

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



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

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## TABLE OF CONTENTS

	Page
<b>1. INTRODUCTION .....</b>	<b>1</b>
<b>2. A REPORT FROM THE IUCN .....</b>	<b>1</b>
<b>3. INDICATORS OF ECOLOGICAL CONDITION .....</b>	<b>2</b>
<b>3.1 THE BARENTS SEA AND WEST BERING SEA LMEs .....</b>	<b>3</b>
<b>4. REPORTS ON PLANNING AND IMPLEMENTATION OF LME ASSESSMENT AND MANAGEMENT PROJECTS .....</b>	<b>4</b>
<b>4.1 THE BALTIC SEA REGIONAL PROJECT (BSRP) .....</b>	<b>4</b>
<b>4.2 THE AGULHAS AND SOMALI CURRENT LME PROJECT .....</b>	<b>6</b>
<b>4.3 BENGUELA CURRENT LME PROJECT .....</b>	<b>7</b>
<b>4.4 THE CANARY CURRENT LME PROJECT .....</b>	<b>7</b>
<b>4.5 THE BAY OF BENGAL LME PROJECT .....</b>	<b>9</b>
<b>4.6 MEDITERRANEAN LME PROJECT UPDATE .....</b>	<b>10</b>
<b>5. PROMOTIONAL FILM PROJECT AND LARGE MARINE ECOSYSTEMS .....</b>	<b>11</b>
<b>6. LME ACTIONS IN THE ASIA-PACIFIC AND ARCTIC REGIONS .....</b>	<b>11</b>
<b>7. LME ETHODOLOGIES .....</b>	<b>13</b>
<b>8. CAPACITY BUILDING FOR THE NEXT LME GENERATION .....</b>	<b>14</b>
<b>9. TOWARD A PERMANENT LME INTERNATIONAL SECRETARIAT ..</b>	<b>16</b>
<b>10. ASSESSMENT OF ASSESSMENT ACTIONS .....</b>	<b>17</b>
<b>10.1 THE ASSESSMENT OF ASSESSMENTS .....</b>	<b>18</b>
<b>10.2 GESAMP AND THE ASSESSMENT OF ASSESSMENTS .....</b>	<b>18</b>

	Page
<b>11. GOOS AND GEOSS .....</b>	<b>19</b>
<b>11.1 LME PROJECTS AND GOOS &amp; GEOSS IN AFRICA .....</b>	<b>19</b>
<b>11.2 GLOBAL OCEAN INDICATORS: GOOS AND NORTH-SOUTH LME PARTNERSHIPS .....</b>	<b>20</b>
<b>12. FORGING PARTNERSHIPS WITH LME PROJECTS .....</b>	<b>21</b>
<b>12.1 THE GLOBALLAST PROJECT .....</b>	<b>21</b>
<b>13. THE AFRICAN SESSION-- A WAY FORWARD FOR AFRICAN LMEs, AND GOOS-AFRICA .....</b>	<b>21</b>
<b>14. OUTREACH ACTIVITIES OF THE LME PROGRAM OFFICE .....</b>	<b>22</b>

## **ANNEXES**

- I. AGENDA
- II. LIST OF PARTICIPANTS
- III. COMMUNICATION FOR THE LME CONSULTATIVE COMMITTEE  
TO THE GOVERNMENT OF NORWAY, FAO AND THE EAF NANSEN PROJECT  
ADMINISTRATION
- IV LIST OF ACRONYMS



## **1. INTRODUCTION**

The Tenth Consultative Committee Meeting on Large Marine Ecosystems (LMEs) was held on 8-9 July 2008. The consultation was convened by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), and the World Conservation Union (IUCN). It was hosted by IOC at UNESCO headquarters, Paris, France. The meeting was co-chaired by IOC Executive Secretary, Dr. Patricio Bernal, and Dr. Kenneth Sherman of NOAA. The meeting agenda is given in ANNEX I and a list of attendees in ANNEX II. The powerpoint presentations of the meeting are available on the LME website at: <http://www.edc.uri.edu/lme/intro.htm>.

Dr. Patricio Bernal, General Secretary of the IOC-UNESCO, welcomed the participants to the first decade of the Consultative Committee Meeting on Large Marine Ecosystems. In his remarks he described the 16 GEF funded LME projects as an important achievement, and discussed the recent success in bringing the LME contribution to the proposed UN-sponsored assessment of assessments oceans process, which will identify gaps in information on the status of world oceans. The assessment will be based on 21 regional ocean areas for which there is a varying degree of information, with good coverage for coastal areas and scant knowledge of the central ocean gyres and biomes. He mentioned efforts to integrate and synthesize the findings of the GEF-funded MSP on "Promoting Ecosystem-based Approaches to Fisheries Conservation and Large Marine Ecosystems" which has recently been completed. He expressed concern about long term oxygen depletion, coastal anoxia events due to inland activities through river basins (e.g. Gulf of Mexico LME), and climate-related anoxia, seen more frequently recently but for which it is difficult to prove the connection with climate. Important papers are being published on these topics. Climate change is high on the agenda. He attended a symposium in Las Palmas that considered the dynamics, structure and functioning of the four major eastern boundary upwellings linked to the Benguela Current, the California Current, the Canary Current and the Humboldt Current, impacted by ocean dynamics and climate change. The IOC is working closely with the Census of Marine Life which is compiling a database of marine fauna and is increasing its partnership with the IUCN. Dr. Kenneth Sherman mentioned that planning is underway for a GEF-sponsored Transboundary International Waters Assessment (TIWAS) process that will provide systematic transboundary assessments of surface water, ground water, LMEs and open ocean gyres. Other proposed medium size projects are being planned for capacity building, and strengthening linkages between satellite remote sensing and fisheries management.

## **2. A REPORT FROM THE IUCN**

James Oliver, the LME focal point at the IUCN, described recent IUCN activities in support of the LME Program. The IUCN, represented by 1,000 people in 62 countries, is a membership organization of 83 states, 110 governmental agencies and over 800 NGOs. It has a volunteer network of 10,000 scientists and experts organized into six commissions (protected areas, species survival, ecosystem management, environmental law, communication and education, and social policy). Hein Rune Skjoldal is a candidate to chair the Commission on Ecosystem Management. The IUCN Global Marine Programme team has

expanded to 22 members in 10 countries. The IUCN has recently changed its logo and developed a new website at [www.iucn.org](http://www.iucn.org) and [www.iucn.org/marine](http://www.iucn.org/marine). IUCN partnership activities with GEF-funded LME Projects and with IW:Learn include a training workshop on economic valuation of LMEs which took place in Cape Town, South Africa in July 2007. The workshop addressed principles of economic valuation of ecosystems, LME benefits and costs, methods of ecosystem valuation using the Benguela Current LME as a case study, the use of valuations to influence decision making, and the design and implementation of valuation studies. A training workshop took place in Hanoi in April 2008, on designing payments for ecosystem services. The workshop results are available on the IUCN website. The IUCN has a number of project activities that support the LME development process, for example in the Bay of Bengal on resilience to climate change, the enhancement of coastal livelihoods, and the restoration of mangroves. The IUCN provides support to the Agulhas and Somali Current LME project, to the Southwest Indian Ocean Fisheries Project (SWIOPF), and to the project addressing land-based activities in the Western Indian Ocean (WIOLaB). The IUCN serves on the WIOLaB Steering Committee.

The IUCN is preparing for a major conservation event, the 4<sup>th</sup> IUCN World Conservation Congress, which will take place in Barcelona on October 5-14, 2008 with an estimated 4,000 delegates. The Congress is held every four years. The World Conservation Forum, on 6-10 October, will include four key marine thematic areas: ocean governance, marine protected areas, climate change and oceans, and fisheries. There is a dedicated LME session on October 7, with four speakers on the 5 module methodology, and a presentation on training, education, and capacity building for the next generation of LME's. This will be followed by an open discussion on lessons learned. Other sessions of relevance to the LME community include Ocean governance in the 21<sup>st</sup> century, Impacts of climate change on marine ecosystems and fisheries, and a presentation by the World Wildlife Fund (WWF) on Achieving sustainable fisheries governance. The emphasis of the Congress is on interactive events, involving from 75 to 2,000 people at a time. The Congress provides a good platform for the LME community to launch new products and make announcements. It is planned that the Benguela Current LME book and the UNEP LME Report will be introduced at the Congress.

### **3. INDICATORS OF ECOLOGICAL CONDITION**

The Large Marine Ecosystems movement is providing countries with a framework for introducing ecosystem-based adaptive management by linking scientific assessments to the protection of the marine environment and the sustainable development of coastal and marine resources (for an article on “A global movement toward an ecosystem approach to management of marine resources”, by Sherman K, Sissenwine M, Christensen V, Duda A, Hempel G, Ibe C, Levin S, Lluch-Belda D, Matishov G, McGlade J, O’Toole M, Seitzinger S, Serra R, Skjoldal HR, Tang Q, Thulin J, Vandeweerd V, and Zwanenburg K, see 2005 MEPS 300: 241-296. The article is available on the LME website at: <http://www.edc.uri.edu/lme/intro.htm>).

### 3.1 THE BARENTS SEA AND WEST BERING SEA LMEs

Academician Gennady Matishov, director of the Murmansk Marine Biological Institution (MMBI), reviewed and compared the West Bering Sea LME and the Barents Sea LME from the perspective of ecological conditions in the Russian Arctic and the ecosystem-based approach. He is the author of a chapter on “Contemporary state and factors of stability of the Barents Sea Large Marine Ecosystem”, published in the 2003 volume on Large Marine Ecosystems of the World. There is a history of research expeditions in the Russian Arctic LMEs. Expeditions were funded in 2001 and 2007 by the MMBI and Russian Academy of Science in the Barents Sea which provided scientific information on water temperature distribution along the Kola transect. Recent MMBI publications include a study of the Barents Sea LME. The main issue in the Barents Sea is the reduced abundance of mass commercial species due to overfishing, from a level of 4 million tons in the 1970s down to 1 million tons in the 1990s. The cod catch was 400,000 tons in 1984 and is now down to 40,000 tons. There are also changes in the relative catches of capelin, black halibut, cod, and herring, with a dominance of cod and herring in the 1950s, followed by a shift in the 1970s to the highest peak of Arctic cod, followed in later years by more herring. Biological resources are being degraded in the Barents Sea and in the White Sea. A Barents Sea biological resources and anthropogenic impact map was published in 1991.

