PACEM IN MARIBUS XXXIII

International Ocean Institute

&

Celebration of the 50th Anniversary of the UNESCO/IOC

Oceans, Climate Change & Sustainable Development: Challenges to Oceans & Coastal Cities

2nd – 4th September 2010
Beijing, People's Republic of China

CONFERENCE PROCEEDINGS

International Ocean Institute

Disclaimer: The views expressed by the authors are not necessarily those of the International Ocean Institute, or the organizers and sponsors of *Pacem in Maribus* XXXIII.

Citation of this publication:
Ralston T. & Zhang Z. (eds) (2012) Proceedings, *Pacem in Maribus* XXXIII Conference, Beijing Raffles Hotel, Beijing, China. 2-4 September 2010.
International Ocean Institute (IOI) - Headquarters
State Oceanic Administration of China (SOA)

ISBN _____

The Chinese Vice Premier Li Keqiang (front middle) met with the representatives of the participants of the Pacem in Maribus (PIM) XXXIII Conference at the Great Hall of the People on 2nd September 2010, Beijing, China

Co-Chairs of *Pacem in Maribus* (PIM) XXXIII Conference & Celebration of the 50th Anniversary of the UNESCO/IOC on 2nd September 2010, Beijing, China

Dr. Awni Behnam
President of the International Ocean Institute (IOI)

Mr. Sun Zhihui
Administrator of State Oceanic Administration (SOA)

Dr. Wendy Watson-Wright
Assistant Director General and Executive Secretary, UNESCO/IOC

CONFERENCE ORGANISATION

International Ocean Institute

President: Dr. Awni Behnam
Executive Director: Dr. Cherdsak Virapat
Programme Officer: Ms. Antonella Vassallo

State Oceanic Administration of the People's Republic of China (local organizing committee)

Chair: Mr. Lianzeng Chen, Deputy Administrator of SOA, China
Vice Chairs: Dr. Haiqing Li, Director-General, General Administrative Office of SOA, China
Dr. Zhanhai Zhang, Director-General, Dept of International Cooperation of SOA, China
Members: Mr. Yinshui Xiao, Deputy Director-General, General Administrative Office of SOA, China - Mr. Lixin Weng, Deputy Director-General, Department of Policy, Legislation and Planning of SOA, China - Dr. Dong A, Deputy Director-General, Department of Sea Area and Islands Management of SOA, China - Dr. Bin Wang, Deputy Director-General, Department of Marine Environmental Protection of SOA, China - Dr. Bo Lei, Deputy Director-General, Department of Science and Technology of SOA, China - Ms. Xiaolei Yi, Deputy Director-General, Department of Marine Forecasting and Disaster Mitigation of SOA, China - Ms. Yue Chen, Deputy Director-General, Department of International Cooperation of SOA, China - Mr. Guangsheng Gai, Director-General, China Ocean News of SOA, China - Mr. Suixiang Shi, Deputy Director-General, National Marine Data and Information Service of SOA, China - Mr. Bin Mao, Department of International Cooperation
Secretary: Mr. Yafeng Yang, Department of International Cooperation of SOA, China

Intergovernmental Oceanographic Commission of UNESCO

Assistant Director General and Executive Secretary: Dr. Wendy Watson-Wright

Scientific Steering Committee

Chair: Prof. Jilan Su, Second Institute of Oceanography of SOA, Academician, Chinese Academy of Sciences, China
Members: Dr. Biliana Cicin Sain, University of Delaware, U.S.A - Dr. Werner Ekau, Chair of IOI Committee of Directors - Dr. Iouri Oliounine, IOC - Dr. Fangli Qiao, Deputy Director-General, First Institute of Oceanography of SOA, China - Dr. Cherdsak Virapat, Executive Director of IOI - Prof. Quan Wen, National Marine Environment Monitoring Center of SOA, China - Prof. Qiulin Zhou, Third Institute of Oceanography of SOA, China

CONFERENCE SPONSORS & PARTNERS

- Antinea Foundation, Switzerland
- Asian Disaster Preparedness Center **(**ADPC**),** Thailand
- Bank of Ayudhya Public Company Ltd., Thailand
- CARGILL Company, USA
- European Environment Agency (EEA), Denmark
- Fondation de Malte, Malta
- Foundation of National Disaster Warning Council (FNDWC), Thailand
- Geo Topic – Hydrographic Services, Germany
- Global Forum on Oceans, Coasts and Islands, USA
- Institute of Earth Systems, University of Malta, Malta
- International Maritime Organization, UK
- International Maritime Pavilion, France
- Lin Gang Marine Science Park, PR China
- Maritimes Cluster – Schleswig-holstein, Germany
- Massachusetts Environmental Trust, USA
- National Oceanic and Atmospheric Administration (NOAA), USA
- Ocean Policy Research Foundation (OPRF), Japan
- Pacific Disaster Center (PDC), USA
- Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Philippines
- Shanghai Maritime University, PR China
- Technopôle – Brest-Iroise, France
- Technopole Maritime du Québec, Canada
- United Nations Conference on Trade and Development (UNCTAD), Switzerland
- UNDP - Special Unit for South-South Cooperation (SU/SSC), USA
- United Nations Environment Programme (UNEP), Kenya
- United Nations International Strategy for Disaster Reduction (UN/ISDR), Switzerland
- World Meteorological Organization (WMO), Switzerland

LOGOS:

International Environment Institute
University of Malta


Technopole
Maritime du
Québec
OPRF
Ocean Policy Research Foundation
Ocean Policy Research Foundation
Promoting Co-existence between Man and the Ocean
Japanese
NGO in Special Consultative Status with the Economic and Social Council of the United Nations
PEMSEA
UNCTAD
UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
UNDP
Special Unit for South-South Cooperation
UNEP
United Nations Environment Programme
environment for development
ISDR
World Meteorological Organization
Working together in weather, climate and water

PACEM IN MARIBUS XXXIII
&
Celebration of the 50th Anniversary of the UNESCO/IOC

The Beijing Declaration

2-4 September, 2010

Beijing, People's Republic of China

The meeting of Pacem in Maribus XXXIII was held in Beijing, People's Republic of China from the 2nd to the 4th September 2010. 2010 is the year of the 50th Anniversary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, and is also the occasion of the World Expo 2010 in Shanghai with the theme "Better City, Better Life".

We the participants of the Conference wish to call the attention of the people of our globe to the potential threats to their future peace and wellbeing resulting from climate and ocean changes and the widespread degradation of coastal and marine systems. This degradation has a direct and potentially very deleterious influence on the environmental, social, cultural and economic sustainability of human communities worldwide and, especially, that of coastal communities. As ecological services are progressively degraded, coastal inhabitants will need to adjust their means of living and their level of dependence on natural resources. The impacts of ecological damage vary across social groups, with more vulnerable members of society being particularly susceptible to negative impacts. Adaptive capacities are also unequal across society, and are strongly correlated to levels of wellbeing. Furthermore, the policy responses of coastal and ocean management are complicated by the fact that coastal zones (in their ecological sense) often extend across multiple political jurisdictions.

We express our concern about the negative destabilizing consequences brought about by causes such as coastal urbanization, pollution, overexploitation of resources, rising sea levels, ocean acidification, and damaging hazard events. The implications of these negative influences are of particular concern given the growing numbers and proportions of people living in coastal zones; this trend of demographic growth is likely to further aggravate driving forces of change and to render negative impacts of such change as a matter of even greater humanitarian concern. Many of these issues also have the potential to affect each nation's security, and to displace human populations, potentially constituting a threat to peace. We, therefore, set forth numerous steps that can be undertaken as an effective means of improving and safeguarding the conditions of sustainable human societies, security and peace across all nations, satisfying the vital needs and ensuring the legitimate environmental rights of all.

Regarding oceans and climate: We emphasize the emergent need for an intelligent and prudent approach to address our long-term wellbeing and security. We propose an approach based on the understanding and communication of the risks of changing climate and oceans, on the evaluation of effective and expeditious management options, targeted towards making our marine and human communities more sustainable and prepared for climate-induced damage.

Our times call for a vastly improved integrated understanding of science and technology, communication, and governance structures that effectively manage our interdependent air, land, marine and human systems. Open and collaborative research, data collection, sharing and analysis, and modelling are needed at the global, regional and local levels. Appropriate science-based recommendations for governance mechanisms to shape our mitigation and adaptation strategies to changing climate, ocean, and human security needs are necessary. Socially-just policies that take into account the adaptation needs of vulnerable populations must be a cornerstone of all recommendations. Communicating and 'framing' the issues so they are understandable and actionable by all people is an important corollary to the integration of science into sound policies.

Regarding the role of oceans in sustainable development: We are experiencing profound changes in coastal and oceanic environments, connected with a loss of living resources and a decline in ecosystem services, both of which are crucial to coastal populations. We have to develop and apply management approaches to withstand the degradation of our coastal seas and to counter the undermining of human rights in coastal communities. New tools have to be developed and existing instruments have to be applied to address the challenges connected to climate and anthropogenically-induced impacts. Policies and strategies relating to marine economic development have to be adapted to be sustainable into the future. We thus need a new strategy for the marine industry which is now facing problems induced by climate change on the one hand, and the global economic crisis, on the other. We strongly recommend the implementation of existing management tools such as Marine Spatial Planning and Marine Sustainable Development, based on the principles of good Integrated Coastal Zone Management. Technical innovation also has to be enhanced to reduce dependence on fossil fuels and we need to focus increasingly on renewable energies and green and bio technologies.

Regarding challenges to coastal cities: The unique challenges which coastal cities face require a broad, transdisciplinary and ecosystem-based approach to management. Such an approach needs to take into account the ecological scale and dynamics of the coastal system, and the full spatial remit of influence. Feasible management of coastal cities requires a long-term perspective, built on all four components of sustainability (environment, economy, culture and society), manifested through strategic assessments and through an understanding of cumulative and synergistic effects. Ecosystem management advocates full involvement of all affected and interested stakeholders for purposes of collaborative management, also enabling a better understanding of linkages and connections between coastal and urban systems. It is thus crucial that an integrated and participatory approach is adopted to ensure the inclusion of scientific, socio-political and economic factors, while considering issues identified at local, regional and national levels as well as from the perspective of all key players. Climate change also brings with it increased vulnerability to certain natural hazards, with attendant risks for coastal zones. These risks can be reduced through strategies involving: (i) risk and vulnerability assessments, (ii) sound development planning, and (iii) emergency response plans (preparedness, early warning alert and mitigation).

We call on IOI and IOC-UNESCO and all relevant agencies to continue to provide a forum for consensus building and leadership promotion by bringing together representatives of the state, civil society and the private sector to promote a common vision on coastal and ocean governance.

We request IOI and IOC-UNESCO and all relevant agencies to encourage governments, stakeholders and all those empowered in capacity building in ocean science and governance education to support the efforts in implementation, research and monitoring in marine science, engineering, technology and governance in all their facets; in particular to promote the concept of operational oceanography, technologies for the mitigation of climate change and marine hazards, and ocean governance.

We invite IOI, IOC and all other relevant stakeholders to foster the holistic, comprehensive and integrated management of coastal and marine systems, in a framework firmly based on ecosystem considerations. Such a framework should include regulation measures and their effective enforcement, but should also foster wider public awareness and appreciation of coastal and marine systems and enhanced public participation in decision-making processes.

We call on all key players and stakeholders to contribute to the informal consultative process (ICP) and further development in the implementation of initiatives relating to the United Nations Convention on the Law of the Sea (UNCLOS).

We request IOI and IOC and all relevant agencies to encourage the adoption of adaptive and evidence-based management practices, not only using insights from science as a basis for policy development and implementation, but also including ongoing monitoring and review of the effectiveness of implemented policies, plans and management measures. Such evidence and evaluation-based management cultures ensure the effective use of resources in the long term.

We express our appreciation for the attention of the United Nations Secretary-General, Mr Ban Ki-moon, who gave an inspiring message to the conference. We also appreciate the message of His Serene Highness, the Sovereign Prince Albert of Monaco.

The conference expresses its deep appreciation and gratitude to the government and people of China for their generous hospitality extended to all participants as well as their excellent arrangements made by the host – the State Oceanic Administration of China (SOA) to ensure the success of the conference.

CONFERENCE BACKGROUND

The ocean covers almost three-quarters of the Earth's surface and by 2025 about 75 percent of the world's population could be living within 100km of its coasts. While the total economic and social value of the ocean can never be fully or accurately estimated, humankind has an economic and social dependency on goods, services and uses provided by the oceans. It is the largest source of protein for humankind and more than 90 percent of the planet's living biomass is found in the ocean (IUCN, 1997).

The *Pacem in Maribus* (PIM) Conference is one of the flagship activities of International Ocean Institute (IOI); the PIM Conference series is titled from the Latin for "Peace in the Oceans". PIM Conferences have played a crucial role in the formulation and promotion of the United Nations Convention on the Law of the Sea (UNCLOS) and provide a forum where the challenges of ocean space can be considered in their interconnectedness. Thirty-two such conferences have been held to date around the globe including PIM XXIV, held in Beijing, China in November 1996, which focused on "*Oceans in the Twenty-First Century*". PIM Conferences have become respected as important events in understanding threats to the world's oceans as well as the potential of oceans resources to sustain humankind.

2010 is the year of the 50th Anniversary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, and is also the occasion of the World Expo 2010 in Shanghai with the theme "*Better City, Better Life*". The State Oceanic Administration (SOA) of China, in cooperation with IOI and IOC, will organize during PIM XXXIII, a celebration of the important contributions of IOC in promoting international cooperation and coordination in ocean scientific research, service and capacity building since its creation in 1960, and in addressing important global, regional and national issues on the role of oceans in climate change and sustainable development. The Conference will be followed by a Review of the Outcome of the PIMXXXIII Conference Meeting and a Joint Meeting of the IOI Governing Board, Experts and SOA in Shanghai during 6th - 7th September 2010.

AIMS OF THE CONFERENCE

The Conference is entitled "Oceans, Climate Change and Sustainable Development: Challenges to Oceans and Coastal Cities" and will provide a forum for intergovernmental organizations, nongovernmental organizations, governments, as well as scientists and experts to address the challenges of oceans and coastal cities, to explore the scientific understanding of the impacts on and of the ocean, to discuss policies on the use and protection of the oceans in supporting economic development, to identify measures for adaptation and mitigation efforts, to share experiences and best practices in order to make better and more liveable coastal cities, and also to make progress in advancing ocean science.

OUTCOMES

It is expected that the Conference will make a major contribution to oceans, climate change and sustainable development, challenges to oceans and coastal cities as a result of the deliberations by scientists, experts and managers having addressed the specificity of ocean, climate change and sustainable development and challenges to oceans and coastal cities.

MAJOR CONFERENCE THEMES

1. Oceans and Climate Change

- Role of the Oceans in Climate Change
- Global Assessment of the State of Marine Environment
- Oceans and Climate Change Mitigation
- Integration of Oceans Issues in Climate Change Negotiations
- Ocean Science Challenges in Addressing Climate Change
- Partnership In Ocean Observations and Data Exchange

2. Role of Oceans in Sustainable Development

- Policies and Strategies of the Marine Economy Development in the Next Decade
- New Strategy for Marine Industry Facing Climate Change and Global Economic Crisis
- Marine Spatial Planning and Marine Sustainable Development
- Technological Innovation and Transfer for Marine Sustainable Development
- Healthy Oceans and Human Health: an Approach to Integrated Coastal Management

3. Challenges to Coastal Cities

- Mitigation of the Climate Change Impacts on Coastal Zones and Cities
- Strengthening Coastal Ecosystem Resilience to Climate Change
- Maritime Security, Piracy, Natural and Anthropogenic Disasters
- Global Economic Crisis and Marine Activities
- Contribution of Coastal Cities to National and Regional Economic Vitality

SOCIAL EVENTS

- Welcome reception on the evening of 2nd September, 2010
- Conference dinner on the evening of 3rd September, 2010
- City tour followed by lunch from the morning of 5th September, 2010

ORGANISERS

- State Oceanic Administration of the People's Republic of China (SOA)
- International Ocean Institute (IOI)
- Intergovernmental Oceanographic Commission (IOC) of UNESCO

DATE AND PLACE OF THE CONFERENCE

Date: 2nd – 4th September 2010
Place: Beijing Raffles Hotel, No. 33, East Changan Avenue, Beijing, CHINA

Tel: +86-10-65137766,
Fax: +86-10-65137842,
Web: www.chinabeijinghotel.com

CONTACT INFORMATION

- **State Oceanic Administration of China**

1. PROF. BIN MAO
   Department of International Cooperation
   State Oceanic Administration of China (SOA)
   1 Fuxingmenwai Avenue
   Beijing 100860
   P.R. CHINA

   Tel: +86 10 6801 9791
   Email: mao@comra.org

2. PROF. LI QIN
   Director, IOI-China
   National Marine Data and Information Service (NMDIS)
   State Oceanic Administration of China (SOA)
   93 Liuwei Road, Hedong District
   Tianjin 300171
   P. R. CHINA

   Tel/Fax: +86 22 2401 0859
   Cell Phone: +86 139 2046 1049
   Email: ioichina94@gmail.com

3. MS. FANGFANG WAN
   National Marine Data and Information Service (NMDIS)
   State Oceanic Administration of China (SOA)
   93 Liuwei Road, Hedong District
   Tianjin 300171
   P. R. CHINA

   Tel/Fax: +86 22 2401 0859
   Email: pim33beijing@sina.cn

- **International Ocean Institute**

1. DR. CHERDSAK VIRAPAT
   Executive Director
   International Ocean Institute - Headquarters
   P.O. Box 3
   Gzira GZR 1000
   MALTA

   Tel: +356 21 346 529
   Fax: +356 21 346 502
   Email: cherdsak.virapat@ioihq.org.mt; ioihq@ioihq.org.mt
   Web: www.ioinst.org

2. MS. ANTONELLA VASSALLO
   Programme Officer
   International Ocean Institute - Headquarters
   P.O. Box 3
   Gzira GZR 1000
   MALTA

   Tel: +356 21 346 528
   Fax: +356 21 346 502
   Email: antonella.vassallo@ioihq.org.mt; ioihq@ioihq.org.mt
   Web: www.ioinst.org

3. MS. HONGRONG YU
   IOI Focal Point-Shanghai
   Director, International Affairs Office
   Shanghai Maritime University (SMU)
   1550 Pudong Da Dao
   Shanghai
   P.R. CHINA

   Tel: +86 21 3882 0765
   Fax: +86 21 5885 3909
   Email: yuhr@shmtu.edu.cn

PREFACE

Human survival and development are closely related to the ocean. The rational utilization and protection of the ocean, the building of a *"harmonious ocean",* and the achievement of the sustainable development of the ocean are the ideal of the peoples of the world and are also a common interest of mankind.

The International Ocean Institute's *Pacem in Maribus* (PIM) Conference series has long been well known for the process of exploring measures to address global ocean issues, and the conference series has a wide influence. Since their beginning, the PIM conferences have played an important role in deepening the understanding of the oceans, in strengthening the management and protection of the oceans, in ensuring the rational, orderly and sustainable development of the oceans, and in promoting international marine cooperation. At the same time, the PIM conferences played and continue to play an irreplaceable and important role in promoting public awareness and safeguarding marine rights for developing countries.

During September 2-4, 2010, the State Oceanic Administration in cooperation with the International Ocean Institute and the Intergovernmental Oceanographic Commission hosted PIM XXXIII with the theme *"Oceans, Climate Change and Sustainable Development: Challenges to Oceans and Coastal Cities".* The theme hit the mark accurately. Under this theme, the conference was a significant international gathering with a rich, far-reaching, and strong forward-looking vision, in line with the common concern of international society with marine development and protection, adaptation of and response to climate change, and the common pursuit of sustainable development of the ocean.

The Chinese Government attached great importance to the convening of PIM XXXIII in China and provided strong support. PIM XXXIII also received the wide attention of the world. The Chinese Vice Premier Li Keqiang met with the representatives of the participants in the Great Hall of the People; Mr. Sang Guowei, Vice Chairman of the Standing Committee of the National People's Congress of China, Mr. Sun Zhihui, the then Administrator of SOA, and Ms. Patricia O'Brien, Legal Counsel and Under Secretary-General at the United Nations attended the opening ceremony and delivered opening speeches. Mr. Ban Ki-moon, Secretary-General of the United Nations, Mrs. Irina Bokova, Director-General of UNESCO, His Serene Highness the Sovereign Prince Albert II of Monaco, Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand, and the Hon. Dr. Tonio Borg, Deputy Prime Minister and Minister of Foreign Affairs of the Government of Malta, and other distinguished personages from countries and global organizations sent their congratulatory messages to the PIM XXXIII Conference and these greatly inspired the conference.

Under different sub-themes, more than 300 participants from around the world discussed in depth the challenges currently facing the oceans, and the adverse effects potentially caused by climate change on the oceans, while at the same time exploring and proposing measures to adapt and respond to these challenges. With the joint efforts of the organizers and participants, PIM XXXIII was a complete success.

PIM XXXIII also issued the Beijing Declaration to show international society that we were determined to join our efforts to meet the challenges facing the oceans, to adapt and respond to climate changes, so as to safeguard the ocean—the homeland of mankind.

To sum up the rich results of the conference and to show our deep appreciation to all authors, we have compiled the speeches, congratulatory messages and papers delivered at the PIM XXXIII conference into these Conference Proceedings. We also hope that the Proceedings will help to promote the scientific understanding of the oceans, to raise the public awareness of the oceans on the one hand, and to explore the ways to adapt and respond to climate change on the other hand so as to achieve the ultimate goal of a sustainable relationship with the oceans.

Let us join our efforts to take good care of our oceans and in so doing, to make our planet a sustainable and harmonious environment with blue oceans and blue skies.

Mr Liu Cigui
Administrator
The State Oceanic Administration of China

INTRODUCTION

The 33rd Pacem in Maribus is taking place at a time of great challenge to the international community. There is no doubt that the existing international legal regime for the ocean has failed to protect the sustainability of ocean resources and services. The reason is not for lack of instruments, but a failure in implementation, enforcement and compliance.

Since the late founder of IOI, Elisabeth Mann Borgese convened the first PIM, and Arvid Pardo declared the Common Heritage of Mankind, we have experienced waves of change, bordering on a tsunami that is unraveling many of the perceived moral and ethical values and aspirations of the founding fathers of UNCLOS.

The advances in technology, the advent of globalization and the supremacy of market power, with the passing of time, have revealed huge gaps in the governance architecture.

Major example is the governance deficit in areas beyond national jurisdiction. The threat to marine biodiversity and the rise of industrial and destructive fishing practices, fishing subsidies, land and marine-based pollution, exploitation and exploration of marine resources beyond areas of national jurisdiction all have posed a formidable challenge to the fuller implementation of UNCLOS. This critical situation has been compounded by the impact of climate change, thus bringing to the forth the cause and effects relationship in the nexus of oceans and climate change.

The lack of effective compliance and enforcement regime based on the political consensus of the world community has become intolerable and turbulent.

There is, however, increasing evidence of an emerging consensus for a new implementation agreement to be negotiated under the auspices of the United Nations. Such an agreement should be aimed at filling the gaps in the governance deficit, but not to rewrite UNCLOS. It is my hope that these presentations and the pursuant debates at the 33rd PIM will make significant contribution to meeting the current and emerging challenges as well as to our comprehension of its scientific, economic and social dimensions as a curtain raiser to any future interaction at the United Nations forums.

It is hoped that these proceedings and the rich agenda of debates at the PIM 33 will make a modest but significant contribution in addressing many of the current and emerging challenges as well as to enrich our comprehension of its scientific, economic, social and policy dimensions, and be a curtain raiser to any future interaction at the United Nations and related Ocean forums.

I thank all the contributors and presenters for giving their time so generously to make such as valuable contribution to Pacem in Maribus. As can be seen from the abstracts, three thematic topics have been addressed which augur well for the rich debates and future actions that are expected at the PIM Conference.

Dr Awni Behnam
President
International Ocean Institute

TABLE OF CONTENTS

PLENARY ABSTRACTS/PRESENTATIONS:

OCEANS, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT: CHALLENGES TO OCEANS AND COASTAL CITIES

- **1st SESSION**

- **2nd SESSION**

PARALLEL SESSION

- **Theme 1: OCEANS AND CLIMATE CHANGE**

CONFERENCE PROGRAMME

Thursday, September 2nd, 2010

13:30 - 16:30 hrs General Meeting of the IOI Governing Board & Operational Center Directors at the Beijing Hotel

15:00 - 18:30 hrs REGISTRATION

18:30 - 20:30 hrs WELCOME RECEPTION for participants hosted by the State Oceanic Administration

Friday, September 3rd, 2010

08:00 - 09:00 hrs REGISTRATION

CONFERENCE OPENING CEREMONY
Chair: **Mr. Chen Lianzeng, Deputy Administrator, SOA**

09:00 - 09:10 hrs Short film show

09:10 - 09:20 hrs Opening of Conference

09:20 - 10:20 hrs Opening Addresses

- Mr. Sun Zhihui, Administrator, SOA
- Dr. Awni Behnam, President IOI
- Dr. Wendy Watson-Wright, Assistant Director-General of UNESCO and Executive Secretary of IOC
- Mr. Liu Zhenmin, Assistant Minister, Ministry of Foreign Affairs, China
- Message from H.S.H. The Sovereign Prince Albert II of Monaco delivered by the Ambassador of Monaco in Spain, Permanent Representative of Monaco International Scientific, Environmental and Humanitarian Bodies and Member of the Scientific and Technical Committee of Foundation HSH Prince Albert II De Monaco, H.E. Mr. Patrick Van Klaveren
- Message from HRH Princess Maha Chakri Sirindhorn of Thailand delivered by H.E. the Ambassador of the Royal Thai Embassy in Beijing, Mr. Piamsak Milintajinda
- Message from Mr. Ban Ki-moon, Secretary-General of the United Nations delivered by Ms. Patricia O'Brien, Legal Counsel and Under-Secretary-General at the United Nations
- Mr. Sang Guowei, Vice President of the National People's Congress of China

10:20 - 10:30 hrs PRESENTATION OF THE ELISABETH MANN BORGESE MEDALS

- (The Chair invites Dr. Awni Behnam to read the decision to award EMB Medals to the awardees)

10:30 - 11:00 hrs Visit to Exhibition/Group Photo/Coffee Break

MEMORIAL LECTURES
Chair: **Dr. Awni Behnam, President of IOI**

11:00 - 11:25 hrs ARVID PARDO MEMORIAL LECTURE
- *Mr. Ranier Fsadni, Advisor to the Prime Minister of Malta*

11:25 - 11:50 hrs ELISABETH MANN BORGESE LECTURE
- *Professor Wang Ying, Member of Chinese Academy of Sciences*

CELEBRATION OF THE 50TH ANNIVERSARY OF THE UNESCO/IOC

11:50 - 12:15 hrs Keynote Address
- *Dr. Wendy Watson-Wright, Assistant Director-General of UNESCO and Executive Secretary of IOC*

12.20 - 13:20 hrs Lunch Break

PLENARY PRESENTATIONS:
Oceans, Climate Change and Sustainable Development: Challenges to Oceans and Coastal Cities

1st Session

13:20 - 13:25 hrs
Co-Chair: Dr. Biliana Cicin-Sain, Director, Gerard J. Mangone Center for Marine Policy, University of Delaware, U.S.A., Co-Chair and Head of Secretariat, Global Forum on Oceans, Coasts, and Islands

Co-Chair: Prof. Wu Dexing, President, Ocean University of China

Rapporteur: Ms. Mara Hendrix, IOI U.S.A.

13:25 - 13:45 hrs The Role of Oceans in Climate Change
- *Prof. E. Huang, Senior Research Scientist of the First Institute of Oceanography, SOA, China*

13:45 - 14:05 hrs Moving toward a United Nations Regular Process for Assessing the State of the Marine Environment
- *Dr. Wendy Watson-Wright, Assistant Director-General for UNESCO and IOC Executive Secretary*

14:05 - 14:25 hrs Ocean Impacts on the Formation, Variation and Projection of Climate
- *Prof. Wu Guoxiong, State Key Laboratory of Numerical Modeling for Atmospheric Science and Geographical Fluid Dynamics (LASG), Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences (CAS), China*

14:25 - 14:45 hrs Integration of Ocean Issues in Climate Change Negotiations
- *Dr. Biliana Cicin-Sain, Director, Gerard J. Mangone Center for Marine Policy, University of Delaware, U.S.A., Co-Chair and Head of Secretariat, Global Forum on Oceans, Coasts, and Islands*

14:45 - 15:05 hrs Policies and Strategies of the Marine Economy Development in the Next Decade
- *H.E. Ambassador Anthony Hill, Former Ambassador of Jamaica to GATT and WTO and UN, Switzerland*

15:05 - 15:25 hrs Technology Development for Ocean Science in the Next Decade
- *Mr. Richard Burt, Sales and Marketing Director, Chelsea Technologies Group Ltd., the United Kingdom*

15:25 -16:00 hrs Coffee Break

2nd Session

16:00 - 16:05 hrs
Co-Chair: Prof. Raphael P.M. Lotilla, Executive Director, PEMSEA, the Philippines

Co-Chair: Dr. Qiao Fangli, Deputy Director-General, the First Institute of Oceanography (FIO), SOA, China

Rapporteur: Ms. Elisabeth Conrad, Institute of Earth Systems, Malta

16:05 - 16:25 hrs Sustain Xiamen's Economic Growth through Scientific Use of Marine Resources
- *Mr. Pan Shijian, Vice Mayor of Xiamen Municipality, China*

16:25 - 16:45 hrs Marine Spatial Planning and its Role in Sustainable Development
- *Dr. Fanny Douvere, UNESCO and Mr. Charles N. Ehler, President, Ocean Visions Consulting, France*

16:45 - 17:05 hrs Challenges to Coastal Cities in Developing Countries: Role of International Cooperation – The UNEP/UN-HABITAT Partnership Agreement
- *H.E. Amb. Mr. Daniel Chuburu, Ambassador and Permanent Representative of Argentina to UNEP & UN-HABITAT*

17:05 - 17:25 hrs Maritime Communities and Climate Change – Role of Public Authorities and Cooperation Networks
- *Dr. Gunnar Tietze, Maritime Pavilion and Dr. Fabienne Vallee, International Cooperation, Science Park Brest Iroise, France*

17:25 - 17:45 hrs Multi-Stressors and Sustainable Marine Development: Alarming Reality in China
- *Prof. Jilan Su, Second Institute of Oceanography, SOA, China*

17:45 - 18:05 hrs Healthy Oceans and Human Health: An Approach to Integrated Coastal Management
- *Dr. Chua Thia-Eng, Malaysia*

18:30 - 20:00 hrs Banquet given by State Oceanic Administration of China

Saturday, September 4th, 2010

PARALLEL SESSIONS

Theme 1: OCEANS AND CLIMATE CHANGE

08:30 - 08:35 hrs
Co-Chair: Ms. Robbin Peach, Executive Director, Collaborative Institute for Oceans, Climate and Security, the Venture Development Center, U.S.A

Co-Chair: Prof. Mao Bin, Department of International Cooperation, State Oceanic Administration, China

Rapporteur: Mr. Michael Butler, Director of IOI Canada

08:35 - 08:50 hrs	Network of Marine Protected Areas to Mitigate Climate Change Impact on the Oceans • *Mr. Ronald Menzel, Founding Member and Director of the Antinea Foundation, Switzerland*
08:50 - 09:05 hrs	The Improvement of Ocean Circulation Models and Climate Models through Surface Waves: From Mean State to Long-Term Variations • *Dr. Qiao Fangli, Deputy Director-General, the First Institute of Oceanography (FIO), SOA, China*
09:05 - 09:20 hrs	Earth Observation and the Oceans-A New Age of Discovery? • *Mr. Dirk Werle, Partner/Geoscientist, Aerde Environmental Research, Canada*
09:20 - 09:35 hrs	Marine Disasters under the Global Change in the China Seas and Near Shore Cities • *Prof. Wang Hui, Executive Deputy Director-General, National Marine Environmental Forecasting Center, SOA, China*
09:35 - 09:50 hrs	Coastal and Marine Ecosystem Services, Their Linkages with the Poverty Alleviation: A Case Study of Vietnam • *Nguyen Van Quan et al., Head of Marine Conservation Department, Institute of Marine Environment and Resources, Vietnam Academy of Science and Technology, Vietnam*
09:50 - 10:05 hrs	Ocean Observation for Climate Research and Prediction • *Dr. Chen Dake, Director of the State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, SOA, China*
10:05 - 10:25 hrs	Coffee Break
10:25 - 10:40 hrs	Strategy for the Development of Marine Industry in the Time of Climate Change and Global Economic Crisis • *Former Ambassador for Environment, Prof. Dr. Yannis Kinnas, Greece*
10:40 - 10:55 hrs	Ocean Water Cycle and Global Warming • *Prof. Wu Lixin, Physical Oceanography Laboratory, Ocean University of China*
10:55 - 11:10 hrs	The Role of the Regional Seas Programme for Climate Change and Oceans • *Prof. Nilufer Oral, Faculty of Law, Istanbul Bilgi University, Marine Law Research Centre, Istanbul, Turkey*
11:10 – 11:25 hrs	Threats to Coral Reefs, Fisheries and Food Security: A Call for More Marine Protected Areas (MPAs) Established and Effectively Managed under Triangle Initiative (CTI) • *Prof. Nor Aieni Haji Mokhtar, National Oceanography Directorate, Ministry of Science, Technology and Innovation, Malaysia*
11:25 - 12:30 hrs	Discussion & Conclusion
12:30 - 14:00 hrs	Lunch Break

Theme 2: ROLE OF OCEANS IN SUSTAINABLE DEVELOPMENT

08:30 - 08:35 hrs	*Co-Chair:*	Dr. Werner Ekau, Leibniz Center for Tropical Marine Ecology, Director of IOI Germany
	Co-Chair:	Dr. Shi Ping, Director-General, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences (CAS), China
	Rapporteur:	Ms. Antonella Vassallo, IOI HQ, Malta

08:35 - 08:50 hrs — Japanese Initiative on Integrated Ocean Management and Sustainable Development
- *Mr. Hiroshi Terashima, Executive Director, Ocean Policy and Research Foundation, Japan*

08:50 - 09:05 hrs — Ocean Wealth – Research – Economy
- *Dr. Iouri Oliounine, IOC/UNESCO, Paris, France*

09:05 - 09:20 hrs — IOI-Brazil, working from local communities up to the global level
- *Prof. Eduardo Marone, Director of IOI South Western Atlantic Ocean, Brazil*

09:20 - 09:35 hrs — Sea Area Management and Marine Economy Sustainable Development
- *Dr. A. Dong, Deputy Director-General, Department of Sea Area Management, SOA, China*

09:35 - 09:50 hrs — Towards Integrated Coastal Management (ICM) in Japan
- *Ms. Masako Bannai Otsuka, Director of IOI Japan & Contracted Researcher, Ocean Policy and Research Foundation, Tokyo, Japan*

09:50 - 10:05 hrs — China's Marine Economy and Regional Coordinated Development
- *Prof. He Guangshun, Deputy Director, National Marine Data and Information Service (NMDIS), SOA and Prof. Wang Xiaohui, Director of the Marine Economy Division of NMDIS, SOA, China*

10:05 - 10:25 hrs — Coffee Break

10:25 - 10:40 hrs — Progress and Prospect of Climate Change Impacts on Fisheries
- *Dr. Jin Xianshi, Deputy Director-General of Yellow Sea Fisheries Research Institute, CAFS, China*

10:40 - 10:55 hrs — Development and Promotion of Coastal Zone Management Women Leadership from National Level Policy to Local Management
- *Dr. Victoria Radchenko, Director of IOI-Ukraine*

10:55 - 11:10 hrs — Coastal Community Social Accompaniment and Participative Model in Venado Island Rose Marie Ruiz, Project Leader and her Team Presentation
- *Prof. Alejandro Gutiérrez, Director of IOI Costa Rica, Universidad Nacional, Costa Rica*

11:10 - 11:25 hrs — Ocean and China's Sustainable Development
- *Dr. Qiu Jun, Research Fellow, China Institute for Marine Affairs, SOA, China*

11:25 - 12: 30 hrs — Discussion & Conclusion

12:30 - 14:00 hrs — Lunch Break

Theme 3: CHALLENGES TO COASTAL CITIES

08:30 - 08:35 hrs	*Co-Chair:*	Dr. Louis F. Cassar, Director of Institute of Earth Systems, University of Malta
	Co-Chair:	Dr. Jin Yongxing, Vice President, Shanghai Maritime University, China
	Rapporteur:	Dr. Albert Caruana, Environment Projects Coordinator, Ministry for Resources and Rural Affairs, Malta

08:35 - 08:50 hrs — What We Know and Don't Know on Harmful Algal Blooms (HABs) in Coastal Eutrophic Systems? – Necessity of End-to-End Studies
- *Prof. Zhou Mingjiang, Research Fellow, the Institute of Oceanography, Chinese Academy of Sciences (CAS), China*

08:50 - 09:05 hrs — Contribution of a Coastal City State to National and Regional Mediterranean Vitality: the example of Monaco
- *Prof. Dr. Alain Piquemal, Vice-President of the University of Nice-Sophia Antipolis (France), Member of the National Council of the Sea (Monaco)*

09:05 - 09:20 hrs — An Integrated Multi-Hazard Decision Supporting System Supporting Early Warning
- *Mr. Stanley Goosby, Chief Scientist of Pacific Disaster Center, Hawaii, U.S.A.*

09:20 - 09.35 hrs — Accountability of Government in the Tsunami Early Warning Arrangement in Thailand
- *Dr. Smith Dharmasaroja, Chairman of Foundation of National Disaster Warning Council, Thailand*

09:35 - 09:50 hrs — Ecosystem Services as Drivers of Coastal Migration
- *Dr. Joe Roman, Gund Institute for Ecological Economics, Rubenstein School of Environment & Natural Resources, University of Vermont, U.S.A.*

09:50 – 10:05 hrs — Beach Nourishment to Improve Coastal City Environment in China
- *Dr. Cai Feng, Deputy Director-General, the Third Institute of Oceanography, SOA, China*

10:05 - 10:25 hrs — Coffee Break

10:25 - 10:40 hrs — Marine Invasive Species and Ballast Water
- *Mr. Adnan Awad, Director of IOI South Africa*

10:40 - 10:55 hrs — Estuarine Biodiversity Conservation: Challenge to Coastal Cities
- *Prof. Wen Quan, National Marine Environmental Monitoring Center of China, SOA, China*

10:55 - 11:10 hrs — Paradigm Shift: Conventional to Green Banking - Way to Promote Coastal Sustainability
- *Mr. Pran Siamwalla, Industry Specialist, Risk Policy & Planning Development, Bank of Ayudhya Public Company Ltd, Thailand*

11:10 - 11:25 hrs — Challenges to Coastal City Environment by Global Shipping
- *Prof. Dr. Hu Yihuai, Shanghai Maritime University*

11:25 - 11:40 hrs Pollution of Marine Zones in Europe - Preview of the EU Policy as applied to the Mediterranean Coast of Cyprus

- *Prof. Dr. Nicholas Kathijotes, Cyprus University of Technology, Cyprus*

11:40 - 12:30 hrs Discussion & Conclusion

12:30 - 14:00 hrs Lunch Break

14:00 - 15:00 hrs POSTER SESSION

PLENARY SESSION

Chair: **Dr. Zhang Zhanhai, Director-General of the Department of International Cooperation, SOA**

15:00 - 16:00 hrs REPORTS OF CHAIRS OF THE PARALLEL SESSIONS

16:00 - 16:30 hrs Coffee Break

CLOSING SESSION

16:30 - 16:40 hrs Acceptance of the Conference Declaration

16:40 - 17:00 hrs Closing addresses & Ceremony for signing of the Memorandum of Understanding (MoU) between the State Oceanic Administration (SOA) and the International Ocean Institute (IOI) on the Establishment of the International Ocean Institute – China Regional Centre for the Western Pacific Region

- *Mr. Chen Lianzeng, Deputy Administrator, SOA*
- *Dr. Awni Behnam, President, IOI*

Close of the Conference

CONFERENCE OUTLINE PROGRAMME

	Thursday 2nd September		**Friday 3rd September**
13.30	Meeting of the IOI Governing Board and Operational Centre Directors at the Beijing Hotel + Registration *(from 15.00 hrs)*	08.00	Registration
14.00		09.00	Short Film Show
14.30		09.10	Opening of Conference
15.00		09.20	Opening Addresses
15.30		10.20	Presentation of Elisabeth Mann Borgese Medals
16.00		10.30	Visit to Exhibition/Group Photo/Coffee Break
16.30		11.00	Arvid Pardo Memorial Lecture
17.00		11.25	Elisabeth Mann Borgese Memorial Lecture
17.30		11.50	Celebration of the 50th Anniversary of the IOC/UNESCO
18.00		12.15	
18.30	Welcome Reception for participants by State Oceanic Administration of China (SOA)	12.20	Lunch Break
19.00		13.20	PLENARY PRESENTATIONS: Oceans, Climate Change and Sustainable Development: Challenges to Oceans and Coastal Cities Session 1
19.30		13.25	
20.00		13.45	
20.30		14.05	
		14.25	
		14.45	
		15.05	
		15.25	Coffee Break
		16.00	Session 2
		16.05	
		16.25	
		16.45	
		17.05	
		17.25	
		17.45	
		18.05	
		18.30	Banquet given by SOA
		20.00	

Saturday 4th September			
PARALLEL SESSIONS			
08.30 08.35 08.50 09.05 09.20 09.35 09.50	Theme 1: Oceans and Climate Change	Theme 2: Role of Oceans in Sustainable Development	Theme 3: Challenges to Coastal Cities
10.05	Coffee Break	Coffee Break	Coffee Break
10.25 10.40 10.55 11.10	Theme 1 (continued)	Theme 2 (continued)	Theme 3 (continued)
11.25 11.40	Discussion & Conclusion	Discussion & Conclusion	Discussion & Conclusion
12.30	Lunch Break	Lunch Break	Lunch Break
14.00			Poster Session
15.00	Report of Chairs of the Parallel Sessions		
16.00	Coffee Break		
16.30 16.40 17.00	Closing Session & Ceremony for signing of the Memorandum of Understanding *(MoU)* between the State Oceanic Administration (SOA) and the International Ocean Institute (IOI) on the Establishment of the International Ocean Institute – China Regional Centre for the Western Pacific Region		

OPENING CEREMONY

Friday, September 3rd, 2010
09.10 - 10.20 hrs

Beijing Hotel
Beijing, People's Republic of China

Co-hosted by:
The State Oceanic Administration of China (SOA)
International Ocean Institute (IOI)
Intergovernmental Oceanographic Commission (IOC) of UNESCO

Chaired by:
Mr. Chen Lianzeng, Deputy Administrator
The State Oceanic Administration of China (SOA)

OPENING REMARKS

Mr. Sang Guowei
Vice Chairman of the Standing Committee of the
National People's Congress of China

Distinguished guests, ladies and gentlemen,

Good morning,

I am so pleased to be able to attend the conference of the 33rd *Pacem in Maribus* (PIM) and Celebration of the 50th Anniversary of the UNESCO/Intergovernmental Oceanographic Commission. First of all, please allow me on behalf of the Standing Committee of the National People's Congress of China to express my heartfelt congratulations on the successful convening of the conference and to extend a warm welcome to all participants from both home and abroad.

