

**Intergovernmental Oceanographic Commission**  
*Reports of Meetings of Experts and Equivalent Bodies*



**IOC-IUCN-NOAA  
Consultative Committee Meeting  
on Large Marine Ecosystems  
(LMEs)**

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# TABLE OF CONTENTS

<b>1.0 INTRODUCTION AND IOC WELCOME</b>	<b>4</b>
<i>Wendy Watson-Wright</i> <i>Luis Valdes</i>	
<b>2.0 GEF SUPPORT FOR THE LME COMMUNITY OF PRACTICE PROJECT</b>	<b>4</b>
<b>2.1 Integrating GEF-ICM projects into the LME Projects</b>	<b>4</b>
<i>Alfred M. Duda</i>	
<b>2.2 Introduction of Draft CoP Proposal and Feedback from LME Representatives</b>	<b>4</b>
<i>Vladimir Mamaev</i>	
<b>2.3 Sustainable Development of LMEs</b>	<b>6</b>
<i>Kenneth Sherman</i>	
<b>2.4 Best Practice GEF Integrated Coastal Management (ICM) Projects – PEMSEA</b>	<b>6</b>
<i>Raphael Lotilla</i>	
<b>2.5 Report on the Meeting of the ICES Working Group on LME Community of Practice</b>	<b>7</b>
<i>Michael O’Toole</i> <i>Jan Thulin</i>	
<b>3.0 AGENCY OVERVIEW OF LME AND LME - RELATED PROJECTS</b>	<b>8</b>
<b>3.1 Coastal and Marine Spatial Planning</b>	<b>8</b>
<i>Bud Ehler</i>	
<b>3.2 IOC Regional and ICM-Related Programs</b>	<b>9</b>
<i>Julian Barbieri</i>	
<b>3.3 UNDP Overview of GEF LME Projects</b>	<b>10</b>
<i>Andrew Hudson</i>	
<b>3.4 GCLME, SAP Process and the Guinea Current Commission</b>	<b>10</b>
<i>Christian Susan and Max Donkor</i>	

<b>3.5 IUCN Fisheries and the Ecosystem Approach to Seamounts In the Southern Indian Ocean</b>	<b>11</b>
<i>Patricio Bernal and Sarah Gotheil</i>	
<b>3.6 U.S., Mexico, and UNIDO Perspectives on the Gulf of Mexico LME Project</b>	<b>11</b>
<i>Antonio Diaz de Leon and Porfirio Alvarez Torres</i>	
<b>3.7 FAO and GEF LME Projects</b>	<b>12</b>
<b>3.7.1 Canary Current LME Project (CCLME)</b>	<b>12</b>
<i>Merete Tandstad</i>	
<b>3.7.2 Bay of Bengal LME Project (BoBLME)</b>	<b>12</b>
<i>Chris O'Brien</i>	
<b>3.8 UNEP GEF Mediterranean LME Projects</b>	<b>12</b>
<i>Virginie Hart and Christian Susan</i>	
<b>3.9 UNEP Overview of GEF LME Projects</b>	<b>13</b>
<i>Jacqueline Alder</i>	
<b>4.0 FIVE MODULE METHODOLOGY</b>	<b>14</b>
<b>4.1 The TDA and SAP Process and LME Community-Based Fisheries in the Agulhas and Somali Currents LME</b>	<b>14</b>
<i>David Vousden</i>	
<b>4.2. The Benguela Current LME Project</b>	<b>14</b>
<i>Hashali Hamukuaya and Michael O'Toole</i>	
<b>4.3. The Baltic Sea LME Project</b>	<b>15</b>
<i>Jan Thulin</i>	
<b>5.0 INTEGRATED LME ASSESSMENTS AND BEST PRACTICES</b>	<b>16</b>
<b>5.1 TWAP projects</b>	<b>16</b>
<i>Sherry Heileman and Julian Barbieri</i>	
<b>5.2 Norwegian Approach to the Assessment and Management of the Barents Sea and Norwegian Sea LMEs</b>	<b>17</b>
<i>Hein Rune Skjoldal</i>	

<b>5.3 The Yellow Sea LME (YSLME) Project</b>	<b>17</b>
<b>5.3.1 LME - based Sustainable Development and Management Practices in the Yellow Sea LME</b> <i>Yihang Jiang</i>	<b>17</b>
<b>5.3.2 Changing States of the YSLME, Carbon Sequestration and the New Mariculture Model</b> <i>Qisheng Tang</i>	<b>18</b>
<b>5.4 Climate Change and Ecological Conditions in the Russian Arctic LMEs</b> <i>Gennady Matishov</i>	<b>19</b>
<b>5.5 The GOOS-Africa LME Connection</b> <i>Justin Ahanhanzo</i>	<b>19</b>
<b>6.0 CONCLUDING DISCUSSIONS</b>	<b>20</b>
<b>ANNEXES</b>	<b>21</b>
<b>ANNEX 1: Agenda</b>	<b>21</b>
<b>ANNEX 2: Participants List</b>	<b>24</b>

## 1.0 INTRODUCTION AND IOC WELCOME

The Twelfth Consultative Committee Meeting on Large Marine Ecosystems (LMEs), convened by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), and the World Conservation Union (IUCN), was held in Paris on 8-9 July 2010. The meeting was hosted by IOC at UNESCO headquarters, and chaired by IOC Executive Secretary Dr. Wendy Watson-Wright, Dr. Luis Valdes, Head Ocean Science Section, IOC-UNESCO, and Dr. Kenneth Sherman of NOAA. The meeting agenda is given in ANNEX I and a list of attendees is provided in ANNEX II. The powerpoint presentations of the meeting are available on the LME website at: [www.lme.noaa.gov/](http://www.lme.noaa.gov/). The meeting was well attended, with 33 marine experts participating. Welcoming the group to the meeting were **Wendy Watson-Wright**, the new IOC-UNESCO General Secretary, and **Luis Valdes**, IOC Chief of the Section for Ocean Science.

## 2.0 GEF SUPPORT FOR THE LME COMMUNITY OF PRACTICE PROJECT

### 2.1 Integrating GEF-ICM projects into the LME projects

**Alfred M. Duda**, GEF Senior Advisor, emphasized the GEF commitment to support training and capacity building through the 5<sup>th</sup> replenishment cycle, especially in the International Waters focal area over the next 4 years. Funding for International Waters will be at a level of \$400 million, increasing by 1/3 since the previous replenishment cycle. He encouraged countries participating in LME projects to put forward their needs in terms of training for sustainable development and capacity building. Dr. Duda indicated that the GEF supports the inclusion of integrated coastal zone management (ICM) projects into the LME 5 module framework for ecosystem based assessment and management of coastal and marine goods and services. Dr. Duda also underscored the need to include assessments on the effects of climate change within the SAPs of GEF supported LME projects, consistent with GEF guidance for 2010-2011. The new GEF Community of Practice (CoP) project proposal for learning and experience sharing among GEF-funded LME projects is supported by UNDP and by PEMSEA. The new Transboundary International Waters Assessment Program (TWAP) project will link LMEs with groundwater and freshwater basins and selected open ocean areas.

