



Proceedings of the IOGOOS Workshop and 10th Annual Meeting

Striving for an Enhanced Ocean Observation Network

**October 21 - 24, 2013
Port Louis, Mauritius**



2013

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1. OPENING CEREMONY

1.1. Welcome by Host

Mr. Rezah Badal, Head, Ocean Matter's Unit, Prime Minister's Office, Mauritius has welcomed the delegates of IOGOOS on the behalf of the Mauritius Government. Mr. Rezah recollected that IOGOOS was formerly established in Mauritius in 2002 and welcomed the IOGOOS community

1.2. Welcome by Dr. Andreas Schiller, Chair, IOGOOS

Dr. Andreas Schiller, Chair, IOGOOS welcomed the distinguished delegates of IOGOOS, Chief Guest, Mr. M. Seebah, Permanent Secretary, Prime Minister's Office of the Republic of Mauritius, Mr. Ashok Kumar, Deputy High Commissioner of India, Dr. Rezah Badal, Head, Ocean Matter's Unit of Prime Minister's Office of Mauritius, directors of national institutes of Mauritius and officials of the Government of Mauritius, IOC representatives, IOGOOS Officers and IOCINDIO officials. Dr. Andreas has briefed about the history and objectives of IOGOOS. Dr. Andreas recollected the series of annual meetings held at various locations in the Indian Ocean rim countries and thanked for the generous support extended by the then host institutes. Dr. Andreas also thanked Government of Mauritius for hosting this IOGOOS tenth annual meeting for the second time in the history of IOGOOS. Dr. Andreas also mentioned that this annual meeting is celebrating the 10th anniversary of IOGOOS and should be remembered as a successful decade for IOGOOS. The detailed welcome address by Dr. Andreas Schiller is attached as **Annexure 1**.

1.3. Welcome by Dr. Nick D' Adamo, Head, IOC/UNESCO Perth Regional Programme Office (PRPO)

Dr. Nick D'Adamo, Head, IOC Perth Regional Programme Office, spoke the welcome address with excitement and felt as privileged to be present in the wonderful and beautiful country to celebrate the IOGOOS 10th anniversary. Dr. Nick acknowledged MR. Seebah, the Permanent Secretary of the Prime Minister's Office of Mauritius, National Institutional Directors, Mauritius Diplomatic Corp, local guests and participants. Dr. Nick also thanked Dr. Rezah Badal of Prime Minister's Office for hosting the meeting and other distinguished delegates who have been involved through the decade journey of IOGOOS. Dr. Nick also recollected the notes of Dr. Wendy Watson-Wright - we have now a functioning GRA 'family' defined by IOGOOS and its related programmatic and project entities, which performs a societally important role in the regions and for the globe in general - made during the IOGOOS integrated meetings held at Perth during 2010. Dr. Nick also thanked and appreciated the involvement and work done by past and present IOGOOS Chairs and officers, IOGOOS Secretary and India's INCOIS for supporting IOGOOS Secretariat and various other delegates involved in successful progress of IOGOOS. The detailed welcome address by Dr. Nick D'Adamo is attached as **Annexure 2**.

1.4.Keynote speech by Mr. William Erb, Former Head, IOC PRPO

Mr. William Erb, the former Head, IOC Perth Regional Programme office has recalled the creation of the IOGOOS from the initial thought process of GRAs concept to the signing of the MoU by countries within and outside the Indian Ocean. He briefed about the first conference of the Indian Ocean GOOS where the MoU signing ceremony by several countries was held with the active participation of 30 countries and 4 international organizations and with the participation of 170 delegates. Mr. Erb also recalled the evaluation of IOGOOS over a period of decade. Mr. Erb also commented on the first International Indian Ocean Expedition (IIOE) and briefed the audience about the plans of the planned IIOE-2 expeditions activities, etc. Mr. Erb also made few suggestions to consider as IOGOOS begin the process of planning for the next Indian Ocean Expedition and further development of IOGOOS itself. Mr. Erb ended his opening speech by wishing the team of IOGOOS a successful IIOE-II. The detailed opening speech by Mr. William Erb is attached as **Annexure 3**.

1.5.Address by Chief Guest Mr. M. Seebah, Permanent Secretary, Prime Minister's Office, Mauritius

Mr. M. Seebah, Permanent Secretary, Prime Minister's Office, Mauritius, on behalf of the Prime Minister's Office, welcomed the distinguished delegates of IOGOOS to its 10th annual meeting in Mauritius. Mr. Seebah felt that the meeting is fitting the most as it is meting again in Mauritius for its 10th anniversary. Mr. Seebah mentioned that the Government of Mauritius is aiming to foster ocean-related activities, a new growth pillar of the economy and briefed the audience about the implementation process. He recollected the IOGOOS key role in implementation of the various observation systems in the Indian Ocean region that contribute immensely to our knowledge of the Indian Ocean . Mr. Seebah expressed that IOGOOS could further expand its networks and will provide readily accessible information on the state of our ocean in the region. He recollected the International Indian Ocean Expedition (IIOE) conducted 50 years ago and the ongoing support of IOGOOS for the IIOE-2. Mr. Seebah, in this regard, assured that Mauritius will support for the realisation of this project on IIOE-2. He wished the delegates a very successful and fruitful annual meeting and workshop and declared the meeting opened. The detailed opening address by Mr. Seebah is attached as **Annexure 4**.

1.6.Organisation of the Meeting:

Dr. Andreas Schiller, Chair, IOGOOS, briefed the gathering about the organisation of the meeting and the details of the agenda and it's confirmation with the members. The agenda of the meeting is attached at **Annexure 5** and the list of participants **at Annexure 6**.

2. IOGOOS Decadal Celebrations - Plenary Science Talks (Chair: Dr. Andreas Schiller, Dr. T. Srinivasa Kumar and Dr. Yukio Masumoto)

2.1.IOP keynote speech on "Progress in Indian Ocean Climate research in a recent decade" by Dr. Yukio Masumoto

Dr. Masumoto talked about ocean-atmosphere coupling aspects of Indian Ocean. He stressed that the region is poorly sampled and thus we need to develop better understanding of the processes not only for IOR countries well-being but also for global scenario. However, he also made the point that in recent times the observations are increased manifold due to the IndOOS initiative. He talked about cyclone Nargis and its association with warm core eddies that were observed from significant heat flux, SST and SSH data. He also elaborated about the Indian Ocean Dipole (IOD)'s coupling with ENSO, especially with reference to Nino 3.4 region. Additionally he talked about subtropical dipole mode of Indian Ocean. Later, he addressed the variability in ocean-met observations before and after year 2000, to show the decadal trends. In summary, he put forth that the understanding of climate variations / climate systems in the Indian Ocean sector has significantly improved in the recent decade due to increased observations in the Indian Ocean, a major part of which is obtained by IndOOS. Dr. Masumoto ended his presentation stressing the need for the continual implementation and enhancement of the IndOOS that is essential for further advances in climate research and also in its societal applications.

It was enquired whether any kind of information is available on the cost estimate on climate impacts, cyclones in terms damage caused, etc. Delegates were informed that a report on the societal values of ocean observations in the Indian Ocean was made by Australian Institute of Technology where estimation were made on the societal benefits in the fields of fishery, oil and gas, engineering, etc.. It was also mentioned that in India, a survey at a national level was carried out to estimate the benefits of various oceanographic services such as Potential Fishing Zone (PFZ) Advisories, Ocean State Forecast, Weather Forecasts and the report could be made available if required.

2.2. The Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) Program: Progress, Challenges and Prospects for 2013 and Beyond by Dr. Somkiat Khokiattiwong

The take home message from Dr. Somkiat's presentation was that the SIBER program is flourishing in right direction. He first introduced SIBER program, its ideology and objectives and planning for the current decade. Then he gave an outline of Indian SIBER program as a national project and sub-project associated with that. He also talked about status of deployment as well as primary results of biogeochemical sensors across the Indian Ocean. Then he introduced to a SIBER/CSIRO initiative, which addresses the nutrient flux observation and modeling through Indonesian Throw-Flow (ITF). Finally, he presented the planning aspects of IIOE-2 expedition. In Summary, it was informed that the SIBER program, initiated in 2010 with the publication of the SIBER Science Plan and Implementation Strategy has been steadily gaining momentum; the Indian national SIBER program was fully funded and up and running with important results coming in; SIBER biogeochemical sensor deployments are proceeding in the Indian Ocean with funding from BOBLME and other sources, and the analysis of the data from prototype deployments is producing exciting new results; a new SIBER/CSIRO research initiative has

been launched aiming at quantifying C, N and P fluxes through the ITF; SIBER playing a crucial role in initiating and motivating the International Indian Ocean Expedition 50th Anniversary Planning effort.

It was requested that the forthcoming activities of SIBER may be posted on website and keep informed to the delegates for their active participation in SIBER.

2.3. International Indian Ocean Expedition (IIOE)-2 Reference Group Meeting by Dr. Nick D' Adamo

Dr. Adamo gave a brief glance on IIOE-2 RG-meeting that was held in Hyderabad, India during 14-15 May 2013. He talked about participating organizations and potential themes that were discussed in the meeting. He listed out probable science questions that IIOE-2 may address. He covered spectrum of topics from proposed governing structure to the naming of the expedition. He also detailed the necessity of a IIOE-2 Programme Office to support various activities of the expedition and other proposed exclusions and inclusion of the activities of the programme office. He also mentioned that the IIOE-2 Reference Group resolved to seek high level government imprimatur due to various strategic reasons in successful completion of the expedition. He also showed commitment of various IOC regional components to support IIOE-2. After talking about expedition related components in big picture, he had also listed out dates of next meetings.

The country representatives from Sri Lanka and Mauritius has expressed that their respective governments might be interested and they will talk to their respective governments to explore the possible contribution for the successful completion of the IIOE-2 expedition. Dr. Nick mentioned that IIOE-2 expedition may essentially require an IIOE-2 Secretariat and requested to explore the possible support to establish / maintain the IIOE-2 Secretariat.

2.4. Large Marine Ecosystems in the Western Indian Ocean - Partnerships for Monitoring and Management by Dr. Lucy Scott

Dr. Scott shared her experiences with ASCLME Project and other collaborative projects in Western Indian Ocean. This included objectives of creating baseline data, monitoring of LMEs and provide policy makers better tools for governance and regional cooperation. The regional Strategic Action Programme has components of Ecosystem Monitoring, Capacity Building and Science-based governance. She talked about cruises undertaken for the period of years 2008-2013. She also highlighted widening collaborations within the region as well as at global scale, to name a few South West Indian Ocean Fisheries Project (SWIOFP), Intergovernmental Oceanographic Commission (IOC), National Oceanic and Atmospheric Administration (NOAA), International Union for Conservation of Nature (IUCN), Indian Ocean Global Ocean Observing System (IOGOOS), Climate and Ocean Variability, Predictability and Change (CLIVAR) and AfriCOG. She also mentioned about the alliance concept to partnership and agree for the responsibilities throughout the ASCLME region through Western Indian Ocean Sustainable Ecosystem Alliance (WIOSEA) with the aim to create sustainability through partnerships addressing critically important activities for

LME management and governance. She also mentioned that over 30 organisations and institutions have now formally associated with the alliance. She also recalled the resolution adopted at IOGOOS IX meeting in Cape Town to support and develop a scientific partnership for collaboration in the WIO and request made to ASCLME and its partner SWIOFP to facilitate the development of this alliance. Finally, she introduced to the upcoming SAPPHIRE Project with the details of the components of the project that addresses the need for research and monitoring (offshore and inshore) to inform management.

To the question of the platform on which the data is made available, Dr. Scott responded that all the data collected are being deposited in the National Oceanographic Data Centers (NODC) of the respective countries. The data is available to the principal investigators of the projects, the secretariat involved and most of data is freely available from data reception centers. To answer the question on the budget cost for the SAPPHIRE project, Dr. Scott has mentioned that the total budget is 12 million dollars for five years. To the query of whether SAPPHIRE will also carry out the physical measurements, Dr. Scott clarified that though it carries the measurements to monitor ecosystem, the focus of the project will be towards policies and management strategies for coastal ecosystems. With regard to the mode of association of SAPPHIRE with IOGOOS, Dr. Scott mentioned that the association is in terms of participation of ASCLME in IRF, IOP, SIBER and IOGOOS meetings. ASCLME has been associating with IOGOOS and its associated projects since last two years and the cooperation between the programmes / projects is good.

