(vii) Tenure of Officers and Procedure for Election: It was decided to constitute a Team to draft detailed procedure for election of Chair and Officers in future, including their tenure. Dr. Neville Smith, Dr. Shailesh Nayak and Dr. Johnson Kazungu volunteered to be part of this team.

(viii) It was decided that the following experts would provide interface between IOGOOS and other external programmes. These experts have agreed to provide at least quarterly updates to IOGOOS Secretariat on the latest developments in the assigned areas.

Dr. Sidney Thurston on GEO & JAMSTEC's Monsoon Experiment
Dr. K. Radhakrishnan and Dr. Steve Piotrowicz on Argo Project
Dr. Neville Smith on GODAE
Prof. Merv Lynch on Remote Sensing
Dr. Gary Meyers on Indian Ocean Panel

It was also decided that the IOGOOS Secretariat could inform the Members about the Capacity Building opportunities in the Region such as POGO, etc. This could be done by posting such information on a separate page in the IOGOOS Website as well as by providing links to other sites offering such opportunities.

(ix) Next Annual Meeting: The meeting requested the interested hosts to send a letter of interest to the IOGOOS Secretariat before end-June 2004. The meeting venue and dates need to be decided well in advance so that the secretariat has sufficient time to organize funding support from the sponsors. The venue for the next annual meeting would be decided based on the following considerations:

a) Geographical Distribution
b) Commitment of funds from the host to meet all the local expenses that is expected to be of the order of USD 5000/-
c) Security

(x) Briefing Session on IOGOOS on the sidelines of IOC-EC: It was decided that a briefing session be organised at the next IOC Executive Council scheduled in June 2004.

(xi) Enhancement of Manpower at IOGOOS Secretariat: The meeting noted that Secretariat had done an excellent job in coordinating the activities of IOGOOS. Keeping in view the quantum of work involved and the recent initiatives it had taken up in Ocean data and Information management, the members recommended that there is a need to immediately augment the manpower at the IOGOOS Secretariat by recruiting two persons.

IOGOOS thanked the Indian Department of Ocean Development for its graciousoffer to provide this manpower for the Secretariat.

6.0 Parallel Sessions of the Working Groups and Panels

The Working Groups and Panels met in two parallel sessions on April 28, 2004 as below to discuss and formulate the recommendations to be presented in the Plenary Session 3.

The Parallel Session 1 was chaired by Dr. Neville Smith and the deliberations on Indian Ocean Panel, Ocean Data & Information Management and Remote Sensing Capacity Building were led by Dr. Gary Meyers, Dr Nasser H Zaker and Prof. Merv Lynch respectively.

The Parallel Session 2 was chaired by Dr. Johnson Kazungu and the deliberations on Penaeid Prawn, Keystone Coastal Ecosystems and Shoreline Change Pilot Projects were led by Prof. A.T Forbes, Dr. Greg Wagner and Dr. Nalin Wikramanayake respectively.

7.0 Plenary Session 2

Chair: Dr. Radhakrishnan, Chairman IOGOOS

Mr. Mika Odido, Head of IOCWIO and Dr. Nasser, Chair of IOCINDIO presented the activities of IOCWIO and IOCINDIO respectively.

Mr. Srinivasa Kumar briefed the meeting on the GRAND execution plan. Dr. Radhakrishnan briefed on the MILAC Pilot Project.

8.0 Plenary Session-3: Presentation of Summary Report

Chair: Dr. Radhakrishnan, Chairman IOGOOS

On April 29, 2004, the Working Group Coordinators were requested to present a brief summary of the initiatives, the achievements since the last meeting and also identify 3-4 key milestones targeted for 2004-05 and identification of the Action Coordinator for each of them, taking into account the comments and suggestions made during the deliberations of the first three days of IOGOOS II. The following are the brief summaries provided by the coordinators:

8.1 Indian Ocean Panel –Report from Dr. Gary Meyers

GOOS (through Indian Ocean GOOS and the Perth Office of the IOC) and CLIVAR have established the Indian Ocean Panel initially charged to develop, coordinate and implement a plan for sustained ocean observations of the Indian Ocean for climate research and ocean state estimation. Its Terms of Reference and long term goals are below. The Panel met for the first time in Pune, India during February 18-20 under its Chair, Gary Meyers (CSIRO). The Panel Chair, Dr Satish Shetye (Director, NIO) and other key players in CLIVAR and GOOS continued their work at the IOGOOS Second Annual Meeting, and began to discuss links between the climate and coastal components of the observing system.

The Pune meeting allowed IOP members to voice views on the essential elements of the climate-component, and to prepare an overview of the scientific and operational objectives for observations of the Indian Ocean. Interactions with the CLIVAR Asian/Australian Monsoon Panel during joint sessions allowed for their reaction and input to the initial direction of the IOP work-plan.

The observations will support research on the key climate phenomena of the Indian Ocean region:

- Intra-seasonal oscillations and variability
- Seasonal monsoon variability
- Indian Ocean zonal dipole mode and its relation to ENSO
- Decadal warming trends
- Shallow overturning cells
- Deep meridional overturning
- Carbon and Biogeochemistry
- Indonesian Through-flow
- Global ocean linkages

The observing system consequently needs to provide data spanning a very large range of space and time scales.

The observations will also support the development of operational ocean-products by GODAE,

- To initialize operational seasonal climate prediction systems
- To provide ocean maps for economic activity (e.g. off-shore engineering, fisheries and shipping), and
- To provide ocean-information for prediction of storm surge and coastal flooding

GODAE needs "metrics" that will facilitate the inter-comparison of analysis-systems produced by different groups around the world and the validation of GODAE products. Four categories of metrics have been identified:

- Model output with standard depth, space, time resolution
- High quality observational data (e.g. SOOP XBT lines, WOCE repeat lines, moorings etc.)
- Observed integral quantities (e.g. Indonesian throughflow, flow onto shelf in upwelling regions)
- Observed fields to verify forecasts

IOP members have undertaken drafting of an Implementation Plan based on an outline plan prepared by the Chair, with initial input due in May, and completion of the first draft in early 2005. A key aspect of preparing this plan is to develop a high degree of consensus among all the agencies that can contribute. This is essential to achieve a high degree of coordination in the implementation. The Panel is making arrangements for an assessment of the planned observing system using Observing System Simulation Experiments (OSSE's) and historical observations. A Workshop in December 2004 will review progress toward the assessment and prepare a proposal for a complete set of experiments. The assessment and experience from pilot observations will allow refinement of the initial implementation plan.

As a direct result of the IOP and IOGOOS meetings, Dr Murthy of NIO and Dr. Mike McPhaden of NOAA submitted a proposal to India's Department of Ocean Development to put three TAO moorings and an upward ADCP at 80.5E and (1.5N, 0 and 1.5S). The new moorings will enhance already existing pilot-mooring projects. The proposal asks for time on RV Sagar Kanya during the September-October 2004 cruise. Dr Shetye reported at the IOGOOS meeting that the proposal has a very good chance of being successful.