### 2.2 Introduction of Draft CoP Proposal and Feedback from LME Representatives

**Vladimir Mamaev**, GEF Regional Technical Advisor for UNDP-Europe and for the Commonwealth of Independent States (CIS), reviewed the Project information form

(PIF) for the Global Community of Practice (CoP), with its target of 10,000 practitioners by 2020. The Project aims to establish a global and regional network of partners, disseminate methodologies and tools that represent best practices, designate country representatives for training and capacity building activities, and negotiate legal agreements. The Project component establishing a global and regional network of partners will help connect across IW boundaries and coordinate with the IW:Learn III effort in science. A website will facilitate partnerships, capacity building and learning between LME project participants. The outreach effort will focus on lessons learned and achievements using portfolio visualization techniques. Timelines for PIF and GEF review will be finalized before the GEF Council meeting in November 2010 which will approve projects under review. It is hoped that the project will be initiated no later than early 2012. The project will need to sustain its activities beyond the cutoff date for GEF funding.

This presentation led to a discussion in which Alfred Duda underscored the importance of operationalizing the CoP project in time to contribute to the Rio+20 conference. Dr. Vousden, project manager for the Agulhas and Somali Currents LME, was concerned about the pressure on project managers to perform this task, and on the need to validate the selection of indicators prior to Rio+20. Yihang Jiang, project manager for the Yellow Sea LME, discussed the need to consider country requirements and not just partners, as agency requirements for technical training are not necessarily those of countries for capacity building. Jacqueline Alder, Head of the Regional Seas Program at UNEP, mentioned existing coastal management protocols and multi-lateral programs that would be helpful to get down to the country scale. A question from Virginie Hart of the Mediterranean Sea Program prompted a general observation about best practices and coordination between projects being useful for strategic thinking and choice of scale of coordination. Chris O'Brien of the Bay of Bengal LME Project said that LME projects underway are already developing methodologies and improving their tool boxes. The purpose of the CoP project would be to ensure that methodologies and best practices were disseminated.

Hashali Hamukuaya welcomed the CoP initiative for the Benguela Current LME project, which has a dedicated training officer and a work plan for the next 5 years. The training project is supported by Iceland and Norway. Christian Susan for the Guinea Current LME suggested a standardized definition of ecosystem based management and the establishment of an LME group that would specifically address training. Those trained initially would take the training back. This concept was of interest to the participants and Christian Susan agreed to write a short concept paper on this theme. In response to the comments, Vladimir Mamaev indicated that the project beneficiaries will be the countries themselves, as LME projects address country needs. Alfred Duda added that the CoP project will serve to initiate a process of best practices exchanges for LME projects. He stressed the role of GEF in encouraging countries to sign legal agreements and conventions for long term support of the projects. He recommended that all participants work with Vladimir Mamaev on the CoP PIF for their comments and additions in anticipation of the project preparation grant (PPG).

## 2.3 Sustainable Development of LMEs

**Kenneth Sherman** discussed the concept of sustainable development of LMEs, as first introduced by Gro Harlem Brundtland of Norway in 1987, resulting in Agenda 21 of the UNCED declarations, and beginning the movement towards an ecosystems approach in the oceans. This movement was continued in the 2002 World Summit for Sustainable Development (WSSD) in Johannesburg. The LME Program is still engaged in meeting the four marine-related targets set in Johannesburg, making progress in turning the corner on the decline of the oceans and initiating an upward spiral. Significant efforts underway to reduce overfishing and establish aquaculture in the Yellow Sea LME are prime examples of progress toward meeting the WSSD programs of implementation (POIs). Other LME projects making progress are the Benguela Current, Guinea Current, and Baltic Sea. GEF support to the 17 LME projects (including to the South West Pacific region) at a level of \$3.1 billion is turning the situation around. The LME upward spiral movement is supported globally with the assistance of 5 UN Agencies, 2 NGOs (IUCN, WWF), and two global financial institutions (GEF and World Bank), and 110 countries in Africa, Asia, South America, and eastern Europe. He described indicators of changing states of Large Marine Ecosystems during climate change that are used to support ecosystem based management. Key indicator categories are productivity ( $\text{gCm}^2\text{yr}^{-1}$ ), fish and fisheries, pollution and ecosystem health, socioeconomic conditions, and governance institutions. In GEF projects, local scale integrated coastal management (ICM) activities can be successfully merged into the transboundary and international scale LME activities. This can be accomplished in the TDA and SAP process.

The presentation was followed by a question regarding how the \$3.1 billion of funding was computed. Dr. Sherman indicated that the LME Program Office downloaded descriptions of each of the LME projects from GEF and World Bank websites. The information was quality controlled for accuracy, tabulated, synthesized, edited and produced in a report entitled "Scope and Objectives of GEF-supported LME Projects". The Report is available for downloading from NOAA's LME website. Dr. O'Toole said that the issue of climate change must be taken into account at all scales and integrated into the 5 modules. Christian Susan expressed concern that fishing vessels being taken out of circulation as part of a fishing effort reduction practice may be sold elsewhere to fish in other LMEs including in West Africa.

## 2.4 Best Practice GEF Integrated Coastal Management (ICM) Projects – PEMSEA

**Raphael Lotilla**, Executive Director of Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), described the results of 15 years of GEF–UNDP activity with PEMSEA in East Asia. He underscored the PEMSEA experience with ICM and the similarities between LME and ICM management practices in developing TDAs and SAPs. He indicated that PEMSEA offers a major opportunity for implementing ICM and spatial planning in LME projects. Scale issues can be addressed by a strong Commission, or other intergovernmental structure, empowered

through the TDA-SAP process to set targets beyond the ICM scale. PEMSEA has developed and used a 6 step development and implementation cycle, with supporting tools and methodologies for each of six steps. These are available on the PEMSEA website. He referred to a publication, the *State of the Coasts of Batangas Province*, developed to assess the progress and impacts of ICM implementation in the Batangas Province of the Philippines. The Province has shown significant progress in expanding its management strategies for sustainable development of coastal and marine areas over the past 14 years. The Batangas Bay Region Environmental Protection Council (BBREPC) serves as a forum in the Province to integrate overlapping responsibilities of provincial agencies and three levels of government. The presence of strong environmental partners (NGOs and civil society) is an advantage in achieving the overall goals of ICM. The Province has an impressive record in its efforts to increase preparedness for natural disasters, particularly earthquakes, volcanic eruptions and typhoons. Emerging issues related to climate change (e.g. sea level rise; flooding; storm surges; the increased frequency and intensity of storms) need to be further considered in disaster planning and preparedness strategies. Mangrove areas continue to decline with habitat conversion and land reclamation projects. Malnutrition rates in the Province are in decline since 1995. Opportunities for employment are increasing. While a considerable effort has been made to improve fisheries management, more stock assessment data is needed.