2.5. Intra-seasonal thermocline variability in the Bay of Bengal by Dr. M. Ravichandran

After briefly introducing with RAMA mooring system, Dr. Ravichandran talked about the observed thermocline variability at three mooring locations in Bay of Bengal. He then talked about cause of it being local or remote forcing. He also addressed how sea-level observations can be useful as proxy for D23 or oxycline depth. He then talked about the relationship of thermocline variability to boundary layer, MLD and temperature inversion. He concluded by stressing the need of basic scale understanding that incorporates wind, heat flux and fresh water input

2.6. Sea-Level Variations in the Western Indian Ocean Region by Dr. Charles Magori

As a regional component of GLOSS, Dr. Magori talked about IOC Regional Committee for the Cooperative Investigation in the North and Central Western Indian (IOCINCWIO) and other initiatives that lead to capacity building in the region for sea-level studies. He also talked about tide-gauge station network that is being expanded in the WIO region. WIOMSA and ODINAFRICA have supported many of these objectives. He also presented time-series observations from the region. He stressed for further capacity building in WIO region for sea-level data processing.

Dr. Srinivas Kumar asked whether there are any protocols available to which tide gauges across the globe adhere. Dr. Magori appreciated and informed that he does not know the protocols. Answering a question Dr. Magori conveyed that 60% of the observations show rising trend while rest showing negative and hence, more observations are required to understand the big picture. Dr. Somkiat pointed out from studies in Thailand that plate tectonics could be taken in to account to make sure it doesn't falsely contribute to SLR. Dr. Magori assured that the system he talked about has its own defined benchmark and added that to circumvent the problem pointed out by Dr. Somkiat, they are now in process of adapting GPS based benchmarks.

2.7. AMESD: the Use of Earth Observation Data in the South West Indian Ocean Region by Mr. Eric Martial

Mr. Eric introduced AMESD (African Monitoring of Environment for Sustainable Development) project initiative. He emphasized the importance of observation network in order to responsibly manage environmental resources as well as for environmental risk management. He then outlined AMESD-IOC THEMA for marine resources management and for climate change impact monitoring. One of the components of this THEMA is operational information services, under which, 10 AMESD data-reception stations are established in 9 countries. The data products being provided with these are Chlorophyll, SST, Wind, Wave, Potential Fishing Zones, biological & physical oceanography variables and MESA (Monitoring for Environment and Security in Africa) initiative.

To the query of utilisation of the environmental parameters that are being used for PFZ were also used for stock assessment, Mr. Martial said that AMESD does not do any stock assessment but the PFZ information is being sent to Ministry of Fisheries for further dissemination to fishermen and hence, they assure the sustainability based on their knowledge. Mr. Nagaraja Kumar asked about methodology that AMESD follow in identification and prioritization of PFZ for dissemination. Mr. Martial conveyed that MOI uses cayula-cornillon algorithm for SST front detection and the same along with Chlorophyll will be determined as PFZ based on technical skills of the responsible team with background of historical fish-catch data. Mr. Martial added that they do not use Oceansat-2 data from their ground station.

2.8. Research Activities in the Andaman Sea and Bay of Bengal by Dr. Somkiat Khokiattiwong

After detailed overview about Phuket Marine Biological Center (PMBC) Dr. Somkiat talked about Thailand-China joint research efforts. The PMBC activities include assessment and monitoring of marine resources, habitat and environment, rehabilitation and research that focuses mangroves, turtles, plankton, coral, benthic community and water quality related aspects. He then addressed to joint laboratory initiative between Thailand and China for Climate and Marine Ecosystem. This partnership covers aspects such as capacity building, moored observatory, coastal forecasting and vulnerability research ability development and monsoon onset monitoring. The major collaborations are initiated for MOMSEI initiative, Ocean Forecasting System, Geology and

Geophysics study and Marine biodiversity, ecosystem and biotechnology that is being achieved by joint cruises.

2.9. Hydro-Meteorological Multi-Hazard Systems & Climate Change Related Extreme Events by Mr. M. Beebeejaun

Mr. Beebeejaun gave an outline of different types of hazards, difference between hazard and disaster and scales of their occurrence. He also presented the recovery time a system needs and disasters' impact on human-lives and capital. He then, put these aspects with the backdrop of changing climate.

2.10. Recent Japanese research activities in the Indian Ocean region by Dr. Yukio Masumoto

Dr. Masumoto talked about Japanese research systems in Indian Ocean viz. CINDY, ADCP Mooring and TRITON buoys. He presented MJO observations collected via CINDY and research outcome from the same. The later systems were found useful for studying IOD events in year 2006 and 2010. He presented observation from these which showed surface heat flux and advection variability, Calvin wave propagation, resultant changes in along-shore wind and upwelling in the region.

Dr. M. Ravichandran asked whether the advection that is presented to affect to the significant heat flux (SHF) in eastern equatorial region is from observation or model. Dr. Yukio responded that though the observation shows SHF is important it does not capture the upwelling in core region and hence, the one which is presented is from model.

2.11. An Overview of Fisheries in Mauritius by Mrs. Yajoshi Basant Rai

Starting from Ministry of Fisheries' (Mauritius) vision, mission, policy and strategies, Mrs. Rai talked about legal framework present in her country. She talked about international collaborations, fishery management tools and in detail, types of fisheries in Mauritius including Tuna fishery. After talking about Marine Aquaculture scenario, she briefed about coastal ecosystem research activities including coral reefs. Finally, she addressed aspects such as vessel monitoring system and fishery economy.

Mr. Nagaraja Kumar enquired about the satellites that are used for Vessel Monitoring System in Mauritius and Mrs. Rai responded that they use mostly INMARSAT satellites. Responding to another question from him she said that the fishermen have to procure their own ground-unit receiver component of this system. Mrs. Rai explained about the methodology of Sea-Bass culture in response to a question.

2.12. Persian Gulf & Gulf of Oman Oceanographic Study (PG-GOOS) by Dr. Vahid Chegini

Dr. Chegini introduced with organizational structure of INIOAS, its affiliated centers, research stations and laboratories along with international

collaborations. He described sampling activities being undertaken during various cruises. He introduced various instruments being used for the observations as well as major physico-chemical, geological and biological findings from the same. He then outlined future plans for expansion of these activities. Dr. Chegini also gave outline significance and objectives of UNESCO recognized Category-II Regional Education & Research Center on Oceanography for West Asia.

To the query on the research vessel of Iran that is being build up, Dr. Chegini responded that this is the first one being built by Iran indigenously and it would cost about USD 8M.

2.13. Ocean Services in India by Dr. S.S.C. Shenoi

Dr. Shenoi gave an account of operational ocean-service related activities being undertaken in India. He provided an insight about Indian marine fishery advisory system and ocean state forecast products such as waves, SST, MLD, surface currents, thermocline depth. The later is now also being provided to Maldives. He talked about coral bleach alerts and other bio-optical observation research initiatives. He showed how tsunami and storm surge inundation models help providing valuable information during events such as Phailin cyclone. He also briefed how integrated observation network of moorings, buoys, HF radars and tide gauges help sustaining these services. He presented dissemination techniques being adopted and user feedback towards the services before concluding with Search & Rescue model initiative.

2.14. New Moored buoy network in Northern Indian Ocean with surface/subsurface Measurements, their analysis and applications by Dr. G. Latha

Dr. Latha gave an account of moored buoy technology research in India and its applications. She briefed about observation network of OMNI buoys, Met-Ocean buoys, tsunami buoys and Reef buoys in Indian Ocean. She also presented ocean-response signature in form of wind, atmospheric pressure, subsurface temperature and salinity and currents, that is captured by these buoys during various episodes such as Phailin and Mahasen cyclones, warm-pool built-up and coral bleaching events. She then gave a brief introduction to ANN applications for wave forecasting and data assimilation from neighboring buoys. She concluded with capacity building initiatives.

While responding to the query of whether NIOT manufactures its own wave-raiders, Dr. Latha said that indigenization process of OMNI-buoys is ongoing. Addressing to if NIOT has looked in to the influence of cyclones occurrence to the coral bleaching, Dr. Latha responded that NIOT has not yet studied in that aspect.

3. Science Workshop Concluding Remarks by Chair, IOGOOS:

In summarizing the previous presentations, the Chair of IOGOOS stated that it is very difficult to summarize the breath of presentation of the science workshop. It was very impressive to see the presentations and the science results presented as

part of the IOGOOS decadal celebrations. The presentations were focussing on physical, bio-geo-chemical, fisheries research and applications and the progress in those areas, issues & challenges and the future opportunities. All the presentations are in line with the IOGOOS objectives and are also referred for ultimate benefit of society, capacity building, international collaboration, etc.. All of these points are core and important to IOGOOS. In closing the session the Chair asked the audience to join him in thanking all presenters.

4. Day-2: Tuesday, October 22, 2013 - Reporting to IOGOOS - Panel of Chairs of IOGOOS, IRF, SIBER and IOP

4.1. Report from IOP by Dr. M. Ravichandran

After briefly addressing CLIVAR-WCRP challenges and opportunities, Dr. Ravichandran reported the status of observations under IndOOS program. This included RAMA mooring cruises, status, data return and access; along with present status of ARGO floats, density, new-generation of sensor-rich floats. He also briefed the status of drifting buoy program, XBTs, tide gauges, Tsunami-BPR. This followed by the research coming out of these observations that addresses wide variety of questions from seasonal to decadal scales. He concluded with research and capacity building related collaborations and initiatives by IOP.

Dr. Ravichandran responded affirmatively when asked if CLIVAR is being supported by IOP. Responding to next set of questions Dr. Ravichandran said that RAMA system is being supported by many countries for instrumentation and ship-time. The later along with piracy issue has affected to the schedule especially in equatorial WIO. He also explained that core-ARGO program is separate from ARGO with biogeochemical sensors and hence, it is up to the countries to decide what fraction of the budget they want to allocate for what types of ARGO floats. Answering to Dr. Shenoi, he said that there are more than 25% of the ARGO floats having oxygen sensors whereas about 15% having chlorophyll sensor (along with backscatter at 700nm, CDOM & turbidity) and hardly 10 floats with nitrate sensor. He also conveyed the concerns scientific community is sharing about using oxygen sensors. To a question, Dr. Ravichandran answered that few countries have attempted to dive ARGO floats more than 3000m but it is yet on pilot basis only. Addressing questions on further plans for ARGO floats with biogeochemical sensors and also about gliders. To this Dr. Ravichandran responded that India is deploying few more such ARGO floats and will look for glider opportunities later.

4.2. Report from SIBER by Dr. Somkiat Khokiattiwong

Dr. Somkiat briefed about updates related to SIBER website and SSC members. Then he reported about SIBER SSC-3 & 4 meetings, emphasizing them being a huge success. He also reported IIOE-2 reference meeting mentioning availability of completed report and the upcoming sequel meeting of the same. He then reported the updates about SIBER-IPO at INCOIS and efforts towards establishing regional program at Australia and South Africa as well as about India national SIBER program. Apart from mentioning SIBER special issue on

Northern Indian Ocean and SIBER special session in IMBER conference, Dr. Somkiat also covered observation and research initiatives by SIBER in Indian Ocean.

4.3. Report from IRF by Dr. Nick D'Adamo

In his brief presentation Dr. Adamo talked about 4th annual meeting of IndOOS Resources Forum (IRF) held at Li Jiang, China on 12th July 2013. Dr. Nick mentioned that Dr. Shailesh Nayak, Chair, IRF has stepped down and Dr. David Vousden was elected inter-sessionally as new chair. He recalled that the piracy is still an issue however the annual piracy incidents were declining. and hoped that the planned IndOOS will be completed in future. He mentioned that 24 actions items were identified and one of the key action items is 'High Level Review of IOP + SIBER with the aim to provide the necessary information for IOP's and SIBER's respective missions (and capacities to achieve their objectives) to be assessed, considered and enhanced via the review process). He hoped that IOP, SIBER, IRF and IOGOOS will meet again together in 2015, preferably during the International Science Symposium to be held as part of NIO 50th anniversary & 50th year celebrations of IIOE-2 during November /December 2015. He detailed few key items identified at IRF-4 meeting such as (i) seeking BOBLME to engage in IRF, SIBER and IOP meetings permanently (ii) resourcing with FIO, China through Dr. Weidong Yu to host IIOE-2 Reference Group meeting -2 at Qingdao during November 20-21, 2013, (iii) establishing the IOP/SIBER Working group for RAMA vessel coordination (Ref: Dr. Yukio Masumoto), (iv) SIBER to receive regional project office support from Australia IOC Perth + IMOS and South Africa and (v) SIBER to receive substantial increase in main SIBER International project office secretariat resources from INCOIS, India . Another decision taken at IRF-4 is that all the four groups should always meet together from 2015 onwards to promote synergy, integration and appropriate resource allocation.

