

Intergovernmental Oceanographic Commission  
Reports of Meetings of Experts and Equivalent Bodies



IOC-IUCN-NOAA  
Consultative Committee Meeting  
on Large Marine Ecosystems

15th Annual Session  
Paris, France  
10 – 11 July 2013

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## INTRODUCTION AND IOC WELCOME

**Wendy Watson-Wright**, Executive Secretary of the Intergovernmental Oceanographic Commission and Assistant Director General of Intergovernmental Oceanographic Commission (IOC) - United Nations Educational, Scientific and Cultural Organization (UNESCO), welcomed the 48 participants and indicated that IOC was delighted to host the annual Large Marine Ecosystem (LME) Consultative Meeting for the 15<sup>th</sup> time (her fourth year). She commended the National Oceanic and Atmospheric Administration (NOAA), International Union for the Conservation of Nature (IUCN), United Nations Development Program (UNDP) and Global Environment Facility (GEF) for catalysing the implementation of the LME projects and especially thanked the tireless efforts of Dr Kenneth Sherman.

Watson-Wright reported on the linked LME Conference and American Association for the Advancement of Science (AAAS) Symposium held recently in Boston, USA (Feb 2013), which she attended. The LME Conference and AAAS Symposium brought together speakers from the world's top financial, scientific, and technical institutions engaged in sustainable development of the ocean to discuss the recovery of stressed LMEs during climate change. She was pleased that during the Conference the GEF CEO expressed renewed interest for international waters, emphasizing how sustainable development of the ocean plays a fundamental part in GEFs role as a champion of LMEs. NOAA Administrator, Jane Lubchenco, in her presentation to the Conference, stressed that the key elements for achieving healthy oceans must include partnerships among the many sectors undertaking activities in the ocean along with cross-sectoral indicators of health.

Watson-Wright indicated that the Conference was an excellent lead-up to the LME Global Governance Project. She pointed to the recent approval by the GEF for the new LME Global Community of Practice Project, which will harness and coordinate much of the knowledge in LMEs including their marine protected areas (MPAs). She indicated the IOC will help define the objectives of the project and continue to improve governance in the LMEs through the application of additional knowledge on climate change, ocean acidification and new tools for Marine Spatial Planning (MSP). Watson-Wright indicated that this is the missing piece of the puzzle, as it will harness the vast amount of knowledge accumulated in the last 20 years in LMEs, as well as in Integrated Coastal Management (ICM) and MPA projects funded through the GEF. This project development process will be led by the IOC together with its key partners including the International Council for the Exploration of the Seas (ICES). Watson-Wright stated that IOC looks forward to leading this process together with their partners. The Secretariat will be hosted at the IOC-UNESCO Paris office. She concluded by saying that the Transboundary Waters Assessment Program (TWAP) project was well underway and in the process of comparison of status indicators in 64 LMEs worldwide and that the project will be peer-reviewed next year. Watson-Wright emphasized that IOC-UNESCO is counting on partners and the LME project managers to help define the objective of this new project for "accumulated practice". These efforts will build on the existing consultative process, offering new tools for triggering incremental change and improving governance, within LMEs and amongst LMEs. Watson-Wright thanked the LME community for the excellent work being done and wished the group an excellent meeting.

**Jorge Luis Valdes**, Head of the Ocean Science Section at IOC-UNESCO, also welcomed participants on behalf of IOC and indicated that the IOC is pleased to continue hosting the annual LME Consultative Committee meeting. The LME movement has been a success story under the leadership of Kenneth Sherman and that much had been achieved and implemented with GEF support. He emphasized the fact that the IOC had become much more engaged in recent years with the LMEs and was now involved in a project with the Canary

Current LME and the Ocean Health Index with LMEs as the unit for comparison. IOC will also coordinate the new LME-GEF Community of Practice (CoP) Project, which is synthesizing and coordinating lessons learned and capacity building across all 64 LMEs with 21 LME projects funded by the GEF. Valdes wished the group an excellent two days of meetings on behalf of IOC-UNESCO.

## **RECOVERY AND SUSTAINABLE DEVELOPMENT OF LMEs**

### **Recovery and Sustainability of LMEs During Climate Change**

**Kenneth Sherman**, Director of NOAA's Large Marine Ecosystem Program, spoke on the *Recovery and Sustainability of LMEs During Climate Change* and focused his talk on areas at high risk. He emphasized how much of the world's ocean productivity and services are concentrated at the edges of continents. LMEs are areas with the highest levels of ocean productivity and eighty percent of marine fisheries yields are produced within the boundaries of LMEs. This is also where urban centers, habitat degradation, pollution, overfishing, and nutrient over enrichment of ocean waters are most pronounced and in need of recovery action. To address such challenges, Sherman outlined the five-modular LME assessment and management practices. He indicated we are experiencing an ecosystem paradigm shift that is moving forward from single-species management to multi-species and holistic approaches incorporating the human dimension as part of the LME recovery process. A 5-module framework - productivity, fish and fisheries, pollution and ecosystem health, socioeconomics, and governance - approach is used to connect the best available science to socioeconomic dimensions of human activities for use in adaptive management decisions.

The total GEF funding for 21 LME projects in 110 countries reached a level of \$3.1 billion and by 2020 Sherman would like to see that double to \$6 billion based on good performance of the present funded projects. He described the greatest current need in LMEs is the training of 10,000 practitioners in the ecosystem approach through a certification program. Currently, an estimated 2,500 LME experts and practitioners exist worldwide. To train thousands of others, Sherman recommended large-scale interactive programs via the web, in massive open online courses (MOOC) to train and certify LME practitioners.

Sherman drew attention to global warming trends in LMEs and the projected decline in primary productivity in lower latitudes with serious consequences for fisheries. Modeling results indicate that there will be an increase in primary productivity in subpolar areas with losses of sea ice and warming surface waters. Developing countries from 20 degrees N to 20 degrees S will likely be negatively impacted by lower primary productivity due to increasing stratification of the upper water layers. If projections hold true, food security in 14 LMEs will be at risk from reduced levels of primary productivity and fish. In these LMEs, the average length of fish in the catches is declining. Sherman said this is a very serious issue and could lead to a tipping point. He stressed the importance of planning precautionary actions for protecting fisheries stocks in these LMEs where food security is extremely important.

### **J.F. Kennedy Library Conference Perspectives**

**Sherman** described highlights from the recent high-level Conference on LME science and finance, held at the JFK Presidential Library and Museum in Boston, MA, USA, on 16 February 2013. A linked LME Symposium was also convened in Boston on 17 February during the annual American Association for the Advancement of Science (AAAS) Conference. The Conference at the JFK Library on *"Stress, Sustainability and Development of Large Marine*

*Ecosystems during Climate Change*” focused on the international partnerships supporting the global effort underway for improving the health of LMEs at risk from climate change and other stressors. It was attended by a unique cross section of scientists, government experts, educators, and the public with talks from leaders from NOAA, GEF, ICES, UNDP, and IOC-UNESCO. The deliberations are to be published shortly as a book, including chapters and titles by:

- **Jane Lubchenco**, NOAA: “*Large Marine Ecosystems at the Leading Edge of Global Tipping Points.*”
- **Naoko Ishi**, GEF: “*GEF Support Toward Sustainable Development of Large Marine Ecosystems.*”
- **Anne Christine Brusendorff**, ICES: “*Accelerated Warming and Sustainability of the Baltic Sea Large Marine Ecosystem.*”
- **Veerle Vandeweerdt** and **Andy Hudson**, UNDP: “*Transforming Markets and Catalysing Finance to Restore and Protect the World’s LMEs*” and “*Catalyzing Ocean Finance.*”
- **Wendy Watson-Wright**, IOC-UNESCO: “*LME Assessment and Management Strategies for Coastal Oceans.*”
- **Barry D. Gold**, Moore Foundation: “*LMEs and Marine Spatial Planning.*”
- **Sandra Whitehouse**, Ocean Conservancy: “*Marine Spatial Planning Applications for LME Management in North America.*”
- **Antonio J. Diaz-de-León-Corral** and **Salomon Diaz-Mondragon**. Pacific Central American LME: “*Marine Spatial Planning and LMEs in Mexico*”.
- **Hashali Hamukuaya**, Benguela Current Commission: “*Science to Governance in the Benguela Current Large Marine Ecosystem.*”
- **Yihang Jiang**, UNDP-GEF Yellow Sea LME Project: “*Carrying Capacity of the Yellow Sea LME for Achieving Sustainability.*”
- **Michael Akester**, UNDP-GEF Humboldt Current LME Project: “*The Resilience and Robustness of the Humboldt Current LME.*”

### **Monitoring and Assessment Practices for the Humboldt Current LME**

**Michael Akester**, Regional Project Coordinator for the Humboldt Current Large Marine Ecosystem (HCLME) Project, began his presentation to the Consultative Committee by indicating this was an exciting time for the HCLME Project because the International Court of Justice is close to its decision on maritime boundaries to resolve boundary disputes between two HCLME countries, Chile and Peru. Once boundaries are legally resolved by the International Court, transboundary efforts will proceed with the HCLME Project. Another legal and governance uncertainty surrounds the constitutionality of separating the Peruvian fishing fleet with exclusive fishing zones for the artisanal fleet that exclude the industrial large fleet (Presidential Decree 005-2012). Recently, the Superior Court of Lima ruled that such fleet separation is unconstitutional. This case continues with court appeals. Its outcome will impact anchovy fisheries in the HCLME. As Peruvian law currently stands, no fishing limit is imposed on anchovy caught by the artisanal fleet. This artisanal fleet uses purse seine nets that are non-selective gear, leading to juvenile and non-target species catch and discards. The lack of regulations means that Marine Stewardship Council (MSC) certification of the artisanal fishery is as yet not possible as indicated by a pre-assessment.

Akester reviewed some of the goods and services provided by the HCLME. He indicated the HCLME contains some of the world’s most productive fisheries, producing 12 million metric tonnes per year, as well as generating the highest global production of fishmeal. Mariculture is currently thriving in Chile but has not been fully developed in Peru. Akester said there is great

potential to develop pharmaceuticals from macroalgae and excellent potential for tourism in Peru. He described a Peruvian alternative to the Galapagos as a tourist destination and the development of new sport fishing enterprises.

In recounting the status of the goods and services of the HCLME, Akester described how overfishing, climate change, and pollution are degrading these goods and services. Anthropogenic stresses, red tides, Harmful Algal Blooms (HABs), coastal erosion, and sedimentation are all on the rise and climate change is also having an impact on the LME—as increased precipitation contributes more runoff. Peru fish stock assessments completed in April 2013 show that sea surface temperature anomalies, and salinities impact the anchovy populations, as does fishing pressure. Wind speeds and coastal upwelling are also increasing with climate change, resulting in productivity changes from an expanding Minimum Oxygen Zone (MOZ) and lower pH. The 2013 stock assessment recommended reducing fishing pressure to allow for continued anchovy recovery from historical overfishing and other environmental stressors.

Unlike most LMEs, increased ocean upwelling from climate change is causing sea surface temperatures to decline in the upwelling zone, especially along Peru. Climate change predictions for the region to 2100 show a steady decline in anchovy landings with negative consequences for the marine food-chain, largely due to changes in upwelling regimes.

