

Report of the

CONSULTATION ON A COLLABORATIVE PROGRAMME TO ASSESS AND MONITOR CLIMATE-RELATED CHANGES IN MARINE ECOSYSTEMS IN TROPICAL/SUBTROPICAL REGIONS AND IN THE HIGH SEAS USING THE RESEARCH VESSEL “DR FRIDTJOF NANSEN”

IOC/UNESCO, Paris, France, 5–6 September 2012



THE EAF-NANSEN PROJECT

FAO started the implementation of the project “Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries (EAF-Nansen GCP/INT/003/NOR)” in December 2006 with funding from the Norwegian Agency for Development Cooperation (Norad). The EAF-Nansen project is a follow-up to earlier projects/programmes in a partnership involving FAO, Norad and the Institute of Marine Research (IMR), Bergen, Norway on assessment and management of marine fishery resources in developing countries. The project works in partnership with governments and also Global Environment Facility (GEF)-supported Large Marine Ecosystem (LME) projects and other projects that have the potential to contribute to some components of the EAF-Nansen project.

The EAF-Nansen project offers an opportunity to coastal countries in sub-Saharan Africa, working in partnership with the project, to receive technical support from FAO for the development of national and regional frameworks for the implementation of Ecosystem Approach to Fisheries management and to acquire additional knowledge on their marine ecosystems for their use in planning and monitoring. The project contributes to building the capacity of national fisheries management administrations in ecological risk assessment methods to identify critical management issues and in the preparation, operationalization and tracking the progress of implementation of fisheries management plans consistent with the ecosystem approach to fisheries.

STRENGTHENING THE KNOWLEDGE BASE FOR AND
IMPLEMENTING AN ECOSYSTEM APPROACH TO
MARINE FISHERIES IN DEVELOPING COUNTRIES
(EAF-NANSEN GCP/INT/003/NOR)

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PREPARATION OF THIS DOCUMENT

The Consultation on a collaborative programme to assess and monitor climate-related changes in marine ecosystems in tropical/subtropical regions and in the high seas using the research vessel “Dr Fridtjof Nansen” was held at the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), Paris on 5 and 6 September 2012, within the framework of the EAF-Nansen project (Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries). The consultation was attended by a total of 19 participants, representing six UN agencies, and four national institutions.

This report captures the presentations made at the workshop and provides highlights of the discussions that followed. It was prepared by the EAF-Nansen Project Management Unit in Rome and circulated to all the participants for comments and confirmation.

FAO EAF-Nansen Project.

Report of the Consultation on a collaborative programme to assess and monitor climate-related changes in marine ecosystems in tropical/subtropical regions and in the high seas using the research vessel “Dr Fridtjof Nansen”

FAO EAF-Nansen Project Report No. 15. Rome, FAO. 2013. 38 p.

ABSTRACT

The Consultation on a collaborative programme to assess and monitor climate-related changes in marine ecosystems in tropical/subtropical regions and in the high seas using the research vessel “Dr Fridtjof Nansen” was held at the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), Paris on 5 and 6 September 2012. The Consultation was held within the framework of the EAF-Nansen project (Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries) and was attended by a total of 19 participants, representing six UN agencies, and four national institutions. Dr Wendy Watson-Wright, Executive Secretary of the Intergovernmental Oceanographic Commission of UNESCO opened the consultation.

The principal objective of the consultation was to discuss the possible components of the new EAF-Nansen project and the involvement of partners other than FAO and IMR, especially other UN Agencies. The project is expected to contribute to answering questions in relation to climate change and impact on the oceans. It is intended to set baselines and develop a system to monitor marine ecosystems in change as a result of climate variability and other drivers of change such as fisheries and pollution, in close cooperation with relevant on-going processes.

1. INTRODUCTION

Climate change is expected to have significant consequences for the oceans and their resources. Some of these changes have already been documented. Detailed knowledge of the impacts of climate change on the marine environment and fishery resources is essential to enable coastal countries to take these impacts into consideration in their planning and as a way to increase their resilience. Climate change related impacts add to others resulting from drivers such as fishing, pollution from land-based activities and oil exploitation at sea, with possible dramatic but poorly documented changes, particularly so in developing countries.

A consultation on “a collaborative programme to assess and monitor climate-related changes in marine ecosystems in tropical/sub-tropical regions and in the high seas using the research vessel “Dr Fridtjof Nansen” was held at the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Paris, France on 5 and 6 September 2012 under the EAF-Nansen project “Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries”.

The consultation was attended by a total of 19 participants, representing six UN agencies, and four national institutions (Appendix 2).

2. OPENING OF THE CONSULTATION

Justin Ahanhanzo of IOC/UNESCO welcomed participants and introduced Gabriella Bianchi, Coordinator of the Marine and Inland Fisheries Service of the FAO Fisheries and Aquaculture Department and Wendy Watson-Wright, Executive Secretary of the Intergovernmental Oceanographic Commission of UNESCO and asked all participants to introduce themselves. He then asked Gabriella and Wendy to give opening remarks.

G. Bianchi thanked Dr Wendy Watson-Wright, Executive Secretary of the IOC for hosting the meeting and for the interest shown in this initiative since November 2011 when IOC was approached with the idea.

Gabriella recalled how it is now internationally accepted that global warming is a fact and that more must be done, including learning how to adapt to the inevitable changes, including those of the oceans. Adaptation has been in focus in recent international climate change negotiations and strong pledges have been made to help developing countries to respond to present and future climate-related changes. One key element is to understand the vulnerability of the resources that underpin national economies, food security and livelihoods. Knowledge is required in this respect and also to develop and implement adaptation policies and investments recommended to reduce likely impacts of climate change (CC) on fisheries and aquaculture or capitalizing on the opportunities that may arise. She recalled how the international agenda that has developed in relation to Rio+20 (including the Rio+20 declarations and the Oceans Compact) has important recommendations in relation to knowledge and capacity needs, particularly in developing nations. She referred to Norway having made available the research vessel Dr F. Nansen to the international community for nearly 40 years, during which the vessel has been used to respond to different needs and challenges. Today global warming and the resulting changes in aquatic ecosystems overlie the impacts of existing stressors posing great challenges to fisheries and aquaculture. She saw the essence of this meeting to be one of initiating a dialogue to develop collaboration on

marine science directly relevant to the sustainability and resilience of fishery and aquaculture systems and to fill major gaps to this end. Gabriella also recalled that of the 80 000 or so scientific papers that have been produced on climate change impacts, more than 90 percent have to do with terrestrial ecosystems. Also, most of the papers that relate to the marine environment are from high latitude countries. Therefore, the programme under discussion could help fill what seems to be a major gap in science and knowledge generation thereby supporting developing countries to enhance their adaptive capacity to climate change.

Wendy Watson-Wright welcomed the meeting participants. She referred to the visit of two of the FAO's EAF-Nansen project staff to IOC in November 2011, during which a special IOC seminar with a focus on ocean observation needs in Africa in support of the Global Ocean Observing System had been organised. Although the focus was on Africa, there was an important element in the presentation of the key speakers, namely Kwame Koranteng and Tore Stromme, addressing the crucial issue of the marine environment and climate change in developing countries with the burning question, "Who will observe and who will pay for it?" There was an understanding that since the question of climate change and ocean observations is global in nature, the answer should be based on a global approach. Wendy noted that subsequent discussions between IOC/UNESCO and FAO colleagues laid the groundwork for the present consultative meeting. The United Nations family was well positioned to provide a global platform to answer global challenges, notably climate change and ocean related observations. Assessing and monitoring climate-related changes in marine ecosystems in tropical and sub-tropical regions and in the high seas is crucial, in particular in the context of the Rio+20 deliberations and outcomes.

Wendy noted the timeliness of this initiative not only because it occurs in connection with 2011 being the Nansen Year, but also considering that the Secretary General of the UN called for a reinforced UN inter-agency cooperation in particular in the current context of the One UN Reform, and the recently released Ocean Compact. This meeting should be seen as our collective effort to answer this call. She also mentioned the call by the IOC governing bodies for enhanced cooperation with scientific institutions and stressed how the IOC/UNESCO, because of its mandate as the focal point for marine science within the UN, was an obvious partner in this initiative. Full text of Wendy Watson-Wright's opening address is given in Appendix 3.

3. ELECTION OF CHAIR AND ADOPTION OF THE AGENDA

Professor Peter Haugan from the University of Bergen, representing Nansen Environmental and Remote Sensing Center and Vice Chair of the IOC, was elected Chair. Gabriella Bianchi, Kwame Koranteng and Justin Ahanhanzo agreed to serve as rapporteurs. The agenda (Appendix 1) was adopted without changes.

4. BACKGROUND AND OBJECTIVES OF THE CONSULTATION

Giving the background of the consultation, Kwame Koranteng, coordinator of the EAF-Nansen project, recalled the history of the Nansen Programme that started in 1975 with the operations of the first "R/V Dr F. Nansen". The programme aimed at supporting newly independent states to develop their fisheries for which a research vessel was provided by the Norwegian Agency for Development Cooperation (Norad) manned by a Norwegian crew and core scientific team, and advised by FAO. As a sign of neutrality and decoupling it from Norwegian fishery interests, the vessel flies the UN flag. The programme undertook surveys

in the maritime waters of many African, southeast Asian and Latin American countries. A second vessel was built and became operational in 1993.

While early stages of this programme aimed at identifying new resources to satisfy developing countries nutrition needs, following stages have covered monitoring needs and more recently the programme has tried to respond to knowledge needs in the context of the EAF. Since 2006, FAO, the Institute of Marine Research (IMR) and Norad developed a project that facilitates EAF management in developing countries through capacity building and by building the knowledge base.