4.4. Report from MOFPS by Dr. Nick D'Adamo

In this short talk Dr. Adamo mentioned about evolution of MOFPS (Modeling for Ocean Forecasting and Process Studies) since 2008 as an IOGOOS Pilot Project. He reported about 2012 workshop that re-affirmed the keen desire of stakeholders for the project. The workshop has provided a good demonstration of MOFPS simulations and potential benefits. He detailed about the over-riding and consistent themes that emerged from the Workshop. He briefed about the need to run various models for use of the MOFPS members and the capacity building necessity which further emphasized to develop a comprehensive MOFPS Capacity building project plan. It is proposed that the plan to be fully budgeted and designed as suitable for submission to relevant funding sources. He mentioned that to take MOFPS forward, a budget of >US\$20 M will be required. He also highlighted that IOR-ARC workshop held in May 2013 at Perth has used BLUELINK Australia for demonstration. He concluded with mentioning the uncertainty of further funds availability to MOFPS.

4.5. Report from IO Core-RS Project - ChloroGIN by Dr. T Srinivasa Kumar

Dr. Srinivasa Kumar gave a brief background of ChloroGIN (Chlorophyll Global Integrated Network) Project and how its objectives fulfilling IO Core-RS Project. After addressing to the components of ChloroGIN Project setup at INCOIS including satellite data reception center, processing chain, products, data delivery system and geographical domains being covered, Dr. Srinivasa Kumar detailed about the applications. These applications cover wide range of science such as Fisheries Resource Management, In-situ measurement and Cal/Val, Coral Reef bleaching alerts, Algal Bloom monitoring, Oil Spill detection and monitoring, Coral Reef & Mangroves mapping and monitoring as well as coastal vulnerability indices assessment. He reported about capacity building efforts including pre-conference tutorial sessions during INCOIS-hosted PORSEC-2012. He also mentioned about the plans for near future and expressed his concern about the future direction for KEY & Shoreline Change projects.

4.6. Indonesian Research Activities in the Indian Ocean by Dr. Muswerry Muchtar

Dr. Muswerry Muchtar gave an overview of Ocean research activities being taken up in Indonesia covering Earthquake and Tsunami impact assessment, Indonesian-GOOS (INAGOOS), MOMSEI (Monsoon Onset Monitoring and its Social and Ecosystem Impacts) and E-WIN (Ekspedisi Widya Nusantara) initiative. Observations under E-WIN project started from year 2008 and its objective is to establish a baseline of oceanographic and marine biodiversity in the outer islands of Indonesia. The talk was concluded with detailed outline of Indonesian ocean research facilities including the research vessels.

5. Report on IOGOOS Pilot Projects status by Nagaraja Kumar

After starting his talk from formulation of the pilot projects and an outline about coastal ocean observations, Nagaraja Kumar listed out country-wise interests for relevant coastal phenomena that were expressed initially at IOGOOS I workshop in 2001. He then stated out rational behind each of the pilot projects formulated with these overlapping interests. He described the activities related to Shoreline Change Project with case studies in India, Sri Lanka, Tanzania and in Thailand. He also gave examples of Mangrove mapping in Indian and Malaysia under Multi-scale Monitoring and Mapping of Keystone Coastal Ecosystems Project. He also addressed other present and past non-functional projects dealing with Penaeid Prawns, Whale Sharks and Remote Sensing of Chlorophyll. He also re-iterated that the main constraint in progressing the projects is the lack of national focal points that need to be reviewed wherein the members can assist-in. Mr. Kumar concluded the presentation with a way forward to bring the projects to active.

Day 3: Wednesday. October 23, 2013 - Chair: Dr. Somkiat Khokiattiwong

6. Discussions about the future Strategic Plan of IOGOOS lead by Chair, IOGOOS

IOGOOS has adopted the Strategic Plan 2007-2011 at IOGOOS VI annual meeting. The IOGOOS X has discussed on the possible Strategic Plan for 2013-2018. The

members suggested few revisions in the Strategic Plan adopted at IOGOOS VI. The final draft Strategic Plan modified need to be circulated to the members and Officers for their comments and the same need to put up at IOGOOS XI for finalization and adoption. The final draft of the Strategic Plan Document after the corrections is at **Annexure 7**.

7. Annual Meeting of IOGOOS

Dr. Andreas Schiller, Chair, IOGOOS has welcomed all the member institutes, invitees to the 10th annual meeting of IOGOOS. He requested the participants, if they have any comments on the agenda of the Annual meeting and then continued to conduct of the annual meeting.

7.1. Chair's Report

Dr. Andreas recalled that he was elected as Chair, IOGOOS in IOGOOS IX Meeting at Cape Town, South Africa and took over from the preceding acting chair, Dr. T. Srinivasa Kumar. He presented the Chairman's report on the activities of IOGOOS for last one year. He also mentioned that most of the activities were carried out in collaboration with IOGOOS Secretariat especially with Mr. M. Nagaraja Kumar, Secretary, IOGOOS. He mentioned that new initiative taken up on creation of IOGOOS News Letter, the first version of which was released during May 2013, which is also available at IOGOOS Website. The newsletter has received positive feedback from the international community as it is providing the information on the IOGOOS activities as well as the activities in the IO region. The Second IOGOOS News Letter is scheduled in November 2013 and requested the members to contribute to the newsletter. He mentioned that there few conversations were made with IOGOOS Officers and Secretariat on the mode of run of the Secretariat. He has participated in his capacity as Chair, IOGOOS in the 6th GOOS Regional Alliances Forum held during May 14-16, 2013 in Hawaii, USA. The highlights of IOGOOS in terms of IndOOS, RAMA and operational oceanography were presented. There was very strong interest among other chairs of GRAs on Coastal and Ocean Forecasting capabilities in the region. He also mentioned that one of the other major activities carried out is the organisation of IOGOOS X Meeting at Mauritius which is in done jointly with Mr. Nagaraja Kumar and Mr. Rezah Badal. He thanked MOI and IOGOOS Secretariat for their efforts in making the IOGOOS X meeting. He was also involved in the workshop on "Ocean Forecasting Workshop to build capacity to progress, validate and apply Indian Ocean Forecasting Systems" which is in line with the objective of capacity building of IOGOOS.

Dr. S.S.C.Shenoi has commented that IOGOOS activities were not reported at IOC Assembly or IOC Executive Council. Dr. Andreas mentioned that IOC would be getting the update through the report of the GOOS Regional Alliances. Dr. Nick mentioned that the wonderful work being carried out in Indian Ocean is not visible at IOC level. The Regional IOC Subsidiary bodies report to IOC like IOCINDIO, IOC PRPO, etc. The IOC Perth Regional Programme Office is a regional body of IOC through which the IOGOOS activities are being reported.

7.2. Presentation of Secretariat report

Mr. M. Nagaraja Kumar presented the Secretariat report in which he detailed the list of activities carried out by the Secretariat. He mentioned that the secretariat has successfully conducted the IOGOOS IX Annual meeting at Cape Town, South Africa wherein an amount of USD 19990 was mobilized towards sponsorship to few delegates to participate in the meeting. He thanked IOC Perth Regional Programme Office and IOC UNESCO Jakarta Office for allocating the funds towards the meeting. The sponsorship amount was utilized towards sponsoring the participation of 06 foreign delegates in the IOGOOS Workshop and 9th annual meeting. The IOGOOS IX report was kept for the approval of the meeting and the same was approved. He also mentioned about the capacity building activities carried out by IOGOOS such as the PORSEC Pre-conference tutorial on Ocean Colour Remote Sensing and Active Microwave Remote Sensing" which was conducted during October 30, 2012 - November 3, 2012. About 31 participants from Australia, China, India, Indonesia, Japan, Malaysia, Russia and USA were participated.

Mr. Kumar also mentioned that biannual newsletter of IOGOOS was started and the first issue was released in May 2013 and the second issue is due in November 2013. Also mentioned that Institute of Marine Sciences, University of Chittagong, Bangladesh was joined as member of IOGOOS and the same was approved at IOGOOS IX meeting. He also mentioned the action items recommended in the IOGOOS IX meeting and the corresponding work carried out. The detailed secretariat report was attached as **Annexure 8**.

7.3. Accounts and Financial Summary:

Chair, IOGOOS has nominated Dr. Yukio Masumoto to verify the accounts of IOGOOS statements. Mr. Nagaraja Kumar has briefed about the total funds received, expenditure made under IOGOOS for the period April 2012-March 2013 and April 2013 to September 2013. Dr. Yukio has gone through all the statement of accounts and certified the accounts. Dr. Srinivas kumar said that the necessity of maintaining two accounts is essential keeping in view of inward remittance of foreign currency and national currency, which is essential as per the procedures followed in India. Dr. Nick has thanked India and INCOIS for their in-kind support towards providing the resources and also to forthcoming IIOE-2 Reference Group meeting being hosted by INCOIS, India. Dr. Nick also mentioned the financial status of the IOC PRPO in terms of sponsorship to IOGOOS and the restrictions in the availability of funds. Dr. Andreas mentioned that the overall financial status of IOGOOS may not be sufficient to support regular meetings and this account should be helpful in case of any emergency requirement only.

7.4. Confirmation of Memberships:

There are no membership requests for this year.

7.5. Elections:

Mr. M. Nagaraja Kumar mentioned that the IOGOOS governance structure was restructured and according to which three officers from IOGOOS Member countries were elected and two nominations were sought from SIBER and IOP to become the Officers of IOGOOS. SIBER and IOP have nominated Dr. Somkiat Khokiattiwong and Dr. Yukio Masumoto as the officers for 2013-15. Hence, there were no vacancies at present and the elections will be held during next year annual meeting. For the reference of the IOGOOS X meeting delegates, Dr. Andreas has presented the re-structured IOGOOS Governance framework. Dr. Bill Erb has mentioned that with the new governance framework, it will be good if the MoU says some terms of reference of the technical services representatives so that they will be able to know the roles and responsibilities within the IOGOOS governance structure and understand the decision level of these members. Dr. Andreas mentioned that the inclusion is to ensure the involvement of the stakeholders to guide in overall direction of IOGOOS activities. Dr. Srinivasa Kumar also clarified that the nominations from the technical services were actually sought to nominate the members who are from Indian Ocean region. If the nominated members are from outside the IO region, they will become associated members. The associated members will normally have no voting authority or role in decision-making. In addition to this, all the 05 officers of IOGOOS will actually handle and supervise key activities of IOGOOS.

7.6. Announcement for Hosting of IOGOOS Secretariat

Mr. Nagaraja Kumar has summarized the status of IOGOOS Secretariat. INCOIS, India has been selected as the first Secretariat of IOGOOS and during IOGOOS VI meeting the annual meeting has requested to continue the secretariat at INCOIS, India. INCOIS, India has hosted the IOGOOS Secretariat for two terms of 6 years each. Mr. Nagaraja Kumar also detailed the criteria for hosting of the IOGOOS Secretariat for the term November 2014 – October 2020 and sought the willingness of the member countries. It was requested to all the members to communicate their willingness within six months to the IOGOOS Secretariat. The notification for IOGOOS Secretariat is attached at Annexure 9.

7.7.Next Annual Meeting Dates and Venue:

It is proposed to host the next IOGOOS meeting in conjunction with IOP, SIBER and IRF meetings. Dr. Nick mentioned that next IOP meeting is scheduled to be held in July 2014 along with the CLIVAR project review meeting and it may be difficult for having integrated meetings in July 2014 and suggested that the integrated meetings can be in October / November 2014 that will be an appropriate period. Dr. Andreas mentioned that it will be difficult to get funding and the experts for more meetings and an integrated meetings on back-to-back will enable the delegates to represents in all the three meetings and make more participation from all the members. Dr. Nick also supported this and referred to the integrated meetings held at Cape Town, South Africa, which was a successful model. Dr. Srinivasa Kumar also suggested whether IIOE-2 Reference group could also be met along with IOGOOS, IOP, SIBER and IRF so that the participation will be much larger and the resources will be

more. Dr. Somkiat has mentioned that the Thailand-China Joint Laboratory at Phuket is agreeing in principle to host the next IOGOOS Meeting. The final acceptance to host the meeting will be intimated after December 2013.