There is currently a large-scale oxygen deficiency in the Eastern Pacific as the MOZ intensifies and comes closer to the surface. This MOZ is impacting marine life and sonar is a useful tool for detecting affected species. This issue may lead to more government-funded research.

Several good practices are underway to improve the wellbeing of the HCLME including the establishment of MPAs to prevent fishing and the promotion of direct human consumption of fish—especially for anchovy. The HCLME Project is also working with the certification of fishmeal and fish oil producers, the creation of an innovative waste recycling at a nitrogen producing facility, and various education programs in area schools.

In conclusion, Akester explained that threats from anthropogenic impacts are increasing and climate change is leading to intensified upwelling in the HCLME. Natural productivity cycles in the HCLME are complicated by the expanding MOZ and red tides/HABs are increasing due to land-based pollution. He said good management practices and EBM are being put in place but the positive impacts of these actions may not be readily detectable for several years. The GEF-UNDP HCLME project is working to quantify these changes and establish a holistic, ecosystem-based management approach to mitigate the negative change by increasing MPA coverage, promoting sustainable fisheries via certification schemes, and reducing coastal contamination.

### **Impacts of Global Warming on Fisheries in LMEs**

**Daniel Pauly**, of the Sea Around Us Project at the University of British Columbia, gave a thought provoking talk on global warming and fisheries. Pauly highlighted the fact that poleward movement of fish was already taking place as a result of sea temperature rise. He presented data on the analysis of temperature and fish species in all LMEs over the last 50 years which indicated that the mean temperature of fish in trawl catches can be calculated and used in modelling of projected shifts in species due to warming of the oceans. He presented a new indicator that is unique to each species, named the “Mean Temperature of Catch” (MTC) indicator. Combining the MTC with geo-referenced fisheries catch data, which the Sea Around Us Project has for every year since 1950s, Pauly showed climate-induced shifts in the distribution ranges of fishes by LMEs in North America, South America, Europe, Asia, and Africa. This work is recently published: Cheung, W.W.L., R. Watson and D. Pauly. 2013. Signature of ocean warming in global fisheries catches. *Nature* 497: 365-368.



Overall for LMEs, Cheung *et al.* (2013) indicated that:

- MTC has increased more regularly than temperature itself.
- MTC increased at rate of 0.19 degrees Celsius per decade.
- Change in tropical waters should be asymptotic with warming occurring rapidly during the first decade and then ceasing once subtropical species leave. The first fish to leave tropical waters are subtropical fish, and after one or two decades only tropical fish remain and the ecosystem is stable (without subtropical species).
- In temperate and cold waters, warm-water fish replace cold-water fish, which is expected to continue in the future.
- In tropical waters, a decline is followed with no replacement. Historical data shows that such changes have already happened in tropical waters, which is worrisome because we will only see local extinctions and future declines in tropical waters without fish movement or replacement.
- These trends are observed in 30+ years of historical data (1970 to 2006), supported by model predictions from MTC and climate change analyses.

Tropical changes already observed are likely irreversible with serious implications for fisheries. Pauly discussed how increases in water temperature may limit the size of fish species due to less oxygen in the water that restricts gill size. Fish sizes tend to be smaller in warmer temperatures. As a result of global warming, the productivity of stocks decrease.

Looking towards the future of fisheries management, fisheries are going to be more of a management challenge and require greater policy flexibility because of shifting distributions with climate change. It will likely become increasingly difficult to manage fish stocks due to shifting populations and migrations out of traditional areas. Conventional fisheries policies often involve time-consuming negotiations and decision processes (e.g., the fixed locations of MPAs or regional arrangements for stock quotas), which are unsuited to rapid adaptive responses from environmental dynamics that oceans are already experiencing. Pauly summarized that we all end up losing with global warming.

### **ICES Working Group on LME Best Practices Report for 2013**

**Hein Rune Skjoldal and Nico Willemse** provided a comprehensive report from the ICES Working Group on LME Best Practices (WGLMEBP) Meeting that was held at IOC on Monday afternoon (7/8) and all day Tuesday (7/9). The main items on the agenda included:

- Review lessons and practices in Integrated Ecosystem Assessments (IEA).
- Presentations by ICES on their Science Plan and experiences of IEAs in ICES areas.
- Presentations on work on the Arctic LMEs.
- Presentations by LMEs, including one on capacity building for the Ecosystem Approach to Fisheries management and emphasizing lessons learned.

Two presentations given by ICES (Wojciech Wawrzynski and Mark Dickey-Collas) focused on the new ICES Science Plan and the IEA work taking place in ICES areas. This has resulted in the establishment of more regional working groups looking at integrated ecosystem assessments in places like the Baltic Sea, NW Atlantic and Celtic Sea/Biscay shelf areas. In relation to the Arctic LMEs, sixteen have now been identified. These modifications bring the total number of official LMEs to 66 – all of the existing 64 plus new additions for the Aleutian Islands (LME #65) and the Canadian High Arctic – North Greenland (LME #66). The Consultative Committee meeting formally approved these revised Arctic LME boundaries and highlighted the Protection of the Arctic Marine Environment (PAME) 2013 report that details Arctic LME boundary revisions ([www.pame.is](http://www.pame.is)). To create LME maps and figures with new Arctic

boundaries, Dr. Ken Sherman at NOAA will take the lead and make updated maps available through the NOAA LME website: [www.lme.noaa.gov](http://www.lme.noaa.gov). The newly approved maps can be viewed in Annex 4.

With regard to other LMEs, most are looking at developing IEA and indicators in relation to the five LME modules. In the case of the Benguela Current LME (Nico Willemse) it is beginning to incorporate socio-economics and governance into its assessments. The Caribbean LME (Patrick Debels) involves intensive stakeholder consultations, and identity of key players, roles and functions as well as causal chain analysis and SAP development. The ASCLME (Lucy Scott) is also focusing on governance and the establishment of alliances and partnerships. In the case of the Bay of Bengal LME (Rudi Hermes) significant investment is being made in EAF training which is participatory and a collective learning process through specialised workshops. WGLMEBP meeting deliberations will be published shortly as a report, co-authored by Skjoldal and Willemse.

Skjoldal and Willemse concluded with a way forward for the WGLMEBP, emphasizing:

- (1) Definition of terms, IEA and the relation between LMEs, eco-regions, and ICES areas.
- (2) Definition of the term “integrated” (vertical and horizontal) to discuss sectors, geographic scales, natural, social and economic environments, and institutions. This recommendation applies to scientists, planners, managers, and policy makers.
- (3) Activities for the WGLMEBP:
  - a. To review methodologies, approaches and experiences gained from the ICES area, and LME projects in other geographical regions;
  - b. To review experiences in the use of indicators in the ecosystem context.
  - c. To consider pilot activities to test the IEA approach: opportunity exists with the BCLME (support from EAF-*Nansen*) and other LMEs with SAPs;
- (4) Draft new Terms of Reference (ToR) for the WGLMEBP by 15 August 2013 and share this draft for review and comment;
- (5) Draft the report of the WGLMEBP for 2013 by 15 August 2013 and share this draft for review and comment.

### **The Transboundary Waters Assessment Program (TWAP)**

**Sherry Heileman**, UNESCO-IOC coordinator of the TWAP LMEs Component, outlined the objectives of the Transboundary Waters Assessment Program (TWAP). She summarized the TWAP timeline, as well as its formalised partnerships with key institutions. TWAPs target audience includes the GEF and GEF LME projects, UN Member States, potential donors, and others.

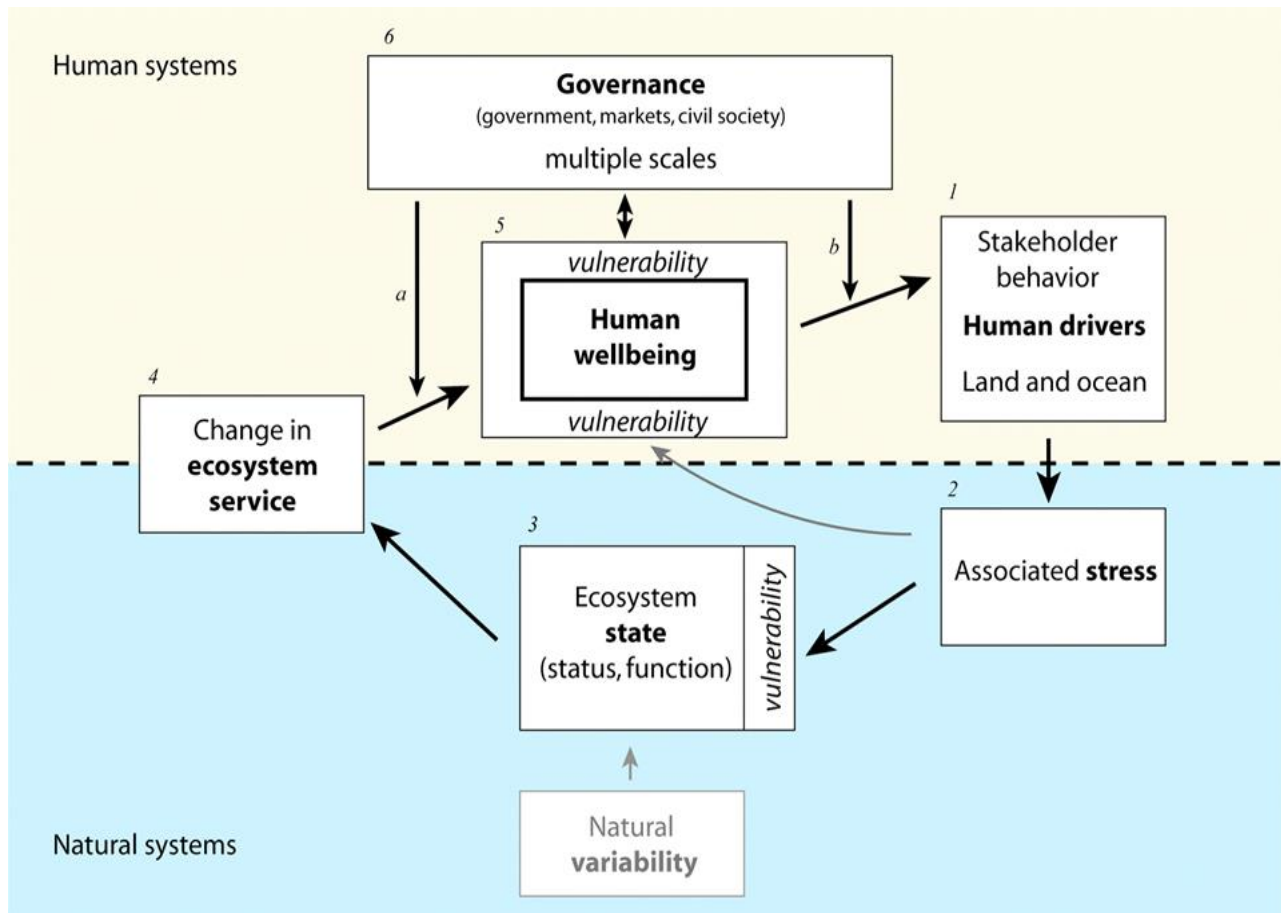
<b>TWAP Timeline</b>	
2009-2010	Medium size project to develop assessment methodologies for 5 transboundary water systems (LMEs, open ocean areas, aquifers, lakes/reservoirs, river basins).
2011	Preparation and approval of a program information (PIF) document
2012	Project preparation grant to develop full size project document
2012 (Dec)	Project approved by GEF
2013 (Jan)	Project start (LMEs inception workshop in March)
2015 (March)	Project completion

The TWAP's two key objectives are:

- (1) To undertake the first global baseline assessments (Level 1) of transboundary water systems through a formalized consortium of partners, that will assist GEF and other international organizations to improve the setting of priorities for funding allocations and track the impacts of their interventions, and
- (2) To formalize a partnership with key institutions for periodic assessments of transboundary water bodies.