It is known to all of us, that about two-thirds of the area of our planet is covered by the ocean. The ocean, the cradle of life, the treasure-house of resources, the arteries of transportation, and the source of winds and rains, is an important part of the human life support system and a valuable space for sustainable development. The promotion of peaceful development of the ocean is the common aspiration of people around the world, and is also the consistent aim of the PIM conference, and is intimately tied up with the concept of the "harmonious world" and "harmonious ocean" put forth by the Chinese Government. The ocean not only gave birth to human civilization, but also plays an irreplaceable important role in promoting the world's scientific and technological progress, economic development, exchange and integration of international cultures. In today's world of global integration economy, the importance of the ocean has become increasingly prominent and common concern of all mankind.

With the progress of science and technology, the fast growth of the world economies, significant increases in resource and energy demands, the development of the world economy is becoming increasingly dependent on the ocean. The ocean with its broad inclusiveness is bearing the brunt of all the negative effects brought about by the development of human society, but man often ignores the vulnerability of the marine environment and ecosystems. In recent years, frequent occurrences of a variety of marine natural disasters sounded a warning again and again; just recently the Gulf oil spill, as the representative of man-made catastrophes, once again reminded us that mankind's unscientific development activities could bring about serious damage to marine environments. More and more people are thus deeply aware of how important it is to maintain a healthy marine environment and to create conditions fostering the development of a "harmonious ocean". Advocating the building of a "peaceful ocean" and a "harmonious ocean" is a manifestation of the wisdom of humanity in line with current common and basic human values, aligned with a sustainable future world vision, and also drawing from humankind's social civilization heritage.

As we all know, global warming and climate change are enormous challenges facing the world today. They have a profound impact on the development and progress of human society. The ocean as climate regulator is the most significant bearer of the adverse impacts caused by climate change. And thus the ocean is the key place for adaptation of and responding to climate change.

The Chinese government attaches great importance to marine development and to responding to climate change. The party and state leaders have always stressed that scientific and rational development and utilization of the ocean and the cherishing and protecting of the marine ecological environment are of equal importance. The previous plans for national economic and social development have always regarded marine development and protection as an important element,

placing them in an equally important position as others. As China's highest legislative body, the National People's Congress has always attached great importance to the development of marine cause in China. In recent years it has approved and promulgated a series of marine laws and regulations such as the *Law of the People's Republic of China on Marine Environmental Protection,* the *Law of the People's Republic of China on Sea Area Use Management* and the *Law of the People's Republic of China on Island Protection.* In 2007, the Chinese government promulgated the *"National Programme for Responding to Climate Change"*, setting out the specific objectives and policy measures, calling for vigorous development of circular and low-carbon economy, and adhering to clean and green production, which fully demonstrated that China has determined to respond to climate change. Meanwhile, China vigorously promotes cooperation with countries in the world, and actively participates in climate change negotiations and international marine environmental protection exchanges, and earnestly fulfills relevant international obligations, and thus has made a positive contribution to the response to climate change, sustainable development and protection of the ocean.

Ladies and Gentlemen:

The 21st century is the Century of the Ocean. The world has entered into a new era of ocean exploration and development with great breadth and depth. The rich marine resources, the fragility of the marine environment, and the complicated implication of the ocean in climate change requires us to scientifically and rationally understand, develop, utilize and protect the ocean, making the ocean a rich benefit to all mankind. Thousands of years of experience teach us that human beings should not pose as rulers and conquerors of the ocean, rather that they should actively promote a harmonious coexistence with the ocean.

Today, the international community attaches great importance to sustainable marine development and to addressing climate change issues. In this context, that the State Oceanic Administration of China, the International Ocean Institute, and the Intergovernmental Oceanographic Commission jointly convene this conference is a timely act. China has always advocated the principle of *"mutual trust, mutual benefit, equality and coordination for cooperation".* We sincerely hope that through this conference, we will further deepen our understanding of the role of the ocean in responding to climate change and achieving sustainable development, get together to explore the ways to meet the challenges facing the ocean and jointly promote the building of lasting peace, the common prosperity of a harmonious world and a harmonious ocean. Let us join hands to form a new consensus through dialogue, to enhance mutual understanding through exchanges, and to achieve mutual benefit through cooperation.

Finally, I sincerely wish this conference a complete success!

Thank you!

Mr. Sun Zhihui
Administrator of State Oceanic Administration (SOA)

Honorable Mr. Sang Guowei, Vice Chairman of the Standing Committee of the National People's Congress;
Honorable Ms. Patricia O'Brien, Under Secretary-General of the United Nations;
Honorable Dr. Awni Behnam, President of International Ocean Institute (IOI);
Honorable Dr. Wendy Watson-Wright, Executive Secretary of the UNESCO Intergovernmental Oceanographic Commission (IOC);
Distinguished guests, ladies and gentlemen, friends;

Good morning!

Today we are gathered here together to hold the *Pacem in Maribus* (PIM) XXXIII and Celebration of the 50th Anniversary of the UNESCO/Intergovernmental Oceanographic Commission.

On behalf of the State Oceanic Administration of the People's Republic of China, I would like to express my sincere congratulations to the conference and extend my warm welcome to the guests and friends both from home and abroad!

The *Pacem in Maribus* is a high-level international forum initiated by the International Ocean Institute (IOI) to explore the global ocean issues, with the aim of deepening the understanding that the ocean is the common heritage of mankind, emphasizing the protection of the ocean, advocating reasonably and orderly the sustainable development of the ocean, and discussing ocean issues which people are most concerned about. Over the years, the *Pacem in Maribus* has attracted the active participation of many politicians, ocean scientists, lawyers on the law of the sea and personages of ocean economic circles, and has produced an extremely wide range of international influence.

Since the IOI China Operational Centre was set up in 1994, China has established close contacts and cooperation with the IOI operational centres in various regions to jointly promote the convention of the *Pacem in Maribus*, and in 1996 it hosted the *Pacem in Maribus* XXIV with "Ocean Management in the 21st Century" as the theme. At the same time, China has been active in carrying out related training in the ocean field, and conducted extensive exchanges and research on the major issues of EEZ management, deep-sea mining, development and protection of island resources, port management, prevention and control of marine pollution, marine scientific and technological innovation and the legislation on national ocean affairs, and has made its due contribution to the *Pacem in Maribus* and development of IOI operations.

In the backdrop of “peace and development" of the current world, today we ushered in the celebration of the 50th anniversary of the UNESCO/IOC, which is a major event in various Member States of the organization. For half a century, adhering to the aim provided in its charter, IOC has organized its Member States to carry out fruitful work in the field of ocean science, co-sponsored a series of major ocean science programmes, established the global operational ocean observing system, and has proposed an important concept to use obtained knowledge of the ocean to improve and strengthen ocean management of the Member States and put it into practice.

Since entering the new century, IOC has taken more clearly the ocean disaster mitigation, response to climate change and protection of the health of the ocean ecosystem as the goals of its work, developed projects on this basis to promote the advancement of ocean science, and has provided strong support to the Member States to implement the sustainable ocean and coastal development strategy. Today, IOC has become a competent United Nations agency guiding ocean management, providing ocean services and organizing scientific activities, and has made an important contribution to the international ocean development and has won universal praise from the international community.

China became a member of IOC since 1977 and has been elected as a member of the Executive Council of IOC since 1979. For more than three decades, China has participated in a number of tasks and activities of IOC, and has actively played its due role. In 1989, China established the World Data Center-D (Oceanography) and became a member of the IOC International Oceanographic Data Exchange Working Committee (IODE); with the joint efforts of the other Member States, in 1989 China contributed to the establishment of IOC/WESTPAC and a representative of China was successively elected Vice-Chairman or Chairman of IOC/WESTPAC; and a representative of China, Prof. Dr. Su Jilan, Academician of Sciences, was elected as Chairman of the 20th Session of the IOC Assembly in 1999 and has made a positive effort in promoting the work of IOC in full swing.

In order to strengthen the coordination of China's participation in the activities of IOC, the State Oceanic Administration established the IOC China Committee in 2005 to organize the country's ocean science and technology forces to participate in the IOC-initiated and organized important action plans for the Global Ocean Observation System, Ocean and Climate Change, Global Ocean Assessment of the State of the Marine Environment and discussions on the future development. In the Western Pacific region, it initiated and organized the implementation of such cooperative programmes as a Response of the Ocean Disasters in the Western Pacific to Climate Change, Monitoring of Monsoon Outbreak and Its Socio-ecological Impact and so on, established the IOC Training and Research Center for Ocean Dynamics and Climate Change, and actively promoted to carry out regional maritime cooperation and capacity-building. In recent years, China has carried out a series of research and practices in the conduct of marine scientific investigation and research, prevention and mitigation of the effects of natural disasters, adaptation to the climate variability and mitigation of its impact, the protection of the health of the ocean ecosystem, and realization of the legislation and policy for sustainable development of coastal and ocean management, which not only effectively promotes the realization of the goals of the IOC, but also played a tremendous role in promoting the development of China's ocean cause.

Ladies and Gentlemen,

The Chinese government has consistently advocated the concept of “building a harmonious ocean and realize the scientific development" and takes the development of ocean cause and ocean economy as an important part of the implementation of sustainable development in China. For more than 30 years since its reform and opening up, China's coastal provinces have become the fastest growing area in China feeding 40% of the population with 13% of land area, and have created more than 65% of the gross domestic product (GDP) with the ocean GDP accounting for 10% of the GDP. With great concern and strong support of the Chinese government, China's ocean cause is booming and has entered the best period of development: the scale of the ocean economy continues to grow, the ocean planning system has been formed basically, a major breakthrough has been obtained in the aspect of ocean legal construction, the strength in management of the use of sea areas and islands continues to intensify, the efforts in the protection of the ocean ecosystem and environment continues to increase, the ability of marine science and technology innovation and support have been raised significantly, remarkable achievements have been made in the ocean public service, research and investigation, and significant progress has been made in the cooperation with foreign countries in the ocean field. In the coming period, China will support and accelerate the development of its ocean cause by the implementation of the strategy for marine science and technology innovation, strive to enhance the quality and efficiency of the ocean economy, change the mode of development, and make efforts to achieve the harmonious development of economic construction and environmental protection.

With the increasing dependence of human development on the ocean, it has become a major issue faced by all mankind to scientifically understand the ocean, to rationally use the ocean, and to protect and cherish the ocean so as to achieve the sustainable development of the ocean. Currently, although the world economy has come out of the most difficult period of international financial crisis positive signs of recovery have appeared, the follow-up impact of the financial crisis still exists; at the same time, it is also important to deal with the issue of climate change in the economic and social development. In this context, it is even of great strategic significance to give full play to the status and role of the ocean in fostering a new economic growth point and to respond to climate change scientifically.

The State Oceanic Administration of China highly appreciates the work of IOI and IOC, and attaches great importance to developing mutually beneficial cooperative relations. The conference co-organized by tripartite this time is designed to give wide publicity to the concept of "Science and Peace", explore the major and hotspot issues of the ocean, climate change and sustainable development , and to seek ways to solve the many challenges facing the ocean. We are willing to make joint efforts with other countries in the world, as always, and support the activities of world's oceans peace, promote the development of marine science, to advocate the spirit of international cooperation in rational development of the common heritage of mankind, earnestly fulfill our international obligations, take the initiative to assume corresponding responsibilities, strengthen cooperation and exchanges with various countries and international organizations, maintain harmony and prosperity of the world's oceans, and protect the ocean ecological environment, so as to make due contributions to the sustainable development of the world.

Finally, I wish the Conference a complete success and all the guests and participants successful work and good health in Beijing!

Thank you!

Dr. Awni Behnam
President of International Ocean Institute (IOI)

Honorable Sun Zhihui, Administrator of the State Oceanic Administration;
Honorable Liu Zhenmin, Assistant Minister of Foreign Affairs China;
Ms. Patricia O'Brien, Legal Counsel of United Nations under Secretary General;
Dr. Wendy Watson-Wright, Executive Secretary of IOC;
Excellency Ambassador Patnick Van Klaveren;
Excellency Ambassador Piamsak Milinlajiuda;

Distinguished participants,

It is a great honour for the International Ocean Institute to hold the 33rd *Pacem in Maribus* (PIM) and the 2nd one in China. IOI is furthermore privileged to have one of its 22 operational centres in Tianjin. We cherish our cooperation with the State Oceanic Administrations of China (SOA) and we are proud of the presence of 160 IOI Alumni in China through SOA. SOA is a shining example of how countries and nations can effectively manage their ocean resources by providing an integrated, comprehensive and overarching governance, policy, and operational framework.

Today we are also celebrating the IOC 50th anniversary ever since its inception. IOC has been the very foundation of the marine scientific research and management of ocean and coastal resources. One only to recall is the recent work of IOC on Tsunami, warning and mitigation systems that are in place to comprehend the importance and the value of the contribution of IOC to ocean governance. We at IOI, share a common history with IOC, not only in the field of cooperation, and especially in capacity building, but in the fact that the first Executive Director of IOI was Dr. Sydney Holt, who came from the leadership of IOC as did other IOI executive directors as Dr. Kullenberg and Dr. Oliounine. We look forward beyond this conference to stronger cooperation and collaboration in advancing our common objectives in ocean governance and in assisting developing countries in this endeavour.

I take this opportunity to wish the new Executive Secretary of IOC, Dr. Wendy Watson-Wright a great success. Forty one years ago, under the leadership and initiative of a most remarkable woman, Elisabeth Mann Borgese whose devotion to the ocean gave birth to the first *Pacem in Maribus* (PIM) in 1972. Our founder, mother of the ocean, brought together a small group of remarkable men and women who drove the process of what came to be UNCLOS and structured that constitution on the ethical and moral foundation of the common heritage of human kind, thus forever changing our perception of common goods and their protection.

Elisabeth Mann Borgese thought and fought all her life for peace in the ocean. Peace not only where nations can avoid armed conflicts over the rich resources of the ocean, but a piece of humanity living in sustainable relations from the ocean and with the ocean. She called that first PIM "a leap in the dark", much has happened since those early days in managing our oceans that we can somewhat regard as encouraging. However, unfortunately, the human impact on the ocean is anything but satisfactory. It is, in short, disastrous. Humans have failed drastically to live with the ocean and from the ocean in a sustainable relationship. To continue this neglect is at the peril of the survival of our species.

At this conference, we have a unique opportunity to address the most critical challenges to the future of our planet. We also have an opportunity to make a contribution to the world Shanghai Expo as it addresses "Better city, Better life". It will be inconceivable in striving for Better cities and Better life that the nexus of ocean, climate change and coastal cities are not comprehensively addressed.

I sincerely hope and expect that the debate by the experts, scientists and policy makers that have gathered here today will make a critical contribution to our understanding of the cause and effect of climate change and ocean interaction and their interdependent relationship so that we can better address the impact on coastal cities and lives of 75 percent of our humanity which dwell by or near the coast.

I am also convinced that this conference will contribute to the next session of the IPC at the United Nations under the able leadership of UN DOALAS. We can also look forward to the Cancun (Mexico) meeting on climate change. It is my hope we can place on the development agenda on the value of the "blue economy" and the stake in a better future for developing countries.

The importance of this conference is underlined by the presence of the under Secretary General, Ms. O'brien and the message she is carrying for Mr. Ban Ki-Moon, the United Nations Secretary General. We are truly honoured by the kind attention of the Secretary General.

I close by expressing our deep gratitude and appreciation for the generous hospitality of the People and Government of China and to the Administrator and the staff of SOA who diligently and efficiently prepared for and organized this 33rd *Pacem in Maribus* Conference under difficult circumstances, we are greatly indebted.

Thank you.

HIGH LEVEL SEGMENT

Friday, September 3rd, 2010
09:20 - 10:20 hrs

Beijing Raffles Hotel
Beijing, People's Republic of China

Messages to the Conference

Mr. Ban Ki-moon

The Secretary-General of The United Nations

I am pleased to send greetings to the Pacem in Maribus XXXIII conference, which is celebrating the fiftieth anniversary of Intergovernmental Oceanographic Commission of UNESCO. I also wish to convey my appreciation to the Government of the People's Republic of China for the various important world events it has hosted this year.

The theme of this year's Conference, "Oceans, Climate Change and Sustainable Development", highlights the centrality of the marine environment to human well-being. Perhaps most significant is the role that oceans play in regulating the global climate -- generating oxygen and absorbing carbon dioxide from the atmosphere.

Among those on the front lines of climate change are coastal communities -- in particular people living in Small Island Developing States. Halting the decline of coastal ecosystems such as mangroves, salt marshes and sea grasses, can help to mitigate the adverse impacts of climate change while providing numerous social and economic benefits to hundreds of millions of people.

This Conference is an occasion to take stock of the many benefits that we derive from the oceans. As we are becoming increasingly aware, these benefits are not limitless. Indeed, in many cases, they are in peril.

Last year, I drew attention to the plight of the oceans, and our collective responsibility to protect them, in the inaugural message for World Oceans Day. With so many people depending on the oceans, it is vital that we pursue universal participation in the 1982 United Nations Convention on the Law of the Sea, the world's "constitution for the oceans". We need to preserve the productivity and essential ecosystem functions of the oceans as a basis for a prosperous and sustainable future for all.

I wish you a successful Conference.

His Serene Highness, the Sovereign Prince Albert II of Monaco

Discours prononcé par S.E. M. Patrick Van Klaveren
Au nom de S.A.S. le Prince
Conférence "Pacem in Maribus"
Pékin, 2-4 septembre 2010

Let me first express my sincere regrets for not being able to participate at this 33rd session of Pacem in Maribus and work with you on our oceans and coastal cities challenges. Let me also express my thanks to the Chinese State Oceanic Administration for convening such an important meeting of the International Ocean Institute and having invited me to share with you some of my concerns and hopes.

For many centuries the oceans were, in the mind of human beings, the place of all dangers and fears. Decade after decade humankind learnt how to run it in a way that we now call sustainable. In every important step of its destiny, Mankind has progressed thanks to the sea and the oceans. They helped in developing trading, politics and modern organization of our societies. By sailing the oceans, human beings became aware of the human race's unity and of the limits of the earth. Then, came the time of abuse, overexploitation of its resource and damage to its functions. Little by little, without any knowledge, mankind pollutes its water and despoils its resources: invisible damages that scar our ocean.

Now, we know. Now, we have science and technology. Now nobody can ignore any further what is happening on, in and around our seas. Now we know enough about the damages caused, we know that instead of using the interests of the goods provided by mother earth, we consume the capital itself. Now, we understand that nothing is free and that tomorrow our children and grand children will have to pay the price.

Human mentality is more to complain than to react. The current challenge is not to look back on what has been done or wasn't done, but to look ahead, keeping the momentum and orient decision. Action is already on many agendas, and I am glad to underline, in particular, the Chinese concerns and decisions related to energy efficiency and Climate Change. But speed is needed; threads and destructions are faster than current actions.

New concepts are on the table, economical value of biodiversity on ecosystem services, strong science for decision, green economy, new scale of values, and better integration of all economical and political sectors. Time, when nature conservation was costly, is over. Equitable sustainable development is development and prosperity for everyone.

A new worldwide social link around common challenges is on the trail for action. Good governance, including effective multi-lateral action could be addressed and reconcile divergent interests.

All international tools are in our hands, in particular the multiple and innovative tools belonging to the UN Law of the Sea family, and especially the new Mediterranean Integrated Coastal Zone Management Protocol of the Barcelona Convention. But we need to raise the institutional walls inside this excellent corpus of internationals treaties. Reinforcing the role of the UN bodies, like UNEP, in order to enhance synergies, harmonize efforts and facilitate national governance is also a challenge. At national or regional levels, all around the world, initiatives are ongoing which will enhance the protection of our maritime resources. Each of us, on our own scale, can contribute to progress and blaze a trail for new actions.

My Foundation, which campaigns for biodiversity, preservation of water resources and the prevention of global warming, is also involved in initiatives designed to protect maritime areas and marine species. This year in particular focus was made on the status of a fish symbol of an overexploited ocean. My Foundation, supporting scientific research on bluefin Tuna, joins its efforts with my Government to launch wide awareness on the collapse of these fish stocks. From the few solutions available we decided to ask for a ban of its international trade, using the CITES tools. The international community decided not to agree to our solution but to rely again on effective management of the fisheries, solutions that unfortunately failed in the last decades. Never have fish received such media coverage, never has the involvement of countries, expressing their concerns and decided to act were registered at such a worldwide level. Together, with all the countries including those that choose another way to succeed, we will act in the coming months.

Oceans health is vital not only for the riparian countries but for the whole earth population. Vital for today and for tomorrow. In this respect, cities around the seas have a huge responsibility. In China today, Beijing PIM 33, focusing on the coastal Cities, will join the Shanghai world exposition to make obvious that Better cities will bring Better life.

I thank you very much and wish you a successful and constructive meeting.

Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand

It is a great pleasure for me to have the opportunity to give a message concerning the environment which has become a principle problem worldwide.

First and foremost, I would like to congratulate IOI for organizing the PIM XXIII Conference to discuss and provide good understanding about threats to the world's environment we are facing today. I have learnt about IOI's missions with admiration and appreciation for its dedication to sustaining all humankind, from which inspiration and aspiration may significantly be derived and expanded throughout the world community.

The planet earth is home to all beings so it is our common heritage. This beautiful planet deserves our care and respect. Yet, it is a pity that, at present, our planet is severely injured. Its dignity and beauty are being immensely damaged. Consciously and unconsciously, we human-beings are burning this planet, our home, with our own hand, and we never realize it. If we look back and think, we will see. Deforestation, air and water pollution, indiscretion in natural resources consumption, emission of poisonous gases are examples. These, in consequence, have caused a chain of major problems: global warming followed by climate change. The seriousness of the phenomena is increasing day by day. The intensity of their impact on all beings living on the planet is apparently unthinkable. The principle factors indispensable for survival such as food, water, and air will be badly affected. If we do not try to find the way to stop them, or let them spread beyond control, they will certainly lead this planet on the way to destruction. We must bear in mind that all beings will not be able to survive with the environment being destroyed. We destroy the environment, we destroy ourselves. Thus, something must be done to save our planet, and it must be started now or it is possible that we will have nothing left for our future generations.

It is undeniable that it is quite hard to solve these problems. Nevertheless they are not the insoluble problems at all. To solve the problems is not the burden of any individual, but of us all. To put our abstract intention into concrete action, factors we need most, in my view, are courage, perseverance, and sincerity. We must have the courage to accept that the problems are really in existence and try to find the way to at least alleviate the problems, if not able to solve in the first place. I believe that alleviation will consequently lead to solution. Perseverance is that, we must be strong in mind and focus on our work without stopping. We must not let our ideal be shaken although interfered by some undesirable impediments. In the light of sincerity, we must exert ourselves to the utmost to perform our duty for the benefits of all beings, and not personal benefits. With these three factors combined, we will gain strength to face great challenge ahead of us. I still have faith in the old saying, "Where there is a will there is a way".

It is time for all of us to look at ourselves and consider what we can contribute to our planet. We must have the courage to change our role from the takers into the givers, and join our hands in restoring our beloved home to its original beauty. Human-beings and the environment rely on each other. We protect the environment and the environment will protect us.

With this message, I would like to offer IOI my very best wishes and sincerely hope for the progress and achievement of IOI's missions.

The Hon. Dr. Tonio Borg

Acting Prime Minister and Minister of Foreign Affairs, Valletta, Malta

MALTA

MINISTRY
OF FOREIGN AFFAIRS

On the occasion of the holding in Beijing of the *Pacem in Maribus* Conference, organised by the State Oceanographic Administration of China for the International Ocean Institute, which we are proud to host in Malta, I wish to confirm my country's abiding dedication to its vocation to develop ocean resources for all humankind in peace and solidarity with all men, re-asserting our conviction that such resources form part of the common heritage of humanity.

To that end, we welcome the theme you have chosen for this year's convocation of *Pacem in Maribus*, believing as we do that the evolution of coastal areas and their communities merits the close attention of all who hold sacred our present responsibility in conserving the sea, its environs and its resources for future generations.

On behalf of the Government of Malta, I thank the Chinese authorities for so splendidly organizing this conference, and the International Ocean Institute for being assiduous in its pursuit of implementing the dream of my countryman Arvid Pardo and in fulfilling it through the legacy of Elisabeth Mann Borgese.

May your Conference enjoy every success!

Ms. Margareta Wahlström
United Nations Assistant Secretary-General and Special Representative of the Secretary-General for Disaster Risk Reduction

Distinguished participants and organizers of this important Conference, Ladies and Gentlemen,

Disasters and Natural Hazards

From the second half of 2009 to the first half of 2010, 285 disasters linked to natural hazards affected more than 158 million people, claimed 232,481 lives and caused US$ 51.3 billion of economic damage[1]. Compared to the previous year, this represents a sixteen-fold rise in disaster fatalities -- most of which were associated with the 12 January 2010 earthquake in Haiti that killed 222,570 people. The nearly 300 percent increase in the number of people affected, despite no rise in disaster frequency, underscores the fact that disaster risk is geographically concentrated, driven by increasing exposure of people and property to natural hazards[2].

The facts are these:

- Disasters caused by vulnerability to natural hazards kill more people in developing than in developed countries, and disaster-related economic losses, measured against a country's wealth are much larger in poor countries[3].
- Developing countries are less resilient to large, or recurring, shocks. Additionally, disaster impacts undermine vulnerable livelihoods, as well as countries' economic growth and progress towards achieving the Millennium Development Goals.
- Disaster risk has become, and will continue to be, an increasingly urban problem. Poorly planned urban environments, weak urban governance, a lack of infrastructure and basic services[4], and rapid population growth have increased exposure and transformed poverty into disaster risk.

The grim reality is that, without proper risk reduction awareness or policies and measures in place by national and local governments, and with more population settling in risk areas and climate change expected to make things worse, we are poised for disasters -- large, medium and small -- that will increasingly affect development gains around the world in the coming years.

The earthquake in Haiti, recent floods in Pakistan, fires in Russia and landslides in this country are but the most recent examples of this phenomenon. Although these particular disasters have happened in in-land regions, we know from tsunami, cyclones and oil spill experiences that coastal areas and islands can be equally heavily affected.

---

1 International Disaster Database, Centre for Research on the Epidemiology of Disasters (CRED, 2010).
2 2009 Global Assessment Report on Disaster Risk Reduction: Risk and Poverty in a Changing Climate, United Nations, 2009.
3 United Nations 2009
4 Ibid.

Commitment to Climate Change Adaptation and Disaster Risk Reduction

When coupled with rapid urbanization, ecosystem degradation increases communities' vulnerability to floods, landslides, storm surges and seismic hazards. Due to climate change, the frequency and intensity of extreme weather events is expected to increase[5], magnifying the risk even further. In addition, there are new major risks, including population displacement posed by sea level rise and melting of glaciers, which are being caused by the global warming effect of climate change.

What is encouraging is that policymakers, scientists and civil society have recognized the urgent need for mitigation and climate change adaptation. This has brought about a positive shift in tackling risks posed by climate change worldwide. Disaster risk reduction approaches to building resilience offer concrete opportunities for climate change adaptation measures. Investing in reducing the impact of climate-related disasters preserves lives and economic assets, and assures that development gains are sustained in the long run.

Other positive developments are:

- The growing number of national platforms, or nationally-owned and nationally-led fora or committees for advocacy, coordination, analysis and advice on disaster risk reduction; and
- Increasing numbers of local governments that have signed up for the 2010-2011 World Disaster Reduction: "Making Cities Resilient" Campaign, which addresses issues of local governance and urban risk while drawing upon previous International Strategy for Disaster Reduction campaigns on safer schools and hospitals.

This commitment by national governments and local authorities the world over is reflective of the spirit of partnership that we at the Secretariat are trying to build and nurture -- for it is only through such steadfast commitment that we can effectively address the myriad challenges facing our world today.

Beijing and Disaster Risk Reduction

I cannot finalize without recognizing the relevance of the venue of this Conference. Beijing has been the venue of very important international discussions on disaster risk reduction. In 2005, just a few months after the tragic Indian Ocean Tsunami, it hosted the First Asian Ministerial Conference on Disaster Risk Reduction. In the following years, a series of international conferences in Beijing attracted disaster risk reduction experts and officials to identify gaps and develop policy guidance on risk reduction.

I trust this XXXIII Pacem in Maribus Conference will also be inspired and motivated by this auspicious city, and I wish this Conference a very productive outcome. Thank you very much.

---

5 Climate Change 2007: The Physical Science Basis: Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Mr. Efthimios E. Mitropoulos

Secretary-General, International Maritime Organization (IMO)

It is only comparatively recently that mankind has begun to understand that the planet that gives us life and sustains us is a fragile entity and that our actions can, and do, have massive repercussions.

All the more reason, then, to applaud the foresight and vision of that iconic and much missed figure, Elisabeth Mann Borgese, whose passion for the oceans in the early 1970s led to the establishment of the International Ocean Institute and to the *Pacem in Maribus* Conferences, which have been, and remain, one of the Institute's flagship activities. This year sees the 33rd edition of this seminal event.

"Peace in the Seas" is, of course, the literal translation from the Latin of the conference title. But a purely literal translation does not, I feel, do full justice to the vision of its founder, nor to the all encompassing events that they have become. In their early days, the *Pacem in Maribus* conferences played a crucial role in the formulation and promotion of the United Nations Convention on the Law of the Sea; subsequently, they have broadened their outlook and today they provide a forum where all the multi-faceted and inter-connected challenges facing the world's oceans can be considered in the round.

This year's conference takes *"Oceans, Climate Change and Sustainable Development: Challenges to Oceans and Coastal Cities"* as its theme. In doing so, it chimes perfectly with both the 50th Anniversary celebrations of the Intergovernmental Oceanographic Commission of UNESCO taking place this year, and the World Expo, currently underway in Shanghai, with its theme of *"Better City, Better Life"*.

It also echoes perfectly some of the issues with which IMO, as the specialized agency of the United Nations responsible for the safety, security and environmental performance of international shipping, has long been deeply concerned. In recent years, as environmental worries have strengthened and public expectations heightened, these concerns have come increasingly to the forefront of IMO's work.

In the context of sustainable development, shipping is a very positive force, making, as it does, a massive contribution to global prosperity with a minimal adverse impact on the global environment. Notwithstanding its excellent environmental credentials – largely the product of internationally agreed standards developed through IMO and technological developments introduced voluntarily by the industry – shipping and its regulators are actively and diligently engaged in efforts to reduce its environmental impact even further.

Indeed, shipping has consistently and continually improved its performance in so many environmental arenas. Less oil is spilled; less chemicals pollute the seas; less garbage ejected; less raw sewage emitted. Atmospheric pollution is being reduced and greenhouse gas emissions are under scrutiny within our energy efficiency schemes; cleaner hull coatings have been adopted; ballast water is being addressed. The list goes on.

It is, as you might expect, a source of satisfaction to me that much of the progress made on these fronts has been in response to the ever more comprehensive, and stringent, regulatory regime established and adopted through IMO. The role played by the industry in this process should, I think, be a source of equal satisfaction. Shipping, through its broad network of specialist representative groups, takes a positive and pro-active stance. From my perspective, the response of the industry to regulatory development is not one of grudging compliance but one of active engagement.

This has contributed in no small way to the fact that the regulatory framework enshrined in the collective body of more than 50 IMO Conventions provides an operational milieu that allows the industry not only to be safe and have a good environmental record, but also to be efficient, competitive and cost-effective. Indeed, it is becoming increasingly apparent that, far from being in conflict with one another, good economic performance and responsible environmental practices are mutually advantageous.

The efforts being made within the shipping community to improve our collective environmental credentials and thus help protect the oceans and the atmosphere are however, being played out within a much broader context. That the earth and its resources do not belong to us and are not ours to squander without thought for the future is not proving an easy lesson for us to learn, but we are gradually succeeding – or, at least, waking up to the enormity of the task that confronts us.

Mankind is on the horns of a dilemma. For, whether we like it or not, our collective way of life has become unsustainable and we need to do something about it – and soon. The choices we have made about the way we lead our lives have been slowly eating away at the very support system that enables us to live and breathe. This cannot, and should not, go on. We need to make some tough decisions, we need to make them now and we need to act on them as one, with total and undivided commitment – today and in the future. Faced with facts we cannot argue against, we need to consider our priorities and accept that we have to make certain sacrifices; we need to start putting “life” ahead of “lifestyle”.

The time for apportioning blame as to who is responsible for the state of the planet has passed. Now it is time for action. Developed and developing countries, industrialized and emerging economies alike have no option other than to confront mutual problems collectively.

I have no doubt that the forthcoming *Pacem in Maribus* event will, as ever, provide a valuable opportunity to add to our broader understanding of these problems and, thereby, to bring the solutions ever closer.

Mr. Michel Jarraud

Secretary-General, World Meteorological Organization (WMO)

World Meteorological Organization
Working together in weather, climate and water

I am especially grateful to Dr. Cherdsak Virapat, Executive Director of the International Ocean Institute (IOI), for the opportunity afforded to me to reach, with WMO's message, the participants in the 33rd *Pacem in Maribus* (PIM) Conference, a key activity of the International Ocean Institute (IOI) which this year also coincides with the 50th Anniversary of UNESCO/IOC and is being held in Beijing, from 2-4 September 2010, at the kind invitation of the State Oceanic Administration of the People's Republic of China. I regret that I am not in a position to attend this conference personally, as the WMO Commission for Instruments and Methods of Observation (CIMO) holds its fifteenth session in Helsinki from 2 to 8 September 2010.

This is however a welcome opportunity for me to recall how WMO's roots are intertwined with the provision of maritime and oceanic services. For millennia, the world's oceans upheld transportation, trade and commerce, a function which still retains a key importance in the modern world.