7.8. Concluding Remarks:

Dr. Andreas Schiller ended the annual meeting by requesting the gathering to provide the inputs to the forthcoming second issue of IOGOOS News Letter. This newsletter will be circulated not only to IO rim countries but also to other regions as well as IOC. Dr. Andreas thanked the local host Dr. Rezah Badal and the Mauritius Government for hosting the meeting. He thanked the IOGOOS Officers and the member countries for their active participation and their valuable time.

Annexure 1

Welcome Address of Dr. Andreas Schiller, Chair, IOGOOS at the Inaugural session of IOGOOS-10 Workshop and Tenth Annual Meeting held at Port Louis, Mauritius during October 21 -24, 2013

The Mr. M. Seebah, Permanent Secretary at the Prime Minister's Office of the Republic of Mauritius

Dr. Rezah Badal, Head, Ocean Matters Unit, Prime Minister's Office, and host of this event

Directors of National Institutes of Mauritius and officials of the Government of Mauritius, Dr. Satheesh Shenoi, Director of INCOIS,

Members of the diplomatic corps,

Dr. Nick D' Adamo, Officer in Charge - Perth Programme Office of the Intergovernmental Oceanographic Commission (IOC) of UNESCO

Dr. Bill Erb, Former Officer in Charge - Perth Programme Office of the Intergovernmental Oceanographic Commission (IOC) of UNESCO

IOGOOS Officers and IOCINDIO officials

Good Morning Ladies and Gentlemen

It is my pleasant duty to welcome you all to the 10th Anniversary Meeting of the Indian Ocean Regional Alliance of the Global Ocean Observing System (or, abbreviated, IOGOOS)

Please allow me to say a few words about the history and objectives of IOGOOS

IOGOOS is an association of marine oration all and research agencies in the India Ocean Region. It's foundation was laid during an Indian Ocean Principals' Meeting held in November 2001 in New Delhi with the key objective to co-operate in promoting the Global Ocean Observing System in the Indian Ocean region. IOGOOS was formerly established during the first meeting here at Mauritius in November 2002; and it's Secretariat was established at the Indian National Centre for Ocean Information Services (INCOIS).

27 marine institutions from 15 countries including Australia, Bangladesh, France, India, Indonesia, Iran, Kenya, Madagascar, Mauritius, Mozambique, South Africa, Sri Lanka, Tanzania and USA are members of IOGOOS. The IOC's Perth Regional Programme Office, the Bay of Bengal Large Marine Ecosystem (BOBLME) Project (Associate Member) and the Agulhas / Somali Current Large Marine Ecosystem (ASCLME) Project (Not member but affiliated) are also members of IOGOOS. Further institutions from several other countries in the region have been actively contributing to the IOGOOS initiatives and a few of them have expressed their willingness to become members.

The following observations were made during the initial high level consultations among the participants

- At least 1.5 billion people on this planet Earth are profoundly influenced by the Indian Ocean characterised by a fragile living environment that is sensitive to climate change, natural disasters and human impact.
- There is an imperative need to take a pro-active role and concerted actions to understand the Ocean and Coasts for making informed decisions that save lives and protect living habitats and resources in the Indian Ocean region.
- There is also a need to contribute, collectively, to the progress of Ocean observations, Ocean science and operational oceanography, focussing on these imperative needs of the Indian Ocean region.
- The Indian Ocean Principals recognised the important role taken by the Global Ocean Observing System (IOGOOS) sponsored by the United Nations Agencies, i.e. (Intergovernmental Oceanographic Commission of UNESCO; World Meteorological Organisation; and United Nations Environment Programme) plus the International Council of Scientific Unions, to facilitate a global coordination of Ocean and Coastal observing systems and to catalyse formation of alliances between nations to focus effort on their pressing regional concerns.
- The Principals agreed to establish IOGOOS to provide an organizational framework for planning, coordination and effective implementation of appropriate regional and sub-regional Ocean and Coastal observing systems and services.

At the conclusion of the inaugural meeting, the Indian Ocean Principals' issued the *New Delhi Statement* declaring the formation of IOGOOS. The creation of IOGOOS was a major milestone in providing access to and supporting the application of oceanic knowledge to benefit all people of the Indian Ocean region.

The members of IOGOOS Committed to collaborate and work together on a variety of objectives.

The specific objectives of IOGOOS are to:

1. Enhance the Ocean Observing System in the region,
2. Promote and facilitate efficient and effective management, exchange and utilisation of oceanographic data,
3. Promote programmes and projects in operational oceanography and ocean services in the region meeting the requirements of end-users,
4. Strengthen capacity building for enhancing the capabilities in the region,
5. Encourage research to support the needs of Users,

6. Develop synergies with other ocean programmes and regional GOOS bodies, and
7. Contribute to international planning and promotion of GOOS.

Most if not all of these objectives will be addressed today and in the coming days at the science workshop and the subsequent annual meeting of IOGOOS.

Regarding the history of annual meetings of IOGOOS, I would like to acknowledge previous host countries of this event:

- 1) Inaugural meeting of IOGOOS I at Mauritius in 2002;
- 2) In 2003, Hyderabad/India hosted the IOGOOS Workshop on Capacity building and Strategy for Ocean Data Information Management in the Indian Ocean Region;
- 3) IOGOOS II in Colombo, Sri Lanka, 2004;
- 4) IOGOOS III in Bali, Indonesia, 2005;
- 5) IOGOOS IV in Zanzibar, Tanzania, 2006;
- 6) IOGOOS V in Phuket, Thailand, 2007;
- 7) IOGOOS VI in Hyderabad, India, 2008;
- 8) IOGOOS VII in Perth, Australia, 2010;
- 9) IOGOOS VIII in Tehran, Iran, 2011;
- 10) IOGOOS IX in Cape Town, South Africa, 2012;
- 11) IOGOOS X in Port Louis, Mauritius, 2013

I would like to use this opportunity to thank the Government. Mauritius for hosting this event for the second time in the history of IOGOOS. Your hospitality is much appreciated.

This year, the Regional Alliance of Indian Ocean GOOS celebrates its 10th anniversary meeting. It has been a challenging but successful decade which culminated in the ongoing implementation of the Indian Ocean Observing System and its tropical moored buoy array called RAMA. The implementation of this observing system is happening under auspices of the CLIVAR-GOOS Indian Ocean Panel (IOP).

Looking forward, In fact, into the future, I think that many opportunities for IOGOOS to contribute to and lead improvements of the livelihoods of millions of people around the Indian Ocean rim are still waiting for us to be exploited. An example is the increasing need by all Indian Ocean countries for timely and accurate ocean analysis, forecasts and services, especially in the coastal domain for a wide range of applications such as risk management associated with extreme

events like tropical cyclones, search and rescue, fisheries' sustainable marine resource management and offshore oil and gas exploration.

With this reflection and outlook about IOGOOS, I would like to conclude my welcome address. I hope that we will have a pleasant time together and can enjoy the Science Workshop to celebrate the progress of IOGOOS which has been achieved over the last ten years as well as the subsequent Annual Business Meeting where we will address the future of IOGOOS.

Once again, welcome everyone. Thank you.

Annexure 2

Opening Speech of Dr Nick D'Adamo, Officer in Charge, IOC/UNESCO Perth Programme Office at the Inaugural session of IOGOOS-10 Workshop and Tenth Annual Meeting held at Port Louis, Mauritius during October 21 -24, 2013

Good morning everyone - on behalf of the IOC Secretariat, through Executive Director Dr Wendy Watson-Wright, as an institutional supporter of IOGOOS and also the Perth Programme Office as a patron and facilitator of IOGOOS, I am sincerely excited and very privileged to be here to celebrate IOGOOS's 10th anniversary in this wonderful and beautiful country, where it all began in 2002.

I'd like to also immediately acknowledge Permanent Secretary of the Prime Minister's Office, Mr Seebah, National Institutional Directors such as the distinguished Director (Mauritius - hazards etc), the Mauritian Diplomatic Corp and local guests and participants.

I wish also to thank my friend and our kind host Dr Rezah Badal of the Prime Minister's Office and also our many other distinguished guests, representing the very beginning of IOGOOS.... its maturation through the past 10 years and now it's strong current status as a foundation for what I am sure will be another decade of important societal contributions.

I myself have had the fortunate opportunity and pleasure of visiting this gorgeous country in my IOC Perth Programme Office role. I remember fondly and with gratitude the many hospitalities, welcomes and both professional and social interactions that I've received here over the past few years through the Mauritius Oceanography Institute, and through former Director Dr Mitrasen Bhikajee and now through Dr Badal.

So here we are now.....celebrating the real success story that IOGOOS is – as a GOOS Regional Alliance that is, interestingly, essentially a voluntarily based entity, where no one constituent is compelled to stay in it or to maintain its support, but for which we have actually seen the alliance grow steadily, strongly and at times with great stepwise jumps in programmatic and institutional breadth and depth with an ever growing number of stakeholders engaged - not just in a spiritual sense, but in a material programmatic sense.

As Dr Wendy Watson-Wright fondly noted - back in Perth in 2010 when IOGOOS, IOP, SIBER and IRF meet in an integrated fashion together for the first time – we have now a functioning GRA 'family' defined by IOGOOS and its related programmatic and project entities, which performs a societally important role in the region and for the globe in general.

So Rezah, please pass on the IOC's institutional and my own personal sincere appreciation to the Prime Minister for allowing us all to transform what was an aspiration to return to Mauritius, 10 years on, into this celebratory reality for IOGOOS.

In that vein, it really is a pleasure to meet up again with former IOC Perth Head Dr Bill Erb, who's speech to follow will be a highlight that I know we are all looking forward to. I acknowledge IOGOOS's new energetic and enthusiastic Chair Dr Andreas Schiller while also warmly noting the presence of our distinguished colleague from India, Dr Satheesh Shenoi, Director of India's INCOIS, and also his colleagues from INCOIS – whom of course have been fundamentally critical in helping IOGOOS establish and grow to what we see it as today. In that regard, I thank you Dr Shenoi for personally enabling and facilitating India's support for IOGOOS through the fundamentally important Secretariat service but also through the many engagements you bring to IOGOOS's wide range of pilot projects, initiatives and collaborative associations with neighbouring stakeholders. Again here, we owe great thanks to our Secretary Nagaraja Kumar for his tireless, precise and efficient preparation and organisation of the meeting.

Could I ask you Dr Shenoi to pass these same sentiments on to our former Chair in Dr Shailesh Nayak, Secretary to the Ministry of Earth Sciences of India – who has also done all that he could to critically assist IOGOOS become a flagship GOOS Regional Alliance in support of societal benefit under the IOC umbrella.

I look around and also see both new and long time supporters of IOGOOS, such as Dr Lucy Scott, representing our new IndoOS Resources Forum Chair Dr David Vousden of the Agulhas Somali Current Large Marine Ecosystem program, taking over from Inaugural IRF Chair Dr Nayak. I also acknowledge our IOGOOS Officers joining Rezah in that role, in Drs Srinivasa Kumar and Somkiat Khokiattiwong, and important constituents such as Professor Yukio Masumoto of JAMSTEC who is an IOGOOS Officer and immediate past Chair of the Indian Ocean Panel, is now working closely in the Indian Ocean Panel in collaboration with the biogeochemical group SIBER and who remains intimately engaged in IOGOOS, such as through co-leading the development of the Indian Ocean Observing System and the emerging East Indian Ocean Upwelling Research Initiative along with SIBER. We're also grateful for Dr Ravichandran's support yet again – Ravi being our IOP Co-Chair and who will help to represent SIBER in relevant matters during the week.

We again are privileged and ably assisted here by my long time friend and IOGOOS supporter in Dr Vahid Chegini who is the Director of the Iranian National Institute of Oceanography - which has recently also been further distinguished through being given a national atmospheric sciences mandate.

In conjunction with Dr Chegini, we will also have important representation here for the IOCINDIO meeting on Wednesday, and the IOC Secretariat thanks IOGOOS for enabling this side meeting so that IOCINDIO can discuss its own future in the context of its own constituent's interests and alignment with Indian Ocean programmes, such as IOGOOS.

It is also great that we see in our midst colleagues from Sri Lanka, Kuwait, Kenya, Bangladesh, Bay of Bengal Large Marine Ecosystem Study and also stakeholders representing an emerging movement to celebrate the 50th Anniversary of the International Indian Ocean Expedition – itself the subject of much work and interest amongst the Indian Ocean and indeed global community at present. To

that end, we will be hearing updates during the week on how the IIOE-2 is progressing and on what we can all do to facilitate it.