It has been proposed that any future phase of the EAF-Nansen project should deal with the challenge of climate change and surveys conducted with the R/V Dr Fridtjof Nansen will have to be multidisciplinary in nature to serve the needs of the countries and other partners. It has been proposed that the vessel should provide a common platform for UN agencies with competencies in marine and climate related issues to work together in a collaborative way towards related objectives.

In November 2011, FAO, through the EAF-Nansen project, approached IOC/UNESCO for a possible partnership for future phases of the EAF-Nansen project, to study climate related changes in the oceans around developing countries using the R/V Dr Fridtjof Nansen. It was agreed that a meeting would be held involving relevant UN agencies with competencies in climate change and the oceans. The IOC Executive Secretary, Dr Wendy Watson-Wright, offered to host the follow-up meeting at the IOC Headquarters in Paris, France.

Mr Koranteng then referred to the stated objectives of the consultation that were to address the below questions:

- What are the main on-going programmes on impacts of climate change on marine ecosystems in tropical/subtropical regions?
- Considering other international initiatives on climate change and marine ecosystems, what will a new programme look like and in what way can it best complement ongoing efforts?
- Are the parties prepared to work together on a common programme with a development objective?
- What will be the nature of the partnership?
- What are the required inputs and possible sources of funding?
- Will there be a need to establish a multi-agency taskforce to develop the idea?

Kwame concluded that while the consultation was kept to UN agencies, other partners would also be welcome.

Following the presentation, there were some discussions on the geographic scope of the program, i.e. whether it should mainly cover tropical/subtropical regions or also temperate areas where support was needed, such as the Black Sea. There was general agreement that emphasis should be put on tropical and subtropical regions and particularly on Africa that is still the continent in greatest need of the relevant support.

5. GLOBAL CLIMATE CHANGE AND REGIONAL IMPACTS ON MARINE ECOSYSTEM

Svein Sundby of the IMR, Bergen, Norway provided a synthesis of present knowledge of climate change impacts at the global and regional levels. He pointed out that global climate change causes regional and local changes in the physical forcing and this, in turn, impacts regional biomes and local ecosystems in diverse ways. Therefore, impact studies of global climate change in a specific local marine ecosystem need to be tailored to the specific local conditions in the form of physical forcing and ecosystem structure.

Mr Sundby continued that global ecosystem models indicate that global primary production (PP) will decrease by about 7 percent during the present century (Steinacher *et al.* 2010¹). However, regional changes in PP show large variations. In large parts of the oceans, particularly in the oligotrophic mid-ocean gyres, PP is assumed to decrease due to increased thermal stratification that prevents nutrients from the deeper layer reaching the upper photic zone. In other regions, e.g. in high-latitude spring-bloom systems, PP seems to increase. Also, in some of the major eastern boundary upwelling ecosystems (EBUEs), PP seems to increase, possibly due to increasing upwelling winds, while other EBUEs seem to be subjected to decreasing PP. It is important to investigate how such changes in PP propagate to higher trophic levels and ultimately to changes in fish production. In EBUEs increased PP might result in increased energy flow and increased productivity at higher trophic levels and increased outcome from fish stocks. Alternatively, the increased PP might result in an increase in the production of low-oxygen water masses. A combination of these two different pathways for energy flow may, of course, also be the result.

Concluding, Svein noted that future studies within the EAF-Nansen project will need to consider the specific regional and local responses to climate variability and climate change. This demands detailed knowledge, not only of key fish species, but also of the structure of the ecosystem at lower trophic levels, and of the overall functioning of the ecosystem. Displacement of species and changes in trophic structure and species diversity are expected in addition to changes in productivity.

In the discussion that followed, some participants noted the importance of including other stressors such as pollution, increased nutrients and increased dust, in addition to climate change. The interconnectedness of marine ecosystems was emphasized as well as the importance of also studying regions that, because of their lower productivity, may seem to have less priority.

6. ONGOING CLIMATE CHANGE WORK ON THE MARINE ENVIRONMENT

Participants made presentations on climate change-related work and programmes that their organizations are involved in. The summaries of the presentations are given below.

6.1 FAO (Gabriella Bianchi)

FAO's interest in climate change work is mainly in connection with its possible impacts on food producing systems, including fisheries and aquaculture. The significance of aquatic ecosystems for millions of people that depend on them as a key source of food and

¹ Steinacher, M., Joos, F., Frölicher, T.L., Bopp, L., Cadule, P., Cocco, V., Doney, S.C., Gehlen, M., Lindsay, K., Moore, J.K., Schneider, B. and Segschneider, J.: Projected 21st century decrease in marine productivity: a multi-model analysis, *Biogeosciences*, 7, 979–1005, doi:10.5194/bg-7-979-2010, 2010.

livelihoods was recalled. The main elements of a newly developed strategy for fisheries, aquaculture and climate change by the Fisheries and Aquaculture Department were presented, i.e.:

- Climate change partnerships to support cooperation and develop policy and management initiatives, e.g. Global Partnership on Climate Fisheries and Aquaculture (PaCFA);
- Knowledge base for policy development and to raise awareness of the importance of the sector, climate change implications and vulnerabilities, including building bridges between science and policy;
- Mitigation actions for the sector at global, regional and national levels; greenhouse gas (GHG) emissions and mitigation potentials;
- Climate change adaptation strategies within sector development frameworks at global, regional and national levels, e.g. National Adaptation Plan of Action (NAPA);
- Lesson-learning and capacity-building processes with partners through specific tools, such as strategies and best practices;
- Communication strategy for a range of audiences and development of a coordinated approach to global planning and feedback;
- Resource mobilization to support prioritized actions.

The strategy can be found at:

ftp://ftp.fao.org/fi/brochure/climate_change/strategy_fi_aq_climate/2011/climate_change_2011.pdf

FAO has collaborated closely with other agencies/organizations in a number of initiatives to increase knowledge and awareness of possible climate change impacts on fisheries and aquaculture, such as the International Symposium “Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses and evaluating management strategies” 26–29 April 2010, Sendai, Japan, the PaCFA Workshop on reducing global and national vulnerability to climate change in the fisheries sectors: Policy perspectives post Copenhagen (convened by FAO & the World Fish Center) and the Second international symposium on “Effects of climate change on the World’s Oceans” (14–19 May 2012, Yeosu, Korea) (PICES-ICES-IOC/UNESCO). FAO is also implementing and developing projects, the main objectives of which are to:

- Provide and initiate assessments of vulnerability in the fisheries and aquaculture sectors;
- Estimate exposure, sensitivity, and adaptive capacity;
- Identify main information gaps;
- Review current governance elements relevant to CC adaptation and disaster risk management;
- Provide member countries with policy recommendations to reduce vulnerability and increase adaptation capacity;
- Recommend priority actions;
- Provide information on the process to assess vulnerability and the way forward to adaptation.

6.2 IOC-UNESCO (Luis Valdes)

One of the four high level objectives of the IOC is to deal with mitigation and adaptation to climate change. Key areas of work include observations (GOOS) and perceptions,

predictions, mitigation/adaptation (e.g. organization of training courses on sea level rise and coastal erosion), input into global assessments (Integrated pollution prevention and control – IPPC and Intergovernmental platform on biodiversity & ecosystem services – IPBES), and organization of international symposia. Public perceptions are very important and results of a worldwide inventory on belief in global warming based on individual surveys conducted at country level between 2006 and 2010 (based on data from the United Nations Development Programme [UNDP], 2011) show that in many countries there are no major concerns due to climate change.

All the above work is done in collaboration with other agencies. Different platforms are used (e.g. the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), UN Oceans, Regional Seas Programme, etc).

He recalled key global initiatives that could be relevant for the programme, including the Oceans Compact (UN), the Global Partnership for Oceans (GPO, World Bank) and the Future Earth (International Council for Science – ICSU). It was noted that the GPO and Global Environment Facility (GEF) could be important partners.

6.3 UNDP/GEF (Vladimir Mamaev)

The goal of the UNDP-GEF Water and Oceans programme is to promote integrated, ecosystem-based, climate resilient management of the world’s major freshwater and marine transboundary waters systems through improved water and ocean governance.

UNDP is working in cooperation with many other UN agencies, the GEF, international financial institutions, regional fisheries organizations and others to improve oceans management and sustain livelihoods at local, national, regional and global scales, through effective oceans governance.

The GEF International Waters internet site (<http://iwlearn.net/>) provides all information on publications, data and future programming activities. The GEF IW: LEARN is a programme that promotes experience sharing and learning among GEF International Waters projects and the country officials, agencies, and partners working on them. Iwlearn.net supports knowledge sharing in the GEF IW portfolio and contains project-related information, contacts, and documents, e.g. case studies, transboundary diagnostic analyses, strategic action programmes, news and events. Outputs from GEF IW conferences, guidance materials and products of GEF IW: LEARN or water-related learning are also available.

A list of relevant projects is provided in Appendix 4.

6.4 United Nations Environment Programme (UNEP) Regional Seas Programme/ Nairobi Convention and Abidjan Convention (Dixon Waruinge)

The presentation focused on the area of work of the Nairobi Convention, covering coastal countries of East Africa from Somalia to South Africa, including island states.

Key objectives of the convention include preventing, reducing and combating pollution, protecting and preserving rare or fragile ecosystems as well as rare, depleted, threatened or endangered species of wild fauna and flora and their habitats. The convention also aims at fostering cooperation in scientific research, monitoring, and the exchange of data and other scientific information. Some areas of work were highlighted, such as the development and implementation of integrated ecosystem-based management of marine and coastal ecosystems, assessments and capacity building on the valuation of coastal and marine

ecosystems to contribute to regional and global assessments, adaptation to climate change and environmental governance.

Regional collaborations include Memoranda of Understanding (MoUs) with the Indian Ocean Commission and with the South Western Indian Ocean Fisheries Commission (SWIOFC).