The LMEs assessment, which covers all LMEs and the Pacific Warm Pool, is a global comparative baseline assessment using a suite of indicators and modeling approaches. The assessment conceptual framework that integrates the natural and human systems is shown in Figure 1 and the five assessment themes and indicators in Figure 2. Full details of the assessment methodology are given in the IOC-UNESCO 2011 report, entitled “*Methodology for the GEF Transboundary Waters Assessment Program. Volume 5. Methodology for the Assessment of Large Marine Ecosystems*,” published by UNEP. A more detailed assessment (level 2) is being considered for the Bay of Bengal (BoB) LME, through the GEF BoB LME project. Heileman also indicated that the analysis will determine which LMEs are under greatest threat, and what are the human implications and emerging issues of critical importance. The presentation provided an outline of the TWAP LMEs assessment report and chapters.

**Figure 1: TWAP LMEs and Open Ocean Conceptual Framework**



**Figure 2: TWAP LME Indicators**

Productivity	Fisheries	Pollution and Ecosystem Health	Socioeconomics	Governance
<ul style="list-style-type: none"> <li>• Chlorophyll</li> <li>• Primary productivity</li> <li>• Sea surface temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Annual landings and value</li> <li>• Marine trophic index</li> <li>• Stock status</li> <li>• Catch from bottom impacting gear</li> <li>• Fishing effort</li> </ul>	<ul style="list-style-type: none"> <li>• Nutrients (N, P, Si)</li> <li>• Coastal Eutrophication Potential</li> <li>• POPs in microplastic</li> <li>• Plastic debris density</li> <li>• Change in MPA coverage</li> <li>• Reefs at Risk Index</li> <li>• Mangrove extent</li> <li>• Cumulative human impacts</li> <li>• Delta Vulnerability Index (with Rivers group)</li> </ul>	<ul style="list-style-type: none"> <li>• % GDP fisheries</li> <li>• % GDP international tourism</li> <li>• Population within 10 m coastal elevation</li> <li>• Human Development Index</li> <li>• Deaths caused by climate related natural disasters</li> </ul>	<ul style="list-style-type: none"> <li>• Governance architecture</li> </ul>

The TWAP LMEs assessment report will focus on the thematic assessment and comparative analysis across all LMEs and the Pacific Warm Pool, not on individual LMEs. A peer review process will be established by IOC and UNEP with reviewers to include marine assessment experts and representatives from LME projects. The TWAP LMEs assessment report and results for individual LMEs will be available on the project website as well as on the LMEs component website and spatial data infrastructure.

**Robin Mahon**, Professor of Marine Affairs at University of the West Indies, discussed governance assessment in the TWAP and its conceptual background highlighting indicators such as improved human well being as the bottom line. He defined governance as “...*the whole of public as well as private interactions taken to solve societal problems and create societal opportunities. It includes the formulation and application of principles guiding those interactions and care for institutions that enable them*”. An expanded perspective of governance was taken on the GEF international water (IW) indicators. Governance effectiveness in IW systems is critical, from the underlying institutional arrangements to the publicly desired social goals and ecosystem outcomes. Mahon stressed that appropriate mechanisms be put in place for assessing governance effectively in the shift from ecosystem health to human well being. TWAP will examine the governance architecture or arrangements in transboundary LMEs.

### **The GEF Support Towards Sustainable Development of LMEs**

**Christian Severin**, Program Manager of International Waters (IW) at the Global Environment Facility (GEF), stated that GEF intends to continue support towards sustainable development of LMEs. Efforts to date have achieved positive impacts and transformational change. He briefly summarised key components of the IW GEF investments and reported that 36 TDAs and 30 SAPs have already been completed. Key deliverables include the Black Sea/Danube Environmental Status Improvements, East Asia Integrated Coastal Management (ICM) Targets, the Ballast Water Convention, and the Benguela Current Commission. These

examples followed the TDA and SAP process for transformational change, which rests on a three-step process: (1) foundational capacity building, enabling environments, basic policy, and cooperation frameworks, (2) strengthening policy, legal, and institutional frameworks, and (3) full-scale SAP Implementation.

Severin reported that there were still some funds left in GEF 5, with approximately 25-30% of GEF 5 funds not yet allocated. GEF 6 replenishment funds will be coming and focusing on the delivery of global environmental benefits. The GEF has so far invested in 21 LMEs in rebuilding global fisheries and restoring habitats. He also drew attention to IW LEARN and the need for more marine publications for knowledge sharing within the LME community and beyond. More information about GEF projects, GEF 6 replenishment, and the GEF 6 IW strategy for delivering global environmental benefits is available online at: [www.thegef.org](http://www.thegef.org).

### **Catalyzing Ocean Finance for LME Recovery and Sustainability**

**Andy Hudson**, head of UNDP Water and Ocean Governance Program and Principal Technical Advisor for International Waters, highlighted the catalyzing effect of the grants provided by the GEF and referred to a UNDP publication containing this information, "*Catalyzing Ocean Finance*" presented at the JFK / AAAS Conference in February 2013. Hudson said the value of the blue ocean economy is over \$1 trillion dollars annually in terms of goods and services creating 500 million jobs. Threats to the oceans from overfishing, hypoxia ocean acidification, invasive species and climate change have socio-economic costs which are large and disturbing. He pointed out the positive effects of the globallast project as a case study that is now generating over \$100 million in Research and Development and stimulating economic developments of up to \$35 billion in the global shipping industry in relation to improved treatment facilities on vessels for alien invasives. The catalytic ratio of GEF finance in this case is as high as 1:2500. Other success stories of GEF catalytic finance were also referred to in the Danube/Black Sea, Yellow Sea and Rio de Plata GEF-financed projects. He also described the commercial development potential offered by the reduction of CO<sub>2</sub> emissions by the shipping sector in redesigning vessels for more efficient fuel consumption and the building of eco-friendly vessels. He concluded that \$5 billion spent over 10-20 years by the GEF would have a truly great effect on reducing the current threats facing our oceans and coasts. With relatively modest sums, the GEF can catalyze sizeable sums of public and private financing to transform ocean sectors toward sustainability.

### **The Guinea Current LME Project: Results and Status**

**Christian Susan**, with the UNIDO Water Management Unit and former Project Manager of the GCLME Project, provided a comprehensive presentation on the terminal evaluation of the Guinea Current LME (GCLME) Project. The GCLME Project involved 16 West African countries and an investment of \$33 million. The evaluation identified where the project was successful, how well the stakeholders were involved, what sustainable institutions were built and what lessons were learned. Main outputs to date include a TDA, the development and endorsement of a SAP, and the establishment of an Interim Guinea Current Commission. National Action Plans were also prepared by all countries and endorsed by 15 of the 16 countries. A successful regional activity center for productivity was established in Ghana, with recognition as a Centre of Excellence by the EU. Shortfalls in the project were also identified. A rating was given for the various activities and the project as a whole. The evaluation recommended dedicated resources and better communication mechanisms. A new plan was proposed to re-start the project with a PIF and SAP implementation process.

**Kristen Honey**, NOAA's Large Marine Ecosystem Coordinator, outlined some of the positive achievements of the GCLME Project which have stretched out over the last 20 years, including the 1995 Gulf of Guinea LME Project. These include many training and capacity development workshops, EAF *Nansen* fisheries surveys, various joint projects and a strong willingness to go ahead with the formalisation of a Guinea Current Commission. She drew attention to the high economic growth potential of the Guinea Current countries and the need to continue with the project.

Additional information is available at <http://gclme.iwlearn.org/>.

### **Gulf of Mexico LME and Pacific Central American Coastal LME Assessment and Management**

**Portfirio Alvarez**, Executive Director of the Mexican Consortium of Marine Research Institutions for the Gulf of Mexico (CiiMar-GoM), summarised LME activities in the Gulf of Mexico. Recent efforts included the creation of a Mexican marine research consortium, CiiMar-GoM, with strong links and interactions with U.S. universities. Achievements are summarized in a Gulf of Mexico LME E-News Bulletin (March 2013) Summary of Results June 2009 – March 2013, available from the IW-Learn website: <http://www.iwlearn.org/>.

Alvarez indicated that improving our understanding of the GoMLME and its resources involves transboundary expertise, knowledge, cooperation, collaboration, political will, support, funding, connectivity, dialog, communication, sharing, exchange, and friendship. Such transboundary efforts have resulted in success for the Gulf MEX-USA Team. Alvarez pointed to the good results of the midterm evaluation of the US-Mexico joint Gulf of Mexico GEF-supported project. He also highlighted the 2013 All Hands Meeting and Gulf Guardian Award Ceremony, which recognized the GoMLME Project with a first place bi-national category Gulf Guardian Award from the EPA Gulf of Mexico Program.

Alvarez stressed the need to continue to highlight the importance of the oceans to the Mexican government in order to maintain and enhance the political will for the project. To achieve this, they established the Consortium of Marine Research Institutions in the Gulf of Mexico (CiiMar-GoM) and convened all the Presidents of 19 participant research institutions throughout the Gulf of Mexico LME. This effort is led by Dr. José Manuel Piña Gutiérrez (President) and Dr. Porfirio Alvarez Torres (Executive Director). The CiiMar-GoM mission is to *"integrate, organize and enhance institutional efforts conducting scientific research to generate appropriate diagnostics and propose and implement sustainable solutions to the environmental, social, and economic problems of the Gulf of Mexico region."* The CiiMar-GoM vision statement is *"to be recognized as a high level and scientific authority committed to strengthening the sustainable development and integral wellbeing of the Gulf of Mexico."* All participating research institutions embrace the following shared objectives to:

- Enhance collaboration with academic and research institutions.
- Strengthen joint research.
- Provide sound science for decision-making.
- Strengthen national and international collaboration.
- Consolidate public policies for regional benefit.

Strategic partnerships and benefits will help to establish strong baseline science, integrate land use planning, and enhance data networks and research. GoM climate change research and technical cluster development were identified key areas to be pursued. To date, CiiMar-GoM has identified research priorities under climate change scenarios, including high prioritization for research on sea level rise flooding, storm surge, hurricanes, pollution, harmful algal blooms (HABs), hypoxia, erosion, sediment management, ocean acidification, and

invasive species (e.g., lionfish). Innovation and development labs include a hydraulic and port engineering laboratory with applied research in:

- Ocean and watershed hydrology models program.
- Ocean observing and monitoring program (buoys network).
- Nautical simulator and training program.

Collaboration between CiiMar-GoM (Mexico) and the Council for Science and Technology has launched a 2013 GoM hypoxia project. The CiiMar-GoM is also helping to convene a MEX-USA Research Consortia of the Gulf of Mexico Regional Ocean Scientific Congress in fall 2014 in Cancún, Mexico. CiiMar-GoM will participate in a summit on the state of ecological and economic sustainability in the Gulf of Mexico to occur in March 2014 in Corpus Christi, Texas.