Another priority issue to address in the Barents Sea LME is the ecosystem consequence of the introduction of the Red King Crab from the Bering Sea, and other alien species such as the humpback salmon into the seas of Europe and the rivers of the Kola Peninsula in particular. The Red King Crab was introduced in the 1960s and burst into a period of maximum abundance in the late 1990s. There are now efforts to prevent further biological pollution through ecosystem restoration. Industrial fish breeding in Norway while providing many economic and social benefits to communities is having an impact on the ecology of rivers of the Kola Peninsula, through the invasion of the Atlantic salmon, trout and other fish species from the Norwegian Sea LME into the Barents Sea LME. Another concern is the impact of the oil and gas industry on the Barents Sea LME. Several major publications (in Russian) investigate the issues of ecosystem monitoring in relation to the exploitation of oil and gas deposits on the Arctic Shelf. The Norwegian oil and gas complex “Snow White” taps Arctic gas beneath the Arctic Ocean at more than 100 kilometers off of Norway’s northern coast. There are possible transfer routes of oil and gas pollutants to the western section of the Barents Sea, an LME shared by Norway and the Russian Federation. Marine bird colonies have been affected by shipwrecks and oil spills and contaminated with oil products in coastal areas. An ornithological database, including data from the Barents Sea, Kara Sea and White Sea, is a joint undertaking of Russia and Norway. Other concerns are: the transfer of chemical and radioactive pollutants through the Gulf Stream system; radionuclide transfer to northern European seas including to the Barents and Kara seas due to the well known nuclear accident; the influence of atomic ranges and Navy bases on the LME; and the anthropogenic pollution of coastal zones. Levels of radioactive contamination and plutonium are quite high due to the nuclear submarine fleets in the Barents and Kara Seas.

Academician Matishov then discussed the West Bering Sea LME in terms of its fisheries, marine mammals, walrus, whales, fur seals, ringed seals and also the Red King Crab. Cod, herring, capelin, and especially Alaska Pollock are important fish species. The Pacific Salmon time series (1925 to 2004) shows a peak in 1997 of about 1 million tons.

Improper management of the fisheries resource has resulted in overfishing. illegal fishing by many countries including Korea, Japan, Russia, the United States, Poland and others is taking place in the so called “neutral waters” beyond country jurisdiction.

Climate is the key factor impacting Arctic ecosystems. The data, based on Khoreva’s 2007 research and other sources on the climatic cycles of the Arctic seas in the Holocene era, suggests that warming and cooling in the Russian Arctic is cyclical. A 2004 climatic atlas of the Arctic seas, which includes data on the Barents, Kara, Laptev and White seas, summarizes 10 years of research. Professor Matishov noted an anomalous cold regime in January and February 2006 in the European seas of Russia, with a shift of the Siberian anticyclone to the west. There were extreme winter conditions in 2005 and 2006 in the Sea of Azov. The scientist Zubov published a book, “The Arctic Ice”, in 1941, which showed the consequences of a warming period. This was followed by a NASA publication on Arctic sea ice in 1973-1976. The rate of loss in the Arctic in the last two decades is 20 percent greater than the rate of loss over the last three decades, said Don Cavalieri, senior researcher at the NASA Goddard Space Flight Center and lead author of the study. The greater rate of sea ice loss in the Arctic may be due to a general warming trend in the Arctic as well as the influence of long-term oscillations or other changes in atmospheric pressure systems, which could pull in more warm air from the south. Asked whether he believes in a long term global warming trend or in cyclical warming and cooling, Professor Matishov brought into question the direction and duration of the present warming period by stating that based on his own information and experience of 40 years as a scientist working on the Arctic, these processes in his opinion are not connected with the effects of greenhouse gases. He agreed to send along a list of references. On the issue of a West Bering Sea application for funding by the GEF, the GEF is committed in its guidelines to ice melt activity and the project would be funded under that theme. A participant suggested linking this new project with an already funded and highly successful UNDP project off the coast of Kamchatka.

#### **4. REPORTS ON PLANNING AND IMPLEMENTATION OF LME ASSESSMENT AND MANAGEMENT PROJECTS**

One hundred and ten developing countries and countries in economic transition are assisted by the GEF which is providing funding to 16 LME Projects in Africa, Asia, Latin America, the Caribbean and Eastern Europe. The U.N. agencies assisting those countries include UNDP, UNEP, FAO and UNIDO.

##### **4.1 THE BALTIC SEA REGIONAL PROJECT (BSRP)**

Jan Thulin, Senior Advisor for the International Council for the Exploration of the Sea (ICES), provided a status report and summary of activities and results since 2003. The Baltic Sea is a fast warming LME, impacted by the major threats of eutrophication, overfishing, chemical pollution, loss of biological diversity and climate change, all induced by human behavior. The goals of the Baltic Sea Regional Project (BSRP) are to introduce and apply the LME concept in the Baltic; to implement the ecosystem based approach to management (EAM); and to build and improve monitoring and assessment capacity necessary for EAM with a focus on the eastern Baltic states. The Project is a partnership of GEF and the World Bank, HELCOM, ICES, nine Baltic States and NOAA and has a budget of \$12.5 million. The

structure of coordination centers, lead laboratories and local implementation units closely follows the 5 module LME approach, with additional institutes in Denmark, Finland, Germany, Sweden and the USA. Some of the activities and results of the BSRP since 2003 include joint expeditions, workshops and meetings on Baltic Sea indicators. Regarding the productivity module, an observation system run by the Gdynia, Poland Laboratory has been installed on the southern transect of the Baltic Sea. Sampling of zooplankton using a Continuous Plankton Recorder (CPR) system was initiated and the results are to be integrated into the Baltic Ship of Opportunity Program (SOOP) data network. ICES has provided advice on cod fisheries. With regard to the fisheries module, a TAC plan was put in place for the recovery of the eastern Baltic cod. However the catch is higher than the maximum fishing mortality and minimum stock size advised by scientists. The BSRP has contributed to improvements in Baltic cod assessments, and some actions have been implemented. A population explosion of sprat is attributed to a combination of global warming, a decrease of the cod population, and eutrophication. The BSRP has influenced a reorganization of ICES to better address the needs of EAM. ICES and its Baltic Committee Group have undergone a structure change based on the five modules. Regarding pollution and ecosystem health, the invasion of the ctenophore *Mnemiopsis leidyi* is having a negative impact on Baltic fisheries. The BSRP has developed a proposal for HELCOM to centralize the information for invasive species monitoring.

A large collection of reports and presentations on the results of the Baltic Sea LME Project (now up to 4000 pages) is available on the website at: <http://www.ices.dk/projects/balticsea.asp>. Direct outcomes of the BSLME project include: the creation of preconditions for EAM of human activities in the Baltic (ICES 2006); significant support during the development of the HELCOM Baltic Sea Action Plan (Baltic SAP, 2007); the improvement of assessment capabilities in the Baltic Sea's eastern countries; the introduction of indicator-based assessments; the improved quality of input data for fish stock assessments; the initiation of coastal fish monitoring and phytobenthos monitoring; integrated assessments for the Baltic Sea; and the development of the SOOP network. The BSLME Project is a key player in the Baltic and the science network it has established will long survive the project. Additional outcomes of the Project include the Programme BONUS+ in which the nine Baltic countries have initiated joint comprehensive research in support of cooperative marine science. BONUS+ is built on the LME concept and is designed to address the needs of EAM. Its budget is 23 million Euros. It has received 149 project applications, of which 16 have been granted funds for 3 years. All 16 are in accordance with the LME concept. Another project spin-off is "Scientific advice for fisheries management at multiple scales" (SAFMAMS) (2005-2008). The aims of this project is to draw on insights from existing research projects and management processes to identify the most useful forms of scientific advice for marine environmental management, and to communicate those insights to scientists and decision makers. A major outcome of SAFMAMS is to improve the ways in which scientific advice is transferred to decision makers; and to strengthen science in support of policy at the European Union. All SAFMAMS reports and products are available at [www.ifm.dk/safmams](http://www.ifm.dk/safmams).

Other Baltic LME Project deliverables are a data base catalogue of marine environmental efforts in northern Europe (available at [www.fishsec.org/organisations.asp](http://www.fishsec.org/organisations.asp)), and a book, "The Paradoxes of Transparency: Scientific Institutions and the Ecosystem Approach to Fisheries Management in Europe". From a Baltic Sea LME management

perspective, a recent ICES workshop on reversing the burden of proof for fisheries management is particularly important. The workshop proposed to give the industry more of a voice in fishery management in exchange for taking a greater responsibility in documenting the sustainability in fisheries. The workshop participants were 12 high ranking scientists, policy makers and stakeholders who discussed the controversial question of access to the fisheries resource, subject to prior demonstration by those who intend to catch the fish that (i) their planned exploitation is sustainable; and (ii) the individual fisher is member of an organization that is accountable for the actions of its members. The advantages of introducing such a new management approach is greater clarity and transparency in the management process; placing responsibility for management closer to those directly involved; greater collective responsibility on the part of the industry; and a more proactive approach to fisheries development. The disadvantages are: a more extended decision making process; increased demands on science; the likelihood of higher transaction costs; and the greater risk of lawsuits.