Alfred Duda commented that PEMSEA is a flagship program and that training and capacity building is a key part of the PEMSEA experience. In scaling up there are difficulties, especially dealing with reluctant local governments. ICM is a bottom up approach which, like the LME approach, addresses transboundary issues. Christian Susan mentioned a demonstration project in Cameroon that has national, regional, and local level cooperation. The PEMSEA representative encouraged project managers to invite chief executives to attend local level activities as they have credibility and more 'power' to convince people to participate. Alfred Duda indicated that it is GEF's job to encourage legal frameworks where there is a country commitment. Good models are the commissions established in the Guinea Current LME and the Benguela Current LME, and these intergovernmental structures need to be supported and sustained.

## **2.5 Report on the Meeting of the ICES Working Group on LME Community of Practice**

**Michael O'Toole**, Programme Manager of the Sea Change Management Unit, Marine Institute, Ireland, and **Jan Thulin**, Senior Advisor, ICES, co-chairs of the ICES Working Group (WG) on the LME Community of Practice (CoP) that met in Paris on July 6-7, 2010, reported on the meeting. They discussed the results of the WG meeting in relation to the ICES approved WG Terms of Reference: (i) To identify best practices in the selection of science-based indicators for adaptive ecosystem-based management in LMEs; (ii) To evaluate and compare among LMEs principal indicators used for resource recovery, climate change and sustaining socio-economic benefits; (iii) To report findings and methods of best practice in Community of Practice handbooks, publications and



reports to regional and global partners; (iv) To develop effective training modules consistent with best practices for ecosystem-based management in LMEs; and (v) To prepare “Terms of Reference” for a 3 year work plan that complements the ICES Science Plan.

Professor Gotthilf Hempel commented that ICES will gain from LME projects occurring in regions outside the usual ICES domain. Gerd Hubold, General Secretary of ICES, expressed an interest in an expansion of ICES to global initiatives, and in training people to train others in support of the LME approach and the challenges facing LMEs projects globally. The ICES training program could join forces with Vladimir Mamaev and UNDP’s work on the CoP proposal. Hein Rune Skjoldal welcomed the ICES initiative and encouraged LME practitioners to develop links to other fora where ecosystem-based approaches are discussed. He recommended for reading an ICES publication representing the ecosystem approach to fisheries management: “Science Dimensions of an Ecosystem Approach to Management of Biotic Ocean Resources” (SEAMBOR).<sup>1</sup> Alfred Duda mentioned that 20 member countries in ICES can contribute to the effort to train and build capacity. Bradford Brown recommended mainstreaming ICES activities into this effort through participation at the meeting of the ICES Science Committee (SCICOM). Gennady Matishov recommended including a member from the Russian Federation in the Working Group. Gerd Hubold mentioned that all WG nominations go through the national delegate of each country; delegates are encouraged to put forward the names of WG representatives, and WG chairs may also nominate WG members.

### **3.0 AGENCY OVERVIEW OF GEF LME PROJECTS**

#### **3.1 Coastal and Marine Spatial Planning**

**Charles ‘Bud’ Ehler**, President of Ocean Visions Consulting and Consultant to UNESCO and IOC, reported on the concept of coastal and marine spatial planning in the US and in other countries, and emphasized the need to uncover good practices at different scales. The US Ocean Policy Task Force defines coastal and marine spatial planning (MSP) as a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and the Great Lakes areas. MSP identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. At all the geographic scales within an LME, there is a need to learn from mutual experience regarding funding, ecosystem-based results, marine protected areas,

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<sup>1</sup> ICES. 2010. Science Dimensions of an Ecosystem Approach to Management of Biotic Ocean Resources. Marine Board Position Paper 14. SEAMBOR, April 2010. 92 pages.

adaptive management, planning and cooperative activities, and governance mechanisms. He presented a diagram showing the nesting of Marine Spatial plans within LMEs. IOC-UNESCO defines the purpose of marine spatial planning to be to help countries operationalize ecosystem-based management, sustain economic development, conserve biodiversity, analyze good practices, and develop capacity and training. The work is being made possible through grants from the Moore Foundation and Packard Foundation. Other contributors are WWF International and the Belgian government.

Good examples of MSP and lessons learned include the Massachusetts Ocean Management Plan; Territorial Sea Functional Zoning in China – the Chinese charge users for use of public space; Australia’s EEZ Marine Bioregional Plans, which are ecosystem-based; the Great Barrier Reef Marine Park representative areas program, which provides a good example of adaptive management in marine protected areas; and multi-scale planning in Coastal First Nations Marine Use Planning in British Columbia. Comments to this presentation included those of Yihang Jiang, who mentioned that the YSLME project pays close attention to MSP and uses its tools but believes MSP to be mostly horizontal. Bud Ehler responded that MSP actually provides a three dimensional environmental perspective. The difficulty lies in getting the various ministries to work together after having identified where the various responsibilities lie. Luis Valdes mentioned that Spain is about to publish its MSP plan.

### **3.2 IOC Regional and ICM-Related Programs**

**Julian Barbieri** reported on ICM activities in IOC, particularly capacity building and training priorities, handbooks, vulnerability maps, practitioner networks, and adaptation to climate change. Integrated coastal management (ICM) can be defined as a continuous and dynamic process by which decisions are made for sustainable use, development, and protection of coastal and marine areas and resources. Luis Valdes expressed the willingness of the IOC to collaborate with the LME CoP project. Adaptation to climate change in the coastal zone must take place at the national and the regional scales, and it is with the latter that IOC is chiefly involved. ICM is mostly focused on terrestrial areas and occasionally on watersheds. It is sub-national and national and integrates across sectors and jurisdictions. The IOC’s ICM Programme was established in 1997 with two main objectives: (i) to assist IOC Member States in their efforts to build marine scientific and technological capabilities in the field of ICM; and (ii) to ensure that scientific requirements are integrated into national and regional ICM programmes and plans. There are already existing guidelines and handbooks for building management and technical capabilities within the boundaries of LMEs, e.g. a pilot program in the coastal zone of the Canary Current LME in West Africa for adaptation to climate change. The TWAP project aims to provide marine and coastal assessment tools and apply indicators for EBM projects within LMEs. Capacity building is one of IOC’s main missions and doing ICM work is to build capacity and to provide training.