### **Canary Current LME Recovery and Sustainability**

**Birane Sambe**, Regional Coordinator of the Canary Current LME (CCLME) Project, provided an overview of the CCLME project that comprises 7 northwest African countries. The Regional coordination Unit (RCU) is in Dakar, Senegal, and implementation of the full phase started 1 April 2010 with FAO and UNDP acting as GEF agencies. The CCLME Project goal is *“to reverse the degradation of the Canary Current Large Marine Ecosystem caused by over-fishing, habitat modification and changes in water quality by adoption of an ecosystem approach.”* Sambe outlined the principal outcomes, the stakeholder involvement, knowledge sharing, capacity building, and project development. Principal outcomes for the CCLME Project are:

- Multi-country agreement on priority transboundary issues, governance reforms and investments to address transboundary issues.
- A sustainable legal/institutional framework for the CCLME.
- Strengthened existing transboundary waters institutions and regional policies and instruments.
- Stakeholders’ involvement in transboundary water-body priority setting and strategic planning.
- Improved knowledge and capacity to address concerns on marine living resources and biodiversity, habitat and water quality.
- Demonstrated management actions and related costs/benefits valuations addressing priority transboundary concerns.

The CCLME Project focuses on five demonstration projects which address transboundary small pelagics, bycatch management in coastal shrimp fisheries, migrating coastal fish species, marine protected areas, and restoration of mangroves. These demonstration projects contribute to the maintenance of a healthy, functioning CCLME capable of providing goods and services upon which human populations depend. Specifically, CCLME demonstration projects are:

- (1) Sustainable transboundary management of shared small pelagic stocks in northwest Africa consistent with an ecosystem approach.
- (2) Reduction of the impact of coastal shrimp trawling through by-catch reduction and management changes.
- (3) Transboundary co-management of migratory coastal species of importance to artisanal fisheries including mullets and bluefish.
- (4) Demonstration of Marine Protected Areas (MPAs) as tools for multiple-resource management benefits.

- (5) Development of a regional mangrove conservation plan with pilot mangrove restoration actions.

Sambe briefly described the TDA and stakeholder consultative process. He concluded by highlighting draft management plans that are in preparation and the structures and cooperation between fisheries and conservation organisations in the CCLME region.

### **FAO-GEF Supported LME Projects**

**Merete Tanstad**, Fishery Resource Officer at the Marine and Inland Fisheries Service (FIRF) of FAO, summarised how FAO supports various LME projects in different ways. FAO supports LME Project and SAP implementation by providing technical support and advice on a range of topics related to governance, management, assessment, and the development and implementation of the Ecosystem Approach to Fisheries (EAF) around Africa and in other parts of the world through the EAF *Nansen* Project. This case study and EAF toolbox is shared on the website: <http://www.fao.org/fishery/eaf-net/en>.

Tanstad reported on a case study with the Caribbean LME project on the North Brazil shelf which addressed the three pillars of EAF. This small project of \$250,000 over 16 months helped to mainstream EAF in the region and provided training and communication strategies to stakeholders as well as assisted in refining the TDA. She also listed the LMEs being supported by the EAF *Nansen* project and the significant achievements and outcomes of these efforts in developing capacity and sustainable fisheries management throughout these regions. A short account was also given of the surveys carried out by the *R/V Dr Fridtjof Nansen* and how these surveys have been expanded to include monitoring of the marine environment, mapping habitats and biodiversity, and general assessment and monitoring of ecosystems. A new *R/V Nansen* replacement vessel is presently being planned and should be launched in 2016. It is intended that the vessel will continue to address the main drivers and constraints in ecosystem-based management in the LMEs of developing nations. FAO is committed to work with the LME projects and other partners.

### ***R/V Nansen* Operations in Support of LME Projects**

On behalf of Kwame Korentang, who could not attend, **Birane Sambe** (Regional Coordinator of the CCLME Project) delivered the *R/V Dr. Fridtjof Nansen* Survey Program presentation. FAO is supporting GEF-LME movement towards ecosystem-based management through the EAF-*Nansen* Program. The Program provides direct support for fisheries management, training in survey data analyses, EAF university courses, EAF management planning, as well as training on guidelines and legal issues. The EAF-*Nansen* Country Projects to improve fisheries are in Sierra Leone and Liberia; Benin, Cote d'Ivoire, Ghana, and Togo; Seychelles and Tanzania; Cameroon, Gabon and Nigeria; Mozambique; Mauritius; Comoros and Madagascar; and Kenya. The output of many of these projects is the development of Fishery Management Plans. In the BCLME and the CCLME, the *Nansen* Project is providing guidance on implementing EAF into fisheries management. Work in the Canary Current concentrates on the management of small pelagic species. Efforts in 2013 include hake and hypoxic surveys for the BCLME, pelagic and demersal surveys in Angola, and environmental monitoring in Ghana.

The *R/V Nansen* surveys help the ASC, BC, and GCLME projects. FAO staff assists in the preparation of the TDAs and SAPs. The *Nansen* surveys contribute to the implementation of the five-module approach as EAF is based on ecological wellbeing, social and economic outcomes, and the ability to achieve management objectives.

Beginning in 2016, the future *Nansen* Program will have a new research vessel and will:



- Continue to support developing countries in their efforts to implement EAF.
- Continue to build capacity for fisheries management.
- Develop a new science program for the new vessel.
- Program is to be expanded to include pollution and climate variability and change as major drivers and constraints.
- Expect to contribute to global climate change program.
- Monitor the oceans around developing nations.
- Use the R/V as a United Nations platform for marine observations.

FAO publishes *Nansen* Program updates in their newsletter, e-APPROACH, available online with additional information on the website: [www.eaf-nansen.org](http://www.eaf-nansen.org).

### **Bay of Bengal LME Project Update**

**Chris O'Brien**, Regional Coordinator of the Bay of Bengal Large Marine Ecosystem (BOBLME) Project, provided an update on the BOBLME which comprises 8 countries with 6 million km<sup>2</sup> of ocean. It is one of the poorest regions of the world with over 450 million people living around the coast, many depending on the oceans for their livelihoods. The BOBLME region includes some of the fastest growing and most dense coastal populations in the world, so considerable pressure and anthropogenic stressors impact BOBLME ecosystems. Overfishing, habitat loss, pollution, and climate change impacts are big threats.

O'Brien presented a progress report for 2013, after four years of BOBLME Project efforts with a vision for BOBLME ecosystem quality objectives for fisheries, critical habitats, and pollution and water quality. The main focus of project activities relate to addressing the challenges of overfishing, pollution and habitat degradation and the conservation and restoring of the integrity of the LME. The project extends over a 5 year period and has an investment of \$31 million. The Mid Term Evaluation (MTE) has been completed and the TDA developed and adopted. The SAP for the Bay of Bengal LME project has also been drafted. Steady progress is being made with building institutional arrangements with existing bodies, UN agencies and the various ministries of the eight countries. Twinning work activities with a number of other LMEs was also highlighted including projects for the Agulhas-Somali Current LME, Canary Current LME and Sulu – Celebes LME. Much work has also been done on developing and implementing training courses in EAF management and delivering workshops on scientific writing and presentations. For example, the Project co-sponsored a workshop in Malaysia on "*Ecosystem Approach to Fisheries Management: Bay of Bengal Large Marine Ecosystem Project and Coral Triangle Initiative – Essential EAFM Pilot training and Training of Trainers*" (23 June – 3 July 2013). O'Brien also highlighted a special Myanmar support program (NORAD), designed to improve fisheries statistics, undertake a marine biodiversity survey and fisheries assessment, training and translation of the course on EAFM, and support socio-economic monitoring in all countries.

The BOBLME Project has been given a 1 year no-cost extension to finish the SAP and strengthen TWAP activities. A second phase of the Bay of Bengal LME project will be developed to implement the SAP. The BOBLME-SAP implementation project is designed to:

- Support and augment a range of existing country and partner activities.
- Implement new activities relating to the transboundary actions and the most common national actions derived from the national action plans.
- Support partner capacity development, coordinate and monitor SAP implementation, create, foster and strengthen partnerships, actively promote the development of additional projects in support of the SAP implementation.

The SAP implementation project requires the involvement of multiple stakeholders of different nations to address its thematic approach to fisheries and aquaculture, critical habitats, pollution and water quality, ocean productivity, and climate change. Therefore, the BOBLME Project plans to establish a Global Steering Committee (GSC), in addition to a Technical Advisory Group (TAG) with representation of key stakeholders from the policy as well as technical and scientific community. The Tuna and Deep Sea Fisheries Projects will each have a Project Steering Committee (PSC) and a Technical Advisory Group (TAG). Project Steering Committee membership will include representatives of the Implementing and Executing Agencies/Partners. Indicative governance arrangements for the Ocean Partnership Fund (OPF), implemented through the World Bank, will support a steering board, a technical advisory group, and an operations secretariat. This structure and process will feed into the management and evaluation arrangements for the GEF Program Global Sustainable Fisheries Management and Biodiversity Conservation in the Areas Beyond National Jurisdiction.

Efforts of the BOBLME Project are meant to be catalytic. They aim to support partners and development organizations to assume these roles. O'Brien highlighted ten areas of work to emphasize for the future of the BOBLME project:

- Identifying the major transboundary issues and their causes, and developing a plan to address them.
- Integrated Coastal Management.
- Policy Harmonisation.
- Fisheries Resources assessment and management.
- Critical habitat management.
- Ocean dynamics, productivity and climate change.
- Marine Protected Areas.
- Ecosystem Health Indicators.
- Land-based sources of pollution.
- Training and Communications.

Additional information is available from the BOBLME website: <http://www.boblme.org/>

### **Assessment and Sustainability of the Agulhas Current and Somali Current LMEs (ASCLME)**

**Magnus Ngoile**, Consultant to the FAO EAF-*Nansen* and ASCLME Projects, described the Agulhas Somali Current LME project and the links with the Western Indian Ocean Laboratory (WIOLAB) Project and Southwest Indian Ocean Fisheries Program (SWIOFP) and the various UN agencies and international bodies involved in fisheries management and conservation in the western Indian Ocean. The ASCLME Project is part of a multi-project, multi-agency GEF supported Program (UNDP/GEF ASCLME Project, UNEP/GEF WIOLAB Project, and WB/GEF SWIOFP), the aim of which is to institutionalize a cooperative, adaptive and results based management of the western Indian Ocean. Its SAP has been completed and given final review by countries and is going through a process of ministerial endorsement now. SAP implementation followed a phased approach that progressively builds the knowledge base and strengthens technical, managerial and decision-making capabilities at the national and regional scales, while addressing environmental concerns and transboundary developments (in all relevant sectors). The ASCLME Project also builds political will to undertake threat abatement activities and leverages finances proportionate to management and governance needs.

Ngoile discussed future directions of the ASCLME project, as recommended by the terminal evaluation. For UNDP, the SAP implementation should focus on core strengths of UNDP, including components addressing:

- Executing management and policy reforms through a knowledge-based governance mechanism.
- Secure improved stress reduction within the LMEs through community empowerment in the SAP management process.
- Deliver private sector/industry commitment to and execution of stress reduction activities and transformations in management practices.
- Negotiating and executing effective management mechanisms for extended continental shelf and high seas areas within the LMEs.
- Realignments in institutional arrangements for stronger coordination and partnerships.

