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Eighth Session of the GOOS Regional Alliance Forum (GRF-VIII)

Singapore
5-7 September 2017

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Executive Summary

The Eighth Session of the GOOS Regional Alliances Forum was held at the National University of Singapore, Singapore, 5-7 September 2017. Tim Moltmann (IMOS) chaired the Forum which was attended by representatives of ten of the thirteen GRAs i.e. EuroGOOS, IMOS, IOC CARIBE-GOOS, IO GOOS, MONGOOS, NEAR GOOS, OCEATLAN, PI-GOOS, SEA GOOS and US IOOS. Three GRAs were not represented in person i.e. Black Sea GOOS, GOOS Africa and GRASP. Also in attendance was the IOC Executive Secretary Mr. Vladimir Ryabinin, as well as officers from IOC-WESTPAC and IOC Perth. There were representatives of the GOOS Steering Committee, GOOS Project Office, GOOS Panels for Physics, Biogeochemistry and for Biology and Ecosystems, JCOMM Observations Coordination Group (OCG), Global Ocean Acidification Observing Network (GOA_ON), Global High Frequency Radar Network, Global Ocean Glider Network; as well as invited experts from GEO Blue Planet, South African Environmental Observation Network (SAEON), Canada Department of Fisheries and Oceans (DFO), and Indonesian Government (IAMCG and BMKG).

The Forum provided an opportunity to discuss the highlights, progress and challenges over the last two years. The Forum was informed about the proposal for an International Decade for Ocean Science. If the Decade for Ocean Science is approved it is expected to have positive implications in terms of driving GRA activities. The Forum was informed about the status of GOOS and its ten-year strategy. The GOOS Strategy will help address the underlying drivers, challenges and urgency resulting from multiple and competing needs (e.g. climate change, trade, food security, Blue Economy). GRAs will be asked to review the draft strategy and provide comments. There is engagement between GOOS/IOC and the G7 regarding a proposal for capacity development in coastal observation systems. In future, if approved, GRAs could help in identifying and proposing pilot locations.

The Forum discussed agreed GRA priorities including actions from GRA VII (including asset mapping and modeling inventories), cross-GRA pilot projects, and new observing networks (ocean gliders, high-frequency radar).

The Forum also explored the potential for new partnerships between GRAs and other programs relevant to GOOS, with an emphasis on capacity development in: 1) Global Ocean Acidification Observing Network (GOA-ON); 2) Regional ocean observing initiatives; 3) Large Marine Ecosystems (LMEs); 4) Modelling and Forecasting. The Global Acidification Observing Network (GOA-ON) has demonstrated how local projects contribute to the success of regional /global scale initiatives, and also how projects can be successfully extended for example from reef monitoring to Ocean Acidification (OA) monitoring and research. IOC has a special mandate on Sustainable Development goal 14.3 concerning minimizing the effects of OA. New work by JCOMM OCG on Best Practices could encourage sharing of technical knowledge, setting requirements and standards; as well as the support of EOVs and access to calibration facilities. The Forum noted the LMEs as an important construct to help manage transboundary issues in marine ecosystems, and the opportunities created by IOC’s involvement in identifying their best practices. It also identified the proposed International Decade for Ocean Science as an opportunity to help GRA communities create additional mechanisms and links.
The GOOS Regional Council agreed on eighteen actions (Annex I). Moreover, there is a need to explore stronger engagement of national programs (such as those emerging in Canada and South Africa) in the GOOS regional observing enterprise, as well as stronger interlinkages between GRAs. It was agreed that IMOS (Tim Moltmann) would pass the Chair of the GRA Regional Council to EuroGOOS (Glenn Nolan) at the end of 2017, with IO GOOS (Dr Satheesh Shenoi) taking up the role of Vice Chair.

We extend sincere thanks to our hosts from the National University of Singapore (NUS). Their help and support ensured an event that was not only very productive, but also very enjoyable.

1. OPENING

The Eighth Session of the GOOS Regional Alliance Forum met on 5-7 September at the National University of Singapore, Singapore. The Chair of the GOOS Regional Council led the Forum, which was attended by representatives from ten GRAs and several other experts. The GRA -8 session agenda provided an opportunity for the Singaporean hosts to inform the Forum about their priorities and capabilities in marine science research. The GRA reports written in advance of the session were used to inform a focused two-hour discussion of highlights and challenges over the last two years. The Forum allowed GRAs to be updated about the status of GOOS and its forward strategy. Significant time was devoted to discussing agreed GRA priorities including actions from GRA VII (including asset mapping and modeling inventories), cross-GRA pilot projects, and new observing networks (ocean gliders, high-frequency radar). The Forum also explored the potential for new partnerships between GRAs and other programs relevant to GOOS, with an emphasis on capacity development in: 1) Global Ocean Acidification Observing Network (GOA-ON); 2) Regional ocean observing initiatives; 3) Large Marine Ecosystems (LMEs); 4) Modelling and Forecasting

2. REVIEW OF PROGRESS SINCE GRA VII

The Chair gave a review of the progress achieved since GRA -VII. There were 29 actions proposed at GRA –VII. He underscored that many actions have been implemented. A meeting report is available at the GOOS website. It is difficult to coordinate all GRAs because of time differences, particularly in the case of PI-GOOS. The GRAs have embraced new observation networks.

2.1. Asset mapping – HF Radar, Ocean Gliders

Erik Buch from EuroGOOS gave a presentation on Asset Mapping (HF Radar, Ocean Gliders, mammals). The asset mapping webpage for Gliders will still need to be set up. The mammal's asset mapping is a collection of data from 2004-2015 mainly in the Southern Ocean. EuroGOOS is working in collaboration with MEOP and there is good progress. EuroGOOS operates a portal for SOOS and the mapping can be done for any GRA.

Erik noted that the development of a universal ocean data system was one of the recommendations submitted to the IOC Assembly in June 2017. The Ocean Data and Information System, ODIS, has the vision to provide a framework for data access for all IOC programmes. The GRA asset map could feed into ODIS as a contribution from the GRAs. The
The ultimate goal is to display and share data. The EMODNET global portal consists of different data sources with currently 25,000 observation points.

In regards to the global modeling inventory, GRAs can edit their information and add new information/models via login directly on the webpage at http://eurogoos.eu/models/

He pointed out there is still a lack of information from a number of GRAs. In order to continue the activity, an update is required if approved. He raised the question whether a guideline is required.

The Forum discussed how to better work together. In EuroGOOS, there are Task Teams to link with other organizations and GRAs. Other discussions focused on ‘selling’ the product portal. However, in order to push products to users, there is a need for more observations. The Forum agreed that it is important to assess modeling assets, because it helps to show the connections between for example observations and modeling, and this is important to demonstrate. An inventory of all these products would be very useful.

2.2. Model inventory and visualization

<table>
<thead>
<tr>
<th>ACTIONS - Review of progress since GRA VII</th>
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<tbody>
<tr>
<td>1. Update analysis of networks operated by GRAs, and use asset mapping to improve the visibility of networks (gliders, radar, animal tracking, OA etc.). Include willing national programs (e.g. SAEON, I-OON, CIOOS etc.) that meet GRA criteria.</td>
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<tr>
<td>2. Update modeling inventory, with requirements for models to be included. Liaise with GOV COSS-TT.</td>
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3. SINGAPORE’S MARINE SCIENCE RESEARCH AND DEVELOPMENT PROGRAMME (MSRDP)

Dr. Serena Teo reported Singapore’s Marine Science Research and Development Programme (MSRDP). Singapore is one of the busiest ports in the world and lies at the boundary of three biogeographic regions (LMEs). Singapore also has the second densest population in the world and has unique environmental challenges including the risk of marine bio-invasion caused by global shipping.

The National Research Foundation (NRF) MSRDP themes include Marine Ecosystem and Biodiversity, Environmental Impact, Monitoring Coastal Ecological Engineering and Marine Technological Platform. The Tropical Marine Science Institute of Singapore consists of a Physical Oceanography, Marine Biology and Ecology, Acoustic Research and Marine Mammals research program.
Key activities include harmful algal bloom monitoring, understanding the effects of tropical monsoons on currents in the Singapore Strait, marine invasive species, and understanding ecosystem and mitigating impacts.

The NRF has a National Marine Laboratory open to all researchers. There is an ongoing effort by the Institute to integrate different data sets. The Forum was informed that there is marine spatial planning activity underway; however, it is less developed compared to land spatial planning.