The oceans cover about two-thirds of the Earth's surface and have long been recognized as a major component of the global climate system. Furthermore, they sustain a large percentage of the Earth's population as well as a substantial proportion of its bio-diversity. Meteorological and oceanographic data and services are therefore vital for the protection, sustainable management and exploitation of the global ocean and its coasts, which are especially vulnerable to extreme weather events, as well as to marine pollution and overexploitation.

By the mid-nineteenth century it had been recognized that substantial benefits could be accrued in terms of safety and the economy, through a better use of marine meteorological information. In 1854 Vice-Admiral Robert FitzRoy, captain of the Beagle during Darwin's famous voyage, was appointed Meteorological Statistician to the British Board of Trade, forerunner to the present UK Met Office. The tragic wreck of the 2,700 ton iron-hulled steam clipper Royal Charter in October of 1859, which took about 459 lives and was vividly described by Charles Dickens in his journal *"All the Year Round"*, inspired FitzRoy to develop predictions charts which he called *"forecasting the weather",* thus coining the term weather forecast. Fifteen land stations were established to use the new telegraph to transmit daily weather reports at set times. The first daily weather forecasts were published in *The Times* in 1860, and a gale warning system was established the following year at key ports.

By then, the First International Meteorological Conference had already met in Brussels, during August 1853, as a consequence of the growth in international trade and the increasing concern for safety in marine transportation, but especially thanks to the efforts of Matthew Fontaine Maury, a US astronomer, oceanographer, meteorologist, cartographer, geologist, educator and mariner. Nicknamed *Pathfinder of the Seas*, he is considered one of the fathers of oceanography and marine meteorology. Published in 1870, Jules Verne's classic science fiction novel Twenty Thousand Leagues Under the Sea narrates the story of Captain Nemo and his submarine *Nautilus*, as seen from the perspective of a shipwrecked marine biologist, Professor Pierre Aronnax. Interestingly, no less than three distinct chapters of Verne's book contain specific references to the scientific studies of a *"Captain Maury",* who can be no other than Matthew Fontaine Maury.

Only a few years later, in September 1873, the first International Meteorological Congress met in Vienna to establish the International Meteorological Organization (IMO), the non-governmental organization which would be responsible for international cooperation in meteorology from its creation until the end of the Second World War. In September 1947, the Conference of Directors of National Meteorological Services (NMSs) held in Washington D.C. unanimously approved the WMO Convention, which became effective after the necessary ratification by Members on 23 March 1950, a date celebrated today by our international community as the World Meteorological Day.

In the mid-1980s, the WMO Commission for Marine Meteorology (CMM) recognized that the new communications requirements to be met under the developing Global Maritime Distress and Safety System (GMDSS) would demand substantial revision of the existing marine broadcast systems for meteorological services, which up to then were mainly based on coastal radio networks. WMO therefore embarked upon the development of a new, globally coordinated marine broadcast system for the GMDSS, which is now fully incorporated into the WMO technical regulations as part of the WMO Manual on Marine Meteorological Services.

The worldwide implementation of the new WMO system has been very effectively undertaken by the National Meteorological Services that accepted the relevant responsibilities and, as of 1999, a global coverage of meteorological forecasts and warnings became available through the SafetyNET service of INMARSAT. Sixteen WMO *Metareas*, which are identical to the International Hydrographic Organization (IHO) *Navareas*, were entrusted to the selected NMSs and, in addition to the SafetyNET broadcasts, meteorological forecasts and warnings for mariners are provided in a variety of other ways, in particular, through NAVTEX.

During the same year, the thirteenth World Meteorological Congress and the twentieth UNESCO/IOC Assembly approved the establishment of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology, in particular to coordinate international marine meteorological and oceanographic services and their supporting observational, data management and capacity building programmes. It was agreed that JCOMM would assume responsibility for activities previously managed individually by the WMO Commission for Marine Meteorology (CMM) and the Joint IOC/WMO Committee for those by the Integrated Global Ocean Services System (IGOSS). At the same time, the International Convention for the Safety of Life at Sea (SOLAS) was revised to incorporate the relevant components of both partners and to meet the requirements of all marine users.

Today, our growing understanding of the links between the ocean, weather and climate conditions, as reflected in the El Niño/Southern Oscillation (ENSO) phenomenon, offers the perspective to forecast critical phenomena such as severe droughts several months in advance in several parts of the world. At the same time, the enhanced importance of climate change has also brought into sharp focus the vital role of the oceans in the capture, storage and release of water vapour, carbon dioxide and other greenhouse gases, as well as the potential impacts of sea-level rise on coastal regions and lowlands, including the Small Island Developing States (SIDS). Climate has thus become, according to UN Secretary-General, Ban Ki-moon, *"the defining challenge of our era".* It is also generally accepted that human activities are modifying climate at an increasing rate and that, even if mitigation actions like greenhouse gas emission reductions would indeed contribute to diminish the rate of this problem, adaptation measures must necessarily also be considered among the options available to society. Through the National Meteorological and Hydrological Services (NMHSs) of its 189 Members, WMO has traditionally played a crucial role in detecting and alerting humanity on climate change and is now at the forefront of responding to this challenge. Observations, in particular observations from space, have shown a global-scale decline of snow and ice over many years. Snow cover is retreating increasingly earlier in the spring and most mountain glaciers are shrinking. Arctic sea ice is also shrinking most dramatically in the boreal summer. Reductions are also reported in the permafrost, seasonally frozen grounds and river and lake ice. Increasingly important coastal regions of the Greenland and West Antarctica ice sheets, as well as some of the Antarctic Peninsula glaciers, are thinning and contributing to sea level rise.

In 1976, WMO issued the first authoritative statement on the accumulation of carbon dioxide in the atmosphere and the potential impacts that this process might have upon the Earth's climate. This was the triggering event that focused policymakers' attention on climate change. As a result, WMO and the United Nations Environment Programme (UNEP) jointly established in 1988 the Intergovernmental Panel on Climate Change (IPCC), which at the end of 2007 approved its Fourth Assessment Report and received the prestigious Nobel Peace Prize.

In 1979 WMO organized the First World Climate Conference, which led to the establishment of the World Climate Research Programme (WCRP) - originally jointly with the ICSU and later also with the IOC of UNESCO - and the development in 1992 of the United Nations Framework Convention on Climate Change (UNFCCC). The 1990 the Second World Climate Conference, also organized by WMO, led in 1992 to the establishment of the Global Climate Observing System (GCOS) by WMO, the IOC of UNESCO, ICSU and UNEP, a long-term, user-driven operational system suitable to detect the impacts of climate variability and change, and to support all research activities required for an improved understanding, modeling and prediction of the climate system. In this sense, GCOS builds upon and operates in partnership with other global observing systems, such as the Global Ocean Observing System (GOOS) and Global Terrestrial Observing System (GTOS), as well as the WMO Integrated Global Observing System (WIGOS), World Hydrological Cycle Observing System (WHYCOS) and Global Atmospheric Watch (GAW).

Climate change will have significant impacts upon societies, particularly in the developing countries. It is therefore vital to provide decision-makers with the capacity to formulate policies on the basis of authoritative and unbiased information. Integration of observations, advanced computational and research facilities and scientific knowledge are essential if we are to achieve progress in the task of understanding the processes determining our climate. Accordingly, in 2009 the third World Climate Conference-3 (WCC-3) unanimously approved in Geneva the establishment of a Global Framework for Climate Services (GFCS), for which a High-level Taskforce (HLT) is actively developing proposals to be submitted to the Sixteenth World Meteorological Congress next year. WCC-3 brought together 13 Heads of State and Government, and more than 100 Ministers and agency heads, as well as 2,500 scientists, experts and decision-makers. Over the coming years, the GFCS shall be a key crosscutting force across all major WMO programmes and many of those of its partner organizations, particularly in the areas of climate variability and change adaptation and natural disaster risk reduction.

Before concluding, I would like to seize the opportunity to reiterate WMO's appreciation for this invitation and its sincere support to the International Ocean Institute. The first decade of this century has been a turning point in terms of the understanding of the role of the oceans in global change. Improvements in information technology have enabled the development of ocean-atmosphere coupled models with unprecedented resolution and precision. There is thus both an opportunity and a need to place more emphasis on marine science activities in the context of climate change, the effects of anthropogenic forcing and the natural variability of ocean ecosystems.

Ocean science is undergoing a conceptual revolution and there exists growing realization that sustainable development and management of the marine environment can only be achieved through a truly interdisciplinary scientific approach and enhanced observations. This will be part of the common challenge of the climate and marine scientific communities for the next decade. WMO is extremely grateful for the collaboration and partnerships that have developed between the meteorological and maritime communities during the past one and a half century, and wishes the *Pacem in Maribus* Conference a very successful outcome.

Thank you.

Dr. Bhichit Rattakul
Executive Director, Asian Disaster Preparedness Center (ADPC)

UNESCO/IOC 50th years Anniversary

It is an honour and a privilege for me to congratulate UNESCO/IOC on their 50th Anniversary. Starting with the International Indian Ocean Expedition in 1960, UNESCO/IOC plays the vital roles in international cooperation and to coordinate programmes in research, services and capacity-building for the coastal and ocean to protect the marine environment.

In the past few years, we have witnessed a significant increase of effects of climate change in the region. The Asia Pacific Region, with 55% of the world population, is subjected to the greatest impacts of natural and man-made disasters. Each year the Asian region suffers due to a multitude of recurring natural calamities that threaten millions of lives and cause large-scale economic, financial, infrastructure, crop and productivity losses that can seriously set back overall development goals of the region. With the onset of climate change and the poverty of the people in the region, unplanned habitation along rivers and shorelines have taken place which put these people at a greater risk.

Over the past 50 years, IOC has been at the forefront of the effort for more cooperation among the various stakeholders for improved natural resources management. IOC has played the lead role in strengthening the collaboration among the stakeholders in ocean resources management and early warning centres for the betterment of the people in Asia and the Pacific region. IOC was ADPC's valuable technical partner in the establishment of the multi-hazard early warning system for the Indian Ocean that is currently serving 27 countries in the region. IOC also provided important technical support to ADPC to several of our climate risk management projects to enhance the capacity of the local communities in understanding and utilizing complex weather information for the betterment of their lives.

With the dedication of its staff and also the cooperation from its partners, I do believe that UNESCO/IOC will continue to play an important part in ensuring a better future for people in our region.

Dr. Mário Soares

Patron of IOI and President of the Fundaçȧo Mário Soares

Even though I hoped that my agenda would allow me to attend PIM XXXIII and share with the Members of the Governing Board and other participants this important event, I very much regret that it will not be possible.

Through the effective system of communication and information on IOI activities, as well as the exchange of views with Prof. Mário Ruivo, I have followed closely the activities of the Institute, namely those aiming at its consolidation as a respected partner in the promotion of responsible Ocean Governance. I wish to express, Mister President, my appreciation for your determination and enlightened view on the role of IOI and NGOs to achieve the objectives of Sustainable Development of the Ocean, in close collaboration with the UN system and other qualified entities from civil society. The opportunity offered by the World Expo 2010 Shanghai "Better City, Better Life" and the openness of the Authorities of the People's Republic of China as host country to address the great challenges resulting from the interaction between human societies and the environment, provide an opportunity to put into action the spirit of PIM and of the inspiring legacy of the founding personalities of IOI. PIM XXXIII will, therefore, offer an opportunity to continue to pursue public and political awareness about the key role played by the Ocean in the global Earth ecological processes and the importance of ensuring the full implementation of the United Nations Convention on the Law of the Sea (UNCLOS).

Bearing in mind the experience as former Chairman of the Independent World Commission on the Oceans (IWCO), and the outcomes of the evaluation that I promoted in 2008 within the framework of the network Ocean Governance XXI to assess the state of international cooperation in Ocean Affairs, it must be acknowledged that, while progress was achieved in many domains aiming at the rational management of the marine environment and its resources, the institutional requirements for effective Ocean Governance are far from being satisfactory.

In view of the theme of PIM XXXIII "Oceans, Climate Change & Sustainable Development: Challenges to Oceans and Coastal Cities" and of the intention to contribute to the Celebration of the 50th Anniversary of the Intergovernmental Oceanographic Commission (IOC) it is expected that the Conference, within the scope of its objectives, pursues the reflection on the capacity of present institutional arrangements at all levels - national, regional and global - to respond to the increasing degradation of the marine environment and to the urgent need for a more effective Ocean Governance.

In this perspective, taking into consideration the positive outcomes of the Panel "Water: Preserving Our Oceans" organized by the IOI within the framework of the 122nd Assembly of the IPU (Bangkok, 30th March 2010) it would be timely to consider how to strengthen the valuable collaboration established between the IOI and the IPU. In order to ensure a better knowledge, the scientific basis and the maintenance of global Ocean observation and monitoring systems at the service of a Sustainable Development of the marine environment, it is therefore of the utmost importance to pay particular attention to furthering cooperation. This calls for a creative capacity-building strategy and adequate financial resources so as to meaningfully contribute to decreasing the inequalities in oceanographic research capacities and to allowing the necessary global solidarity. The IOC, whose functions, potentials and future within the framework of the UN system have been the object of debate by Member States, the Subsidiary Bodies of the Commission, as well as by the UNESCO General Conference, has a relevant role to play in this domain.

It is time to direct our efforts to overcome the institutional gaps affecting Ocean Governance and to encourage the Informal Consultative Process to address this issue. Thus, PIM XXXIII may wish to consider bringing this matter and the major outcomes of the Conference to the attention of the UN Secretary-General as a contribution to the debate on the item on the Ocean and the Law of the Sea of the forthcoming UN General-Assembly, in New York.

Mr. President, please convey this brief message to PIM XXXIII as well as my wishes for the success of the Conferences.

Mário Soares

H.E. Ambassador Salvino Busuttil

IOI Host Country Representative and President of the Fondation de Malte

Malta, the birth-place of the process that led to the UN Convention on the New Law of the Sea, and home of the International Ocean Institute, salutes the Republic of China and its SOA for so generously welcoming and sponsoring this year's *Pacem in Maribus* convocation and congratulates the Inter-Governmental Oceanographic Commission on its Golden Jubilee!

Celebrating all these events augurs well for the dedication of the international community to issues addressing equity and solidarity, in the context of sustainable development, in ocean affairs and in the just and peaceful exploitation of marine resources for the good of all humanity.

As we particularly devote this year's *Pacem in Maribus* to coastal areas, we are aware of the growing importance of coastal communities in relation both to their hinterland and to the sea lapping their shores. May we jointly ensure that we promote integrated coastal development as a service not just to these communities but to the whole population and peoples surrounding the coasts of our one world and of our one ocean.

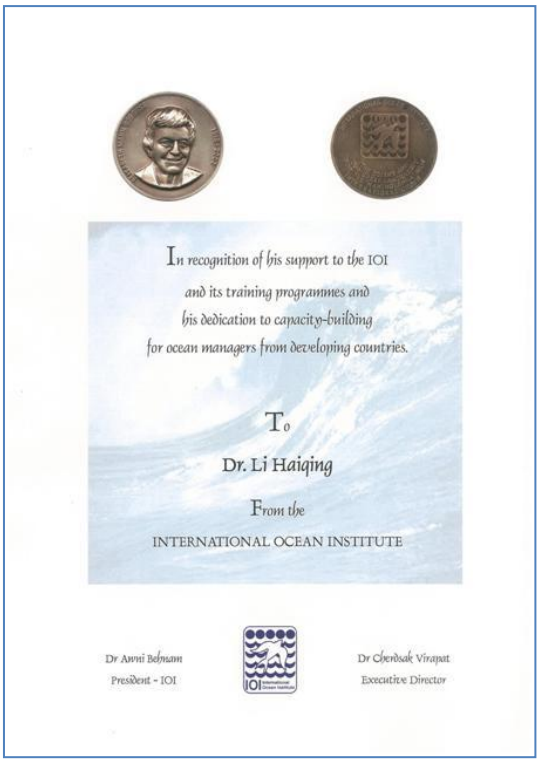
Wishing you every success.

PRESENTATION OF THE ELISABETH MANN BORGESE AWARD MEDALS

Above: Award of the EMB Medal to Dr. Li Haiqing; Prof. Salvino Busuttil's medal was awarded in absentia
and collected in his name by Mr. Ranier Fsadni.

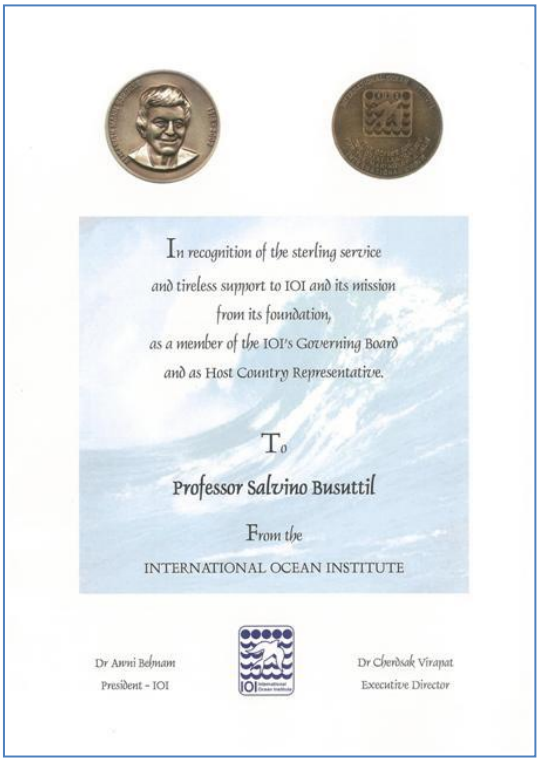
In recognition of their contribution to Ocean Governance and support to the International Ocean Institute, the following persons were awarded, during PIMXXXIII, the Elisabeth Mann Borgese Medal and Diploma by Dr. Awni Behnam in representation of the IOI:

- Dr. Li Haiqing, for his support to the International Ocean Institute and its training programmes and for his dedication to capacity-building for ocean managers from developing countries.



Certificate awarded to Dr. Li Haiqing

- Professor Salvino Busuttil was awarded, for his sterling service and tireless support to the International Ocean Institute from its foundation, as a member of the Institute's Governing Board and the IOI Host Country Representative since 2004. Since the medal was awarded in absentia and collected in his name by Mr. Ranier Fsadni, present in Beijing to give the Arvid Pardo Memorial lecture, it was considered fitting to honour Professor Busuttil with an official recognition of his role in the success of IOI and the Training Programme. After a brief address of praise and thanks, Dr. Awni Behnam invited Mr. Fsadni to officially hand over the EMB Medal to Professor Busuttil and thus to complete and give a fitting culmination to a collaboration begun many years earlier with Professor Busuttil's early friendship and support of Elisabeth Mann Borgese and the IOI in Malta.



Certificate awarded to Prof. Salvino Busuttil

Prof. Busuttil during the ceremony. Photo Credit: Dr. Cherdsak Virapat

ARVID PARDO & ELISABETH MANN BORGESE MEMORIAL LECTURES

&

CELEBRATION OF THE 50TH ANNIVERSARY OF THE UNESCO/IOC

The now customary memorial Lectures in honour of Elisabeth Mann Borgese and Arvid Pardo were given respectively by Professor Wang Ying, Member of the Chinese Academy of Sciences and Mr Ranier Fsadni, Advisor to the Prime Minister of Malta during a special session chaired by Dr Awni Behnam, President of IOI. This session was followed by a Keynote Address delivered by Dr Wendy Watson-Wright, Assistant Director-General of UNESCO and Executive Secretary of IOC in celebration of the 50th Anniversary of the UNESCO/IOC.

Above From L-R: Dr. Behnam, Dr. Fsadni, Professor Wang and Dr. Watson-Wright.

Arvid Pardo Memorial Lecture - Time and Ocean-Space

Advisor to the Prime Minister of Malta
Mr. Ranier Fsadni

Arvid Pardo's historic 1967 speech before the United Nations General Assembly is justly celebrated for its innovative conception of the oceans and how the various interdependent relationships embraced by the maritime and marine environment encapsulated global human relationships, too. I suspect that his address has so often been described as electrifying not only because of its diplomatic and legal ambition, but also because his key concept of 'ocean-space' effected a significant perceptual shift in his listeners, such that they came to understand their own world in a new way. Indeed, the idea of 'ocean-space' has been so suggestive that it has probably been partly responsible for the neglect, generally, of the point that Arvid Pardo was, in addition, also historicising the oceans; that is to say, to coin a term Arvid Pardo did not use, introducing the notion of 'ocean-time' – the notion that the human relationships in which the seas are involved are necessarily historical, relationships belonging to particular times as well as space.

What I would like to sketch out, therefore, are three things. First, I would like to highlight the dimension of time that was implied by Arvid Pardo. Second, I want to relate his particular time-bound vision to the Cold War context in which he articulated it. It is worth noting that Arvid Pardo's vision subscribed to neither of the two major contending ideological visions of the time, those of capitalist individualism and of socialist collectivism. Finally, I would like to trace out what differences the post-Cold War context makes, and has made, to 'ocean-time'.

The historicity of oceans may not have been explicitly discussed by Arvid Pardo in any detail. However, the idea underpins the urgency of his speech. The idea of a critical juncture in humanity's relationship to the oceans, the notion that the status quo was not a sustainable option given that certain limits were fast being approached, give a salient time dimension to maritime and marine activity. It was not a banal point at all. Even today, over 40 years later, it is all too common for the oceans either to be thought of as virtually 'timeless' (an idea perhaps unintentionally bolstered by film footage and images of certain pre-historic creatures that still inhabit the sea). If time is introduced at all, it is usually when the oceans are discussed in terms of ecological catastrophe; which is to say, in terms of the cancellation of time, as it were.

So how did Arvid Pardo historicise the oceans? He clinically showed how the Cold War context was structuring the motives, opportunities and means that the sea offered the superpowers to fulfil their geo-political strategies. In his detailed analysis of how the sea's resources were becoming intertwined in competition between nation-states, Prof. Pardo essentially was showing that the sea was becoming, almost by stealth, increasingly like land territory: a zone to be claimed or annexed for the nation.

Prof. Pardo did not stop at describing the political logic governing the uses of the sea. He insisted it was unsustainable, not just ecologically but also politically. The mineral resources in the water column, just like fish, move from one national zone to another. And, unlike land, the sea has areas which belong to no nation. So applying the logic of the apportionment of territorial resources to those of the sea was bound to run into difficulties and contradiction.

With hindsight, we can tell Prof. Pardo got some things wrong in that speech. He overestimated, for example, the speed with which technology would enable the resources of the seabed to be tapped. But he got the essential framework right. That framework showed the inadequacy of the two broad contending visions of progress current at the time. Free-market capitalism was too individualist to handle the interrelated challenges raised by the oceans sustainably and accountably; the massive cost in terms of externalities could prove catastrophic. However, the ecological challenges could not be adequately understood or addressed in terms of class relations or the nation-state alone, the key terms of ideological understanding that illuminated socialist and other collectivist visions of progress.

Effectively, Prof. Pardo offered a third way of understanding economics, culture and politics. Economically, by invoking the concept of a common heritage of humanity, he was updating the notion of commons – an understanding of property relations that was different from that of both industrial capitalism and state socialism. Culturally, he invoked an innovative idea of human solidarity – where human identity would draw on an understanding of culture (reciprocally meaningful interdependence) that drew not only on 'roots' and 'terror' (the very etymology of the term 'culture' indicates the linkages with the idea of bonding with land) but also on water and mobility. Politically, he was not calling for the abolition of the state, nor for its over-exaltation. Rather, he was appealing for experiments in governance in which states represented one form of political organisation within a wider network.

Today, two decades after the end of the Cold War, what can we make of Prof. Pardo's vision? It was his hope to generate a different logic – of peace creation – in international relations. He died disappointed. But we have reason to entertain a more ambivalent picture.

On the one hand, the territorialisation of the sea is still going on (although constrained by the 1982 Law of the Sea Convention that his speech inspired, even if he himself was disappointed by the actual result). Allow me to illustrate by reference to my country, Malta – if only because of the irony that it was, of course, the country that Prof. Pardo represented at the UN in 1967. The territorialisation of the sea can be seen, for instance, in the fact that ordinary people have become well-versed in the distinction between territorial waters and the search and rescue area (SAR); in the fact that strong national sentiment is aroused by the very suggestion that Malta gives up part of its SAR; when the armed forces are detailed (like, say, their French and Italian counterparts) to provide protection for the nation's fishermen...

Alas, the problems facing 'ocean-space' remain and have been, in many ways, exacerbated: inadequate policies, the limitations of UNCLOS, the so-far elusive promises of aquaculture… On this point, Prof. Pardo's legacy is to have provided us with the conceptual prism with which to grasp, in its grim detail, humanity's self-destructive behaviour.

On the other hand, however, since he made his famous speech, humanity has become much more mobile – to the extent that some anthropologists are calling for the concepts of 'culture' (derived from the image of gardening) and 'identity' to pay more attention to the idea of 'mobility' than of 'roots'. It remains true that the sea is being territorialised: with virtual races to declare exclusive zones in the search for new resources and environmental protection being perhaps the best illustration. However, it is also true that life on land is getting to resemble that of mobile life at sea: two of the drivers of globalisation – urbanisation and migration – are making, it has been suggested by thinkers such as Jacques Attali, nomads of us all.

In such a world, Prof. Pardo's vision illuminates important aspects of our predicament – far more usefully, I suggest, that two more famous current contenders. Unlike the idea of the 'end of history', offered by Francis Fukuyama, which argues essentially that liberal democratic capitalism can meet any challenge the contemporary world throws up, Prof. Pardo's framework highlights the necessary changes in property and political relations that have yet to be made. And unlike the idea of a 'clash of civilisations', as articulated by Samuel Huntington, Prof. Pardo draws our attention to how the sea and

its challenges should make us focus not on hard and fast boundaries, but on the intermediate zones, where land meets sea, resources and concerns are common, and culture is necessarily based on exchange.

The implications for policy development are great, whether one is applying Prof. Pardo's vision to coastal and traditional communities or to the 21st-century coastal city. Prof. Pardo points the way to a recasting of the narrative of progress that humanity tells itself. Let us hope its telling will also help dispose us – the lot of us – to be more receptive to his prescriptions.

This article is a summary of the Arvid Pardo Memorial Lecture 2010.

Elisabeth Mann Borgese Memorial Lecture

Environmental Nature and Development Problems of Coastal Wetland, China

Professor WANG Ying, Member of the Chinese Academy of Sciences

Coastal wetland of China consists of lowland, tidal flat and associated biological assemblage. The total area occupies 1/5 of China's wetlands, as across 39 latitudes. The nature of coastal wetland is characterized by monsoon wave action, tidal dynamics and larger river influence, i.e. land-sea interaction.

Coastal wetlands can be summarized as three types according to its genetic features: estuary reed and grass wetlands, plain coastal grass and salt marsh, and mangrove swamps located in the sheltered bay head of South China. All of the three types have the zonation features as divided by superior tidal zone, inter tidal zone and lower tidal zone. Coastal wetlands are precious space resources, but it suffers from forest denudation, foreign species occupation, coastal erosion as short cut sediment supply by a series dams constructed along river basin, accompanied with sea level rising, and frequent disaster by salt water intrusion and low land flooded over. As a whole, the environmental quality of coastal wetland has lower down gradually. To face the conflicts between wetland's ecological protection and basic living condition of local resident. It needs a systematic study on regional environment nature, to compare and summarize historical experiences of successful and failure practice, to find out the critical value for best protection wetland and suitable way of wetland utilization.

CELEBRATION OF THE 50TH ANNIVERSARY OF THE UNESCO/IOC

Mrs. Irina Bokova, Director-General of UNESCO

United Nations
Educational, Scientific and
Cultural Organization

My greetings to everyone attending the *Pacem in Maribus* Conference focusing this year on a highly topical subject: climate change and the development challenges of ocean and coastal cities. I am delighted that this Conference is convened to mark the 50th anniversary of the Intergovernmental Oceanographic Commission and held in conjunction with the Shanghai Expo 2010, 'Better City, Better Life', to which we have proudly contributed. I regret not being here in person today and extend my warmest congratulations to the IOC on this special occasion. The title of the Conference itself, 'Peace in the Seas,' touches on the very purpose of our mission to manage and protect oceans and coastal zones through international cooperation.

Almost half of our planet's population lives in coastal cities – in fact, eight of the world's ten largest cities are located by the coast, of which two, Shanghai and Tokyo, are in this region. Coastal cities continue to attract 'new settlers', whether to live, work, retire or for leisure. Your conference will look for an answer to the obvious question: how many more humans can coastal systems and, in particular, coastal cities sustain, and how?

Over the years, the IOC has mostly focused on the coordination of research and services – this is particularly important, as oceanography is a multidisciplinary endeavour that requires international cooperation.

However, the IOC's activities have broadened to address marine pollution, coastal development and management issues that will be at the heart of discussions over the next few days. Its achievements over the past five decades, including in the wider United Nations context, are a source of great pride to UNESCO and are highly valued across the United Nations.

Allow me to cite just a few examples of the IOC's accomplishments, from helping to establish the first topographical atlas of the Indian Ocean, conducting intensive studies of the Kuroshio current and co-sponsoring the World Climate Research Programme to managing the Global Ocean Observing System and overseeing the establishment of a tsunami early warning system in the Pacific. Efforts are now focused on integrating the latter with other regional coastal hazard and tsunami warning systems currently under development.

In short, the IOC has always been at the forefront of efforts to develop cutting-edge responses to critical global challenges such as sea level change, acidification and sustaining world marine ecosystems, while encouraging the sharing of knowledge for sustainable development.

None of this would be possible without the close co-operation of other governmental and non-governmental organizations and Member States. I would like to make special mention of the close partnership established between the IOC and the International Ocean Institute, a non-governmental organization and one of the organizers of this Conference. Together we are jointly addressing leading concerns, notably climate change, biodiversity loss, and the impact of both on our environment and human livelihood.

Partnership between the IOC and the International Ocean Institute has a long history rooted in the discussions that led to the adoption of the United Nations Convention on the Law of the Sea (UNCLOS) in 1982, in the formulation of ways to increase the effectiveness of ocean governance presented in the publication: “The Future of the Ocean”, and in promoting ocean issues during the 1998 International Year of the Ocean and World Ocean Days. The fact that over the past decade both the former Executive and Deputy Executive Secretaries of the IOC were appointed to head the Institute speaks for itself! UNESCO is extremely grateful to the Institute for being such a dynamic partner, helping us to build bridges between academia, policy-making circles and civil society, and fostering excellence and innovation at the regional and local level.

I would also like to take this opportunity to join UN Secretary-General Ban Ki-moon in congratulating the Commissioner General of the United Nations Pavilion at Expo 2010, Mr. Awni Behnam, who is also the President of the IOI and Co-Chair of this Conference, for his excellent job in developing the pavilion that gives visitors such a rich presentation of the United Nation’s leadership in sustainable urban development.

It is extremely encouraging to see so many leading experts from international organizations, government, science, business and research communities present at this Conference. The issues you will be discussing over the coming days are of tremendous importance and can only be addressed through pooling your different perspectives and expertise. I will be most attentive to the outcome of your exchanges and wish this Conference every success.

Irina Bokova

PLENARY 1st SESSION

OCEANS, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT: CHALLENGES TO OCEANS AND COASTAL CITIES

Friday, September 3rd, 2010
13.20 – 16.00 hrs
Beijing Raffles Hotel
Beijing, People's Republic of China

CO-CHAIR: Dr. Biliana Cicin-Sain, Director, Gerard J. Mangone Center for Marine Policy, University of Delaware, U.S.A., Co-Chair and Head of Secretariat, Global Forum on Oceans, Coasts, and Islands

CO-CHAIR: Prof. Wu Dexing, President, Ocean University of China

RAPPORTEUR: Ms. Mara Hendrix, IOI U.S.A.

The Role of Oceans in Climate Change

Prof. E. Huang
Senior Research Scientist of the First Institute of Oceanography, SOA, China

ABSTRACT

Given the surface of the Earth is covered by the oceans, where over half of the area is more than 3000 meters in depth, the ocean could affect the climate in various ways: The ocean currents constitute a great conveyor belt system to transport heat throughout the global oceans, but primarily polar ward to moderate the large temperature gradient seen on the land surface. The oceans are the main sources of water vapour, which is a more potent greenhouse gas than all the others combined. And oceans also serve as a sink for greenhouse gases as they dissolve and been sequestered in the great depth. Finally, the great heat content of ocean water provides a great heat reservoir. Therefore, without thorough knowledge of the oceans, it would be impossible for us to construct an accurate model of the climate. Indeed, with the existing observational data it indicates that there are close correlations between the North Atlantic Ocean surface temperature anomalies and the global surface temperature anomalies from the El Niño phenomena of 2 to 7 years to multi-decadal Pacific Decadal and Atlantic Multi-decadal Oscillations time scales. This close correlation gives the strong indication that oceans are a crucial factor in affecting the climate change. In this talk, the role of the oceans in affecting the climate condition is reviewed for various time scales covering geological ones depending on the global land mass ocean relative distribution down to the ocean dynamics scale of the El Niño phenomena. This review actually serves as a plea and an urgent call for intensifying ocean research as a crucial part of the global climate studies.

Moving toward a United Nations Regular Process for Assessing the State of the Marine Environment

Dr. Wendy Watson-Wright
Assistant Director-General for UNESCO and IOC Executive Secretary

ABSTRACT

Despite the central role oceans play in our lives, significant gaps exist in our understanding of the complex processes at work – both natural and caused by human intervention. From the role of oceans in the global climate system, the impact of climate change on the oceans, to the full dynamic of ocean circulation, the origin and fate of nutrients, carbon and other bio-active elements and molecules, to large-scale changes affecting marine habitats, natural resources and marine ecosystems are under increased pressure from human activities.

That is why the status of ocean natural systems, responsible for key ecological services, needs to be regularly monitored to establish a baseline upon which to compare changes and trends, and to provide scientifically based information to decision makers and more generally to society.

In view of these alarming trends, governments – at the 2002 World Summit on Sustainable Development (WSSD) decided to establish by 2004 a Regular Process for the global reporting and assessment of the state of the marine environment, including its socio-economic aspects. Subsequently, the UN General Assembly in 2002, through Resolution 57/141: "decided to establish by 2004 a regular process under the United Nations for the global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable, building on existing regional assessments […]" (paragraph 45).

In 2005 the UN General Assembly, by resolution 60/30, requested the UN Environment Programme (UNEP) and the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) to serve as the lead agencies to carry out a three year start-up phase, in cooperation with all relevant UN agencies and Programs of the UN, to conduct an "Assessment of Assessments (AoA)". The AoA was implemented through an independent and geographically diverse Group of Experts set up in 2006, tasked with a detailed examination of the various existing marine assessments, an evaluation of factors central to the quality of assessments, such as scientific credibility, policy relevance and legitimacy. The Group was also charged with the identification of best practices; thematic, geographic or data gaps; scientific uncertainties; as well as research and capacity-building needs, particularly in the developing world.

The final and most critical task of the group was to formulate a series of options and recommendations regarding the institutional arrangements that would need to be put in place to implement the Regular Process. Amongst these, the proposal to establish a coordinating UN secretariat within one or two UN agencies is key to the process. The report also describes the type of assessment product that is expected from the process.

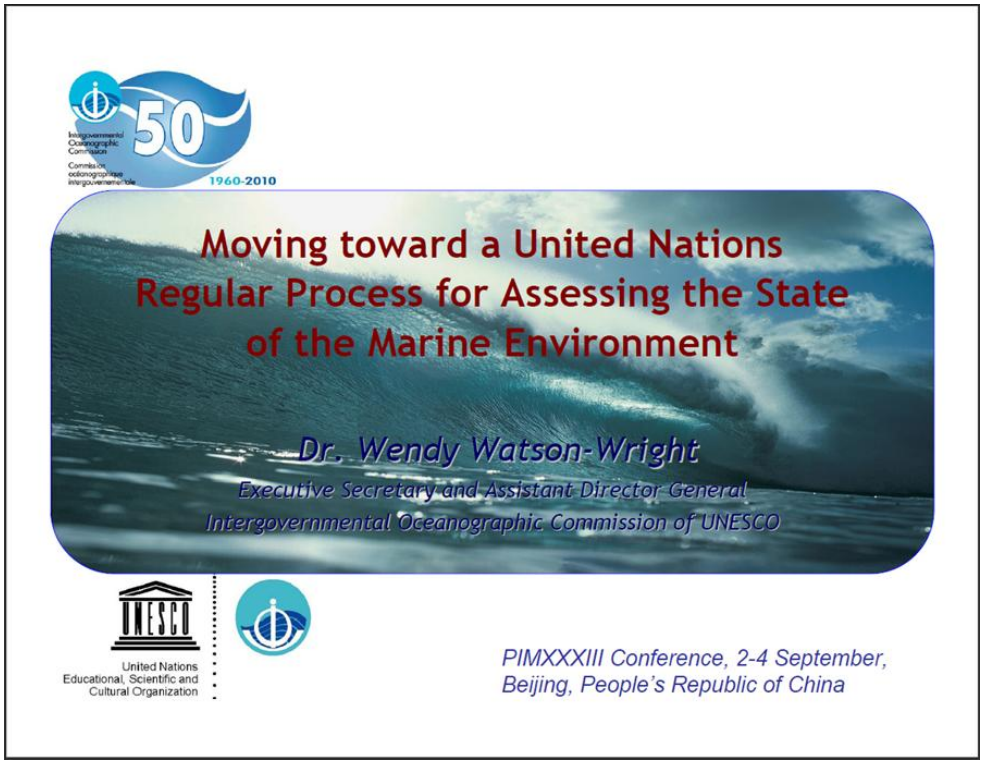
The crucial added value of the Regular Process will be its ability to deliver fully integrated assessments, bringing together environmental, social and economic aspects. The centerpiece of the package of products that the first cycle will deliver should therefore be a first version of an integrated assessment of the world's oceans and seas. This would be produced in the later years of the first cycle (2014–2015) on the basis of a number of preparatory, supporting products. As part of this integrated assessment, there could also be a thematic assessment of a major cross-cutting aspect of the world's oceans, such as food security. This would help develop novel cross-disciplinary and cross-sectoral approaches.

The published version of the AoA report was launched by IOC and UNEP on 31 August 2009 in New York. (The AoA report and its Summary in 6 UN languages is available at http://www.unga-regular-process.org). Whilst UN Member States have agreed in principle on the scope of the Regular Process, the UN General Assembly has decided to provide additional time for Member States to agree on the modalities for the implementation of the regular process, including the key features, institutional arrangements and financing. This review, which it is hoped will lead to the launch of the Regular Process in 2011, should be completed by a second meeting of the Ad Hoc Working Group (in September 2010).