My apologies if I've missed anyone but I certainly look forward to interacting with you all during the week and to doing whatever I can on behalf of IOC to make this week a success and to continuing to underpin IOGOOS's needs to the best of mine and the IOC's broader capacities.

With these comments, I now look forward to sitting back and enjoying what I am sure will be an interesting and nostalgic journey on IOGOOS from our friend and early champion in Bill and to then enjoying another interesting and productive IOGOOS annual meeting in this beautiful setting. So thank you all and I hand the floor over to Bill.

Annexure 3

Keynote Speech on “The Creation of Indian Ocean GOOS and Planning the first Indian Ocean Expedition” by Mr. William Erb

Good morning everyone! How great to see so many old friends and colleagues and, just as important, so many new people involved in the work of IOGOOS. And how special it is that we are back in Mauritius where IOGOOS was born in November of 2002.

I would like to thank Andreas Schiller, Chairman of IOGOOS, for inviting me to participate in this tenth anniversary meeting. I was thrilled and honoured to receive Andrea's invitation, which allows me an opportunity to reengage with you all. Nick D'Adamo and the Secretariat were willing to support my trip and for that, I am most grateful.

It is now almost seven years since I left the Perth Office and it seems like only yesterday. On a rainy Sunday in mid August, I sat down to review documents for the meeting. After a few hours of reading, I had this feeling of again being a part of the process including its challenges, excitement and hurdles. As such, instead of just addressing IOGOOS history, I thought it would be useful to provide comments on the first International Indian Ocean Expedition.

The Creation of IOGOOS

The Global Ocean Observing System began its development in the 1990's with the objective of establishing a worldwide network of instruments for systematically collecting ocean and coastal data according to a design plan. The data and information collected would be transformed into useful products for use by governments, industry and scientists for better understanding and managing oceans and coastal zones. IOC, WMO, UNEP and ICSU led the planning process for GOOS and became the first sponsors.

As GOOS evolved the need for a regional approach led to the creation of GOOS Regional Alliances (GRA's). At that time, the term “GRA” was unknown. Within the ongoing debates of various GOOS committees, of which there were many, it became clear that a GRA was needed for the Indian Ocean. In 1999, the government of Australia stepped forward and in partnership with the IOC, established the IOC Perth Regional Programme Office in Western Australia. In November 2000, Gary Meyers chaired the workshop on Sustained Observations for Climate in the Indian Ocean (SOCIO) in Perth. Shortly after taking up the position in Perth, and using the results from SOCIO, I began drafting the Indian Ocean Strategy document, which eventually became the IOGOOS Strategy. I soon came to realize that a higher-level mechanism was needed to promote IOGOOS. Thus, the group known as the Indian Ocean Principals was formed. Dr. Harsh Gupta, Chairman of the Department of Ocean Development in India was elected its Chairman. The “Principals” included the highest-level representatives from eleven agencies around the Indian Ocean. This was perhaps the most critical step in formulating a consensus to move forward and create IOGOOS. The key factors

were the ability of these individuals to commit resources to the enterprise, the power of their positions to convince governments to commit to it and their willingness to see the process through. They agreed that a major conference was needed to solidify regional support, identify needs and plan future activities. The conference was to also include the first official meeting of IOGOOS. Thus, the Perth Office planned its first conference with lots of help from many individuals and funding agencies.

Work soon began on drafting an agreement, which would guide the organization. Logically the IOGOOS MOU embedded the GOOS principles to more effectively link and enhance existing programs for more cost-effective use of existing knowledge, building infrastructure and expertise, and more rapid detection and timely prediction of environmental changes and events in marine and estuarine systems. The GOOS emphasis of course is operational oceanography but there was clearly recognition that the research and operational oceanography communities are mutually dependent. Research leads to operational oceanography and conversely it uses GOOS data for research purposes. Issues such as these had to be vetted and clearly stated in the IOGOOS MOU.

The MOU allows for the participation of countries from outside the Indian Ocean region through mechanisms such as Associate Membership status. Especially important is the GOOS principle that all data collected must be shared in reasonable and agreed timeframes.

During November 1-9, 2002, the first conference and meeting of the Indian Ocean GOOS organization came together in Grand Bay with enormous help from the Government of Mauritius. There were 30 countries, 4 international organizations, and over 170 participants in attendance.

Numerous high level officials attended including the Honourable Minister for Environment, Mauritius, Mr Rajesh Bhagwan; Dr. H. K. Gupta, Secretary of the Department of Ocean Development, India; Mr Harry Ganoo, Chairman, Mauritius Oceanographic Institute; Dr Patricio Bernal, Executive Secretary IOC and Dr K. Radhakrishnan, Director of the Indian Centre for Ocean Information Services.

By all accounts, the conference was a huge success with numerous work plans formulated, signature of the IOGOOS MOU, officers elected and even a research cruise and visit by the Indian research vessel, Sagar Kanya, completed under the sponsorship of IOGOOS and, finally, the first official IOGOOS meeting was convened.

Dr Radhakrishnan was elected the first Chairman of IOGOOS with Randolph Payet (Seychelles) as First Vice Chairman. To ensure that all regions of the Indian Ocean had equal representation, the other Officers were elected to represent various sub-regions. The results were: Johnson Kazunga for East Africa, Neville Smith for the eastern Indian Ocean, Ranadhir Mukhopadhyay for the Indian Ocean islands and Tickie Forbes for southern Africa. The Government of India agreed to host the Secretariat in Hyderabad at the Indian National Centre for Ocean Information Services for a period of six years.

IOGOOS hit the ground running. The conference was not typical. Instead of numerous papers, although there were plenty, there were several workshops on topics such as ocean dynamics and climate, coastal observing, data management and satellite applications. Time was allocated for the workshops to meet jointly to encourage knowledge transfer, and each workshop produced work project plans with identified project leaders and participants. It's fair to say that a number of these projects were implemented and continue today.

On a lighter note, the following story comes from a UNESCO report entitled "Understanding the Indian Ocean" published in 1998.

In the Hindu Vedic literature there is story about Lakshmi, the Goddess of Riches and the daughter of the King of the Seas. The story is known as Samudra Manthan (churning of the oceans) and it's about the birth of Lakshmi. The Aryans in Vedic times believed that the oceans contained all sorts of resources. Lord Vishnu suggested that the gods and demons should come together and churn the oceans to obtain the elixir which would render them immortal. They used a mountain as a stirrer and a large snake as a rope and mixed the ocean. Out came Lakshmi followed by Halahala, a highly potent poison. These were followed by all sorts of things and then finally came the elixir. At this point a big fight broke out between the demons and gods but Lord Vishnu only allowed the gods to drink the elixir, thus depriving the demons of immortality.

The point is that the Vedic Aryans believed the oceans held many things useful to mankind but unfortunately they left no written or pictorial history of what they extracted from it. Some may consider this the first ever GOOS, and use of the oceans to serve mankind.

Planning the first International Indian Ocean Expedition

Over the centuries, a number of Indian Ocean explorations were conducted by various countries. In 1937, the seed was planted to establish the first expedition of the Indian Ocean. A Mr. T.W. Vaughn wrote a report entitled International Aspects of Oceanography. He cited the need to the oceanographic community that very little was known about the Indian Ocean. Not much happened until 1957, when Lloyd Barkner, then President of the International Council of Scientific Unions (ICSU) asked Roger Revelle, Director of Scripps to appoint a Special (later, Scientific) Committee on Oceanographic Research. This would give oceanographers a major role in the planning process. At their first meeting at Woods Hole in 1957, they decided to plan an international expedition to the Indian Ocean. At this time, the only Indian Ocean countries involved were Australia, India and South Africa. SCOR decided the main problems facing the region were fisheries, monsoons and the limit of the oceans for dumping wastes, human and nuclear. The first two years of the expedition would focus on standardization of the instruments, data logging and analysis to be followed by two years of research cruises by as many as 16 ships. The total number expanded to over 46 ships.

After the SCOR meeting scientists began the process of exchanging ideas. A publication popped up entitled the "Indian Ocean Bubble", which appeared irregularly and contained suggestions and ideas from various scientists. Apparently this was the internet of the day. One scientist wrote a note to the

“Bubble” suggesting that it would be good to meet in a bar, or some other relaxing place, during the Oceanographic Congress in New York to discuss the issues. Also, the idea of setting up national centers in the region appeared in the “Bubble” which did eventually result from the IIOE, both in India and Pakistan.

SCOR invited 40 scientists from various disciplines to prepare a prospectus which was finalized by Roger Revelle (US), George Deacon (UK) and Anton Bruun (Den). After IIOE was completed Roger Revelle wrote a book and stated “There were so many scientific problems and the Indian Ocean was so far away from all our institutions that no one felt that his territory was being usurped. The Indian Ocean Expedition was a pioneering effort in international oceanographic planning.”

Henry LaFond wrote in the “Bubble” in 1959, “to me, the problem is not what to do, but rather, who in the region can be rounded up to do it? Everyone should be reminded that this is the Indian Ocean and not the Woods Hole or Scripps Ocean.” He went on to say that to attain lasting results the work has to be carried out partly by the scientists of the Indian Ocean. This means not just coming along for a ride, but actually a major share in planning, analysis and reporting. Lafond recommended contacting high level people, heads of scientific organizations, naval and fisheries laboratories, universities and explaining the program to them.

Dr. N.K. Panikkar, an Indian scientist on SCOR, helped immensely with these issues. He was responsible for India setting up the Indian National Committee on Oceanic Research. It was charged with drafting India's plan for IIOE, coordination within India, approving detailed plans and grants for participation and advising the Indian Government. INCOR became the focus for all Indian oceanographic developments and research projects. This led to the establishment of an Indian Ocean Expedition Directorate as a department in CSIR and the International Meteorological Centre at Colaba (now Mumbai) and the Indian Ocean Biological Centre at Cochin.

A Dr Robert Snider was charged by SCOR to visit all the Indian Ocean countries to explain the expedition and solicit support. In 1962, SCOR passed the planning off to the newly formed Intergovernmental Oceanographic Commission but continued to provide advice through their scientific committees.

The total estimated budget for the expedition was about \$4 billion but not much attention was paid to this number because no one could fund it anyway. Thus, individual countries came up with the funds needed to make it work.

Most of you are likely familiar with the scientific results of the expedition, which are rather impressive. so I won't discuss them here, except to say that the scientists pursued research of the Somalia Current, the mid-ocean ridges, the effects of monsoonal winds on surface currents, the productivity of upwelling areas, geochemistry and geophysics, etc.

Suggestions for Future Planning

I have covered a lot of ground in relatively few words but I hope this gives you a sense of how IOGOOS got its start and how the stage was set for the IIOE. In summary, I have compiled a list of suggestions to consider as you begin the process

of planning for the next Indian Ocean expedition and the further development of IOGOOS.

1. Numerous scientific questions remain concerning the Indian Ocean that needs to be understood and explained. These should be defined in a manner that relates them to the GOOS principles.
2. The scientific questions should be related to user needs and real problems within the region, which may be easily described by the media, and with a sense of urgency.
3. Reach out and recruit the best scientists and organizations from within and outside the region. They will have the best chance of success at securing the required funding.
4. Begin planning early, as the process will be slow and complicated.
5. Invest in project development: including coordinators, secretariat, publicity, workshops, etc. You are in competition with dozens of other important causes and the resources are scarce.
6. Establish a high-level committee to provide oversight and to promote the project on an international and national basis. They must meet, talk and establish a bond.
7. Consider a major scientific conference or workshop to encourage proposal drafting and cooperation amongst principal investigators, perhaps under the auspices of the IOC.
8. Reach out to partners in all communities: including science, operational oceanography, industry including oil, gas and fisheries, shipping, both private and government.
9. Be realistic: no pot of gold will be found. Depend on governments directly or indirectly for providing the lion's share of the funding and inkind support.

I sincerely hope that you are successful with IIOE II and I trust that some of these historical perspectives may help you avoid stumbles in the future. I see that IOGOOS is flourishing and helping to guide progress in the region and, hopefully, it will play the key coordination role in new expedition. As in most cases, success is usually the result of a team effort with everyone contributing as much as they can. The journey is a long one and will be undertaken step by step. The region needs your hard work and deserves a successful outcome. Good luck with it.

Thank you for your kind attention.