Emerging issues/areas of work include:

- Drafting, negotiation and adoption of protocol on Integrated coastal zone management (ICZM), including ecosystem based management (EBM) principles;
- Programs on: ports and harbours in the convention area;
- Partnerships for new projects – Western Indian Ocean-Strategic action programme (WIO-SAP) (critical habitats, river flows and water quality);
- Green economy in a blue world (including overexploitation of stocks contiguous to areas beyond national jurisdiction (ABNJs)/high seas, in collaboration with SWIOFC);
- Climate change and policy implications for WIO;
- On and offshore oil and gas exploration and implications;
- Marine protected areas (MPAs) and birds as indicators of ecosystem health.

The need for a scientific and technical body within the convention was highlighted. Possible collaborations as part of existing projects or project proposals were put forward.

6.5 GESAMP (Peter Kershaw)

GESAMP is an advisory body, established in 1969, that advises the UN system on the scientific aspects of marine environmental protection.

GESAMP is an inter-agency body providing independent scientific advice to its sponsoring agencies (International Maritime Organization [IMO], IOC-UNESCO, World Meteorological Organization [WMO], United Nations-Division for ocean affairs and the law of the seas [UN-DOALOS], United Nations Industrial Development Organization [UNIDO], UNEP, International Atomic Energy Agency [IAEA], UNDP, FAO). At present GESAMP is jointly sponsored by nine UN organizations with responsibilities relating to the marine environment, and they utilize GESAMP as a mechanism for coordination and collaboration. GESAMP itself today consists of 16 experts, drawn from a wide range of relevant disciplines, who act in an independent and individual capacity. Studies and assessments are usually carried out by dedicated working groups, most of whose members are not sitting members of GESAMP but part of the broader GESAMP network.

Its main activities consist of providing authoritative reviews and assessments on many aspects of the status of marine ecosystems and the impact of human activities on the marine environment. It does this by inviting acknowledged experts on particular topics to form a task team, working group or ad-hoc group, making sure that there is adequate regional coverage. The majority of work is carried out on a pro-bono basis. Current and recent issues have included fisheries & aquaculture; chemical hazards; ballast water treatment systems; sources, fate & effects of metals (especially mercury); atmospheric input of chemicals; bio-magnification of contaminants; potential effects of hypoxia on fish health; sources, fate & effects of plastics & micro-plastics, including their contaminant burden. None of these topics has been specifically set-up to investigate climate effects, but several of them have clear climate-related components. In future, GESAMP will be in a position to provide independent scientific advice on climate- or multiple-stressor-related issues, with the agreement of the

GESAMP Executive Committee. Any work GESAMP undertakes is dependent on securing a funding stream to cover the cost of essential elements, such as travel to workshops and potentially to cover limited consultancy payments.

6.6 Regular Process (Assessment of Assessments) (Alan Simcock)

The "Assessment of Assessments" is being undertaken as part of the START-UP PHASE OF THE REGULAR PROCESS (in accordance with paragraph 64(a) of the United Nations General Assembly [UNGA] resolution 58/240). It is coordinated by the UN, UNEP and IOC-UNESCO. It was requested by governments in order to serve as one of the main foundations for the development of a regular process for the global reporting and assessment of the state of the marine environment, including socio-economic aspects. It builds on the work done by other international forums and, either directly or indirectly through those forums, by national authorities concerned with the marine environment.

Alan Simcock provided some highlights of the recently published volume on Assessment of Assessments where a section covers data and information availability globally. He stressed its usefulness as a comprehensive view of where more ecological information is needed, region by region (see summary in Appendix 4). The Nansen work already appears in this volume but most of its results are not included because the information and data can only be obtained by applying directly to individual coastal states, which is very time-consuming.

He stressed that any future programme based on the operations of the R/V Dr Fridtjof Nansen should be developed against identified needs. There is a strong case for building links to existing processes and research programmes such as the National Oceanic and Atmospheric Administration's (NOAA) ARGO. Reference was also made to the large number of satellite monitors and the need to link between these and actual species (ground-truthing).

In the north Atlantic the continuous plankton recorder (CPR) programme has been going on for 60 years. This programme is not available in tropical areas and could be an idea for high seas. Habitat mapping was seen as another important area of work that could only be done by using a research vessel.

The merit of linking with the work being done in large marine ecosystems (LMEs) globally was highlighted.

The recommendation was made that any future multiagency programme should have a multidisciplinary/multiagency advisory board.

A recommendation was made to develop a questionnaire perhaps as part of the UN Oceans coordination mechanism, to investigate ongoing climate change activities.

6.7 Benguela Current Commission (BCC) (Moses Maurihungirire)

Reference was made to the development of the LME concept as a way of addressing key sustainability objectives that resulted from the United Nations Conference on Environment and Development (UNCED), process.

Key to the LME concept is the inclusion of a scientifically based strategy to monitor and assess the changing states and health of the ecosystems by tracking key biological and environmental parameters.

The BCC was established in January 2007 through the signing of an interim agreement by three countries. One of the prescripts of the interim agreement is that Angola, Namibia and South Africa should work together to negotiate, sign and ratify a legally binding multilateral convention that will formalise and entrench the BCC and over the past two years these countries have negotiated the terms of the BCC. Once it is ratified, the BCC will commit Angola, Namibia and South Africa to:

- preventing and eliminating pollution and taking steps to protect the marine ecosystem against any adverse impacts;
- building capacity based on local capacity/context; making sure that scientific knowledge is user friendly; multisectoral aspects; mitigation/adaptation; reduction of causes of CC;
- undertaking environmental impact assessments for activities that might have negative impacts on the marine and coastal environment;
- collecting, sharing and exchanging data;
- where possible, reversing and preventing habitat alteration and destruction;
- protecting vulnerable species and biological integrity;
- improving human capacity and infrastructure.

The BCC has a key mandate as regards generation and provision of scientific advice on marine issues, including capacity building in these aspects. Present projects include work on transboundary pelagic and demersal fish stocks, habitat mapping and plankton studies.

As regards climate change work, this is not specifically mentioned although it was noted that the multisectoral nature of the commission makes it suitable to climate change work. Furthermore, each of the participating states is deeply involved in climate change work which makes the commission very well positioned to work in this field.

6.8 IAEA - Environment Laboratories (EL) (Thomas Lacoue-Labarthe)

The marine ELs of the IAEA focus mainly on four objectives:

- The development of techniques and research on dispersion of natural and anthropogenic radionuclides and other chemicals (inorganic and organic pollutants);
- The application of nuclear and isotopic techniques to help better understand physico-chemical and biogeochemical processes in the marine environment;
- The transfer of technical knowledge and expertise to member states, providing training and building capacity in member states in the different fields of expertise of the laboratories;
- The implementation of partnerships with other organizations to set up a synergetic approach to study and assess the marine environment and contribute to a sustainable use of its resources.

Through its own mandates and the increasing concerns formulated by member states, IAEA–EL dedicated a part of its activities to studying climate change issues and related-consequences (e.g. ocean acidification), trends and impacts on the marine environment.

Nowadays, the main CC-related work of the IAEA–EL includes:

- Home-made work: is developing and carrying out experimental studies using radio- and isotopic tracers to assess the impact of ocean warming and acidification on

marine organisms, highlighting sensitivity or resistance of commercial and key ecological species;

- Collaboration with member states: is promoting, in the framework of the IAEA Technical Cooperation Programme, the use of isotopic and nuclear applications to assess ocean change trends (paleoclimatology) and impacts on marine environment functioning in combination with other anthropogenic stressors (e.g. nutrient pollution in coastal areas);
- Partnerships: is hosting the Ocean Acidification International Coordination Center (OA-ICC) that aims at promoting, communicating and facilitating global actions in ocean acidification issues.

In the context of the Nansen Project, IAEA-EL can assist the project through its technical expertise, especially in the framework of a Regional Technical Cooperation Project on Climate Change that the IAEA will be implementing in Africa (project currently being designed).

More specifically, the IAEA can contribute to the multidisciplinary approach in synergy with other UN agencies and participants to better understand the global functioning of a biome and the consequences of a change in fisheries resources. Based on the collection of samples of sediment and/or coral skeleton, seawater and biota, IAEA-EL can provide outputs regarding:

- stable isotope ratios and trace elements that are proxies of temperature, salinity, pH, nutrient inputs, pollution (e.g. Sr, Ba, Ca, Mg, $\delta^{18}\text{O}$, $\delta^{11}\text{B}$, $\delta^{13}\text{C}$) in biological archives (coral or carbonate sediment cores) to allow reconstructing past ocean conditions (at long and recent scale: U series, ^{14}C , ^{210}Pb , ^{210}Po dating techniques) in specific geographical areas.
- “climate change is here: baseline must be set” and an understanding of the functioning of regional ecosystems: stable isotopes and trace elements as tools to establish the trophic relationships in food webs and to investigate ecosystem functioning. Stable isotopes are also a unique and powerful tool to determine the source (origins) of nutrients and fluxes of carbon in food webs implication in term of fisheries production.
- use of natural radionuclides (Th/U ratio disequilibrium, ^{14}C) as tracers of vertical carbon fluxes from the sea surface to the bottom and deep ocean.

In OA-related studies, IAEA-EL can also contribute in information dissemination through its OA-ICC.

6.9 Nansen Environmental and Remote Sensing Center (NERSC) and related centres (Peter Haugan)

The NERSC has a 25 year history as a non-profit research centre affiliated with the University of Bergen, Norway. Its vision is to serve society through advancing knowledge on the behavior of the marine environment and climate system in the spirit of Fridtjof Nansen. The main research areas are:

- Climate variability and changes
- Climate process research
- Marine remote sensing studies
- Ocean modelling, data assimilation and forecasting
- Socio-economic impacts of global change

The Nansen Scientific Society is a related idealistic foundation for “knowledge without borders”. The vision of the Nansen Scientific Society is that education and research within global environment and climate problems, including their impacts on society for students and young scientists from different countries and cultures, will provide a foundation for greater understanding and co-existence in the world – in the Nansen spirit.