Ngoile summarized the proposed PIF and its five components for the new Western Indian Ocean LMEs **Strategic Action Program Policy Harmonization and Institutional Reforms (SAPPHIRE)** Project. The SAPPHIRE Project PIF has been submitted for review by participating countries and has all but one endorsement letter from the countries. It has now gone to the GEF for formal review and technical approval. The SAPPHIRE Project objective is to deliver and execute the agreed management reforms and policy realignments for effective long-term ecosystem management in the Western Indian Ocean LMEs in line with an endorsed SAP. The developing PIF phase includes five key components with expected outcomes: 1) executing management reform 2) building a knowledge base and governance mechanisms 3) ecosystem stress reduction through community stakeholder involvement 4) stress reduction through partnership with industry to reform operations and practices 5) innovative management mechanisms for extended continental shelf and high seas areas and 6) capacity building for effective SAP implementation.

Ngoile also reported on another initiative, AfriCOG, which will focus on capacity building for ocean science in the region and strengthen skills in marine resource management. The regional AfriCOG alliance of partners is growing, and continues to jointly support ecosystem assessments and monitoring. This “Science to Governance” initiative is in a development phase with plans to locate such an academic centre at Rhodes University. AfriCOG has been formally adopted by Rhodes University as an Academic Centre. Therefore, AfriCOG is established as an academic center and partnerships are actively being built. It has the backing in principal from a number of international organisations and regional players.

Additional information is available from the ASCLME website: <http://www.asclme.org/>

## **Practices of Recovery and Sustainability of the Yellow Sea LME Under Multiple Stressors**

**Qisheng Tang**, Director of the Yellow Sea Fisheries Research Institute (YSFRI), presented on the changing states of the Yellow Sea LME (YSLME) and their causes. Much of the stressors in the YSLME stem from over fishing, increased sea temperatures, eutrophication, and nutrient overloading. Over the past 60 years the commercially important long-lived, high trophic level, piscivorous bottom fish have been replaced by the low-valued short-lived, low trophic level, planktivorous pelagic fish. In recent decades, 61 of the world’s 63 LMEs evaluated have increased in temperature, and significant warming is happening in China’s coastal waters. Serious eutrophication and nutrient changes have been observed in the YSLME and East Sea / Sea of Japan LME, such as red tides, green tides, jellyfish blooms and anoxic zones (dead zones). Such impacts of multiple stressors overlap and cumulatively impact

the YSLME ecosystem. Faced with these multi-stressor impacts, the YSLME project is developing diverse strategies for science-based ecosystem management (EBM).

Mitigation to reduce stressors are being taken. Professor Tang outlined the methods being used in the Yellow Sea LME to assist recovery and reduce environmental stress. These include the use of closed seasons, reducing fishing effort, promoting stock enhancement and encouraging environmentally friendly aquaculture. Collectively, these efforts were part of a two-prong strategy to simultaneously (1) conserve fishery resources and (2) encourage environmentally friendly mariculture. Tang demonstrated how integrated multi-trophic aquaculture in the coastal waters can absorb significant quantities of CO<sub>2</sub> and excessive nutrients from the surface layers. The use of integrated multi-trophic aquaculture methodology using a combination of finfish, seaweed, sea cucumbers and abalone uses the environment more efficiently and increases the social acceptability of the system as well as providing significant economic and social benefits.

Additional information, including newsletters and peer-reviewed scientific publications, are available from the YSFRI website: <http://www.ysfri.ac.cn/english/>.

## **ADVANCING SUSTAINABLE DEVELOPMENT IN LMEs DURING CLIMATE CHANGE**

### **Benguela Current LME Commission and Convention**

**Hashali Hamukuaya**, Executive Secretary of the Benguela Current Commission, reported on the world's first LME legal framework that was created on 18 March 2013 with the signing of the Benguela Current Convention in Benguela, Angola. A large number of ministers and deputy ministers from Angola, Namibia and South Africa attended the signing ceremony of the Benguela Current Convention, which signifies an important international milestone for LME transboundary governance. With this signing, the Benguela Current Commission (BCC) becomes a permanent inter-governmental institution through which Angola, Namibia and South Africa will collaborate in promoting the long-term conservation, protection, rehabilitation, enhancement and sustainable use of the Benguela Current Large Marine Ecosystem (BCLME).

Due to unwavering political will and support from BCC Ministers, the BCC currently has established structures and functions that include:

- Ministerial Conferences
- A Management Board
- Ecosystem Advisory Committee
- Regional Working Groups
- A Secretariat

The BCC core mandate states that signatory countries will agree on, where necessary, measures to prevent, abate and minimize pollution caused by or resulting dumping from ships or aircraft, exploration and exploitation of the continental shelf and the seabed and its subsoil, and land-based sources. Signatory countries will also agree on, where necessary, conservation and management measures concerning transboundary marine resources and the environment. They will agree, as appropriate, on participatory rights, such as harvest levels and sharing arrangements concerning transboundary fishery resources.

BCC supporting functions include the promotion and support of students, human capacity development, and research programs related to the transboundary marine resources and the environment. Such activities advance the collection, exchange, dissemination and

analyses of the relevant data and information, including statistical, biological, environmental and socioeconomic data. There are also efforts to encourage collaboration on monitoring, control and surveillance, including joint activities in the Southern African Development Community (SADC) region. The BCC has a strong harmonisation function including the integration and enforcement of existing policies and laws pertaining to the conservation and management of transboundary marine resources and environments. It also coordinates administrative efforts, for example by, helping with implementation and review of the SAP; providing strategic direction, coordination and evaluation in the implementation of the work plans and budget; appointing an Executive Secretary; ensuring sustainability of operations, and; establishing subsidiary bodies. Collectively, all these efforts promote a coordinated, regional approach to long-term conservation, protection, rehabilitation, enhancement, and sustainable use of the BCLME for economic, environmental, and social benefits.

Looking towards the future, the BCC is revising and updating of the BCLME TDA, SAP, Science Plan, Business Plan, and regional management plans. It is now finalising SAP updates to give effect to the Convention, thus scaling up “Science-to-Governance” efforts. The BCC is also emphasizing data-sharing policies and protocols, as it aims to develop shared policies and protocols for financial and administrative procedures, personnel policy, and procurement policy. Future efforts will strongly focus on establishing partnerships with the private sector, academia, and relevant organisations. In the next few months, the BCC will engage with the private sector through the BCC Literate Forum. This will ensure that all major industry (oil, gas, shipping, diamond mining, fisheries) become aware and have a stake in BCC, as they become engaged through BCLME public-private partnerships. Additional information is available online at <http://iwlearn.net> and [www.benguelacc.org](http://www.benguelacc.org).

### **IUCN Global Activities Related to LMEs**

**James Oliver** of the IUCN Global Marine and Polar Program presented the IUCN role and current activities related to LMEs. The IUCN program is the world’s first global environmental organization (founded 1948) with over 1,200 member organizations including 200+ government and 900+ non-government organizations. Consisting of almost 11,000 voluntary scientists and 1,000 staff in 45 offices working on hundreds of conservation projects all aimed at the sustainable management of biodiversity and natural resources, the IUCN is the largest professional global conservation network. It has official Observer Status at the United Nations General Assembly.

IUCN chairs an Ocean Acidification User Group providing policy and scientific advice to decision makers and the Global Coral Reef Monitoring Network with projects in Egypt and Maldives. The Ocean Acidification User Group collaborates with ICES, through the IUCN Global Marine and Polar Program. It translates science into decision-making guidance for policy makers. In 2013, these efforts convened experts to identify ecologically sensitive areas in the Bering Strait, named “Super EBSA”, which are very biologically rich and under increasing pressure because of global warming, increasing shipping activity, pollution, and other stressors. The IUCN also recently completed a research study on sea grasses and the role of sea grasses in the carbon cycle. Seabeds are significant carbon sinks. Research conducted in Australia indicates that sea grass habitat absorbs five times more carbon than land. Recent IUCN activities and outputs include the:

- Bering Strait EBSA report.
- Sea grasses: Research study into sea grass carbon sink potential.

- Maldives: capacity building on Marine Managed Areas.

In the near future of 2013, the IUCN expects to release three publications on:

- Open ocean carbon, which argues for rebuilding fish stocks.
- Coral status report on the tropical Americas Region.
- Guidelines on monitoring indicators and methods for wider Caribbean/Tropical Americas oceans and coastal areas.

To request IUCN reports or additional information, please contact James Oliver at [James.Oliver@iucn.org](mailto:James.Oliver@iucn.org) or visit websites: [www.iucn.org/marine](http://www.iucn.org/marine) and [www.protectplanetoocean.org](http://www.protectplanetoocean.org)

The IUCN has a global presence but its greatest regional strengths are Africa and Asia with recent effort and upcoming offices in Oceania and Latin America. The IUCN plays a strong and supportive role in the Bay of Bengal LME with a concentration of activities in Myanmar, India, and Asia.

In October 2013, IUCN will co-sponsor the 3<sup>rd</sup> International Marine Protected Areas Congress (IMPAC), Marseille and Corsica, France. This is an important event that happens only once every two years. This year, IMPAC has six overarching themes to run throughout the week, each deemed especially relevant to the objectives of the Congress:

- (1) Accelerating the Establishment of MPAs (Towards a Global MPA Network).
- (2) Promoting the Growth of the Blue Economy within MPAs.
- (3) Successfully Implementing the Ecosystem Approach.
- (4) Supporting Local Governance and Broadening Participation.
- (5) Incorporating the Heritage of Cultural and Traditional Knowledge.
- (6) Advancing MPAs as Part of the Strategy Against Climate Change.

Other universal themes include the high seas and poles. Full information is available at the IMPAC website: [www.impac3.org](http://www.impac3.org) .

Oliver concluded by publicly sharing the idea of creating a LME layer in Google maps, which would connect millions of new people to the LME concept for ocean science and management. The group expressed enthusiasm for a LME Google layer, as NOAA, IW-LEARN, and others had independently thought of this and would like to see this come to fruition. IUCN is the logical lead on this idea of a LME Google layer because IUCN has an existing working relationship with Google, as they co-created the MPA layer in Google maps. The preliminary vision for a LME Google layer would be similar to the MPA layer, where users can look up statistics, photos, films, links, etc. One potential example to follow is the UNEP Atlas of Our Changing Environment: <http://na.unep.net/atlas>. The benefits of a LME Google layer to the LME community would be multiple. It would raise awareness on trends in LMEs, reach new audiences, provide learning opportunities, and serve as teaching aid to the global community. It an opportunity to be associated with new features in Google Earth, like bathymetry and topography, through a global partnership. Such ideas need to be approved by Google. The Consultative Committee expressed strong support for moving ahead in creating an LME layer for Google maps

### **Large Marine Ecosystem Research and Assessments in Malaysian Waters: Bay of Bengal, South China Sea, and Sulu-Celebes LMEs**

**Siew Moi Phang**, Director of the Institute of Ocean and Earth Sciences (IOES) at the University of Malaya, overviewed activities and recent highlights in Malaysian waters. This area

includes the Bay of Bengal, South China Sea, and Sulu-Celebes LMEs, as well as the Coral Triangle efforts to the east. Most MPAs in these LMEs are in the peninsula of Malaysia. Despite growing numbers of MPAs, the number of threatened species in Malaysia has increased as investigators continue to discover new species amidst this decline. Threats to Malaysian biodiversity and fisheries are largely due to habitat degradation and overharvesting, especially along coastlines. In the last 50 years, a UNEP study documented a dramatic decline of leather back turtles (99%), olive ridley (95%), hawksbill (80%), and green turtle (60%) from fisheries bycatch mortality, loss of habitat, pollution (including persistent plastics and marine debris), and illegal poaching for shells, meat, and eggs. Sea turtles and dugongs (or “sea cow”, a marine mammal similar to a manatee) are highly endangered in Malaysia largely because of fisheries bycatch, entanglement with fisheries gear, poor tourism practices, and vessel strikes of these animals. Coral reefs are at risk with massive coral bleaching reported throughout Malaysia and neighboring countries, which deleteriously affects reef ecosystems and fisheries. Mangroves and their species diversity are also under pressure in Malaysia with 22% of mangrove forests already lost along with several endangered species in these disappearing habitats. Low levels of local awareness about the need for species conservation exacerbate problems.