**ACTIONS - Presentations on activities in Singapore**

3. Singapore to explore how to get involved in SEA-GOOS.

4. **KEY NOTE ADDRESS (IOC)**

The Executive Secretary of IOC, Mr. Vladimir Ryabinin addressed the eighth Forum. He referred to the planetary situation and elements of governance. He mentioned about the SDG Goal 14, the Ocean Climate, the UN General Assembly, the law of the sea and the development of Biodiversity in areas beyond national jurisdiction (BBNJ). He remarked that the High Seas will be protected through this legal framework and the process is linked to ocean economy, and that is expected to lead to more sustainable ocean observation. He also highlighted the potential for tension between ocean governance and underlying science. In future, ocean governance will be more legally binding. He noted that peace, human security are at stake. He highlighted that the foundation for solutions are ocean science and observations. He emphasized that in order to progress in oceanography perhaps there is need to learn from what happened in meteorology. There is a need for high-level recognition concerning the value of ocean data services, while at the same time recognizing the requirements to provide better service in terms of data and information. The value chain shows the different societal benefits, and the many players working on different parts and components of the value chain. In this light IOC would like to support strengthening these connections. He underlined that the first World Ocean Assessment was ‘eye-opening’ for some governments. The recent Ocean UN Conference in New York showed many commitments, with opportunities for them to be better connected within a global framework.

IOC and partners have submitted a proposal on a Decade of Ocean Science for SD, 2021-2030. He remarked that IOC hopes to be appointed to be the coordinator of the Decade for Ocean Science (DOS).

He stressed that it is important to develop better ocean information systems. IODE can provide a backbone, noting that there is a need for other mechanisms to provide services to the wider public. To achieve such a goal will require capacity development and technology transfer.

In conclusion, it was stressed that by the year 2030, under the Decade of Ocean Science, the requirements for ocean science and technology will be much more societally driven. This will require some changes in our approach to governance. If the DOS proposal is approved at the UN Assembly, IOC will start developing mechanisms to design the DOS and hopefully, it will drive an increase in GRA activities. IMO, FAO, WMO, for example, have agreed to participate in the DOS.
The Forum welcomed and appreciated the presentation of the IOC Executive Secretary. Several key issues were discussed including the relationship between the Decade for Ocean Science and operational oceanography. It was agreed that it is important to have a good understanding, visibility, and clear targets in order to get support.

5. NEW OBSERVING NETWORKS

5.1. Ocean Gliders – global coordination and the role of GRAs

Prof. Chari Pattiaratchi gave a presentation on ocean gliders focusing on global coordination and the role of GRAs. He described the basic functions and capability of ocean gliders. Gliders are currently a mature global observing network. There are different types of gliders, the Spray (Scripps Institute of Oceanography), Slocum (Teledyne Webb Research), Sea glider (University of Washington/Kongsberg), SeaExplorer. A steering team has been formed with a two-year mandate as a component of the GOOS/GCOS. Key objectives are to strengthen the glider community and facilitate the sustained use of gliders globally; launch and maintain an international glider program as a component of GOOS/GCOS and report on global glider activities to WMO/IOC/JCOMM-OCG. A first meeting of the glider steering team was organized at the 7th EGO conference Southampton, the UK in September 2016. The steering team has agreed on a ToR. The steering team also met recently at UNESCO in Paris, April 2017. The team adopted governance rules and agreed on plans for the international and regional communities. A short-term action plan was agreed. Almost all glider data are stored in a few public databases, which allow the mapping of glider tracks and activities. There are now 20-30 gliders globally at any given time. There is also an ocean glider data management task team. There is a significant need to develop the glider network capacity by globally coordinating regional and national developments. Some countries need support to build glider infrastructure. A website has been developed at www.OceanGliders.org. It was highlighted that there is a clear need for a technical coordinator for ocean gliders and currently this position is supported by CNRS/ France thanks to the EU H2020 AtlantOS project. It was suggested that IOC/WMO would be a suitable institution to welcome international funds for such a position. In parallel, a technical framework for OceanGliders needs to be set up. Prof. Pattiaratchi reported on the climatology (temperature, chlorophyll structure, and variation) and storm effects of NWF observed from the gliders.

The Forum discussed technical training and capacity development issues related to operating ocean gliders. There is a set of information emerging that can be used in training and capacity development in ocean gliders. Ocean gliders can be used as a forecasting tool and useful for understanding boundary currents. The Forum noted that the use of gliders in storm conditions is still under investigation. India outlined that they have started using ocean gliders outside the Indian EEZ.

**ACTIONS - New Networks**

4. Encourage all GRAs with ocean glider programs to engage with the Ocean Gliders team, helping to set standards, getting involved in task teams, contributing data. OG Team to promote training and exchange opportunities.
NEW PARTNERSHIPS

5.2. Global Ocean Acidification Observing Network (GOA-ON) – Regional Hubs and GRAs

Dr. Rusty Brainard, NOAA Pacific Islands Fisheries Science Center reported on new partnerships concerning the Global Ocean acidification Observing Network (GOA-ON)-Regional Hubs and GRAs. Our ocean provides benefits for people including livelihood, fishing, tourism, recreation, coastal protection. He stressed that all the ocean ecosystem services and benefits are threatened by Ocean Acidification (OA) and it is no longer just a theory, it is being observed and will continue. OA negatively affects ocean life due to change in pH and coral reefs are severely impacted. Different organisms have different responses. GOA-ON is a Global Ocean Acidification Observing Network and partnership to document the status and progress of OA, understand the impacts of OA on diverse marine ecosystems and support forecasting of OA conditions to enable societal adaptation. There are now 370 scientists involved from 67 countries. GOA-ON has organized several regional trainings in 2016. GOA-ON has developed an interactive data portal and regional networks. It has a National Coral Reef Monitoring Programme in the Pacific consisting of five regions of monitoring. The programme is integrated, interdisciplinary, and is ecosystem-based observations. GOA-ON regional networks include OA-Africa, North American Hub, Pacific Island hub, Arctic hub, WESTPAC, and Australia. He raised the question whether OA will shift the balance for reef survival and noted the relationship between OA, biodiversity loss and the sixth mass extinction induced by human development. The Programme is investigating what environmental factors drive reef accretion (production of calcium carbonate). Calcification Accretion Unit (CAU) rates by island suggests OA impacts have already happened and are happening now. GOA-ON has developed biodiversity maps to better understand how biodiversity is changing.

Finally, Dr. Rusty Brainard noted that GOA-ON is interested to work with GRAs and GOOS. The Forum noted the progress of GOA-ON, which started out with coral reef monitoring and now extended to OA. GOA-ON is successful at a global scale because it is successful at the local level. The Forum further noted that IOC has a special mandate concerning sustainable development goal 14.3 concerning minimizing the effects of OA.

**ACTIONS - New Partnerships**

5. **GRAs to work with GOA-ON to support the development of standard methods in regional nodes where possible, noting that programs can range from simple to complex (Class 3/2/1/0 sites).** The partnerships between Pac-IOOS, WESTPAC, PI-GOOS provide a good example of what can be achieved.

6. **THE ISSUE OF SCALES IN MODELLING SINGAPORE’S WATERS**

Dr. S K Ooi gave a presentation on the issue of scales in modelling Singapore’s waters. A history of numerical modelling of Singapore waters was provided, starting in the 1990s mainly for research purposes. Progress on understanding large scale influences was then discussed, including climate change, storms, human impacts, tides, seasonal winds, and climate variability. Recent work has demonstrated that sea level variability depends on ocean-atmosphere forcing
from the Indian Ocean and peripheral environment. The sensitivity of different nested modelling approaches to forecasting water levels and currents was then discussed. Recent work has shown that measurement of water level alone is not sufficient to inform reliable forecasts, and that current velocity also needs to be taken into account in the Singapore Strait. In summary, it was concluded that by re-looking at the physical forces driving Singapore’s regional and coastal waters, numerical models are now in a much better position to provide realistic and holistic assessments.

See ACTION 3.

7. GOOS STRATEGY, AND G7

7.1. Role of GRAs in the new GOOS Strategy and its implementation, including G7 interest in enhancement of regional ocean observing through GRAs

Albert Fischer reported on the development of the GOOS Strategy 2017-2027. GOOS aims to deliver for all IOC Member States the essential sustained observations for climate mitigation and adaptation (GCOS), operational ocean services for disaster risk reduction and to support the development of the Blue Economy, safeguard ocean health and continued ocean ecosystem services. He then introduced the Framework for Ocean Observing System, the value chain and the three GOOS structures for scientific oversight.

In 2016 the GOOS SC requested the development of a draft 10-year strategy for review. A workshop was organized at the SC Executive meeting in February 2017. The draft strategy was presented at the SC-6 in September 2017. A review by GOOS structures including GRAs is planned, followed by a more open community review.

The challenges and urgency identified include the role of the ocean in climate, trade, food security, tourism, Blue Economy, risks from ocean hazards, broad range of ocean observing activity and the need for improved coordination.