The next steps for the BSLME Project are to stimulate discussions within the European Commission as part of the agenda for the new Common Fisheries Policy, to move the Regional Baltic Plan from abstract discussions to practical actions, and to address the drawbacks and problems arising during project implementation. An evaluation of Baltic Sea stakeholders (2003-2007) including scientists, farmers, politicians, decision makers, and international organizations shows the need to make the information accessible to politicians through a short fact sheet. Plans for a Baltic Sea Second Phase await a final report of the World Bank. Professor Gotthilf Hempel said that the Baltic Sea LME Project has done a marvelous job and achieved more than was expected. Jan Thulin agreed that 2<sup>nd</sup> phase goals were already reached in the first phase of this 3-phase project. The project is preparing a “lessons learned” report.

#### 4.2 THE AGULHAS AND SOMALI CURRENT LME PROJECT

David Vousden, Director of the GEF-funded Agulhas and Somali Current LME Project (ASCLME), provided an update on the implementation of the five LME assessment modules (productivity, fish and fisheries, pollution and ecosystem health, socioeconomics, and governance). The nine participating countries are Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa, Tanzania and Somalia. Funding by GEF is at a level of \$12.2 million, with co-funding, mostly in-kind, at a level of \$20 million. The project time frame is 5 years (2008-2012). The project objectives are to undertake an environmental baseline assessment of the ASLME in order to (i) capture existing information relevant to management; (ii) identify and fill the information gaps needed to improve LME-based decision-making in the ASLME; and (iii) ascertain the role of external forcing functions from the Mascarene Plateau and the South Equatorial Current. The Project consists of three partner projects: The Western Indian Ocean Land Based Management Project (UNEP WIOLaB), which addresses land-based activities; the Southwest Indian Ocean Fisheries Project (SWIOFP, World Bank), addressing offshore and near shore commercial fisheries; and the ASCLME Project (UNDP), addressing oceanography, artisanal and subsistence fisheries, persistent organic pollutants, larval transport, spawning and nursery areas. The project Transboundary Diagnostic Analysis (TDA) will identify gaps and data needs in oceanographic information and near shore artisanal fisheries, nursery areas and other biologically rich habitats, and persistent organic pollutants using key indicator species. The

gaps will be filled through research cruises. A sound economic evaluation of marine goods and services is needed. The use of GIS and predictive models will expand on the scientific knowledge of the ecosystem. National TDAs will use the LME modular approach and examine transboundary impacts (e.g. pollution, fish migration, larval transport). The regional TDA will include descriptions of the modular theme, with a component focused on long-term forecasting of ecological conditions.

For the Productivity Module, the main activity will be to uncover productivity hotspots, toxic tides and algal blooms, and the role of gyres and eddies under monsoon conditions. This will be accomplished through cruises and the deployment of moored equipment. Satellite imagery will be used to track productivity hotspots and upwelling incidents. The *R/V Nansen* will use 110 days of ship time in 4 legs in late 2008 to survey the Mozambique Channel, around Madagascar, and along the Mascarene Plateau and its plankton communities. The Agulhas and Somali Currents are discontinuous and break off into a series of eddies and rings, which the cruise will be researching. The cruise is a major event for the oceanographers of the region and has great potential for mentoring and capacity building among the scientists and technicians from the participating countries. The cruise will investigate the upwelling areas and their high levels of productivity, along with the effect on fisheries and on the sea birds in the vicinity of the eddies. Trainees and scientists from all countries will participate with a new scientific crew coming on board with each leg of the journey. For the Fish and Fisheries Module, the project will survey the coastal artisanal/subsistence fishery and investigate the competition between the various fisheries sectors and the impact on biodiversity. It will provide capture data on artisanal/subsistence fisheries, commercial fisheries and the inshore crustacean fishery. The research cruises will also provide plankton data, and data on fish biodiversity. The cruise will provide baseline information for building the ASCLME program on ecosystem-based management. For the Pollution and Ecosystem Health Module, the project will provide information on marine pollution, invasive species, critical habitats, MPAs, heavy metals and POPs concentrations in key indicator species, and chronic tanker pollution in the ASCLME and Mascarene Plateau. Data on harmful land based pollution and habitat degradation will be provided by the WIOLaB component of the project. For the Socioeconomics Module, a valuation of marine goods and services (e.g. MPAs, tourism, fisheries), and social, economic, and biological baseline surveys of coastal communities will be carried out to identify human forcing factors. The Governance Module signals a general movement away from single species fisheries management to a more holistic ecosystem approach. Participating countries will need to harmonize policy and legislation by negotiating governance mechanisms including institutional arrangements across all three projects.

The issues cutting across the 5 modules are environmental variability, capacity building, training and educational initiatives, data storage and access, the creation of national and regional monitoring and evaluation programs, and TDA updates. Policy issues will be addressed through an inter-ministerial committee. Progress has already been made in setting up a Project Coordination Unit (PCU) and recruiting staff. The Steering Committee has adopted an updated budget and work plans. The PCU is providing a strong scientific base and will ensure that the various project components are well integrated and coordinated among the national governments and the relevant ministries (e.g. Tourism, Energy, Foreign Affairs, and Treasury) to support and encourage training and institutional change to carry the project forward and build capacity. The ASCLME Program has been approached by fisheries

institutions who want to be involved in training. Policy level stakeholders will be engaged at an early stage in the TDA and SAP process, The TDA will require regular updates. The website at: <http://www.asclme.org/> contains project updates.

### **4.3 BENGUELA CURRENT LME PROJECT**

In the absence of Michael O’Toole, former Chief Technical Advisor for the Benguela Current LME (BCLME) Project, David Vousden provided a brief update on the Benguela Current LME Project for which he was an evaluator. The project has very successfully completed its first phase and has recently established an LME Governance Commission, the first of its kind in the world. The project has been built on a strong foundation of science in support of the TDA process, with \$7 million spent on scientific research and networking to build strong links among the three participating countries (Angola, Namibia and South Africa). The Namibian Minister of Fisheries and Marine Resources Abraham Iyambo has championed the project cause and played a key role in the establishment of the Commission. Phase 2 of the BCLME project is presently being initiated.

### **4.4 THE CANARY CURRENT LME PROJECT**

Merete Tandstad, of the Fisheries Management and Conservation Service of FAO, provided an FAO perspective on the Canary Current Large Marine Ecosystem (CCLME) Project. The CCLME is one of the world’s major cold water upwelling boundaries currents. The 7 participating countries are Morocco, Mauritania, Senegal, the Gambia, Guinea Bissau, Guinea and Cape Verde. The CCLME comprises a diverse assemblage of marine and coastal ecosystems and three distinct zones: a northern, subtropical upwelling zone centered off northern Mauritania; a southern, tropical estuarine zone centered off Guinea Bissau and extending from the Gambia to Guinea, dominated by estuaries and mangroves, and a western, sub tropical to tropical oceanic zone which includes the Canaries and the adjacent waters of the Cape Verde Islands. The coastal zone provides important goods and services to the coastal states and holds significant petroleum reserves. The main transboundary concerns are declining fisheries, habitat modification, changes in water quality, ecosystem variability and loss of biodiversity. The fisheries affected include vulnerable small pelagic resources, declining demersal finfish fisheries, vulnerable elasmobranchs (sharks and rays), declining marine turtles and cetaceans and the uncertain status of the tuna resource. Habitat issues of concern include the disappearance and destruction of mangroves, the degradation and modification of seabed habitat and seamounts, and the degradation and modification of wetlands, coastal zones, coral reefs and estuaries. Water quality is affected by changing salinity in river mouths and hydrocarbon pollution, coastal eutrophication, alien invasive species, sediment mobilization in the water column and toxicity from pesticides. The project aims to take the CCLME countries through the TDA and SAP process using the LME assessment and management approach. Demonstration projects will be selected to test and strengthen management capacity and to serve as concrete steps towards achieving the agreed ecosystem objectives and the broader goal to “reverse the degradation of the Canary Current LME caused by overfishing, habitat modification and changes in water quality by adoption of an ecosystem based management approach”. This will be achieved through governance reforms, investments and management programs.

Project Component 1 focuses on multi-country frameworks for addressing priority transboundary concerns, with specific activities relevant to the two LME Modules of Socioeconomics and Governance and aimed at strengthening LME-wide cooperation. Project Component 2 focuses on the Fish and Fisheries Module and will address priority transboundary concerns relating to the declining marine living resources of the CCLME. Project Component 3 strengthens the transboundary assessment and management of habitats, biodiversity and water quality critical to fisheries. Components 4 and 5 will build human and institutional capacity and feed into the SAP process. The demonstration projects include a pilot on shared pelagic stocks and one on the reduction of the impact of shrimp trawling through by-catch reduction and management changes. The transboundary management of migratory coastal pelagics is of importance to CCLME artisanal fisheries, which are focused on mullets and bluefish. Surveys are being carried out by the *R/V Nansen* and a Senegalese vessel. Information on this project is available at: [www.smallpelagics2008.org](http://www.smallpelagics2008.org). Marine protected areas (MPAs) will be established to measure their effectiveness in promoting sustainable management of both demersal and artisanal fisheries. A regional mangrove conservation plan will be developed that will include pilot restoration actions. This UNEP-backed project will measure the benefits of mangrove restoration and demonstrate an approach that can be replicated or adapted for other critical habitats. The project brief was accepted and will be submitted for CEO endorsement. The full project will be implemented in the 4<sup>th</sup> quarter of 2008. The FAO is now partnering with the Benguela Current, Guinea Current, and Agulhas and Somali Current LME projects with regard to joint surveys and an ecosystem approach to fisheries (EAF) through the *R/V Nansen*. The Nansen Project is designed to strengthen the knowledge base of the fishermen, research institutions, and management administrations of participating developing countries for implementing an ecosystems approach to marine fisheries. Ms. Tandstad's presentation was followed by a discussion concerning logistics and costs to the LME projects of using the *R/V Nansen* (\$20,000 a day, with GEF providing 50%). Rising fuel prices are affecting all the African LME projects and in particular the ASCLME Project. The matter will need to be negotiated with Norway. *R/V Nansen* survey reports and data can be downloaded from the FAO website. The *R/V Nansen* is engaged in both data collection and training. See ANNEX 3 for the Communiqué from the LME Consultative Committee to the Government of Norway, the FAO and the EAF Nansen Project Administration.