Antonio Diaz de Leon indicated that Mexican terminology in ICM is different as Mexican environmental law uses sea and land use planning. He added that Mexico would be happy to collaborate with the LME CoP project. Max Donkor asked for an elaboration on adaptation to climate change at different scales. The answer was that each country implements responses (e.g. protection of sand dunes, mangroves, drainage devices) on the national scale. There are also activities on a regional level: training, the mapping of vulnerability areas, practitioner networks, capacity building and sharing of experience between countries. Donkor said that many of these activities are and should be taking place at the LME scale.

### **3.3 UNDP Overview of GEF LME Projects**

**Andrew Hudson**, Principal Technical Advisor, International Waters for UNDP, spoke of UNDP's current involvement with GEF LME Projects and funding for those activities. UNDP LME projects include the Red Sea, Agulhas and Somali Currents, Yellow Sea, PEMSEA, Guinea Current, Black Sea, Humboldt Current, Benguela Current, Caribbean Sea, Sulu Celebes LMEs and the LME-related Pacific Warm Pool. Some have completed their Strategic Action Plans (SAPs).

### **3.4 GCLME, SAP Process and the Guinea Current Commission**

**Christian Susan**, of the Water Management Unit of UNIDO in Vienna, and **Stephen 'Max' Donkor**, Regional Coordinator & Executive Secretary of the Regional Coordinating Unit of the Interim Guinea Current Commission, GCLME Project, presented a short overview on the GCLME, The Strategic Action Programme (SAP) process, and the Guinea Current Commission. The GCLME is a class I highly productive ecosystem (> 300 gC/m-2y-1), with diverse coastal habitats, lagoons, bays, estuaries and mangrove swamps. While it is rich in living marine resources and other resources (oil, gas, timber, minerals), it is threatened by natural processes along with overfishing and other anthropogenic activities that have detrimental environmental impacts. Other issues are the uncertain status of the LME in a highly variable environment, the deterioration of water quality from land and sea based activities, eutrophication and harmful algal blooms, the destruction and alteration of habitats, and coastline erosion. Obstacles identified in the TDA were the fragmentation of data sets, which are not shared amongst the 16 countries, the inadequate regional institutional capacity and human resources, and ill defined property right regimes.

The ensuing discussion focused on ways to mobilize contributions from industry and on the mandates of the prototype Gulf of Guinea Commission tasked to work with the petroleum industry. Nigeria will be the first targeted country. Offshore petroleum production in Nigeria is a highly unregulated industry but the hope is that the Gulf of Mexico oil spill will serve as a wake-up call. The industry is already tapped for taxes so it is not certain that the stream of benefits would be made available to the GCLME. The Guinea Commission is already mandated to work with the oil industry, and the GCLME

ministers are ready to work with the industry. Max Donkor said there is an MOU with FAO already in place.

### **3.5 IUCN Fisheries and the Ecosystem Approach to Seamounts in the Southern Indian Ocean**

**Patricio Bernal**, IUCN Global Ocean Biodiversity Initiative (GOBI) Coordinator, and **Sarah Gotheil**, IUCN Program Officer discussed the first GEF-funded project addressing high seas governance and management. The project is funded under the GEF fourth replenishment and partners with the ASCLME project in data collection and analysis coming from the *Nansen* cruises. The objective of the Southern Indian Ocean high seas pilot project is an ecosystem-based approach to fisheries for the Indian Ocean's seamounts. The GOBI Initiative will eventually map areas in the Atlantic and Pacific open oceans of particular biological or ecological concern according to criteria now being developed. Links between this initiative and the assessment and management of open ocean gyres within the TWAP effort have yet to be explored. Dr. Bernal further discussed the Convention on Biological Diversity (CBD) and GOBI efforts to establish and support international scientific collaboration to assist States and relevant regional and global organisations to identify ecologically significant areas using the best available scientific data, tools, and methods, and assist in the development of regional analyses. Biological criteria are: uniqueness or rarity, the special importance for the life history of species, the importance for threatened, endangered or declining species and/or habitats, degree of vulnerability, fragility or sensitivity, the rate of recovery, the degree of biological productivity, biological diversity and naturalness. Some of the areas identified might potentially evolve into marine protected areas.

### **3.6 U.S., Mexico and UNIDO Perspectives on the Gulf of Mexico LME Project**

**Antonio Diaz de Leon**, Director General of Environmental Policy, and **Porfirio Alvarez Torres**, Director of Regional Integration at the Ministry of Environment and Natural Resources (SEMARNAT), presented a video on the status of the Gulf of Mexico LME project from the perspective of Mexico. The work plan is approved and the TDA should be completed by March of 2011. Survey cruises are now being planned for 3 Mexican vessels and 1 U.S. vessel. In answer to a question by Alfred Duda regarding the TDA and whether there exists a National Committee in the US and in Mexico, the response by Antonio Diaz de Leon was that a meeting in Miami approved the work plan. The Mexican side must gather all the necessary data from the field. An SAP has already been prepared that will need to be agreed upon by both countries. The challenge for organizing a high priority joint LME assessment cruise to provide data on the plankton, productivity, and early life stages of fishes in the Gulf of Mexico is to commit U.S. and Mexican vessels. Three Mexican vessels can be made available.

## **3.7 FAO and GEF LME Projects**

### **3.7.1 Canary Current LME Project (CCLME)**

**Merete Tandstad**, FAO Fisheries Resource Officer, briefed the group on the LME projects with which the FAO is engaged. FAO is the lead agency, and UNEP and FAO are implementing agencies, for the Canary Current LME project which has recently initiated a new website at [www.canarycurrent.org](http://www.canarycurrent.org). The EAF-Nansen Project is aimed at strengthening the knowledge base for, and implementing an ecosystem approach to marine fisheries in developing countries. The aim is to promote the sustainable use of marine living resources and improve marine environmental protection. The concept of EAF-Nansen was initiated in 2006 and was implemented in 2008 with a five-year time frame. The project is executed by FAO in close collaboration with the Institute of Marine Research (IMR) of Bergen, Norway, and is funded by the Norwegian Agency for Development Cooperation (NORAD). The EAF-Nansen Project aims to strengthen regional and country efforts to reduce poverty and create conditions to assist in the achievement of food security through the development of sustainable fisheries and the application of an ecosystem-based approach to fisheries in a number of developing countries. The initial focus of the project is on Sub-Saharan Africa. The EAF-Nansen project relates to several of the LME projects in Africa (e.g. 19 coastal African countries are participating in an EAF training course in Ghana). The FAO has several fisheries projects in Africa that relate to LMEs but need better integration, for instance the projects in the southern CECAF region involving Cameroon and Congo; and Benin, Togo, Ghana, and Cote d'Ivoire. FAO also has several fisheries projects in the Mediterranean LME and has ongoing climate change activities looking at adaptation and mitigation.