Between 2007 and 2011, Malaysian fisheries catch increased in shellfish and deep-sea landings with overfishing identified as a problem. In order of importance, the causes of threat to Malaysian fisheries are (given in percentage of fisheries impacted): habitat degradation (76%) overharvesting (27%), bycatch (23%), pollution (16%), human disturbance (12%), and dams (<1%). Malaysia has a rapidly growing seaweed industry, based in Sabah. It harvests green and red seaweeds for sources of food, feed, fertilizer, medicine, and industrial materials like phycocolloids (agar, carrageenan, alginic acid, keratin, etc.).

Within this context, national and regional efforts are taking place for improving ocean health and long-term sustainable development with ecosystem-based management. The Malaysian government recently launched new initiatives with renewed national interest in protecting biodiversity in Malaysian waters through a National Oceanography Directorate (NOD) and support for its National Ocean Policy (Figure 3).

**Figure 3: Malaysian National Ocean Policy**



Malaysia is active in the Coral Triangle Initiative (CTI), which is a transboundary effort to sustainably manage 5.7 million km<sup>2</sup> of coral reefs, fisheries, and food security for 120 million people. As part of the CTI, Malaysia created a National Plan of Action (NPOA), which embodies 134 action plans accompanied by a comprehensive program of implementation target dates and performance indicators. Beginning in November 2011, Malaysia became Chair of the CTI Council of Ministers for a two-year term. During Malaysia's tenure as Chair, Phang identified challenges like their need to:

- Ensure a smooth transition process from the Interim Regional Secretariat to a permanent Regional Secretariat to be based in Manado, Indonesia by April 2012.
- Ensure implementation of the CTI Activities Roadmap 2012.
- Strengthen regional cooperation towards sustainable financing for the CTI program.

Phang discussed marine spatial planning (MSP) work in Tun Mustapha Park as an example partnership for collaborative management with zoning recently proposed for several categories: No Take, Multi-use, Community Use, Special Managed, and Buffer zones. She also highlighted the Semporna Marine Ecological Expedition that identified CTI biodiversity, resulting in a 2012 WWF-Malaysia Project Report with NCB Naturalis and Universiti Malaysia Sabah. Aquatic invasive alien species and climate change adaptation and mitigation efforts are priority for dealing with Malaysia's changing marine ecosystems with rising sea levels. In 2013, national coordinators signed and approved a policy on coral bleaching, as well as fisheries management plans for Indian Mackerel and sharks.

Malaysian research is expanding and carried out by several marine research centers, many of which were recently upgraded. These efforts include maritime culture research. A new marine research station will launch in late 2013 on the east coast, facing the South China Sea.



## **Multidecadal Changes in Russian Arctic LMEs: Status of LME Atlas of the Arctic**

**Gennady Matishov**, Chairperson of the Russian Southern Scientific Centre of the Russian Academy of Sciences, provided a short overview of the research work being carried out in the Russian Arctic LMEs and highlighted the recent studies on fisheries and the publication of the Atlas on Arctic LMEs and information on climate change in the region. He pointed to the large database that exists on 12 LMEs around Russia which include those of the Barents Sea, the Kara Sea, the Laptev Sea, the East Siberian Sea and others. For example the Barents Sea is very well studied and has data from over 250,000 stations. There is also a lot of information collected by the US, Norway and others in the region. These include sea temperature data, zooplankton, tracking data on killer whales illustrating migration routes, the structure of bottom fish distribution and links with oceanographic conditions. Maps also show location and impacts of activities on LMEs including seismic surveys, vessel noise, water pumping, and oil and gas extraction. Matishov discussed how ice is a significant ecological factor in life support of Arctic organisms. The inter-annual variations in ice cover were also described and illustrated, which point to significant signs of cooling during 2011-2012 as well as abnormal advection. For the commercial fisheries species in the Pacific and Arctic Oceans, the most important driver of species variability is the temperature in pelagic waters. The accuracy of fishery forecasts depends on data collected to describe life cycles and patterns of fish stocks. The overall picture suggests a natural climate variation linked to multi-decadal warming and cooling in the Russian Arctic LMEs. Matishov highlighted the importance of monitoring Arctic climatic processes, as climate is cyclical and changes that happened in earlier centuries may repeat in certain cycling periods today.

## **Trends in Large Marine Ecosystems of Interest to Arctic Council**

**Hein Rune Skjoldal** of Norway's Institute of Marine Research provided a presentation on the ecosystem approach to management of LMEs in the Arctic. He highlighted the importance of Atlantic Ocean water flowing into the Nordic seas, as it contains considerable heat to melt ice. Skjoldal outlined the history of ecosystem assessments used within the Arctic Council and the development of the Arctic Marine Strategic Plan, which uses the ecosystem approach (EA) as its core principal. He reported on the updating of LMEs in the Arctic.

In 2013, boundaries of the Arctic LMEs were revised based on recent ecological information and a report submitted to the Arctic Council (AC) (see Annex 4 for new LME maps). The report is available from the Protection of the Arctic Marine Environment (PAME) website: <http://www.pame.is/arctic-large-marine-ecosystems-lme-s>. The Arctic LMEs are evaluated in terms of ecosystem status reports, ecological important areas, spatial planning, and integrated ecosystem assessments. Six actions comprise the EA framework – define the elements; describe the ecosystem; determine ecological objectives; assess the ecosystems; value the ecosystems; and manage human activities. The assessment will incorporate the best available scientific information. Further studies have also been completed, such as studies on shipping in the Arctic along with biological information on marine mammals, seabirds, fish and plankton in ecologically important areas. In the Arctic, there is strong focus on coupling of animals with habitats, so researchers have identified a high number of ecologically important areas and described species ranges based on habitats, season, and time of survey. Arctic fauna, including endemic fauna on the underside of ice are highly sensitive to temperature and habitat changes. Investigations have been completed on polar bear populations and migration routes and the oscillation in fish biomass in the Barents Sea where there is an inverse relationship between juvenile herring and capelin abundance. There is strong collaboration with the Russians on fisheries in the region and presently a large biomass of cod available for harvesting with over 1

million tonnes quota. This has led to complaints by fishermen of too much fish taken in trawls and logistic difficulties in getting fish on board and processing. A September 2013 report will summarize this Arctic science.

Skjoldal emphasized how the Arctic is part of an important system that needs to feed into a global reporting system on the status of the Arctic. This can be achieved through operational assessments for each of the LMEs in the Arctic. Such assessments can be scaled up to the pan-Arctic area through broader thematic assessments. Elements of integrated assessments (IA) were described; a) status of species and habitats; b) climate variability as a driving force for all lmes and perhaps even more so for high-latitude lmes. it plays a huge role as a driver for ecosystem variability and change and needs special focus in an integrated assessment; c) ecological interactions among species and food web dynamics as key to gauge the functional integrity of the ecosystem; and d) human pressures and impacts. The modules under such IA would include: climate variability and change; pollution; fisheries stocks and ecosystem effects; conservation (species, habitats and biodiversity) and; Industrial sectors (shipping, oil and gas, tourism, etc.). The Arctic is linked to the globe through migratory routes of animals with “GPS in their brains,” including birds, mammals, and fish that seasonally migrate long distances with predictability and precision. For successful outcomes, scientists and managers must start thinking of the Arctic as connected through all these migratory links with an emphasis on understanding how the Arctic functionally links to habitats and populations in southern latitudes.

## **Indonesian Sea LME Assessment and Management Development**

**Subhat Nurhakim**, ATSEA National Focal Point for Indonesia in the Indonesian Ministry of Marine Affairs and Fisheries, overviewed the Indonesian, Arafura and Timor Sea LME. This area involves collaboration of three countries: Australia, Indonesia, and Timor Leste. The Indonesian Sea Large Marine Ecosystem (IS-LME) consists of a large area of the Indonesian archipelago and is located within the territorial waters of the Indonesian jurisdiction. As the Indonesian fisheries statistical area has 11 Fisheries Management Areas (FMAs), the IS-LME covers 4 FMAs including: FMA 712 (the Java Sea); FMA 713 (Makassar Strait, Bone Bay, Flores Sea, and Bali Strait); FMA 714 (Tolo Bay and Banda Sea); and FMA 715 (Tomini Bay, Maluku Sea, Halmahera Sea, Seram Sea and Berau Bay). These areas can be viewed as a “*donut hole*” that has not been part of any GEF-LME projects.

The IS-LME has an important role in providing food security both for Indonesia and the Asia Pacific region. Other important features of IS-LME include: (1) part of the Coral Triangle Initiative (CTI) Region, (2) migration pathway of highly migratory species, (3) area connected by currents from the Pacific to the Indian Ocean (Indonesia Trough Flow), (4) part of Indonesian archipelagic sea lane, (5) possibilities that some pelagic fish are straddling stocks among neighbouring countries, and (6) an extensive habitat of seagrass, mangroves and coral.

However, from the fisheries management point of views, there have been several issues related to the IS-LME such as: (1) some species of fish are in the stage of being overexploited, (2) increase in the threat level from coastal development, (3) increased land base and marine pollution as well as unfriendly fishing practices, (4) lack of integrated management as the utilization of the marine and coastal zone is undertaken by different sectors, (5) Fisheries Management Plans (FMP) have not been well developed.

The objectives of the IS-LME project are the restoration, conservation and sustainable management of marine and coastal areas. The project has five main components of work which

centre on fisheries, habitats, land-based pollution, threatened marine species and climate change which form the core of the TDA. The project milestones for completion of the TDA / SAP include economic and thematic reports, baseline reports and governance and stakeholders' analysis. Nurhakim emphasized the complex nature of fisheries in the Indonesian waters and that the region has been divided into eleven FMAs. There also was a need to treat the Indonesian Sea as a sub-area of the Coral Triangle Initiative and that the way forward was to set up a task team and develop strong strategic partnerships with the GEF, IUCN, FAO and various other LME projects in East Asia.