Most countries are supportive of the process, and have expressed intentions to fund it, while some other countries requested additional time for Member States to review and decide on the modalities of implementation of the Regular Process. It will be therefore important to ensure political support of those nations in the coming months. Another issue that will need to be clarified is the interaction of a future Regular Process with other global environmental assessment processes such as the future Intergovernmental Science-Policy Interface on Biodiversity and Ecosystem Services (IPBES) in terms of mandate, scope and deliverables, since it is the stated intention of the IPBES mechanism to include marine biodiversity.

The coordination of the Regular Process will require the engagement of all UN Programmes and Agencies relevant to ocean affairs, and in particular the Division for Ocean Affairs and the Law of the Sea (DOALOS), Food and Agricultural Organization (FAO), International Maritime Organization (IMO), World Meteorological Organization (WMO) and International Seabed Authority (ISA).

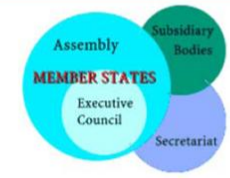
POWERPOINT PRESENTATION



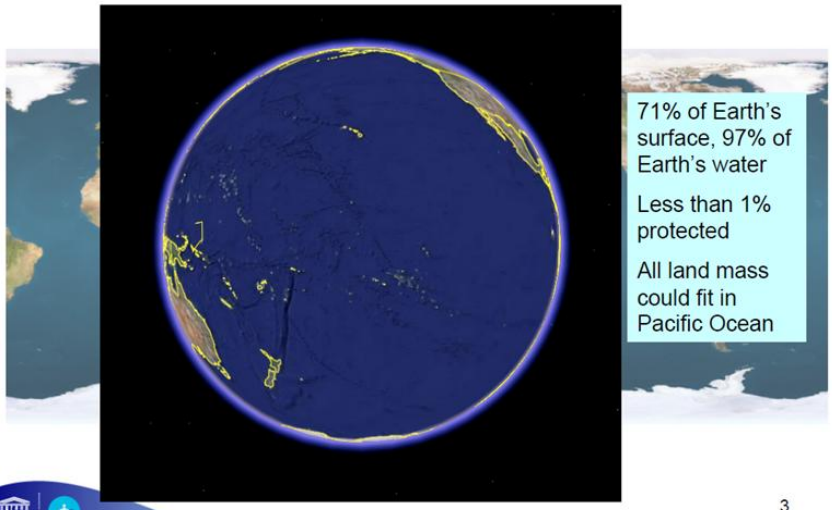
IOC-UNESCO

Intergovernmental Oceanographic Commission -UNESCO

- *Promote international cooperation and coordinate programmes*
- *Apply that knowledge for improvement*



The oceans are a global commons



71% of Earth's surface, 97% of Earth's water

Less than 1% protected

All land mass could fit in Pacific Ocean

3

Why assess the ocean?

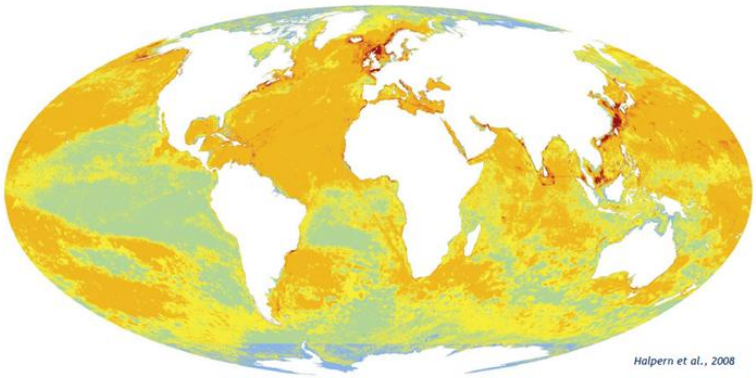
PRESSURES

- Fishing, aquaculture
- Invasive species
- Climate change
- Acidification
- Pollution, debris
- Habitat loss






Global Cumulative Impact Scores



Very Low Impact (<1.4) | Low Impact (1.4–4.95) | Medium Impact (4.95–8.47) | Medium High Impact (8.47–12) | High Impact (12–15.52) | Very High Impact (>15.52)

5

Rationale for an Assessment Process

"...there is no systematic effort to keep under continuing review the state of the world's oceans

... impossible to place current status and recent trends into historical context

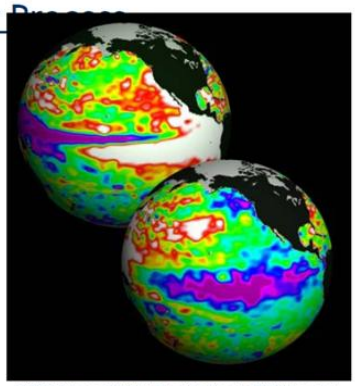
... limited ability to detect or predict indirect and cumulative effects"

6

Measuring What We Wish to Manage

Call for the Regular Process

- **World Summit on Sustainable Development 2002** - to *"establish by 2004 a Regular Process ..."*
- Ad-hoc Steering Group and Group of Experts established by UNGA Resolution 60/30 - fall 2006.
- Work of Group of Experts commenced 2007



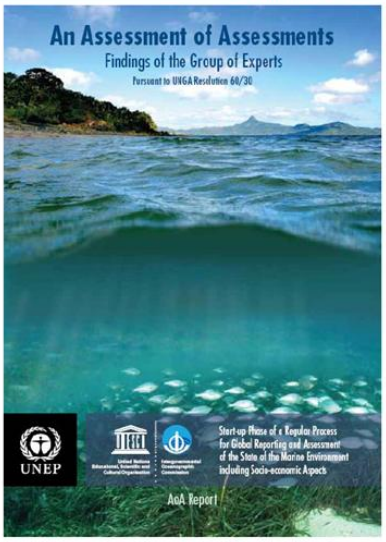
1997 El Niño and 1999 La Niña (U.S./French TOPEX/Poseidon)

7

Mandate of the AoA

- Assemble information
- Undertake critical appraisal
- Identify a framework
- Communicate existing assessments
- Result:

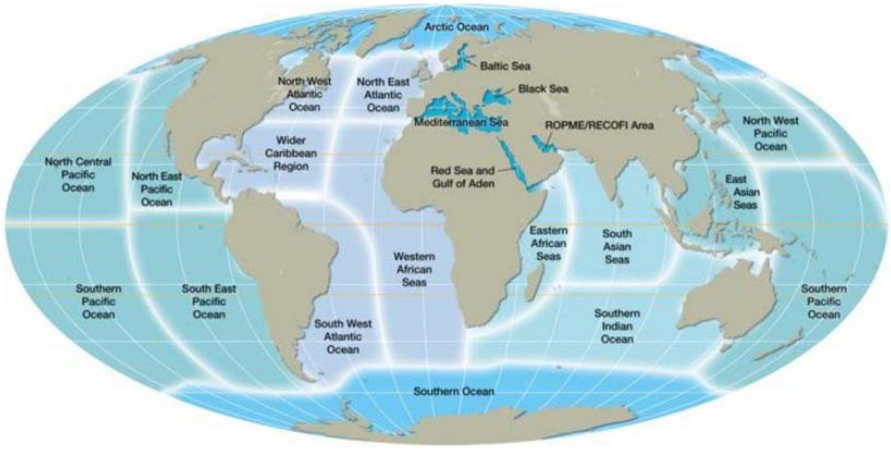
ASSESSMENT OF ASSESSMENTS REPORT



Published 31st August 2009

www.unga-regular-process.org

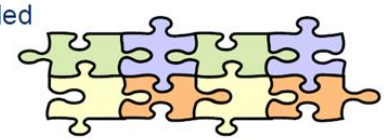
21 Regional Summaries



9

Findings of Assessment of Assessments

- Living marine resources and water quality assessments strongest
- Data collection funding insufficient
- Habitat status and trend assessments increasing
- Social and economic assessments lacking
- Integrated assessments rare
- Poor understanding of conditions and policy analysis
- More reference points needed
- Global coverage limited



10

The Value of Assessments

Both product and process

Fisheries engaged in the MSC programme (MSC.org).

Assessments important for:

- Informing decision making
- Identifying issues
- Providing authoritative analysis of policy-relevant scientific questions
- Demonstrating benefits & costs
- Identifying new research directions
- Providing technical solutions

11

The Value of a Regular Process

- Shows linkages
- Helps focus initiatives
- Feeds policy development
- Identifies ways to address activities
- Guides capacity building
- Stimulates cooperation
- Frames results

Framework for the Regular Process

Overall Objective:

To serve as the mechanism to keep the world's oceans and seas under continuing review by providing regular assessments at global and supra-regional levels

Scope of the Regular Process

- Geographical Coverage
- Sustainability
- Analytical framework - DPSIR
- Vulnerability
- Forward- looking

Sign marking the no-take marine sanctuary on Apo Island, Philippines. (Marine Photobank)

Deliverables:

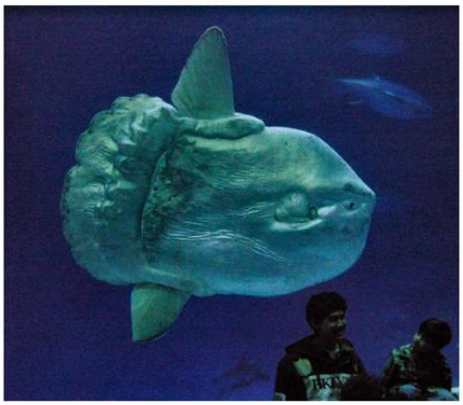
❖ First Cycle 2010-2015

- Integrated assessment
- Global improvements in processes
- Promotion of capacity development
- Improved access to relevant information for decision-making
- Support for integrated policy and management

Building on existing processes = better value for money

15

Guiding Principles for Assessment Process



Mola mola, ocean sunfish at Monterey Bay Aquarium

- Oceans as part of ecosystem
- Regular evaluation of assessment products
- Regular and proactive analysis
- Continuous improvement in capacity
- **Effective links with policymakers**
- Communication and engagement
- Transparency and accountability

Institutional Arrangements for the Regular Process proposed by AoA Report

- Relationship with United Nations
- Management & Review Body
- Expert Panel
- Pool of Experts
- Secretariat
- Focal Points of a mutually supportive network

17

The Regular Process: An Opportunity

- Current expenditures ~ tens of **billions** $ US
- Regular Process → much better return on expenditures:
  - Global picture of the environment
  - Fully integrated
  - Marine activities worldwide plus capacity development

In September 2010 UNGA will debate the final approval and implementation of the Regular Process

MEMBER STATES ARE URGED TO FIRMLY SUPPORT THE LAUNCH OF THE REGULAR PROCESS


50
1960 2010
Thank you!
謝謝！

Ocean Impacts on the Formation, Variation and Projection of Climate

Prof. Wu Guoxiong
State Key Laboratory of Numerical Modeling for Atmospheric Science and Geographical Fluid Dynamics (LASG), Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences (CAS), China

ABSTRACT

The ocean impacts on the formation and variation of the climate system and on the global and regional climate projections are briefly reviewed.

Although solar radiation is the ultimate energy source of the atmospheric circulation, nearly two thirds of the energy needed to drive the climate system comes from the underlying surface. Therefore, air-land and air-sea interaction processes are fundamental for the formation and variation of the climate system. In the tropics, the air-sea interaction together with the external force from the subtropics, including orography, contributes effectively to the evolution in the tropics of the sea surface temperature, atmospheric circulation and air-sea interaction, and the seasonal monsoon, including its onset, propagation, activation and halt. In the subtropics, the multi-scale forces in association with land-sea distribution results in the occurrence of deserts and monsoons. In this regard, the global land-sea distribution is primary in determining the climate pattern over the world.

Climate variation includes not only its trend, but also the periodic and aperiodic variations. A trend in a historical record can be considered as a segment of its periodic oscillation with a longer duration. Based on observations, the variations of temperature and precipitation either over the world or over China are presented. Their intrinsic connections are discussed.

The issue of regional climate projection is also discussed. Due to the existence of complicated feedback and coupling processes, this projection possesses certain uncertainty. The way of reducing such an uncertainty is explored in this review, particularly for the East Asian area. It is shown that the global warming reduces the surface evaporation on the northern tropical region of the central Pacific, a key region for transferring water vapour into the northwestern Pacific for the in situ genesis and development of tropical cyclones, resulting in the reduction of strong typhoon frequency in the region. This type of mechanism-focused study can help us to a certain extent in clarifying different regional climate projections produced from various climate models, and judging the different conclusions on the issue produced from different datasets.

Key words: Climate change, regional climate projection, feedback, uncertainty.

Integration of Ocean Issues in Climate Change Negotiations

Dr. Biliana Cicin-Sain
Director, Gerard J. Mangone Center for Marine Policy, University of Delaware, U.S.A., Co-Chair and Head of Secretariat, Global Forum on Oceans, Coasts, and Islands

ABSTRACT

The world's oceans play a central role in climate, akin to the Earth's lungs and circulatory system. The world cannot do without healthy ocean generating oxygen, absorbing carbon dioxide and regulating climate and temperature. Oceans already absorb over 80% of the heat added to the climate system and nearly 50% of all CO2 added to the atmosphere by burning fossil fuels over the past 250 years.

The oceans' ability to provide these life-sustaining services is now at risk. Rising ocean temperatures trigger broad-scale effects--from melting polar ice, rising sea levels, shifting species distribution and abundance, erratic weather patterns, increased frequency and intensity of storms, to changes in ocean currents. Moreover, additional CO2 absorbed by seawater has caused a 30% increase in acidity, posing serious threats to marine ecosystems and the millions of people dependent upon them.

The more than 50% of the human population that lives in 183 coastal countries, including 44 small island nations, are at the frontline of climate change and will suffer disproportionate impacts from ocean warming, sea level rise, extreme weather events, and ocean acidification. For example, a 2009 report by the United Nations University predicts that the number of people flooded per year may reach 370 million by 2100.

Oceans and coasts have not yet figured out the agenda of the UNFCCC, where there has been a tendency to regard any realm other than the atmosphere as a "sectoral nuisance."

All members of the global oceans community—governments, international agencies, NGOs, science groups, and the private sector—are mobilizing to call attention to this issue. The need to craft a comprehensive program related to climate and oceans, both within and beyond the UNFCCC process, is among the key recommendations from the first Oceans Day at the Copenhagen UNFCCC COP-15 (www.oceansday.org/pdf/summary.pdf) and the Global Oceans Conference in May 2010 at UNESCO in Paris (www.globaloceans.org).

A comprehensive oceans and climate program would encompass:

Mitigation

Ensure the continuing functioning of the oceans in sustaining life on Earth by adopting stringent reductions in greenhouse gas emissions, within a short timeframe, to avoid disastrous consequences on oceans and coastal communities.

Emphasize the positive contributions that oceans and coastal areas can play in the mitigation of global warming through:

1) Use of natural carbon sinks in coastal areas (e.g., mangroves, seagrass beds, kelp forests, tidal marshes) which have a greater capacity (per unit of area) than terrestrial carbon sinks in achieving long-term carbon sequestration in sediments. "Blue carbon" could be traded and handled in a similar way to green carbon (such as rainforests) and entered into emission and climate mitigation protocols.
2) Reduction of CO2 emissions from ships through a variety of technical and operational measures. CO2 emissions from international shipping, accounting for 2.7% of global CO2 emissions in 2007, are expected to grow to 18% by 2050 as a result of growth in world trade.
3) Development of ocean-based renewable energy, such as wind power, currents, tides, and OTEC, through the use of marine spatial planning, giving appropriate priority to marine renewable energy and through funding for large-scale development and implementation.

4) Careful consideration of carbon capture and storage via injection in deep seabed geological formations. Some geo-engineering approaches such as direct injection of CO2 into the water column, and ocean fertilization, however, should be discouraged due to the potential for irreversible harm to the marine environment.

Adaptation

1) Implement adaptation measures through integrated coastal and ocean management institutions at national, regional, and local levels to achieve the preparedness, resilience, and adaptive capacities of coastal communities.
2) Encourage the application of ecosystem-based adaptation strategies to preserve, restore and increase the resilience of coastal and marine ecosystems, including through the use of marine protected areas.
3) Prepare for the legal, economic, social, and humanitarian issues associated with the displacement of coastal populations due to climate change.

Capacity development and public education

Extensive capacity development, public education and awareness programs are urgently needed to prepare national and local officials and the public in coastal regions to address climate change.

Financing

Adaptation cost estimates for coastal areas and small island states are woefully inadequate, as are the adaptation resources currently available. UNFCCC 2007 estimates the costs of adaptation in coastal zones at about $11 billion/year, using lower sea level rise predictions and not including potential impacts of increased storm intensity. With over half of the world's population living in coastal regions and likely to experience the most pronounced effects of climate change, at least half the funds made available for adaptation should target coastal and island peoples and countries.

Policies and Strategies of the Marine Economy: Sustainable Development in the Next Decade

H.E. Amb. Mr. K. G. Anthony Hill[1]
Former Ambassador of Jamaica to the UN and Specialized Agencies, Geneva and to GATT and WTO

PRESENTATION

Protocol greetings and appreciation to organizers and hosts -

- I join in extending my deepest sympathy to the relatives of those millions lost to floods and landslides across China, Pakistan and other affected countries. Loss extends to property, infrastructure and the vastly reduced prospects for the future. As climate change brings intensified weather events the costs may even be larger.

- This conference should add a sense of urgency to the responses required at national and international levels. It must deepen our understanding of the science and strengthen our commitment to work cooperatively.

- I join others too in thanking the organizers of the Conference, the Intergovernmental Oceanographic Commission (IOC) of UNESCO celebrating its 50th anniversary, the International Ocean Institute (IOI) on its Pacem in Maribus XXXIII Conference and the State Oceanic Administration (SOA) of the People's Republic of China. We thank them for their foresight, their service and hospitality.

Our conference will consider some important aspects of **the oceans and their relationship to climate change**. It will follow on the 1996 PIM XIV Conference here in Beijing when in its Declaration on "Oceans in the XXI century" called for *'a comprehensive and consistent system of ocean governance, integrating local community, regional cooperation and global organization, and considered that this could be part of world order for the twenty-first century'*. The steps towards achieving this have been intermittent and less than sure.

At this conference we have the opportunity to help push the process on 'oceans and climate change', 'oceans and sustainable development' and 'challenges to oceans and coastal cities'. Unfortunately, the impact on and by the oceans in the climate and earth system has not been sufficiently well integrated into the mainstream of international negotiations. We should do more to fill in the gaps. And the three sponsoring institutions are well placed to make important contributions.

It is by design that this conference and its theme is coincident with that of the Shanghai Expo 2010 and its all embracing theme of "Better City, Better Life". On the one hand our proposals should suggest policies and strategies that would assist in building a comprehensive and consistent system of ocean governance, an essential element in halting the damage done to the oceans and its living resources as to indicating action for climate change adaptation and mitigation.

The focus on cities, bordering coast lines, harbouring the majority of mankind within their precincts will force us to consider practical ways to apply new and renewable technologies for more efficient and sustainable lifestyles.

Earth's climate system appears headed into unsustainable territory and requires more focused, practical and timely actions. **A greatly improved international framework of cooperation** among nations and their social and business sectors, working in different groupings and through the United Nations would improve the prospects considerably. The geopolitical and strategic relationships, if cooperative and mutually beneficial, will be decisive.

---

[1] Former Ambassador of Jamaica to the UN and Specialised Agencies, Geneva and to GATT and WTO.
9c Plateau de Frontenex – Cologny 1223 – Geneva – Switzerland; kgahill@gmail.com

China's modernization and rapid integration in the international political and economic systems bring some degree of angst among the major powers as sharing dilutes their national privileges and power. China's signaling of harmonious competition through the Olympics of Sport and the World Exposition on cities and its place in the new global environment of nature and man could be an augury of better times. Each 'rising' power has used its World Expo to signal its worldview, starting with the London 1851 World Industrial Exposition in Great Britain, the Chicago 1893 World Columbian Discovery Exposition of America through to the latest one in Shanghai.

Both Britain and America, two pre-eminent powers were interestingly maritime powers, using the oceans to expand their political and economic advantages and build their scientific and technological achievements.

China is once again reaching out across the oceans and building the necessary maritime industry and naval fleet. This increases its capacity for transporting the enormous need for raw materials as to move its manufactured goods into new distant markets as the country becomes a leading source of growth in the tanker, chemical and container trades. The impact on the oceans will in time be observed, especially as the exclusive economic zones are exploited.

It is estimated that the worldwide fleet of over 90,000 ships transporting 90 percent of the world's goods, shipping emissions are projected to grow by more than 70 percent as early as 2020. Emissions of greenhouse gases (GHGs) by shipping, once considered to be more eco-friendly than other transport modes, is now said to emit double the amount of CO2 than aviation and estimated at between 3-5 percent of the global total.

The oceans are thus prime arenas for cooperation in scientific research in many different disciplines. But the potential is there for unfriendly competition, which could be detrimental to constructing that consistent system of ocean governance. There are in fact scenarios constructed by some major countries setting out the challenges emerging from climate change and the likely responses by their armed forces.

We may perhaps wish to encourage international communities as regards the geopolitical and strategic aspects related to the oceans, in full recognition that the new international order in the making will evolve slowly and with inevitable setbacks. This is a time of another great transition.

At the democratic level we should be sensitive to the fact that the limited Security Council-like forum, the G7/8 of major industrialized economies, has engaged in its own 'oversight' of 'oceans governance' issues, given their "predominant and equalizing (governance) capabilities" and their considered national security interests. These deliberations and decisions are not inclusive and less than collaborative. Understandable as this is, the most important climate change effects are global and if not dealt with on that basis will result in less than optimum results for all.

The UK and some others have raised climate change issues at the UN Security Council. These have been resisted successfully. Future attempts in this forum may lead to more misunderstanding. The challenges brought by climate change should therefore encourage greater seriousness in bringing the Security Council and other major UN bodies more in line with contemporary norms and made more effective in their deliberations.

The following **suggestions** are made with the above in mind. It is accepted that many of the promises arising from international agreements have been compromised by lack of faithful implementation. It is also accepted that the risks to the present climate system increase dramatically when commitments, especially those underpinned by sound science, are ignored or are thwarted by shortsighted national special interests.

A widely held view is that the next thirty to fifty years could be critical to the health of the earth system and its inhabitants, if the strategies are pursued on 'business as usual' basis. The global climate system is considered to be at a critical stage of transition. So too are the social and economic systems at the national level. It is clear that the **national and regional governance arrangements must be restructured** to meet the emerging situation, especially at the community level where the

impacts will be felt most directly. A significant number of countries, the small island developing countries (SIDS) are especially vulnerable.

Studies indicate that global sea level, rising by some 4-8 inches in the past century, are 'guesstimated' to rise by an additional 19 inches by the end of this century. The major ocean heat conveying currents, sea level rise aggravated by subsidence of the land areas, will affect these small islands.

In developing countries, science, pure, applied and its commercialization by technicalisation of its labour force have not been embraced energetically in its education system. China and several other developing countries have recognized this and are entering what is regarded as the 'emerging' phase of development. Others will either follow or fall further and more quickly behind.

As daunting as the challenges are in domestic jurisdictions, the developing countries will have to muster the will and resources to be part of the international collaborative work in progress in the field of ocean science. The WMO Secretary General Michel Jarraud has given fair notice - "**Ocean science** is undergoing a conceptual revolution and there exists a growing realization that sustainable development and management of the marine environment can only be achieved through a truly interdisciplinary scientific approach and enhanced observations. This will be part of the common challenge of the climate and marine scientific communities for the next decade".

Linked to the emphasis on 'science' is the requirement to make available the indispensable technologies on an affordable and large scale. Should these **renewable (clean) energy and other technologies** be enmeshed with the overly restrictive and monopolistic proprietary rights, which have been shown to be restrictive and inhibiting to the spread of knowledge and therefore capital accumulation in developing countries, then the transition to low carbon economies will stall.

Commercialization through less restrictive intellectual property mechanisms and instruments and technology innovation and transfer must be immediate and affordable. It will not be enough to plan for 'green jobs' via investments and renewable energy technologies unless the skills are learned on the scale and in the range of disciplines.

In this transitional period, without dynamism in economies reaching down to the community level, there will be little, certainly much less enthusiastic concern about 'global warming' despite the intensifying manifestations and real suffering. The demands will be for immediate relief. Resources will be devoted to this and the necessary structural adaptation measures will become unaffordable. The decent jobs, 'green' and otherwise promised will elude societies.

Those countries that take an inventory of their critical infrastructure, modernize them in the light of climate change projections, introduce and enforce strict standards for design and operation, incorporate these into their medium and long term investment and maintenance programmes for all construction, and link them to disaster and emergency responses will better cope with the intensified weather events.

In both the science and technology fields, given the compartmentalization in the UN system, (note the 'green revolution' technologies applied in the agricultural field and the uneven application in the industrial field) it will certainly require some imaginative approaches beyond 'task forces' and 'coordinating' mechanisms of the UN Secretary General's Chief Executives Board and the UN system.

At the UN multilateral level there is clearly some urgency to rationalize the many different bodies, both political and bureaucratic. The aim should be the optimum use of the scientific resources and maximum effectiveness at the national levels. Perhaps, the IOC, the WMO and the UN's Division for Ocean Affairs and the Law of the Sea might find more effective ways to address the deficiencies well identified. This can be done only by serious and dedicated action by national actors across all sectors.

The UN Secretary General Ban Ki-Moon has established most recently a Global Sustainability Panel with the mandate of "***Rethinking the development paradigm for prosperity in a low-carbon world.***" The UN Secretary General was inspired by the report 'Closing the Gaps' prepared by the Commission on Climate Change and Development, itself seized the results of the Summit on Climate Change on 22 September 2009.

This would seem to be a case of 'business as usual'. Problems identified, well documented, solutions agreed, inaction, followed by yet another 'Commission' of eminent persons. Another 'bureaucracy' will be formed, myriad reports, discussions, usually among the already well informed and far too little to make the difference required in the lives of those most seriously affected.

The more pressing, missing element is 'implementation' and 'facts on the ground' in developing countries. In this context, UNESCO's 5th Global Oceans Conference in May 2010 ended with the assessment that 'the various commitments and targets agreed to at the 2002 WSSD and in other related fora, have not been met on a global basis, although there have been notable examples of success at regional and national levels'.

It is nigh a year after the Copenhagen Conference on Climate Change and its 'Copenhagen Accord' promising a fast disbursement of finance to developing countries from an indicative US$20 billion Fund for the period 2010-2013. It appears that settling the details threaten to derail the 'promise'. Governments, international organizations and their social partners on both sides of the 'promise' share in whatever shortcomings.

Imagine what could be achieved were the IOC and IOI take the lead to identify 'bankable' projects, including climate system research linked to the oceans with the emphasis on measurable results for the coastal zones and cities in developing countries.

It is certainly more than 'anecdotal evidence' that all small and middle-size countries simply cannot cope with the volume of 'events' staged by the UN and other regional intergovernmental and non-governmental bodies. The quality 'work' in preparing for and emanating from them simply cannot be 'processed' at the national level; and national administrations seem to be too distanced to process it at local community levels in the time frames to make a real difference. Given the scores of spin-off meetings/events and new organizations (intergovernmental, public-private, Non-governmental) on climate change/renewable energy, the task becomes ever more daunting to the point of immobilizing.

We should recognize that all governments function with legacy governance institutions incorporating their organizational, bureaucratic structures for administration and management. This makes for less coherent, inter-related and interdependent policy formulation and implementation.

All countries will need to frame policies based on spatial land and coastal waters to ensure that the often taken for granted 'marine economy' with their productive sectors and disaster prone infrastructure girding their coasts threatened by storm surges, rising sea level and acidification of groundwater are not overlooked in framing macro and sector policies in the traditional way of primary, industrial and tertiary production. At risk are not only maritime and coastal tourism, aquaculture and the marine environment but also the already built infrastructure of the road, rail and runway networks and related industries and social capital.

In the most advanced industrial and technologically endowed economy, the US with its 95,000 miles of coastline, over 3.4 million square miles of ocean within its territorial waters and with 53 percent of its population occupying 17 percent of the increasingly crowded land space in the coastal zone, and the marine economy is of critical importance to its wealth and prosperity.

The international economic environment is not conducive to bold cooperative ventures. The large economies are focused on finding ways to cope, on the one hand with the challenges of rapid growth and change, and on the other hand on relative stagnation and a reversal of gains secured over many decades. Yet the challenges cannot be met by unilateral and self-serving measures. The international community is too closely integrated. But the several organizational arrangements both of national administrations and the UN system clearly are not adequate to meet the challenges of the interconnected nature of climate change on oceans and cities.

In both the human rights and world trade bodies peer review processes have been used to bring to light those measures taken by governments within their jurisdictions, which run counter to the spirit if not the letter of the obligations undertaken. In the absence of enforceable sanctions within climate change treaties and agreements, a similar approach should be encouraged in the hope that it will

better inform each other and international public the opinion of progress aimed at a ‘better city, with a better life’ and a healthier planet.

With the present lifestyles of the burgeoning middle class the goal will be next to impossible to attain without very significant productivity gains in the use of fossil fuel and the substitution of renewable low carbon technologies. This calls for a more rational management of community commons (common resource pools) and the global public commons of the oceans and atmosphere. Ignoring the ‘externalities’ of wasteful production and consumption models of private operators in unfettered markets has imposed costs in excess of equitable sharing of benefits to the poorer members of society and the global environment.

It is in cities where industry has thrived, where mass production and consumption, mass transit (private and public) have flourished and from which intercontinental transport by sea, land and air has used the oceans as transits, as theatres of war, of discovery, exploitation and eventually despoliation where the start must be made.

All countries will do well to recall the 1992 UNCED Agenda 21 recommendation that *‘countries with seacoasts establish a comprehensive marine management system to ensure sustainable utilization of the sea and coordinated development of the marine programs’*. One wonders how many developing countries, the most vulnerable, have obliged.

4 November 2010

Technology Development for Ocean Science in the Next Decade

Mr. Richard Burt
Chelsea Technologies Group Ltd, West Molesey, UK (rburt@chelsea.co.uk)

INTRODUCTION

Oceanographic instrumentation has traditionally been developed within academic centres of excellence in order to provide answers to challenging scientific questions. Early instruments began with lead lines for water depth and sediment type analysis. These were supplemented with water bottles for seawater samples and reversing thermometers for in situ temperature measurements. Salinity was determined initially by weighing the dried salts of seawater and then later by chemical titration. These techniques were the standard for many decades but only enabled samples at discrete depths. Early nets enabled biological samples to be captured and studied.

Advances in engineering gave rise to the first current meters with mechanical recording devices for speed and direction. With the development of electronics in the early 1960's there was a step change in oceanographic measurements. Continuous profiles of the water column became possible.

Profiling Systems

The availability of platinum resistance thermometers and bead thermistors enabled rapid, accurate temperature measurements. In situ salinity is now determined by measuring electrical conductivity, using inductive or resistive probes, and referenced to a standard potassium chloride solution. Advances in stable, accurate pressure sensors established the Conductivity, Temperature, and Depth (CTD) as the workhorse of oceanography. Today CTD systems enable real time data to be collected from the surface to full ocean depths.

Profiling systems are often fitted with additional sensors to meet particular scientific requirements. There are many examples of industry working with scientists to commercialise new technologies and make them available on a global scale. Today commercially available sensors exist for dissolved oxygen, pH, nutrients and a wide range of optical parameters including chlorophyll-a, turbidity, sediment sizing, hydrocarbons, primary productivity and dye tracing (*Figure 1*). Miniature systems have been developed for use on marine mammals such as seals and dolphins (*Figure 2*).

Platforms and Sensors

As scientific programmes have become more complex so have the platforms for sensors. Dedicated research vessels are necessarily becoming multirole and are expensive to operate. To ensure efficient use of ships a range of towed vehicle systems have been developed to gather oceanographic data whilst underway between hydrographic stations. These Undulating Oceanographic Recorders (UORs) are typically towed at 10-12 knots and undulate from the surface to 500 metres (*Figure 3*).

MetOcean buoys are well established and provide a stable, versatile platform. Autonomous Underwater Vehicles (AUVs), with onboard power, navigation and sensor systems, are now a mature technology. They are in regular use by military, research and commercial groups to study lakes, the ocean, and the ocean floor. A wide range of sensors can be affixed to AUVs for hydrographic survey and water column measurements.

To fully understand the ocean circulation, and its key role in climate change studies, measurements are required on a global scale. To begin to address this need technology advances have been made in drifting profiling buoys and gliders (*Figure 4*). There are now in excess of 3000 Argo floats deployed globally providing regular temperature and salinity profiles to depths of 2000 metres with the data being made available hours after collection. To maintain this number of floats 800 new Argo buoys are required each year (*Figure 5*).

Underwater gliders are a variation on the variable buoyancy float using wings to convert vertical motion into horizontal movement. While not as fast as conventional AUVs, gliders represent a significant increase in range and duration compared to vehicles propelled by electric motor driven propellers extending missions to weeks or months, and to thousands of kilometres in range. Gliders follow a saw tooth profile through the water, providing data on temporal and spatial scales previously unavailable. They are particularly cost effective when compared to traditional shipboard techniques.

Gliders and floats are very sensitive to changes in mass and have limited power budgets. To fully exploit these platforms a new generation of miniaturised, low power sensors are needed. Micro Electrical Mechanical Systems (MEMS) are being developed for micro CTDs and optical sensors. The "laboratory on a chip" approach is particularly suited to fluorometric and colorimetric assays and sensors are being developed for pH, dissolved oxygen, pCO2 and nutrients.

FerryBox and OceanScope

Technology developments are needed to support marine science programmes of the next decade. Long term data sets are required to support environmental monitoring and climate change science. Sensors and systems will be deployed for long periods of time, unattended and must provide high quality data with low through life costs.

Commercial passenger vessels have been used successfully over the last decade as data collection platforms. Vessels are fitted with a suit of sensors in a flow chamber which is typically installed in the engine room. A surface sea water supply flows through this "FerryBox" which measures and stores the data for analysis. Modern FerryBox systems have auto cleaning systems, provide passengers with real time displays and automatically transmit the data ashore for near real time analysis.

In 2008 the Intergovernmental Oceanographic Commission (IOC) established the OceanScope working group to investigate the capability of commercial vessels to undertake large scale detailed water column measurements. FerryBox systems are a well established method of obtaining surface water data from ferries and ships but systems for unattended, detailed water column profiles will present new technology challenges.

International shipping routes give good global coverage and would provide ideal sea truth data to correlate with satellite observations. Any water column measurements from commercial vessels must not affect their operational use and trading methods. Data collected must be transparent to the vessel and not hinder manoeuvrability. The OceanScope programme will conduct initial feasibility studies into the system requirements for new ship builds and the challenges for retrofitting to existing ships. Consideration will be given to sea chests, pipe work, power, data and communications. If only 5% of the worlds ships were fitted with OceanScope systems these 3000 vessels would require a network for service and support, possibly spawning a new service industry.

Alliance for Coastal Technology

One key criterion is the selection of appropriate sensor technology for global monitoring systems. There are a wide variety of oceanographic environments and a sensor technology used successfully in warm coastal waters may not be suitable in cold, highly energetic conditions. The prevention of bio fouling is a major consideration and established sensors may need a redesign for use in highly productive waters.

In US NOAA is funding the Alliance for Coastal Technologies (ACT) to provide the information required to select the most appropriate tools for studying and monitoring coastal environments. This includes quantitatively evaluating the performance of new and existing coastal technologies in the laboratory and under diverse environmental conditions. ACT maintains a dialogue among technology users, developers, and providers and identifying current and future technology needs. Work is underway to establish a European partner to build upon the achievements of ACT and coordinate technology assessments within the EU.

Opportunities for IOI and IOC

These are global challenges which require a global response. Both the IOI and IOC are ideally placed to provide an important identification and coordinating role. Multinational workshops will be required to bring together scientists, industry and end users to indentify the scientific drivers, capability gaps and technology requirements. There will also be opportunities to discuss how the data products will be defined and coordinated.

Summary

Traditional oceanographic techniques have enabled a significant understanding of the world's oceans. However much is left to discover and the role of the oceans in climate processes is not fully understood. This illustrates the need for a global network of observations of both surface water and water column processes. New sensor technologies, combined with new and established platforms, will be necessary. There will be exciting challenges in both the marine science and maritime areas and the IOI and IOC have an opportunity to participate in the coordination activities.

Acknowledgements

I gratefully acknowledge the information provided by Professor Tom Rossby (University of Rhode Island) for information on OceanScope and Dr. Mario Tamburri (ACT Director) for details on the Alliance for Coastal Technology programme.