The Nansen group of research institutes around the world includes centres in Bangladesh, China, India, Russia and the Nansen-Tutu Centre in South Africa. Its vision is to serve Africa through advancing knowledge of the marine environment and climate system in the spirit of Nobel Peace Laureates Desmond Tutu and Fridtjof Nansen.

6.10 Monitoring ecosystems in change by R/V Dr Fridtjof Nansen (Tore Stromme)

The original concept that characterised the Nansen Programme since its inception was to place an ambulating vessel at the disposal of developing nations. The vessel would be operated by IMR and the research activities would be strategically coordinated by FAO and Norad.

Initially, in the 1970s, the vessel was used to identify new fishery resources for newly independent nations. Following the establishment of Exclusive Economic Zones (EEZs) by coastal countries, the vessel was increasingly used to monitor fishery resources in established fisheries. More recently, through the EAF Nansen project, the vessel has been used to monitor a wider range of marine ecosystem features in partner countries/regions.

There is an interest from Norwegian authorities to fund a continued programme, possibly with a new vessel to be built in the near future. If feasible, the new programme should also serve the needs of monitoring the marine environment with respect to impact of climate change on marine ecosystems, preferably as part of a concerted effort across other relevant international initiatives and programmes.

In the period 2012–2014, efforts will be put into testing the use of the vessel as a collaborative platform to develop a research programme to study marine ecosystems by establishing baselines and standardised monitoring systems. For this purpose a total of 90 survey days are available for demonstration surveys over the next two years. The planning and execution of these surveys should be the joint responsibility of partners in the new initiative, perhaps operating through a technical task force.

At present the core focus is on acoustic methods for monitoring pelagic fish stocks and trawl survey for demersal fish populations. Physical oceanography, plankton and benthos are usually collected at standard reference transect lines. In addition visual methods (remotely operated vehicles [ROVs] and Campods) are used for habitat mapping and the multibeam echosounder for seafloor mapping.

Trawl, fisheries acoustic and fisheries oceanographic data are processed underway and are available at the end of the survey as distribution maps, abundance estimates and oceanographic profiles. However, there are difficulties in integrating plankton, benthos and sediment samples into the survey report as it takes longer to be analysed ashore and processed into a comprehensive ecosystem state analysis, also involving more partners. Any future programme will have to address these difficulties.

Appendix 5 is a preliminary compilation of activities on oceans and climate at the institutions represented in the consultation.

7. EXPLORING THE MERITS OF A UN-WIDE MARINE ECOSYSTEM MONITORING PROGRAMME INCLUDING THE USE OF A RESEARCH VESSEL

7.1 Preliminary ideas for the proposed programme

In introducing this agenda item, G. Bianchi recalled the significance that aquatic ecosystems have for millions of people that depend on them as a key source of food and livelihoods. She also recalled the timeliness of this initiative, especially considering relevant international processes and related calls for action. In particular, she recalled that at the Conference of the Parties (COP) 15 of the UN Framework Convention on climate change (UNFCCC) in Copenhagen in 2009, the over 320 participants of the Oceans Day event stressed the need to address threats faced by coastal communities, especially in developing nations and small island developing states (SIDS), as a result of the effect of climate change on the world's oceans. It was noted that since climate change is a global issue, observations to understand the nature and effect of the changes should also take place in oceans bordering developing nations (obvious victims of climate change). The research capacity needs of developing countries also have to be addressed. More recently, various calls had been made as regards the need to improve knowledge on the impacts of climate change on the oceans (e.g. Rio+20 and the Oceans Compact).

A number of questions in relation to climate change and impact on the oceans, including the following, need to be addressed:

- How will productivity be affected by climate change?
- How is climate change affecting the distribution and abundance of marine species and communities?
- Where are sensitive areas or hotspots of change?
- What tools are available – especially in developing countries – to monitor changes in marine ecosystems?
- Which marine species will be the best sentinels of climate change impacts? They could include corals and kelp, or species with key ecological roles such as phytoplankton.
- How would reduction in non-climate related stress increase ecosystem resilience to climate change?
- To what extent will marine climate change impacts affect socially and economically developing countries?

The programme under discussion “Assessing and monitoring climate-related changes in marine ecosystems in tropical/subtropical regions and in the high seas” is expected to contribute to answering the above questions. It is intended to set baselines and develop a system to monitor marine ecosystems in change as a result of climate variability and other drivers of change such as fisheries and pollution, in close cooperation with relevant ongoing processes.

There was general agreement on the uniqueness and the potential value of the RV “Dr Fridtjof Nansen” to serve the international community and member countries of the UN. A great advantage to its operations is the fact that it flies the UN flag.

Several participants highlighted the need to make sure that data collected by the vessel were efficiently used for policy making. It was also noted that the activities of the RV “Dr Fridtjof Nansen” had to be well harmonised and integrated with activities carried out by local vessels.

The data and information produced by the vessel are already an important basis for developing assessments at country and regional levels. These could be made even more useful by developing reports on the state of ecosystem health, which could, in turn, feed into the UN Regular Process.

Participants emphasised that the marine environment has always been in the back seat, now the oceans are at the front. This can be used as a powerful tool in forming this programme.

The meeting then discussed key features of the proposed programme; highlights of the discussion are presented in the table below.

Table 1: Possible elements of the proposed programme

Vision	<p>Providing knowledge on marine ecosystem status and biodiversity that will support developing countries to be better prepared to address the impacts of multiple stressors on marine ecosystems. (Preliminary, in relation to the vision important to:</p> <ul style="list-style-type: none"> • Building the vision • Sharing the vision • How can this be done, what are the steps?)
Programme objectives (including problems to be addressed)	<ul style="list-style-type: none"> • In collaboration with ongoing initiatives at the global, regional and local scales, fill identified knowledge gaps on marine ecosystems, in support of policy making at the local, regional and global scales. • Monitoring and assessing marine ecosystems status to improve the management of the activities that affect their quality in tropical and subtropical systems. <p>The programme will consist of internal and external parts.</p> <p><i>“Internal” part</i></p> <ul style="list-style-type: none"> • At the moment as series of separate projects to produce information, focused on fisheries management. This could continue to cover ecosystem information, including full range of ecological aspects relevant to EAF. <p><i>“External” part</i></p> <ul style="list-style-type: none"> • Coordinate with ongoing activities (Argo programme and others). • Make sure that the internal programme also serves “external needs” (e.g. the UN Regular Process). <p>There are various scales (local, regional, global) and perhaps all needs can be covered. On the other hand it may be too ambitious to cover all scales, hence there may be the need to have an open mind in terms of scope.</p> <p>Link between climate change and other stressors.</p>
Stakeholders, beneficiaries and partners	<ul style="list-style-type: none"> • National: Fisheries and environment institutions in developing countries <ul style="list-style-type: none"> ○ Coastal communities • Regional: Regional programmes: IOC subcommissions, Regional seas programmes, LMEs, Conventions, Fisheries bodies; New Partnership for Africa's Development (NEPAD), EU Commission • Global: UN and relevant UN agencies
Main programme components and expected results	<ul style="list-style-type: none"> • Data collection (integrated coastal observing system, world association of marine stations) • Producing knowledge (research, modeling, definition of EBSAs, e.g. oil and gas in Tanzania, northern Madagascar and Mozambique) • Translation into policy recommendations (policy briefs,

	<p>specific training of scientists to provide policy advice)</p> <ul style="list-style-type: none"> • Capacity development • Public awareness and outreach (IOC multi-sectoral programme on climate change including education kit) • Catalyst for regional cooperation in support of existing regional institutions.
Proposed roadmap for programme development	<ol style="list-style-type: none"> Upcoming events to launch the idea (science global conference GEF Bangkok – open oceans sessions and coastal sessions); Set up two task forces, including TORs: <ul style="list-style-type: none"> • one for the programme development; • one for the demonstration survey; FAO and IOC, Norway, LMEs (GEF/UNDP using programme managers) to develop task forces (e.g. Mick O’Toole, UNEP Marine Branch–Abidjan/Nairobi Conventions); End of 2013 – first draft; Input to demonstration survey: high level input? Develop key scientific questions the demonstration survey will address; Inform respective institutions on this process, take it up in connection with the UN-Oceans.
<ul style="list-style-type: none"> • Possible sources of funding 	

The discussion also resulted in key recommendations including:

- Adoption by the programme of innovative approaches as regards capacity building, e.g. using local universities to develop local capacities (it was noted that the EAF Nansen project has already done a lot in this direction).
- Programme to be grounded 1) on the environmental pillar (looking at various stressors), placing emphasis on management; 2) putting value on ecosystem goods and services and costing the impacts; 3) scientific pillar to serve social needs; 4) institutional pillar.
- Importance of IOC for biodiversity database is also a key pillar in this programme. The "International Oceanographic Data and Information Exchange" (IODE) programme (IOC-UNESCO) established in 1961, to enhance marine research, exploitation and development, by facilitating the exchange of oceanographic data and information between participating member states, and by meeting the needs of users for data and information products. The Ocean Biogeographic Information System (OBIS) is a part of IODE.
- Important to link with UNDP/GEF LME projects and the GEW-IW community of practice.
- The Nansen project linking various mandates of UN agencies, for the research vessel to become a common platform for the UN agencies.

A number of specific recommendations for follow up to raise awareness of and support for this initiative included:

- IOC to take the lead in organizing a common, UN call for funding such a programme (supporting letter to NORAD).
- FAO to publicize this activity in UN Oceans and UN Atlas of the ocean.
- Link with LMEs as regards their needs on ship time.
- Prepare a note on the initiative for IW-Learn (news, LMEs, partnerships); also copy GESAMP.
- Norway to make GEF aware that the country is co-funding international waters efforts.
- Need for a push at the top for IW to support Nansen and also try to understand how we prepare a sound proposal where some of the ship time could be covered.
- General Assembly of IOC to provide information to member states.