He stressed that understanding, forecasting, and adapting to these growing risks urgently requires that more ocean information be collected, processed and made available in better ways to support multiple users. The Global Ocean Observing System (GOOS) is the internationally recognized entity that can and should take on the challenge of coordinating this effort, with a broad range of partners and stakeholders. The draft strategy includes GOOS history, GOOS Structures (including GRAs), partners, collaboration, the future GOOS, goal, vision, mission and the five 10-year strategic goals. The draft Strategy will be reviewed by the GRAs along with the GOOS panels, and the JCOMM Observations Coordination Group, before a subsequent public review period. Questions of interest include which objectives link most strongly with GRAs, what internal and external partnerships are needed, and how to measure successes of GRAs.

The Forum agreed that it is important to be inclusive to include landlocked countries in the GOOS strategy and implementation. The strategy refers to the sustainable development goals
and relates new developments, for example, the International Decade for Ocean Science. There is a need to raise awareness of GOOS and the benefits it delivers. Expert panels, as well as GRAs, all need to act as ‘GOOS ambassadors’ to raise awareness of the GOOS Strategy and activities. GOOS will also need to develop new information to be disseminated through the networks.

Albert Fischer also reported on the G7 with a presentation focused on the Future of the Seas and Oceans, action of G7 on sustainable coastal ocean observing systems for marine management in support of blue economies. G7 supports the achievement of the SDG 13, 14 and supports the development of an initiative for enhanced global sea and ocean observation. The requirement is to monitor climate change and marine biodiversity (for example through the Global Argo Network and other observation platforms), while fully sustaining and coordinating ongoing observations and strengthening collaborative approaches to encourage the development of regional capabilities and knowledge networks in a coordinated and coherent way, including supporting capacity building in developing countries. In relation to action 4 on regional and capacity development, G7 proposed to develop a joint programme to define the implementation of essential building blocks required to develop an integrated coastal observing system. G7 is expected to work with IOC to identify and propose pilot project locations (e.g. through GOOS, GRAs). Activity 1 is the stakeholder engagement with a Symposium (500K Euro) as a key achievement focusing on observing system requirements, best practices, tools, and technologies for coastal management issues while activity 2 is the actual design, implementation, and delivery of demonstration projects (1-3 M Euro). Activity 3 involves developing capacity and sustainability in parallel with activity 2 over a 3-6 years time frame (2 M Euro/year). Additionally, a technology transfer activity is envisaged (coordinated with action 1) to promote the development of affordable robust sensors for and within developing countries (750 K Euro). A review will be carried out following the Science Ministers’ Meeting, 28-29 September 2017, Turin. In 2018, Canada will assume G7 Presidency, and new discussions will resume with G7 Government Ministries.

**ACTIONS - GOOS Strategy**

6. GRAs to provide feedback on the Draft GOOS Strategy during the internal GOOS review period. Strategy should explicitly include coastal observation, modeling, and products. GRA teleconference to discuss cross GRA feedback and GOOS SC reactions.

7. Maintain watching brief on the G7 opportunity for GRA pilot projects.
8. GRA REPORTS

Eleven GRAs have provided written background reports in advance to the Forum focused on general information about GRA, successes, challenges, and opportunities. PowerPoint presentations are available at the following link below. Following each GRA presentation the Forum engaged in a roundtable discussion of highlights and challenges:

8.1. EuroGOOS
8.2. IMOS
8.3. IOCARIBE-GOOS
8.4. IOGOOS
8.5. MONGOOS
8.6. NEARGOOS
8.7. OCEANTLAN
8.8. PI-GOOS
8.9. SEAGOOS
8.10. US-IOOS
8.11. Black Sea GOOS (was not present, but report made available)
8.12. IOCAFRICA (was not present, but report made available)
8.13. GRASP (was not present, and no report)
8.14. Roundtable discussion of highlights and challenges

The Chair invited all to discuss of highlights and challenges facing all GRAs. Key issues discussed include clarifying the leadership and structure of GOOS-Africa in relation to the IOC Sub-Commission IOCAFRICA; opportunities to engage emerging national ocean observing systems in the GRA network, including South Africa’s SAEON and Canada’s CIOOS.

**ACTIONS - GRA Reports/regional initiatives**
8. Explore potential for GOOS Africa to evolve, including engagement with SAEON.
9. Support CIOOS in its development, and its collaboration with U-IOOS (and others).
9. NEW PARTNERSHIPS (CONTINUED) - Regional ocean observing initiatives

9.1. The South African Environmental Observation Network (SAEON)

Juliet Hermes reported on the South African Environmental Observation Network (SAEON). The South African Observation Network consists of a coastal and offshore component. The Sentinel coastal site for long-term ecological research consists of 100 in situ instruments collecting data (mostly delayed mode) continuously since 2008. The pelagic ecosystem consists of eight stations sampled on a monthly basis since 2010 measuring and sampling physical, chemical and biological oceanography parameters. The SA Research Infrastructure roadmap (DST funded) will provide real-time data buoys in key locations as well as in-situ measurement of parameters not observed to date. There are 173 coastal temperature sensors deployed since 2014 by various institutions around SA within 5-meter depth, collecting data continuously in delayed mode. SAEON has a national estuaries network with 13 sites mostly in the Eastern Cape. The estuaries network is expected to expand in the future. The center is fully equipped with coastal research vessels. The Ocean Sciences Campus has a marine and estuarine water quality laboratory, aerial surveillance platform, dive chamber and data management facilities.

The SAEON offshore node consists of large mooring arrays around SA including the Agulhas system climate array moored observation network-multidisciplinary observations. Ocean gliders are being deployed; however, they are not long-term yet. The towed benthic camera is being used to measure long-term benthic biota change at Prince Edward Islands Southern Ocean. SAEON has developed a field guide for SA offshore invertebrates to be published in 2017. SAEON is also modeling the Benguela upwelling to better understand the seasonal variability of the Benguela ocean current system. Access to the research infrastructure and platforms are equal and open, but on a competitive basis. All data collected by the DST /NRF platforms are free and of high quality.

Linking SAEON with relevant GRAs would encourage: 1) government support; 2) technical support from other GRAs (e.g. IMOS); 3) setting requirements and standards; 4) support the measurement of EOVs and access to calibration facilities. The Forum welcomed the potential collaboration with SAEON.

9.2. Towards a Canadian Integrated Ocean Observing System - Department of Fisheries and Oceans (DFO)

Andrew Stewart from the Department of Fisheries and Oceans, Canada provided a report update on CIOOS focusing on the Canadian Integrated Ocean Observing System. Oceanography is well established in Canada, but it not necessarily strongly interrelated and coordinated. Mission and vision statements have been developed. He pointed out that CIOOS implementation will be phased and plans to become a GOOS Regional Alliance. There are ongoing discussions with US IOOS, considering the possibility of forming a North American GOOS. There are several actors from Government organizations to universities and non-Government agencies. Several activities have been carried out including a workshop in March 2016 on CIOOS, the creation of a Task Team on CIOOS and its Governance. The progress of CIOOS Program Development includes the hiring of two new staff. A request for proposals has been published for Investigative Evaluations (IE) to move CIOOS from the concept stage to the design stage. The Task Team has agreed on a number of fundamental scoping and design
elements of the CIOOS Governance. The draft Governance structure includes National Coordination Office, Executive Office led by DFO, Regional Coordination Committee, Technical Expert Committees and ad-hoc Working Groups. He mentioned that the IE will evaluate the current ocean observing landscape in Canada, the standards followed, the gaps, limits or barriers to setting up an integrated OOS. Three recommendations have been put forward in regards to IE-Data, IE-Cyber Infrastructure and IE-3 on Visualization.

The Forum discussed CIOOS stakeholders engagement and audience. The Forum also noted that the IE will give an idea how to move forward. CIOOS will continue to exchange experiences and ideas with the US-IOOS and will consider including a modeling component.