Keywords

Oceanographic sensors
Oceanographic platforms
Global Ocean Observing Systems
Argo floats
Ocean gliders
FerryBox
AUV
OceanScope
Alliance for Coastal Technology

FIGURES

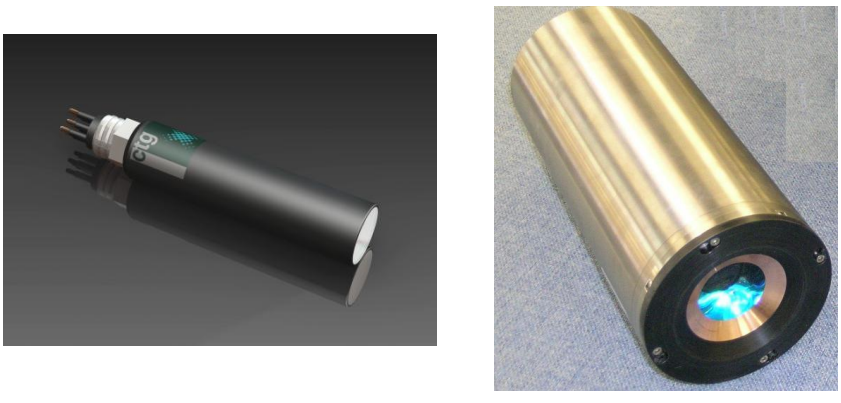


Figure 1: Miniature chlorophyll fluorimeter and Primary Productivity Sensor

Figure 2: Seal with miniature CTD

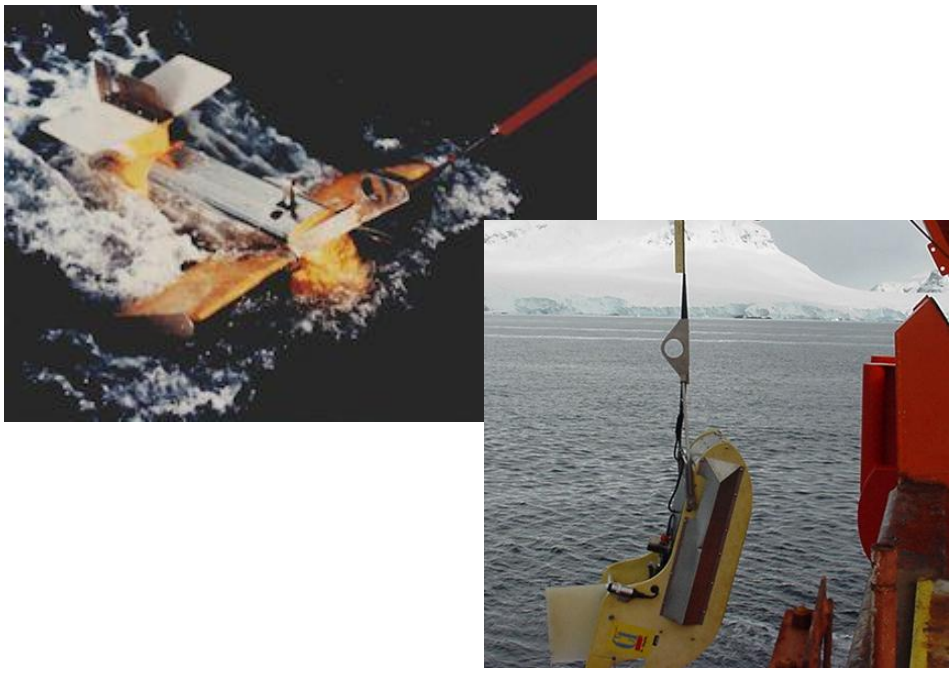


Figure 3: SeaSoar and NuShuttle Undulating Oceanographic Recorders

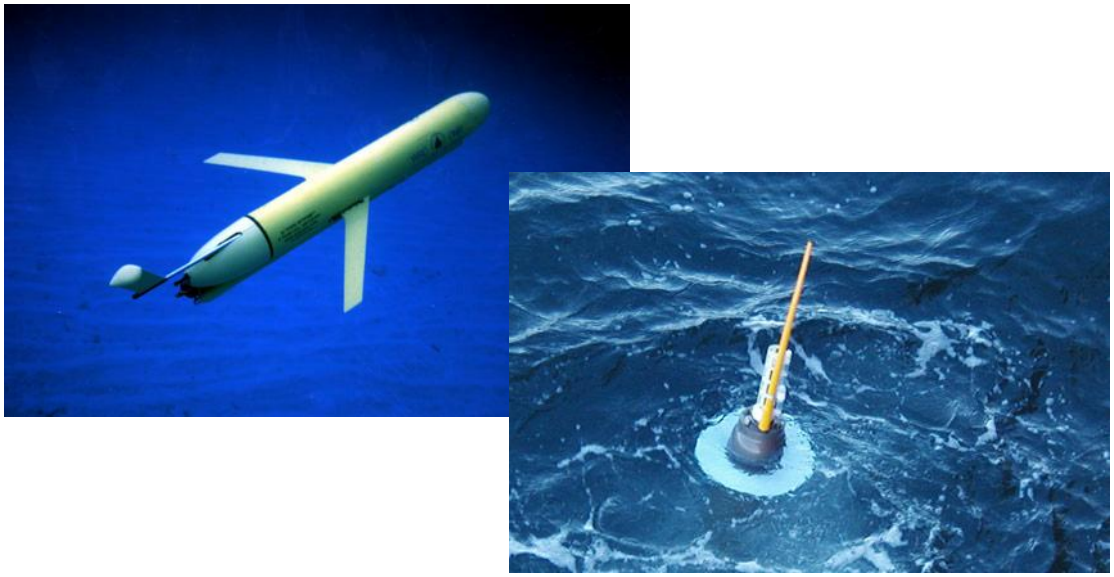


Figure 4: Glider and Argo Float

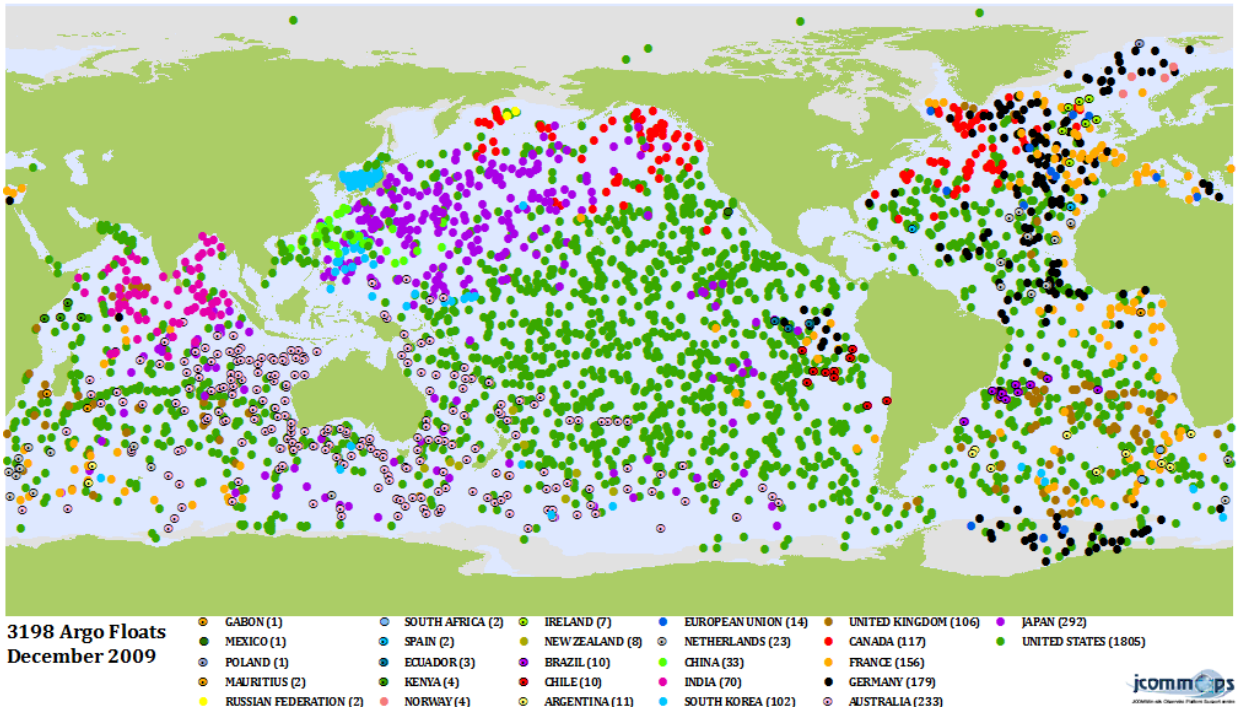


Figure 5: Argo Float Deployments December 2009

PLENARY 2nd SESSION

OCEANS, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT: CHALLENGES TO OCEANS AND COASTAL CITIES

Friday, September 3rd, 2010
16.00 – 20.00 hrs
Beijing Raffles Hotel
Beijing, People's Republic of China

CO-CHAIR: Prof. Raphael P.M. Lotilla, Executive Director, PEMSEA, the Philippines

CO-CHAIR: Dr. Qiao Fangli, Deputy Director-General, the First Institute of Oceanography (FIO), SOA, China

RAPPORTEUR: Ms. Elisabeth Conrad, Institute of Earth Systems, Malta

Sustain Xiamen's Economic Growth through Scientific Use of Marine Resources

Mr. Pan Shijian
Vice Mayor of Xiamen Municipality, China

ABSTRACT

The copious marine resources around Xiamen provide the fundamental living and growth possibilities for the city. Since the beginning of the new century, Xiamen has succeeded in harmonizing human demands and natural capacity of our seas, thus enabling the sustainable use of marine resources which in turn allows the sustainable development of our city through scientific use of marine resources.

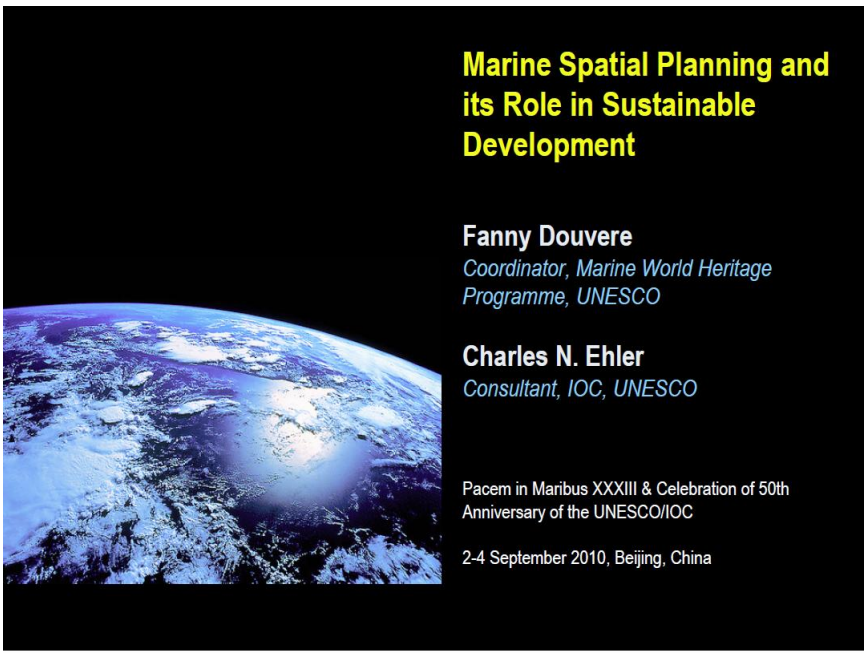
Marine Spatial Planning and its Role in Sustainable Development

Dr. Fanny Douvere, *UNESCO*
and
Mr. Charles N. Ehler, *President, Ocean Visions Consulting, France*

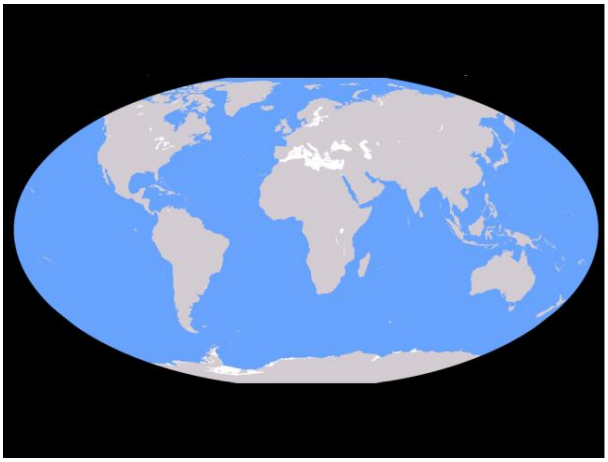
ABSTRACT

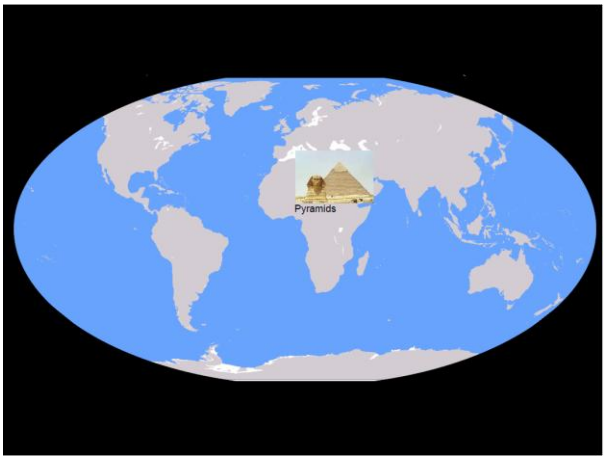
In recent years, marine spatial planning (MSP) has gained considerable importance as a new paradigm toward ecosystem-based management of marine areas. While various countries already implemented marine spatial plans, others are currently creating legislation or new policy frameworks that will enable MSP in the near future. MSP has also spurred interest among Arctic countries and High Seas experts, as a promising means to conserve valuable marine places while simultaneously achieving social and economic objectives. A central problem and potential impediment to the future success of MSP, however, lies in the lack of understanding about what MSP is really about, what it entails to produce valuable outcomes, and how it is linked to other management approaches. This presentation will showcase some of the key conclusions achieved in the context of the UNESCO-IOC Marine Spatial Planning Initiative and will illustrate how these results are now being applied in other contexts, including the World Heritage Marine Programme.

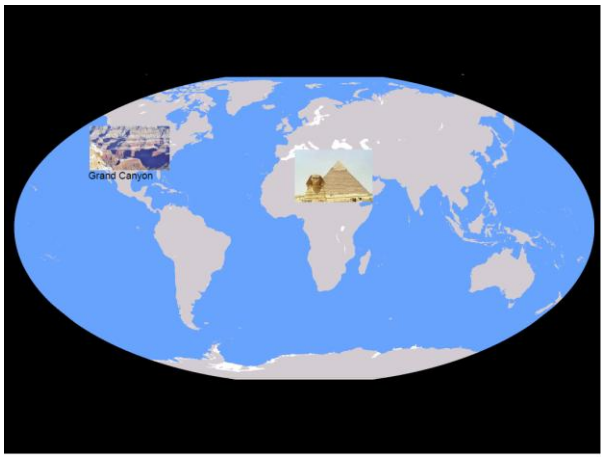
POWERPOINT PRESENTATION

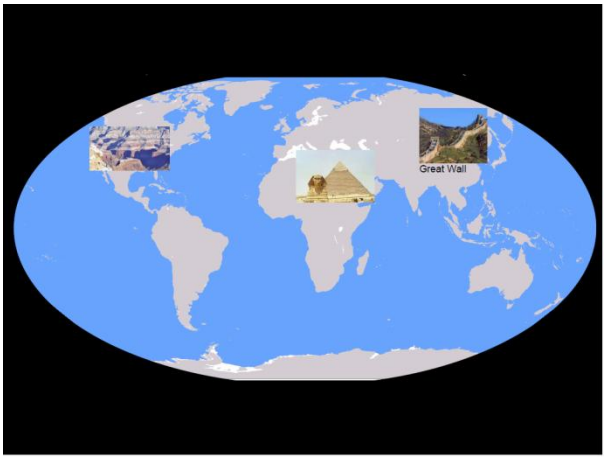


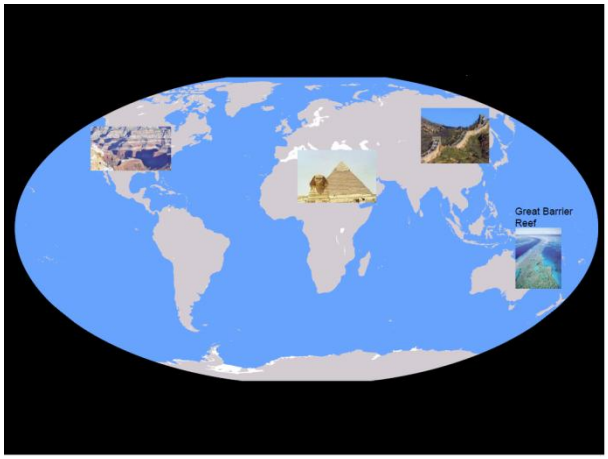
But first a word about
UNESCO's Marine World
Heritage

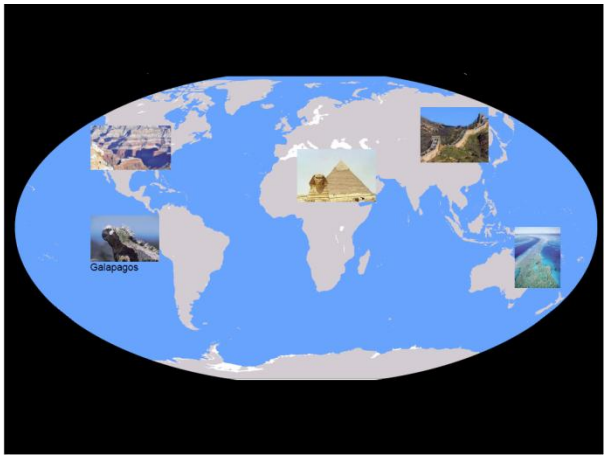




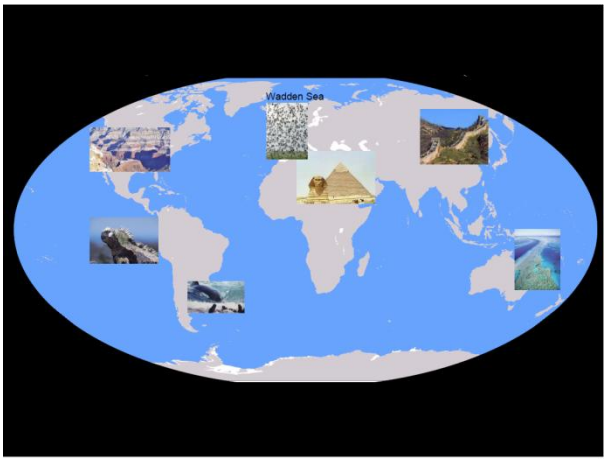


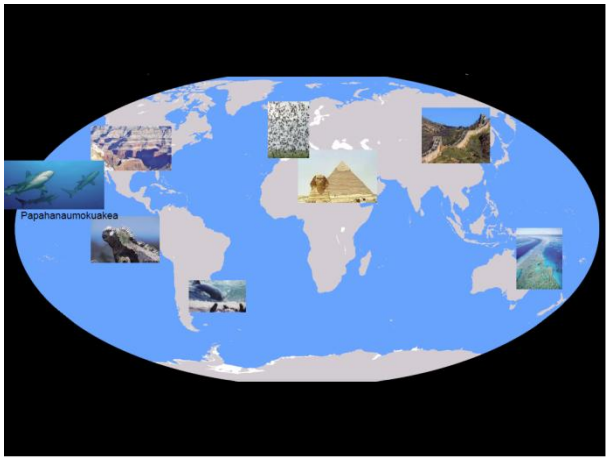


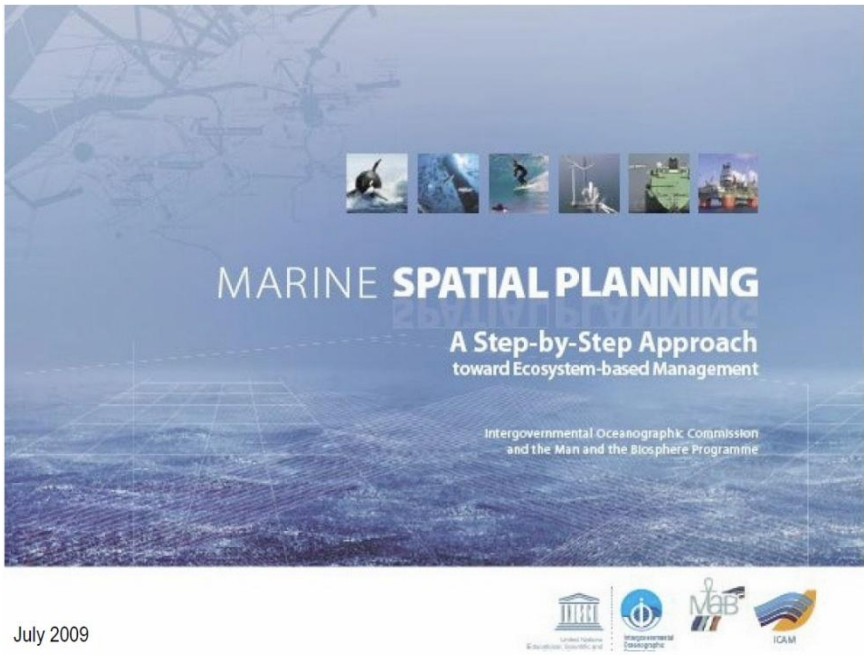



Galapagos


Peninsula Valdes

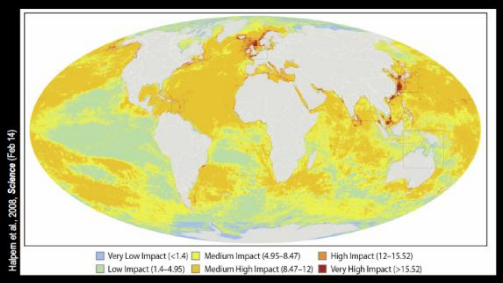

Wadden Sea


Papahanaumokuakea


MARINE SPATIAL PLANNING
A Step-by-Step Approach
toward Ecosystem-based Management
Intergovernmental Oceanographic Commission
and the Man and the Biosphere Programme
July 2009
ICAM

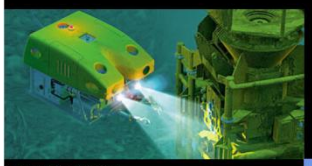
Why Do We Need
Marine Spatial Planning?

No Area of the Ocean Is Untouched by Human Activity



Many marine places are under increasing development pressures....

From traditional human uses....



AUV Monitoring Wellhead
3,000-meter water depth

From technological change....

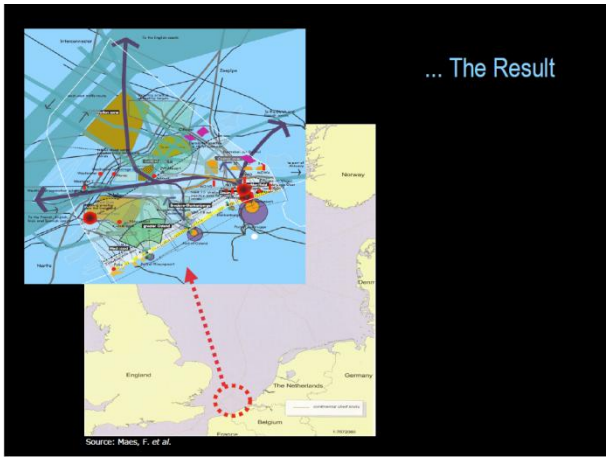
World's Largest Floating Platform
250,000 barrels of oil/day

From new demands for ocean space....

Arctic Explorer Unloading LNG at Cove Point, MD, USA

From development in new ocean places....

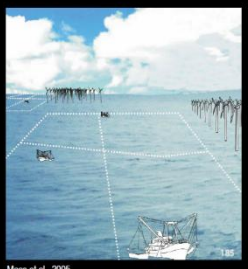
Shtokman Gas Field, Barents Sea, Russia



Zoning without marine spatial planning

- Vessel Traffic Routes
- Vessel Traffic Separation Zones & Precautionary Zones
- Areas To Be Avoided (by vessels)
- Particularly Sensitive Sea Areas (PSSAs)
- Safety Zones Around Vessels and Terminals
- Anchoring & No-Anchoring Areas
- Security Zones in Ports and Waterways
- Oil & Gas Lease or Concession Areas
- Wind Farm and Wave Park Lease or Concession Areas
- Safety Zones Around Oil & Gas Installations, Wind Farms, Wave Parks, etc
- Military Operations or Exercise Zones
- Dredging Sites or Areas
- Dredged Material Disposal Areas or Zones
- Oil & Gas Pipeline Rights of Way
- Submarine Communications Cable Rights of Way
- Energy Transmission Line Rights of Way
- Sand & Gravel (Aggregate) Extraction Areas
- Fishery Closure Areas, including seasonal closure
- No-Trawl Areas
- Critical Habitat Designations
- Offshore Aquaculture Areas
- Marine Protected Areas
- Protected Archeological Areas, e.g., Ship Wrecks
- Cultural or Religious Areas
- Scientific Reference Sites

Defining marine spatial planning

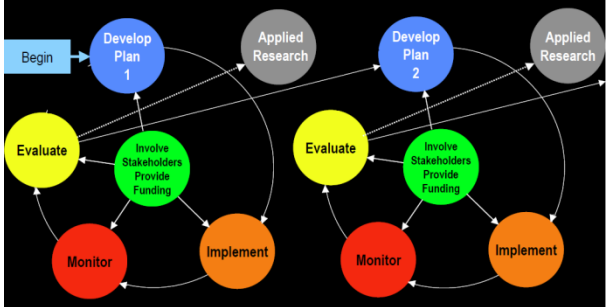


Maes et al., 2005

The public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process.

Ehler & Douvere
UNESCO, 2007

Marine spatial planning process



Adaptation, participation, ecosystem-based, integration, and future-oriented

10 Steps of Marine Spatial Planning

Step 1	Defining Context and Authority
Step 2	Obtaining Financial Support
Step 3	Organizing Stakeholder Participation
Step 4	Organizing the Process Through Pre-Planning
Step 5	Analyzing Current Conditions
Step 6	Analyzing Future Conditions
Step 7	Developing the Spatial Plan
Step 8	Implementing and Enforcing the Plans
Step 9	Monitoring and Evaluating Performance
Step 10	Adapting the Spatial Planning Process

Key questions for marine spatial planning

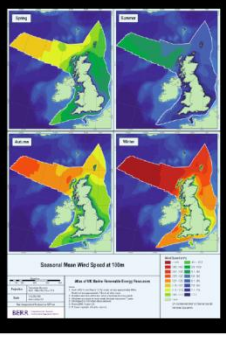
1. Where are we today?
   Baseline conditions
2. Where do we want to be?
   Forecasts, scenarios, vision
3. How do we get there?
   Management plan

Some areas are
ecologically more important
than others

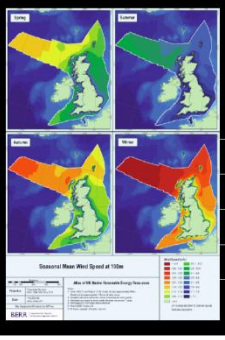
Some areas are
ecologically more important
than others

- Areas of high biodiversity
- Areas of high endemism
- Areas of high productivity
- Spawning areas
- Nursery areas
- Migration stopover points

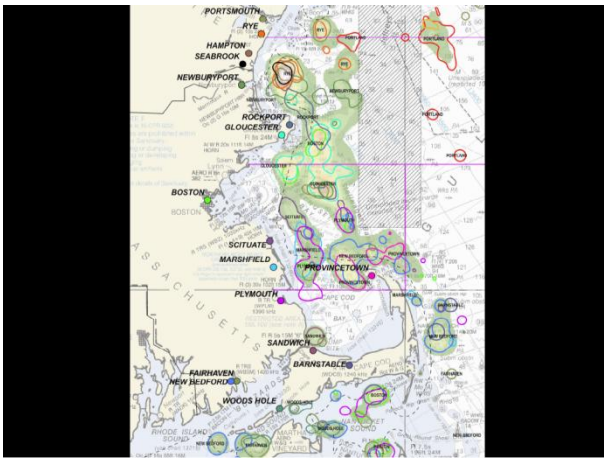
Some areas are
economically more important
than others



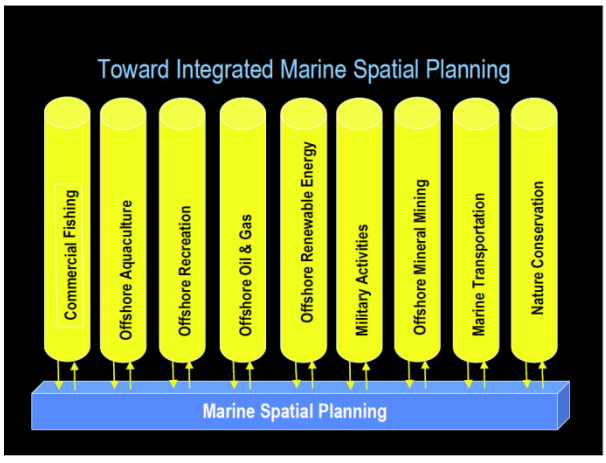
Some areas are
economically more important
than others



- Oil & gas deposits
- Sand & gravel deposits
- Fishing grounds
- Transportation routes
- Areas of sustained winds
- Areas of sustained waves

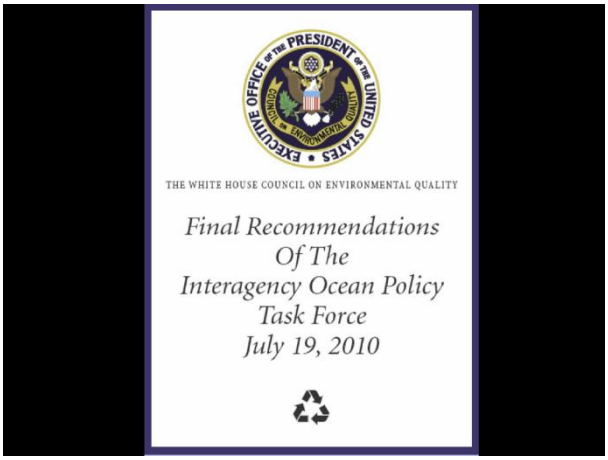


Toward Integrated Marine Spatial Planning



Marine Spatial Planning - International

- At least 10 countries have MSP programs underway
- At least 18 different MSP projects within those countries
- Three countries are working on second-generation MSP plans
- Australia is completing five bioregional plans for EEZ
- China has zoned its territorial sea
- France is developing program of "planification strategique marine"
- The UK is implementing its new Marine Act, including MSP; Sweden is drafting new MSP legislation
- US is now developing national MSP framework and potential executive order for implementation
- Coastal First Nations in British Columbia completing MSP plans at the community level
- At least four US coastal states developing MSP plans or new authorities



The future of marine spatial planning: challenges and opportunities

Future challenges

1. How to improve methods for making trade-offs explicit?
   - Is a spawning area more valuable than a wind farm?
   - Is a wind farm more important than a sand mining area?

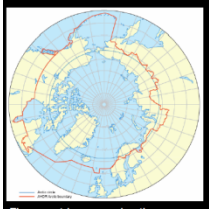
Future challenges

1. How to improve methods for making trade-offs explicit?
   - Is a spawning area more valuable than a wind farm?
   - Is a wind farm more important than a sand mining area?
2. How to evaluate the success of first-generation marine spatial plans?
   - What are meaningful indicators of success?

Future challenges

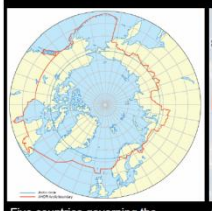
1. How to improve methods for making trade-offs explicit?
   - Is a spawning area more valuable than a wind farm?
   - Is a wind farm more important than a sand mining area?
2. How to evaluate the success of first-generation marine spatial plans?
   - What are meaningful indicators of success?
3. How to develop marine spatial planning in trans-boundary ecosystems?
   - What are meaningful incentives for cooperation?

Marine spatial planning in trans-boundary ecosystems

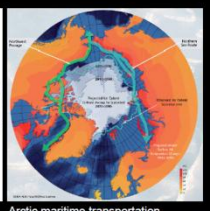


Five countries governing the Arctic

Marine spatial planning in trans-boundary ecosystems

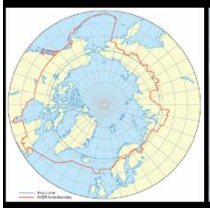


Five countries governing the Arctic

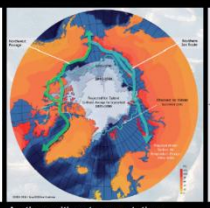


Arctic maritime transportation

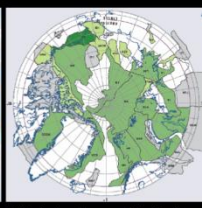
Marine spatial planning in trans-boundary ecosystems



Five countries governing the Arctic

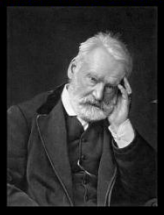


Arctic maritime transportation



Estimated undiscovered Arctic oil

"An invasion of armies can be resisted, but not an idea whose time has come."



Victor Hugo, 1802-1885
French Poet & Novelist

Thank you!

Fanny Douvere
f.douvere@unesco.org

Thanks to the Gordon and Betty Moore Foundation and the David and Lucile Packard Foundation for their support of the UNESCO work on marine spatial planning. WWF-International and the Government of Belgium also contributed funds to the program.

Challenges to Coastal Cities in Developing Countries: Role of International Cooperation – The UNEP/UN-HABITAT Partnership Agreement

H.E. Amb. Mr. Daniel Chuburu
Ambassador and Permanent Representative of Argentina to UNEP & UN-HABITAT

ABSTRACT

The world is facing a high growth rate of urban population which is especially acute in developing countries. Today, more than 50% of the global population lives in cities, while 60% live in low elevation coastal zones (LECZ) and 64% of the cities in LECZ are in developing countries. The urbanization rate is even higher in coastal cities although this trend has to be considered carefully as new developments are affecting it, e.g. improvements in transportation allow people to live up to 100 kilometers away from the cities.

LECZs are more densely populated than inland urban zones. The global average density along coastlines is more than double that in dry lands and more than 60% of that in cultivated areas. Density in LECZ of developing countries is 50% higher. In the case of southern Asia, it is 2.6 times the global average. Urbanization poses an important challenge to coastal cities unless it is done in a planned and sustainable way.

It is no coincidence that global change has become a leading development issue as the world is becoming increasingly urbanized. Global warming will have severe impacts including increased flood risks and reduced water supply, declining crop yields, an increase in vector-borne health problems, displacement from coastal cities and small islands and significant changes in marine ecosystems. In particular, coastal locations are at risk of the impacts of accelerated global sea level rise and other implications such as changing storm frequencies. Oceans have been absorbing approximately 30% of carbon dioxide emissions attributed to anthropogenic activities since the industrial revolution, causing seawater to expand as ice sheets in the North and South poles melt, and causing the ocean pH to change and become more acidic.

Coastal populations can be a burden on coastal ecosystems if urban growth is not well managed and many of them are already under heavy stress, amplifying the risks of climate change. The Millennium Ecosystem Assessment concluded that both offshore and coastal ecosystems are among the most productive in the world, and also among the most threatened by human settlements. In delta regions, subsidence due to ground water withdrawal and reductions in the rate of sediment deposition can lead to sea level rise, increasing the flood risk.

High economic activity without proper controls, patterns of high consumption, unrestricted economic growth, and unsustainable urbanization increase the environmental pressures, while low income settlements and the poor groups within them are the most vulnerable to the risks in these coastal cities. Mitigation may be the best means of avoiding risks related to climate change, but it is too late to rely solely on mitigation, it will require a combination with other adaptation measures, among them, migration, sustainable urbanization and ecosystem based adaptation approaches.

At the global level, international cooperation and international negotiations play a central role as well as improved International Organizations. In this context, UNEP and UN/Habitat within their own mandates and through specific projects drawn from the framework partnership agreement have to be seen as important support for developing countries in regard to building capacity, technology transfer and normative developments to assist in the adaptation and the mitigation strategies to be considered and implemented at the national and local levels.

The presentation will further elaborate on some of the most important challenges that coastal cities are facing, particularly in the context of accelerated urban growth, will provide the most updated (aggregated) data on the population at risk living in coastal cities and highlights which are the cities and regions more exposed. It will refer briefly to some solutions that cities and local communities can adopt in this sense and will conclude by highlighting some of the most important contributions that

UNEP and UN-Habitat can provide in this area, giving some concrete examples in different coastal cities.

INTRODUCTION

I will first outline the most important challenges that coastal cities are confronted with and highlight the impacts that may threaten their future existence: a combination of rapid and unplanned urbanization, of a magnitude never experienced by human kind before, associated with climate change and global warming are causing vulnerabilities that place coastal cities particularly in the developing world at high risk.

Thereafter, I will highlight some of the policy responses and strategies required at national, regional and international levels to deal with this life threatening process and underscore the role of international cooperation and specially the Partnership Framework Agreement between the United Nations Human Settlements Programme (UN-HABITAT) and the United Nations Environmental Programme (UNEP).

Challenges

Coastal cities are confronted with a wide range of challenges, particularly in developing countries.

Amongst the most important challenges it is worth highlighting:

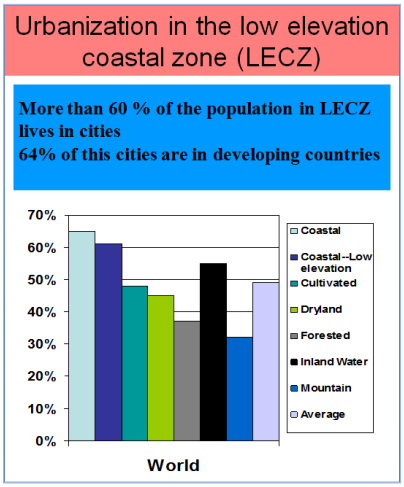
(1) rapid and unplanned urbanization:
- It causes pressure on coastal and marine ecosystems as well as air and coastal zones/ocean pollution if there is not an adequate transportation system and a sound waste management.

(2) the impacts of climate change and global warming:
- In particular sea level rise and changing storm frequencies

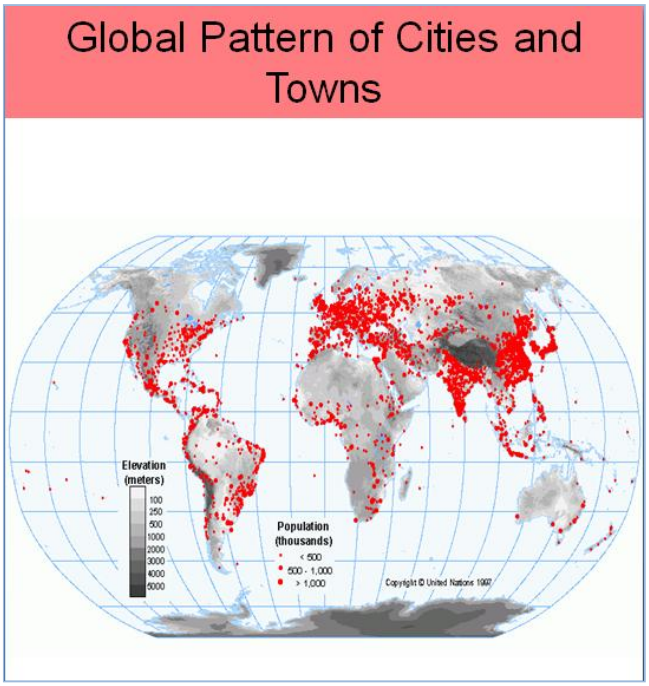
(3) Subsidence:
- Associated with the problem of sea level rise, particularly in delta regions, it increases flood risks.

Today, more than 50% of the global population already lives in cities and this is projected to become 60% in 2030.

Additionally, more than 60% of the population in Low Elevation Coastal Zones (LECZ) lives in cities, and 64% of these cities are in developing countries.

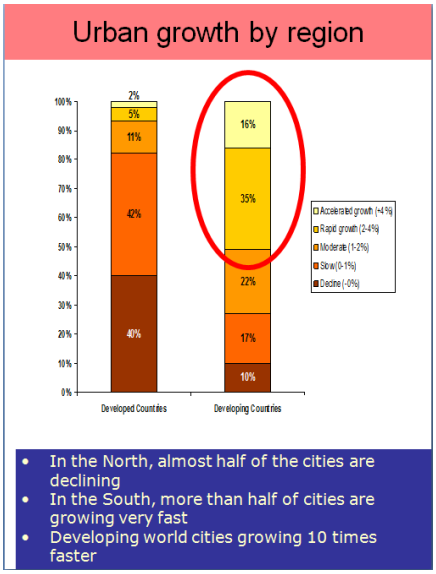


This slide shows a graphic representation of how cities are mainly concentrated in coastal zones.