### **3.7.2 Bay of Bengal LME Project (BoBLME)**

**Chris O'Brien**, FAO Regional Coordinator for Asia and the Pacific and Program Coordinator for the Bay of Bengal (BoB) LME project, briefed the meeting on the BoB LME project, initiated in 2009. A work plan is in preparation, along with a list of activities. Partners are still needed for this project, along with funding and in-kind contributions.

## **3.8 UNEP GEF Mediterranean LME Projects**

**Virginie Hart** reported on the UNEP GEF Mediterranean LME Projects. Of the 22 countries involved, 12 are GEF eligible (MED Partnership 2009-2013). Over-development in the coastal zone has led to pollution, wastewater issues, serious fisheries depletion, and concerns over exacerbation by climate change. She cited the MED Partnership and the Barcelona Convention as highlighting the need for ICZM. She outlined the four pollution related components of the World Bank Investment Fund Regional Project for the Mediterranean Sea LME. Coordination among projects and

agencies operating within the region remains a goal. A work plan is in place, but ‘fatigue’ at the national level is reported to be a problem. Virginie noted that the 6<sup>th</sup> Biannual GEF IW meeting in the fall of 2011 will be hosted by the Mediterranean Sea LME project.

**Christian Susan**, of UNIDO’s Water Management Unit in Vienna, reported on a UNIDO test pilot approach to identify investments that have environmental outcomes while benefiting industry around the Mediterranean Sea LME, with incentives for companies to comply with environmental rules and regulations. Tunisia, Morocco and Egypt are participating in Med Test, a pilot project that addresses pollution from industrial land-based sources in the Mediterranean through an integrated approach. The overall objective is to build national capacity and conduct pilot projects within priority industrial areas affecting the Mediterranean basin to improve environmental and socioeconomic performance. Most of the world’s CO<sub>2</sub> emissions from fuel combustion in 2006 were due to electricity and heat (45.9%), transport (23%) and industry (19.6%). An example of energy efficiency in industry is provided by the Novo Nordisk climate strategy. The results of Med Test are expected in 2012.

The discussion focused on incentives around the issue of water quality. UNESCO’s International Hydrological group, a MED partner, is looking to determine the extent to which pollution enters the Mediterranean LME from freshwater and aquifers. It is proposing that 13 countries adjacent to the Mediterranean reduced stress on surface waters, apply best practices in aquifer management, and integrating results into ICM. It is hoped that a clear picture of aquifers and their role in the pollution and ecosystem health of the Mediterranean will emerge.

### **3.9 UNEP Overview of GEF LME Projects**

**Jacqueline Alder**, Head of the Marine & Coastal Ecosystem Branch, Division of Environmental Policy Implementation of the United Nations Environment Programme (UNEP), prepared with Isabelle van der Beck and Kelly West a briefing on current UNEP LME-related projects. The Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) for the West Indian Ocean (WIOLAB) were completed in June 2010. The SAP is now being implemented. The Project information form (PIF) for the Guinea Current SAP is being drafted. The Canary Current LME project is expected to begin in October 2010. The LME project in the Mediterranean Sea is a year into its SAP planning phase. The South China Sea LME project is also implementing a SAP. Fish refugia were created in the South China Sea and Gulf of Thailand Large Marine Ecosystems. The implementation of a SAP is underway in the Russian Arctic Region. The Transboundary Waters Assessment Program (TWAP) is linking the LME component to other water systems (groundwater, surface water, lakes and aquifers). The ‘Blue Forests’ and Med Climate Change initiatives involve research at the LME scale. Of future interest are the LME projects in the Pacific Ocean Region.

## 4.0 FIVE MODULE LME METHODOLOGY

### 4.1 The TDA and SAP Process and LME Community-Based Fisheries in the ASCLME

**David Vousden**, manager of the Agulhas and Somali Currents LME (ASCLME) project, presented the project background and provided updates on the Marine Ecosystem Diagnostic Analyses (MEDA), contributing to the TDA being prepared on the basis of the offshore monitoring underway in the West Indian Ocean. The goal of MEDA is to develop indicators for long-term ecosystem monitoring. The ASCLME includes the Comoro Islands, Kenya, Madagascar, Mauritius, Mozambique, the Seychelles, Somalia, South Africa, Tanzania and France and supports a coastal population of about 50 million people. The project is funded at a level of \$12.2 million. The South African vessel *The Algoa* will be used for continuing the ocean surveys. Maps representing areas where the current offshore monitoring is taking place were presented. A coastal livelihoods assessment will collect data on fisheries both inshore and offshore, tourism, mariculture, coastal transportation and oil and gas, helping to better understand the capacity and vulnerability of the coastal communities dependent on fishing. Marine-related economic activities to supplement incomes from inshore fishing are being investigated. A second activity, cost-benefit analyses, will drive the project SAP and help key institutions support the fishing industry beyond the life of the ASCLME Project and into the future. A third activity is habitat mapping with remote sensing. This will help identify areas of greater production, vulnerable areas and areas in need of conservation. A Distance Learning and Information Sharing Tool (DLIST) project will build training courses for communities in the LME region and support the MEDA-TDA development process.

In the ensuing discussion, there was concern regarding the priority given to oceanography. It was recognized as important to link ICZM and DLIST activities to the Nairobi Convention. While the value of the contribution made by the Norwegian research vessel *Dr. Fridtjof Nansen* was acknowledged, using the locally based *Algoa* costs less and will push the project toward greater sustainability. The GCLME representative asked for copies of ASCLME outreach materials and training manuals.