#### **4.5 THE BAY OF BENGAL LME PROJECT**

Merete Tandstad also provided a status report on the Bay of Bengal LME Project. The FAO-sponsored project covers a large LME encompassing more than 400,000 square km. The 8 participating countries (Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand) have a combined population of 1.5 billion people, representing ¼ of the world's population. Four hundred million people live in the coastal catchment areas. The expected population growth is 20% by the year 2015. The region is characterized by its fishing dependency (including part time and small scale fisheries), limited economies, small GNPs and high levels of poverty. The project objective is to enhance food security and reduce poverty in the coastal communities, while at the same time protecting the LME and sustainably managing its living marine resources. Priority issues are the overexploitation of living marine resources, critical habitats and land based pollution. The transboundary species selected for management are sharks, Indian mackerel and hilsa. The 8 participating countries have endorsed the project, which is funded by the GEF and donors including Sweden,

Norway, FAO and NOAA. The GEF CEO endorsed the project in June 2008. The project's anticipated startup will be in November 2008. Two positions needing to be filled are the Project Coordinator and Chief Technical Advisor.

#### **4.6 MEDITERRANEAN LME PROJECT UPDATE**

Virginie Hart, Task Manager for UNEP's International Waters projects, manages the portfolio for the Mediterranean Sea and African projects including the Canary Current LME, WIOLaB, the Guinea Current LME, ecosystem-based fisheries, and the GEF/UNEP/FAO project on reducing the impact of tropical shrimp trawling fisheries on living marine resources. The UNEP Coordinating Unit, responsible for all activities related to the Mediterranean Action Plan under the Barcelona Convention, is located in Greece. She was a consultant in the PDF-B phase of the Mediterranean Sea project, which was endorsed by GEF in early 2008. Dr. Hart provided a comprehensive update of the UNEP GEF Strategic partnership for the Mediterranean Sea LME project. The 13 GEF eligible countries involved are: Albania, Algeria, Bosnia and Herzegovina, Croatia, Egypt, Lebanon, Libya, Morocco, Montenegro, Syria, Tunisia, Turkey, and the Palestinian Authority. Morocco also participates in the neighboring Canary Current LME Project. The UNEP Mediterranean Action Plan (MAP) is the executing agency. Other agencies involved include the World Bank, IOC-Unesco, UNIDO, FAO and WWF. The GEF UNEP Project (Phase 2) prepared a TDA in 1997 and a SAP to address pollution from land-based activities and improve the conservation of marine and coastal biological diversity. The Barcelona Convention on the Protection of the Mediterranean Sea against Pollution and its ICZM protocol provide the background context for the project.

The objective of the strategic partnership in the Mediterranean LME Protect is to catalyze investments, address transboundary pollution and the loss of marine and coastal biodiversity, and identify conservation priorities. The project has two components: the regional component, for the protection of environmental resources (\$12.9 million, and \$36.5 million in co-financing for 5 years), and the investment fund. The objective of the regional component is to harmonize governance reforms and aim to reverse marine and coastal degradation trends and the depletion of living resources. The investment fund is implemented by the World Bank at a level of \$30 million and \$90 million in co-financing for 10 years. Project Component 1 addresses water management. Component 2 addresses pollution. Component 3 addresses biodiversity. The critical Component 4 focuses on the coordination of activities and results with regard to specific regional and national targets. This is an active time for the Mediterranean Sea LME region. Other projects initiated include EU Horizon 2020 which is committed to the reduction of pollution in the Mediterranean Sea by 2020, and is investing financial resources and technical support for project implementation. There is an active coordination effort underway by UNEP to ensure that the two projects are linked and to share lessons learned. Contacts are Paul Mifsud at UNEP MAP ([Paul.Mifsud@unepmap.gr](mailto:Paul.Mifsud@unepmap.gr)), and Virginie Hart at UNEP DGEF ([Virginie.Hart@unep.org](mailto:Virginie.Hart@unep.org)). The website is <http://www.unepmap.org>. In answer to a question on the Investment Fund and how it is applied to the Mediterranean Sea LME project, the presenter discussed the example of a river basin management project for Egypt, and water treatment plants in Croatia and in Montenegro. On the question of whether the GEF expects an integrated ecosystem accounting for all the projects, there is a real need to coordinate project activities in the Mediterranean, develop key indicators in common with the European Union, and track the combined impact

of all investments made. UNEP MAP and the Barcelona Convention Secretariat are seen as the key agents for maintaining project vision and interagency coordination.

## **5. PROMOTIONAL FILM PROJECT AND LARGE MARINE ECOSYSTEMS**

Anthony Ribbink and Marjolein Duermeijer presented a proposal for a short film project that would provide an opportunity to showcase LMEs and raise the profile of the LME approach with senior policy makers by highlighting critical linkages between international waters, climate change, food security and poverty issues. They discussed target audiences and costs for two films. A short six minute promotional film would carry important messages to the G8 leaders and their electorates, while a longer 25-30 minute supporting film would promote a better understanding of the role of the oceans and the need to encourage investment in marine ecosystem research, climate change and sustainable practices. The objective is to influence the decisions of leaders, who are the ones who can inspire confidence in the public that their actions will make a difference. The two films can be made at an estimated cost of \$300,000 and will rely on existing footage (from the BBC, Discovery, NOAA, the GEF) and original footage including a statement by Nelson Mandela and other ocean leaders and possible animations. The 2 films would be screened at the World Ocean Conference and at the G8 Summit in 2009. It would be distributed world wide through networks such as the World Ocean Network, Sustainable Seas Trust, Google, Sea Web and You Tube and would be made available to major TV stations, governments, organizations, institutions, educational facilities and the public at large. Film is a very powerful tool sending a strong message to millions of people and influencing their thoughts and decisions. To film top quality new footage requires 1,500 Euros a day. To purchase already edited film costs 60 Euros a second. Computer generated images cost 200-7,000 Euros a second. There is presently a great demand for films on environmental issues. This project needs input from the LME projects in terms of who is available, when and where, what are the messages to be conveyed, and how to deliver the messages in a powerful way. The project also needs core funding, perhaps from the GEF, before it can approach commercial organizations, foundations, universities and NGOs.

## **6. LME ACTIONS IN THE ASIA-PACIFIC AND ARCTIC REGIONS**

Marie-Christine Aquarone reviewed the Asia-Pacific Economic Cooperation (APEC) Project and the new map of the 27 LMEs of the Region. APEC, established in 1989 as a forum for facilitating economic growth, cooperation, trade and investment in the Asia-Pacific region, has 21 "Member Economies", which account for approximately 41% of the world's population, 55% of world GNP and 49% of world trade. The 27 LMEs make a major contribution to the global economy of \$12.6 trillion in marine ecosystem goods and services. APEC economies account for 75% of world's capture fisheries, 90% of the world's aquaculture production, valued at \$58 billion in 2005, and 70% of world's consumption of fish products. Some issues affecting APEC economies include natural disasters (e.g. tsunami of 2004) threatening sustainable growth, protection of the food supply, adaptation to climate change, marine pollution, marine invasive species, coral reefs and other vulnerable areas. The Marine Resource Conservation Working Group (MRCWG) aims to apply an ecosystem-based approach to coastal and marine decision-making, to improve cooperation across the APEC region for the responsible care of oceans and coasts, and to develop a clearer understanding of

the value of the marine sector. The Project is consistent with targets and declarations such as the 2005 Bali Plan of Action on ecosystem-based management, the 2002 WSSD targets, and the 2002 Seoul Oceans Declaration (2002). Project Part 1 included meetings in Qingdao, China (2007) and in Peru (2008). Its focus is to begin the process of developing a strategy for recovering and sustaining ecosystem goods and services in the Asia-Pacific region by gaining a scientific understanding of its marine ecosystems and applying ecosystem based management. In Qingdao the Working Group chose the LME scale based on 4 ecological criteria rather than administrative or political boundaries. It agreed on a suite of 5 LME indicators (productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance) to monitor and assess changes in the APEC LMEs. It produced a draft map of Large Marine Ecosystems in the APEC region, to be completed in 2008. The report for Project Part 1 will be released in September 2008.

The APEC Project Part 2 (2008-2009) will build on Part 1 and will include the following objectives: (i) a baseline science-based ecosystem assessment for all of the APEC region's 27 Large Marine Ecosystems, following the 5 LME Modules; (ii) a finalized LME Map; (iii) an agreed upon strategy based on best practices for the recovery and sustainability of LME goods and services; and (iv) the identification of two demonstration projects/pilots and seek funding to initiate those projects. Both project Parts 1 and 2 will provide essential scientifically-based information for decision-makers, focus on the economic benefits gained from a more sustainable marine resource base, and provide legal and administrative support for ecosystem-based management practices. A portal is being developed at a funding level of \$30K at <http://www.lme.noaa.gov>, which will provide linkages to existing GEF-funded LME projects in the APEC Region (e.g. Yellow Sea, PEMSEA) and beyond. US leadership has proposed this APEC initiative, with 4 co-sponsoring economies (Mexico, Korea, Peru and Thailand). Project Part 2 is presently co-sponsored by US and Mexico. The potential partners are other APEC working groups (Fisheries, Industrial Science and Technology, Tourism, Transportation, and Sustainable Development Initiative), 5 UN agencies, the Yellow Sea LME Project and PEMSEA. LME projects can provide expertise, lessons learned, and experience in the application of the 5 module assessment and management approach.