9.3. India's Ocean Observation Network (OON)

Dr. R. Venkatesan reported on India's Ocean Observation Network (OON) current status and future plans. In the last decades, India's OON has improved significantly due to continued support from the Government. The OON is governed under the Ministry of Earth Sciences. India's moored buoy programme has been completed in two decades and has contributed to sustain this network

He presented India's OON encompassing the Argo, XBT/XCTD, current meter network, wave rider buoy network, tide gauge network, ship-based weather station and mooring buoy network. India has for example 142 Argo floats, 50 drifting buoys, 16 wave rider buoy network, 35 tide gauge network, 7 mooring buoys to support the tsunami detection network India has also started piloting ocean gliders. India supports the Indo US RAMA buoy network. A wave rider buoy network was deployed in the Maldives, Sri Lanka and the Seychelles for ocean monitoring and forecast. India has published several publications and has developed different mobile Apps. Future plans are to deploy 37 Argo floats with normal CT sensor and 17 with BGC (chlorophyll, dissolved oxygen and nitrate) to help validate ecosystem model output and temperature-salinity data assimilation. To better understand biochemical variations (e.g. Ocean acidification) in the Bay of Bengal and track how the marine ecosystem changes over time, India has deployed the first buoy in northern Indian Ocean in November 2013 in partnership with the Norwegian Agency for Development Cooperation, NOAA's Ocean Acidification Program, RAMA, and NIOT. India has its own satellite data validation and calibration and is assessing wind energy potential along Indian coast for offshore wind farm advisories. There are 43 customized forecast products for a wide range of users. India has signed an agreement with IOC/UNESCO to organize International training courses in collaboration with IOCs capacity development programmes. The International Training Center for Operational Oceanography has conducted 11 international and 12 national training courses on different aspects of oceanography. Current challenges include the sharing of observations taken in the EEZ, vandalism, ship time and biofouling of sensors.

The Forum appreciated the major improvement and commitment of India in contributing to sustained global ocean observation. Long term sustained national programmes such as India's OON could be considered as an International program as they contribute to the global ocean observational network.
9.4. GEO Blue Planet –Regional Projects of relevance to GRAs

Emily Smail reported about GEO Blue Planet and regional projects of relevance to GRAs. GEO is a voluntary partnership of governments and organizations that are working to link Earth observations resources world-wide for the benefit of society. Blue Planet’s mission includes advancing and exploiting synergies among ocean and coastal observational programmes to raising awareness of the societal benefits of ocean observations at the public and policy levels. It has 100 member countries and over 100 participating organizations. Blue Planet is establishing four working groups (WGs) which will be tasked with identifying and sharing best practices and supporting Blue Planet projects. The four WGs are: 1) Data Integration and Informatics; 2) Information Services; 3) User Engagement; and 4) Capacity Building and Advocacy. Blue Planet has recently organized a Symposium (Washington DC, June 2017). The key recommendation includes building the user engagement WG as a priority, building high-level products and services tailored to specific regional and local needs, and produce and compile studies and examples of how ocean observations support sustainable development. Blue Planet has organized a Caribbean SDG workshop in January 2017 in St. Vincent and the Grenadines. The Forum was informed that a project concept on multipurpose marine monitoring mechanism is being developed by the UNDP in Barbados and the OECS, IOCARIBE-GOOS, and GEO-Planet with an initial focus on detection and monitoring of pollution occurrences at sea and service for detection, monitoring, and forecasting of sargassum. GEO Blue Planet is involved in a joint project with NOAA and CSIRO to develop a multivariate extreme sea level flooding EWS in the entire Pacific region and engaged with the Council of Regional Organizations in the Pacific (CROP) Marine Sector WG and Asia-Oceania GEOSS (AOGEOS) initiative.

10. GRA PILOT PROJECTS

10.1. MESCAT

Giovanni Coppini (MONGOOS) presented on MESCAT (Mediterranean Sea-level Change and Tsunamis): A step forward in Mediterranean marine science and sea-level related risk prevention. The motivation for MESCAT is that sea level (climate change induced and tsunami) is a key variable in the region and has an enormous impact on economy and population. There is a huge sea-level monitoring gap between the north and south Mediterranean Sea preventing improving tsunami early warning system and understanding of sea level changes under climate change conditions. MESCAT will address the existing gaps and challenges. The sea-level network will be integrated a part of MonGOOS, EuroGOOS etc.

GOOS will continue to advocate for funding of MESCAT as an approved pilot project. It was considered that inclusion of meteo-tsunamis may assist in attracting partner and donor interest.

10.2. Pacific waves and coastal inundation

Tommy Moore (PI-GOOS) and Tim Moltmann (IMOS) outlined ongoing partnership opportunities in the Pacific region.
A ‘PACWAVE’ project concept was developed in the context of the 2016 APEC Earth and Marine Observing Workshop. Its aim is to improve the quality of life in the Pacific through real-time access to wave data. There are currently over 100 wave buoys operated by APEC economies in the Pacific region. It was proposed that these economies work together to make all of this wave data available at regional level. This would make more data available for use, help to improve wave modelling and forecasting systems, and help to identify key gaps at the regional level. Participants would include IMOS/Bureau of Meteorology, USA (PacIOOS/NOAA), Pacific Islands Forum (SPREP), New Zealand (NIWA) and others to be determined.

Another project concept developed at the APEC workshop focused on bringing coastal inundation forecasting tools to the Pacific Islands. U.S. IOOS-PaciIOOS has developed coastal inundation forecasting tools and community awareness raising materials for communities in the Republic of the Marshall Islands and Hawai‘i. These tools could be applied to vulnerable communities in the Pacific Islands using expertise in the region (Pacific Islands, US, Australia, and NZ). Bathymetric data could be sourced from Sentinel-2 remote sensing data, using tools developed by CSIRO.

Pathways to progress these concepts have not yet been evaluated. It may be time to revisit the focus of a potential GRA pilot project in the Pacific region. For example, opportunities identified in the GOA-ON presentation may be more prospective.

10.3. Multipurpose Marine Monitoring Mechanism (4M)

Doug Wilson reported on a potential GRA Pilot Project for the Caribbean. In 2015, discussions started with GEO Blue Planet (GBP) to develop a GEO Coastal Ocean Pilot Project. The project would benefit the Caribbean region—perhaps as much as any region on the globe—through implementation of a Coastal Zone Services pilot project.

IOCARIBE XIII (2015) endorsed a collaboration with GBP on an IOCARIBE-GOOS Pilot Project. This led to an opportunity to work with the UNDP Barbados and OECS office on a potential project of their initiation “4M: Multipurpose Marine Monitoring Mechanism (MMMM)”, which shares important design concepts and objectives with both IOCARIBE-GOOS and GEO Blue Planet. In essence, the 4M project would serve as an operational observing system for the marine environment that supports an integrated approach to detecting and predicting changes in coastal marine and estuarine systems; promotes evidence-based marine and fisheries policy programming; strengthens the justification and accuracy in resource mobilization efforts; and addresses sustainable development. The project will be focused on Grenada and Barbados, but will create a system that is valuable and applicable to all Small Island Developing States (SIDS). The project was endorsed at IOCARIBE XIV. Presently, there is a startup proposal to UNDP, but not funded yet. Seemingly, the best opportunities might be an Oil Spill forecast (suggested by Samy Davidjnia following GBP) and a Sargassum Weed Forecast (discussed with Peter Pissierssens at IOCARIBE XIV), which would build tools for delivering coastal forecasts and allow specific end-to-end examples using existing tools.

The Forum welcomed the project proposal, and ideas proposed with reference to GRAs.
ACTIONS - GRA Pilot Projects
10. Continue to support MESCAT in seeking funding opportunities.
12. Maintain watching brief on the 4M project as a potential GRA pilot, and explore links with the NASA-led ‘COVERAGE’ project.
13. Potential new pilots
   • Modelling/forecasting in the IO/multi-model comparison
   • Defining requirements across GRAs (modular approach)

11. NEW PARTNERSHIPS (CONTINUED)

11.1. Large Marine Ecosystems (LMEs), GOOS Biology & Ecosystems Panel

Nic Bax (Co-Chair GOOS Biology and Ecosystems Panel) reported on LMEs. There are 66 LMEs globally which are large areas extending from the shoreline to the edge of the continental shelves or to outer margins of major coastal currents.

The Biology and Ecosystem Panel are working on prioritization of EOVs. A total of 24 relevant conventions have been examined. In order to identify and reduce EOVs, they are working closely with MBON (U.S. Marine Biodiversity Observation Network), and OBIS.

The Biology and Ecosystem Panel has organized capacity building monitoring workshops in 2016 and 2017. Several key points were elaborated including the urgent need for establishing baselines, sustained standardized monitoring, regular review and improved data. A new partnership with UNEP and US-NOAA has been developed linking coast and ocean activities. This initiative will support several countries in Africa, Asia, Latin America, Caribbean and Eastern Europe to restore and sustain resources, coastal environment, and linked watersheds. There are ten LME programme recommendations emerging from a review conducted in June 2017. This includes the urgent need for more formal coordination arrangements and agreements on roles and responsibilities between the mandated regional bodies that deal with various aspects of ecosystem-based management. There is a need to center LME process within and under a formal agreement. It is important to link capacity building to sustained observation as well as infrastructure. The next step in the process is to continue engaging with UNEP, promote monitoring (GOOS/MBON/OBIS) within the international communities (CBC, FAO), develop strategic plans to deliver EOVs from BioEco panel, and organize a monitoring workshop in Montreal in May 2018.