Annexure 4

Opening Address by Mr. M. Seebah, Permanent Secretary, Prime Minister's Office of Mauritius at the Inaugural session of IOGOOS-10 Workshop and Tenth Annual Meeting held at Port Louis, Mauritius during October 21 -24, 2013

Dr. Andreas Schiller, Chairman of the Indian Ocean Global Ocean Observing System

Dr. Nick D'Adamo, Officer in-charge of IOC-UNESCO Perth Regional Office

Dr. William Erb, former Head of IOC-UNESCO Perth Regional Office

Distinguished Guests

Ladies and Gentlemen

On behalf of the Prime minister's Office, allow me to welcome you this morning to the 10th Annual meeting of the Indian Ocean Global Ocean Observing System, commonly known as IOGOOS.

As you are aware, 10 years ago we had witnessed the creation of IOGOOS in Mauritius itself. It is, therefore, most fitting that for its 10th anniversary, IOGOOS is meeting again in Mauritius. I take this opportunity to welcome distinguished scientists in our midst.

This meeting and the workshop are particularly important in view of the fast increasing role, the Ocean has to play in the global economy.

As most of you may be aware, the Government of Mauritius is aiming to make ocean-related activities a new growth pillar of the economy.

To this end, a process of national consultation had been undertaken to draw up a clear roadmap that will chart the way to the development of our Ocean economy. We are in the process of finalising the roadmap.

In order to ensure a sustainable development of the Ocean economy, we will ensure that an integrated and holistic approach is adopted to all ocean related economic activities to ensure optimisation, coherence and balance between economic, conservation ecological and social implications.

Conscious of the very complexity of the marine environment, we will leave no stone unturned to ensure eco-friendly and sustainable practices.

Distinguished Delegates,

I am told that IOGOOS has been playing a key role in promoting the observation of the Ocean. It would be unthinkable for us to observe and predict the dynamics of our ocean without a capable system. I understand that a number of such systems have been put in place in the Indian Ocean, namely the Research Moored Array

for African-Asian-Australian Monsoon Analysis and Prediction, also known as RAMA. These systems are now contributing immensely in a regional network that provides information on oceanic parameters.

Distinguished Delegates,

I am sure that IOGOOS will expand further its networks and will provide readily accessible information on the state of our ocean in the region. It is also important for IOGOOS to build up the regional capacity for an enhanced ocean observation network. In fact, IOGOOS is being called upon to play a vital role to improve our capacity in Ocean science. Here we have to salute the initiatives of the various scientific communities like SOBER and IOP.

Fifty years ago, the Indian Ocean witnessed one of its unprecedented research campaigns to explore the Indian Ocean, known as the International Indian Ocean Expedition, IIOE. This resulted in expanding our knowledge of the behaviour of our ocean and contributed much in regulating our developmental activities. After half a century, it is important that such an experience needs to be replicated. I understand that IOGOOS members are fully supportive for an IIOE-2 and you can rest assured that Mauritius will support for the realisation of this project.

Distinguished Delegates,

I wish to reiterate our commitment to the goal of IOGOOS which is in essence to strive for an enhanced ocean observation system for the region and to build up our own national capabilities to make ocean forecast a daily business.



Let me end by wishing you all a very successful and fruitful Annual Meeting and Workshop.

Thank you for your attention.

IOGOOS Workshop and Tenth Annual Meeting (IOGOOS-X)

October 21– 24, 2013 , Mauritius

Agenda

Monday, October 21, 2013	
08:30 Hrs to 09:15 Hrs	Registration
09:15 Hrs to 10:30 Hrs	<p> Opening Ceremony</p> <p>(Master of Ceremonies: Dr Rezah Badal, Prime Minister's Office)</p> <ul style="list-style-type: none"> ➤ 0915 Hrs Welcome by Host ➤ 0920 Hrs Welcome Address by Dr Andreas Schiller, Chair IOGOOS ➤ 0935 Hrs Opening Remarks by Dr. Nick D'Adamo, Officer in Charge, IOC-Perth Regional Programme Office ➤ 0945 Hrs Key note speech on the history of IOGOOS by Dr Bill Erb ➤ 1015 Hrs Opening of the Meeting and Address by Chief Guest, Mr. M. Seebah, Permanent Secretary, Prime Minister's Office, Mauritius ➤ Organization of the Meeting (including confirmation of agenda and additional agenda items) by Dr. Andreas Schiller, Chair, IOGOOS
10:30 Hrs to 11:00 Hrs	Tea Break
11:00 Hrs to 12:00 Hrs	<p>IOGOOS Decadal Celebrations - Chair: Dr Andreas Schiller</p> <ul style="list-style-type: none"> ➤ IOP key note speech on "Progress in Indian Ocean climate research in a recent decade" by Dr. Yukio Masumoto ➤ The Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) Program: Progress, Challenges and Prospects for 2013 and Beyond by Dr. Somkiat Khokiattiwong
12:00 Hrs to 13:00 Hrs	<p> Plenary science talks (Duration of each speaker: 15 + 5 (Q & A)minutes)</p> <ul style="list-style-type: none"> ➤ International Indian Ocean Expedition (IIOE)-2 Reference Group Meeting by Dr. Nick D'Adamo ➤ Large Marine Ecosystems in the Western Indian Ocean - Partnerships for Monitoring and Management by Dr. Lucy Scott ➤ Intraseasonal variability of thermocline in the Bay of Bengal by Dr. M. Ravichandran
13:00 Hrs to 14:00 Hrs	Lunch Break

14:00 Hrs to 16:00 Hrs	<ul style="list-style-type: none"> ✚ Plenary science talks (contd...) - Chair: Dr Srinivas Kumar <ul style="list-style-type: none"> ➤ Sea Level Variations in the Western Indian Ocean Region by Dr. Charles Magori ➤ AMESD: the Use of Earth Observation data in the South West Indian Ocean Region by Mr. E. MARTIAL, Systems Administrator/MOI-AMESD Counterpart ➤ Research Activities in the Andaman Sea and Bay of Bengal by Dr. Somkiat Khokiattiwong ➤ Hydrometeorological Hazard Assessment using Ocean Observations – Mr. M. Beebeejaun, Director, Mauritius Meteorological Services ➤ Recent Japanese research activities in the Indian Ocean region by Dr. Yukio Masumoto ➤ South West Indian Ocean Fisheries Project by Representative of Ministry of Fisheries, Mauritius
16:00 Hrs to 16:30 Hrs	Tea Break
16:30 Hrs to 17:30 Hrs	<ul style="list-style-type: none"> ✚ Plenary science talks (Contd...) - Chair: Dr. Yukio Masumoto <ul style="list-style-type: none"> ➤ Persian Gulf and Gulf of Oman Oceanographic Studies (PGGOOS) by Dr. Vahid Cheginy ➤ Operational Ocean Services in India by Dr. S. S. C. Shenoi ➤ New moored buoy network in Northern Indian Ocean with surface and subsurface measurements, their analysis and applications by Dr. G. Latha ✚ Science Workshop Concluding Remarks by Chair, IOGOOS
19:30 Hrs to 21:00 Hrs	Welcome Dinner hosted by Prime Minister's Office, Mauritius.

Tuesday, October 22, 2013	
08:30 Hrs to 12:30 Hrs (Tea Break between 10:00 Hrs to 10:30 Hrs)	<p>Reporting to IOGOOS (25 minute presentations and 5 minute questions– Panel of Chairs [IOGOOS, IRF, SIBER & IOP]</p> <ul style="list-style-type: none"> ➤ Report from the Indian Ocean Panel by Dr. M. Ravichandran ➤ Report from Sustained Indian Ocean Biogeochemistry and Ecosystem Research by Dr. Somkiat Khokiattiwong ➤ Report from IndOOS Resource Forum by Dr. Nick D'Adamo ➤ Report from Modeling for Ocean Forecasting and Process

	<p>Studies Project by Dr. Nick D' Adamo, Project Leader</p> <ul style="list-style-type: none"> ➤ Report from the IOGOOS Pilot Project: Indian Ocean Core Remote Sensing Project IOGOOS by Dr. T. Srinivasa Kumar, Project Leader
12:30 Hrs to 13:30 Hrs	Lunch Break and travel time to ship
14:00 Hrs to 16:00 Hrs	<ul style="list-style-type: none"> ✚ Visit to the German Oceanographic Research Vessel 'Meteor'
16:00 Hrs to 16:30 Hrs	✚ Tea Break
16:30 Hrs to 18:00 Hrs	<ul style="list-style-type: none"> ✚ Pilot Projects: general discussion in plenary (30 minutes)– Chair: Nick D'Adamo <ul style="list-style-type: none"> ➤ Modeling for Ocean Forecasting and Process Studies ➤ Indian Ocean Core Remote Sensing Project <ul style="list-style-type: none"> ▪ Chlorophyll-a Mapping Project ▪ Keystone Ecosystem Project ▪ Shoreline Changes Monitoring Project ✚ Plenary review of list and identification of projects to retain and remove from list.

Wednesday, October 23, 2013	
08:30 Hrs to 12:30 Hrs (with 11:00 Hrs to 11:30 Hrs Tea Break)	<p>IOCINDIO Meeting</p> <ul style="list-style-type: none"> ✚ Opening by IOC Secretariat staff ✚ Election of interim chairperson ✚ Status & current governance of IOCINDIO by the interim chair. ✚ <u>Background information and update since the last session by interim chair</u> ✚ Way forward with discussions focusing on the organizational framework of IOCINDIO towards the fifth session of IOCINDIO with commitments from the IOCINDIO member states including potentials and opportunities: <ul style="list-style-type: none"> ➤ Current status of development and implementation of IOC programmes in the IOCINDIO region. ➤ Historical legacy in international cooperation in the fields of ocean sciences and research such as the international Indian Ocean

	<p>expedition and plans for its 50th anniversary celebration.</p> <p>✚ Closure of the Meeting</p>
12:30 Hrs to 14:00 Hrs	Lunch Break
14:00 Hrs to 17:00 Hrs	<p>Chair: Dr. Somkiat Khokiattiwong</p> <p>✚ Examination of overall IOGOOS membership. Development of a strategy to reactivate member engagement or replace inactive or resigning members.</p> <ul style="list-style-type: none"> ○ Approaching the permanent delegation to IOC (to be discussed) ○ IIOE-2 Members to be active in IOGOOS (to be discussed) <p>✚ Discussions about future Strategic Plan of IOGOOS lead by IOGOOS Chair</p>

Thursday, October 24, 2013	
09:30 Hrs to 11:00 Hrs	<p>✚ IOGOOS Annual Meeting. Chair, Dr. Andreas Schiller, IOGOOS Chair</p> <ul style="list-style-type: none"> ➤ Report by Chairman, IOGOOS ➤ Presentation of Secretariat Report ➤ Accounts and Financial Summary ➤ Confirmation of new memberships ➤ Elections ➤ Announcement for Hosting the IOGOOS Secretariat for 2015 – 20 ➤ Next meeting date , venue and hosting - to be considered with joint input from IOGOOS, IOP, SIBER and IRF Chairs
11:00 Hrs to 11:30 Hrs	Tea Break
11:30 Hrs to 12:30 Hrs	<p>✚ IOGOOS Annual Meeting to be continued....</p> <p>✚ Concluding Session</p>
12:30 Hrs to 13:30 Hrs	Lunch Break

Annexure 6

List of IOGOOS X Participants October 21 – 24, 2013 Port Louis, Mauritius

Sl. No.	Country	Name and Address of the Participant	Remarks
1.	Australia	Dr. Andreas Schiller, Senior Principal Research Scientist, CSIRO Marine and Atmospheric Research, Castray Esplanade, Hobart TAS 7000, AUSTRALIA Email: Andreas.Schiller@csiro.au	IOGOOS Chair
2.	Bangladesh	Dr. Mohammed Ashraful Azam Khan Professor and Director Institute of Marine Sciences and Fisheries University of Chittagong Bangladesh. Email: aakimscu@yahoo.com	IOGOOS Member and BOBLME Representative
3.	India	Dr. Sateesh Shenoi, Director, ESSO-Indian National Centre for Ocean Information Services (INCOIS), 'Ocean Valley', Pragathi Nagar BO, Nizampet SO, Hyderabad-500054, Andhra Pradesh, India Tel:0091 40-23895000 Fax: 0091 40 2389 5001 Email: shenoi@incois.gov.in	IOGOOS Member
4.		Dr. M. Ravichandran, Head, Modelling and Ocean Observations Group (MOG), Co-Chair, IOP, Pragathi Nagar BO, Nizampet SO, Hyderabad-500054, Andhra Pradesh, India Tel:0091 40-23895004 Fax: 0091 40 2389 5001 Email: ravi@incois.gov.in	IOP Co-Chair
5.		Dr. T. Srinivasa Kumar, Head, Advisory Services and Satellite Oceanography Group (ASG), Officer, IOGOOS, Indian National Centre for Ocean Informaiton Services (INCOIS), 'Ocean Valley', Pragathi Nagar BO, Nizampet SO, Hyderabad-500054, Andhra Pradesh, India Tel:0091 40-23895006 Fax: 0091 40 2389 5001 Email: srinivas@incois.gov.in	IOGOOS Officer
6.		Dr.G.Latha Scientist "F", Head Ocean Acoustics & Modeling National Institute of Ocean Technology	IOGOOS Member