Also, following a discussion paper on tide gauges from IOP to Dr Y.E.A. Raj (Director of the Meteorological Office at Chennai), Indian Meteorological Department is preparing a proposal to modernize the Indian coastal tide gauge network using instrumentation developed at NIOT. The new instrumentation will allow the collection of real time sea level data, which will assist IMD's efforts to predict storm surge and coastal flooding. The real time data collection will also assist future storm surge research, because the sea level record from standard tide gauges is usually destroyed during a storm surge event. IOGOOS provides an opportunity to link the Indian tide gauge development to similar developments on the coasts of Africa by IOCWIO.

IOP will work with the CLIVAR data management project to identify DM needs in the Indian Ocean region and will discuss how the increasing capacity for DM at INCOIS might help fulfill those needs.

While IOP's initial task is preparation of the Implementation Plan for the climate component of the Indian Ocean Observing System, its Terms of Reference gives it a broad mandate for future activity. The TOR recognizes a consensus in CLIVAR and GOOS on need for oceanographic observations to support research and operational activity. Briefly, the TOR instructs the Panel to

- Provide scientific and technical oversight of oceanographic observations
- Develop an implementation plan for sustained observations
- Liaise with relevant bodies (e.g. AAMP, JCOMM), and
- Report to CLIVAR SSG and GOOS.

Beyond preparing the Implementation Plan, the IOP faces two important future challenges. Firstly, it is essential to build bridges to the coastal component of IOGOOS. Climate impact is one of the key drivers of coastal ecosystems, fisheries (prawn in particular) and coastal erosion. A capability for downscaling the basin scale observations to the smaller scales of interest at the coasts needs to be addressed and needs to be founded on a two way flow of information and plans between developers of the climate component and users of marine information in the coastal environment. With this challenge in mind, IOP will open a discussion with GODAE to identify how products can be made available to IOGOOS users. Secondly, IOP needs to develop an integrated theme of oceanographic research on the role of the Indian Ocean in climate variability and change. The theme needs to look at the full impact of the Indian Ocean, from regionally controlled monsoon variability to the global ocean linkages that play a role in the global transports of mass, heat, freshwater, nutrients, carbon and other important properties.

Following are some of the priority actions for 2004-05.

Sl. No	Action	Time line	Action Coordinator
8.1.1	Achieve the first draft for basin scale sustained ocean observations	Early 2005	Gary Meyers
8.1.2	Enhance the Equatorial Mooring Array with 3 moorings & an ADCP	October 2004	Gary Meyers
8.1.3	Coordinate with IMD to pursue modernization of Tide gauge network along the Indian coastline		Gary Meyers

8.1.4	Workshop in Hawaii to initiate the observation System simulation experiments	December 2004	Gary Meyers
8.1.5	Define the needs of CLIVAR for Data Management in relation to IOGOOS	October 2004	Gary Meyers

8.2 Ocean Data and Information Management-Report from Dr Nasser H. Zaker

Dr. Nasser Zaker presented an overview of the IOGOOS Workshop on Capacity Building and Strategy for Ocean Data and Information Management in the Indian Ocean Region (Hyderabad, India, December 8-10, 2003). He pointed to the remarkable role of Dr. Radhakrishnan, Mr. Pissierssens and Mr. Kumar in the success of the Hyderabad workshop. He recalled that the workshop acknowledged that the effective management of data is central to the successful implementation of GOOS in the Indian Ocean region. There are many capacity building activities that need to be identified and planned for, a network is needed to accomplish the work, and common methods and procedures have to be identified.

The Hyderabad workshop agreed that the strategy for Oceanographic Data and Information management in the Indian Ocean region should be based on the following requirements: (i) there is a need to sensitize and get commitment from Governments (decision makers) to assure sustainability of the IOGOOS network. This will require a 'marketing' strategy; (ii) there is a need to give due attention to local/national problems and producing services to solve these; (iii) local problems often have regional/global sources. To solve local/national problems data might be required from other countries in the IOGOOS region This is one of the important justifications for the regional approach of IOGOOS; (iv) there is a need to establish an equitable balance between providing and requesting of data and services but this needs to take into consideration the different capacity levels between countries (more developed countries may need to provide more than they can request from developing countries);. (v) there is a need to empower the countries in the region to generate their own services; and (vi) coastal and climate GOOS require data at different scales.

With respect to Capacity Building the Hyderabad Workshop concluded that there are big differences in Data and Information Management capacity between IOGOOS members. Therefore a detailed assessment of available capacity and requirements is to be undertaken.

Accelerated "ODIN+" programmes ("traditional" IODE data and information management + operational oceanography) are required. IODE training has already been provided by ODINAFRICA-II during 2001-2003 for IOCWIO (and IOCEA) countries. A similar training is planned to be provided by the planned ODINCINDIO (2004 & beyond) for IOCINDIO countries. Additional skills for operational data management are to be provided by ODINAFRICA-III (2004-2007) and by ODINCINDIO (2004- TBD). However, funding for the ODINCINDIO capacity building initiatives needs to be identified, since ODINCINDIO itself is in the initial planning stages. Accordingly ODINCINDIO should be the capacity building instrument for IOGOOS.

With regard to Marine Information Management, the Hyderabad Workshop acknowledged the expertise of the library and information professionals in preparing the descriptions of the publications, and the same could be used for preparing metadata for the data sets. Incorporation of the metadata directories within the catalogues of publications of library and information centres would enhance the access to the existing data sets.

With respect to "Structure and Coordination" the Hyderabad Workshop concluded that at the national level, a mix of distributed as well as centralized mechanism is to be adopted. Each country needs to have a focal point for data management and the NODC could take up this responsibility. Countries without an NODC should be encouraged to establish such a facility. It is necessary to have a coordination mechanism for data and information management at the regional level as well. An IOGOOS data and information management working group is to be set up with national contact points and experts as members. The need for a regional data archive for the Indian Ocean was discussed and it was decided this should be agreed upon during the first meeting of the data and information management working group.

The Hyderabad Workshop acknowledged that Work Plan Objectives should be met during three divided time lines: Short-term (2004), Medium term (2004-2007) and Long-term (2004-2014).

The objectives that will be met during the Short-term include: (i) identify national/regional problems, required services/products, required data types, national/regional partners, users/stakeholders through surveys/studies.; (iii) arrange the Data and Information training (ODIN+ cycle, etc.) and (iv) startup limited services to all IOGOOS members for public use.

The objectives to be met during the Medium term are: (i) assist members to develop the necessary national capacity to participate fully in IOGOOS (ODIN+, modeling and data assimilation, satellite oceanography); (ii) .start data collection, management and service/product development through relevant pilot projects; and (iii) provide services to all IOGOOS members for public use.