The Forum was reminded that IOC/UNESCO is leading a GEF-sponsored programme on best practices across LME projects.
12. THE SECOND INTERNATIONAL INDIAN OCEAN EXPEDITION (IIOE-2)

Nick D’Adamo reported on the second international Indian Ocean Expedition (IIOE-2) presenting on behalf of Dr. Sathee Shenoi. Regional exploration was the motif of the first expedition. However, the Indian Ocean remains poorly understood. There are now new challenges and emerging drivers.

The Second International Indian Ocean Expedition (IIOE-2) is a major global scientific program which will engage the international scientific community in collaborative oceanographic and atmospheric research from coastal environments to the deep sea over the period 2015-2020, revealing new information on the Indian Ocean (i.e. its currents, its influence upon the climate, its marine ecosystems) which is fundamental for future sustainable development and expansion of the Indian Ocean’s blue economy. Its aim is to advance our understanding of the Indian Ocean and its role in the Earth System in order to enable informed decisions in support of sustainable development and the well-being of humankind.

IIOE-2 was planned during 2012-2014. There have been several meeting, workshops and consultations with many people and institutions to galvanize a convergence of support. It has links with local GRAs and indirect links with other GRAs.

A large number of scientists from research institutions from around the Indian Ocean and beyond are planning their involvement in IIOE-2 in accordance with the overarching six scientific themes of the program. There are some large collaborative research projects under development, and it is anticipated that by the time these projects are underway, many more will be in planning or about to commence as the scope and global engagement in IIOE-2 grows.

Focused research on the Indian Ocean has a number of benefits for all nations. The Indian Ocean is complex and drives the region’s climate including extreme events (e.g. cyclones, droughts, severe rains, waves and storm surges). It is the source of important socio-economic resources (e.g. fisheries, oil and gas exploration/extraction, eco-tourism, and food and energy security) and is the background and focus of many of the region’s human populations around its margins. Research and observations supported through IIOE-2 will result in an improved understanding of the ocean’s physical and biological oceanography, and related air-ocean climate interactions (both in the short-term and long-term). The IIOE-2’s program will complement and harmonize with other regional programs underway and collectively the outcomes of IIOE-2 will be of huge benefit to individual and regional sustainable development as the information is a critical component of improved decision making in areas such as maritime services and safety, environmental management, climate monitoring and prediction, food and energy security.
IIOE-2 activities will also include a significant focus on building the capacity of all nations around the Indian Ocean to understand and apply observational data or research outputs for their own socio-economic requirements and decisions. IIOE-2 capacity building programs will therefore be focused on the translation of the science and information outputs for societal benefit and training of relevant individuals from surrounding nations in these areas.

He also outlined the Governance structure and SC of the IIOE-2. A website has been created at http://www.iioe-2.incois.gov.in/. It was pointed out that IOC Africa played a key role in facilitation.

13. REPORT ON JCOMM

13.1. Observations Coordination Group (OCG) – standards and best practices

Dr Juliet Hermes reported on the Observations Coordination Group (OCG) focusing on standards and best practices. The JCOMM OCG includes entities such as the Data Buoy Cooperation Panel (DBCP), GLOSS, OceanSites, GOSHIP, Argo, JCOMMOPS, Observing System (OS) Monitoring center. New interactions with JCOMM OCG include the Ocean Glider and HF Radar groups.

Dr Hermes introduced the OCG Work Plan focusing on requirements, OS operations, development and standards, tracking and improving performance and integration, and interoperability. In terms of OS Development, the attention was around EOVs, establishing Global Glider and Radar Networks, and engaging with the global animal tracking community. The key OCG challenges include an emphasis on integration; incorporating recommended changes from pilot projects (TPOS, AtlantOS etc) and inclusion of new technologies. In order to develop best practices and standards, there is a need to review current best practices, identify gaps, and harmonize across networks where possible.

The Forum was informed that Dr Hermes is the new Vice Chair of JCOMM OCG on Standards and Best Practices (SBP). The vision and five goals of JCOMM OCG on SBP were presented. A desk study has been carried out on the overall situation of marine observation technical documents. For example, there are 167 documents sourced form JCOMM, WMO, IOC, SCOR ODIP ) on methods of observation, instruments, and data quality control and 8 documents on Marine Energy (IEC). In order to meet the goals, an analysis is being carried out by programme, sensor type, accuracy, calibration, and validation of sensors frequency, procedures to understanding information and knowledge transfer and capacity development updates. A specific example regarding the GO-SHIP repeat Hydrography Manual was provided.

Several questions concerning BP were raised. How much better would another practice have to be to justify a change in baseline practice? When does a common practice become a best practice and standard? How best to publish and disseminate information and keep it updated? Dr Hermes outlined several steps forward for BP including engaging with members of each platform to conform BP documentation, to coordinating with new technologies as they develop and offer recommendations. An Ocean Best Practices Guideline for Depositor (version 1) is available at http://www.oceanbestpractices.net.
The Forum discussed several issues including what are the best formal and informal practices within the GRAs and how they are shared and reviewed. A Workshop is being organized on Evolving and Sustained Ocean Best Practices in Paris, 15-17 November 2017.

India pointed out that they have a best practice Manual on buoys to share. The Forum discussed EOV definition and implementation. IOC is currently developing an EOV database including best practices. It was highlighted that EU projects include BP.

13.2. Task Team for integrated Marine Meteorological and Oceanographic Services within WIS (TT-MOWIS)

Erik Buch gave a presentation highlighting the efforts of the Task Team for integrated Marine Meteorological and Oceanographic Services within WIS (TT-MOWIS). The ToR of the TT-MOWIS was introduced. The TT is delegated to suggest a JCOMM strategy for building and activating the interfaces between Marine Meteorological and Oceanographic services and the WMO Information System (WIS). TT-MOWIS is mandated to function as the JCOMM Focal Point for the interface with stakeholders (SFSPA, OPA etc.).

There are many ocean and marine data; however, the question is how to integrate into WIS? The work of MOWIS will make it easier to discover, increase the visibility of met-ocean data to the user community with the aim of improved met and ocean forecasts. The benefits of a center becoming a WIS DCPC includes gaining worldwide exposure to potential users of the products and services offered, enhancing the link between Met-Marine communities to interoperability through international standards that can be implemented at other levels within the organization and partners. All data, observation (real-time, delayed mode), satellite and model data will be included in MOWIS. He further explained how to provide metadata files to relevant GISC and have them registered. A list of the current participants by country was provided, chaired by Rabia Merrouchi (Morocco) and Erik Buch (Denmark). A work plan of TT-MOWIS was presented. It was highlighted that there is a need to establish an Expert Team to follow on all technical aspects related to registration process within WIS. The JCOMM Registration and Certification process consists of defined steps for application, demonstration, assessment, and endorsement. It was underlined that TT-MOWIS should evolve into an Expert Team (ET-MOWIS), with responsibility to liaise with CBS, manage and monitor the registration process of marine candidate centers, identify needs and conduct relevant activities; as well as engage with WMO/CBS WIS related experts teams (ET-WISC and ET-CAC). In order to move forward, TT-MOWIS reports and guidelines need to be presented and approved. Furthermore, there is a proposal to establish an Integrated Marine Meteorological and Oceanographic Services within WMO and IOC Information Systems.

The Forum agreed that engaging with MOWIS is important. It was also recognized that there is presently a lack of contribution from the GOOS Biology and Ecosystems Panel.

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<th>ACTIONS - JCOMM</th>
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<tr>
<td>15. Engage with the OCG Best Practices and Standards activity, providing information on existing BPs in GRAs and advice on priorities.</td>
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<tr>
<td>16. Maintain a watching brief on ET-MOWIS and Open GTS.</td>
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14. NEW OBSERVING NETWORKS (CONTINUED)

14.1. High-Frequency Radar – global coordination and the role of GRAs

Dr Simone Cosoli (UWA/IMOS) reported on behalf of the Global High-Frequency Radar Network. He introduced the Australian Coastal Ocean Radar Network (ACORN). The primary application of ACORN is to study the dynamics of the major Australian current systems. The HF radar data is openly accessible through the IMOS Ocean Portal. Two commercially available technologies are used (CODAR and WERA), both with different approaches and advantages and disadvantages. The HF radars were originally designed for scientific research, but can be applied for operational purposes such as search and rescue. Other applications include the analysis of surface currents to support fishery management, coastal management planning, and ship optimization. Use of the HFR network is very mature in the UST, and there is rapid expansion in Europe Asia, and Latin America. The importance of a global coordination effort for HF radars was emphasized e.g. regional operating frequencies, call signs, minimum separation distances between HFR, data management, sharing etc. HFR is an operational tool and its use will continue to increase globally; however, several countries are not included in the current global coordination effort, and there is an opportunity to involve them. The Forum noted progress achieved in the HFR network. Thailand offered to collaborate with the HFR network.