Regarding the Arctic Region, the Arctic Council Working Group on the Protection of the Arctic Marine Environment (PAME) has since 2004 led Arctic Council efforts to move toward "an integrated ecosystem-based management" approach, and has implemented steps identified in the Arctic Marine Strategic Plan (AMSP). The plan identifies the five LME modules and indicators (productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance) as the best approach for managing the Arctic marine environment. The PAME Working Plan (2006-2008) has established membership for the LME Arctic Group of Experts to guide the development and implementation of an ecosystem-based approach to the assessment and management of the Arctic Region. A peer reviewed volume based on the AAAS Symposium presentations of February 2006 in St. Louis is being prepared for the Arctic. Pilot assessments based on the 5-module LME assessment and management strategy are being developed for the West Bering Sea (US/Russia), Barents Sea (Norway/Russia) and Beaufort Sea (Canada/US) Large Marine Ecosystems. A working map of 17 Arctic Large Marine Ecosystems has been finalized after significant scientific review of the ecological boundaries. The map was accepted by PAME to guide the 2006 to 2008 Work Plan and is available on the PAME website at: <http://www.pame.is>. The map includes two new LMEs, the Arctic Archipelago (LME #65), and the Baffin Bay/Davis Strait (LME #66).

The LME Group of Experts met in Montreal in May 2008. Results of the meeting were reported to PAME in Newfoundland in June 2008.

## **7. LME METHODOLOGIES**

Dr. Villy Christensen reported on the winding down of the University of British Columbia's activities for the GEF-supported mid-size project (MSP), "Promoting Ecosystem-based Approaches to Fisheries Conservation in LMEs". The project was funded at a level of \$995K to develop methodologies and ecosystem models for all LMEs. The UBC component in phase 1 (2004-2006) and phase 2 (2007-2008) was ecosystem modeling, training and application for GEF-funded LME projects. Five training workshops for LME projects took place between 2004 and 2008 for the Baltic Sea, Benguela Current, Guinea Current and Southeast Asia LMEs. A final report is available and a variety of global databases are in existence (e.g. SeaAroundUs, FishBase, SeaLifeBase). Ecosystem models have a reputation of being data hungry. Years of work have produced ecosystem models and estimates of carrying capacity for sustainable fisheries in each of the LMEs. The databases produced include: the biomass of benthos, plankton, mesopelagics, marine mammals and birds; fish diversity, growth parameters, and diets; primary production (1950 to the present); fishing effort (1950 to the present); fish catches and money values (1950 to the present); and biomass trends for 2,600 different populations. The modeling process includes the spatial cells, data extraction, Ecopath (snapshot of the food web), parameterization, Ecosim (time dynamics), Ecospace (spatial dynamics), and their application to LMEs and policy evaluation. Four climate models were used to determine primary production. The objectivity function assigns an equal weight to long term sustainable profit and catch value. Fish 2020 provides an analysis of world fish markets to 2020 that models supply and demand based on economic theory, taking into account economic, technological, and biological variables. The presented map of most valuable fisheries shows for the first time the current real estate value or catch value in the world's LMEs, with the most valuable fisheries located in North West Europe, the North East United States, East Asia and in the Gulf of Thailand LME. There is an overall estimated biomass decline of 50% for species larger than 90cm. A map of LME catches and scenario outlook shows a present level of about 55 million tons, a steady increase until the 1990s, a leveling off, and a slight increase moving toward 2030. This is still a work in progress.

Ecosystem models are sensitive to changes in fishing effort and system productivity impacted by climate change. In applying Ecopath with Ecosim in the context of climate change, Cheung and Pauly are modeling how individual species are impacted by climate change. This has not yet been accomplished in LME models. The climate models used for productivity are coupled with hydrographic NPZ models. In terms of fisheries, an Ecopath with Ecosim model follows the flow of food, value, jobs and trade through a value chain from catches to producers (boats), to processors, to distributors, to markets, and to consumers. This ecosystem modeling continuing all the way from primary productivity to the consumers is available for all major fishing nations of the world. All the necessary information is now available for modeling climate change. In terms of how these fisheries and ecosystem models and this science can be communicated and used in the management process, the numbers can be translated into a visual similar to 3D video games. Dr. Christensen showed an example of this real time technology based on fisheries models and the topography of the Canadian Grand

Banks. It was suggested by the meeting participants that this presentation of information would be useful in the Baltic Sea, to show what happened to the codfish during the past 50 years. The carrying capacity models are viewed as useful in LME projects that are missing large areas of detailed information. In answer to a question on the applicability of the modeling to the high sea areas, Dr. Christensen answered that the same approach can be used.

## **8. CAPACITY BUILDING FOR THE NEXT LME GENERATION**

During the 9<sup>th</sup> Consultative Committee Meeting, following a discussion of concern over the limited attention given to training the next generation of LME experts, Dr. Gotthilf Hempel agreed to prepare a “white paper” on this important issue for consideration at the 10<sup>th</sup> Consultative Committee Meeting. Professor Hempel wrote and delivered the following text on “Capacity building for the next generation of LME practitioners, scientists and policy makers”:

“44 years ago, when I was one of the four professionals and the only biologist at the IOC-UNESCO, I was charged with capacity building in marine biology and related fields in developing countries. Most of them had recently been released by their colonial powers which had already introduced scientific and technical training of local staff and in the case of the British colonies of Africa also regional centers for marine research. The French ORSTOM centers in West Africa, Madagascar, Latin America and New Caledonia were built on similar principles of regional support. Those regions, however, were constituted of clusters of former British and French colonies and were hence much bigger than LMEs. Working on a regional rather than on a national basis seemed to be the best solution to meet the needs of developing countries sharing common marine resources. In the following years, regional training courses and seminars, research centers, and research vessels were established and supported by international and national funding. It was a good time for TEMA: Training, Education, and Mutual Assistance on a regional and global scale.

“The large international expeditions in the Indian Ocean and in the tropical Atlantic and Pacific as well as cooperative studies in the eastern boundary upwelling regions gave further strength to the regionalization of ocean research and relevant capacity building. In the 1980s, the increasing emphasis on national rather than regional interests impeded further regionalization and much of the regional infrastructure got lost.

“Many of the local scientific and technical staff created in the late 1960s and in the 1970s formed the first generation of LME professionals two or three decades later. They helped younger staff in their training and paved the way for a new era of regional cooperation, now under the label LME. Each LME project developed its own scheme for the formation of new scientific, technical, administrative, and political staff. In Africa alone, several thousand professionals of different levels of training and experience are engaged in the LME projects. Many of them are highly qualified after several years of studies at universities and institutes of technology and much training on the job. Unfortunately the LME projects suffer from substantial brain drain with many of their best people moving into more lucrative jobs within the region or overseas. In order to cope with the brain drain and with the increasing complexity of present and future LME activities, attempts are needed to recruit a new generation of qualified staff.

“The new generation has to be different from the former one by addressing the sustainability issue in a much broader sense than before, encompassing not only the preservation of fish stocks and the other goods and services of the ecosystem but also fostering the socio-economic development of the region. Management goals have to be defined and defended under the pressure of conflicting interests and political constraints.

“On the one hand, in order to address all five modules of the LME concept, specialists are needed like ichthyologists and plankton experts, gear designers, sociologists, economists and experts in international law. On the other hand, experienced generalists and modelers are required to put the facts and findings together and to create management scenarios on the medium and long term consequences of various management strategies. Those generalists are rather rare and not easy to recruit. The future of the LME development will depend on the enhancement of scientific, technical, and managerial capacity in the various regions of the world. For LMEs you need both architects and bricklayers. How to meet those requirements? It is not only the specific LME project itself but also the quality of the academic, administrative and political environment that counts.

“I cannot tell how to meet those capacity requirements but will just make proposals on how to find out which steps have to be taken to develop specific strategies of capacity building. Four steps are needed: (i) to engage in an overall review; (ii) to take stock of present LME capacity; (iii) to determine what activities are required; and (iv) to propose some priority actions. In Step 1, an overall review will determine the kind of staff needed in any successful LME project, both directly engaged in the project and in the supporting academic framework of universities and research institutions. Step 2 (taking stock) will uncover the specific capacity status and deficits in each of the existing and envisaged LME projects and its academic environment. It will review ongoing capacity building activities at the national, regional and mega-regional level including capacity building activities by the IUCN, IOC-Unesco, International Ocean Institute and other agencies. Step 3 will identify required activities, including: programs for meeting the identified needs of various scientists, politicians, managers, and technicians by hands on training, regional and mega-regional workshops, and fellowships; the exchange of trainers and trainees between the LMEs of a mega-region or between LMEs of similar physical and biological nature (upwelling, tropical coasts and estuaries, boreal and polar waters); the strengthening of local, national and regional high schools, technical institutes, and universities and their linkages with UN universities; more communication amongst LME project regions on capacity needs and enhancement. Step 4 will propose priority actions. A three-day workshop on the status and needs for global capacity building would begin the process. The participants would include experienced LME officers of different mega-regions plus a few representatives of international organizations engaged in capacity building. The workshop’s outcomes would be summarized in a comprehensive document prepared by the Coordination Center, to be followed by an action plan for the enhancement of marine capacity. Further steps would be developed by the LME Board, implemented by the Coordination Center, and financed through a GEF-supported Medium Size Proposal (MSP) on marine capacity building. This will be needed in order to carry a new generation of LME practitioners into the future.”

The discussion that followed Professor Hempel’s presentation focused on the utmost importance of LME projects and their resources in providing Africans with the opportunity to

do the work for which they were trained and ensuring they improve their expertise. Also, university administrators by being exposed to the LME concept can provide linkages with development activities taking place in universities. This, along with the teaching of ocean science, is part of the university mission. Capacity building and training at different levels from scientists to managers and policy makers were seen as very important by the Consultative Committee. LMEs need more exposure to the scientific and academic community. A permanent structure for the LME movement might be the way forward (for an article on “A global movement toward an ecosystem approach to management of marine resources”, by Sherman K. et al., see LME website at: <http://www.edc.uri.edu/lme/intro.htm>).