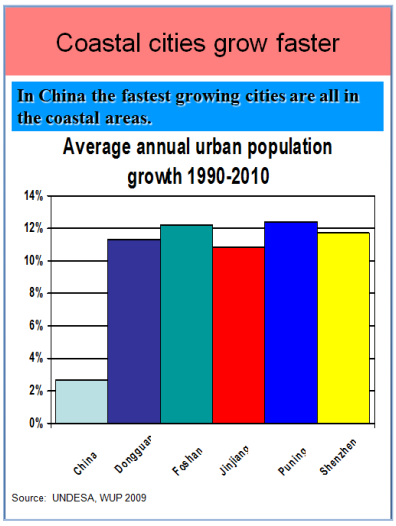


Urbanization will be a phenomenon of the developing countries during the next decades where half of the cities are already growing at annual rates above 2% per annum.

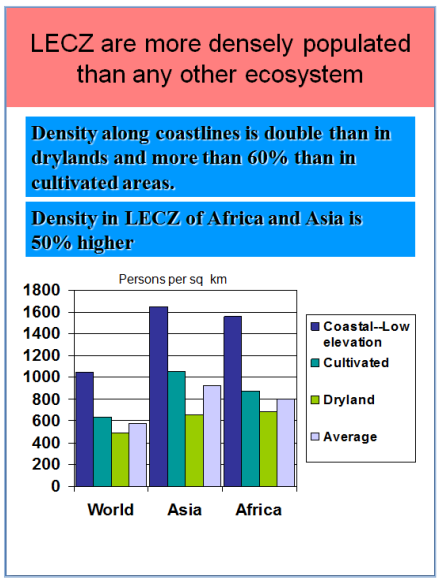
What is more critical is the fact that one third of this growth takes place outside the formal and official systems of planning resulting in slum formation and informal settlements, often on land not suitable for human settlements. Urban growth is currently a synonym of slum formation in Africa and Asia where it has become evident that the incapacity of national and local governments provides housing, land and infrastructure to its rapidly growing population.



The urbanization growth rate is even higher in coastal cities. If we take into consideration the urban growth rate in China, as you can see in this slide, while the average for the country is around 2%, in some coastal cities it goes up to 12% per annum.



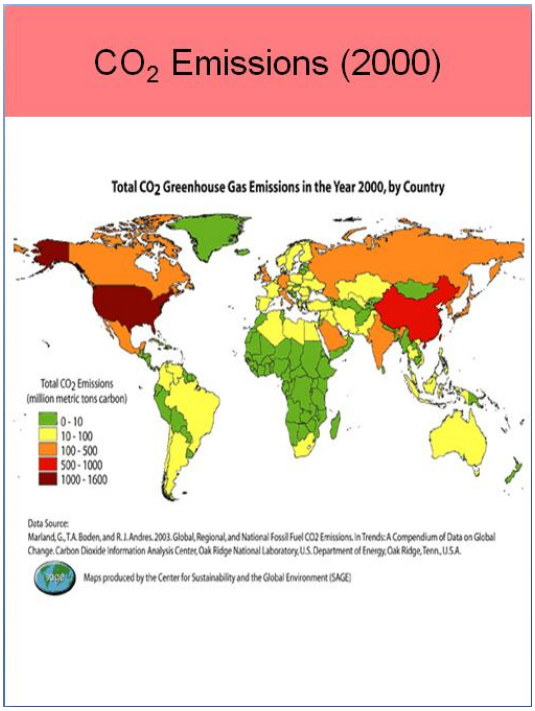
Another aspect to consider is the concentration of population and economic activities in coastal zones, which are more densely populated than inland urban zones. The global average density along coastlines is more than double that in dry lands and more than 60% in cultivated areas.

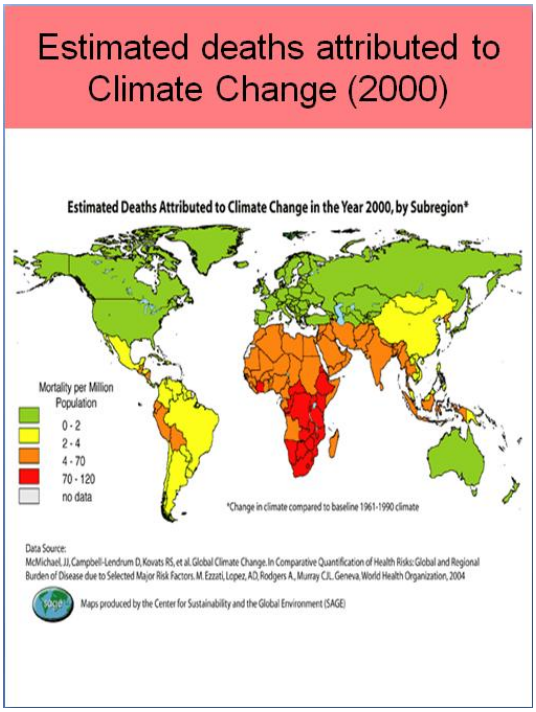


Density in Low Elevation Coastal Zones of Africa and Asia is 50% higher than in developed countries.

Concerning climate change, it is not a coincidence that global warming has become a leading development issue while the world becomes increasingly urbanized. There is a strong link between urbanization and carbon emissions.

A very quick look at the next two slides. The first one shows the CO_2 emissions, by country, in the year 2000. The second one refers to the estimated deaths attributed to Climate Change also in the year 2000. This one shows clearly that the developing countries are the most affected and in particular, Africa.

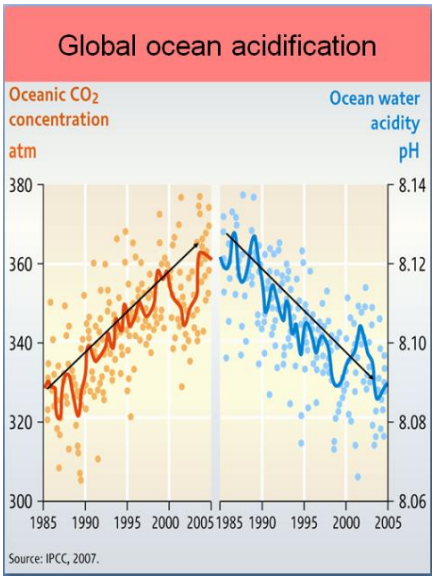




Global warming will have severe impacts including increased sea level rise, flood risks and reduced water supply, change in storm frequencies, declining crop yields, redistribution of fish populations towards the poles, an increase in vector-borne health problems, significant changes in marine ecosystems and is likely to cause displacement from coastal cities and small island developing states.

In delta regions, subsidence due to ground water withdrawal and reductions in the rate of sediment deposition can lead to increased risks of sea level rise, though increasing flood risks.

This slide, prepared by the IPCC is very illustrative in this regard. It shows a graphic representation of the problems generated by global warming.



The global rise in temperatures is causing seawater to expand as ice sheets in the North and South poles melt. Since 1961 sea level has risen at an average of 1.8 mm/year and since 1993 it has gone up to 3.1 mm/year.

Oceans have been absorbing approximately 30% of carbon dioxide emissions attributed to anthropogenic activities since the industrial revolution causing the ocean pH to change and become more acidic.

The concentration of population, economic activities without proper controls coupled with patterns of high consumption and human settlements in coastal zones can become a serious overload on coastal and marine ecosystems if this process is not well planned and managed. Many of them are already under heavy stress, amplifying the risks associated with climate change and global warming. The Millennium Ecosystem Assessment concluded that both offshore and coastal ecosystems are among the most productive in the world, and also among the most threatened by human settlements.

Today, it is estimated that almost 50% of the world's coasts are threatened by development-related activities. In the case of Asia, 69% of their coastal ecosystems are at risk.

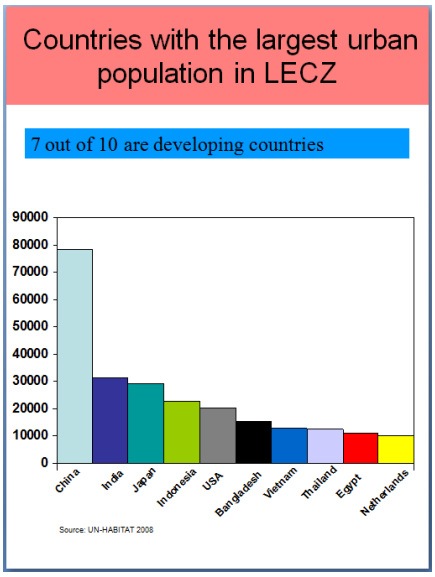
As much as 80% of the pollution load in coastal waters and the deep oceans originate from land-based activities. This includes run-off and wastewater from farms, cities and factories, and pollutants from power generation, heavy industry, automobiles, etc.

Coastal habitats such as mangroves, seagrass beds, salt marshes and shellfish reefs continue to decline in extent, threatening highly valuable ecosystem services.

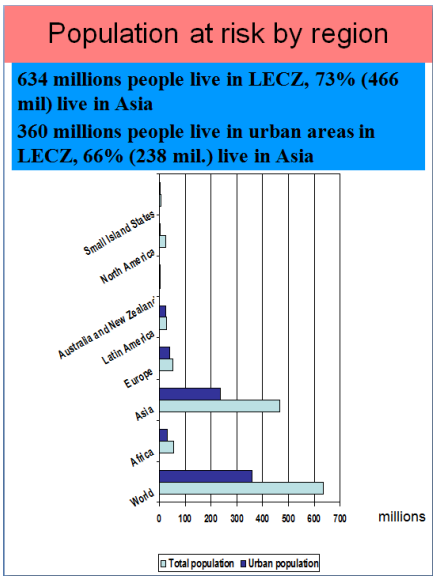
Some 10% of the world's reefs may already have been degraded beyond recovery, and another 30% are in decline.

About 80% of the world marine fish stocks are fully exploited or overexploited, fish stocks since 1977 have experienced an 11% decline in total biomass globally, and the average maximum size of fish caught declined by 22% since 1959.

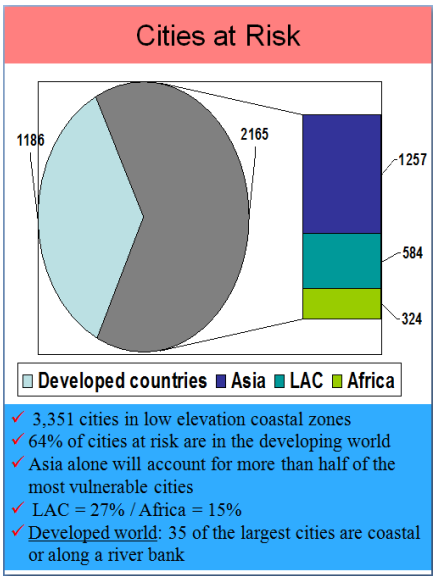
The most updated data on the urban population at risk living in Low Elevation Coastal Zones shows clearly that the highest numbers come from developing countries. 7 out of 10 countries with the largest urban population in Low Elevation Coastal Zones are developing ones.



Regarding the population at risk by region, clearly Asia is the most exposed region with 238 million people living in urban areas in Low Elevation Coastal Zones.



Concerning the number of cities at risk, there are more than 3300 cities in Low Elevation Coastal Zones, out of which 64% are in developing countries. Asia alone accounts for more than half of the most vulnerable cities, while Latin America and the Caribbean account for 27% and Africa for 15%.



You can see in these slides the distribution of cities that are more exposed by region. Alexandria, Dakar, Lagos, Abidjan, Mombasa and Maputo, among others, are the ones facing the highest risk in Africa.

The Caribbean island states in Latin America and the Caribbean region are also at risk, I also would like to mention Tijuana, Rio de Janeiro, Salvador, Caracas and Maracaibo and even Buenos Aires in my own country, Argentina.

In the case of Southern Asia the most exposed ones are Dhaka, Kolkota, Rangoon and Hai Pong.

In conclusion, coastal cities in developing countries are more vulnerable than in developed countries due to the lack of human and financial resources, and well-equipped institutions all of which are needed to put in place the adequate mechanisms of protection and preventive policies. Infrastructure plays in this regard a key role. Low income settlements and the poor groups within coastal cities are the most vulnerable to the risks mentioned above. The poor live in marginal areas, they have no means to occupy prime land and they do not have access to adequate basic infrastructure which increases their vulnerability.

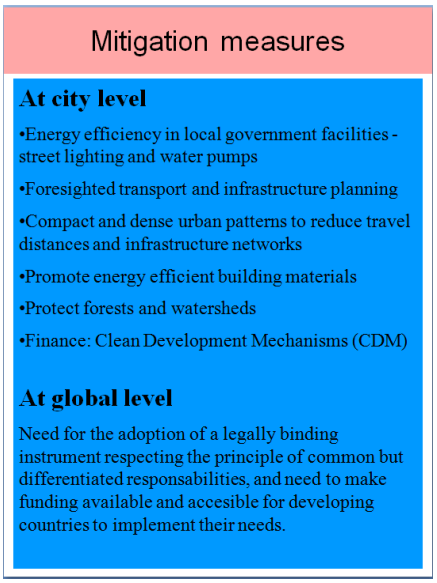
Policy responses

Given this wide range of problems and critical challenges faced by coastal cities in the developing world, what measures and strategies should be designed to prevent, mitigate and address both the impacts and the deep-rooted causes of the problem? Mainly, strategies combining mitigation and adaptation policies.

For developing countries International organizations can play an important role assisting them in the adoption of correct strategies and facilitating access to financial resources.

With regard to mitigation, at the local level there are some measures that need to be incorporated in a mitigation strategy in order to reduce the level of emissions, like energy efficiency in local government facilities, energy efficient building materials, foresight transport and infrastructure planning, as well as protection of forests and watersheds and development of compact and dense urban patterns to reduce travel distances and infrastructure networks.

At the global level, in addition to measures adopted nationally and locally by governments at their discretion, there is a need for the adoption of legally binding instruments at the global level that respect the principle of common but differentiated responsibilities. There is also a need to make funding available so that developing countries may access adequate financial resources to implement the required measures to fulfill their needs.



Although mitigation strategies may be the best way of avoiding risks related to climate change, the impacts are in such advanced stages that makes mitigation alone not an option.

In the case of adaptation measures, cities can or are already taking steps to ameliorate the impacts caused on their coastal surroundings.

There is a need to formulate and implement preventive policies aiming at risk reduction and preparedness; this will require a combination with other adaptation measures, to address not only the ecological footprint of cities but also the modes of transportation, density, land use and typology of housing and construction technology as well as urban waste management.

These policies must be accompanied by institutional and capacity building mechanisms to ensure sustained response and proper monitoring of their results and impacts.

Other direct actions include:

- Adoption and compliance of planning and building regulations which prevent construction in unsuitable areas.
- Enforcement of regulations governing industrial, municipal and agricultural pollution.
- Implementation of integrated water resources management (IWRM) and integrated coastal zone management (ICZM) strategies.

Cities policy responses – adaptation measures

-Adopting adaptation strategies including risk reduction and preparedness. Capacity building for sustained response and monitoring of results and impacts.

- Adoption and compliance of planning and building regulations which prevent construction in unsuitable areas.

-Enforcement of regulations governing industrial, municipal and agricultural pollution.

-Implementation of integrated water resources management (IWRM) and integrated coastal zone management (ICZM) strategies.

In the development of strategies there might be a need to consider, the eventual relocation of population currently residing in areas that are disaster-prone and more exposed to risks and life threatening situations and particularly those living in low lands subject to floods in Small Islands Developing States. This will certainly prevent loss of human lives that we frequently observe in the event of tropic storms.

In the context of adaptation strategies we have to highlight the use of Ecosystem-based Adaptation approaches, which make use of the environment and its natural resources as tools to address climate change impacts. Healthy and well-managed ecosystems provide services that reduce the vulnerability of people to the impacts of climate change. Ecosystems can replace or complement expensive 'hard' infrastructure, and it is cost effective, sustainable and engages local communities.

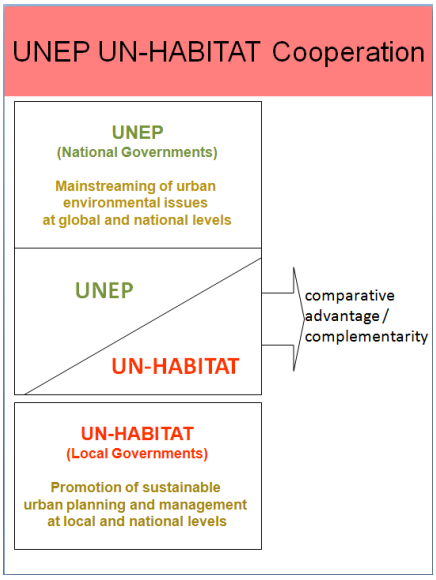
Ecosystem-based Adaptation

- Healthy, well-managed ecosystems provide services that reduce the vulnerability of people to the impacts of climate change
- Ecosystems can replace or complement expensive 'hard' infrastructure
- "Ecosystem-based Adaptation" (EbA) values and uses ecological services for adaptation
- Cost effective, sustainable, engage local communities

The example of the mangrove plantation in Vietnam is a very interesting one, the project undertaken by the Red Cross allowed savings in the order of US$ 7.3 million in dyke protection per year.

International cooperation and international negotiations play a central role as well as improved International Organizations that can set international normative standards, references, guidelines and a set of monitoring and reporting mechanisms to ensure coherence in international responses to these global challenges.

In this context, UNEP and UN-Habitat should be seen as important support for developing countries within their own mandates and through specific projects drawn from their Partnership Framework Agreement. This will enhance capacity building, technology transfer and normative developments to assist in the adaptation and the mitigation strategies that need to be considered and implemented at the national and local levels.



These organizations can also play an important role at the regional level, where countries sharing transboundary ecosystems have to coordinate and implement strategies for the sustainable management and use of the marine and coastal environment.

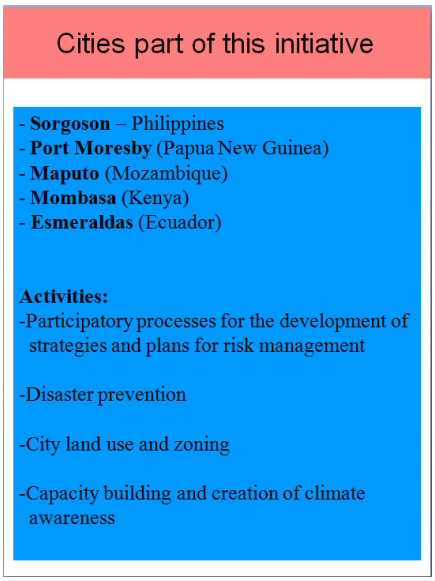
UNEP and UN-Habitat have been cooperating for a long time, they started in the 90s with the joint Sustainable Cities Programme (SCP) and this process resulted in the adoption of the Partnership Framework Agreement (2008-2013) currently in place.

It´s main objective is mainstreaming the environmental perspective into local, national and global urban policy-making, and the urban perspectives in environmental policy-making at all levels. The scope comprises developing countries, cities and their partners in Africa, Asia and Latin America and the Caribbean.

Some of their thematic areas are, climate change; transport, pollution and waste; biodiversity and ecosystems.

It supports governments to address urban environmental issues at all levels in cooperation with partners among which, Cities Alliance and ICLEI (Local Governments for Sustainability) play a central role.

With regard to specific projects in coastal cities, different activities are taking place in pilot cities such as Sorsogon City (Philippines), Port Moresby (Papua New Guinea), Maputo (Mozambique), Mombasa (Kenya) and Esmeraldas (Ecuador). The concrete actions include participatory processes for the development of plans for risk management, disaster prevention, cities land use and zoning, capacity building and creation of climate awareness.



Let me show you a few practical examples of the risks coastal cities are faced with, poor infrastructure, poor urban planning and the risk of sea level rise.

To conclude taking into account the magnitude of the challenges faced by coastal cities in developing countries it is of particular relevance to stress and advocate the role of these International Organizations and the support they can give to developing countries.

Maritime Communities and Climate Change – Role of Public Authorities and Cooperation Networks

Dr. Gunnar Tietze, *Maritime Pavilion*
and
Dr. Fabienne Vallee, *International Cooperation, Science Park Brest Iroise, France*

****

Fabienne Vallée[1], Gunnar Tietze[1], Niko von Bosse[2], Peter Beckmann[3], Cheng Sheng Hai[4], Laurent Bellavence[5]

[TERRITORIES OF BREST, KIEL/SCHLESWIG HOSLTEIN, SHANGHAI PUDONG, QUÉBEC]

****

1. ABSTRACT

With the globalisation phenomena, the "blue planet" is becoming a major driver of the economy: supporting 90% of international trade, welcoming more than 45% of the world's population within 50 km of the coasts, providing millions of jobs, and 40% of energy resources.

Ports and port cities are the corner stone's of this economy. If they are per nature major transportation and economic hubs, driving local and regional development from all marine and maritime related activities, they are also the connection point between two worlds, the earth and the sea, and between human activities, on-shore and offshore.

For port cities, and maritime regions, the questions raised by the "sustainable development" concepts address quite concrete and complex issues. They constitute a set of challenges for public authorities, who must deal with urban, social, economic, cultural, environmental facets of the development prism to define suited policies, in a more and more competitive and global world, with a new threat: "climatic change".

The paper is a joint contribution from partner port cities and territories. It is based on *parallel studies carried out by interest and cooperation networks: the Conference of Peripheral port cities, the International Association of Ports and Cities, the Conference of Maritime Regions, the International Association of Science parks.* Convergent strategies emerge from these studies and they have clearly two dimensions: the regional and the international one.

Through the presentation of concrete cooperative actions undertaken, at local and international levels, the paper aims at setting out potential roles maritime cooperation networks may endorse to federate maritime communities and provide self-defined (adapted and localised) measures to reduce the impacts on the environment, and per consequence on climate change.

2. KEYWORDS

- Sustainable development of maritime territories, ports and port cities
- Natural hazards, environmental and climatic changes
- Impact of global changes and public perception

[1] Manager of International cooperation – Science Park Brest – France – fabienne.vallee@tech-brest-iroise.fr and Executive manager – GeoTopic- Kiel – Germany – gunnar.tietze@geotopic.de
[2] Executive manager – Maritime Cluster Schleswig Holstein – Germany – vonbosse@wtsh.de
[3] Executive manager – Economic development agency of Kiel – Germany – pbeckmann@kiwi-kiel
[4] Executive manager – Shanghai Lingang Marine Science Park – China – Cshai69@sina.com
[5] Executive manager – Maritime Technopole of Quebec – Rimouski – Canada – lbellavance@tmq.ca

- Maritime spatial management, ICZM[6]
- Conflicting interests
- Solution provision by cooperation between public authorities, science and industry
- Support of regions and territories
- Organizing action at three levels:
  - local
  - regional
  - global
- Public private scientific partnership (PPSP)

3. INTRODUCTION AND OBJECTIVES – POSITION OF THE PAPER

Often repeated and very true – no need to explain in detail to this distinguished audience:

- Water covers over 72% of the blue planet.
- Most people live in coastal zones within 50 km from the oceans, which are
  - the hot spots of economy and
  - Man's activity.

Its magnitude and importance is continuously ***rising***, demanding increased

- ***knowledge*** and
- ***understanding*** of the oceans' complexity regarding ***resources*** and ***environment***.

Maritime communities, people living close to and in most cases by the sea, are affecting the oceans' health by over exploitation and degradation of marine resources. Also inland communities are using the oceans as their main trade-way, energy supplier or for dumping wastewater by the rivers. They are all contributing environmental change and – probably – also have an impact on climate.

At this point we make a break:

At least in the Western world, public authorities and engineering capabilities are used to designing the living environment. This means adaptation to nature with whatever design.

Obviously mankind needs a change in paradigm in order to face the hazards from environmental and climatic change (as well as other changes). As nature (including climate and environment) is the platform for all living and all policies should derive as a function of natural resources and opportunities, instead of the other way round.

Maritime communities are aware of their responsibility but are also conscious of their role at taking charge of the development of better practices and techniques, to preserve their living and economic resources and to adapt themselves to future changes.

So, to accelerate these changes, in policies and practices:

- Have we considered other solutions other than taxes and regulations?
- Have we considered the innovation capacities available in the 'maritime community' and its capability at organising itself to improve its current practices and techniques?

The paper will consider these questions and explore means to better exploit the intrinsic capabilities of maritime communities at organising and inventing the sea world of tomorrow.

So, based on global ocean observing, data and models provided by nature, we develop political strategies and actions from this starting point by taking into account geographical facts. Following this idea, our paper is divided into two parts:

[6] ICZM = Integrated Coastal Zones Management

I. Environmental and climate change and impact on maritime communities

II. The role of public authorities and cooperation networks in addressing these impacts

4. ENVIRONMENTAL AND CLIMATE CHANGE AND MARITIME COMMUNITIES

This first part is dealing with the impact of these changes in maritime communities while the second part will discuss the response required and examples of best practices.

4.1. QUESTIONS

So, what is the impact of climate/environmental change on maritime communities?

Why do we attempt to minimize the impact (whatever it is exactly)?
Or shall we better adapt to the changes?

Does mankind influence or even change the climate?
A positive answer would be a prerequisite to minimize the impact.

But: This is not the question, even though the discussion is open and often pursued with alacrity. Let's try to explain why.

4.2. ANALYSIS

As there are two major logical lines here is a table to develop them in parallel:

<table>
<tr><td colspan="2">"Climate" is defined by the mean statistics of temperature, air pressure, precipitation, wind, dust etc. (essentially all tangible values) in a given region over a period of time, usually 30 years. – Weather is the spot situation of the same complete set of parameters at a given place and moment of time.</td></tr>
<tr><td>

30 years is long in a man's life but very short on a geological time scale. Looking at this, we see that stable climate was rare and it usually changes; i.e.: At the very beginning of history in the early Holocene a dramatic warming and sea level rise occurred.
As a matter of fact, the instrumentation to measure the climate and its derivate, the change, is poor, poor in space and in time.
Under-Sampling produces an aliasing effect. The result is incorrect data even when strong high frequency signals overlay a long period signal. This is usually the danger when deriving climate from real time weather data.
Computer models help to overcome this dilemma. They reflect the actual status of man's understanding of the climate process. These models require ground truths. They are accepted if plausible and free of contra-diction to the measurements. However, even with historical data from geology and glaciology the lack of data in space and time is enormous.
Generally, politicians and the press like indicators to promote some action. However, the matter is still too complex for defining a "Climate Dow Jones Index"
Data acquisition and research became very expensive. However, funds are restricted. Thus, contrary to the classical Humboldt University scientists in spite of their free

</td><td>

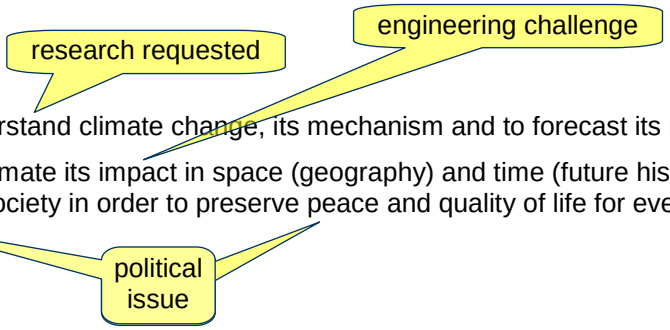
However, climate is more than low pass filtered data, we need words to describe the climate in geography with seasonal and diurnal variation, probability of exceptional situations (i.e. hurricanes) its interaction and even reciprocity with agriculture and other human activities over centuries (like deforestation and urbanization, territorial water management and irrigation).
We want sustainable development.
But what does this really mean?

It certainly does not mean to fix the status quo,
Neither going back to some status quo ante.
Sustainable development implies development, raising wealth and quality of life.

Does not “sustainable” also mean to live in harmony with the environment?
Is a dynamic balance allowed?
Stone Age Homo sapiens were chasing mammoths.
Was their way of life sustainable when after thousands of years at the end of the ice age the climate changed, the ice melted away and the manifold herds in the Eurasian steppes died out. This mass extinction of big mammals was due to climate change and just a little due to over-hunting when mankind grew in number.
As a result, sustainable development was not

</td></tr>
</table>

spirit have to apply for money via proposals. These have to meet the criteria of politically decided programs. Does this shape the behaviour of science leading to politically welcome proposals resulting in some–how mainstream polarisation of research directions and goals? Is there a risk of a short circuit from politics to science?	doable, but with new technologies as agriculture and stockbreeding mankind survived and thoroughly changed the face of the Earth. ▪ What do we learn out of that: The point is not whether climate change is manmade. The simple fact is it changes urges action, no matter why. To find the guilty guy is more a juridical question. ▪ We have to accept climate change as a fact, and to develop new technologies, political networks and administrative structures to cope with. (By this we do not recommend careless boosting degradation of environment and climate.)



So, why two columns?

1. Left column: to understand climate change, its mechanism and to forecast its magnitude.
2. Right column: to estimate its impact in space (geography) and time (future history) and to react in policy and society in order to preserve peace and quality of life for everybody.

4.3. CONCLUSION

On that basis we have to work on the extension of column 2 as obviously there is not much time to lose:

- to dispread best practice solutions via the network of communities
- to adapt the solutions to the geographical specifics of a region including socio-geographical and economic facts
- to image new ways to finance the different maritime communities for their own needs of R&D
- to also adapt education and training programs
- to communicate to the public at large, including professionals.

If the impact of climate change on a region is within the bandwidth of weather variation, mitigation of the impact seems obsolete. However, this may not be true for all parameters. Just a synthetic example:

If the regional warming falls within this bandwidth, society will not run into a problem due to some more pleasant summer days. However, if the sea level rises only a couple of metres, the same climate change may have a tremendous impact on the economy (i.e. port infrastructure).

Here both columns come together: It seems difficult to forecast the impact and to react in an economically reasonable way without understanding climate. It is well known that the ocean is the driver of climate. Its energy density (heat content) per cubic metre is a thousand times higher than that of air at sea level. Here comes the link of climate and oceans and maritime communities. Thus, considering the oceans impact on mankind is condensed in the abstract action plan, task and motto "***Pacem in Maribus***".

Obviously, the proclamation to the UN-delegation and its 5 "overarching principles" are directly addressed by the above said:

1. Our times call for a vastly improved ***integrated understanding*** of science and technology, communication, and governance structures that effectively manage our interdependent air, land, marine and human systems.
2. ***Open and collaborative research***, data collection, data sharing and computer modelling is needed at the global, regional and local levels.
3. ***Appropriate science-based recommendations for governance*** mechanisms are necessary to shape mitigation and adaptation strategies to changing climate, ocean, and human security needs.
4. Socially just polices that ***take into account the adaptation needs*** of vulnerable populations must be a cornerstone of all recommendations.
5. ***Communicating and "framing"*** the issues so they're understandable and actionable by all peoples is an important corollary to the integration of science into sound policies.

4.4. ACTION

Have we considered all solutions?:

- To accelerate data acquisition on climate/ environmental changes,
- R&D, adoption of better techniques and practices for a faster adaptation and reaction of the maritime community to that double threat: environmental degradation and climatic hazards,
- To imagine new ways to finance the maritime communities for their own needs in terms of R&D as well as application of cleaner / safer techniques and practices?

At this point we come to the second part of our contribution:

5. ROLE OF PUBLIC AUTHORITIES AND COOPERATION NETWORKS

The second part of the paper starts from case studies to set out the positive role public policies and cooperation networks can play to accelerate research and exploitation of research:

- For improving the management of the maritime territories.
- For improving quality and safety of the maritime industries.

5.1 LOCAL LEVEL: COOPERATION BETWEEN PUBLIC AUTHORITIES AND POLES OF EXCELLENCE

For port cities and maritime regions, the questions raised by the "sustainable development" concepts address quite concrete and complex issues. They constitute a set of challenges for public authorities, who must deal with all facets of the development prism to define suited policies, in a more and more competitive and global world, and with a new threat: "climatic change".

Case studies will be presented to illustrate the positive influence of public policies:

- ***Territorial management:*** Cooperation between public authorities and experts (companies and scientists) enable developing both poles of competencies in operational environmental management centres with localised services (GIS, remote sensing networks and forecasting models).

- ***Innovation and new economies:*** Cooperation between science and industry organised in thematic R&D programs enable developing new techniques and services for a green and safe maritime industry. Among the success stories analysed, these "theme clusters" are very generally steered by "science parks" or High Tech Park "which are the liaison with public policies.

5.2 COOPERATION BETWEEN TERRITORIES

Maritime territories share similar concerns (environment, energy, climate, economic development). Territorial cooperation has proved to be a very powerful means to transfer experience and to develop new visions and policies.

The examples taken demonstrate the positive effect of such cooperation when they are built on two layers:

1. between public authorities, and
2. between their economic and scientific actors,

no matter if between "developed" territories, or between developed and less developed ones, at a scale of either city or region.

Example 1: Brest -Vung Trau/ Haiphong in Vietnam:

At local/regional level, public authorities face the issues of fast development (degradation of water and environmental quality), combined with the impacts of climate changes (sea level rise, erosion, typhoons...) and a necessary investment in infrastructures (ports, tourism, industries in particular).

This two-layer cooperation enables implementing concrete actions for sustainable management of the coastal areas (including climatic issues) by:

- Developing local competencies in different maritime sectors of the maritime economy (coastal management, ports development, aquaculture/food safety...).
- Setting up "operational management centres of the environment" and their localized decision making tools.
- Providing education and training programs for industry and public authorities.

Even if the results are encouraging the example raises the question of funding. Such cooperation would require easier access to "climate" and "development' funds in order to invest in technologies (monitoring systems, labs...) and in external services (status of the marine environment, hydrological an oceanographic studies ...).

Example 2: Brest – Kiel – Shanghai / Qingdao

Cooperation between the science/high tech parks and their members to develop coordinated R&D programs (transport and shipping, new energies, biotechnologies...) that contribute to the development of new techniques and services for a cleaner/safer maritime economy.

This cooperation is sustained by local, national, trans-national public policies. ***Positive influence on industry****:* At more global levels, these joint R&D programs inscribe themselves in larger cooperation networks, e.g. "e-navigation, e-maritime, MITS" (Maritime Information Technologies and Services[7]), cooperation between science and industry that aims at developing technologies and services for a cleaner, safer maritime economy.

These examples demonstrate that:

- ⇨ Whatever their geographic and economic situation is, territories can invent their own future, based on local competencies and cooperation between policy, science and industry.
- ⇨ This requires strong involvement of public authorities, which provide the impulse, the funds and play as intermediates with stakeholders at national level.

[7] MITS: An international cooperation set up to boost R&D and use of « Maritime Information Technologies and Services » what includes « Maritime Intelligent Transport Systems ».

- The research results are exploited directly by public and private sectors: unlike R&D programs, which provide excellent scientific results but are generally poorly exploited. This is particularly important for the current needs of the maritime industry and policy: to invest rapidly in “clean and safe technologies and practices”.

Both examples underline the efficiency of such R&D cooperation programs, which ***accelerate the exploitation of research by the industry***. However, it underlines the lack of or access to R&D funds.

5.3 CO-OPERATION AT INTERNATIONAL LEVEL

Finally, at a global level, the analysis reveals a mesh of institutional, scientific, industrial cooperation, which constitute ***an intrinsic innovation source*** for the whole maritime community.

For public authorities, these cooperation networks are means to set out new development schemes, exploiting the collective knowledge issued from the number and variety of their members. There, all global challenges faced by maritime communities are being studied, in tight cooperation with the scientific and private sectors.

At last, they induce efficient collaboration between territories, which have experience, funds, and experts, with developing regions that, typically lack human, technical and economic resources.

Some of these networks are analysed as examples:

- **The Conference of Maritime Regions** (CRPM):

  That involved itself in global challenges (globalization and maritime economy/innovation strategies; environmental degradation and climate change). It supports concretely the development of territorial cooperation between developed and less developed countries facilitating the use of AID funds and the transfer best practices.

- **Networks of Port & Port Cities** (AIVP[8], CVPP in Europe):

  Which address the economic development and territorial management of Port-Cities (the Port & the City), the innovation and cluster strategies. This network carries out interesting and recognized studies from which emerge new policies, best practices, and cooperation.

- **Networks of Science Parks: International Association of marine science parks:**

  A truly global network that carries out studies, organizes conferences to set out needs, trends, best practices in a quite concrete way**.**

The set up of a sub-network: (***International Network of Marine Science Parks***) would be a real added value to reflect the ***emergence of networks of theme clusters*** (maritime transport, offshore, energy, environmental management, biotechs…) and become the right hand of public policies (coordination of R&D programs, funds…).

6. CONCLUSION AND PROPOSALS

6.1 STATUS OF THE ANALYSIS

The Maritime Community has the capability to organize itself to define suited R&D and action plans in order to face new challenges such as the environmental and climatic ones.
The role and influence of public authorities has been underlined through its double impact on local maritime policies (innovation and sustainable development) and capability to transfer experience, knowledge at all levels through territorial cooperation.
Being it for the public or private sector, a funding strategy can be established, with and without climate taxes.

[8] AIVP: International association of port and cities.

Our proposal thus is to favour a self-management of the problems raised by environmental and climatic changes, by maritime communities and for the benefit of maritime communities, investing in research to develop and adopt “cleaner and safer” techniques and services.

6.2 CORE OF THE PROPOSALS

THE PPSP MODEL: A COOPERATION MODEL TO ESTABLISH THE LIAISON BETWEEN SCIENCE, MARITIME POLICY AND ECONOMY:

The basis of the proposal relies upon cooperation, at local and international levels, between Public authorities, the Private and Scientific sectors.

More concretely it relies upon the following components:

- Cooperation at two levels: Under the impulse of Public Authorities:
    - At local level: to develop local competencies to address environmental/climate issues and innovation/economic issues.
    - At bilateral and international levels: between maritime territories, from developed and less developed countries.
- This cooperation will benefit from the support of marine science parks (an International Network of Marine Science Parks) to provide coordinated support for the development of advanced techniques and services:
    - Operational management centres of the environment, with localized services.
    - Technologies, services, applications for a cleaner maritime industry (port and shipping, offshore and new energies…).
- The Steering of International organisations like IOI or UNESCO is crucial for providing the initial impulse and power for science, policy and funding strategies.