		Velachery Tambaram Road, Pallikaranai, Chennai 600100 Office Tel : +91 44 66783399 Mobile: 09444399828 Email: latha@niot.res.in	
7.		Mr. M. Nagaraja Kumar, Secretary, Indian Ocean Global Ocean Observing System (IOGOOS), Scientist In- charge, PFZ Mission, Indian National Centre for Ocean Informaiton Services (INCOIS), 'Ocean Valley', Pragathi Nagar BO, Nizampet SO, Hyderabad-500054, Andhra Pradesh, India Tel:0091 40-23895013 Fax: 0091 40 2389 50141 Email: raja@incois.gov.in ; raja.masuluri@gmail.com	IOGOOS Secretary
8.	IOC/Perth	Dr Nick D'Adamo Head- Perth Regional Programme Office of the IOC, UNESCO c/- Bureau of Meteorology 5th floor, 1100 Hay Street (corner of Harvest Tce), West Perth 6005, Western Australia. Ph (direct) +61-8-92262899 or (reception) +61-8-92632222 Fax +61-8-92260599 Email nick.d'adamo@bom.gov.au	Head, IOC PRPO and IOGOOS Member
9.	Indonesia	Mr Muswerry Muchtar, Senior Researcher, Research Center for Oceanography, Indonesian Institute of Sciences, Jakarta, INDONESIA Tel:+622164713850, Mob: + 628129391511 Email: muswerry.muchtar@gmail.com	IOGOOS Member and BOBLME Representative
10.	Iran	Dr. Vahid Cheginy Director of Iranian National Institute for Oceanography and Atmospherice Sciences (INIOAS) #3, Etemad Zadeh St., Fatemi Ave., Tehran , Iran, 1411813389 Tel: (098)2166944867 Fax: (098)2166944866 Email: v_chegini@inio.ac.ir , vahid.chegini@gmail.com	IOGOOS Member
11.	Japan	Dr. Yukio Masumoto Principal Scientist, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokohama, JAPAN Email: masumoto@jamstec.go.jp	IOGOOS Officer
12.	Kenya	Dr. Charles Magori,	IOP Member

		Member, Indian Ocean Panel (IOP) Kenya Marine and Fisheries Research Institute Headquater & Mombasa Station P.O. Box 81651 080100 Mombasa, KENYA Email: cmagori24@gmail.com	
13.	Kuwait	Dr. Faiza Al-Yamani, The State of Kuwait Representative in the IOC, and The Executive Director of the Environment and Life Sciences Research Centre, Kuwait Institute of Scientific Research, P.O. Box 24885, 13109 Safat, KUWAIT Email: faizayamani@gmail.com	IOCINDIO
14.	Malaysia	Profesor Dr. Mohd Lokman Bin Husain Director, Institute Of Oceanography And Environment Universiti Malaysia Terengganu, 21030 Kuala Terengganu, Terengganu, MALAYSIA Tel: +609-6683195 Fax: +609-6692166 Email : mlokmn@umt.edu.my	BOBLME Representative
15.	Mauritius	Mr. M. Seebah, Permanent Secretary, Prime Minister's Office, Port Louis, Mauritius	Chief Guest, IOGOOS X
16.		Mr. Rezah Badal, Head, Ocean Matter's Unit, Prime Minister's Office, Port Louis, Mauritius Mob: +230 57290150 Email: rezahmb@moi.intnet.mu	IOGOOS Officer and Local Host
17.		Mr. Eric Martial, Systems Administrator/MOI-AMESD Counterpart, Mauritius Oceanography Institute (MOI) France Centre, Victoria Avenue Quatre-Bornes, Mauritius Email: emartial@moi.intnet.mu	Invitee / Speaker
18.		Mr. Mohamudally Beebeejaun, Director, Mauritius Meteorological Services, St. Paul Road, Vacoas-Phoenix, Mauritius Tel: (+230) 686 1031 or (+230) 686 1032 Fax: (+230) 686 1033; Email: meteo@intnet.mu	Invitee / Speaker
19.		Mrs. Nazli Tegally, Confidential Secretary, Mauritius Oceanography Institute (MOI) France Centre, Victoria Avenue Quatre-Bornes, Mauritius	

		Email: director@moi.intnet.mu	
20.	Sri Lanka	Dr. T. K. D. Tennakoon, Research Officers, National Institute of Oceanography and Marine Sciences, National Aquatic Resources Research & Development Agency (NARA), Crow Island, Colombo 15, SRI LANKA Email: kamal@nara.ac.lk / tkdkamal@hotmail.com	IOGOOS Member and BOBLME Representative
21.	Thailand	Dr. Somkiat Khokiattiwong, Chair, SEA-GOOS, Phuket Marine Biological Center, Thailand Department of Marine and Coastal Resources 51, Dhidate Road, P.O. Box 60, PHUKET 83000 THAILAND Tel: +66 76 391128; Fax: +66 76 391127 Email: somkiat@e-mail.in.th ; skhokiattiwong@gmail.com	IOGOOS Officer, and SIBER Member
22.	USA	Dr William Bill Erb, 18258 Park Drive St. Inigoes, Maryland 20684, USA Tel: +1 3018724072; Cell: +1 (o) 240 4343953 Email: williamerb34@yahoo.com	Ex-Head, IOC, PRPO and Special Invitee / Speaker
23.	ASCLME / South Africa	Lucy Scott UNDP GEF Agulhas and Somali Current Large Marine Ecosystems Project, ASCLME House, 18 Somerset Street, Grahamstown, 6140, South Africa Cell: +27-82-879-5006 Email: lucy.scott@asclme.org	ASCLME

Annexure 5

Draft Strategic Plan put up for adoption by IOGOOS XI Global Ocean Observing System for Indian Ocean (IOGOOS) Strategic Plan 2014-2019

- 1 Mission of IOGOOS**
- 2 Objectives**
- 3 Strategic Approaches**
 - 3.1 Enhancement of Ocean Observing System**
 - 3.2 Data Management, Data Exchange and Communication**
 - 3.3 Applications and operational Services**
 - 3.4 Capacity Building**
 - 3.5 Research**
 - 3.6 Co-operation with other programmes and bodies**
 - 3.7 Publications**
 - 3.8 Ocean and coastal systems and services**
- 4 Strategic Priorities 2007-2010**
- 5 Operational Plan (Programme of Work)**
 - 5.1. Project Areas**
 - 5.1.1 Currently being pursued**
 - 5.1.2 Potential New Projects**

1. Mission of IOGOOS

To foster cooperation and concerted actions on ocean observations, ocean science, operational oceanography and ocean services to meet societal needs for the Indian Ocean, to mitigate the impacts of natural disasters and climate change and to inform policy and decision making for protecting life and property and marine habitats and resources.

2. Objectives

The association of marine operational and research agencies and institutions which is IOGOOS recognized the imperative need to take a pro-active role and concerted actions to understand the ocean and coastal regions of the Indian Ocean for making informed decisions that save lives and protect living habitats and resources in the Indian Ocean region,

The broad intent was to contribute, collectively, to the progress of ocean observations, ocean science and operational oceanography, focusing on these imperative needs of the Indian Ocean region,

IOGOOS provides an organizational framework for planning, coordination and effective implementation of appropriate regional and sub-regional ocean and coastal observing systems, associated research and development, and services,

Members of IOGOOS will collaborate and work together for developing programmes for the implementation of GOOS in the Indian Ocean and for promoting activities of common interest for the development of operational oceanography in the Indian Ocean region

The specific objectives are to:

- a) Contribute to the enhancement and establishment of the ocean observing system in the region;
- b) promote and facilitate efficient and effective management, exchange and utilisation of oceanographic data;
- c) promote and facilitate projects in coastal oceanography, in particular in relation to the prediction and mitigation of the impacts of hazards;
- d) promote programmes and projects in operational oceanography and ocean services in the region meeting the requirements of end-users;
- e) strengthen capacity building for enhancing the capabilities in the region;
- f) encourage research in support of the above and the needs of users; and
- g) develop synergies with other ocean programmes and regional GOOS bodies and
- h) contribute to international planning and promotion of GOOS.

3. Strategic Approaches

3.1. Enhancement of the Ocean Observing System

- a. Identify gaps and deficiencies in the existing/planned in-situ and remote sensing ocean observing system, and develop a programme for realising a well-designed and

affordable ocean observation system for the region, adhering to the 'GOOS principles'

- b. Promote the development of cost-effective operational instrumentation and observing systems

3.2.Data Management, Data Exchange and Communication

- a. Promote the development of cost-effective systems for acquisition, management, processing and interpretation of data.
- b. Expand and strengthen networking of countries using modern technology including internet for real and near real time exchange of data and products.
- c. Promote the development of standardized data procedures, including data quality control, adoption and use of metadata models, and data management more generally.
- d. Provide high quality data and time series for a better understanding and improving the Indian Ocean ecosystem,
- e. Collaborate with other programme and bodies in the field of data collection and data management, including as appropriate, through the ocean contribution to GEOSS
- f. Co-ordinate GOOS data acquisition with existing regional and national data gathering systems under the agreements and conventions relating to pollution monitoring, marine meteorology, navigation and safety at sea,
- g. Inventory of available data and products
- h. Promote the exchange of coastal sea level data

3.3.Applications and operational Services

- a. Identify priorities for operational oceanography and ocean services in the Indian
- b. Ocean region, based on evaluation of social and economic benefits,
- c. Promote the development of regional and local operational oceanography, taking into account the components of GOOS, for realising services and products of maximum value to the countries of the region
- d. Support operational oceanography and services in collaboration with marine- related public and private sector organizations and programmes

3.4.Capacity Building

IOGOOS should work with IOC to identify requirements in Capacity Building for the region and possible solutions encompassing the following.

- a. Involve institutions, develop leadership
- b. Identify the training needs of countries in the region and promote organisation of training courses, workshops and seminars
- c. Promote the development of common infrastructure, major systems or capital installations required to support operational oceanography in Indian Ocean,
- d. Promote and aid capacity building, exchange of know-how, technology and personnel as well as collaboration, within the framework of GOOS;

- e. Promote pilot projects and studies in the countries of the region to demonstrate the economic benefits of GOOS
- f. Strengthen collaboration with GOOS and JCOMM, including DBCP capacity building panels and other capacity building programmes of IOC and its sub-commissions in the Indian Ocean region. .
- g. To exploit bilateral and multi-lateral opportunities for CB in the region (e.g., exchange of training for access to facilities)

3.5. Research

- a. Promote research and operational research for solving problems relating to operational oceanography in the Indian Ocean, including modeling and analyses of observation,

3.6. Co-operation with other programmes and bodies

- a. Contribute to international planning and implementation of GOOS,
- b. Assist in developing policies for the furtherance of GOOS and co-ordinate the best regional participation in GOOS, identifying where greatest value is added by collaboration
- c. Promote collaboration between existing regional multi-national agencies, programmes, organisations, and initiatives having expertise in oceanography, operational systems, and remote sensing of the ocean,
- d. Collaborate, as appropriate, with relevant regional GOOS-related and complementary regional initiatives, such as LME programmes through joint projects and activities,
- e. Cooperate, as appropriate, with organisations concerned with the assessment of climate change, global environmental research, and the impacts of climate variability and climate change,
- f. Promote collaboration with space agencies and remote sensing scientists and engineers so as to ensure optimum integration of both in situ and remote sensed data in operational oceanography;
- g. Promote collaboration between Institutes and agencies in providing aid and assistance to developing countries for operational oceanography, and the necessary capacity building.
- h. Provide as appropriate, expertise, consultants, etc., to the IOC WMO UNEP GOOS Steering Committee (GSC), , and to the international sponsoring agencies of GOOS

3.7. Publications

- a. To publish findings of meetings, workshops, studies and other documents commissioned by the IOGOOS members and submission of documents to international meetings related to GOOS and collective representation of GOOS to regional and national agencies when requested by members

3.8. Coastal systems and services

- a. Ocean and coastal hazards
- b. Coastal Zone Management

- c. Marine Ecosystems and resources
- d. Shoreline change, including coastal erosion/inundation
- e. To contribute to the development of the IOTWS through fostering and promoting collaboration on sea level observations and systems;
- f. To promote development of observational networks (pilot and operational) that support monitoring;
- g. Ocean data analysis and forecasting;
- h. Climate variability and change impacts on the marine environment, including trends

4. Strategic Priorities 2013-2018

4.1. Observing System Activities

- a. The ongoing Indian Ocean (Climate) Observing System activities that are being pursued by the Indian Ocean Panel are progressing well and are direct contributions of IOGOOS to the Observing System activities in the Indian Ocean. These activities are to be pursued.
- b. Add statement about SIBER
- c. Add statement about IRF
- d. Add statement about IIOE-2
- e. IOGOOS role and contributions to the Global Coastal Network (GCN): An audit could be coordinated from IOGOOS that could cover national programmes of the IOGOOS members in coastal monitoring, in-situ and remote sensing activities, data products, modelling and prediction activities, Data and Information Management, etc.
- f. IOGOOS role and contributions to the coastal ocean beyond the Global Coastal Network (GCN): The coastal ecosystem pilot project, the Indian Ocean elements of Chloro GIN and the remote sensing activities of IOGOOS have been identified as the IOGOOS contributions to the coastal ocean beyond the GCN. These activities are to be pursued

4.2. Data and Information Management

- a. INCOIS and the IOGOOS Secretariat are involved in the Data Management of the IOP Data. An interface to the data is already provided on the IOGOOS Website (<http://www.incois.gov.in/Incois/iogoos/home.jsp>). Further, a comprehensive data and information management plan could be evolved by ensuring wide participation of the data managers from the region.