## **9. TOWARD A PERMANENT LME INTERNATIONAL SECRETARIAT**

Thomas Laughlin, of NOAA International Affairs, reported on the conversations that have taken place over several months regarding the need to maintain and strengthen the LME network into the future. He provided a framework for discussion by putting forward a structured approach that would formalize an international LME organization with three units. The first unit, the LME Council, would formalize the Consultative Committee process that takes place every year with approximately 25 persons. The functions of the Council, a kind of LME Parliament, would be to serve as a forum for the coordination and implementation of LME projects globally. The second unit, the LME Coordination Board, consisting of about 10 selected LME project experts and field practitioners, would provide expertise to steer the LME movement. The third unit, the LME Coordination Center, would operate under the direction of the Board and act as an International Host Institution to which funding could be transferred and from which funding could be disbursed. The functions of the Coordination Center would be to provide advocacy and support to developing and operational LME projects. The Coordination Center might seek a formal affiliation with the IOC-Unesco through a proposal that would be submitted to the IOC Assembly in 2009.

Professor Hempel mentioned his involvement in earlier discussions (November 2007) with Qisheng Tang, Chidi Ibe, Kenneth Sherman and Michael O’Toole. The number of LMEs is increasing, and the LME approach has taken on more complexity with wider connections. The LME projects are structured around the funds provided by the GEF and are carried out by UN agencies. In the USA, the LMEs are under the NOAA umbrella; something similar is needed in the international sphere. On the initiative of Kenneth Sherman and others, mega-regional symposia have been held over the years and their proceedings have been published in the LME Elsevier series. More recently, continent-wide mega-regional alliances were proposed at the Pan-African LME Forum in 2006 in Cape Town and at the 9<sup>th</sup> LME consultation in 2007 in Paris, with Africa taking the lead with a Pan-African Alliance. The alliances and governing boards should foster the three big Cs: Communication, Collaboration, and Coordination, amongst the LMEs of the world. At present Africa takes the lead in the movement towards those alliances. On the global level, the annual LME consultation at IOC headquarters brings together the program leaders of the various LME projects worldwide, along with representatives of international organizations and scientists, to report on recent developments. All LME projects share the same overall concept, scientific language, scientific methodology, organizational structure, and UN support. It is time to develop more interaction between LME science and academia, natural and social scientists, science and

industry, and science and administration. There is a common global interest in further developing the theoretical and methodological basis of LMEs and strengthening the mega-regional alliances. A global umbrella for the LME movement is needed, that would be provided by the Coordination Board. The Board would support the LME Alliances; provide communication between the LME projects; cooperate in the development of the LME concept and methodology; transfer experience from the established LME projects to the new ones; speak in one voice to UN agencies and NGOs; and promote the LME approach at international scientific and political fora. The annual Consultative Committee meeting would be formalized into the structure of an LME Council. The LME Coordination Center would be the international focal area of the Board. The LME Board should have its first meeting in early 2009. This approach and structure could survive for a long time.

The group then discussed the need for good regional coordination among LME activities, and the tracking of project results. It was pointed out that the LME movement is among the strongest activities relating to WSSD goals, to the Convention on Biological Diversity, other conventions, and the Regional Seas Programme. The LME approach has a unique scientific basis. With GEF support, countries have moved towards the first ever ecosystem-based governance commissions for the Benguela Current and in the Guinea Current LMEs. The formalization of an international structure is a logical and sensible step in the evolution of the LME global process. The IOC-Unesco would not provide funding but might play the role of a coordinating mechanism. Funding is a primary consideration. The University of Galway's Marine Institute in Ireland is in discussion with LME experts to host the LME Coordination Center. It would look for funding to support its activities. A newly developed LME portal, funded by NOAA, is prepared to serve all LME projects and archive important LME documentation. It will also post the full text of the soon-to-be published UNEP LME Report. A significant amount of information has been produced by the LME projects. NOAA is committed to maintaining an LME Program in the United States. One group member warned against the Coordination Center being funded by individual countries as this was seen as a compromise of its independence. This was followed by a question regarding the role of the Coordination Center and whether it might be funded directly through the Global Environment Facility or the LME projects. In the future, all LME projects need to be evaluated. The LME Board could contribute to this process. It was believed that GEF might be in a position to offer seed money. The setting up of an LME Coordination Center could include a capacity building component. The question was raised of how to obtain long term funding. Perhaps the GEF Council could initiate a forum to bring prospective donors together to fund the LME International Coordination Center. Financial pledges might also come from private industry and companies depending on healthy LMEs for their business.

## **10. ASSESSMENT OF ASSESSMENT ACTIONS**

The United Nations has expressed interest in an "Assessment of Assessments" process for Global Reporting and Assessment of the state of the Marine Environment including socio-economic aspects. UNEP and IOC-Unesco are lead agencies for the process. The LME Program is contributing to the assessment.

## **10.1 THE ASSESSMENT OF ASSESSMENTS**

Julian Barbieri, of IOC-Unesco, reported that the Assessment of Assessments process was established by decision of the UN General Assembly. It represents an international initiative to improve our understanding of the oceans and to develop a global mechanism for delivering science based information to decision makers and the public. A group of experts was appointed by lead agencies in November 2006 and met in March 2007. The work plan was approved in June, 2007. The IOC and UNEP are the leading agencies for this process which will examine the landscape of existing assessments and best practices, to be submitted and published as a report in July 2009. The LME program has contributed to the assessments. The process, “for the global reporting and assessment of the state of the marine environment, including socioeconomic aspects”, has 3 phases or parts: Part 1 will assemble and evaluate existing assessments and obtain background information on 21 ocean regions that have been allocated between the experts. Part 2 will analyze the evaluations and establish criteria for assessing the scientific credibility, legitimacy, and relevance of these evaluations. Part 3 will develop a framework for the report, and options. The general idea is that it is important to have a global regular assessment of the oceans as a process for identifying gaps and creating synergies. Those who are being asked to participate in the process are governments, international organizations and NGOs. The activity has been methodical in its approach. The regions are addressing open oceans mainly through the work of GESAMP on marine pollution issues.

## **10.2 GESAMP AND THE ASSESSMENT OF ASSESSMENTS**

Fredrik Haag, based at the GESAMP office at IMO, London, reported on the activities of GESAMP that are of direct interest to LME projects and to the LME community. The Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) is a multidisciplinary scientific advisory body that was established in 1969. It is presently sponsored by 8 UN agencies, including IOC-Unesco, IMO, UNEP, FAO, WMO, IAEA, UNIDO and UNDOALOS. Although sponsored by UN agencies, all experts act in an individual, independent capacity. The Group has published 49 scientific reports on a range of issues. Fredrik Haag discussed GESAMP’s contribution to the Assessment of Assessments process and also its collaboration with the Transboundary International Waters Assessment (TIWAS) Project. GESAMP has established a task team of 7 scientists to perform a review of assessments related to marine pollution in the open ocean, including ship-based pollution and atmospheric inputs. The team produced a draft report in March 2008. The open ocean is difficult to study due to scale, variability, and remoteness. No comprehensive assessment of the state of the world’s open oceans has been made to this date. Some identified gaps are CO<sup>2</sup> and ocean acidification and their impacts on marine ecosystems; noise; the input of atmospheric nitrogen into the ocean and its effects; and ship exhaust emissions. GESAMP’s new chairman is Tim Bowmer. Larry Awosika and Sandor Mulsow are the new vice chairmen. Among the seven working groups within GESAMP that are active today are WG 35 (fisheries), WG 36 (mariculture in relation to the ecosystems approach); and WG 39, which is building a global database and assessment of pollution trends in sensitive coastal ecosystems through retrospective ecosystem analysis. GESAMP is developing ecosystem trend indicators on pollutant concentration and fluxes using the wealth of knowledge of radio-chronology in coastal marine sediments. The data on bottom sediments, corals and shells is of interest to the LME community. The Group has also developed a critical review of existing

methodologies for dating pollution records. A well defined sedimentary record, dated and associated with measured levels of organic and inorganic contaminants, is a powerful tool for evaluating and defining benthic habitats around the coastlines of the world. The Group is still building its pool of experts. The contacts for coastal ecosystem health are Professor J.A. Sanchez-Cabeza, IAEA Marine Environment Laboratories, Monaco; Salif Diop (UNEP); Pablo Huidobro (UNIDO); Julian Barbieri (IOC-Unesco) and Rene Coenen (IMO). The GESAMP website address is [www.gesamp.org](http://www.gesamp.org). GESAMP is funded by the Swedish Government and 8 UN agencies are providing in kind and technical support to the working groups.

## **11. GOOS AND GEOSS**

The Global Earth Observation System of Systems (GEOSS) is an international program that routinely and continuously provides quality controlled data and information on earth's current and future states. The Global Ocean Observing System (GOOS) is intended to be a permanent global system for observations, modeling and analysis of marine and ocean variables needed to support operational ocean services worldwide. GOOS is coordinated by the Intergovernmental Oceanographic Commission (IOC), World Meteorological Organization (WMO), United Nations Environment Programme (UNEP) and the International Council for Science (ICSU).

### **11.1 LME PROJECTS AND GOOS & GEOSS IN AFRICA**

Justin Ahanhanzo, of IOC-Unesco, discussed LMEs in relation to GOOS-Africa and GEOSS. Global systems cannot be fully realized without integrating local observations. Local environments cannot be adequately understood or predicted without data and information relating to the regional and global scales. In his presentation, the result of a consultation with African stakeholders, he described GOOS regional alliances (GRAs) and how they interface with LMEs to build advanced global and regional scale capability. The building of regional capacity will require South/South and North/South cooperation. LMEs are the chosen vehicles for regional funding of GOOS. The four LME projects in Africa (Canary Current, Guinea Current, Benguela Current, and Agulhas and Somali Current LME projects) need ongoing product development from scientists familiar with regional systems. GEONETCAST is a partnership between African LME projects, GOOS-Africa and GEOSS. Senegal is the GOOS focal point for the Canary Current LME; the University of Ghana for the Guinea Current LME; the National Marine Institute in Swakopmund, Namibia for the Benguela Current LME; and the Institute of Marine Sciences, Zanzibar for the Agulhas and Somali Current LME. The Regional Ocean Observing and Forecasting System (ROOFS Africa Project) involves several African countries in remote sensing of marine and coastal environments, ocean modeling and forecasting, monitoring of natural hazards and disasters, the prediction of climate variability, and the management of natural resources. The shared vision is of a complete and integrated African ocean observing and forecasting system in position and fully operational, to empower institutional and human capacity in Africa. The GOOS-Africa contribution is described in [www.earthobservations.org](http://www.earthobservations.org) and [www.sciencedirect.com](http://www.sciencedirect.com). A joint GOOS-Africa, LME and GEO Coastal Zone Community of Practice (CZCP) initiative will run a workshop in 2009 in the Guinea Current LME region. The funding needed is \$100,000 for attendance by 50 participants. The key factors for the success of the LME and GOOS-Africa partnership are a

strong grassroots approach, ownership and leadership of local and regional stakeholders, strong coordination between knowledgeable specialists and professionals from within the region, and positive synergy with established and ongoing programs and networks.