The Long-term objectives identified are: (i) empowering ALL members to generate/share and disseminate products and services by themselves using data from national and regional sources; (ii) develop user-oriented and user-friendly ocean services system accessible by all; and (iii) ensure long-term sustainability of the national and regional IOGOOS facilities.

With respect to Work Plan the Hyderabad workshop agreed that the Work Plan will include the following elements:

- Regional coordination and communication;
- National contact points; National Surveys and Services;
- Dissemination of existing standards and policies;
- Capacity Building;
- Funding Sources;
- Future Meetings.

A detailed work plan was prepared by the Hyderabad meeting under the above mentioned topics.

The IOGOOS-II meeting **acknowledged** the results of the Hyderabad Meeting and **endorsed** its proposed work plan (attached as Annex-1). The meeting **recalled** the importance of Capacity building as the basis for the achievements of IOGOOS objectives in terms of Data and Information Management and **recognized** the importance of ODINCINDIO as the Capacity Building Instrument for IOGOOS. The meeting **noted** that the ODINCINDIO planning meeting will be held in Tehran in August 2004.

Other priorities for the action plan for the period of 2004-2005 were identified as: completing the survey on the assessment of current Data and Information Management capacity of the region; formation of an e-group for IOGOOS; establish a clearing house mechanism and start services for the IOGOOS Members on the internet.

The meeting **strongly welcomed** the close collaboration between IOGOOS, IOCINDIO, IOCINCWIO and IODE on the advancement of Data and Information Management capacity in the Indian Ocean region.

In addition to the Hyderabad Workshop Work plan, the following are some of the priority actions to be taken up during 2004-05.

Sl. No	Action	Time line	Action Coordinator
8.2.1	Setting up the DIM e-group	May 2004	IOGOOS Secretariat
8.2.2	Clearing House for Data & Information management: Generate a Draft Work plan	June 2004	IOGOOS Secretariat
8.2.3	Start services for IOGOOS Members on the Internet	October 2004	IOGOOS Secretariat
8.2.4	Proposal on Regional Data Archive for Data & Information Management	December 2004	INCOIS
8.2.5	ODINCINDIO project formulation Meeting at Iran	August 2004	Dr. Nasser H. Zaker, Chair IOCINDIO
8.2.6	Complete the IOC Survey for Data & Info. Management		IODE

8.3 Remote Sensing Capacity Building Strategy- Report from Prof. Merv Lynch

Prof. Merv Lynch introduced this discussion and suggested several areas and approaches for fruitful discussion:

- Areas of contribution (e.g. prawn project, coastal ecosystems, coastal erosion, and climate)
- Remote sensing products (SST, fluxes, etc.)
- RS needs/capacity building (Oceanography: basic knowledge, physical/ biological basis of RS, in situ data)
- Project specific CB workshops (in R/S)
- Research projects (IO dipole; Kelvin waves; Subduction and upwelling)
- CB Inventory (Training packages for Workshops; Fellowships / higher degrees).

Meyers suggested that this covered most things and noted that fluxes were a real priority. Dr S Nayak emphasized the need for training in the use of products (e.g., interpreting ocean colour data) but also reasoned that IOGOOS should initially ensure the products (content) were there.

The group ultimately converged on some more specific projects. Following the suggestion of Prof Lynch in the Plenary session, they agreed that an initiative to develop an advanced high-resolution SST product for the Indian Ocean region would both meet identified needs across a range of areas and provide a framework for cooperation in delivering a unique product: a product that what be associated with IOGOOS. The approach would be similar to that taken by Prof H Kawamura for the NEARGOOS region and seek to blend polar orbiter infrared estimates (NOAA AVHRR, ENVISAT AATSR) with geostationary satellite estimates and microwave data. For the Indian Ocean, the focus might be shifted more to the resolution of the diurnal cycle and initially not be concerned with very high-resolution products. The upcoming July GHRSST meeting would provide an opportunity to outline plans. It would be possible to develop a work program on the time scale of the February meeting in Perth. Prof Lynch agreed to follow up on the first task.

It was also agreed that a regional ocean colour product should also be developed.

Following are some of the priority actions for 2004-05.

Sl. No	Action	Time line	Action Coordinator
8.3.1	Submit a proposal to the GHRSST Workshop (Townsville) addressing the need to initiate a GHRSST product for application in the Indian Ocean GOOS program	July 2004	M Lynch, N Smith, I Barton
8.3.2	Organise a Workshop (in cooperation with GHRSST) that focuses on the value that GHRSST products will play in IOGOOS ocean prediction (schedule the Workshop to coincide with the Indian Ocean Marine Environment Conference, Perth).	February 2005	M Lynch
8.3.3	Organise a CB Workshop on the Fundamentals of Oceanography as they relate to the interpretation of remote sensing data. The Workshop materials should be designed to be implemented in a web-based format for ease of future use. (location to be resolved)	April 2005	M Lynch, B McGann, G Meyers
8.3.4	Organise a Workshop on the physical basis of remote sensing of the oceans, the products and their application (South Africa)	July 2005	M Lynch, F Schillington, R Barlow

8.3.5	Organise a Workshop on remotely sensed biological products for use in coastal resource monitoring and management projects (Indonesia, Sept 2005)	Sept 2005	M Lynch, S Nayak and Tanaka san
8.3.6	Organise a Workshop on the use of high spectral resolution remotely sensed data in support of coastal resource management including applications to coastal erosion, mangrove mapping, coral reef monitoring etc (Hyderabad)	Feb 2005	Shailesh Nayak
8.3.7	Collaborate with the current pilot projects on sustainable prawns fisheries and sustainable ecosystems in the delivery of prescribed remote sensing Workshops (see the individual project descriptions).	Time schedule identified elsewhere	M Lynch, S Nayak, T Forbes and G Wagner
8.3.8	Completion of report for the Five-Year Strategy for Remote Sensing Capacity Building	July 2004	M. Lynch, S. Nayak, Tanaka san, N. Zaker, F. Shillington, R. Barlow

8.4 MILAC Pilot Project- Report from Dr. Radhakrishnan

It was suggested that IOGOOS may endorse MILAC-India, with the proviso that the efforts of the pilot project would not only result in operational capability but also the knowledge base would be adaptable for the entire region.

8.4.1	Initiation	Dec 2004	

8.5 The development of monitoring and management systems for the shallow water penaeid prawn resource in the Indian Ocean integration of the effects of human impacts and climate change on a natural resource in the coastal zone- Report from Prof. A. T. Forbes:

A major outcome of the inaugural meeting of the Indian Ocean Global Ocean Observing System (IOGOOS) held in Grand Baie, Mauritius in November 2002 was the incorporation of a coastal component into what had historically been a programme aimed at oceanic processes. This developed out of a survey of Indian Ocean rim and island countries in which representatives were asked what they considered to be major coastal environmental problems. These were then, by consensus, reduced to three, *viz.* biodiversity loss, coastal erosion and sustainability of fisheries. Committees were then constituted which would deal with each of these topics.