APPENDIX 1

ANNOTATED AGENDA

DAY 1 (Wednesday, 5 September 2012)		
09.00	Opening	
	<ul style="list-style-type: none"> ○ Opening remarks by Gabriella Bianchi and Wendy Watson-Wright and ○ Self-introduction ○ Election of chair/moderator and rapporteurs ○ Adoption of the agenda ○ Background and objectives of the consultation (Kwame Koranteng) ○ Global climate change and regional impacts on marine ecosystem (Svein Sundby) 	<p><i>Meeting will be called to order by Justin Ahanhanzo (IOC/UNESCO) after which opening remarks will be made by Gabriella Bianchi (FAO) and Wendy Watson-Wright (IOC/UNESCO).</i></p> <p><i>After a brief introduction to the background and objectives of the consultation, a background paper will be presented to set the stage on present knowledge related to climate change impacts on marine ecosystems.</i></p>
10.30	<i>Morning Tea / Coffee</i>	
10.50	<ul style="list-style-type: none"> ○ Discussions ○ Brief presentations by partners on ongoing climate change work relevant to marine ecosystems ○ Discussions 	<p><i>All partners at the consultation are expected to make brief presentations (5–10 minutes) on their institution's work on climate change and related impacts (FAO, IOC, UNEP, UNDP, GESAMP, Regular Process, IMR, NRSC, IAEA, BCC).</i></p>
12.30	<i>Lunch</i>	
13.30	<ul style="list-style-type: none"> ○ Introduction to the survey programme being carried out by the R/V Dr Fridtjof Nansen as part of the EAF Nansen project (Tore Stromme) ○ Discussions 	<p><i>An overview of the FAO/IMR fisheries and ecosystem survey work carried out with the R/V Dr Fridtjof Nansen will be given. Key components of the programme and key findings will be presented.</i></p>
15.00	<i>Afternoon Tea / Coffee</i>	
15.20	<ul style="list-style-type: none"> ○ Use of research vessels to monitor ecosystem status and biodiversity ○ A framework for biodiversity and marine ecosystems research priorities that can be addressed by ecosystem surveys 	<p><i>FAO has been working on indicators for ecosystem surveys in support of EAF. Some options for monitoring the impacts of fishing on aquatic ecosystems and for monitoring aquatic ecosystems have been proposed. Participants will be asked to discuss the options and to consider some for inclusion in a possible monitoring programme.</i></p>
17.00	○ Close of Day 1 session	

DAY 2 (Thursday, 6 September 2012)		
09.00	<ul style="list-style-type: none"> ○ Exploring the merits of a UN-wide marine ecosystem monitoring programme, especially in the light of the relevant outcomes of RIO+20, including the use of a research vessel and the possible nature of such a programme ○ Programme objectives (including problems to be addressed) ○ Stakeholders/beneficiaries and partners ○ Proposed strategy ○ Main programme components and expected results ○ Possible sources of funding 	<p><i>Participants will be reminded about relevant outcomes of RIO+20, to be followed by discussions on existing (and proposed) UN-wide global and regional initiatives on climate-related changes in the marine environment.</i></p> <p><i>The discussions will focus on the merits of a monitoring programme involving the use of research vessels and in particular the R/V Dr Fridtjof Nansen as a UN-wide platform to establish baselines and increase knowledge on climate-related changes in the oceans (especially around developing countries).</i></p>
10.30	<i>Morning Tea / Coffee</i>	
10.50	<ul style="list-style-type: none"> ○ Exploring the merits (cont.) 	
13.00	<i>Lunch</i>	
14.00	<ul style="list-style-type: none"> ○ Way forward (roadmap for concept note and programme formulation) ○ Outstanding issues <p>Closing</p>	<p><i>Participants will discuss the necessary steps and timelines for developing the agreed monitoring programme.</i></p>
15.30	<i>Afternoon Tea / Coffee</i>	

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APPENDIX 3

Opening speech of the Executive Secretary and Assistant Director General of the Intergovernmental Oceanographic Commission of UNESCO

Madame Gabriella Bianchi, Chief Marine & Inland Fisheries Service of the Food & Agriculture Organization of the United Nations

Prof. Peter Haugan, Vice Chair of IOC/UNESCO and Director of the Nansen Environmental and Remote Sensing Center in Bergen

Dr Kwame Koranteng, Coordinator of the EAF/FAO Nansen project (Ecosystem Approach to Fisheries)

Dr Tore Stromme, Coordinator of the research activities of the EAF Nansen project (Ecosystem Approach to Fisheries)

Representatives of other UN agencies and of regional and national marine related organizations and institutions

IOC colleagues, Ladies and gentlemen/Mesdames et Messieurs

It gives me great pleasure to welcome you to the Headquarters of the Intergovernmental Oceanographic Commission of UNESCO in this beautiful city of Paris on the occasion of the “Consultation on a Collaborative Programme to Assessing and Monitoring Climate-related changes in Marine Ecosystems, in Tropical/Sub-tropical Regions and in the High Seas using the Research Vessel “Dr Fridtjof Nansen”.

I am especially glad to welcome you to the IOC of UNESCO, as this consultative meeting exemplifies well our excellent inter-agency cooperation within the United Nations System, in partnership with regional and national marine related organizations and institutions. To refresh our memories, I would like to recall that this meeting is a follow up to the earlier visit of our FAO colleagues to IOC last November 2011. During that visit, we organized a special IOC Seminar with a focus on Ocean Observation Needs in Africa in support of the Global Ocean Observing System there. Although the focus was on Africa, there was an important element in the presentation of the key speakers, namely Dr Kwame Koranteng and Tore Stromme, addressing the crucial issue of the marine environment and climate change in developing countries with the burning question, “Who will observe and who will pay for it?” There is an understanding that since the question of climate change and ocean observations is global in nature, the answer should be based on a global approach. Subsequent discussions between IOC/UNESCO and FAO colleagues laid the groundwork for the present consultative meeting. In fact, the United Nations family is well positioned to provide a global platform to answer global challenges, notably climate change and ocean related observations.

Assessing and monitoring climate-related changes in marine ecosystems in tropical and subtropical regions and in the high seas is crucial, in particular in the context of the RIO+20 deliberations and outcomes.

As such, this consultation meeting among United Nations agencies and programmes on the future development of the well-known multidisciplinary capacity building programme named after the pioneering oceanographer, Dr Fridtjof Nansen, is timely and appropriate for several reasons:

First, Norway, the native country of the giant scientist and statesman, Dr Fridtjof Nansen, celebrated the year 2011 as the Nansen Year with a successful and attractive cultural and

scientific exhibition entitled: “The Nansen Heritage: Science at the end of the world”. This exhibition showcased the pioneering role of Dr Nansen as a great oceanographer and polar explorer with an enduring legacy in marine research and technology, especially in polar regions.

It is worth noting that for decades, the research vessel Dr Fridtjof Nansen has been carrying out ecosystem assessments in tropical waters, supplementing available observing systems with in-situ measurements and observations from the work on board the vessel.

Secondly, my UN colleagues will recall that the Secretary General of the UN called for a reinforced UN inter-agency cooperation in particular in the current context of the One UN Reform, and the recently released Ocean Compact. This meeting should be seen as our collective effort to answer this call.

Thirdly, the IOC governing bodies called for enhanced cooperation with scientific institutions. As such, I am glad that the participation of selected regional and national marine science and research related organizations and institutions will help to gather the scientific information needed to answer the critical questions before us today.

Finally, I would like to stress that the IOC of UNESCO, as the focal point for marine science with the UN and thus the interface between marine science institutions and governments, acts at both the upstream level, in helping to build the knowledge base of scientific research and monitoring of world ocean and coasts, and at the downstream translation and application at regional and national levels including climate change adaptation and mitigation.

With these few welcome words, I thank you for coming here to IOC/UNESCO and I wish you a very productive meeting with successful outcomes.

APPENDIX 4

SUMMARY OF THE FINDINGS OF THE ASSESSMENT OF ASSESSMENTS ON ECOSYSTEM DATA FOR REGIONS COVERING TROPICAL AND SUB-TROPICAL SEAS

(Alan Simcock)

East Asia

For the entire region, or much of it, there is good coverage of data on the physical and chemical background of the marine environment, marine habitats, fisheries, mariculture, waste disposal, land-based development and litter. Data on offshore wave and wind energy generation and maritime catastrophes is sparse. Information on living aquatic resources is usually inadequate, incomprehensive, unsystematic and sometimes contradictory. Standardization among countries on data collection, and international cooperative surveys are needed to obtain more comparable and consistent data. In addition, there is a need for long-term, well-planned biodiversity studies to develop a species composition checklist and determine temporal and spatial changes.

Eastern Africa

While a moderate amount of information exists at the regional level, most of it is inaccessible to all interested parties in the East African Seas region. Data availability varies from country to country in both quantity and quality. A clearing-house mechanism, consisting of datasets in remote sensing, socioeconomic aspects, elevation and bathymetry, has been established under the Nairobi Convention/GEF WIOLAB project. National Oceanographic Data Centres such as those in Kenya, Mozambique and Tanzania have datasets consisting of oceanographic station data, baseline maps and ecological field data. Mauritius has a database of marine organisms. Lack of data is often cited as a constraint in conducting assessments in the region. Several studies have identified a number of information gaps and the GEF WIOLAB project recognized a number of areas in which to address these gaps, especially those associated with land-based sources of pollution. For example, priority information gaps for South Africa include a lack of understanding about the freshwater requirements of estuaries and the marine environment, and methods and techniques which help to create equity in shared river basins. In the case of Kenya and Tanzania, the lack of information on the short and long-term cumulative effects of pollution on marine ecosystem functions and on humans is a priority information gap.