### 4.2 The Benguela Current LME Project

**Hashali Hamukuaya**, Chief Technical Advisor of the Benguela Current Commission (BBC), reported on Benguela Current LME assessment and monitoring in support of the BCC. Long-term zooplankton data is now available for the BCLME region. The Angola-Benguela front is shifting toward the south, an indication of warming. He reported increases in seal pup numbers after the declines in the 1990s, declines in the overall population of African penguins, and changes in pelagic landings, with a slight increase in the Southern Benguela and sharp declines in the Northern Benguela. In 2009, CPR and Angola-Namibia transboundary pelagic surveys were

carried out, including a hake survey completed from commercial vessels and the Norwegian research vessel *Dr. Fridtjof Nansen* along the South Africa and Namibia boundary. A change has been recorded of anchovy/sardines to goby/jellyfish dominance. A reduced population density of seabirds and diminished fishery catches have been observed in the northern Benguela. In the Southern Benguela, changes in the abundance and relative importance of small pelagics has been observed and documented. Both CPR and the Mariner Shuttle have been deployed in the region. The three participating countries (Angola, Namibia and South Africa) share a long time series of transboundary deep hake data, and transboundary top predator surveys that indicate changes in abundance of seals and seabirds. A map for the shared deep hake stocks has been prepared and is available.

**Michael O'Toole** and **Hashali Hamukuaya** presented the Benguela Current LME's ecosystem approach to ocean governance. The target date for the fully operational Benguela Commission is December 2012. A convention process and draft are currently being discussed. The Secretariat and other structures have been established, and there are 10 functioning working groups. A treaty is being developed and part of the work to follow will include lessons learned and best practices. The Benguela Current Commission is funded at a level of \$15 million for 2008-2011. The first meeting will take place in August 2010. Part of the work will include lessons learned and best practices at all levels. The key to the success of the Benguela Current LME project resides in a bottom-up approach that includes the consultation of stakeholders, the TDA and SAP processes, links with industry and NGOs, a training and capacity building plan, media and website outreach, and the completion of a valuation of BCLME goods and services.

### **4.3 The Baltic Sea LME Project**

**Jan Thulin** of ICES presented the goals of the Baltic Sea LME project, aimed at introducing and applying the LME concept to the Baltic Sea, implementing an ecosystem-based approach to the management of its resources, and improving its monitoring and assessment capacity. The Eastern Baltic States are building and improving their capacity. Participating countries are Denmark, Germany, Poland, Lithuania, Latvia, Estonia, Finland, Sweden, and Russia. The project began in 2003, when the Global Environment Facility provided \$5.4 million of the project's \$16 million budget. It ended in 2007, however many of its activities continue and are organized in 5 major categories: fisheries, ecosystem health, GIS data, productivity, and socioeconomics. Within these 5 groups there are various scientific laboratories that monitor specifics within the LME and conduct surveys and experiments. A major project outcome is the ongoing coordination and cooperation with the EU project BONUS+, a theme-driven project that began in 2007. BONUS+ links science and policy via 8 themes, and uses indicators similar to those noted in the LME modules. A joint comprehensive research program conducted by the Baltic Sea LME project and BONUS+ supports cooperative marine science. Sixteen of the joint program's projects have been recommended for funding. The Baltic Sea Science Plan and Implementation



Strategy, known as Bonus plan 169, began in 2009 with a budget of 23 million Euros. This project is expected to continue for the next 3 years. Although the Baltic Sea project has a well-established history, Dr. Thulin noted that a downside of the executing agencies is that they are politically and economically bound, and slow to act due to their bureaucratic nature. The Baltic Sea LME staff is employed at key institutes and is highly qualified and dedicated, with well-established networks. It is expected that the next phase of the BONUS program could reach funding levels by the EU approaching 100 million Euros, thereby providing a confirmation of the LME approach that brought ecosystem-based assessment and management practices to the Baltic Sea region.

## **5.0 INTEGRATED LME ASSESSMENTS AND BEST PRACTICES**

### **5.1 TWAP Project**

**Sherry Heileman**, Fisheries & Environment Consultant for IOC-UNESCO, and **Julian Barbieri**, Programme Specialist for Integrated Coastal Area Management and Regional Programmes at the IOC-UNESCO, reported on the progress of the Transboundary International Waters Assessment Project (TWAP), due to be developed into a full size project proposal later this year. TWAP methodologies provide linkages between water 'sectors', including open ocean areas, LMEs, groundwater, surface water and lakes. The project has a large number of partners and donor organizations. Former LME assessments and reports have provided an overarching conceptual framework based on the 5 LME modules and the TDA-SAP approach. Indicators are in place, but need further assessment. The proposed LME governance framework integrates different scales. Integrating indicators to provide comparability across LMEs and other water sectors is a challenging task. The Global NEWS model allows this integration for nutrient over-enrichment. The rivers group has adopted a scoring system which the LME group is considering. Mapping cumulative human impacts in marine ecosystems is difficult. The tool developed by Ben Halpern is being considered for adaptation to the LME and for open ocean assessments.

In the discussion, Hein Rune Skjoldal emphasized the scientific risk in downscaling indicators from global to regional levels. Luis Valdés spoke to the care given to ensure scientific credibility. Alfred Duda pointed to the two tiers of assessments in the TWAP process, and thought that the tiered methodologies would adequately address the question of the scaling of indicators. The two tiered system should help approach results-based management. Antonio Diaz de Leon stated the need for socioeconomic and governance indicators including employment, markets, tourism, and infrastructure. There was agreement on the use of the 5-module approach and of indicators. Michael O'Toole suggested that indicators are most easily comparable among similar LMEs, e.g. upwelling systems. Ibrahim Thiaw mentioned that UNEP was attempting to develop an IPCC-type program for biodiversity and ecosystem services, a program he felt would be useful to the LME community.

## **5.2 Norwegian Approach to the Assessment and Management of the Barents Sea and Norwegian Sea LMEs**

**Hein Rune Skjoldal**, of the Norwegian Institute of Marine Research in Bergen, presented 5 components, somewhat different from the 5 LME modules, currently in use by Norway in the management plans for the Barents Sea and Norwegian Sea LMEs and in the Norwegian framework for an ecosystems approach to ocean management. The management plan for the Barents Sea was adopted in 2006 and is about to be revised. A new plan is being developed for the Norwegian Sea LME. Maps of important fisheries areas, of petroleum licensing and drilling, and of closed areas are currently being used in the process. Other tools for sustainability are a biodiversity inventory, management plans, reference areas, a listing of target species (genetics and stock structure,) by-catch species, habitats and trophic interactions. Examples were provided from the *Joint Norwegian-Russian environmental status 2008 Report on the Barents Sea Ecosystem*, from illustrated maps of whale and seal populations, from maps detailing stakeholder participation, and maps showing species vulnerabilities in the Arctic Region. The presenter said that the ecosystem-based approach should begin at the scale of the individual countries before addressing the international scale, and that all should work together to achieve sustainability.