TO PUSH INTERNATIONAL AWARENESS AT THE POLITICAL LEVEL AS WELL AS TO THE PUBLIC:

A ‘Sea World Expo’ & an International Maritime Pavilion to link the maritime community

As one core idea the authors propose to set up a ***permanent “International Maritime Pavilion” to assemble maritime communities on a common goal: to define and implement a new maritime policy by strengthening cooperation between science, policy and industry (the PPSP[9] model).*** This could take benefit of existing networks of marine/maritime related agencies, marine science parks, clusters and territories. They share the same will to work together for defining and implementing the next generation’s maritime activities: safer, cleaner, and more sustainable.

In addition, we propose to organise a true “maritime pavilion”, to host a “Sea World Expo” at the next world expo in 2012 in Korea.

This year in Shanghai, besides many national pavilions, no pavilion hosts the oceans and maritime communities in their own, international space to address the importance and role the oceans play on food, renewable and exhaustive energies, mineral resources, climate, transport, ICZM, littoral spatial planning etc. Without the oceans’ the World Expo loses part of its objective: communication and exchange between all communities of the world.

For the next edition in Korea the red line will be blue: The Ocean. Setting up a “Maritime Pavilion” is more than evident: A truly international space to gather the maritime community, to promote international cooperation and to present and debate the complex multitude of maritime issues.

[9] PPSP = public private scientific partnership

7. DISCUSSION

The discussion is open on the best way to proceed, under the coordination of relevant Inter-governmental and International Non Profit organizations such as IOI, UNESCO/IOC, IMO and UNEP.

Our proposal is therefore to set up a steering group to elaborate a detailed work program and to define concrete pilot actions that would prove the concept and initiate a larger scale international action.

8. ACKNOWLEDGEMENT

We express our sincere thanks to:

- IOI and more particular to Dr. Behnam and Dr. Virapat for their support, encouragement, and having enabled our participation at the important event “PIMXXIII”.
- SOA managers and staff who have welcomed us so kindly and efficiently.
- Public authorities, experts, science parks, clusters from maritime territories, especially from Haiphong, Vun Tau, Shanghai, Québec, Kiel and Brest, who have provided their support, information and their expressed wish to pursue the presented ideas by concrete follow-up actions.
- Partner networks and in particular the Conference of Peripheral Port Cities (CVPP), the International Association of Ports and Cities (AIVP), the Conference of Peripheral Maritime Regions (CPMR), the International Association of Science Parks (IASP) for basic ideas developed in their networks and compiled in our contribution.

9. REFERENCES

- Conference of Peripheral Port Cities (CVPP): www.cvpp.eu
- International Association of Ports and Cities (AIVP): www.aivp.org
- Conference of Peripheral Maritime Regions (CPMR): www.cpmr.org
- International Association of Science Parks (IASP): www.iasp.org
- Science Park Brest, France: www.tech-brest-iroise.fr
- GeoTopic, Kiel, Germany: www.geotopic.com
- Maritime Cluster Schleswig Holstein, Kiel, Germany: www.maritimes-cluster.de
- Economic development agency of Kiel, Germany: www.kiwi-kiel.de
- Shanghai Lingang Marine Science Park, China: www.marinesciencepark.com
- Maritime Technopole of Quebec, Canada: www.tmq.ca

Multi-Stressors and Sustainable Marine Development: Alarming Reality in China

Prof. Jilan Su
Second Institute of Oceanography, SOA, China

ABSTRACT

Oceans and coasts have provided a key contribution to the rapid development of China's national economy. In the process, the health of China's ocean and coastal ecosystems has been seriously compromised due to a multitude of stressors. Over the past few years, the pace of the use of China's oceans and coasts has been accelerated. As a consequence, sustainable development of its ocean economy is threatened as China moves toward realizing its grand blueprint of development in the 21st Century. In this presentation, important stressors affecting and their impacts on China's ocean and coastal ecosystems are discussed. Driver identification examples indicate that studies and management actions to reduce environment stresses are urgently needed.

1. Introduction

China has been undergoing a rather rapid economic growth over the last 30 years, with an average annual GDP increase around 10%. The coastal provinces have contributed the most to this growth, reaching over 60% in 2006. The contribution from China's ocean economy sector has also accompanied the rise, accounting close to 5.8% of the GDP in 2008. The five most important sectors of marine industries are marine transportation, marine tourism, fisheries, offshore oil and gas, and shipbuilding. These five accounted for about 91% of the marine primary industry revenues in 2008, while the first three 55%. (Unless otherwise noted, all data and references are derived from a recent report co-chaired by the author[1].)

Projections suggest that by the year 2020, the GDP from coastal areas will experience a 2.5 fold increase from 2008 figures and the coastal areas' population will grow to 700 million people. At the same time, land reclamation of more than 5000 km^2 is planned for coastal industries and urban development. As marine space is one of the main elements supporting sustainable economic development in the future, ecosystem functions must be considered when analyzing the capacity of marine spatial resources to accommodate projected development needs.

Along with the fast growth of the country's economy, the health of China's ocean and coastal ecosystems has already been seriously compromised due to a multitude of stressors. In this paper, important stressors affecting China's ocean and coastal ecosystems are discussed, along with their impacts. The need for studies and management actions to reduce environment stresses is demonstrated through an example of driver identification.

2. Increasingly Urgent Threat to China's Coastal and Marine Ecosystems from Human Impact

As shown by Halpern et al[2], no area of the global marine ecosystems is unaffected by human influence and that a large fraction (41%) is strongly affected by multiple stressors. Stressors naturally occurring and human resulting can be grouped into five general categories, namely, land-based activities, resource uses, invasive species, extreme events, and climate change.

Marine pollution, especially eutrophication from nutrients, constitutes the most important one in the first category, the land-based activities. For China, because of its large population, drastically reduced river discharge is also an important stressor locally. Over-fishing is commonly the primary one in the

[1] Ecosystem Issues and Policy Options Addressing the Sustainable Development of China's Oceans and Coasts, Task Force Report of the China Council for International Cooperation on the Environment and Development (CCICED), 2010, Beijing.
[2] B.S. Halpern *et al*, A Global Map of Human Impact on Marine Ecosystems. *Science* **319**, 948 (2008), DOI: 10.1126/science.1149345

second category, resource uses. For China, large-scale and rapid-completion land reclamation projects over recent years exerts tremendous pressure on the coastal ecosystems. In addition, rapid expansion of aquaculture in China has caused eutrophication locally in coastal waters.

In the following, urgent threats to China's coastal and marine ecosystems from eutrophication, large-scale land reclamation and overfishing are discussed. Threats associated with other natural and anthropogenic stressors such as reduced river discharge, oil pollution, invasive species, sea lever rise and others can be found in the report referred to in Footnote 1.

2.1 Increasing coastal eutrophication and accompanying ecological disasters

Increasing eutrophication is a serious problem in Chinese coastal waters. In 2009 the coastal sea not meeting the water quality standard was found to be about 147000 km^2, over half of China's coastal waters. Overloading of nutrients, especially the dissolved inorganic nitrogen, from both the river inputs and atmospheric deposition, is the principal cause. From 2004-2009, sea areas with moderate eutrophication increased by 6% and those with severe eutrophication by 66%.

Associated with the upward trend of the nutrient pollution is the rising incident of harmful algal blooms (HABs), green tides, and hypoxia zones.

The frequency of HABs in China has been increasing at a rate of 3-fold every decade since the 1970s. It distributes widely all over the China seas and with an ever increasing extent. The Bohai Sea experienced a 6000 km^2 HAB in 1999, while the East China Sea has experienced large scale HABs over 10000 km^2 every year between 2000-2010. Toxic HABs such as Alexandrium, Karenia and Gymnodinium are also on the rise. In 2005, one large scale Karenia bloom caused several tens of millions RMB losses in caged fish-aquaculture off the coasts of the Zhejiang Province.

Large-scale green tides started to appear in Yellow Sea in 2007 and persisted yearly to 2010. The one in 2008 occurred just before the Olympic sailing competitions and caused a direct economic loss of 1.3 billion RMB. It covered an area of around 30000 km^2 and has an biomass estimated to be several million tonnes.

Hypoxia is another ecological problem closely related to eutrophication. The serious lack of oxygen leads to the formation of the so-called "dead zones" in the lower layer, resulting in local collapse of marine ecosystems and fisheries resources. The most prominent hypoxia in China is in the areas surrounding the Changjiang River Estuary. From 1990 onwards, wide extent of hypoxic zones have been observed there in summer[3], often covering areas over 10000 km^2.

It is no exaggeration to state that China's offshore coastal ecosystems are at a critical period of evolution from eutrophication. Given China's rapid economic development and increasing urbanization, the problem of coastal eutrophication will certainly be one of the key challenges to China's marine environment. HABs, green tides, jellyfish proliferation and hypoxia will be more pronounced, threatening the sustainable ocean development in China.

2.2 Widespread land reclamation and loss of ecological services

Since the founding of the People's Republic of China in 1949, there have been 4 waves of such activities. The first wave up to the early 1960s was for salt production. The second wave spanning the mid-1960s to 1970s was for agricultural land. The third wave ran from the late 1980s to the early 1990s for aquaculture. The fourth wave focuses on port construction, and industrial and urban development. From 1990 to 2008, the average annual reclaimed land was about 285 km^2. To fulfill the goal of the planned coastal development strategy up to 2020 the pace of the land reclamation will need to increase further to an average of 480 km^2 annually, based on incomplete statistics.

[3] Li Daoji et al, Oxygen depletion off the Changjiang (Yangtze River) Estuary. *Science of China (D)* **45 (12)**, 1137 (2002)

Coastal wetlands are areas of marine water with depth not exceeding 6 m at low tide, precisely the areas where land reclamation is carried out. However, coastal wetlands possess ecological functions producing valuable goods and valuable services to humans. Important functions performed by wetlands include, for example, nurseries for fish and shellfish, carbon sink and food production, water purification, wildlife habitat, flood buffer and shoreline erosion control, and recreation.

Land reclamation, including sea-enclosing, is an integral part of man's development throughout history. However, during China's first three waves, both the scale and the pace of such activities were usually moderate. Under such conditions the affected coastal and marine ecoststems may have sufficient time to adjust to the disturbance. Nowadays, because of the pressure for rapid development demanded by local governments and the availability of modern technology/machinery, reclamation in the fourth wave has already been typified with large-scale reclamation project completed over a rather short time span. Many of the reclamation works lacked a proper environmental impact assessment study and went through a hasty approval and implementation. Such a fast pace of land reclamation will undoubtedly create detrimental impacts on the coastal ecosystems for years to come.

Large-scale reclamation works have inflicted great damage on the Chinese coastal and marine ecosystems: (1) Decrease in benthic biological diversity. Dredging and land-fill associated with reclamation work cause dramatic changes to the marine environment, including the decline in benthic and community structural change. (2) Decline in water purification capability. A large-scale reclamation project not only causes marine pollution directly through industrial wastes, its massive destruction of wetlands also lowers the environmental capacity in purifying the marine water. (3) Damage to fish habitats. Most spawning and nursery grounds of fish are in shallow seas or estuaries, where most of the reclamation takes place. High concentration of suspended particles from reclamation work causes damage to fish eggs and juveniles. Destruction of habitats will result in difficulties in recruitment, leading to a decline in fishery resources. (4) Coastal landscape diversity damaged. Reclamation work often results in artificial landscapes replacing natural ones. Valuable coastal and island landscape scenery and resources are damaged during the reclamation process. (5) Increased risk of marine disaster. Reclamation increases the risk of coastal land subsidence and coastal erosion, and weakens the ability of protection services for marine hazards. (6) Loss of wildlife habitats.

2.3 Overexploitation of fisheries and decrease in resource population reproduction

Over the past 30 years, the fishery industry has contributed significantly to food safety in the economic development of China. However, the indiscriminate bottom trawl has been the principal fishing method and, at the same time, exploitation of fisheries has surpassed stock-recovery capability. Consequently, not only has the biomass of the fishery resource been depleted dramatically, but also the habitats have been destroyed overwhelmingly.

Overfishing has caused biomass reduction of high-valued species and the extinction of some commercially important species. Also observed is a decrease in body size (e.g. the average length of small yellow croaker decreased from 20cm in the 1970s to 10cm today), early maturation, lowered trophic level, increasing catch of juveniles, and decreasing quality of catches. As the dominant natural species are gone, biodiversity has decreased. Changes in the ecosystem structure and functions pose great difficulties for the restoration and sustainable development of marine fisheries.

Jellyfish are found to bloom[4] in a heavily fished ecosystem and also benefit from eutrophication. The former removes its predators, while the hypoxia benthic areas likely found in the eutrophied water may be beneficial to the jellyfish at its larval stage. Since 2000, proliferation of jellyfish with no economic value has been on the rise in the East China Sea. Jellyfish bloom consumes a large amount of zooplankton which feeds fish. Thus, in rerturn, jellyfish bloom is also detrimental to fishery.

Rapid development of mariculture has exerted significant impacts on coastal and marine ecosystems. Although the production of fed species, such as fish and shellfish, takes only 10% of the total

[4] J. E. Purcell et al, Anthropogenic causes of jellyfish blooms and their direct consequences for humans: a review. *Marine Ecology Progress Series*. 350(13), 153 (2007).

mariculture production in China, they are the major source of pollution from mariculture. Wide use of fishmeal as the feed for these species has resulted in significant increase in N, P and organic wastes in the seawater. Large-scale mariculture has imposed severe stress on intertidal ecosystems, damaging habitats including wetlands, seaweed beds and coral reefs. All of these have negative effects on the fishery resource recovery.

3 Stressor Impact Assessment

The above discussions show clearly the multi-stressor nature that coastal and marine ecosystems of China coast are experiencing. The global study of Halpern et al[5] touched briefly on the impacts on the marine ecosystems in the East China Sea from mutli-stressors. A recent study[6] by UNDP/GEF has also discussed, in a qualitative way, the multi-stressor impacts on the Yellow Sea Large Marine Ecosystem.

Much research is needed to understand the impacts of the stressors on the ecological services of an ecosystem. Take fisheries as an example. Many stressors will affect this resource.

Overfishing is obviously an important one, as China harvests from the China Seas around one-tenth of world's production in tonnage[7], mostly from the Yellow Sea and East China Sea. The decline of the trophic level of some resources species over the years correlates well with the increase of the fish catch. However, under the same fishing pressure, the biomass yields of some exploited stocks in the Yellow Sea appear to be fairly stable or recovered[8]. In fact, the same study also showed that the catch of certain pelagic species showed a decadal variability as the regime shifts in the North Pacific. So climate is another important factor for the variation of resource species.

Many of the commercially important fish species use coastal wetlands as spawning and nursery grounds at some stage in their life cycle. Thus habitat loss from land reclamation activities will have a rather detrimental effect on important fish species. For example, Penaeid Prawn is one of the highly valued catch of capture fisheries in the Bohai Sea. It spawns in shallow near shore water and seeks the wetlands or estuaries for their post larvae period. At present, there is practically no meaningful landing of the Bohai Penaeid Prawn. Most people attributed this to overharvesting, which no doubt is a very important factor. On the other hand, widely practiced aquaculture has eliminated a large part of the wetlands. Furthermore, many of the rivers along the Bohai Sea, except for a few heavily polluted ones, are either dammed for irrigation purposes or running dry for most of the year. Changes in circulation of the estuaries from such causes, based on numerical models, are found to be unfavorable for the survival of the prawns in either the larval or post-larval period[9].

In conclusion, to implement an ecosystem-based management practice, much needs to be done to truly understand how each stressor can affect a certain ecological function.

Acknowledgement: This presentation is based on a recent report co-chaired by the author (see Footnote 1). Contribution from all scientists involved in the report is graciously acknowledged.

[5] See Footnote 2.

[6] UNDP/GEF 2009. UNDP/GEF Project: Reducing Environmental Stress in the Yellow Sea Large Marine Ecosystem. Strategic Action Programme. 56 pages.

[7] Close to 12.6 million tons in 2008 (http://www.stats.gov.cn/tjsj/ndsj/2009/indexch.htm).

[8] Q.S.Tang, Changing states of the Yellow Sea Large Marine Ecosystem: Anthropogenic forcing and climate impacts. In: Sherman K, Aquarone M. C, Adams S. (eds.) Sustaining the world's large marine ecosystems. IUCN, Gland, Switzerland, pp 77-88 , (2009).

[9] L.X. Dong et al, The importance of estuarine gravitational circulation in the early life of the Bohai Penaeid Prawn. *J Marine Systems*, **67**, 153 (2007)

Reflections from two decades of Integrated Coastal Management (ICM) Practices in East Asia: Achievements and Inadequacies.

Dr. Chua Thia-Eng
Council Chair, Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

Introduction

The concept of integrated management of the coasts was introduced to the East Asian region in the early 70s soon after the enactment and implementation of the Coastal Management Act of the USA in 1972 (Chua, 2006). Since then various coastal management efforts were undertaken in the region especially in Southeast Asia driven mainly by international aids (Chua 2004, Chua and Scura, 1992). On the world scale there were more than 700 coastal management initiatives in about 90 countries (Sorensen, 2002) but the number of country implementing ICM to date is expected to be much higher. These ICM initiatives are mainly confined to estuaries and selected coastal areas addressing a wide variety of area- or issue-specific environmental and sustainable coastal and marine management concerns. In recent years, interests in the Regional Seas (Terttu, 2008) and the Large Marine Ecosystems (Sherman et al. 1993; Sherman and Duda, 1999, Duda, 2002) have generated increasing interests in extending the integrative, strategic planning and management approach to national and regional scale (PEMSEA, 2003).

More serious application of the integrated management concept took place in the early 90s that greatly strengthened coastal governance as human activities in the coastal areas intensified and both population and economic development pressures increased accompanying by a range of social and multiple use conflicts arising from intensification of resource exploitation, coastal space utilization, poverty, coastal urbanization and rapid industrialization (Olsen, 2003, Chua 2006, Kullenberg, 2008).

The concept and practices of ICM have made significant advances and refinements primarily from lessons and experiences from a range of activities in several East and Southeast Asian countries primarily initiated through the efforts of the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), the multilateral financing agency (World Bank and ADB), International Aids from the USA (USAID), Denmark (DANIDA), Canada (CIDA) and Australia (AUS aids) among others (Chua, 2006, 2008).

The purpose of this paper is a follow-up of an earlier reflection of ICM concept and practices (Chua 2008) by focusing on assessing the major conceptual and operational advancements and their inadequacies largely based on the area-specific ICM programs implemented by PEMSEA participating countries during the last 17 years. The reflections cover the following: i) integrated planning and management, ii) coordination, iii) consolidation of ICM concepts and practices, iv) environmental awareness and involvement of local governments, v) participation of stakeholders, vi) policy support vii) individual and institutional capacity development, viii) environmental investment, ix) political interest and support, x) mainstreaming and xi) progress reporting.

1. Integrated Planning and Management

Integrated planning and management is central to ICM practice. Integrated planning of coastal and marine areas ensures strategic, science-based and holistic planning for prioritized, sustainable use of the ecosystem services guided by a set of clearly defined, stakeholder-owned common visions (Chua, 2008). Integrated management on the other hand ensures the implementation of policies, strategies and prioritized action plans developed through the process of integrated planning. They address multiple resource uses, regulate economic, social and environmental conflicts arising from competitive use of space and natural resources, coordinate and integrate specific functions of concerned government agencies, and involve multiple stakeholders in the process of planning and implementation of action plans.

During the last two decades there was a general recognition of the usefulness of integrated planning for sustainable use of coastal and marine resources at local, provincial and national level as reflected in the increasing application of the concept of coastal and marine zoning. For example, coastal

governments at provincial and local levels in China are required by the Marine Space Utilization Law of 2002, to develop coastal zoning plans based on the sustainable use of the ecological characteristics of the given coastal and marine areas with due consideration of traditional practices. However, in actual practices most zoning schemes are biased towards economic development rather than placing emphasis on ensuring the sustainable use of the ecosystem services (CCICED, 2010). On the other hand, Marine Special Planning (MSP) is being promoted and implemented largely in Australia, Europe, Canada and USA with a more balance approach in achieving the ecological, economic and social objectives (Ehler and Douvere, 2009). The MSP approach has gained international acceptance. However, MSP has yet to be tested in the East Asian Sea region which is marked with heavy population and economic pressures and varying political and social complexities. The confusion of the two approach lies largely in the implementation and enforcement rather than on the original concept.

Whilst the MSP or the Functional Zoning Scheme is certainly an evolutionary development from traditional planning practices, integrated planning for coastal and marine areas is still in an early stage of development. They are practiced in limited localities around the world. On the other hand, the East Asian Sea Region has made substantive progress in the application of coastal zoning concept. In addition to China, other countries such as Cambodia, Indonesia, the Philippines, R.O. Korea and Vietnam have implemented coastal zoning plans in several of their local cities and provinces (PEMSEA, 2005).

The Integrated Management approach, on the other hand, is being adopted and implemented in many countries in the region primarily through implementing the strategic actions plans developed as part of the ICM programs. Unlike integrated planning, management measures have to take into consideration the cooperation of the concerned governing agencies and the stakeholders, the availability of financial resources and human capacity to implement various action plans, the availability of political opportunity conducive for plan implementation, and the correct timeframe for ICM program to be fully executed.

Results of integrated management in terms of impacts might be difficult to attain in a short term, but certainly measurable in terms of processes such as setting up supportive policy, administrative orders or legislation, developing human resources, securing budget, etc. A key challenge to integrated management is the ability to utilize and integrate the functions of the key tools of ICM to change human behavior such as the effective use of policy, legislation, budget, human resources, stakeholder's cooperation, political opportunity to enhance the implementation of a well developed action plan. This explains why it takes much longer timeframe to generate visible results. The ICM processes allow the progressive use of the key tools to achieve the final goals.

Most PEMSEA's initiated ICM practices have been operating for more than 5 years and they are being continued by local and national financial and human resources. The more mature ones such as Xiamen (China) and Batangas (Philippines) have exceeded 17 years of continuous operation. So far all ICM demonstration sites established by PEMSEA are able to sustain as they continue to benefits from the ICM cycles despite varying degree of success. On the other hand, many donor-funded coastal and marine initiatives, unfortunately failed to continue beyond the project life-span (Dahuri and Dutton, 2000, Christie, P. 2005). Integration of management functions of concerned government agencies, stakeholder and political interests remains a difficult challenge. The main reasons are that coastal and marine management issues are complex and complicated both from the standpoint of governing and being governed. Effective management requires not only good scientific support but also strong interpersonal, technical and management skills on the part of the coastal practitioners.

The need to adopt a more holistic and integrative planning and management approach from river-basin to coastal seas is now better understood by policymakers and the stakeholders in resolving issues such as transboundary water allocation and use; pollution management efficiency and responsibility, legal and political conflicts, major environmental disasters arising from algal blooms, water shortage and contamination of water quality and flooding (Chung, 2010, Tropical Coasts, 2010). There are better understanding and appreciation for multidisciplinary approach through the application of risk analysis to identify root causes of problems, the resulting social and economic implications and the availability of management options. The value of integrating science into management decision process is an important step in the ICM process. The role of integrative science is increasingly

understood as an involving branch of scientific disciplines to provide reliable management option and advice as advocated by McFadden (2007).

Strategic planning in a holistic and participatory manner in ICM enables local governments to include natural and man-made disasters into their strategic action plans especially the impacts of climate change. Thus ICM has proven over several demonstration projects that it helps to reduce the scale and level of negative impacts on lives and properties as well as decrease the losses to GDP (PEMSEA, 2006). Thus in 2009, ministers from the East Asian Seas region recognized the importance and role of ICM unanimously endorsed ICM as the viable sustainable development and climate change adaptation mechanism (Manila Declaration, 2009).

2. Vertical and Horizontal Coordination

A key challenge to coastal and marine management is the effectiveness of coordination. The complexities of ICM practices call for strong vertical (central and local government) and horizontal (interagency, cross-sector) coordination aiming at delineation of responsibilities and use of resources, reduce interagency and multi-sector conflicts as well as mainstreaming ICM into the local economic and environmental protection agenda. This could be achieved by establishing a strong and effective interagency, multi-stakeholder organizational structure at national, provincial and local levels for addressing different kinds and levels of governance issues. The main challenges usually encountered include a) organizational bearer caused by the traditional segregation of administrative functions and allocation of financial and human resources between line agencies; b) strong sector interest; c) unclear roles and responsibilities of the proposed coordinating mechanism; d) no institutional base for ICM and e) fail to see the pressing need for such mechanism.

ICM has to overcome the above mentioned challenges. Whilst some of the challenges could be addressed through policy and administrative measures, others require high degree of consensus building, transparency and partnerships. This will require strong communication skills on the part of the coastal managers to clarify issues, negotiate and mediate conflict of interests.

PEMSEA's experience shows that interagency coordination is comparatively easy to set up and they are effective at the provincial and local level. All its ICM sites in the region have set up coordination mechanisms although they might vary in terms of composition and functions depending on the political systems. In most cases, these coordinating mechanisms are placed directly under the governor or vice governor of a province (e.g. Batangas Bay, Bataan province and Guimaras province) or mayor or deputy mayor of the municipality (e.g. Xiamen, Danang) who are responsible for the development of their respective provinces and municipalities...

Effective national inter-ministerial coordination mechanism pertaining to coastal and ocean issues is much more difficult to set up especially with powerful central line agencies. However national coordinating mechanism might become possible through organizational restructuring such as the establishment of the Ministry of Marine Affairs and Fisheries (MOMAF) of Indonesia or through legislation such as the Ocean Policy Basic Law of Japan.

Sustaining an effective coordinating mechanism through regular stakeholders and interagency consultations, collaborative planning and where appropriate joint enforcement (as in the case of Xiamen ICM) is even a greater challenge. It requires continuous political and stakeholder's support as well as the strong involvement of the local leaders in addition to shared benefits. These are basic conditions that somehow support the continued functions of the coordination mechanism in most of PEMSEA ICM sites today. They are often difficult to meet. Strong administrative directive may work for a while but for a longer term, the perceived benefits from ICM by all sectors and all agencies of the local government well justified the needs and function of the coordinating body.

The office supporting the implementation of decisions of the ICM coordinating mechanism may vary according to the local conditions. In most cases, the environment or a technical agency takes up the responsibility. Thus the concerned local environmental and natural resource agency in Philippines serves as the office of the Coordinating Mechanism in Bataan, Cavite, Guimaras and Batangas provinces, while the Marine and Fisheries Bureau in China serves as the office of the coordinating mechanism in Xiamen, Dongying and other local ICM sites in China. This arrangement is the result of lack of an institutional home base for ICM and certainly challenges the impartiality in the distribution of

benefits. Hence, the ICM cycle should play a critical role in revisiting the basic principles and processes so that the coordinating functions are repeatedly emphasized.

3. Consolidation of ICM concept and practices

The concept and practices of ICM as described in Cicin-Sain and Knecht (1998) and Clark (1992, 1996) have evolved over the last two decades into a more systematic, science-based planning and management system. The essential elements of ICM which include the framework, process, approach and mechanism have evolved over time into a set of clearly defined operational planning and management tools (Chua, 2008). Over the past 20 years there are sufficient accrued knowledge and practical experiences that allow the system to develop, tested and mature.

The ICM system is made up of 5 components:

a) Governance---This includes a Sustainable Coastal Development Framework which covers the essential elements of governance including policy, legislation, institutional arrangements, sustainable financing, information and communication, participation and capacity development. This component provides the needed direction for management intervention in achieving ecological, social and economic objectives.

b) Sustainable Development Aspects---This component addresses key environmental and sustainable development challenges including natural and man-made disasters, loss of biodiversity, overexploitation of natural resources, transboundary pollution, water use and water resource management. This component emphasizes the need for prioritization through the process of risk analysis.

c) Planning and Implementing Cycle (ICM cycle)---This component focuses on planning and implementing processes which allows incremental gains in terms of experience and knowledge as well as management adaptation to new challenges. It is a cyclical process for continuous improvements in approach, strategies and specific actions to cope with changing conditions. This component emphasizes the importance of preparedness not only in terms confronting issues but also the wise use of the essential dynamics or driving forces of ICM to build political and financial commitments, capacity, stakeholder's support and participation and their feedbacks.

d) Monitoring and Reporting----This component links monitoring the progress and performance of ICM program with reporting of evaluation results to the targeted stakeholders using set indicators for measuring process, performance and impacts. PEMSEA's State of the Coasts reporting system provides a structured monitoring and reporting format that enables the documentation of the current state of conditions, the various actions taken, measurable outputs and outcomes in line with the set objectives of local Agenda 21, WSSD, the Sustainable Development Strategy for the Seas of East Asia as well as the Millennium Development Goals (MDG).

e) Quality Control (certification) -----The ICM system has been found to match closely the requirements of the International Standards Organization (ISO) in governance (ISO9001) and environmental management (ISO 14001) especially the objective, framework, contents and processes. As such this final component adopts ISO standards for regulating the quality of ICM performance. Whilst PEMSEA has made efforts in formalizing the certification requirements through testing sites and the development of the ICM Code of Practice, the full implementation of this final component of the ICM system will require more time and efforts in terms of technicality, acceptability and resources. However the merit of linking ICM with ISO certainly will strengthen quality control, self confidence and trust in the system.

The ICM system ensures the integration of concerned multidisciplinary science into the process of planning and management to meet its ecological, economic and social objectives. The incorporation of scientific expert panel into the management structure and the coordinating mechanism provides opportunity for scientific interventions in decision makings.

The evolution of ICM from a trial and error approach to a systematic operational system with measurable outputs and outcome has come a long way from more than 4 decades of untiring efforts of coastal managers around the world. The ICM system, despite room for improvements, enables coastal management practitioners to follow a standard of practice that fully put the integrated planning and management concept into viable practices.

On the other hand, the concept and practices have yet to be well understood and popularized amongst local coastal and managers. There are still insufficient buy-in from local governments and stakeholders especially those who are used to the conventional management practices as well as those who are motivated by short-term economic gains.

4. Awareness and involvement of local governments

The implementation of ICM and other coastal management projects in the region has indeed raised greater awareness amongst the stakeholders and local and national officials. ICM builds vision, awareness and commitments (Lowry and Chua, 2008) and enables local governments to a) understand not only the contributions of ecosystem services to human security, economic growth and social well being but also the need to protect the ecosystems which generate the goods and services; b) assume greater environmental responsibility by putting the basic policy and management fundamentals in place that will increase their preparedness and response to disasters, biodiversity conservation, pollution management and food security, amongst others; c) take greater advantage of the decentralization process of central authority to the local governments that are occurring in many countries in the region so as to better control and protect their local coastal resources and economic opportunities.

Both national and local governments in the region are increasingly aware of the impacts of environmental consequences arising from human activities and thus there are stronger political wills and greater management initiatives to address many of the environmental disasters and environmental degradation problems. This is reflected by a greater number of national coastal and ocean policy, strategies and legislation that are in place during the last decades as well as increasing number of coastal management efforts initiated through national and local initiatives. Most local governments of countries in the region (notably China, Cambodia, DP.R Korea, Indonesia, Malaysia, Philippines, Timor Leste, Thailand and Vietnam) were actively involved in implementing coastal management projects, and many with their own financial resources. Several PEMSEA ICM sites such as Xiamen (China) and Danang (Vietnam) are able to sustain high GDP growth of 11-17% over several years without further degradation of their environmental quality. Such achievements strengthen both local and national confidence and investment in ICM in the region.

Nevertheless, the number of local government practicing ICM is still very limited. ICM's coverage in the region is less than 10% of total regional coastline (PEMSEA, 2010). PEMSEA is making effort to extend ICM coverage to at least 20% by 2015 (PEMSEA, 2007). This will require greater investment from the part of the national and local governments but also the need to intensified international efforts especially those from the financial institutions.

5. Participation of stakeholders

The strength of an ICM program lies in its ability to create an informed public and active involvement and participation of the local stakeholders. PEMSEA has some interesting and impressive stories along this line. Many of its ICM programs include a well prepared communication plan to keep the stakeholders informed through regular consultations and consensus buildings. In the Philippines, not only the local communities are involved but also the scientists and the private sectors which form a very important stakeholder's groups that participate in the planning and management of the ICM programs. Corporate responsibility is best reflected in the development and implementation of ICM program in Bataan and Batangas provinces where multinational and national corporations took a strong role not only in financing conservation and livelihood projects but also in the long term strategic planning for the sustainable use of the coastal resources (PEMSEA, 2005).

Creating an informed public helps in deterring ill-prepared government projects that might have serious human and environment health implications. A case in point is the approval for the establishment of the largest Chinese petrochemical plan in the industrial area in Xiamen, a PEMSEA

ICM demonstration site. The petrochemical plant which receives investment from Taiwan is expected to create hundreds of jobs and bring substantial economic returns for Xiamen has been endorsed by the central and provincial government. But the human health implication brought forward by the scientists and the realization of its potential health hazard to the community in Xiamen, has led to a 3-years self-motivated public protest which finally convinced the concerned government authorities at central, provincial and local level to move the proposed petrochemical plant to another less populated area. The long-term ICM investment in building public awareness on environmental issues helps to generate local concerns and actions to protect their own rights.

On the other hand, the local government of Xiamen has also been able to use the power of communication and public awareness to mobilize the strength of an informed public to gain public support in a case of city-wide water shortage in 2009 when laying of underwater pipelines across the Xiamen Straits requires the temporarily shut down of water supply for four days affecting the normal supply of drinking water to the millions of residents. The very effective use of communication tool ensures that the public was well informed of the reasons for such government actions, the benefits to the city and the actions taken by the City government to relief the difficulties encountered by the residents. The City government also mobilized water supply trucks and hundreds of volunteers to assist residents in securing the needed drinking water. This had gained the acknowledgement and praises from every corner of its citizenry.

On another case is the involvement of judiciary of the Philippines on marine pollution in the Manila Bay. In an unprecedented resolution, the supreme court of the Philippines have ruled against the concerned government agencies in a court case between the residents of Manila Bay against the concerned government agencies of the Philippines. Speared headed by 7 environmental lawyers, the concerned government agencies were sued for not making enough efforts to protect the Manila Bay from increasing pollution and the concerned line agencies are ordered to present their actions plans and budgetary commitments to clean the Manila Bay over a specific period of time. Although the court proceeding took more than 10 years from the filing of the case on January 29,1999, the court decision in favor of the residents demonstrates a high degree of recognition of citizen right to protect their natural endowment. The impacts of the Supreme Court decision have led to much higher budgetary commitments on the part of the government. PEMSEA's initiated Operation Plan for the Manila Bay Coastal Strategy becomes the plans of actions to be implemented as ordered (http://sc.judiciary.gov.ph/jurisprudence/2008/december 2008 /171947-48.htm).

Whilst PEMSEA has demonstrated the effectiveness of stakeholder's participation in few ICM demonstration sites, the general lack of stakeholder's participation remains a barrier for ICM scaling up and replications. Only a small sector of stakeholders realizes the benefits and their rights to participate. Corporate participation is rather limited to large companies and those with economic investment in the sites. Smaller corporate organizations adopt the 'wait and see' attitudes. Stakeholder participation is a time consuming process, requiring concerted efforts to cultivate trust amongst stakeholders and mobility of its dynamic for change of attitude and commitments.

6. Coastal and marine policy, strategies and legislation

Perhaps a major achievement of the region is the increasing number of countries enacting coastal and ocean policy, strategies and ICM legislations which largely strengthen the role of ICM and provided the legal foundation for its application throughout the regional coastline. In addition to the legislative initiatives (Tropical Coasts, 2000) and those legislations listed by Chua (2008), the Island Protection Law of China which was approved by the People Assembly in 2009 has come into force in 2010. China also embarks on the development of national ocean policy for sustainable development of its coastal seas and beyond. Stronger legislative controls are being placed in regulating coastal reclamation and integrated pollution control from river basin to the coastal sea. Malaysia is currently developing its coastal/ ocean policy (Mohd.Nizam, 2000).

At the regional level, the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) has provided a holistic governance and management framework for the sustainable use of ecosystem services, provision of livelihoods and protection of the functional integrity of the ecosystems (PEMSEA, 2003). The SDS-SEA has 6 strategies and 217 action plans the implementation of which at a regional scale would contribute immensely to the development of blue economy by several

countries in the region (e.g. RO Korea, China) and protection of the ecosystem health at which the blue economy depends.

The main regional challenge of ICM implementation lies not only in the ability of the region to scale up ICM replication throughout the national coastline, but also the ability to scale up integrated planning and management beyond local and national jurisdiction. The realization on the need to address transboundary issues and the usefulness of the ICM approach has greatly enhanced efforts on the implementation of the SDS-SEA.

7. Individual and institutional capacity development

Until very recently, ICM is hardly incorporated into national and international training and educational programs. Specific knowledge and practices on integrated planning and management are mostly acquired from trial and errors through coastal management initiatives around the world. The evolution of ICM concept and practices has finally provided a better pool of technical and management knowledge and tested practical knowhow.

The implementation of ICM programs provides both individual and institutional development in coastal and ocean governance. ICM promotes adaptive learning and therefore enriches individual and organizational learnings. A key characteristic of ICM is the multidisciplinary and multisector approach in planning and management. It is the adaptive learning that gradually transforms the acquired technical and management knowhow into a new set of knowledge and standards of practices.

Compare with many parts of the world, the East Asian Seas region has definitely made good progress in generating rich knowledge and experience in ICM and the much needed individual expertise and institutions to undertake ICM programs in the region. The near 17 years of PEMSEA's efforts and those of other donor and national initiatives have made the East Asian Sea region a center for ICM practices. There is no region in the world other than this region that has set clear regional target (20% by 2015) for ICM implementation. The implementation of each ICM program shall spawn several local expertise and institutions familiar with the concept and practices of ICM. Although this is a slow way of generating individual expertise, it is so far the best way to generate coastal management expertise built on practical experience and exposure to various types of management issues.

PEMSEA has undertaken institutional development through the establishment of a Networks of ICM Learning Centers. These centers are universities who are closed to the areas of ICM practices and willing to develop ICM as one of their areas of excellence. The university professors and staff involved are not only given special short-term training by PEMSEA on the concept and practices of ICM but also involved in specific ICM projects that will provide them the practical orientation. This innovative approach allows the gradual development of management expertise of the concern academia by exposing them to the reality on the ground. An advantage of this approach is the opportunity to allow the propagation of ICM knowledge which is mostly written and delivered in the English language, through the respective native languages of the region.

Through the network of learning centers, PEMSEA hopes to transfer general and specific ICM knowledge and skills to the countries of the region more effectively. The challenge however, is the time required in skill building and the needed incentives to attract the involvement of university academia.