## **11.2 GLOBAL OCEAN INDICATORS: GOOS AND NORTH-SOUTH LME PARTNERSHIPS**

Ned Cyr, Chief of Marine Ecosystems Division, NOAA Fisheries Office of Science and Technology, described the contribution of the LME concept and its suite of indicators to GOOS. The LME projects are unique in their focus on regional conditions and drivers but similar to GOOS in terms of data collection. Each employs a 5-module approach with regard to data and information gathering. LMEs and GOOS have similar geographical locations, observations, regional scales, and a mutual emphasis on capacity building. GOOS Regional Alliance Regions are US GOOS, IOCARIBE GOOS, GRASP (West Coast of Latin America), EUROGOOS, GOOS-AFRICA, IOGOOS (Indian Ocean), SEAGOOS (South East Asia) and NEARGOOS (East Asia). Some GRAs, or GOOS regional alliances, are presently missing because of the absence of an LME project as in the Pacific Islands. However, the overall coverage is significant. The challenges for GOOS-Africa are the limited resources and need for capacity building. LME programs operate in African countries that are most in need of assistance for capacity building to initiate observing programs like GOOS. LME projects and GOOS are both intended to be permanent structures with sustainable funding by national institutions. LME projects and GOOS have a strong incentive to collaborate because of limited resources and a common emphasis on the regional scale and capacity building. In 2006, the participants of the LME Consultative Committee meeting agreed to provide GOOS and GEOSS with information on changing states of LMEs in relation to the five modules. Examples of overlapping observing requirements are currents, phytoplankton biomass and diversity, pollution, zooplankton species and biomass, commercial finfish species abundance and distribution, non exploited species abundance and distribution, top predators and extent of biologically structured habitats. Ned Cyr and Ken Sherman attended the third GOOS Regional Forum which took place in Cape Town in November 2006 and agreed that LMEs and GOOS should work together. The idea was that GOOS-Africa and the Benguela Current LME Program would implement an observations, data management, and modeling pilot project that would contribute to the development of both efforts. The GOOS Panel for Integrated Coastal Observations (PICO) held a meeting earlier this year. It recommended continuing to engage LME projects and encouraging interactions. The GOOS Regional Council will hold its meeting in Ecuador in November 2008. The LME community should be prepared to provide an update of GOOS-Africa activities with the Benguela pilot project. This could provide the basis for a strategy for extending LME partnerships in other relevant GRAs.

## **12. FORGING PARTNERSHIPS WITH LME PROJECTS**

There is an ongoing effort with UN agencies and NGOs to coordinate activities with the 16 GEF funded LME projects.

### **12.1 THE GLOBALLAST PROJECT**

Andrew Hudson, principal technical advisor at UNDP-GEF, described the joint GEF, UNDP and IMO Globallast Project, summarizing some of the current and future key challenges to the management of marine invasive species. A 50-minute video on the “Invaders of the Sea” has been produced by the BBC and IMO, which won an award as a documentary feature. He emphasized the need to better understand the nature and threat posed by invasive species. There is also a need for increased cooperation and coordination among oceans institutions and marine programs, and increased capacity to deliver marine biosecurity in developing regions. Shipping, which moves over 90% of world trade, is a major vector of marine invasions. The loading and unloading of cargo, and ballast water, are responsible for the introductions of known harmful alien species. The risk is accelerating, with 10 billion tonnes of ballast water transferred each year, and with particularly high numbers in Europe, the US West Coast, and SE Australia. The shipping industry is also a key stakeholder in LME management. Both trapped sediments and ballast water carry 7,000 species of microbes, plants and animals. GloBallast is the result of a catalytic GEF intervention, which had the foresight to include the threat of invasive species among its 4 priorities. The ballast program is now in its second phase (2008-2012). Its main focus is a governance approach that encourages legal, policy, and institutional reforms. LMEs and GloBallast can jointly build capacity to address invasive species as a priority issue in project TDAs and jointly develop economic policies and tools for integrating ballast water management into a wider policy framework. The project has a very effective public awareness component. It is undertaking biological baseline surveys in sensitive port areas which it is willing to share with LME projects. The maritime industry should be involved in LME discussions, and the issue should be highlighted in the LME projects. The principal contact is Jose Matheickal, Chief Technical Adviser, at [jmatheic@imo.org](mailto:jmatheic@imo.org).

## **13. THE AFRICAN SESSION--A WAY FORWARD FOR AFRICAN LARGE MARINE ECOSYSTEMS, AND GOOS-AFRICA**

The goal of the African session was to review the achievements and progress of African LME projects and their cooperation with GOOS-AFRICA, followed by proposed actions for reinforcing cooperation with IOC/UNESCO, UNEP, UNIDO, FAO, GEF, and UNDP. Dr. Kenneth Sherman (US-NOAA) and Professor Gotthilf Hempel (Kiel, Germany) chaired the session. The rapporteurs were Justin Ahanhanzo (IOC/UNESCO/GOOS-AFRICA) and Andrew Hudson (UNDP-GEF). In the summary discussions, due to a weak representation of regional representatives from the African LMEs at the 10<sup>th</sup> Consultative Committee Meeting, Mr. Ahanhanzo invited the group to consider using the African Session to explore ways to increase participation and contributions from the regional LME leaders and programs managers. He highlighted the strong coherence between LME projects and programs in Africa and GOOS-AFRICA. LME projects in Africa have attained a critical stage in need of support. Dr. Bradford Brown identified the establishment of the two Commissions

(in the Benguela Current and Guinea Current LMEs) as the major outcomes of the LME programs to date. Dr. David Vousden, the independent evaluator of BCLME and now the ASCLME Project Manager, highlighted a significant improvement in the scientific understanding of the functioning of the BCLME. Dr. Andrew Hudson reported that the second phase of the BCLME Project has been submitted for CEO endorsement and should receive it soon. The BCLME Project Part 2 is scheduled for implementation in the Fall of 2008. Professor Gotthilf Hempel noted the precarious state of the BCLME in this transition stage from a project to a country-owned Commission with the requisite financial and other commitments needing to be met. The group discussed its overall concern with the key transition step from interim to full Commissions in both the GCLME and BCLME. The group called upon national Governments and the implementing and executing agencies to reinforce regional coordination, leadership and ownership in support of the established Commissions and ongoing LME projects.

The 10<sup>th</sup> Consultative Committee Meeting expressed appreciation of the high level of cooperation established between the African LME projects and the positive synergy of GOOS-AFRICA, which reinforces regional cooperation in Africa and with international agencies including IOC-UNESCO, UNIDO, UNDP, UNEP, FAO, GEF and The World Bank. Successful results came from the GOOS-AFRICA/LME Leadership Workshop on Operational Oceanography and Satellite Remote Sensing, and from the Third Forum of the GOOS Regional Alliances organized at the University of Cape Town in 2006. The 10<sup>th</sup> Consultative Committee Meeting supported the proposed joint LME/GOOS-AFRICA initiative to hold a Pan-African Workshop on the framework of the Group on Earth Observations (GEO) Coastal Zone Community of Practice (CZCP) in 2009 in Accra, Ghana. The leaders of African LME Projects might consider joining the Scientific Committee of the GEO/CZCP Workshop, as the workshop is conceived to meet key LME objectives.

The meeting expressed some concern regarding the progress of the Guinea Current LME Project, presently funded at \$50 million and at a critical juncture. The three agencies involved in the project are UNDP, UNEP and UNIDO. The Steering Committee meeting has been postponed in order to review the results of a mid term evaluation. The Guinea Current Commission was established with the enthusiastic support of government ministers. The Guinea Current Commission is a significant achievement which needs to continue in the right direction. After a slowdown of activities at the end of 2007, activities in the Guinea Current LME project are now resuming. The UNDP and UNEP have encouraged UNIDO to fill the leadership gap and recruit a program director in a transparent process over the next 2 or 3 months.

#### **14. OUTREACH ACTIVITIES OF THE LME PROGRAM OFFICE**

Marie-Christine Aquarone briefly described some of the outreach efforts of the Large Marine Ecosystems Program Office in 2008. Outreach and educational activities included the distribution of 2 DVDs (“Turning the Tide--Sustaining Earth’s Large Marine Ecosystems” and “Africa on the Cutting Edge”), a DVD booklet based on the “Turning The Tide” DVD, a booklet on the problem of nutrient over enrichment of LMEs from river runoff, and the development of the LME Portal. The outreach materials have been successfully tested in schools, with the general public, stakeholders, policy makers, and the media. An October 27,

2007 event at the University of Rhode Island brought together 50 New England school teachers to celebrate 200 years of NOAA science. Classroom discussions focused on the LME 5-modular approach and what can be done about ecosystem degradation (e.g. fisheries habitat, pollution). The keynote and workshop presentations by scientists are available on the LME website and on the Office of Marine Programs website at: <http://omp.gso.uri.edu/omp/nbc/oceansalacarte.htm>. Featured presentations include: "How to Study Primary Productivity in the Oceans from Space", "Primary Productivity in a Large Marine Ecosystem", "Fisheries and the Northeast US Shelf Large Marine Ecosystem", "Ecosystem Based Fishery Management", and "Assessing Pollution in Large Marine Ecosystems". In response to growing interest in capacity building for the next generation of LME specialists, a pilot course of university level training in LME assessment and management is under preparation using the five module LME strategic framework (productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance). The syllabus is being developed in collaboration with Dr. Obinna Chukwu, Head of the Department of Marine Sciences, University of Lagos.