### **Recovery and Sustainability of the Mediterranean Sea LME**

On behalf of Virginie Hart, **Kelly West**, Task Manager of the International Waters Division of Environmental Policy Implementation, United Nations Environment Program, gave a brief overview on the project history and recent progress of the Mediterranean Sea LME project. The TDA for the project was adopted in 1997 and 2005 and SAPs were also adopted during this time frame. The long-term goal of the MedPartnership (Investment Fund and Regional Component) is to facilitate full implementation of national participation in approved Strategic Action Plans (SAPs) and National Action Plans (NAPs), leverage long-term financing, and ensure sustainability of the projects. Components of the SAPs / NAPs include controlling pollution from land-based activities and conserving biodiversity. There are 11 executing partners in the MedPartnership and components of the project involve information sharing, strengthening the knowledge base, supporting ICZM, and translating science to policy recommendations. The 2012 Annual Report is on the website at [www.themedpartnership.org](http://www.themedpartnership.org).

Climate change has been a recent focus of work in the Mediterranean and there is much coordination needed between all the organizations working on this issue. A current focus is integrating climate variability and change into national strategies and to implement ICZM protocol in the Mediterranean, as well as determining the impact of climate change on biodiversity. To date, there are 73 demonstration sites and projects will be replicated in 13 countries in the project, including efforts with coastal aquifers. UNESCO promotes best practices to reduce the degradation of groundwater quality and has developed a new framework to address coastal areas in an integrated fashion. The project recently upgraded its new "app" for iPhone and videos online for the Mediterranean Sea LME.

### **Key Components of the Strategic Action Program for the Caribbean and North Brazil Shelf LMEs**

**Patrick Debels**, Regional Project Coordinator of the Caribbean LME (CLME), provided an update on the CLME Project. There are 23 partner countries, two GEF-eligible states, and the project covers two LMEs – the CLME and the North Brazil Shelf LME. The project started in May 2009 with a \$7 million GEF grant (GEF 4) and is expected to end in April 2013 with the delivery of an (endorsed) Strategic Action Program (SAP). In early 2013, the project finalized its SAP, which was technically approved by all countries in March 2013 through a Steering Committee. The project is now securing Minister endorsements and this is going well.

The CLME is geopolitically very complex. Debels discussed the TDA/ SAP process for the CLME and how this is laying a foundation for Ecosystem Status Assessments (ESAs) for the region. He gave an overview of the TDA process and how, due to the complexity of the ecosystem and institutions, the LME was sub-divided into three sub-ecosystems. The latter included reef and associated habitats, pelagic and, continental shelf subsystems. The TDA identified the three key transboundary problems as a) unstable fisheries, b) pollution and, c)

habitat degradation. The need to incorporate climate and societal change (as drivers) has also been recognized. The CLME SAP has six main strategies and four sub-strategies.

Debels highlighted how the CLME with 23 countries face challenges with access to information and data management with a long-term goal of integrated ocean governance. To address this, the CLME project delivered a prototype information management system (IMS) while metadata would be accessible via the website with links to different data sources. Further challenges identified include weak governance, limited human and financial resources, and inadequate public awareness.

To solve these problems, the CLME managers and leaders have made an effort to become aware of the many projects underway at local and sub-regional levels. Then, the CLME project can leverage these efforts. Currently in the Caribbean, the return on investments is low to improve ecosystem status and reduce stress due to insufficient enabling conditions and legal systems. This is a root cause of weak governance that must be tackled. To explore this challenge, the project mapped stakeholders/institutions and clearly identified their roles in policymaking and management and their area of jurisdiction and level of influence. This is important to obtain a higher rate of return on investment as one would know better how to approach or target certain stakeholders and/or institutions. Some institutions that have made strides in ecosystem-based and transboundary resource management are not representative of the LME and for example, may exclude some countries with large coastlines. This historical discrepancy can be challenging as the project tries to target all stakeholders/ institutions equitably and to foster cooperation among all. The extensive stakeholder and governance analysis done informs the project of the different role players and their influences, which is important for setting objectives and agreeing on an approach for an ecosystem status assessment. Particularly for decision makers, it is important to know what information they require to inform their decisions and to shape interventions. The CLME SAP with indicators provides a framework for research, information and data collection to enable an ESA. The CLME project vision is to achieve a healthy marine environment in the wider Caribbean that is adequately valued and protected through robust, integrative, and inclusive governance arrangements at all levels that effectively enables adaptive management. The CLME project vision looks to maximize the provision of goods and services in a sustainable manner in support of enhanced livelihoods and human well-being.

### **Marine Spatial Planning for Recovery and Sustainability of LMEs**

**Sandra Whitehouse**, Senior Advisor for the Ocean Conservancy emphasized the need for balancing society, economy, and ecology. She indicated that the LME approach to ecosystem-based management offers a way to do this, as do some National Ocean Policies like those adopted by the USA, Malaysia, and an increasing number of nations. Ecosystem based management includes humans, so it is important to explicitly include inter agency coordination. For example, over 20 different agencies in the USA are engaged in marine spatial planning issues. In 2010 by Executive Order, President Obama enacted the USA National Ocean Policy, which is similar to Former President Bush's 2004 Ocean Blue Print. Sustainable ocean use is not a partisan issue—it is in everyone's best interest.

This National Ocean Policy offers a framework for implementing Coastal and Marine Spatial Planning (CMSP). CMSP is a tool. It is science-based and, like the Ocean Atlas, offers a way to integrate many different ocean uses—conservation, energy uses, shipping, tourism, recreation, offshore aquaculture, fishing, and more. The CMSP process brings stakeholders together around the same table with the same information to discuss trade-offs and alternative scenarios in an informed way. Case studies in the USA highlight the potential success of ocean planning: for the Northeast US Shelf LME and its two regional planning areas – the Northeast

Regional Planning Area, and the mid-Atlantic Regional Planning Area. In both cases, the process of CMSP reduced conflict, provided for conservation, and increased renewable energy for the regions. One striking example of success is that New England ship strikes of endangered Right Whales decreased by 30% after shipping lanes were moved because of the CMSP findings. CMSP also gives managers a tool for dealing with climate change mitigation and adaptation, using best-available science. Examples of CMSP success go far beyond New England and the USA, as many nations have globally implemented similar National Ocean Policies with ecosystem-based management successes in recent years.

### **USAID Investments in West Africa Sustainable Fisheries Initiative: Lessons Learned**

**Brian Crawford**, Interim Director of the Coastal Resources Center at the University of Rhode Island, summarized three USAID-URI West Africa Fisheries Initiatives with their lessons learned. The three country projects, totaling approximately US\$ 30 million with implementation years of 2009-2016, are the:

- Ghana *Hen Mpoano* Initiative for food security, biodiversity, and sustainable landscapes
- Gambia *Ba Nafaa* Project for biodiversity, water and sanitation, and climate change
- Senegal *Pencoo Gej / COMFISH* Project for sustainable fisheries, climate change, and biodiversity

Cross-cutting objectives and themes for all three projects include improved governance and capacity development. More specifically, improved governance involves developing management institutions and plans at the ecosystem scale, promoting co-management frameworks, creating legal and policy enabling conditions, and building constituencies to support management. Capacity development involves the creation of co-management committees; fisheries departments, local NGOs, CSOs, private sector collaborations; and improved information support systems, including fisheries stock assessment.

After summarizing each of the unique case studies in West Africa, Crawford highlighted key messages and shared lessons learned. In all cases, co-management practices must be at the scale of the ecosystem. Context matters, so the transfer of conservation-based methods and models from Asia is risky without careful consideration of the unique West Africa context. Careful consideration of the legal basis for co-management and regulatory measures is essential because without legal authority, cooperative management fails. Investments in capacity development are important, including supporting co-management institutions and enforcement systems. There is a need for better scientific information and local knowledge to be incorporated into planning and decision processes for long-term sustainability.

### **Benguela Current LME Responses to Stressors**

**Nico Willemse** highlighted the importance of Strategic Environmental Assessments (SEA) and planning across all sectors in the Benguela Current LME. This includes looking at the mandates and roles of various institutions and also the cumulative effects of various marine industries on the environment and how best to use more integrated support tools in marine spatial planning. He stressed the need to learn more about the non-fisheries sectors, the drivers and economic systems and the goods and services generated. Better descriptions need to be done on the key industrial sectors including shipping and ports, the oil and gas, marine phosphorite and diamond mining as well as examining marine leisure opportunities and linking growth and job creation in coastal populations with industrial development. These non-fisheries sectors strongly influence government policy and there is a need to integrate the needs of the

various marine sectors through a strategic planning process and to update the TDA and SAP to reflect these new requirements especially within the framework of future climate change. The policy objectives and mandate of the Benguela Current Commission should address these needs and involve a stronger engagement with the private sector. It is estimated that the ecosystem goods and services from the BCLME is at the approximate amount of U\$260 billion per annum.

### **A Global Community of Practice to Improve the Management of LMEs and Their Coasts (LME / ICM-CoP)**

**Vladimir Mamaev**, GEF Regional Technical Advisor at UNDP, provided a summary of the GEF-LME Community of Practice project “Strengthening Global governance of LMEs and their coasts through enhanced sharing and application of LME / ICM / MPA knowledge and information tools.” He reported that the Project Identification Form (PIF) had been approved by the GEF in June 2013. A copy of the latest PIF document was made available to the rapporteurs. He outlined the objectives of the project and its various components and that details on the next phase i.e. the Project Preparation Grant (PPG) were now being prepared. This will include the development of training programs, capacity assessment, stakeholder involvement and the requirements and commitments towards co-financing. It is expected that the PPG will be completed by May 2014. Commencement on the scoping phase of the project would begin at a workshop held at the IOC-UNESCO headquarters immediately following the LME Consultative Committee meeting for which most of the stakeholders would be in attendance. This project will be supported by IW-LEARN. He also provided an update on the GEF-supported “*West Bering Sea LME in a changing climate*” project (Russian / US bilateral) including a description, goals, implementation, execution, and stakeholder involvement. Among those involved are NOAA, IUCN, WWF, and the private sector. A description was given on the main outputs and components of the project, which related to 1) transboundary issues, 2) ecosystem function, 3) climate change and, 4) knowledge gaps for ecosystem-based management. One of the key objectives is the undertaking of a targeted demonstration project addressing safety and navigation, prevention of environmental degradation and a marine electronic highway component.

### **Building and Enhancing an Operational Oceanography Capability in a LME**

**Glenn Nolan**, Section Manger of Oceanographic Services at the Irish Marine Institute, presented end-to-end oceanographic systems for LME data collection and long-term monitoring programs. This includes new technologies, in-situ systems, modeling and satellite products, data archives and resources, and decision support services available from the Irish Marine Institute. In terms of the LME modular assessments for sustainable development, these technologies can directly support module indicators for productivity, pollution and ecosystem health, fish and fisheries, and governance (e.g., stakeholder participation). To demonstrate its usefulness, Nolan reviewed the Irish in-situ network (2000-2013), which is integrated with the global earth observation system of systems - a global, coordinated, comprehensive, and sustained observing system. Nolan highlighted a marine service, MyOcean available at <http://www.myocean.eu/>. MyOcean provides affordable ocean monitoring and forecasting services for temperature, salinity, currents, surface wind, sea level, sea ice, biogeochemistry, and other indicators of potential use for LME projects. Nolan reviewed “frugal innovation” technologies, including platforms with telemetry for approximately €2,000 (comparable to €10,000 technologies). He discussed low-cost sensors and platforms and low-cost telemetry for an achievable maintenance strategy that may meet LME monitoring needs.