After consideration by the relevant committee the sustainable fishery issue was focused on the shallow water prawn resource. This was done for several

reasons including the value of the resource, the ease of human access to the stocks by virtue of the use of shallow inshore waters and estuaries by the juvenile stages, the general existence of catch data as a measure of population fluctuations, and the perception of the significance of the physico-chemical components of the environment in the population dynamics of these species. The latter aspects are of significance because of the historical focus of the GOOS programmes on environmental monitoring and the choice of the prawns as a focus of the programme imparted an immediate added value and relevance to these data. It also brought the proposal into the realm of the IGBP interest in global climatic change and the effects of such changes on, *i.e.* biological and ecological processes.

The first step in the development of the programme involved the formation of a network of prawn researchers in the Indian Ocean rim and island countries. On the basis of interest shown by various researchers at the Mauritius meeting, complemented by subsequent contacts, an exploratory workshop funded by the IOC was held in Perth, Australia in November 2003. This was attended by representatives from Australia, Bangladesh, India, Kenya and South Africa, all of whom gave presentations on the prawn fisheries and aquaculture situations in their particular countries. Possible lines of development of the programme were discussed in detail and a possible plan of action drawn up. A record of the proceedings of this workshop has been synthesised and has been circulated in draft form to the participants and will be made available on the IOGOOS website. This will include the presentations given by the participants. It is intended that this be completed by the end of May 2004.

Amongst the recommendations arising out of the Perth workshop was a resolution that a network of prawn researchers and institutions be set up linking all Indian Ocean rim and island countries where there were commercial prawn resources. Additional contacts in Tanzania were established following the Perth workshop and contacts in Sri Lanka and Iran during this workshop in Colombo, Sri Lanka. In addition a letter detailing the rationale and benefits of the project would be drafted by Prof Forbes and Dr Jim Penn (Western Australia Fisheries) and circulated to all Indian Ocean rim countries with potential interest in the project.

It was further agreed that a website be created which would incorporate the following information:

- Map of region – institutions and people with interests, links and expertise relating to penaeid prawns
- Species involved
- Types of fisheries - techniques, fleets
- Summary fact sheet for each area
- Institutional arrangements
- Bibliography – information & literature pertaining to penaeids on a region specific basis
- Oceanic events influencing prawn resources – e.g. currents, water temperature etc.
- Upcoming events, recent publications

This was discussed at the IOGOOS ll meeting in Colombo, Sri Lanka in April 2004 and a commitment was made that the network and website be completed by the end of 2004.

Substantial discussion at the Sri Lankan meeting was devoted to the potential and feasibility of the use of remote sensing techniques in monitoring of environmental parameters of possible significance to prawn population dynamics. This technique was also mooted as being of potential significance to the other two coastal IOGOOS pilot projects on costal biodiversity and shoreline dynamics. It was felt that the executive committee responsible for the coastal projects should meet in a preliminary consideration of the parameters relevant to the coastal projects. This would then be followed by a workshop on remote sensing techniques which, depending on finances, would possibly involve contributors to all three coastal projects. The details, including location and date of the workshop, which would be run by Dr. Merv Lynch of Curtin University of Technology in Perth, remain to be resolved.

In summary the short term goals for the various implementation modules of the project (to be completed by the end of 2004) are:

Sl. No	Action	Time line	Action Coordinator
8.5.1	Generate the report of the Perth Workshop	end of May 2004	A T. Forbes
8.5.2	Circulation of a letter to the Indian Ocean rim countries and islands with prawn resources and establishment of a Network of participants	Dec 2004	A T. Forbes
8.5.3	Development of the Website	Dec 2004	A T. Forbes
8.5.4	A capacity building workshop in remote sensing techniques with a directed focus for prawn fisheries to be arranged in collaboration with Dr Merv Lynch		A T. Forbes

The medium term goal would be primarily the development of a detailed project proposal which could be circulated to various national funding agencies as well as organisations such as IOC, ONR and World Bank.

The long term goals would be the implementation of this project with the collection of appropriate parameters in various countries around the Indian Ocean rim to improve management and predictions of change with regard to prawn fisheries in the region.

8.6 Multi-scale monitoring and mapping of keystone ecosystems through remote sensing and participatory in-situ operations-Report from Dr Greg Wagner

Justification: Keystone coastal ecosystems are, by definition, very important components of the ocean and affect the health and well-being of the entire marine environment. The primary keystone ecosystems in the Indian Ocean region are coral reefs, mangrove forests, seagrass beds and rocky shores, which have been partially or severely degraded in most countries and which have therefore been selected as the targets of this project. Monitoring of these

ecosystems will facilitate their proper management, which can have significant positive impact on the entire coastal/marine environment.

Goal or Development Objective: The goal of this project is to take a regional approach to rapidly detecting changes and making timely predictions of changes in high priority phenomena of interest in coastal waters, namely, keystone ecosystems and their biodiversity. Relevant information will be provided to environmental managers and coastal resource users.

This project is compatible with the goals of the coastal module of GOOS, focussed particularly goals 2, 3, 5, and 6 (The Integrated, Strategic Design Plan for the Coastal Ocean Observations Module of the Global Ocean Observing System, presented at the First IOGOOS Conference, Mauritius, 4-9 November 2002).

General Methodology: This project will be a multi-scale operation involving, firstly, large-scale remote sensing over wide areas; secondly, detailed remote sensing in particular areas of interest; and thirdly, community-based or participatory monitoring *in situ* at selected sites. Measurements at all three levels of monitoring will be repeated on a regular basis over time.

Outputs and Long-Term Sustainability: Data from all levels of monitoring will be fed into GIS databases and processed to obtain a number of valuable outputs, including maps, baseline information, detection of change over time and predictions about future changes. Interpretation of these outputs will result in outputs at a higher level such as recommendations for management and/or further research, as well as information that can be used to increase environmental awareness of the respective communities.

At the completion of the project, the work of monitoring the keystone ecosystems will be taken over by the governments and/or research institutions of the respective countries. Therefore, the relevant government departments and institutes must be engaged at an early stage in the project so that they become aware of the benefits available and the commitment required and will come to regard monitoring as a routine part of government business.

Progress over the Past Few Months: Over the past few months, considerable progress has been made in developing the proposal. There has been input by email. In addition, the project was presented at the First Workshop on Coastal and Marine Biodiversity of Indian Ocean organized by Census of Marine Life (CoML) at Goa, 12-15 December 2003, where it was well received. Therefore, it is proposed that the project be considered as a joint IOGOOS/ CoML project.

Progress during the IOGOOS Workshop at Colombo, 26-29 April 2004: It is gratifying that significant progress was made during the workshop in terms of valuable input by additional countries, new commitments to undertake the project, recruitment of individuals and exchange of information.