**ANNEX I**  
**AGENDA**

**DAY 1 - 8 July 2008**

<b>TIME</b>	<b>TOPIC</b>	<b>SPEAKER</b>
9:00 am - 12:30 pm	IOC Welcome & Marine Ecosystems Overview	Patricio Bernal
	Report from IUCN; Upcoming Barcelona Congress; Joint IUCN/NOAA LME Outreach	James Oliver
	<b>LME PROJECT STATUS</b>	
	Summary of Conditions from Fast Warming LMEs: Baltic Sea LME Indicators	Jan Thulin
10:30 am - 10:45 am	<b>COFFEE/TEA</b>	
	Indicators of Ecological Conditions in the West Bering Sea LME	Gennady Matishov
	Implementation of 5 Module Indicators in the Agulhas Current LME & Somali Current LME	David Vousden
12:30 pm - 1:30 pm	<b>LUNCH</b>	
1:30 pm - 5:00 pm	Mediterranean Sea Project Update	Virginie Hart
	Progress with the G8 Promotional Film & the Next Steps	Tony Ribbink Marjolein Duermeijer
3:30 pm - 3:45 pm	<b>COFFEE/TEA</b>	
	APEC Map and 5 Module Indicators; PAME Activities	Marie-Christine Aquarone
	Application of Ecopath with Ecosim in the Context of Climate Change	Villy Christensen
5:00 pm	<b>ADJOURN</b>	

**DAY 2 - 9 July 2008**

<b>TIME</b>	<b>TOPIC</b>	<b>SPEAKER</b>
<b>9:00 pm - 12:00 pm</b>	<b>LME PROJECT STATUS</b>	
	Status Report on the Canary Current & Bay of Bengal LMEs	Merete Tandstad
	<b>CAPACITY BUILDING FOR THE NEXT GENERATION</b>	
	Capacity Building for the Next Generation of LME Practitioners, Scientists, & Policy Makers	Gotthilf Hempel
	Toward a Permanent LME International Secretariat	K. Sherman, T. Laughlin, N. Cyr
<b>10:30 am - 10:45 am</b>	<b>COFFEE/TEA</b>	
	<b>ASSESSMENT OF ASSESSMENTS ACTIONS</b>	
	The Assessment of Assessments	Julian Barbieri
	GESAMP & the Assessment of Assessments	Fredrick Haag
	GEF-UNDP-IMO GloBallast Programme: Forging Partnerships with LME Projects	Andrew Hudson
<b>12:00 pm - 1:00 pm</b>	<b>LUNCH</b>	
<b>1:00 pm - 5:00 pm</b>	LME Projects & GOOS & GEOSS in Africa	Justin Ahanhanzo
	Global Ocean Indicators : GOOS & North-South LME Partnerships	Ned Cyr
<b>3:30 pm - 3:45 pm</b>	<b>COFFEE/TEA</b>	
	Africa Session - A Way Forward for LMEs	G. Hempel K. Sherman
	Public Awareness: The LME Network for Education & Outreach	Marie-Christine Aquarone
	Roundtable Discussion/Planning Session 2008-2010, Including New Projects	ALL
<b>5:00 pm</b>	<b>ADJOURN</b>	

ANNEX II

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### ANNEX III

#### Communication from the LME Consultative Committee to the Government of Norway, FAO and the EAF Nansen Project administration

The LME Consultative Committee refers to the FAO/Government of Norway Cooperative Programme on **Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries** (hereafter referred to as the EAF Nansen Project)

The Consultative Committee recognizes the valuable partnership which has been forged between the LME Projects of the African Continent and the EAF Nansen Project. The Consultative Committee further notes the important co-funding agreements reached between the Government of Norway, the EAF Nansen Project and the various GEF-funded LME Projects in Africa in terms of the use of the research vessel 'Dr. Fridtjof Nansen'.

The Consultative Committee now notes with concern the impact of increased global fuel costs which may effectively raise the daily cost to the LMEs of the research vessel 'Dr. Fridtjof Nansen'. As the GEF budget for these LME projects is fixed, this would result in a reduction in the number of days available to the LME projects for ship-based scientific data collection. This data collection is essential for the development of the Transboundary Diagnostic Analyses which provide the foundation to the Strategic Action Programmes that drive the LME management process. The long-term implications of such actions would represent a threat to the adoption of such sustainable ecosystem-based management strategies and thus to the future ecosystem stability and welfare of the African coastal countries.

The Consultative Committee therefore urges the Government of Norway and FAO to give serious consideration to maintaining the original co-funding agreements with the existing African LME Projects now under implementation in terms of the cost-per-day of access to the 'Dr. Fridtjof Nansen', and to indicate this decision to the parties involved at the earliest opportunity in order to facilitate effective further planning by the LME projects.

Paris, 8<sup>th</sup> July 2008.



ANNEX IV

**LIST OF ACRONYMS**

<b>AMPS</b>	Arctic Marine Strategic Plan
<b>APEC</b>	Asian-Pacific Economic Cooperation
<b>ASCLME</b>	Agulhas and Somali Current LME Project
<b>BSLME</b>	Baltic Sea Large Marine Ecosystem
<b>BOBLME</b>	Bay of Bengal Large Marine Ecosystem
<b>BCC</b>	Benguela Current Commission
<b>BCLME</b>	Benguela Current Large Marine Ecosystem
<b>BSLME</b>	Baltic Sea Large Marine Ecosystem and Eutrophication
<b>CCLME</b>	Canary Current Large Marine Ecosystem
<b>CEM</b>	Commission on Ecosystem Management
<b>CZCP</b>	Coastal Zone Community of Practice
<b>EAM</b>	Ecosystem Based Approach to Management
<b>ECOPATH</b>	Mass-Balance Food Web Modeling Using “ECOSIM”
<b>EUROGOOS</b>	Regional Alliance for Europe of Global Ocean Observing System
<b>FAO</b>	Food and Agriculture Organization (UN)
<b>GCLME</b>	Guinea Current Large Marine Ecosystem
<b>GEF</b>	Global Environment Facility
<b>GEOSS</b>	Global Earth Observation System
<b>GEONETCAST</b>	Group on Earth Observations Global Network of Satellite
<b>GESAMP</b>	Group of Experts on Scientific Aspects of Marine Environmental Protection
<b>GOOS</b>	Global Ocean Observing System
<b>HAB</b>	Harmful Algal Bloom
<b>HELCOM</b>	Helsinki Commission
<b>IAEA</b>	International Atomic Energy Agency
<b>ICES</b>	International Council for the Exploration of the Sea
<b>ICSU</b>	International Council for Science
<b>ICZM</b>	Integrated Coastal Zone Management
<b>IMO</b>	International Maritime Organization
<b>IOC</b>	Intergovernmental Oceanographic Commission
<b>IOCARIBE</b>	IOC Sub-Commission for the Caribbean and Adjacent Regions
<b>IOOS</b>	Integrated Ocean Observing System
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>IUCN</b>	World Conservation Union
<b>JSOST</b>	Joint Subcommittee on Integrated Management of Ocean Resources
<b>LME</b>	Large Marine Ecosystem
<b>MAP</b>	Action Plan for the Mediterranean Sea
<b>MMBI</b>	Murmansk Marine Biological Institution
<b>MRCWG</b>	Marine Resource Conservation Workshop Group
<b>NASA</b>	National Aeronautics and Space Administration
<b>NEARGOOS</b>	North-East Asia Regional of Global Ocean Observing System
<b>NEPAD</b>	New Partnership for Africa’s Development
<b>NGO</b>	Non Governmental Organization
<b>NMFS</b>	National Marine Fisheries Service

<b>NOAA-NMFS</b>	National Oceanographic and Atmospheric Administration – National Marine Fisheries Service
<b>NORSEPP</b>	North Sea Pilot Project
<b>ORSTOM</b>	Institut Français de Recherche Scientifique pour le Développement en Coopération
<b>PAME</b>	Protection of Arctic Marine Environment
<b>PEMSEA</b>	Partnership in Environmental Management for the Seas of East Asia
<b>PERSGA</b>	Project of the Red Sea and Gulf of Aden
<b>ROOFS</b>	Regional Ocean Observing and Forecasting System
<b>SAFMAMS</b>	Scientific Advice for Fisheries Management and Multiple Scales
<b>SEAGOOS</b>	South-East Asian of Global Ocean Observing System
<b>SEAMAP</b>	South-East Area Monitoring and Assessment Program
<b>SIDA</b>	Swedish International Development Cooperation Agency
<b>SOOP</b>	Baltic Ship of Opportunity Program
<b>SWIOPF</b>	Southwest Indian Ocean Fisheries Project
<b>TEMA</b>	Training, Education and Mutual Assistance
<b>TIWAS</b>	Transboundary International Waters Assessment
<b>UNDOALOS</b>	United Nations Division of Oceans Affairs and Law of the Sea
<b>UNDP</b>	United Nations Development Program
<b>UNEP</b>	United Nations Environment Program
<b>UNESCO</b>	United Nations Educational Scientific and Cultural Organization
<b>UNIDO</b>	United Nations Industrial Development Organization
<b>WIOLAB</b>	Land Based Activities in the Western Indian Ocean
<b>WMO</b>	World Meteorological Organization
<b>WSSD</b>	World Summit on Sustainable Development
<b>WWF</b>	World Wild Fund
<b>YSLME</b>	Yellow Sea Large Marine Ecosystem