## **LME Consultative Committee – Synthesis by Dr. Mick O’Toole**

In the closing summary, Dr. Michael O’Toole of the Marine Institute, Rinville, Oranmore, Co. Galway, Ireland, highlighted the large number of participants taking part in this year’s LME Consultative Committee Meeting and the high standard of presentations given by the speakers. These covered a wide range of topics ranging from integrated ecosystem assessment and the implementation of the ecosystem approach to fisheries management in LMEs, to the challenges facing coastal states in relation to marine spatial planning, and addressing the impacts of climate change on fisheries and marine ecosystems. It was also noted that participants from Indonesia and the Philippines were present at the meeting for the first time representing the Indonesian Sea and the Sulu–Celebes LME projects. This pointed to the expanding network of LMEs globally and the increasing acceptance of the LME concept based on the five modules as a successful formula for integrated ocean governance. The challenge of training people in sufficient numbers with relevant certified courses on the LME approach to ecosystem-based assessment and management was emphasized along with the need to put in place mechanisms to ensure that capacity is retained. More sociologists, economists and spatial planners will be required in LME regions in the future to address increasing commercialization of the oceans in relation to fisheries, maritime transport, offshore oil and gas, seabed mining, and marine renewable energy. At the same time, we need to have policies in place to ensure that the integrity of Large Marine Ecosystems are preserved and protected for future generations.

**ANNEX 1: Agenda**  
**IOC-IUCN-NOAA Large Marine Ecosystem**  
**15<sup>th</sup> Consultative Committee Meeting, Paris, France**  
**10-11 July 2013**

**DAY 1 - July 10, 2013**

<b>TIME</b>	<b>TOPIC</b>	<b>SPEAKER</b>
<b>9:00 am - 12:15 pm</b>		
	<b>IOC WELCOME</b>	<b>Luis Valdes</b>
	<b>RECOVERY and SUSTAINABLE DEVELOPMENT OF LMEs</b>	
	Recovery and Sustainability of LMEs During Climate Change Also: J.F. Kennedy Library Conference Perspectives	Kenneth Sherman
	Monitoring and Assessment Practices for the Humboldt Current LME	Michael Akester
	Signature of Ocean Warming in Global Fisheries Catch	Daniel Pauly
	ICES Working Group on LME Best Practices Report for 2013	Hein Rune Skjoldal Nico Willemse
<b>10:30 am - 10:45 am</b>	<b>COFFEE/TEA</b>	
	The Transboundary Waters Assessment Program (TWAP)	Julian Barbieri Sherry Heileman
	The GEF Support Toward Sustainable Development of LMEs	Christian Severin
	Catalyzing Ocean Finance for LME Recovery and Sustainability	Andrew Hudson
	The Guinea Current LME Project: Results and Status	Christian Susan Kristen Honey
	<b>LUNCH</b>	
<b>1:30 pm - 5:00 pm</b>	Gulf of Mexico LME and Pacific Central American Coastal LME Assessment and Management	Antonio Diaz de Leon Porfirio Alvarez Patricia Muñizo
	Canary Current LME Recovery and Sustainability	Birane Sambe
	FAO- GEF Supported LME Projects	Merete Tanstad
	<i>R/V Nansen</i> Operations in Support of LME Projects	Kwame Korentang
	Bay of Bengal LME Project Update	Chris O'Brien Rudi Hermes
<b>3:15 pm - 3:30 pm</b>	<b>COFFEE/TEA</b>	
	Assessment and Sustainability of the Agulhas Current and Somali Current LMEs (ASCLME)	Magnus Ngoile Lucy Scott
	Benguela Current LME Responses to Stressors	Nico Willemse
	Practices of Recovery and Sustainability of the Yellow Sea LME Under Multiple Stressors	Qisheng Tang
<b>5:00 pm</b>	<b>ADJOURN</b>	



**DAY 2 - July 11, 2013**

<b>TIME</b>	<b>TOPIC</b>	<b>SPEAKER</b>
9:00 am - 12:00 pm	IOC Welcome by the Executive Secretary of IOC-UNESCO	Wendy Watson-Wright
	<b>ADVANCING SUSTAINABLE DEVELOPMENT IN LMEs DURING CLIMATE CHANGE</b>	
	Benguela Current LME Commission and Convention	Hashali Hamukuaya
	IUCN Global Activities Related to LMEs	James Oliver
	LME Research and Assessments in Malaysian Waters: Bay of Bengal, South China Sea, and Sulu-Celebes LMEs	Siew Moi Phang
	The GEF Supported Governance Best Practices for LMEs Projects and Status of the W. Bering Sea LME Project	Vladimir Mamaev
10:30 am - 10:45 am	<b>COFFEE/TEA</b>	
10:45 am - 12:15 pm	Multidecadal Changes in Russian Arctic LMEs: Status of LME Atlas of the Arctic	Gennady Matishov Roman Mikhalyuk
	Trends in Large Marine Ecosystems of Interest to the Arctic Council	Hein Rune Skjoldal
	Indonesian Sea LME Assessment and Management Development	Subhat Nurhakim
	Recovery and Sustainability of the Mediterranean Sea LME	Virginie Hart
12:15 pm - 1:30 pm	<b>LUNCH</b>	
1:30 pm - 6:00 pm	Key Components of the Strategic Action Program for the Caribbean and North Brazil Shelf LMEs	Patrick Debels
	Marine Spatial Planning for Recovery and Sustainability of LMEs	Sandra Whitehouse
	USAID Investments in West Africa Sustainable Fisheries Initiatives: Lessons Learned	Brian Crawford
	Building and Enhancing an Operational Oceanography Capability in a LME	Glenn Nolan
3:00 pm - 3:15 pm	<b>COFFEE/TEA</b>	
3:15 pm - 6:00 pm	<b>BEST PRACTICES FOR CAPACITY BUILDING and MODELING FOR LMEs</b>	
	Commentary and Summary	Mick O'Toole
	Discussion/ Planning Session LME Consultative Committee 2013-2014	Chair and ALL
6:00 pm	<b>ADJOURN</b>	

**ANNEX 2: Participants List**  
**IOC/UNESCO-IUCN-NOAA Large Marine Ecosystem**  
**15<sup>th</sup> Consultative Committee Meeting, 10-11 July 2013 – Paris, FRANCE**

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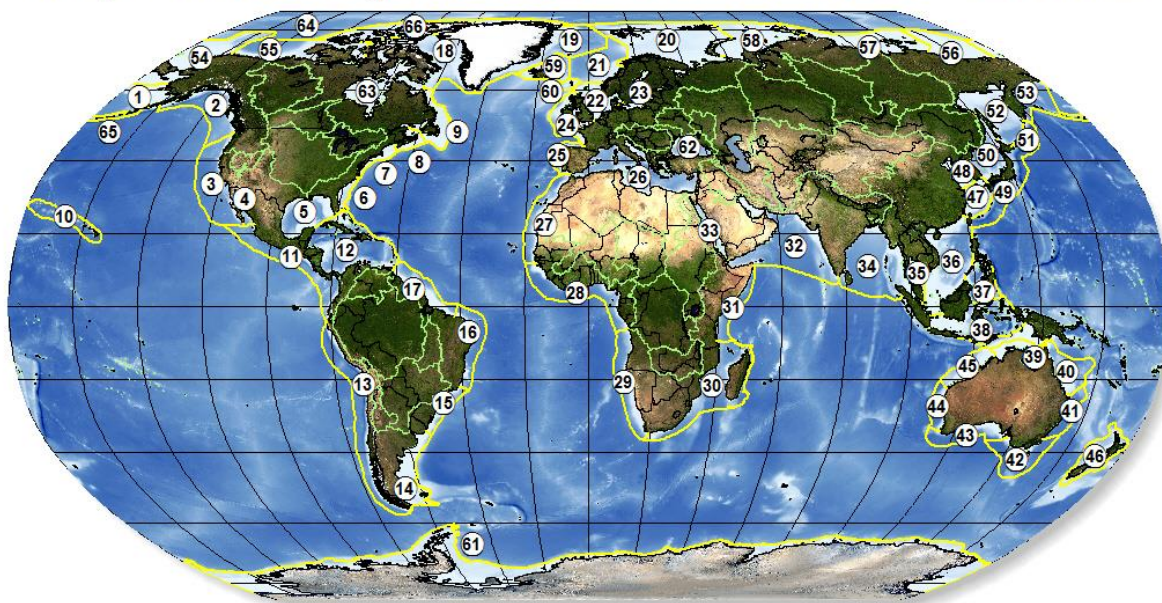
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## ANNEX 3: Newly Approved Maps of the World's 66 Large Marine Ecosystems

### Large Marine Ecosystems of the World and Linked Watersheds



- |                                     |   |                                   |                                      |  |
|-------------------------------------|---|-----------------------------------|--------------------------------------|--|
| 1. East Bering Sea                  | 15. South Brazil Shelf                          | 28. Guinea Current                | 42. Southeast Australian Shelf       | 55. Beaufort Sea                             |
| 2. Gulf of Alaska                   | 16. East Brazil Shelf                           | 29. Benguela Current              | 43. Southwest Australian Shelf       | 56. East Siberian Sea                        |
| 3. California Current               | 17. North Brazil Shelf                          | 30. Agulhas Current               | 44. West-Central Australian Shelf    | 57. Laptev Sea                               |
| 4. Gulf of California               | 18. Canadian Eastern Arctic -<br>West Greenland | 31. Somali Coastal Current        | 45. Northwest Australian Shelf       | 58. Kara Sea                                 |
| 5. Gulf of Mexico                   | 19. Greenland Sea                               | 32. Arabian Sea                   | 46. New Zealand Shelf                | 59. Iceland Shelf and Sea                    |
| 6. Southeast U.S. Continental Shelf | 20. Barents Sea                                 | 33. Red Sea                       | 47. East China Sea                   | 60. Faroe Plateau                            |
| 7. Northeast U.S. Continental Shelf | 21. Norwegian Sea                               | 34. Bay of Bengal                 | 48. Yellow Sea                       | 61. Antarctic                                |
| 8. Scotian Shelf                    | 22. North Sea                                   | 35. Gulf of Thailand              | 49. Kuroshio Current                 | 62. Black Sea                                |
| 9. Newfoundland-Labrador Shelf      | 23. Baltic Sea                                  | 36. South China Sea               | 50. Sea of Japan/East Sea            | 63. Hudson Bay Complex                       |
| 10. Insular Pacific-Hawaiian        | 24. Celtic-Biscay Shelf                         | 37. Sulu-Celebes Sea              | 51. Oyashio Current                  | 64. Central Arctic Ocean                     |
| 11. Pacific Central-American        | 25. Iberian Coastal                             | 38. Indonesian Sea                | 52. Sea of Okhotsk                   | 65. Aleutian Islands                         |
| 12. Caribbean Sea                   | 26. Mediterranean                               | 39. North Australian Shelf        | 53. West Bering Sea                  | 66. Canadian High Arctic-<br>North Greenland |
| 13. Humboldt Current                | 27. Canary Current                              | 40. Northeast Australian Shelf    | 54. Northern Bering-<br>Chukchi Seas |  |
| 14. Patagonian Shelf                |   | 41. East-Central Australian Shelf |                                      |  |