Examples of assessments which considered the data issue are those conducted to produce the first "State of the Coast 2000" for Tanzania. In these assessments, comparative analyses of assessment methods were undertaken to determine which methods would provide results that could be regarded as a baseline for future reference. Recommendations were also made for the improvement of assessment methods.

In addition, through the IOC-UNESCO ODINAFRICA project, participating institutions in the region have developed an integrated database, as well as centres equipped with human resources and infrastructure focused on oceanographic and coastal data requirements. There is a need, however, to ensure sustainability of such centres in the longer term.

The GEF Agulhas and Somali Current Large Marine Ecosystems (ASLME) project as well as the GEF South Western Indian Ocean Fisheries (SWIOF) project will provide up-to-date quantitative data on the state of the marine environment in terms of fisheries, trophic levels,

productivity and other indicators. Both projects aim to undertake a series of ocean cruises to collect primary ocean and ecological data to determine the state of the region and to identify pressures. When compared to historical data, important inferences can be made as to the appropriate strategic action which could be undertaken by countries in the ASLME region. Both projects will have limited collection on data in shallow coastal environments.

North Central Pacific

There is extensive fisheries data for the North Central Pacific Ocean, particularly for economically important migratory large pelagic species. Data on other fishery resources are available for some areas such as bottom fish in the Hawaiian and Northwest Hawaiian Islands. Extensive data have been collected on shallow water coral reefs and, more recently, on deep water coral resources.

Red Sea and Gulf of Aden

A large amount of data collected for the most part during major expeditions to the Red Sea over the past several decades is available in international oceanographic databases such as the World Data Center for Oceanography (<http://www.nodc.noaa.gov/General/NODCdataexch/NODC-wdca.html>). These expeditions have led to an excellent understanding of the broad oceanographic processes in the Red Sea and its exchanges with the Indian Ocean (Grasshoff 1969, Morcos 1970). However, information is relatively sparse and of variable quality for areas closer to the coast which are most affected by human activities while at the same time, containing some of the most interesting and sensitive ecosystems such as coral reefs and mangroves (Sheppard and others 1992). In the absence of regular, organized data collection, including monitoring for time-series measurements, most of the observations have been made for a specific, narrowly targeted purpose, resulting in the data collected being of limited scope in terms of the parameters measured. For example, while substantial taxonomic information is available on fish and hard corals, much less is known about other organisms such as microbes, phytoplankton and zooplankton and soft bottom fauna. There is a general lack also of integrated biogeochemical and ecological studies. In addition, the geographical coverage seems also to be associated with the political situation and the economics of any given subregion, with some subregions being less investigated, particularly the Somali coast.

Regional Organization for the Protection of the Marine Environment (ROPME)/ Regional Commission for Fisheries (RECOFI) – unofficially referred to as the “Gulf”

A substantial amount of data are available in the international oceanographic databases, mostly collected during major expeditions over the past several decades to the Persian Gulf (Dietrich and others 1966, Brewer and Dyrssen 1985, Price and Robinson 1993) and western Arabian Sea (<http://www1.who.edu/research/arabian.html>). This body of data has led to an excellent understanding of the broad oceanographic processes in the Persian Gulf and its exchanges with the Indian Ocean. The understanding obtained in these expeditions has been enhanced through observations since 1990 on cruises by research vessels Mt. Mitchel, Unitak Maru, Kuds and Mukhtabar Al-Bihar belonging to the University of Qatar which has been running a continuous monitoring programme since the early 1980 covering Qatar’s EEZ.

However, information from areas closer to the coast which are most affected by human activities and contain some of the most interesting and sensitive ecosystems, such as coral reefs and mangroves, is relatively sparse and of variable quality. There are some established institutions in the region, including the Sultan Qaboos University in Oman, the University of Qatar and the Kuwait Institute for Scientific Research, all of which have fairly well-developed observation programmes and datasets, including coastal time-series data. ROPME

organizes basin-scale cruises from time to time. The Ministry of Agriculture and Fisheries of Oman recently deployed an array of instruments to record several key environmental variables in real time, off its coast in what is the first cabled seabed observatory in the North Indian Ocean.

However, there is still a general lack of integrated biogeochemical and ecological studies due to insufficient technical expertise. Moreover, in view of the volatile security and political situation prevailing in the region, there are several serious impediments for data collection in some key regions such as the Shatt-al-Arab Estuary.

South Asia

A large amount of data has been collected over the past four decades on all aspects of oceanography from the open ocean in both the Arabian Sea and the Bay of Bengal. Most of these data can be accessed through global data centres, such as the World Data Centre for Oceanography (<http://www.nodc.noaa.gov/General/NODC-dataexch/NODC-wdca.html>). The Arabian Sea in particular has been subjected to intensive studies under a number of international programmes such as the Joint Global Ocean Flux Study (<http://www1.whoi.edu/research/arabian.html>). Much of the research under such programmes was carried out by scientists from developed countries and hundreds of articles have been published in scientific journals, providing an excellent understanding of the biogeochemical and ecological processes in the open sea (Naqvi and others 2003). However, the processes operating over continental shelves and in coastal waters, including estuaries, are not so well known. This is largely because access to these waters is restricted and some countries in the region do not have the infrastructure and resources to undertake their own quality research. Even in cases where such capability exists, there are restrictions on the exchange of data obtained from territorial waters. Organized and sustained observations in the coastal ocean are quite limited at present in the South Asian Seas region. However, India does have a long-term monitoring programme, the Coastal Ocean Monitoring and Prediction System (COMAPS) which is coordinated and funded by the Indian Ministry of Earth Sciences (MoES) (<http://www.icmam.gov.in/comaps/index.html>) and covers almost the entire coastline. The MoES is in the process of developing a Geographical Information System (GIS) package for the data on the health of the Indian coastal region collected since 1991 under COMAPS.

Assessment of the water quality has led to the identification of 13 hot spots for year-round monitoring of the health of the seas, which helps the Central and State Pollution Control Boards to take steps to reduce the adverse impacts of pollutants on the coastal and marine ecosystem of the Bay of Bengal and the Arabian Sea.

South East Pacific

The strength of the South East Pacific Ocean's ecosystem data is associated mainly with fisheries research and climate-ocean monitoring. The fisheries ecosystem data coverage is extensive, well-reported and well-kept, with substantial time-series residing largely in each country and in the FAO Fisheries Global Information System (FIGIS) as well as in the Inter-American Tropical Tuna Commission (IATTC) and the Latin American Fisheries Development Organization (OLDEPESCA) databases. In addition to the national fisheries databases, the IATTC databases in particular are increasing their coverage on non-target species such as seabirds, turtles and cetaceans, and other ecosystem components including food web and stable isotopes, as well as the life history of a range of biota (IATTC 2006, 2007). Ecological data on benthic ecosystems do not exist at the regional level, but countries

are stepping up their benthic surveys and coverage. No regional benthic or coastal assessments currently exist. There is, however, some country-specific assessment of coastal habitats, in particular for mangrove ecosystems, but the data are not publicly available. Since 1998, biophysical climate-ocean characterization has been increasing. The best environmental data are associated with El Niño and La Niña oscillation monitoring. Periodic climate-ocean alerts are found in the bulletins of the El Niño Phenomenon Regional Study, or Estudio Regional del Fenómeno El Niño (ERFEN) which is an IOC/WMO/CPPS programme and in the regional Global Ocean Observing System (GOOS), which concentrates the regional information on the South East Pacific Ocean and provides summaries and secondary climate-ocean data (CPPS 2008). The CPPS does not have public access to the oceanographic primary data. Additional ecosystem monitoring data are being compiled by a Chile-Peru Humboldt Current Ecosystem Integrated Management Programme, which is a GEF/UNIDO programme. To date, however, no reports or data are available. Each country of the South East Pacific Ocean region, as signatories of the Convention on Biological Diversity, has various national instruments for the protection of endangered and threatened species. With the exception of Colombia, all South East Pacific Ocean countries are Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS), which embraces species such as albatrosses and petrels. There are several regional governance instruments also for the protected species of the South East Pacific Ocean, in particular for sea turtles through a regional conservation programme approved in 2007 and for marine mammals with an Action Plan introduced in 2004.

Southern Pacific

In most of the Southern Pacific Ocean (SPO) region, reasonably reliable time-series data are available for only a few high-level indicators, including some oceanographic parameters, industrial-scale fisheries (primarily tuna), population and demographics, gross economic indicators (e.g. GDP, imports/exports and overseas development assistance) and some indicators of human and economic development. Most assessments of environmental status and trends rely heavily on expert opinion, case studies, grey literature and snapshot studies. Reasons for the lack of quantitative time series include a lack of human, technical, institutional and financial capacity in the Pacific Island countries and territories (PICTs) as well as the geographic distribution of PICTs over a vast, remote and generally rural area. Integrated marine environmental assessments of the SPO region will be based primarily on expert opinion, based in turn on a mosaic of available data and information, for the foreseeable future.

Much of the time-series data that do exist is collected and held within the Southern Pacific Ocean region. The Secretariat of the Pacific Community (SPC) maintains a database for commercial tuna and billfishes. The Western and Central Pacific Fisheries Commission (WCPFC) also holds tuna fisheries data provided by the SPC and member governments. The SPC maintains an online digital library for its coastal and oceanic fisheries programmes.

The Pacific Islands Marine Resource Information System (PIMRIS), maintained by the University of the South Pacific in Fiji, provides an online database of publications and information, mostly relevant to fisheries and marine resources.

The Secretariat of the Pacific Regional Environment Programme (SPREP) maintains an online list of SPREP publications, some of which are available for download. SPREP also hosts the Pacific Environment Information Network, which maintains links to a wide range of

country profiles held in other databases as well as a directory of regional frameworks and action plans.