**ACTIONS - New Networks (continued)**

17. Encourage all GRAs with radar programs to engage with the Global HF Radar team, helping to set standards. Specific follow up with SEA-GOOS and NEAR-GOOS GRAs involvement, and availability of metadata if not data.

15. NEW PARTNERSHIPS (CONTINUED)

15.1. Modelling and Forecasting - GOOS Physics Panel (OOPC) and links to GODAE OceanView

Dr John Wilkin (OOPC/GOOS Physics Panel) reported on the physics panel. He outlined the responsibility and mandate of the GOOS Physics Panel. The most recent meeting report is available [www.goosocean.org/oopc20](http://www.goosocean.org/oopc20). Overall, the panel is working on boundary currents, shelf seas interactions, open access to GTS, and developing relationships with other networks. The OOPC key task areas include communication and engagement, boundary currents, shelf-coastal interaction (e.g. coordinate with GODAE COSS-TT), multidisciplinary projects (boundary current reviews), ocean surface stress heat fluxes (e.g. working with TPOS2020 to better define requirements) and ocean change detection (coordinate with GODAE OSEval-TT). Dr Wilkin further elaborated on integrating ocean observation across the coastal shelf boundary, moored buoy arrays, cabled observations, SOOP, ocean gliders boundary ocean observing network; as well as drifting buoys and sail drones. There is a need to coordinate with GOOS Regional Alliances for pilot projects (access) and sustained observing and modeling (capacity and training). Other initiatives and opportunities encompass the international Ocean Gliders Steering Team, and the Altimetry for Regional and Coastal Ocean Modeling Task Team. Further details were provided about the Open GTS Pilot Project, underpinned by ERDDAP web access where one can generate graphs and download data.
New Partnerships (continued)
18. Provide input to the OOPC Boundary Current/ Shelf Sea Interaction task, including GRA report to GOV and stronger engagement with COSS-TT.

16. MEETING WRAP-UP AND NEXT STEPS

16.1. Agreed actions and Meeting Report

In general terms, it was agreed that there is a need to explore stronger engagement of national programs in GRAs, and interlinkages between them. For example, between GOOS Africa and SAEON, IOGOOS and IOON, CIOOS and USIOOS.

It was also noted that there is a need to maintain continuity of contact with GRAs that routinely rotate leadership responsibility e.g. GRASP.

Annex I summarises the agreed actions from the Forum.

16.2. Intersessional activity and GRA IX

No decision was made on the timing or location of GRA IX. However, when planning the next GRA Forum, we must note the OceanObs’19 Conference, to be held on 16-19 September 2019 in Honolulu, United States. There is a preference to hold the next Forum in advance of OceanObs’19 in order to provide input.

16.3. GRA Council Chair

It was agreed that IMOS (Tim Moltmann) would pass the Chair of the GRA Regional Council to EuroGOOS (Glenn Nolan) at the end of 2017, with IO GOOS (Dr Satheesh Shenoii) taking up the role of Vice Chair.
Annex I: GOOS Regional Council Actions

Review of progress since GRA VII

1. Update analysis of networks operated by GRAs, and use asset mapping to improve the visibility of networks (gliders, radar, animal tracking, OA etc.). Include willing national programs (e.g. SAEON, I-OON, CIOOS etc.) that meet GRA criteria.
2. Update modeling inventory, with requirements for models to be included. Liaise with GOV COSS-TT.

Presentations on activities in Singapore

3. Singapore to explore how to get involved in SEA-GOOS.

New Networks

4. Encourage all GRAs with ocean glider programs to engage with the Ocean Gliders team, helping to set standards, getting involved in task teams, contributing data. OG Team to promote training and exchange opportunities.

New Partnerships

5. GRAs to work with GOA-ON to support the development of standard methods in regional nodes where possible, noting that programs can range from simple to complex (Class 3/2/1/0 sites). The partnerships between Pac-IOOS, WESTPAC, PI-GOOS provide a good example of what can be achieved.

National Programs

6. GRA has noted the effective contribution of long term sustaining national programs such as India’s OON and Canada’s Observation network and is considered to be part of International programs in line with IMOS, US GOOS etc., and urged them to continue their contribution.

GOOS Strategy

7. GRAs to provide feedback on the Draft GOOS Strategy during the internal GOOS review period. Strategy should explicitly include coastal observation, modeling, and products. GRA teleconference to discuss cross GRA feedback and GOOS SC reactions.
8. Maintain watching brief on the G7 opportunity for GRA pilot projects.
GRA Reports/regional initiatives

9. Explore potential for GOOS Africa to evolve, including engagement with SAEON.
10. Support CIOOS in its development, and its collaboration with U-IOOS (and others).

GRA Pilot Projects

11. Continue to support MESCAT in seeking funding opportunities.
13. Maintain watching brief on the 4M project as a potential GRA pilot, and explore links with COVERAGE.
14. Potential new pilots
   a. Modelling/forecasting in the IO/multi-model comparison
   b. Defining requirements across GRAs (modular approach)

New Partnerships (continued)

15. Support GOOS Bio-Eco Panel in advocating for capacity building in sustained observing/monitoring – GEF/LMEs, UNEP/Regional Seas, CBD/SOI etc. (Any specific actions?)

JCOMM

16. Engage with the OCG Best Practices and Standards activity, providing information on existing BPs in GRAs and advice on priorities.
17. Maintain a watching brief on ET-MOWIS and Open GTS.

New Networks (continued)

18. Encourage all GRAs with radar programs to engage with the Global HF Radar team, helping to set standards. Specific follow up with SEA-GOOS and NEAR-GOOS GRAs involvement, and availability of metadata if not data.

New Partnerships (continued)

19. Provide input to the OOPC Boundary Current/Shelf Sea Interaction task, including GRA report to GOV and stronger engagement with COSS-TT.
Annex II: Objectives of the Eighth Session of the GOOS Regional Alliance Forum (GRF-VIII)

1. To update the asset mapping for HR Radar and Ocean Gliders and circulate questionnaire (ALL)
2. GRAs to provide information for a global modeling inventory
3. To develop and make available a guideline for inventory-asset mapping (Glenn to provide/prepare guidelines?)
4. GRAs to identify/explore and communicate for any interest in ocean gliders
5. To strengthen partnerships and collaboration between GOA-ON and relevant GRAs on coral reef monitoring and Ocean Acidification.
6. GRAs to individually identify/explore/provide further input before 15 October 2017 on which objectives resonate with respective GRAs, what are the missing issues, how to implement the proposed GOOS strategy and how to measure GOOS success?
7. GOOS GRAs/ IOC to consider identifying pilot project locations if the G7 projects on oceanography and observations are approved
8. MESCAT project proposal to consider factoring Meteorological tsunamis as part of the proposal and to continue seeking funding opportunities
9. Encourage GRAs to submit abstracts for a workshop in the Caribbean on how they relate to the Ocean. Implementing and Monitoring the SD: Role of the Ocean
10. GRAs are encouraged to promote Multipurpose Marine Monitoring Mechanism project for potential funding
11. To consider developing GRAs project–database
12. The GOOS Biology & Ecosystems Panel and IOC to engage with GEF, UNDP at the Meeting in Cape Town in November 2017? on LMEs
Annex III: GOOS Regional Policy 2013

Available as GOOS-200; IOC/INF-1308;

The Global Ocean Observing System (GOOS) Regional Alliances (GRAs) identify, enable, and develop sustained GOOS ocean monitoring and services to meet regional and national priorities, aligning the global goals of GOOS with the need for services and products satisfying local requirements. As an integral part of GOOS, the GRAs are tasked with adhering to the GOOS Principles (1998) of shared ocean observations, data policy, best practices and capacity development in their implementation of regional and national ocean observation systems.

Historically, the GOOS Regional Alliances were introduced as a way to integrate national needs into a regional system and to deliver the benefits of GOOS strategy, structure, and programmes at a regional and national level. The first GRAs were formed in 1994 and 1996 and were guided by the GOOS Regional Policy (IOC-WMO-UNEP/I-GOOS-VI/3 Annex VII, 2006)\(^1\). This Regional Policy grew outdated after the reform of GOOS structures by the IOC Assembly in 2011, and this document is intended to replace the 2006 GOOS Regional Policy\(^1\). The GRAs have evolved to meet a wide range of societal challenges related to both coastal and open ocean observations, and so this policy has also evolved to reflect GRAs today.