## **5.3 The Yellow Sea LME (YSLME) Project**

### **5.3.1 LME - based Sustainable Development and Management Practices in the Yellow Sea LME**

**Yihang Jiang**, Program Manager of the GEF-funded YSLME Project, outlined some of the stressors on the Yellow Sea ecosystem. Joint studies between Korea and China and the results of stock assessment cruises have revealed declines in economically important fisheries, changes in age composition of yellow croaker, increases in jellyfish across the entire ecosystem, nutrient over-enrichment, harmful algal blooms and hypoxic areas occurring in the Yellow Sea. These stressors are increased by human population growth, requiring more goods and services from the YSLME and especially seafood. In recognition of the excessive fishing mortality of the capture fisheries, China and Korea have agreed to reduce fishing effort by 30% by 2020. The expected annual loss in seafood catch from capture fisheries will be offset by the ramping up of molluscan mariculture using advanced, integrated, and multitrophic technology. Integrated multi-trophic mariculture (IMTA) will protect Yellow Sea fish stocks and water quality, as energy/organic matter transfers through the mariculture system. The Sungo Bay IMTA example is working, with a low impact on the environment, a reduction of nutrient discharges and a high return on molluscan fishery yields, as evidenced by the economic valuation study carried out. The project website is located at [www.yslme.org](http://www.yslme.org). In the ensuing discussion, participants representing the

ASCLME and GCLME projects found the ITMA results most relevant and Yihang Jiang was congratulated for the project's accomplishments.

### **5.3.2 Changing States of the YSLME, Carbon Sequestration and the New Mariculture Model**

**Qisheng Tang**, Director of the Yellow Sea Fisheries Research Institute in Qingdao, China discussed 50 years of changing states in the YSLME, the 4 major temperature regimes occurring since 1870, changes in species composition and trophic level for 3 species of fish, and the new mariculture and carbon sequestration model. He described the changes taking place over the past 50 years in species composition, with examples of Pacific herring, Spanish mackerel and small Yellow croaker. Most changes are attributed to excessive fishing mortality. However, even under intensive fishing pressure those stocks are currently fairly stable and have recovered in recent years. Unusual observations and events taking place in the Yellow Sea LME include the sighting of a sperm whale in the coastal waters of Sungo Bay off the Qingdao Peninsula. Professor Tang indicated that climate change has significant effects on fish recruitment, especially for pelagic species and shellfish. Based on SSTs recorded over the last 138 years, the Yellow Sea is observed to be in a warming trend (1997-2007). Pacific herring has recovered from the relatively low levels of 2005. Fluctuations in herring abundance follow SST regime shifts in the YSLME.

Professor Tang presented carrying capacity studies of filtration rates for shellfish, undertaken before Integrated multi trophic mariculture (IMTA) was formally instituted. Two new mariculture models are being applied in the Yellow Sea LME for suspended mariculture, for sea ranching and for ponds of various combinations of animals and seaweed. The carrying capacity and aquaculture (CCA) model focuses on scallops and mussels. For scallops, traditional aquaculture density in the Sungo Bay is about 50% higher than its carrying capacity. The aquaculture density of mussels in the Bay is 8-10 times higher than the carrying capacity. To determine optimal carrying capacity, the IMTA model was applied in Sungo Bay in 2007. The model takes into account factors such as diet, hydrodynamics, and nutrients (e.g. nitrates and phosphates). Long line culture of macro seaweeds (e.g. kelp) feed the abalone. Another IMTA model is designed for sea ranching in which benthos seaweeds feed abalone, sea cucumber and sea urchin. In ponds, IMTA has successfully developed co-cultures of animals and seaweeds (e.g. shrimp/bivalves such as clams and bay scallops; shrimp/fish such as sea bass; or shrimp/sea cucumber; and shrimp/crab). Pilot operations have demonstrated that IMTA operations that conform to carrying capacity rules produce high yields and improved water quality.

Professor Tang highlighted the finding that cultivated seaweed and shellfish function as a carbon sink for an estimated 3.7 million tons per year of coastal ocean carbon in the Yellow Sea LME. The estimate is based on the carbon content of both shellfish and seaweed. Large amounts of carbon used by cultivated shellfish and seaweed are removed from the ocean by harvesting, and not returned until they are

consumed. Cultivated shells also function to capture and store carbon, thus increasing the capacity of the coastal ecosystem to absorb atmospheric CO<sup>2</sup>. Professor Tang suggested that a global workshop be held on the fisheries carbon sink function and used as a coastal ecosystem remediation option. UNEP has suggested a global 'blue carbon' fund for ensuring that these coastal marine carbon sinks are included in national inventory submissions (see *The Management of Natural Coastal Carbon Sinks*, IUCN, 2009). In response, Luis Valdes of IOC offered to host a workshop on carbon sequestration.

#### **5.4 Climate Change and Ecological Conditions in the Russian Arctic LMEs**

**Gennady Matishov** provided results of annual surveys in the Barents Sea LME, Black Sea LME and Caspian Sea. A series of expeditions has been carried out by the Murmansk Marine Biological Institute (MMBI) along the 8,000 km of the Arctic northern sea route in order to better understand climate change. Marine research in the Arctic carried out by the MMBI included phytoplankton and bottom fauna in the Kara Sea LME as an indicator of climate change and biodiversity variability. The Red King Crab was introduced to the Barents Sea LME 50 years ago, and had a 40 year period of adaptation before a substantial increase in biomass related to climate warming was observed. Other topics reviewed were: (i) natural mortality and fishing statistics for Barents Sea cod; (ii) population studies of northern sea birds, based on aerial surveys; (iii) colonization of Arctic archipelagoes by soil invertebrates; (iv) satellite tagging of Greenland seals; (v) polar bears in Arctic polynyas; (vi) the range of factors impacting marine ecosystems and marine resources; (vii) modeling the Barents Sea LME and White Sea; (viii) transportation routes of Russian oil and oil products in the Barents Sea and vulnerability to oil contamination; (ix) impacts on the ecology of rivers of the Kola Peninsula; and (x) salmon escapes from Norwegian fish farms.

Regarding climate cycles, the Russian Republic has multidecadal time series of observations. Warming phases appear to occur at 30 year cycles with the most recent warming in the early years of the 21<sup>st</sup> century (2001 – 2006), with a return to average climate conditions after 2006. Thermohaline anomalies were observed at selected Arctic transects in 2001 – 2009.