The Pacific Islands Applied Geoscience Commission (SOPAC) maintains data relating to the geology of the Pacific as a set of MapInfo data layers. It also hosts a database of indicators (<http://www.vulnerabilityindex.net>) of environmental vulnerability. Data from the South Pacific sea level and climate monitoring project is held by the Australian National Tidal Facility. The New Zealand National Institute of Water and Atmospheric Research (NIWA) has compiled extensive data on climate in the region.

The Pacific Island Roundtable maintains an inventory of conservation activities conducted by Roundtable members and an online database of protected areas including marine protected areas, hosted by the Pacific Biodiversity Information Forum (<http://www.pbif.org>).

The Seagrass Watch monitoring programme (<http://www.seagrasswatch.org>), which is jointly supported by several Australian government agencies, maintains a database of results from community-based monitoring of intertidal seagrass beds at sites in a number of countries in the region. The database is hosted by the Queensland Department of Primary Industries and Fisheries. Summary reports by monitoring site are available online, but raw data and metadata, including quality control information and data analysis methodology, are not publically available.

Time-series of satellite data on sea surface temperature and chlorophyll are available for the entire Southern Pacific Ocean region. Time-series data for other water quality parameters are available for many coastal areas in Australia and New Zealand but do not exist in most of the Pacific Islands region.

West Africa

A substantial amount of data has been collected from studies, surveys and assessments conducted in the region by the organizations mentioned above. There are a few reliable databases existing in the region such as:

- a. Fish stock assessment and oceanographic survey data held by the research institutes listed above;
- b. Data collected through international surveys of fisheries and oceanography such as surveys by the Norwegian research vessel Dr Fridtjof Nansen and assessments such as the Global International Waters Assessment (GIWA) and the African Process. The Institute of Marine Research (IMR) in Bergen (Norway) holds several years of fisheries survey and oceanographic data for the Western African Seas region. These data may be the only consistent regional datasets which could be considered as held in a central data repository. It is expected that the Fisheries Information and Analysis System (FIAS) datasets may also be accessible from the Sub-Regional Fisheries Commission in Dakar, Senegal;
- c. Data collected through the preparation of TDAs for the three Western African Seas region's LMEs. The TDAs provide syntheses and assessment of information on various themes. In the case of the GCLME for example, the syntheses are compiled into a suite of six comprehensive reports on Fisheries, Oceanography and Environmental variability, Diamond mining, Coastal environments, Offshore oil and gas exploration/ production and Socio-economics of some key maritime industries;

- d. The Africa Marine Atlas (geospatial datasets) is an atlas of environmental themes for Africa, under the sponsorship of the IOC-UNESCO ODINAFRICA project and the International Oceanographic Data and Information Exchange (IODE) Programme. The African Marine Atlas includes a number of other geo-spatial data projects on and around the African continent (<http://iodeweb2.vliz.be/omap/OMAP/index.htm>). National Oceanographic Data Centres (NODCs) established under the auspices of the IOC-UNESCO have some very useful coastal/marine environment/oceanographic data which can be used to prepare assessments. Over the years, IOC-UNESCO has also supported monitoring of sea level variations in a number of locations in the Western African Seas region. The resulting data is held not only by NODCs, but also by the University of Hawaii;
- e. Also available, but not readily, are data and information compiled through the FAO working groups on statistics and resource evaluation and the West and Central Africa Programme (coastal zone management).

All data held by the various institutions may be obtained directly from them, except the FAO/Nansen cruise data, which may be acquired from the countries in whose waters the surveys were conducted. The FAO/Nansen Programme and/or the IMR are not allowed to release survey data to a third party under the conditions of the surveys. Data from regional and subregional assessments such as the GIWA and the Africa Environment Outlook are held by, and may be obtained from, the University of Kalmar in Sweden and UNEP Division of Early Warning and Assessment, respectively.

According to the International Union for Conservation of Nature (IUCN), five endangered marine turtle species have been identified in the Western African Seas region. These are the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*), the loggerhead turtle (*Caretta caretta*), the leatherback turtle (*Dermochelys coriacea*) and the olive ridley turtle (*Lepidochelys olivacea*). These species are widely distributed in tropical and subtropical waters and are under threat everywhere due to over-harvesting of both eggs and adults and from accidental mortality in fishing nets and longlines. Major threats to marine turtles in the Western African Seas region are harvesting and over-exploitation of eggs, meat and other products, incidental capture by gillnets, trawlers and other fishing gear and loss and degradation of habitats. In most of the countries in this region, information concerning turtle habitats and population dynamics is incomplete. Regional collaboration in the collection and sharing of research data is needed to guide management actions and determine management priorities.

Wider Caribbean

A significant amount of marine data is collected within the Wider Caribbean Region. Each year, numerous assessments are carried out at the national, subregional, regional and international levels and it would take a considerable amount of effort to assess all of what has been done in the Wider Caribbean Region to date. However, there is a large pool of information at the regional and sub-regional levels. At present, data are available in the following areas in varying levels of detail and on varying geographic scales:

- a. Offshore pelagic and near-shore fisheries;
- b. Coastal habitats, with an emphasis on coral reefs;
- c. Watersheds/hydrology;
- d. Pollution, particularly land-based sources;
- e. Endangered species such as sea turtles and manatees;

- f. Oil and gas deposits;
- g. Climate;
- h. Physical oceanography through field and remote sensing data on atmospheric processes, bathymetry and currents; and
- i. Litter.

A substantial amount of data is available in global databases such as the FAO Fishstat, the World Resources Institute (WRI) Earthtrends, the UNEP World Conservation Monitoring Centre, the Global Environment Outlook (GEO) data portal and ICCAT. Data are collected also during oceanographic and fisheries surveys such as the Fridtjof Nansen surveys on the northeastern South American continental shelf and in global observing programmes such as the Global Ocean Observing System (GOOS).

Many countries in the Wider Caribbean Region are engaged in developing environmental indicators and related databases, including those for the marine environment. For instance, under the GEF-supported Integrated Watershed and Coastal Areas Management Project in Caribbean SIDS, a template of the environmental state (including that for marine and coastal areas), stress reduction and process indicators, has been developed for use by Wider Caribbean Region countries. Environmental indicators are also being developed or have been proposed by the Organisation of Eastern Caribbean States (OECS) under the St. George's Declaration as well as by CARICOM. In addition, countries are developing or using indicators for state of the environment assessment and reporting and for reporting to environmental conventions and international donors. Some of the countries have produced national compendia of environmental indicators and statistics. Among the indicators are those related to fisheries (e.g., annual catch levels), marine biodiversity and water quality although the availability and use of indicators varies among countries. There is a need to develop a standard suite of robust indicators which can be applied at national/regional levels for the assessment of the state of the marine environment as well as human and natural driving forces.

Various regional organizations, such as CARICOM, OECS, UNECLAC and the Secretaries-General of the Central American Integration System (SICA) collect socio-economic and environmental statistics from their member countries. A Caribbean marine atlas is under development by IOC237 International Oceanographic Data and Information Exchange (IODE) and will include geo-spatial data and environmental indicators.

APPENDIX 5

Oceans and Climate activities by Institution (not to be considered exhaustive, based on the information available to the meeting participants)

Organization	Marine CC-related priorities	Ongoing marine CC-related programmes/projects ⁱ	Marine CC-related Partnerships
BCC	<ul style="list-style-type: none"> • Not specifically but the multi sectoral nature of the Commission declares it open for CC work from a cross country point of view • Each of the participating states is deeply involved in CC work • Commitments of the ratification of the BCC Convention with regard to Parties is promising in CC work • Shared resources data and environmental parameters data collected could be used for CC work with some adjustment • Workshop on formulation of proposal to GEF on funding of CC work on fisheries (FAO Namibia) • Adaptability of work program possible, MTR has discussed this issue at length and adjustment is warranted, it will include CC work through new TDA and SAP and Science Plan 	May be the data collection by Dr Fridtjof Nansen RV, which has been demonstrated by the NANSCLIM work on CC work	FAO, NANSCLIM
FAO	<ul style="list-style-type: none"> • CC partnerships to support cooperation and develop policy and management initiatives (e.g. PaCFA) • Knowledge base for policy development and to raise awareness of the importance of the sector, CC implications and vulnerabilities, including 	<ul style="list-style-type: none"> ○ Building adaption in Fisheries and Aquaculture ○ PIF development for GEF funding (Benguela Current and Chile) ○ Disaster Risk Management and CC (Africa) 	PaCFA is a UN-Oceans task force coordinated by FAO with participation from UNEP, IOC, UNDP, CBD and the World Bank. It includes