4.3. Applications and Operational Services

- a. Applications of ocean climate reanalyses and climate change projects through downscaling (coral reefs and fisheries applications)
- b. Downscaling ocean analysis and prediction: The long-term objective is to develop regional, coastal and near-shore modeling capability within the constituency of IOGOOS
- c. ChloroGIN Project

4.4.Capacity Building and Training

- a. IOGOOS should work with IOC and IRF to identify requirements for the region and possible solutions
- b. Activities need to align with the projects of IOGOOS
- c. IOGOOS should pursue activities that facilitate expert/scientist exchange/visits

4.5.Support Ocean and Coastal Research/Observing

- a. IOGOOS has strong programmes in ocean and coastal ecosystems and climate as well as remote sensing. IOGOOS could play a potentially strong role in coordinating coastal research/observing

4.6.Co-operation

- a. Participation of IOGOOS on the GOOS Regional Forum
- b. Collaboration between the IOP, SIBER and IRF
- c. and other GOOS entities and related regional programmes.

5. Operational Plan (Programme of Work)

Regional work programs are a fundamental component of the IOC structure to translate the global programmes and ocean services of the Commission into activities that maximize the benefit for Member States, taking into account the regional-specific perspectives and capability and the priorities indicated by Member States.

IOGOOS is not part of the intergovernmental structure but is recognized as one of the GOOS Regional Alliances and can influence the development of GOOS. The MoU for IOGOOS delivers a measure of autonomy since it is the Members themselves who decide actions and mutual commitment.

However, IOGOOS will only be seen as effective as a GRA if its work and actions truly add value and capacity in line with GOOS objectives and related Member State needs. The creation of a GOOS Regional Alliance does provide a mechanism for formally linking the work program of IOGOOS to GOOS itself but, in practical terms, it will be through working to the priorities established in GOOS plans, collaboration in bodies and panels of GOOS, and national coordination via GSC and JCOMM.

Regional alliances have a unique role in terms of building partnerships and cooperation at the agency level and it is at this level that IOGOOS is most effective.

Work (action) of IOGOOS takes on many forms:

- a. Building scientific knowledge and supporting data for ocean and coastal management,
 - decision making and policy formulation, and
 - as contributions to the broader base of oceanographic data and knowledge;
- b. Increasing national and regional capacities in marine sciences and observations through

- training,
 - development of leadership,
 - networking among scientists and research institutions, and
 - the mobilization of resources;
- c. Improving bilateral and multilateral support arrangements; and d) Enhancing communication and awareness building.

The work program can be organized in a number of different ways including

- a. Sector/field or regional specific projects. They are characterised by (among other things)
 - A project plan, with specified objectives, outcomes and measures of performance;
 - An agreed period for the project; and
 - Identified leaders and participants.
- b. Work that is a direct contribution to a GOOS or related IOC program of action. The definition of this work should include
 - Well defined objectives, which may be ongoing;
 - Designation of rapporteurs and/or leaders responsible for interaction with GOOS;
 - A schedule of work for each inter-sessional period; and
 - A clear identification of the IOGOOS role and responsibility

The IOGOOS Work Program falls under three Main Lines of Action (MLA) of IOC:

- **MLA 2** : Building capacities in the basic sciences, including through the International Basic Sciences Programme (IBSP), in engineering and for the use of renewable energy
- **MLA 6** : Enabling the application of ecological and earth sciences for sustainability, including through the Man and the Biosphere (MAB) Programme and the International Geoscience Programme (IGCP)
- **MLA 7** : Natural disaster risk reduction and mitigation (through the implementation of ocean observing systems and capacity building in operational oceanography and ocean forecasting).

5.1. Project Areas

5.1.1. Currently being pursued

- a. Indian Ocean Panel and IndOOS
- b. Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) Program

- c. IndOOS Resource Forum
- d. Modeling for Ocean Forecasting and Process Studies
- e. Indian Ocean Core Remote Sensing Project with sub-projects on Coastal Ecosystems, Shoreline Changes and Real-time Chlorophyll Mapping and Applications
- f. Capacity Building

5.1.2. Potential New Projects

- a. Regional (coastal) projections of climate change (sea level, sea temperature, acidification)
- b. Extended provision of remote sensing products and involvement in satellite missions
- c. Call for proposals for Ocean Colour Sensors
- d. Invitation to develop payload instruments for future small sat missions
- e. Digital elevation projects to support inundation studies (storm surges, sea level rise), coastal morphology and shoreline change, tsunami modelling
- f. Contributions to the Tsunami and Other hazards Warning System (TOWS)
- g. Ensure appropriate remote sensing CB activities are built into IOGOOS Pilot Projects

**IOGOOS Workshop and 10th Annual Meeting (IOGOOS-X)
October 21 – 24, 2013 at Port Louis, Mauritius**

Action Taken report from IOGOOS Secretariat Report

Sl. No.	Item	Status / Progress
1	IOGOOS Annual Meeting	
1.1	IOGOOS IX Annual Report	<ul style="list-style-type: none"> • Six Delegates (IOC-Africa, Mauritius, Sri Lanka, Tanzania and Thailand) were supported for participating in the IOGOOS IX Annual meeting through sponsorship from IOC Perth Regional Programme Office. • Prepared and finalised the IOGOOS IX annual report in collaboration with Officers and IOC Perth Office.
1.2	Conduct of IOGOOS X	<ul style="list-style-type: none"> • Notification, Invitations, Agenda, and Mobilization of funds for IOGOOS X delegates participation. • Funding from UNESCO Jakarta Office facilitated by IOC Perth Office (USD 19,990) to partially / fully sponsor 06 delegates.
2	<ul style="list-style-type: none"> • Capacity Building 	
2.1	PORSEC Pre-conference Tutorial	<ul style="list-style-type: none"> • Announcement of opportunity provided to IOGOOS member countries for the PORSEC 2012 Pre-conference Tutorial on Ocean Colour Remote Sensing and Active Microwave Remote Sensing. • PORSEC PCT was conducted during Oct 30 – Nov 03, 2012 at Kochi, Kerala. 31 participants from INDIA, CHINA, INDONESIA, MALASIYA, USA,

		AUSTRALIA, JAPAN, RUSSIA have been trained.
3	IOGOOS IX Action Items	
3.1	1. IOGOOS was suggested to communicate the activities and applications to partner countries and users, for example in the areas of coral bleaching, circulation, sea level, hazards, etc.	<ul style="list-style-type: none"> IOGOOS Secretariat has started its bi-annual News Letter which depicts various activities of IOGOOS that is being forwarded further to various stakeholders in IO region.
3.2	2. IOGOOS to consider the request of JAMSTEC to become Associate Member	<ul style="list-style-type: none"> Secretariat will further pursue this with JAMSTEC along with the membership fees to existing member institutes.
3.3	3. IOGOOS should send a letter to members to ascertain their membership status, and in that context, encourage them to better engage in IOGOOS or seek a clear understanding that they wish to resign from IOGOOS	<ul style="list-style-type: none"> IOGOOS Secretariat will initiate the action and pursue with the member institutions. However lack of the details of focal contacts is still a concern to write even for communicating the information.
3.4	4. IOGOOS to request IOP and SIBER for the nominations of IOGOOS Officers from their own respective memberships	<ul style="list-style-type: none"> Action Completed. Obtained the nominations of Dr. Yukio Masumoto from IOP and Dr. Somkiat Khokiattiwong from SIBER.
3.5	5. IOGOOS Secretariat was requested to coordinate the process of venue/date selection for IOGOOS-X, inter-sessionally and with the facilitation of the IOGOOS Officers	<ul style="list-style-type: none"> Action Completed.
4	<ul style="list-style-type: none"> Governance 	
4.1	IOGOOS Secretariat to reflect the new elected positions in its communications and communicate to all the members	<ul style="list-style-type: none"> Action Completed
4.2	IOGOOS Officers meetings	<ul style="list-style-type: none"> Teleconference meeting within

		Officers and IOC Perth Office
4.3	IOGOOS News Letter	<ul style="list-style-type: none"> • Bi-annual News Letter of IOGOOS has been started. The first issue of the letter has been prepared and issued in May 2013. The second issue of the same will be out during November 2013.
4.4	IOGOOS Member	<ul style="list-style-type: none"> • Facilitated the approval of IOGOOS Membership of Institute of Marine Sciences, University of Chittagong, Bangladesh during IOGOOS IX meeting.
5	<ul style="list-style-type: none"> • Finance 	
5.1	Membership Fees for 2011-12 and 2012-13	<ul style="list-style-type: none"> • Requests are to be sent to the Members for remittance of the Annual Membership fee for the period 2011-12 and 2012-13. Contacts are to be established for few member countries as the original signed dignitaries are not available.
5.2	Audit	<ul style="list-style-type: none"> • Completed Financial Accounting and Audit for the Period October 2012 – Till date. • Statement of Account is being submitted for verification and approval.

Specific actions with respect to IOP, SIBER, Modelling and Remote Sensing project initiatives will be presented by the respective project leaders

IOGOOS Secretariat:

The IOGOOS Secretariat term in India will be ending soon by October 2014 and the proposals are sought from the member institutes to host the Secretariat. The proposal may be sent to IOGOOS Secretariat considering the following criteria below.

Status of IOGOOS Secretariat hosting:

Term	2002 – 2008	2009 – 2014	2015 – 2020
Secretariat	INCOIS, India	INCOIS, India	Location of Office may be rotated after six years from one Member to another by agreement of Members at an Annual Meeting.
Secretary	Dr. T. Srinivasa Kumar	Mr. M. Nagaraja Kumar	To be Nominated
	(2008-2009: Dr. T. Srinivasa Kumar and Mr. M. Nagaraja Kumar has worked as Co-Secretaries)		

Criteria for hosting the IOGOOS Secretariat:

The host agency has to a leading oceanographic research establishment in the Indian Ocean region and is expected to provide and bear the cost of the following facilities to host the IOGOOS Secretariat:

- Nominating a Secretary for provision of administrative (communication and information exchange, travel planning, meetings, staff agenda organization, arrangements for shipping) and technical support (pursue decisions of the annual meetings and coordinate Inter-sessional activities related to IOGOOS Pilot Projects)
- Provision of Office Space for Secretariat Staff
- Provision of Computers and Communication facilities such as Telephone, Fax, and Internet
- Providing accommodation, support services, and/or professional staff
- Hosting and Management of IOGOOS Website
- Collection of Annual Membership fee, maintenance of Bank Account and issue of audited annual financial statements
- Support day-to-day functioning of the Office by following the practices of the host Agency

The proposals for hosting the Secretariat is now tabled for discussion in the IOGOOS X Annual Meeting.



Group Photo of IOGOOS X Delegates at Port Louis, Mauritius