#### **5.4 The GOOS-Africa LME Connection**

**Justin Ahanhanzo** is coordinator for the GOOS-AFRICA Programme, and team leader for the IOC-UNESCO Project on the Application of Remote Sensing for Integrated Management of Ecosystems and Water Resources in Africa. He reported on a workshop held in February 2010 in Cotonou, Benin that addressed decision-making support for coastal zone management and water resources in relation to climate change. The workshop, intended as a forum for African scientists, scholars and policy makers, addressed two major themes: (1) the strengthening of observation system capacity and (2) climate change and water resource management. Current regional

challenges include shipping, fires, floods, storm devastation, increasing coastal erosion, threats from oil and gas drilling, and overfishing. GOOS-Africa is attempting to provide observation tools for a better understanding of LME systems in Africa. African Universities and their post-graduate programs will be central for changing the capacity building paradigm in science, education, information and communication technologies. The workshop recommended that a high level governance mechanism be established for pan-African projects, and that African nations share best practices.

## **6.0 CONCLUDING DISCUSSIONS**

A round-the-table discussion indicated consensus on going forward in support of the Community of Practice (CoP) proposal. Representatives of the IOC-UNESCO and IUCN stated their interest and provided suggestions and additions to the project proposal. Alfred Duda discussed tier 1 and tier 2 methodologies for TWAP and use of indicators. Professor Hempel proposed more time for discussion of the CoP in next year's meeting. Antonio Diaz de Leon mentioned last year's APEC workshop in Korea and invited other Asia-Pacific representatives to participate. He also mentioned that the United Nations Framework Convention on Climate Change and the Kyoto Protocol (COP 16) takes place in Mexico on November 29 – December 10, 2010, to which observers, national and international officials, and media representatives are invited.

**ANNEX 1: IOC-IUCN-NOAA Large Marine Ecosystem  
12<sup>th</sup> Consultative Committee Meeting  
Paris, FRANCE  
8-9 July 2010**

**A G E N D A**

**DAY 1 - July 8, 2010**

TIME	TOPIC	SPEAKER
9:00 am - 12:00 pm	<b>INTRODUCTION AND WELCOME</b>	
	IOC Welcome	Wendy Watson-Wright Luis Valdes
	<b>GEF LME COMMUNITY OF PRACTICE</b>	
	GEF Support for Transforming the LME Network to an LME-ICM Community of Practice (CoP) Background	Alfred Duda
	Introduction of Draft CoP Proposal & Feedback from LME Representatives	Vladimir Mamaev
	Large Marine Ecosystems & Integrated Coastal Management Linked to the Five LME Modules	Kenneth Sherman
	Best Practice GEF ICM Projects - PEMSEA	Raphael Lotilla
10:30 am - 10:45 am	<b>COFFEE/TEA</b>	
	Report on Meeting of ICES Working Group on LME-ICM Community of Practice	Michael O'Toole Jan Thulin
	<b>AGENCY OVERVIEW OF GEF LME PROJECTS</b>	
	IOC Regional & ICM-Related Programs	Julian Barbieri AND Charles 'Bud' Ehler
	UNDP Overview of GEF LME Projects	Andrew Hudson
	Guinea Current LME TDA/SAP & UNIDO Perspective	Stephen 'Max' Donkor, Christian Susan
	IUCN - Seamounts in the Southern Indian Ocean— Fisheries and the Ecosystem Approach	Patricio Bernal Sarah Gottheil
12:30 pm - 1:30 pm	<b>LUNCH</b>	
1:30 pm - 5:00 pm		
	U.S., Mexico, & UNIDO Perspectives on the Gulf of Mexico LME Project (Demo linked to Ecosystem-wide Assessments)	Antonio Diaz de Leon Porfirio Alvarez
	FAO Overview of GEF LME Projects	Merete Tandstad Chris O'Brien

**Day 1 - July 9, 2010** (cont'd)

TIME	TOPIC	SPEAKER
	<b>AGENCY OVERVIEW OF GEF LME PROJECTS</b> (cont'd)	
	UNEP GEF Mediterranean LME Projects	Virginie Hart Christian Susan
	UNEP Overview of GEF LME Projects	Jacqueline Alder
<b>3:15 pm - 3:30 pm</b>	<b>COFFEE/TEA</b>	
<b>3:30 pm - 5:00 pm</b>	<b>FIVE MODULE METHODOLOGY</b>	
	Transboundary Waters Assessment Programme (TWAP) Methodology	Julian Barbieri Sherry Heileman
	The TDA/SAP Process & LME Community Based Fisheries in the Agulhas & Somali LME Project	David Vousden
<b>5:30 pm</b>	<b>ADJOURN</b>	



**DAY 2 - July 9, 2010**

TIME	TOPIC	SPEAKER
<b>9:00 am - 12:00 pm</b>		
	<b>INTEGRATED LME ASSESSMENTS &amp; BEST PRACTICES</b>	
	The Norwegian Approach to Assessment & Management of the Barents Sea & the Norwegian Sea	Hein Rune Skjoldal
	Best Assessment & Management Practices in the Yellow Sea LME: Linkage between IMTA & Open Ocean Carrying Capacity	Yihang Jiang
	Assessment & Monitoring of the Benguela Current LME in Support of the Benguela Current Commission	Hashali Hamukuaya
	Climate Change & Ecological Conditions in the Russian Arctic LME	Gennady Matishov
<b>10:00 am - 10:15 am</b>	<b>COFFEE/TEA</b>	
	<b>INTEGRATED LME ASSESSMENTS &amp; BEST PRACTICES continued</b>	
	Changing States, Carrying Capacity, & Carbon Sequestration of the Yellow Sea LME	Qisheng Tang

**DAY 2 - July 9, 2010** (cont'd)

TIME	TOPIC	SPEAKER
	<b>INTEGRATED LME ASSESSMENTS &amp; BEST PRACTICES continued</b>	
12:00 pm - 1:00 pm	LUNCH	
1:00 pm - 5:00 pm		
	Decision-Making Support for Coastal Zone Management, Water Resources & Climate Change in Africa	Justin Ahanhanzo
	Global GEF Community of Practice for Learning & Experience Sharing Among GEF-Funded LME & ICM Projects & Role of ICES	Gotthilf Hempel, Werner Ekau, Kevin Stephanus,
3:00 pm - 3:00 pm	COFFEE/TEA	
	Discussions of Community of Practice (CoP) Project Planning & Implementation	Chair and ALL
	Roundtable Discussion/Planning Session 2010-2011, Including New GEF Supported LME Projects (e.g. Indonesian Sea, South China Sea, Pacific Central American, West Bering Sea)	ALL
5:00 pm	ADJOURN	



**ANNEX II****IOC/UNESCO-IUCN-NOAA Large Marine Ecosystem****12<sup>th</sup> Consultative Committee Meeting****8-9 July 2010 – Paris, FRANCE****Participant Contact List**

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