The main inputs/changes in the proposal as a result of this workshop included a new title, so that it mentions the purpose of the project as being to facilitate sustainable management; improvements in methodologies on remote sensing, identification of possible sources of funding, the necessity of linking data from the climate community, particularly, temperature, salinity, turbidity, sea level, etc., which all affect ecosystem health and area coverage.

Countries interested in undertaking the project increased from 4 to 11. These include Australia, Bangladesh, India, Iran, Kenya, Mauritius, Reunion, South Africa, Sri Lanka, Tanzania and Thailand. Most of these provided basic information during the meeting about their country implementation plan.

The Way Forward: During the workshop, the following schedule of events was agreed upon for 2004/05:

Sl. No	Action	Time line	Action Coordinator
8.6.1	Complete draft proposal and country implementation plans	August 2004	Greg Wagner
8.6.2	Hold regional Workshop (to be attended by two or more experts from each country) to agree on methodologies, sites, equipment required, budget and implementation strategies and finalize the proposal	Dec 2004	Greg Wagner
8.6.3	Produce final proposal and send it to funding agencies	January-February 2004;	Greg Wagner
8.6.4	Once funding is obtained, launch the project with a capacity building workshop, with separate sessions on remote sensing, coral reefs, mangrove forests, seagrass beds, and rocky shores for standardization of techniques and training of trainers; as well as plenary sessions so that these groups can interact and make project implementation more coherent.	end of 2005	Greg Wagner

During the next five-year period, the following main steps to be undertaken would be:

- Training of trainers in each country, including both training of junior scientists at the national level and training of community members in the field at monitoring sites,
- Monitoring of keystone ecosystems once per year in all countries,
- Remote sensing at least once per year, with selected variables being obtained more often,
- Analysis of data,
- Writing a full report including management recommendations directed at improving government policies at all levels.

8.7 Report on the Development of the Pilot Project on Shoreline Change- Report from Dr. Nalin Wikramanayake

Introduction: Coastal erosion was identified as one of the critical problem in the coastal areas by the participants at the first meeting. As the position of the shoreline is one of the key variables identified by the COOP program it was

decided that a pilot project on monitoring of the shoreline should be developed under IOGOOS. The aim of the project is to establish a Regional Network to quantify, understand and predict shoreline change

The objectives of the project are as follows:

- To assess historical data on shoreline change, establish trends and place these in the context of coastal geomorphology, hydrodynamic regime and natural and anthropogenic drivers of change.
- To establish an adequate, cost effective system to monitor changes in the shoreline and coastal morphology.
- To develop a quantitative understanding of coastal processes and the relationship between shoreline change and the various natural and anthropogenic drivers.
- To develop the ability to make predictions of shoreline change due to extreme events

Progress since last meeting: An e-group was set up to facilitate discussions, information sharing and project development. A request for preliminary country information on existing monitoring, coastal zone management framework and current knowledge of coastal processes was circulated to all the participants in the coastal section of the first meeting. However, progress has been minimal due to the limited response to these requests.

Discussions at the 2nd Annual Meeting

Project Title: The title of the project was changed from "Coastal Erosion" to "Shoreline Change" to reflect the fact that all shoreline changes are of interest, even though it is erosion that has the most immediate impact.

Expansion of network: It was decided to develop a network of contact persons and institutions in the region who are interested in participating in this project. These contacts would then undertake the task of filling in the required details of the coastal zone management framework, state of knowledge of coastal processes and existing monitoring programs for the respective countries. Compilation of this information would be a "ticket" to further participation in developing the project proposal. Some of those attending the conference volunteered to compile the information of to identify contact persons.

Methodology: It was decided that the methodology to be adopted to monitor shoreline changes should conform to the guidelines and specifications being developed by the COOP panel. However it was recognised that the requirements of the methodology – in terms of cost, equipment and training – should be within the capabilities of the countries concerned. Therefore the committee developing the proposal will initiate contact with the COOP panel in this regard.

Data Needs – Remote Sensing, In-situ and Global Model Results: Two types of remotely sensed data will be required for this project. The first type is high-resolution data on shoreline change while the second is lower resolution data on wind and waves. The second category can be supplemented by the output of global climate models, particularly for the case of wind data. It was noted

that wave and wind statistics compiled from such sources are already available commercially for the region. Local measurements of waves and wind are needed to validate the hydrodynamic models.

Capacity Building Needs: Several capacity building requirements were identified during the discussions. One of the first steps toward predicting shoreline change is to use historical data to obtain an understanding of on-going coastal processes in the context of geomorphology and forcing. There appears to be a wide disparity in the state of knowledge of coastal processes among the countries in the region. Capacity building is also needed to process and interpret remotely sensed data and to model shoreline changes using data on ocean wind and waves.

Pilot Project in Sri Lanka: In response to the severe coastal erosion that has taken place over the last three decades, many of the activities envisaged by the project – including assessment of historical data, obtaining a qualitative and quantitative understanding of coastal process and modelling nearshore hydrodynamics – have been carried out in Sri Lanka. A detailed baseline for monitoring shoreline change has also been set out. However, continuous, detailed monitoring by the responsible central authority is not feasible due to the costs involved. Therefore it was decided to undertake a pilot monitoring program using the resources available at the local level such as tourist hotels, fishery harbours and coastal communities.

Links to other Panels in IOGOOS: Several connections between the requirements of this project and the activities planned by other panels under IOGOOS were discussed. The prediction of shoreline change, particularly in response to extreme events, is one of the "customers" of the operational oceanography that is the ultimate goal of the climate panel. The project has many requirements related to capacity building in processing and interpreting remotely sensed data. It was also recognised that the creation of a "clearinghouse" for all available data on the winds and waves in the Indian Ocean – whether from satellites or global models – would be a very useful step in stimulating work through out the region in linking observed shoreline changes to the ocean climate.

Action plan for next year: The following actions and deadlines were decided upon for the 12 months following the meeting.

Sl. No	Action	Time line	Action Coordinator
8.7.1	Develop a network of contacts, institutions and countries interested in participating in the project	August 2004	Nalin Wikramanayake
8.7.2	Obtain information on the coastal zone management framework, state of knowledge of coastal processes and existing monitoring programs for these countries	December 2004	Nalin Wikramanayake
8.7.3	Interact with the COOP panel to develop suitable and feasible methodologies for monitoring	April 2005	Nalin Wikramanayake

8.7.4	Identify the relevant remote sensing data and products	August 2004	Nalin Wikramanayake
8.7.5	Initiate shore line change monitoring system in Sri Lanka	October 2004	Nalin Wikramanayake
8.7.6	Plan the next project development meeting, which may coincide with the next IOGOOS meeting	Along with the annual meeting of IOGOOS.	Nalin Wikramanayake

Outlook for the future: Looking beyond the one year period covered by the action plan outlined above, the following activities are anticipated over the next few years.