	<p>building bridges between science and policy</p> <ul style="list-style-type: none"> • Mitigation actions for sector at the global, regional and national levels; GHG emissions and mitigation potentials • CC adaptation strategies within sector development frameworks at the global, regional and national levels (e.g. NAPA) • Lesson-learning and capacity-building processes with partners through specific tools, such as strategies and best practices • Communication strategy for a range of audiences and develop a coordinated approach to global planning and feedback • Resource mobilization to support prioritized actions 	<ul style="list-style-type: none"> ○ EAF Nansen (including a possible new phase) 	<p>international and regional organizations such as:</p> <ul style="list-style-type: none"> ○ CBD ○ IFAD ○ OECD ○ UNDP ○ UNEP ○ IOC/UNESCO ○ IAEA ○ World Fish Centre ○ ICAFIS ○ ISDR ○ NACA ○ European Bureau for Conservation and Development (EBCD) ○ BCC ○ NEPAD ○ OSPESCA ○ ICES ○ PICES ○ SPC ○ SEAFDEC
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GESAMP	<p>GESAMP is an inter-agency body providing independent scientific advice to its sponsoring Agencies (IMO, UNESCO-IOC, WMO, UN-DOALOS, UNIDO, UNEP, IAEA, UNDP, FAO). Its main activities consist of providing authoritative reviews and assessments on many aspects of the status of marine ecosystems and the impact of human activities in the marine environment. It does this by inviting acknowledged experts together on particular topics to form a task team, working group or ad-hoc group, making sure that there is adequate regional coverage. The majority of work is carried out on a <i>pro-bono</i> basis. Current and recent issues have included fisheries & aquaculture; chemical hazards; ballast water treatment systems; sources, fate & effects of metals (especially mercury); atmospheric input of chemicals; biomagnification of contaminants; potential effects of hypoxia on fish health; sources, fate & effects of plastics & micro-plastics, including their contaminant burden. None of these topics has been specifically set-up to investigate climate effects, but several of them have clear climate-related components. In future, GESAMP will be in a position to provide independent scientific advice on climate- or multiple-stressor-related issues, with the agreement of the GESAMP Executive Committee. Any work GESAMP undertakes is dependent on securing a funding stream to cover the cost of essential elements, such as travel to workshops and potentially to cover limited consultancy payments</p>	<p>WG37: Metals [<i>mercury</i>] in the marine environment working group (UNEP, SIDA)</p>	<p>UNEP (Chemicals)</p>
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		WG38: Atmospheric input of chemicals to the ocean (WMO, UNIDO, IMO, SCOR)	WMO, UNIDO, IMO, SCOR
		WG39: Establishment of trends in global pollution in coastal environments (IAEA, UNIDO)	IAEA, UNIDO
		WG40: Sources, fate & effects of microplastics in the marine environment – a global assessment (IOC, IMO, UNEP, UNIDO, NOAA, PE, ACC)	UNESCO-IOC, IMO, UNEP, UNIDO, Plastics Europe, American Chemistry Council, PICES, ICES
		GESAMP Correspondence Group – potential impacts of hypoxia on fish reproduction	UNDP
		GESAMP Correspondence Group on biomagnification	CIESM
IAEA	<p>Nuclear Techniques to understand climate and environmental change.</p> <p>Nuclear techniques and isotopes for understanding ocean acidification and related socio-economic impact</p>	<ul style="list-style-type: none"> • Intern programme • Technical Cooperation Projects • OA-International Coordination Center 	<p>MoU signed with IOC-UNESCO and UNCEP.</p> <p>IOC-UNESCO, NOAA, FAO, Prince Albert II of Monaco Foundation, CIESM, CSM, LOV-CNRS, PML.</p> <p>Group SOLAS-IMBER</p>
IOC	<p>Observations</p> <p>Projections</p>	<p>GOOS, IOCCP, WCRP</p> <p>WCRP (CLIVAR/CLIMAR), IndiSeas</p>	<p>IOC addresses CC programmes and activities through a</p>

	<p>Mitigation/adaptation/capacity development</p> <p>UN Reporting processes/assessments</p> <p>Scientific knowledge (Symposia/Publications)</p> <p>Public Awareness</p>	<p>Blue carbon/blue forest Coastal Zone Adaptation in Africa and Latin America Access to Adaptation Fund interventions ICAM/MSP</p> <p>IPCC, WOA, IPBES</p> <p>(i) Effects of Climate change on the World's oceans (ii) Oceans in a high CO2 World Expert group Workshops</p>	<p>multi-scale and participatory approach e.g.:</p> <p>UNESCO: Intersectoral Platform on Climate Change</p> <p>UN organizations: FAO, WMO, UNEP, UNDP, IAEA, UN-Oceans</p> <p>UN conventions: UNFCCC, CBD</p> <p>ICSU: WCRP, GOOS...</p> <p>Regional Intergovernmental Organizations: PICES, ICES, CPPS, MAP</p> <p>NGOs: IUCN, CI...</p> <p>IOC environmental programmes and activities are implemented through existing international platforms such as: LME Regional Seas GESAMP Regional fisheries organizations</p>
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<p>GOOS-AFRICA (IOC/UNESCO)</p> <p>Applications of Satellite Remote Sensing for Integrated Management of Coastal and Marine Ecosystems in Africa</p>	<ul style="list-style-type: none"> • In situ ocean observations for marine ecosystems management • Coastal Sentinel Stations along African coasts • Impacts of climate changes on marine ecosystems • Marine Meteorological data • Access to Dr F. Nansen RV historical data records in African waters • Onboard training for technicians, students and mid-career professionals in fisheries and oceanography • Combined in situ and satellite data for modeling towards ecosystems hindcasts, nowcasts and forecasts • Workshops on data collection, processing, analysis, interpretation, modeling and simulation. • Twinning between Norwegian and African marine related institutions and universities <p>Climate Change Adaptation strategies for coastal communities in Africa</p>	<ul style="list-style-type: none"> • National programmes in Africa • Joint programmes in the context of the European Commission Framework Programme such as European African Marine Network (EAMNET) • Regional networking in marine sciences, oceanography and fisheries • South/south Cooperation between Africa and Korea in ocean sciences, technology & innovations • Promotion of UNESCO Chairs in oceanography, marine sciences and fisheries in Africa <p>Concept of floating University</p>	<p>Pan-African programme involving all African coastal countries with their national academic, research institutes/ universities, African Union Commission, African Regional Economic Commissions, African Development Bank, NEPAD. UNESCO Chairs in marine sciences and Oceanography in Benin, Senegal, Mozambique, Tanzania</p> <p>UN Agencies: FAO, UNIDO, UNDP, UNEP & African Regional Seas Conventions (Abidjan and Nairobi Conventions), African LMEs (CCLME, BCC, GCLME, ASLME) Global LME Consultative Expert Group, Space</p>
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			<p>agencies: ESA, EUMETSAT. Nansen Tutu Center in South Africa, Nansen Environmental Remote Sensing Center & Meteorologisk Institute in Bergen, Norway, NOAA, French IRD. PML, National Oceanography Center of UK</p>
UNESCO/IOC-Africa	<p>Improving the application of climate science knowledge Improving climate change response and adaptation Ocean Climate interaction (climate variability and climate change) Climate change impact in the coastal zones and ocean ecosystems</p>	<ul style="list-style-type: none"> - ODINAFRICA (Installation of Coastal observation stations for long time series measurements, including sea level; Coastal and Marine Atlases; development of databases for a wide range of parameters); - Early warning and Mitigation systems for marine and coastal hazards - Development and use of decision support tools such as models, - Comprehensive assessment of capacities available for ocean sciences - Ocean forecasts and modelling, application of remote sensing to climate studies and adaptation, establishment of coastal observing stations 	<p>UNEP Regional Seas (Abidjan and Nairobi conventions), African LMEs (ASCLME, BCC/BCLME, IGCC/GCLME, CCLME) WIOMSA, African Union Commission, Regional Economic Communities. WMO and its regional programmes (e.g. ICPAC, ACMAD) FAO</p>

<p>Nansen Environmental and Remote Sensing Center and the Nansen group</p>	<p>Numerical ocean modelling and forecasting, integration of data streams through data assimilation, satellite remote sensing, student exchange</p>	<p>EU funded projects including GreenSeas (response of planktonic marine ecosystems to climate change) and SOCCLI (Southern Ocean and carbon) both with Africa collaboration, OC-CCI (ESA Ocean Colour Climate Change)</p>	<p>University of Bergen including in particular its Geophysical Institute, Centre for Climate Dynamics and Department of Biology, Nansen-Tutu Center in Cape Town and other Nansen-related centres including the Bjerknes Centre, India</p>
<p>UNDP</p>	<p>The goal of the UNDP-GEF Water and Oceans programme is to promote integrated, ecosystem-based, climate resilient management of the world's major freshwater and marine transboundary waters systems through improved water and ocean governance.</p> <p>UNDP is working in cooperation with many other UN agencies, GEF, international financial institutions, regional fisheries organizations and others to improve oceans management and sustain livelihoods at the local, national, regional and global scales through effective oceans governance.</p>	<p>Africa</p> <ul style="list-style-type: none"> • Agulhas and Somali Current Large Marine Ecosystems (ASCLME) • Applying an ecosystem approach to fisheries management in the high seas • Benguela Current Large Marine Ecosystem Program • DLIST - Benguela • Guinea Current Large Marine Ecosystem <p>Asia & the Pacific</p> <ul style="list-style-type: none"> • Arafura and Timor Seas • Partnerships in Environmental Management for the Seas of East Asia • Pacific Islands Oceanic Fisheries Management Project (OFM Project) 	<p>Forum Fisheries Agency/Secretariat of the Pacific Community FAO, UNEP, CAR RCU (Carib Sea LME) PEMSEA Benguela Current Commission Interim Guinea Current Commission, UNEP, UNIDO NOAA IUCN Conservation</p>

		<ul style="list-style-type: none"> • Strategic Action Programme for the South Pacific Small Island Developing States (completed) • Sulu-Sulawesi Large Marine Ecosystem • Yellow Sea Large Marine Ecosystem • West Pacific – East Asia Oceanic Fisheries Management Project <p><u>Under development:</u></p> <ul style="list-style-type: none"> • Pacific C. America LME TDA/SAP • Black Sea LME Ecosystem Management • Antarctic Sea LME TDA/SAP • Global Seabirds project • Bering Sea LME • Implementation of Global and Regional Oceanic Fisheries Conventions and Related Instruments in the Pacific Small Island Developing States (SIDS) - jointly with FAO • Reducing pollution and rebuilding degraded marine resources in the East Asian Seas through implementation of intergovernmental agreements and catalysed investments 	<p>International (Sulu-Celebes Sea LME, LME-COP Global Ocean Forum World Ocean Council</p>
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ⁱ Possibility to include other marine ecosystem related initiatives