1. **BACKGROUND**

1.1. The Global Ocean Observing System (GOOS) is a permanent global collaborative system for observations, modeling, and analysis of marine and ocean variables to support operational ocean services worldwide. GOOS provides accurate descriptions of the present state of the oceans, including living resources; continuous forecasts of the future conditions of the sea for as far ahead as possible, and the basis for climate change assessments and scenarios. GOOS is sponsored by the Intergovernmental Oceanographic Commission (IOC), United Nations Environmental Programme (UNEP), World Meteorological Organization (WMO) and International Council for Science (ICSU), and is the ocean component of Global Earth Observing System of Systems (GEOSS). GOOS is implemented by the Member States through their government agencies, navies, and oceanographic research institutions working together in a range of global thematic panels and observing networks and regional alliances.

1.2. GOOS Regional Alliances (GRAs) are comprised of national and institutional efforts that come together at the regional scale to facilitate the advancement of GOOS, to aid the integration and coordination of sustained interdisciplinary ocean observations and services for scientific and societal benefit, and to provide mutual support for capacity development. The membership of GRAs varies between regions. In general, they are made up of governmental and/or non-governmental organizations and therefore have limitations in the controls they can impose and the communities they reach. The overall GOOS objectives will be most effectively met through GRAs adopting GOOS guidelines and principles (GOOS Principles\(^4\), Framework for Ocean Observing\(^7\)) as well as supporting GOOS implementation plans (GOOS-1845, GOOS-1936), within the constraints of available resources and national law.

1.3. Within the framework of GOOS, the GRAs are encouraged to continue developing joint projects and alliances to meet the needs of their constituents.
1.4. GRAs contribute to and benefit from the global observing system coordinated through GOOS global panels. GRAs facilitate sustained ocean observing, data management, modeling and services that meet regional and national priorities. GRAs are not distinctly open ocean or coastally focused but respond to the needs of national and regional efforts they represent; however, the nature of the GRAs is well-suited to accelerate the integration and expansion of observations and modeling from global to local scales. GRAs are capable of identifying observing system gaps and proposed strategies to fill those gaps.

1.5. GRAs are both informally and formally brought together. Informally in that, they are often voluntary organizations that see benefit in coordinating across national boundaries. Formally, a minimum structure and adherence to GOOS Principles are outlined below for recognition as part of GOOS.

1.6. GRAs are and need to be driven by regional initiative. Considering the strong links that GRAs have with their national and regional stakeholders and regional heterogeneity, they can choose to embrace various organizational structures and forms. The relationship of the GRAs to GOOS must be flexible to take this into account.

2. THE ROLE OF GOOS REGIONAL ALLIANCES

2.1. GRAs should strive to:

- Uphold GOOS Principles (1998, GOOS-41) and implement a Framework for Ocean Observing (IOC/INF-1284 rev.)

- Serve as a platform for coordination and facilitation of:
  
  o the identification of regional sustained observing requirements for societal benefit areas,
  
  o transboundary observing networks, and their link to global GOOS/Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) networks including those identified in GOOS implementation plans by the GOOS Steering Committee and its disciplinary panels,
  
  o real-time and archived data streams, from in situ and relevant satellite observations, and their link to regional and global networks (e.g. International Oceanographic Data and Information Exchange IODE, Carbon Dioxide Information and Analysis Center CDIAC, the World Data Centers system, and the WMO Information System WIS),
  
  o the timely, free, and unrestricted access to data collected by the GRAs, as stated in Resolution XXII-6, IOC Oceanographic Data Exchange Policy, To achieve this, GRAs may develop and adopt their own international legal instruments in support of their regional data exchange policies, as appropriate.
information products and model output for the region that provides societal benefit, and their links to global and other international efforts (e.g. GODAE OceanView, JCOMM), and

- assessment of regional readiness and capacity in each of the areas above, and the overall performance of the system in providing users with fit-for-purpose data and information products.

- Promote/manage programmes on developing regional capacity:
  - Through sharing of experience, success stories, best practices,
  - Institutional capacity: seeking sources of national and international financing, as part of end to end systems, developing win-win partnerships for technology transfer, working with existing GOOS, JCOMM, and IODE capacity-building programmes, and
  - Human capacity: scholarships, exchanges, technical skills workshops, programmes/workshops to develop leadership and grant-writing skills.

- Encourage the development of Regional and National Ocean Observing Systems by:
  - Promoting the visibility and value and recognition of the services provided by ocean observing systems with governmental agencies and private companies and encourage integration at national, regional and global levels,
  - Advancing the scientific and technological developments upon which services depend,
  - Identifying gaps at regional and national level for ocean observations; and
  - Encouraging and coordinating participation in international initiatives considered of interest by the GRA.

3. QUALIFICATIONS

3.1. A GRA is formed via recommendation or by agreement by IOC Regional Subsidiary Bodies, and/or between participating countries, and/or national organizations, and/or international bodies (Regional monitoring networks, Regional Fishery Bodies, Regional Seas Conventions, etc.). Membership should be chosen to best serve the data and information needs of organizations that use, depend on or are responsible for the management of the marine environment and its resources in the region.

3.2. To be recognized as a part of GOOS, a GRA must show that it conforms to GOOS Principles and guidelines.

3.3. To the extent that the geographic range and activities of a GRA overlap with those of other GRAs, the GRAs involved shall establish formal and informal cooperation to ensure effective use of resources to the benefit of all.
4. APPROVAL

4.1. Proposals to be a recognized as a GRA must be approved by the Assembly or the Executive Council of the IOC. Recommendation for recognition will be received through the GOOS Steering Committee (GOOS SC) or from IOC Regional Subsidiary Bodies in consultation with the GOOS SC.

4.2. Proposals to be recognized as a GRA must include the following:
   - Evidence that a management structure is in place that can deliver an integrated and sustained system by linking, enhancing and supplementing existing infrastructure and expertise in the region.
   - Provision of an acceptable plan that has been endorsed by stakeholders (data providers and users) from the region and describes the procedures by which the observing system will be established, developed, and sustained. This must include procedures for quality assurance, conformance to internationally accepted standards and protocols for measurements, data management, and communications.

5. GRA RESPONSIBILITIES

5.1. To ensure that there is a single forum where regional GOOS activities can be considered in their entirety, all recognized GRAs are expected to:
   - designate one or more representatives to the GOOS Regional Council,
   - participate in the bi-annual GOOS Regional Forum,
   - provide at a minimum an annual report of activities,
   - be responsive to GOOS Implementation Plans,
   - participate in activities agreed to by the GOOS Regional Council, and
   - maintain current management information with the GOOS Project Office for public display.

5.2. Reports to the GOOS SC shall include among other things (a) analyses of the extent to which GOOS Principles have been implemented, (b) status of regional ocean observing and forecasting systems and plans for development and (c) information about the provision of data (data quality and data availability) and the development of downstream services in forms and at rates required by user groups.

5.3. A decision to remove recognition of a GRA can only be made by the IOC Assembly or Executive Council, informed by advice from the GOOS Regional Council or the GOOS Steering Committee, or by recommendation from an IOC Regional Subsidiary Body in consultation with the GOOS SC.
6. GOOS REGIONAL COUNCIL (GRC)

6.1. The GOOS Regional Council consists of the lead from each of the GRAs or their designated representative. The GOOS Regional Council was created by the GRAs at the 2nd GOOS Regional Forum (Nadi, Fiji, 2004) and is not a subsidiary body of IOC. Its creation was noted by I-GOOS-VIII (2007). This section is provided for the information of the Assembly.

6.2. The GOOS Regional Council provides a unified voice for global coordination and facilitates the exchange of information between GRAs and communication to and from the GOOS SC and GOOS Project Office (GPO).

6.3. The GOOS Regional Council responsibilities are to:
- capture information about each of the GRAs,
- discuss potential pilot projects for consideration regionally and by the GPO for funding through IOC or other mechanisms,
- communicate information about GOOS to the GRAs,
- assist with communications on the importance of ocean observing, and
- provide expertise across the GRAs and share best practices.

6.4. The GOOS Regional Council will be funded by the GRAs. The GPO may seek extrabudgetary funding to support representation of GRAs from developing countries at meetings of the GRC.

6.5. The GOOS Regional Council chair roles are to:
- collect information about the activities of the GRAs in coordination with the GPO,
- provide information about the activities of GOOS to the GRA’s in coordination with the GPO,
- organize the GOOS Regional Forum bi-annually, and
- actively represent the GRAs to the GOOS SC and participate in the GOOS SC work plan as agreed to by the GRC.

GOOS Regional Council leadership will be a member of the GOOS Regional Council. The chair will be elected by simple majority vote by the GOOS Regional Council and will serve for 2 years. The chair can be extended for a second 2 years if agreed to by the GRC and the incumbent. The GOOS Regional Council may decide to elect a vice chair to aid the chair in the administration of the GOOS Regional Council. The leadership structure of the GOOS Regional Council may be changed by consensus of the GOOS Regional Council members.