- Capacity building workshops in the assessment of shoreline change using existing data, use of remote sensing data to quantify shoreline change and modelling of nearshore hydrodynamics using large scale ocean data – 2005/2006
- Final project proposal development workshop – late 2005
- Initiation of project – late 2006 or beyond

The actual project would have duration of five to seven years. It is expected that the first year of project implementation would involve the final selection of sites, training of personnel involved in monitoring, quality control and data management and setting up a regional data sharing network. Monitoring would begin late in the first year and products would be available by the end of the second year. Acquiring and interpreting remotely sensed data on shoreline change would also begin in the first year while development of a capability to predict shoreline change would begin in the second or third year.

8.8 GOOS Regional Alliances Networking Development (GRAND)

8.8.1	Survey among IOGOOS Members as part of WP1 of GRAND		IOGOOS Secretariat

9.0 Concluding Session

Chair: Dr. Radhakrishnan, Chairman IOGOOS

IOGOOS-II endorsed the summary reports and action plan presented under paragraph 8 and requested the Action Coordinators identified therein to pursue the actions in consultation with all concerned. Further, IOGOOS II adopted the Meeting Statement that is attached as Annexure-2

The list of participants and Meeting Agenda are attached as Annexure 3 & 4 respectively.

Annex-1

Work Plan of the Workshop on Capacity Building & Strategy for Ocean Data and Information Management held at Hyderabad during December 8-10, 2003

Work Plan includes the following elements:

- Regional coordination and communication
- National contact points; National Surveys and Services
- Dissemination of existing standards and policies
- Capacity Building
- Funding Sources
- Future Meetings

Regional coordination and communication

Action	Action by	Time line
Strengthen IOGOOS Secretariat for Coordination-	IOGOOS Secretariat	
Form an e-group for IOGOOS DIM and coordinate the E-Group (1)	IOGOOS Secretariat	2004
Enhance Bandwidth (> 1 MB) in all NODC's	Respective Agencies	
Set up Domain for IOGOOS for GTS and provide data to members (To be Discussed at JCOMM).	IOC Secretariat	2004
Study the need for a Secure Regional Archive	IOGOOS Secretariat	Report by end 2004
Organize meeting on data and information management at 1st day of IOGOOS Annual meeting	IOGOOS Secretariat and Dr. Zaker	April 2004

(1) IOGOOS Secretariat will set up an e-group on Ocean Data & Information management in the Region. This group will among other issues also discuss on the following items:

- Study the Standard Formats including Meta data format, QC, Integrity, Version control etc.
- Identify Data Exchange Mechanisms as well as regional service/application providers
- Study the National Data Archival policies in the Region and suggest a policy for IOGOOS
- This working group could work by e-mail and identify (i) standards and methods to be used by all members, (ii) data exchange mechanisms
- Set up Domain for IOGOOS for GTS and provide data to members

Establishment of a Coordination Mechanism (contact points); Surveys and Services

Action Item	Action by	Time line
Identify National Contact points- Letter from Executive Secretary, IOC for Commitment from Member States to participate in the DIM initiative.	Mr Pissiersens to follow up	2004
UN Agencies and other Regional bodies (Asian Development Bank, NORAD, GTZ, etc) to be invited by IOC to be partners in the DIM initiative.	Mr Pissiersens to follow up	2004
Setting up and meeting of National coordination Committees- IOC Secretariat to send out a letter.	Mr Pissiersens to follow up	2004 Before IOGOOS II
Report of the National coordination Committee set up by Mauritius report to be obtained from Mr. Beebeejaun & circulated to the Members	IOGOOS Secretariat	2004 Before IOGOOS II
Conduct National Level Surveys (1) [Note: (a) Use the results of survey conducted by Mr. Greg Reed; (b) Information Management Capacity Assessment Questionnaire to be provided by Dr. Murari Tapaswi]	Dr. Zaker	T = 6 Months (June meet at Paris to take review)
Start Services on Internet to IOGOOS Members (2)	IOGOOS Secretariat to coordinate	2004

(1) Conduct a survey of the Indian Ocean Countries for addressing the following issues:

- Capacity Assessment for Ocean Data and Information Management
- National/Regional Problems of Interest
- Services/Products of Interest
- Partners
- Ocean Data & Information management Capabilities
- National Data Archival Policies
- Band Width available in the Countries (telecom /satellite link)

(2) It was decided to start delivering products/services to IOGOOS Members on the Internet. IOGOOS Secretariat was requested to coordinate by sending requests to organisations in the Region who are capable and willing to provide products/ services such as the following:

- Capacity Assessment for Ocean Data and Information Management
- OCM/SST processing S/W (India)
- PFZ know how and training -India(Cost TBD)
- OSF –India (Cost TBD)
- Open source S/W such as GRASS
- DDB, Meta data and Visualisation tools

Dissemination of existing standards and policies

Action Item	Action by	Time line
Study the Standard Formats including Meta data format, QC, Integrity, Version control etc.	By e-Group (Coordinator for group)	Before May 2004 Preliminary Report
JGOFS Protocols and IODE Formats to be circulated	IOGOOS Secretariat in cooperation with JCOMM/IODE ETDMP	Before May 2004 Preliminary Report
Study the National Data Archival policies in the Region and suggest a policy for IOGOOS	By e-group	April 2004 (Review by DIM Group in IOGOOS-II)
National Policy for Data dissemination. IOC to send out a letter to member-states	IOC to follow up	2004
Data repatriation: IOC to send out a letter and contact Member States	IOC	Could be addressed in IOGOOS-II; Action to be completed by 2005
Incorporate the feedback from IOP-Ocean & Climate and COOP on the parameters required for each of the regional applications identified	Dr. Ravichandran (IOP) Dr. Aarup (COOP)	

Capacity Building

Action Item	Action by	Time Line
Modelling and Data assimilation		
Request POGO for fellowships- IOGOOS Secretariat to write to POGO and IOC	IOGOOS Sec	2004
Identify higher education programmes in the region: One month training programme in a country. Start with learn how to run models (Australia & India-short-term). Approach JCOMM under capacity building.	Mr Pissiersens to follow up	2005

Data & Information Management

D & IM Training (ODIN+ Cycle)	Mr. Pissiersens Dr. Zaker	2004-07
Experts Exchange and Visiting Scientist programme Has to be linked to the CB initiatives. Identify the requirements of IOGOOS. Link this with all the pilot projects that are being submitted.		2004-07

Prepare ODIN proposal for IOGOOS	IOGOOS Secretariat, Dr. Zaker, Mr. Pissierssens	2004-07

Remote Sensing Capacity Building

Training in RS applications in Oceanography funded by IOC, Perth and IOCCG in July 2004. To explore the possibility of having annual training programmes in 2005, 2006 & 2007 also	Prof. Merv Lynch	July 2004
Training in Satellite Oceanography in India	IOGOOS Secretariat To follow up.	2005
Arrange for BILCO training of IOC	IOGOOS Sec to follow up.	2005

Funding Sources

Action Item	Action by	Time Line
Invite UN agencies and other Regional bodies (Asian Development Bank, NORAD, GTZ, etc) to IOGOOS-II.	IOGOOS Secretariat to send out letters	2004
Invite potential Funding agencies for IOGOOS-II	IOGOOS Secretariat. Send to invitations to all IOGOOS -2	2004

Future Meetings

Action Item	Action by	Time Line
ODINCINDIO Planning meeting and Drafting project proposal	Dr. Nasser to coordinate with IOGOOS sec.	2004
RS strategy paper underway by a WG. To meet in February 2004 at Kuala Lumpur (15,000 USD is being funded by IOC Perth)	Prof. Merv Lynch	2004
Have back-to-back meetings of D&IM along with IOGOOS Annual Meetings		
IOP meeting (2005) to have a W/S on DM along with the IOGOOS-III. Inform Meyers. Seek agreement.		2005
Evaluation of Pilot projects , along with IOGOOS-III-Exhibition		2006
Formulate 7-year Plan 2007-14	IOGOOS	2007

Annex-2

Colombo Statement-April 29, 2004

Over the last 18 months since its formal launch at the First Indian Ocean Conference held at Mauritius in November 2002, IOGOOS has taken a place of pride among the GOOS Regional Alliances. The membership of IOGOOS has grown from 19 to 21 institutions from 13 countries. IOGOOS has now been endorsed by the Intergovernmental Oceanographic Commission of UNESCO as one of the nine GOOS Regional Alliances.

The Second Annual meeting (IOGOOS II) held at Colombo during April 26-29, 2004 agreed on a detailed action plan and on the implementation of several initiatives.

IOGOOS is providing a focus for the region, developing cooperation and opportunities for synergy among members, and creating the ability to take advantage of global initiatives such as Global Ocean Data Assimilation Experiment (GODAE), Climate Variability and Predictability Programme (CLIVAR) and *Argo*. IOGOOS is playing an important regional role in terms of observations and associated research, using pilot projects and focussed initiatives to enhance the capacity and productivity of the region. It is facilitating regional cooperation with research programs such as CLIVAR and Land Ocean Interactions in the Coastal Zone (LOICZ).

IOGOOS has been instrumental in the formation of the Indian Ocean Panel (IOP) to address the ocean and climate observing system in the region. The first meeting of IOP held at Pune in February 2004 assessed the state of the observing networks. IOGOOS members have played a key role in *Argo* deployments and in enhancing the tropical moored buoy array. The IOP is operated jointly with CLIVAR and is providing an energetic and effective link to the climate research community. An implementation plan will be prepared during 2004-05, including extension of the mooring array, assessment and review of the ship of opportunity program, and initiating a series of observing system experiments.

The IOGOOS II meeting endorsed the recommendations of the IOGOOS Workshop held at Hyderabad in December 2003 and decided to create a Regional Data Centre at the Indian National Centre for Ocean Information Services (INCOIS), to provide a focus for data assembly and distribution activities. The Centre will also develop a clearinghouse for the region to allow members to efficiently and effectively exploit observations and products from the region. The delivery of key information to users will be expedited.

IOGOOS is working within the framework of the GOOS Coastal Panel and taking responsibility in collaboration with that Panel in the implementation of initiatives within the region, including contributions to the measurement of key common variables and testing of common methodologies.

The IOGOOS project on monitoring of keystone coastal ecosystems is directly addressing issues concerning degradation of seagrass beds, coral reefs and mangrove forests. It was recognized that a coherent and coordinated approach can deliver improved management policies and mitigate impacts. A draft proposal has been prepared based on the recommendations of the Census of Marine Life (CoML) Workshop held at Goa during December 2003 to ensure community participation in the measurement/monitoring of variability and change in these important ecosystems.

The IOGOOS prawn project is addressing the risks and opportunities facing the prawn industry and establishing a network and website, and pooling the expertise to gather observations and improve understanding of the issues.

IOGOOS is addressing issues of coastal change and developing a network of people and countries to examine shoreline position changes in a coherent and systematic way. A pilot project to be undertaken in Sri Lanka will interact with the broader GOOS community and demonstrate methodologies.

The IOGOOS II meeting recognised the urgent need for satellite products and associated capacity building, through all activities, and agreed to assist in the development of enhanced SST products as well as other products for the coastal and biological community.

The IOGOOS II meeting noted that the Secretariat at INCOIS, Hyderabad has been energetic, competent and proactive in supporting the activities of IOGOOS, in cooperation with the IOC Perth Office. With the support of the Department of Ocean Development, India the Secretariat has grown significantly supporting various activities such as data management. The Secretariat has developed an informative web site that is providing effective communication for the region

IOGOOS welcomed the international adoption of a data policy that will enhance the timely exchange and utility of observations. The meeting agreed to test the implementation of the IOC's data policy and to demonstrate the advantages that accrue to the region from such an approach.

IOGOOS will give specific attention to enhancing the capacity of the region and developing a coherent education and training program.

The meeting, above all else, demonstrated that IOGOOS has developed a community spirit for the region, a "oneness" among all agencies and participants for the benefit of the entire region.

The meeting acknowledged the gracious financial support provided by the IOC for organising IOGOOS II. The meeting also thanked the Government of Sri Lanka for hosting and supporting the IOGOOS II through its National Aquatic Resources Research and Development Agency.

Annex-3

Agenda for IOGOOS Workshop and Second Annual Meeting (IOGOOS-II) April 26-29, 2004 at Colombo, Sri Lanka

April 25, 2004 (Sunday)

- Informal Meetings
- 1900 Ice Breaker (Taj Samudra)

April 26, 2004 (Monday)

0900-0930	Registration	
0930-1645	Preparatory Meeting of Working Groups/Panels	
	Activity	**Coordinator**
0930-1015	• Indian Ocean Panel on Climate	Dr. Gary Meyers, Australia
1015-1100	• Data Management	Dr.Nasser H Zaker, Iran
1100-1115	Tea/Coffee	
1115-1200	• MILAC Pilot Project	Dr. Radhakrishnan, India (on behalf of Dr. Johannes Guddal, Co-chair, JCOMM)
1200-1245	• Remote Sensing Capacity Building Strategy	Prof. Merv Lynch, Australia
1245-1400	Lunch	
1400-1445	• Penaeid Prawn Pilot Project	Prof. Ticky Forbes, South Africa
1445-1530	• Coastal Ecosystems	Dr Greg Wagner, Tanzania
1530-1615	• Coastal Erosion	Mr. Santaram Mooloo, Mauritius
1615-1630	Tea/Coffee	
1630-1730	Meeting of IOGOOS Officers 1. Review Agenda for IOGOOS II Annual Meeting. 2. Discuss Term of Office of serving Officers/Election of Officers for 2004-06. 3. Assign Officers' responsibilities for this meeting and interim session. 4. Assigning an Officer to review the Financial statements 5. Discuss issue of funding for Annual Meetings 6. Guidelines for formulation of Plan for 2004 – 2005 7. Any other item.	
	1930: Dinner (Taj Samudra)	