7. RELATIONSHIPS of GRAs WITH GOOS AND IOC BODIES

7.1. The GOOS Steering Committee (SC) recognizes the GRAs as an important component of GOOS. The GRAs are represented on the SC by the GOOS Regional Council chair, an ex officio member. The GOOS SC does not have an official role in the governance of the GOOS GRAs but will act to bring issues associated with GRAs to the IOC governing bodies if an intergovernmental decision is required.
7.2. The GOOS panels will be developing the work plan and implementation plan for the GOOS SC. The GRAs should take the panel’s guidance into consideration when determining their work plans.

7.3. GOOS global observing networks and programmes are those linked to the three GOOS disciplinary panels and appearing in GOOS Implementation Plans. GRAs should seek to participate in these global GOOS networks and programmes by providing expertise to the panels, implementing programmes through the GRA, or facilitation at a regional scale. GRAs can be very effective in accelerating the build out of the GOOS in coastal areas. GOOS-193 and the output of the three GOOS panels will guide the work of the GRAs in the coastal domain, which will complement national needs.

7.4. GRAs also support collaboration with regional and developing observing systems (e.g. the Southern Ocean Observing System SOOS, and the Sustained Arctic Observing Network SAON).

7.5. GRAs also support national ocean observing systems.

7.6. The IOC Sub-Commissions, Committees, Programme Offices, and Project Offices have important roles in the development and coordination of GRAs established under their purview. The IOC Bodies can (as appropriate) provide facilitation and support to all GRAs. GOOS is particularly closely linked to other IOC global programmes such as JCOMM and IODE. GRAs should engage with regional activities in these programmes to seek mutual benefit.

References

3. IOC Res. XXVI-8 Resolution Strengthening and Streamlining GOOS
8. IOC Oceanographic Data Exchange Policy: IOC Resolution XXII-6, 2003
# Annex IV: List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AATAMS</td>
<td>Australian Animal Tagging and Monitoring System</td>
</tr>
<tr>
<td>BS GOOS</td>
<td>Black Sea GOOS</td>
</tr>
<tr>
<td>BulARGO</td>
<td>Bulgaria Argo</td>
</tr>
<tr>
<td>CLIVAR</td>
<td>Climate Variability and Predictability</td>
</tr>
<tr>
<td>COSS-TT</td>
<td>Coastal Ocean and Shelf Seas Task Team</td>
</tr>
<tr>
<td>CPPS</td>
<td>Comisión Permanente del Pacífico Su</td>
</tr>
<tr>
<td>EOVs</td>
<td>Essential Ocean Variables</td>
</tr>
<tr>
<td>EuroGOOS</td>
<td>European GOOS Regional Alliance</td>
</tr>
<tr>
<td>GEOSS</td>
<td>Global Earth Observation System of Systems</td>
</tr>
<tr>
<td>GLOSS</td>
<td>Global Sea Level Observing System</td>
</tr>
<tr>
<td>GODAE</td>
<td>Global Ocean Data Assimilation Experiment</td>
</tr>
<tr>
<td>GOOS</td>
<td>Global Ocean Observing System</td>
</tr>
<tr>
<td>GOOS Africa</td>
<td>GOOS Africa GOOS Regional Alliance</td>
</tr>
<tr>
<td>GOOS SC</td>
<td>GOOS Steering Committee</td>
</tr>
<tr>
<td>GRA</td>
<td>GOOS Regional Alliance</td>
</tr>
<tr>
<td>GRASP</td>
<td>GOOS Regional Alliance of Southeast Pacific</td>
</tr>
<tr>
<td>GRF</td>
<td>GOOS Regional Forum</td>
</tr>
<tr>
<td>IMOS</td>
<td>Integrated Marine Observing System</td>
</tr>
<tr>
<td>IndOOS</td>
<td>Indian Ocean Observing System</td>
</tr>
<tr>
<td>IOC</td>
<td>Intergovernmental Oceanographic Commission</td>
</tr>
<tr>
<td>IOCAFRICA</td>
<td>IOC Africa Sub-Commission</td>
</tr>
<tr>
<td>IOCARIBE</td>
<td>IOCARIBE GOOS Regional Alliance</td>
</tr>
<tr>
<td>IOCCP</td>
<td>International Ocean Carbon Coordination Project</td>
</tr>
<tr>
<td>IODE</td>
<td>International Oceanographic Data and Information Exchange</td>
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<tr>
<td>IOGOOS</td>
<td>Indian Ocean GOOS Regional Alliance</td>
</tr>
<tr>
<td>IOOS</td>
<td>Integrated Ocean Observing System</td>
</tr>
<tr>
<td>JCOMM</td>
<td>Joint WMO-IOC Commission for Oceanography and Marine Meteorology</td>
</tr>
<tr>
<td>MOMSEI</td>
<td>Monsoon Onset Monitoring and its Social &amp; Ecosystem Impacts</td>
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<tr>
<td>MONGOOS</td>
<td>GOOS Regional Alliance</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanographic and Atmospheric Administration</td>
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<tr>
<td>OBIS</td>
<td>Ocean Biogeographic Information System</td>
</tr>
<tr>
<td>OCEATLAN</td>
<td>GOOS Regional Alliance for the Upper Southwest and Tropical Atlantic</td>
</tr>
<tr>
<td>OTN</td>
<td>Ocean Tracking Network</td>
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<tr>
<td>PACIOOS</td>
<td>Pacific Integrated Ocean Observing System</td>
</tr>
<tr>
<td>PIGOOS</td>
<td>GOOS Regional Alliance</td>
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<tr>
<td>PIRATA</td>
<td>Prediction Research Moored Array in the Tropical Atlantic</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Name</td>
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<tr>
<td>PNBOIA</td>
<td>Programa Nacional de Bóias, Brazilian National Buoy Programme</td>
</tr>
<tr>
<td>REMO</td>
<td>Rede de Modelagem e Observazao Oceanografica, Observation Research Network</td>
</tr>
<tr>
<td>SEAGOOS</td>
<td>Southeast Asia GOOS Regional Alliance</td>
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<tr>
<td>SEAGOOS OFS</td>
<td>SEAGOOS Ocean Forecasting System</td>
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<td>SOOS</td>
<td>Southern Ocean Observing System</td>
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<tr>
<td>SPREP</td>
<td>South Pacific Regional Environment Programme</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strengths, Weakness, Opportunities, and Threats</td>
</tr>
<tr>
<td>WESTPAC</td>
<td>Western Pacific IOC Sub-Commission</td>
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<tr>
<td>WIGOS</td>
<td>WMO Integrated Global Observing System</td>
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<td>WMO</td>
<td>World Meteorological Organization</td>
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Annex IV: Attendance List

<table>
<thead>
<tr>
<th>GRAs</th>
<th>PEOPLE</th>
<th>EMAIL</th>
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<tbody>
<tr>
<td>1.</td>
<td>EuroGOOS</td>
<td>Erik Buch, Glenn Nolan</td>
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<td>2.</td>
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<td>5.</td>
<td>MONGOOS</td>
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<td>6.</td>
<td>NEAR GOOS</td>
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<td>7.</td>
<td>OCEATLAN</td>
<td>Frederico Nogueira</td>
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<tr>
<td>8.</td>
<td>PIGOOS</td>
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<tr>
<td>9.</td>
<td>SEAGOOS</td>
<td>Somkhat Khokhiattiwong</td>
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<td></td>
<td><a href="mailto:skhokhiattiwong@gmail.com">skhokhiattiwong@gmail.com</a></td>
</tr>
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<td>10.</td>
<td>US IOOS</td>
<td>Carl Gouldman, Jessica Snowden</td>
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<td></td>
<td></td>
<td><a href="mailto:Carl.Gouldman@noaa.gov">Carl.Gouldman@noaa.gov</a>, <a href="mailto:jessica.snowden@noaa.gov">jessica.snowden@noaa.gov</a></td>
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| IOC Secretary General | Vladimir Ryabinin | v.ryabinin@unesco.org |
| IOC Perth, Australia | Nick D’Adamo | nick.dadamo@bom.gov.au |
| IOC-WESTPAC | Mr. Gao Zhigang | gzg_ocean@163.com |

Invited Speakers
- Ocean Gliders (Chari Pattiaratchi),
- GOA-ON (Rusty Brainard),
- JCOMM (Juliet Hermes)
- Ocean Radar (Simone Cosoli)

Other invited guests
- SAEON (South Africa), represented by Juliet Hermes (see above)
- Andrew Stewart (DFO, Canada)
- Emily Smail (GEO Blue Planet)
- Nelly Florida Riama (IAMCG, Indonesia) and Andri Ramthani (BMKG)

Hosts
- Dr Serena Teo
- Dr SK Ooi