Opening Ceremony

April 27, 2004 (Tuesday)

0855-1000	**Opening Ceremony**	
0855 Hrs	Welcome	Mr. A.R.N Amaratunga, Secretary, Ministry of Fisheries & Ocean Resources, Sri Lanka
	Inaugural Address	Mr. Lalith Wikramaratne, Secretary to Hon. Prime Minister of Sri Lanka
	Opening Remarks	Dr. K. Radhakrishnan, Chair, IOGOOS and Vice Chair, IOC
	Remarks	Mr. William Erb, Head, IOC Perth Office

	Remarks	Dr. Neville Smith, IOGOOS Officer
	Remarks	Dr. Johnson Kazungu, IOGOOS Officer
	Remarks	Prof. Ticky Forbes, IOGOOS Officer
	Remarks	Dr. Nasser H. Zaker, Chair, IOCINDIO
	Remarks	Dr. Mika Odido, Head, IOCWIO Project Office
	Vote of Thanks	Dr. Kamal Tennakoon, Director General NARA
	Inauguration of Exhibition	
1000-1030	High Tea	
1030-1300	Plenary Session 1-Invited presentations 20 minutes presentation followed by 5 minutes discussion each Chair: Dr. Tickie Forbes, IOGOOS Officer	
1030-1055	• Effect of Salinity on SST	Dr. Satish R. Shetye, India
1055-1120	• Oceansat II	Dr. Shailesh Nayak, India
1120-1145	• GODAE	Dr. Neville Smith, Australia
1145-1210	• Ocean Modelling for Monsoon Applications	Dr. Andreas Schiller, Australia
1210-1235	• Coastal GOOS	Mr. William Erb, IOC
1235-1300	• New LOICZ & Draft science plan for the next 10 years	Dr. Martin Le Tissier, UK
1300-1400	Lunch	
1400-1600	IOGOOS-II Annual Meeting (including Induction of New Members) 1. Report by Chairman IOGOOS 2. Welcoming and recognising New Members a. University of Dar-e-Salam, Tanzania b. Indian Space Research Organisation 3. Secretariat Report on Activities since November 2002 4. Accounts & Financial Summary (Nov 02 -April 04) 5. Annual Dues 6. Potential New Members 7. Funding Mechanism for Future Annual Meetings 8. Appointment of Officers for the Term November 2004-November 2006 9. Guidelines for Summary Action Plan and Meeting Statement	
1600-2000:	Working Group Meetings/Social Visits	
2000:	Dinner	

April 28, 2004 (Wednesday)

0900-1300	Parallel Sessions-Working Groups/Panels	
	Parallel Session 1 Chair: Dr. Neville Smith, IOGOOS Officer	Parallel Session-2 Chair: Dr. Johnson Kazungu, IOGOOS Officer
0900-1015	• Indian Ocean Panel on Climate (Dr. Gary Meyers)	• Penaeid Prawn Pilot Project (Prof. Ticky Forbes)
1015-1130	• Data Management (Dr.Nasser H Zaker)	• Coastal Ecosystems (Dr Greg Wagner)
1130-1145	Coffee/Tea	

1145-1300	• Remote Sensing Capacity Building Strategy (Prof. Merv Lynch	• Coastal Erosion (Mr. Santaram Mooloo)
1300-1400	Lunch	
1400-1430	MILAC (Dr. K. Radhakrishnan)	• GRAND Execution Plan (Mr. Srinivasa Kumar)
1430-1530	Plenary Session-2 Chair: Dr. Radhakrishnan, IOGOOS Chair	
1430-1450	• Presentation of the activities of IOCWIO	Mr. Mika Odido, IOCWIO
1450-1510	• Presentation of the activities of IOCINDIO	Dr. Nasser H Zaker, IOCINDIO
1510-1530	• Geo & Japanese Monsoon Experiment	Dr. Sidney Thruston
1530-1600	Coffee/Tea	
1600-1800	IOGOOS Plenary (Members Only) 1. Secretariat to present Budget for April 04- April 05. 2. Decide Funding Mechanism for Future Annual Meetings 3. Strategy for Mobilisation of Funding for implementation of Pilot Projects/Studies 4. Election of Officers 5. Discuss Date and Venue for IOGOOS-III	

April 29, 2004 (Thursday)

0930-1100	Plenary Session-3: Working Group Coordinator's Summary Report Chair: Mr. William Erb, IOC Perth Office	
0930—0940	• Indian Ocean Panel on Climate	Dr. Gary Meyers, Australia
0940-0950	• Data Management	Dr.Nasser H Zaker, Iran
0950-1000	• MILAC Pilot Project	Dr. Radhakrishnan, India
1000-1010	• Remote Sensing Capacity Building Strategy	Prof. Merv Lynch, Australia
1010-1020	• Penaeid Prawn Pilot Project	Prof. Ticky Forbes, South Africa
1020-1030	• Coastal Ecosystems	Dr Greg Wagner, Tanzania
1030-1040	• Coastal Erosion	Mr. Santaram Mooloo, Mauritius
1040-1100	• Discussions	
1100-1130	Coffee/Tea	
1130-1230	Concluding Session	
1130-1135	• Introductory Remarks	
1135-1145	• Summary of Action Plan 2004-05 for IOGOOS	
1145-1200	• Adoption of Meeting Statement and Action Plan 2004-05	
1200-1205	• Presentation of Mementos	
1205-1210	• Vote of Thanks	
1210-1215	• Closing the Meeting	
1215-1300	Lunch	

Annex-4

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ACKNOWLEDGEMENT

IOGOOS wishes to acknowledge the Financial/ Logistical support provided by the following organizations (in alphabetical order) for successful organisation of the IOGOOS Workshop and Second Annual Meeting.

- Department of Ocean Development (India)
- Intergovernmental Oceanographic Commission (IOC)
- National Aquatic Resources Research and Development Agency (Sri Lanka)

Also, IOGOOS wishes to thank all the participants including invited experts for their excellent contributions.

Inauguration of the IOGOOS Workshop and Second Annual Meeting (IOGOOS II)

Dignitaries from Left to Right: Dr. Nasser H Zaker, Chair IOCINDIO; Dr. Johnson Kazungu, IOGOOS Officer; Mr. William Erb, Head IOC-Perth Office; Mr. A.R.N. Amaratunga, Additional Secretary, Ministry of Fisheries and Ocean Resources, Sri Lanka; Dr. K. Radhakrishnan, IOGOOS Chairman; Dr. Lalith Weeratunga, Secretary to the Honourable Prime Minister of Sri Lanka; Dr. Neville Smith, IOGOOS Officer; Prof. A. T. Forbes, IOGOOS Officer; Mr. Mika Odido, Head IOCWIO Project Office

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