An ICM practitioner should process the needed competencies in terms of knowledge and skills in order to effectively implement an ICM program throughout its planning and implementation cycles. Current Marine Affairs training and education programs around the world are not adequate to prepare their graduates to effectively and confidently implement an ICM program on the ground. A coastal manager should possess good knowledge and skills in a) understanding, assessing and monitoring ecosystems and their functions as well as their interrelationship with mankind; b) integrated planning, development and management of ICM programs; c) mediating, facilitating, negotiating and adapting changes that add value to resolution of coastal management issues; d) application and mobilization of available planning, monitoring, assessing and management tools; e) application of the ICM dynamics or driving forces; and g) application of the ICM system and code of practices.

The above competences need special training. While URI has already developed courses along the same thought (Olsen et al., 2010), PEMSEA is still in the process of developing a postgraduate course that provides the certification for ICM professionals.

8. Environmental and Coastal Investment

ICM can provide a broad and useful institutional framework for environmental investment as its strategic plan of actions has identified investment opportunities for environmental improvements such as sewage and pollutant reduction facilities, water supply and treatment facilities, coastal erosion protection facilities, oil and chemical spill response system, facilities that strengthened preparedness and response to natural disasters and other green technologies.

Local governments generally do not have the financial resources to fund large scale infrastructure nor the authority to borrow from multilateral financial institutions without the blessing from the central government. On the other hand, experience of many countries have shown that large number of environmental improvement projects installed by central government or multilateral financial institutions might not be implementable at the local level due to capacity and maintenance capability.

The ICM approach, on the other hand could help central government and the multilateral financial institutions to identify environmental improvement projects that require national or international loans and financial assistance. In all ICM strategic action plans, such requirements are identified and prioritized including their justification. PEMSEA thus play a facilitating role between the public sector (central, local governments) and the potential investors either from the private sector or the multilateral financing institutions, a public –private sector partnerships that builds on the process of planning and management (Tropical Coasts, 2010b).

Although PEMSEA has made some good progress in promoting environmental improvement investments (Tropical Coasts, 2010), its PPP program have yet to be considered successful. Whilst environment investment opportunities have been identified in most ICM plans of actions, PEMSEA loses its intermediary role as the investors from the private sector or the financial institution negotiate directly with the local or national partners either because of political or financial consideration.

9. Political Interest and Support

The objective of ICM and its interactive process are well within the political interest of most politicians from different political systems. Sustainable development, biodiversity conservation, pollution prevention and control, water supply and use, livelihood generation, and disaster prevention and response are activities that any educated politician would like to advocate for. Therefore it is usually not difficult to attract general political interests in support of the ICM endeavors especially those politicians from the local levels.

Political support for ICM is critical as it relates to garnishing budgetary allocation and mobilizing community, donors and private sector supports to the Program in addition to facilitating coastal policy development at national or provincial levels. The challenge is how to maintain continuous political interest and yet able to avoid unnecessary political interference during program implementation.

PEMSEA has good experience in mobilizing political support in almost all local ICM sites despite the change of ruling parties as well as local and national leadership. Securing stakeholder's support and involvement especially those from the private sector could encourage greater buy-in from local politicians. At national level, members of the legislature also participated in coastal and ocean conferences such as those organized by PEMSEA during the triennial East Asian Sea Congress or by the Global Ocean conferences organized by the Global Ocean Forum.

10. Mainstreaming into local economic agenda

ICM sustainability can be achieved by mainstreaming ICM program into the local government's economic development agenda. ICM is a cyclical process, each adding values to the previous efforts, thereby continuously improving the dynamics of ICM operation and increasing ICM impacts.

Many past ICM or other coastal management initiatives failed to continue beyond the project phase largely because of project design failure resulting in the lack of project ownership, inadequate local capacity and the lack of a longer term approach. PEMSEA adopted a different approach in setting up ICM program. Financial support to local governments in developing and implementing ICM program is limited to 3 - 5 years on a cost-sharing basis. In many cases, local government was requested to cover the total cost of the project either from its own budget or through financial contributions from the private sector. A large part of PEMSEA's financial contribution was used in capacity building to ensure local capability to continue the ICM Program. Ensuring government and stakeholder's buy-in is a very important step towards mainstreaming ICM into the local economic agenda.

Despite some successes, mainstreaming ICM remains a difficult task. Firstly, ICM has no home-based in the traditional government structure. The implementing mechanism is often not a part of the line agency and therefore does not have independent budget line once the ICM project was completed. Secondly, the ICM implementing body is often viewed by other line agencies as competing for resources and responsibility and as such ICM is always viewed as a temporary measure. Thirdly, most government line agencies were and still are depending on donor support in undertaking new project initiatives such as ICM which do not fall within their traditional functions. Unless the local government and the stakeholders fully understand the principles and objectives of ICM, mainstreaming remains a major challenge to overcome.

11. Reporting progress

ICM requires a longer timeframe (at least 3-5 years) to yield some visible results and much longer to attain its sustainable development goals. As such it does not attract great interest amongst local government leaders or political supporters who are more interested in projects that yield results in a shorter time frame. This is one of the reasons why most past ICM projects were largely donor driven.

PEMSEA has made significant efforts to develop a reporting format known as "State of the Coast Reporting" (SOC) that measures progress and impacts using a range of more than 30 indicators largely linked with those of Agenda 21, MDG, WSSD and related international conventions as well as those set by the Global Environmental Facilities and other relevant indicators (IOC, 2006). The SOC ensures a comprehensive coverage of coastal and ocean governance issues. Local government adopting the SOC is not required to report on the outcomes if they are not yet available but their actions in achieving those outcomes.

The SOC is unique in that it aims at reporting local initiatives. It is developed through a long process of interagency and stakeholder's consultation on their own performance against a set of agreed indicators. The SOC is considered as a living document that improves with time. It is prepared at least triennially to track changes. As such SOC is very different from the conventional State of the Environment Report which provides much more general analysis of the trend rather than on the process.

Although several SOC reports have been developed and published (Provincial Government of Batangas Province and PEMSEA 2008, PEMSEA http://www.pemsea.org), there are still several challenges that need to be overcome. First, the added value of the SOC has yet to be fully realized. Second, the use of SOC report as a monitoring tool has yet to be fully understood and used by all stakeholders. Third, SOC reporting is a relatively new endeavor and it will require time and efforts to promote its wider application.

Conclusion

The East Asian Seas Region has played a significant role in developing, testing, replicating and scaling up of ICM practices throughout the countries bordering the Seas of East Asia. This was made possible initially through the efforts of the Global Environmental Facilities which supports PEMSEA through its implementing and executing agencies (UNDP, IMO and UNOPS) for strengthening sustainable management of the coastal areas. The concept and practices of ICM is widely accepted by countries of the region and also have been strongly endorsed by UN and international agencies, conventions and regional agreements.

Over the last two decades, ICM has evolved from a “trial and error” management practices to an integrated management system built on tested frameworks, approaches, processes and mechanisms. ICM practices can now be codified following a standard ICM code of practices. This development enables the countries in the region to set an ambitious ICM expansion target to cover at least 20% of the regional coastline with supporting national coastal and ocean policies, strategies, ICM legislations and administrative directives.

The usefulness of ICM in building the basic policy and management fundamentals that make the local authorities more prepared in responding to disasters, environmental degradation, resource overexploitation, water shortage and other human induced environmental impacts, is being increasingly appreciated by local and national governments. As such the implementation of ICM is in their own interest. ICM has proven to be an effective integrated planning and management system that will contribute to the management of ecosystem services from watersheds, river-basins to the coastal seas. It can be an effective management tool for addressing many of the near shores issues of the Large Marine Ecosystem. In fact, ICM has proven to be an indispensable tool for achieving the goals of Ecosystem-Based Management (EBM).

Local capacity has become the biggest challenge to the implementation and scaling up of ICM practices. Traditional educational programs which are largely discipline based is unable to provide the needed expertise possessed by a truly ICM coastal manager. Current postgraduate programs on Marine Affairs or Ocean Governance though provide cross disciplinary training, are still not adequate to meet the required basic competence of an ICM coastal manager. As such there is pressing need to develop a new set of postgraduate curriculum that will provide the needed competencies. This is a new challenge ahead indeed.

References

- CCICED (China Council for International Cooperation in Environment and Development). 2010. Ecosystem issues and policy options addressing sustainable development of China’s ocean and coasts. CCICED task force report. 203 p.

- Cicin-Sain, B. and R.W.Knecht.1998. Integrated coastal and ocean management: Concept and practices. Island Press, Washington D.C. 517 pp.

- Clark, J.R. 1992 Integrated management of coastal zones. FAO. Technical Paper No. 327. FAO. Rome, Italy

- Clark, J.R. 1996. Coastal zone management handbook. CRC. Press, Inc., Boca Raton, Florida, USA. 694.

- Chua T.-E. and L.F. Scura (eds), 1992. Integrative framework and methods for coastal area management. International Center for Aquatic Resource Management. Conference Proceedings No. 37. ICLARM, Manila, Philippines. 169 pp.

- Chua, T.-E. 2004. Integrated coastal management in transformation. Tropical Coasts, 11: 4-11.

- Chua T.-E. 2006. The dynamics of integrated coastal management: Practical application in the sustainable coastal development in East Asia. GEF/UNDP/IMO Regional Programme for Building Partnerships for the Seas of East Asia (PEMSEA), Quezon City, Philippines 468pp

- Chua T.-E. 2008, Coastal governance: A reflection of integrated coastal management (ICM) initiatives with special reference to the East Asian Seas Region. P371-402. In: Securing the oceans: Essays on ocean governance---global and regional perspectives. Chua T.-E., G. Kullenberg and D. Bonga (ends). Global Environmental Facility /United Nations Development Program/International Maritime Organization Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and the Nippon Foundation, Quezon City, Philippines 770 pp.

- Chung, S. 2010. Strengthening regional governance to protect the marine environment in Northeast Asia: From a fragmented to an integrated approach. Marine Policy 34:549-556.

- Christie, P. 2005. Is integrated coastal management sustainable?. Ocean and Coastal Management 48: 208-232.

- Dahuri, R., and I.M. Dutton, 2000. Integrated coastal and marine management enters a new era in Indonesia. Integrated Coastal Zone Management 1:11-16.

- Duda, A.M. 2002. Monitoring and evaluation indicators for GEF International Waters Projects. Monitoring and Evaluation Working Paper 10. Global Environmental Facility, Washington DC.

- Ehler, C and F. Douvere. 2009. Marine special planning: A step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man the Biosphere Programme. IOC Manual and Guides No. 53. ICAM Dossier No. 6. UNESCO.

- IOC (Intergovernmental Oceanographic Commission). 2006. A handbook for measuring the progress and outcomes of the integrated coastal and ocean management. IOC Manual and Guides No. 46/ICSM Dossier No. 2. UNESCO, Paris.

- Kullenberg, G. 2008. The coasts and beyond: Multiple use, conflicts and management challenges. P131-154. In: Securing the oceans: Essays on ocean governance---global and regional perspectives. Chua T.-E., G. Kullenberg and D. Bonga (eds). Securing the Ocean—Essays on ocean governance-global and regional perspectives. Global Environmental Facility /United Nations Development Program/International Maritime Organization Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and the Nippon Foundation, Quezon City, Philippines. 770 pp.

- Lowry, K and Chua T.-E. 2008. Building vision, awareness and commitment: The PEMSEA strategy for strengthening regional cooperation in coastal and ocean governance. P 343-369. In: Securing the oceans: Essays on ocean governance---global and regional perspectives. Chua T.-E., G. Kullenberg and D. Bonga (eds). Global Environmental Facility /United Nations Development Program/International Maritime Organization Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and the Nippon Foundation, Quezon City, Philippines. 770 pp.

- McFadden, Loraine. 2007. Governing coastal spaces: The case of disappointing science in integrated coastal zone management. Coastal Management, 35:4,429-443.

- Manila Declaration 2009: Manila Declaration on strengthening the implementation of integrated coastal management for sustainable development and climate change adaption in the seas of East Asia. The Third Ministerial Forum East Asian Seas Congress 2009, Manila Philippine, 26 November, 2009

- Mohd. Niazan bin Basiron. 2000. The development of a coastal zone management policy for Malaysia. Tropical Coasts 7(2): 45-51.

- Olsen, S. B. 2003. Crafting coastal governance in a changing world. Coastal Management Report No 2241. Coastal Resource Management Program, US Agency for International Development, University of Rhode Island Coastal Resources Center.

- Olsen, S.B., Pamela Rubinoff, Emilio Ochoa, Stella Maris Vallejo. 2010. A certificate program in the governance of coastal ecosystems. Coastal Management, 38:3, 262-271.

- Provincial Government of Batangas Province and PEMSEA. 2008. State of the Coasts of Batangas Province. Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 119 p.

- PEMSEA. 2003. Sustainable development strategy for the seas of East Asia. GEF/UNDP/IMO Regional Programme on Building Partnerships for the Seas of East Asia, Quezon City, Philippines.

- PEMSEA. 2005. Sustaining benefits. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 36 p

- PEMSEA. 2006. Xiamen: An ICM journey. PEMSEA Technical Report No. 18. GEF/UNDP/IMO Regional Programme on Building Partnerships for the Seas of East Asia, Quezon City, Philippines. 93 p.

- PEMSEA. 2007. PEMSEA (Partnerships in Environmental Management for the Seas of East Asia): A regional mechanism facilitating sustainable environmental benefits in river basins, coasts and seas. PEMSEA IEC Material 2 GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 80 p

- PEMSEA. 2010. Top ten PEMSEA achievements (2008-2010). PEMSEA information leaflet. Quezon City, Philippines.

- Sorenson, J. 2002. Baseline 2000 background report. The status of integrated coastal management as an international practice. Second Iteration—26 August 2002. Accessed at http://www.uhi.umb.edu/b2k .

- Sherman, K, L.M. Alexander, and B.D. Gold. 1993, Large Marine Ecosystems: Stress, mitigation, and sustainability. AAAS Press, Washington D.C. USA. 376 pp.

- Sherman, K and A.M. Duda. 1999. Large Marine Ecosystems: an emerging paradigm for fishery sustainability. Fisheries, (24)15-26.

- Terttu Melvasalo. 2008. Perspectives and experience of the UNEP Regional Seas Programme. In: Securing the oceans: Essays on ocean governance---global and regional perspectives. p229-250. In Chua T.-E., G. Kullenberg and D. Bonga (eds). Securing the Ocean—Essays on ocean governance-global and regional perspectives. Global Environmental Facility /United Nations Development Program/International Maritime Organization Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and the Nippon Foundation, Quezon City, Philippines. 770 pp.

- Tropical Coasts, 2000. Coastal and marine policy making in East Asia. Tropical Coasts, 7(2): 78 p.

- Tropical Coasts. 2010a. The nexus of water, energy, food an environment: Creating a ripple effect. Tropical Coasts: 16(2) 46-59.

- Tropical Coasts. 2010b. Finding opportunities for public-private sector partnerships in the Manila Bay area. Corporate social responsibility (CSR) Forum for Manila Bay Rehabilitation. Tropical Coasts: 16 (2) p112-115.

PARALLEL SESSION – THEME 1

OCEANS AND CLIMATE CHANGE

Saturday, September 4th, 2010
08.30 – 12.30 hrs
Beijing Raffles Hotel
Beijing, People's Republic of China

CO-CHAIR: Ms. Robbin Peach, Executive Director, Collaborative Institute for Oceans, Climate and Security, the Venture Development Center, U.S.A

CO-CHAIR: Prof. Mao Bin, Department of International Cooperation, State Oceanic Administration, China

RAPPORTEUR: Mr. Michael Butler, Director of IOI Canada

Network of Marine Protected Areas to Mitigate Climate Change Impact on the Oceans

Mr. Ronald Menzel
Founding Member and Director of the Antinea Foundation, Switzerland

ABSTRACT

Climate change heavily affects the Oceans

Climate change is certainly one of the biggest issues humanity is facing. We are now aware that we need to drastically reduce our emissions of greenhouse gases if we want to avoid future dangerous shifts in the planets climate. However what is less known to the public and to the decision makers is the critical role the oceans play in our climate system and how they are, at the same time, impacted by climate change.

The oceans act as natural carbon sinks, absorbing alongside forests and other ecosystems, vast amounts of carbon dioxide. In recent history, marine ecosystems had to absorb even larger amounts of CO2 due to changes in atmospheric composition. They are therefore undergoing substantial changes including warming water, sea level rise, altered weather patterns, and ocean acidification.

Healthy ecosystems better cope with environmental changes

A global map of the cumulative impact of human activity on the oceans, including climate change, published in Science, February 15, 2008 showed that little if any of the oceans can be considered pristine anymore. Pristine areas tend to support more complex food webs with greater biodiversity and biomass compared to degraded areas. This complexity and diversity creates resilience to the many ways humans stress and exploit marine ecosystems. Degraded marine ecosystems on the other hand have a compromised capacity to provide the ecological services we depend on, and thus have reduced resilience to climate change in the ocean. If we want the oceans to continue to provide the services on which we depend, we need to improve their protection.

The Antinea Foundation has launched an oceanic expedition campaigning for a better network of Marine Protected Areas (MPAs) to preserve our oceans for future generations. “The Changing Oceans Expedition” tries to demonstrate that MPAs are effective and practical solutions which can help to maintain and restore ecological resilience and the capacity to provide ecological goods and services. The scientific work done on board heralds the second phase in the development of the global map of the cumulative impact of human activity on the oceans and will allow a better understanding of the early warning signs of critical ecological decline. This will hopefully allow us to flag sites for urgent action to halt further decline and help restore them thanks to appropriate management. By increasing the ecosystem resilience and reducing the human stress factors on the marine ecosystems we should be able to improve the capacity of ecosystems to resist and recover from the impacts of climate change in the ocean.

The Improvement of Ocean Circulation Models and Climate Models through Surface Waves: From Mean State to Long-Term Variations

Dr. Qiao Fangli
Deputy Director-General, the First Institute of Oceanography (FIO), SOA, China

ABSTRACT

Incorrect parameterizations of the ocean mixing processes essentially render the atmospheric and oceanic dynamics to be either decoupled or coupled incorrectly. Because the ocean covers three quarters of the global surface, it is essential that we correctly model the ocean mixed layer (ML) so that we can better simulate and predict the climate. However, the simulated mixed layer depth is always too shallow for nearly all ocean circulation models, especially for the summer season. In most ocean dynamics studies, wave motions have always been treated separately from the ocean circulation. To overcome this shortcoming, we have established a new scheme of non-breaking wave-induced vertical mixing (Bv) that will correct the systematic error of insufficient mixing. We have already observed this kind of non-breaking surface wave-induced vertical mixing in laboratory experiments. The new scheme of Bv has enabled the mixing layer to deepen, resulting in a much better agreement with observed climatologic data. Different OGCMs, such as POM, ROMS, MOM4, POP and HIM, show similar improvements in the global ocean. Then we examine the effects of Bv on climate models, CCSM3 and FGCM0. Both climate models show dramatic improvements from mean state to long-term variations. For example, the tropical biases which, in fact, are a common problem for all climate models without flux correction, are much improved.

Earth Observation and the Oceans - A New Age of Discovery?

Mr. Dirk Werle
Partner/Geoscientist, AERDE Environmental Research, Canada

ABSTRACT

The Oceans have been discovered many times over, if seen through the prism of surveying and mapping techniques and knowledge of the day. Using well-honed, now almost vanished navigational skills, ancient Polynesian sailors settled the island world of the Pacific Ocean. Some 600 years ago, ocean voyages by Chinese and by European seafarers were guided by capable practitioners like Admiral Zheng He (郑和) and well prepared by progenitors like Portugal's Prince Henrique the Navigator, broadening their horizons and extending respective spheres in influence. As this talk will argue, modern Earth observation technologies, as pioneered in 1978 by the American SEASAT satellite and by the Coastal Zone Colour Scanner (CZCS) instrument, are likely the tools of this day and age to make ocean discoveries of a different kind and survey vast areas in a more or less continuous fashion from orbital altitudes. The experience over the past three decades with active and passive microwave, infrared and visible remote sensing satellite data collections has led to the deployment of the diverse fleet of satellites and sensor systems available today. Examples include the American TERRA & AQUA, the European ENVISAT, GOCE and SMOS, the US-France JASON, the Canadian RADARSAT, the Japanese GCOM satellite missions, and an impressive addition of Indian and Chinese sensors. They will serve to illustrate applications in sea floor mapping; monitoring sea surface temperatures and ocean productivity on a global basis; wide-area as well as near-shore wind and wave field analyses; global tidal and current dynamics, as well as sea ice monitoring. The satellite sensor systems and their data streams are being utilized in a variety of settings from scientific research to operational monitoring of marine environments and resource analysis. Yet, one of the main challenges is to measure parameters of the ocean – atmosphere interface in order to better assess impact on global environmental change. During the recent International Polar Year (IPY 2007-2008) the coordinated deployment of imaging radar capabilities resulted in an unprecedented collection of satellite data of rapidly changing polar ocean environments. The importance of satellite observations and measurements is growing; there is a good sense of cooperation and coordination among scientists. There are similar efforts needed at the institutional level among space agencies to meet global observation objectives in the long term. Hopefully national governments and international institutions will appreciate the need for continued and improved monitoring of the global marine environment to address global environmental change. Looking beyond borders modern Earth observation has helped to attain important monitoring, surveillance and compliance goals, both experimentally as well as in "real world" settings. New discovery and practical achievements at regional and global scales are well within reach; they can help us to guide and develop policies that improve ocean governance, sustainable development and marine security.

PRESENTATION

Abstract. *Earth observation satellites are important tools of our day and age for making important ocean discoveries and for contributing crucial information for ocean policy. They are contributing comprehensive and timely geospatial data for climate change studies. Examples include observation of sea ice, sea level, sea surface temperature, ocean colour, and sea state. Data continuity and coordination of Earth observation activities are essential not only for making new discoveries, but also for bridging the gap between research and widespread use of ocean satellite data and information.*

(Transcript of presentation at *Pacem in Maribus XXXIII*, on Sept. 4, 2010)

Our Eyes in the Sky

For a geoscientist the analysis of satellite imagery for environmental monitoring presents quite literally a wide field. Earth observation technology has helped to survey remote and inaccessible parts of the globe's surface and provides into useful geospatial information for decision makers and the people. In

fact, the capabilities of the radar and optical instruments to “see” or “sense” coastal and marine environments have helped us to extend our human vision. Perhaps they also offer another facet to Arvid Pardo’s “Ocean Space” envisaged some 40 years ago.

Consider the almost iconic “Haxby Map” (*Figure 1*). Following pioneering but all too brief American SEASAT satellite mission in 1978, a young scientist, William Haxby, experimented with the data profiles of the new radar altimeter instrument that had recorded with *centimeter* precision small variations in ocean *surface* topography. Surprisingly, the map that emerged appeared to show the topographic shapes and patterns of the *entire ocean floor*, matching and in cases exceeding existing sea floor maps. in terms of detail and consistency. In actual fact, the map shows something different than bathymetry; it shows variations in the gravity field shaping ocean surface elevation. The deployments of more sensitive and longer-lasting satellite radar altimeter instruments have since lead to other discoveries.

Surely, the oceans and distant shores have been discovered many times over when seen through the prism of surveying and mapping techniques and with the knowledge of the day (*Figure 2*). Some 600 years ago, expeditions by the Chinese Admiral Zheng He (郑和) and by Portugal’s Henry the Navigator broadened the horizon. As it turned out, the knowledge gained from seafaring voyagers began to shape public perception of the globe and eventually gave rise to a revolutionary planetary consciousness.

Satellite-based sensors are among the tools of this day and age to make ocean discoveries of a different kind from orbital altitudes (*Figure 3*). Perhaps it is not unjustified to display some examples of Earth observation satellites and in-situ measurement tools against the backdrop of another iconic image, ‘Earth Rise’, taken by the Apollo-8 astronauts in 1968. Modern space-faring as well as in-situ sensor systems come in all sizes.

Focus on Important Marine and Environmental Measurements

Being the most formidable public policy challenge of our time, climate change and its assessment must have a peerless research and observation infrastructure to match. Technological development has placed marvelous things at our disposal, but we need to make sure that publicly funded satellite remote sensing systems and other important tools are utilized in effective and beneficent ways to shape mitigation and adaptation strategies and address ocean and human security needs. It is also important that the benefits of Earth observation should accrue to all members of the international community and the public at-large to improve our marine-environmental stewardship. The experience over the past three decades has led to the deployment of the formidable and diverse fleet of satellites and sensor systems available today. Series of American, European, Canadian, Japanese satellite missions have recently been complemented by an impressive array of Indian and Chinese satellites and instruments.

At an international level, the Global Climate Observation System Steering Committee detailed 28 essential climate variables in the 2006 report of the WMO and IOC; six specifically refer to the ocean domain.

Sea-ice is a key indicator of climate variability and change. Parameters such as ice extent and concentration play a major role. Earth observation satellites have collected a tremendous amount of detailed as well as synoptic sea ice data during the recent International Polar Year (*Figure 4*). The image maps of Arctic and Antarctic regions provided a synoptic view of annual changes in ice cover. Repeated data acquisition over key areas witnessed the seasonal, and in some cases cataclysmic, disintegration of large ice sheets Satellite imagery of ice infested waters have already been an indispensable tool of operational ice forecasting services to support ship routing, offshore oil & gas operations, and search & rescue missions (*Figure 5*).

I have already hinted at the importance of *Sea Level,* and it is fair to state that satellite altimetry, supplemented with *in situ* tide data, has revolutionized both measurement and view of global sea-level variability. It is bound to affect all low-lying coastal regions and many small-island states, like the Maldives. Since 1992, a series of satellite altimeters have measured global sea levels (*Figure 6*). The results indicate an annual rise of 3 millimeters, continuing the upward trend indicated by tide gauge recordings since the late 1800s. The prospect is not encouraging at all. Almost two decades of

satellite measurements also indicate that there appear to be *regional* variations as well (*Figure 7*). Some regions experience as much as 10 to 20 millimeter in sea level rise on average, whereas others seem to be unaffected.

Like air temperature over land, *sea-surface temperature* (SST) is a fundamental indicator of the state of the climate system (*Figure 8*). Sea surface temperature is also critical for weather forecasting under specific conditions. The animated time series of satellite pictures taken over just a few days prior and during the formation of Hurricane 'Katrina' in 2005 shows the great value for actual forecast and warning and the power of animated imagery for visualizing environmental processes. In a similar vein, yet from a synoptic, hemispheric perspective, sequences of SST satellite data collected over a period of 18 month show the pulsating seasonal changes in warmer and colder surface water temperatures (*Figure 9*). For the specialist, of course, the devil is in the detail: "What about anomalies?" Clever computing and visualization can reveal spatially and temporally significant anomalies (*Figure 10*), where blue indicates relatively cooler, red relatively warmer temperatures. Overall, concerted efforts are needed to sustain the quality of the satellite-era SST data record.

Ocean colour is another essential parameter. It allows us to assess chlorophyll-a concentration, and thus biological production in the oceans. Measurements are critical for natural living-resource management, monitoring of the health of coastal seas, and global carbon cycling. Satellite ocean colour has been studied in spits and spurts for three decades, using different sensors, including the aging *SeaWiFS* (*Figure 11*). The authors of 'Oceanography from Space' (2010) recently reported that continuity is an issue. Ocean colour measurement from space can now distinguish a wide range of targets, such as plankton blooms and sea grass vegetation at spatial resolutions as good as a few hundred meters. On a global scale level *changes* in *SeaWiFS*-derived chlorophyll concentration over an entire *decade* have also been computed (*Figure 12*). This map shows relatively lower biomass production in oligotrophic gyres in blue; and relatively higher biomass in red. How significant are these trends? It is difficult to answer the question with a degree of certainty. Longer time series are needed to affirm observations and impacts.

Sea-State governs air-sea fluxes of momentum, and it concerns safety at sea and coastal impact during extreme events. But despite its significance, there is presently no coordinated and sustained effort to deliver global, high-quality sea-state information for climate. However, let me just give you one brief example of how experimental satellite remote sensing tools, so called radar scatterometers, have been used to obtain data on global wind fields (*Figure 13*). During the joint US - Japanese ADEOS satellite mission, the *SeaWinds* instrument has demonstrated remarkable capability to detect, even in the presence of clouds, wind forces at the ocean surface. This sample map product shows just one day's worth of data acquisition. Take note of the high winds in the North Atlantic region and strings of high wind systems in southern latitudes; moderate wind speeds are coded in green; low wind areas in blue.

Outlook and Challenges

The intent here is not to indulge in colourful maps and satellite imagery of the oceans, but to convey a sense that the modern fleet of space-faring satellites and their sensors are highly capable, indeed indispensable, tools for assessing, visualizing and communicating environmental change. Mariners, chief among them Ferdinand Magellan, needed ships to first explore and circumnavigate the globe (*Figure 14*).

In our time, we need to rely on orbiting Earth observation satellites to map the changing ocean environment and climate.

Operational Earth observation satellites involve many drivers. Figure 15 provides examples of anticipated national and international Earth observation satellite deployments for the 2005 - 2015 period. The missions listed on the horizontal lines are numerous; their sequence is fairly continuous; and the number of agencies involved in their launch or operation is also significant. But does all this assure continuity? Does this bode well overall for our space-based observation capacity of climate change and the oceans?

Data continuity is not necessarily assured, even for important measurements of ocean colour or sea surface temperature. There are efforts needed at the institutional level to safeguard global observation objectives and the validity of the data records over the long term. National governments and international institutions, including space agencies, must appreciate the need for *continued* and *improved* monitoring of the global marine environment to address global environmental change.

Coordination is a challenging task. It involves more than 20 national and international space agencies and an almost equal number of stakeholders under the guidance of the Committee of Earth Observation Satellites. Presently, the *user community* for coastal ocean satellite observations is *very small*. Compare that to the broad user community of offerings like "Google Earth", or visualization effects on the TV weather channel showing satellite imagery by the hour.

Can we expand similar efforts on a *similar* scale to include many of the global scale information products that I have shown here for more detailed *regional* use on a regular basis and in informative ways? The transition from "*science domain*" to "*operational usage*" to a broad-based component of public "*geospatial marine data and information infrastructure*" is not an easy one. Some of these "applications" are still at the experimental stage; others have successfully been integrated into day-to-day "real world" operations, measuring and visualizing the pulse of the world's oceans. There are important international initiatives underway, including, among others, the Global Ocean Observation System, GOOS, the Group of Earth Observation (GEO), the Ocean Colour Working Group, or the Pan Ocean Remote Sensing Conference.

Another discovery. Last year, the GOOS *Summary of the Global Ocean Observing System for Policy Makers* contained the disquieting statement that investments in the ocean observing system over the past decade have stagnated at a level of about 1 billion US dollars per year; disquieting, because the far-reaching policies and decisions that climate change adaptation requires ought to be based on well-funded, sound scientific work and rely on first-rate observation capacity. But that's not all. We also need to galvanize our energies.

During the recent, and forth, International Polar Year, cooperation among a multitude of scientific projects and programs and coordination of logistical efforts over vast polar regions brought rich scientific as well as political rewards. On account of the IPY summary reports in 2010, IPY was a successful undertaking, yielding dividends of crucial environmental knowledge. Earth observation satellite technology played a crucial role, and the data analysis is contributing very valuable insights into polar environments. Should we - can we – in the coming years embark on a similar venture, coalesce technical capabilities, scientific, administrative skill, financial resources and public forces, and mount an IPY equivalent of an 'International *Ocean* Year'? A constructive dialogue needs to continue among scientists, leading decision makers and the community at large in order to advocate, build and secure a *geospatial commons of the oceans*.

References cited:

Barale, V. Gower, J.R.F. and Alberotanza, L. (eds.) (2010) Oceanography from space, 361 p., Springer.

GOOS (2009) The Global Ocean Observing System – A summary for policy makers. 12 p., IOC/UNESCO.

IPY Joint Committee (2010) IPY summary report. ICSU (International Council for Science), the WMO (World Meteorological Organization), SCAR (Scientific Committee on Antarctic Research) and IASC (International Arctic Science Committee).

WMO and IOC (2006) Systematic observation requirements for satellite-based products for climate - Supplemental details to the satellite-based component of the "Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC". 90 p. GCOS-107, WMO/TD No. 1338.

* * *

Figure 1:
The "Haxby Map" of the oceans, based on global SEASAT altimeter measurements, 1978.
Credit: William F. Haxby, NOAA Report MGG-3, 1985.

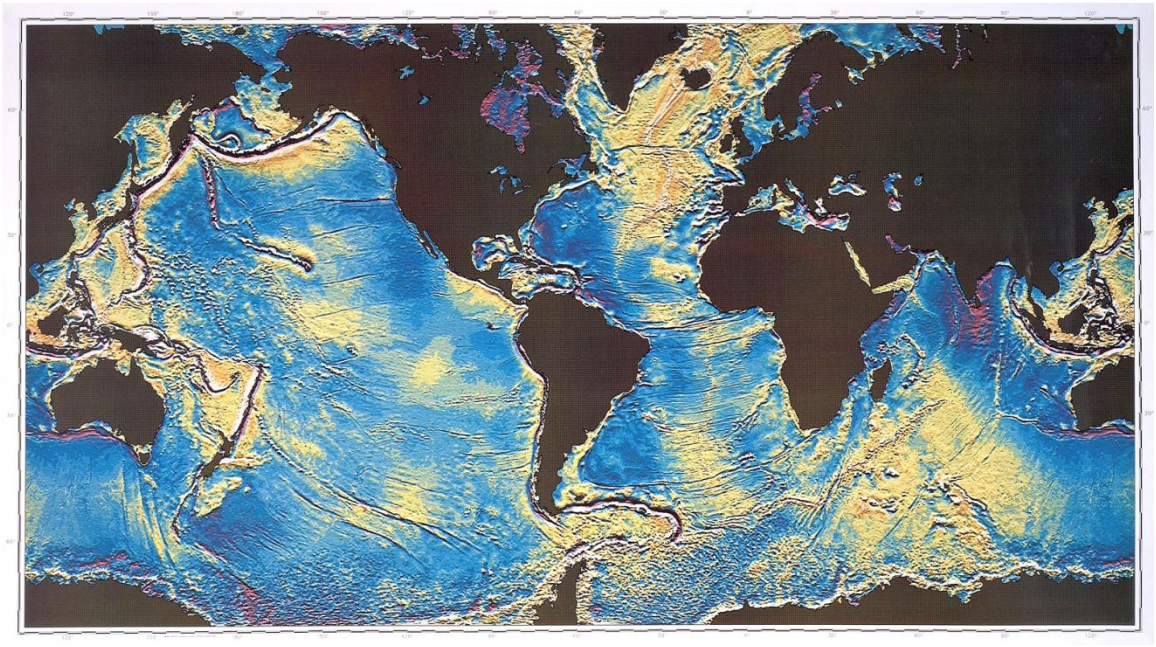


Figure 2:
The shape of public perception of the global sphere, as expressed in 15th century mapping efforts in the West and in the East: (a) Martin Waldseemüller's map, published in 1507, based in part on reports from European ocean voyages during the 1400s, and (b) Zheng He's sailing map, published in 1608, based on Chinese ocean voyages during the early 1400s.

A

B

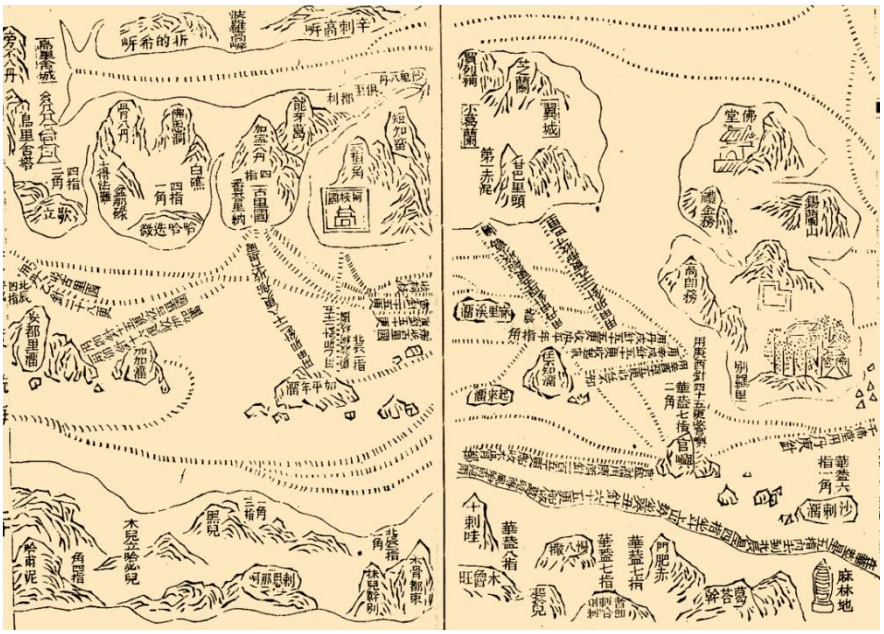


Figure 3:
Expanding public perception of global and planetary spheres: Earth observation satellites and in-situ measurements a tool for modern scientific discovery.

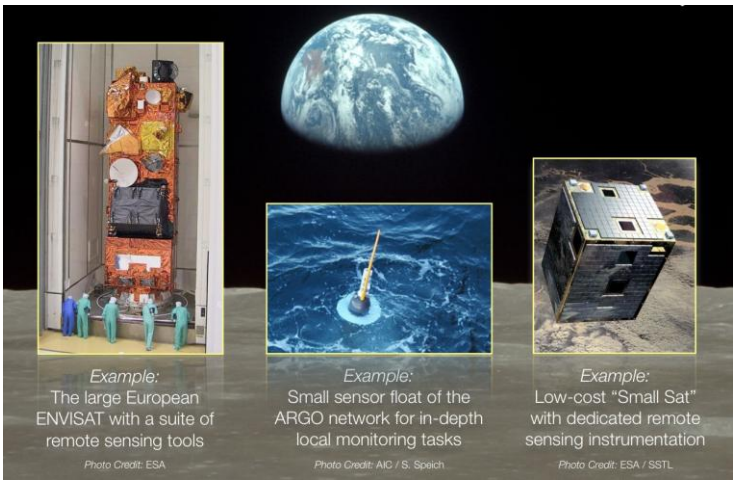


Figure 4:
Seasonal arctic sea ice movement through Nares Strait, captured by a sequence of satellite radar imagery in May, August and October, 2008. Source: Envisat ASAR Imagery, European Space Agency (ESA).

Figure 5:
Example of an operational sea ice chart of the Labrador Sea and Newfoundland water, Canada, based on regular expert and computer-assisted analysis of RADARSAT imagery. Source: Environment Canada, Ice Service.

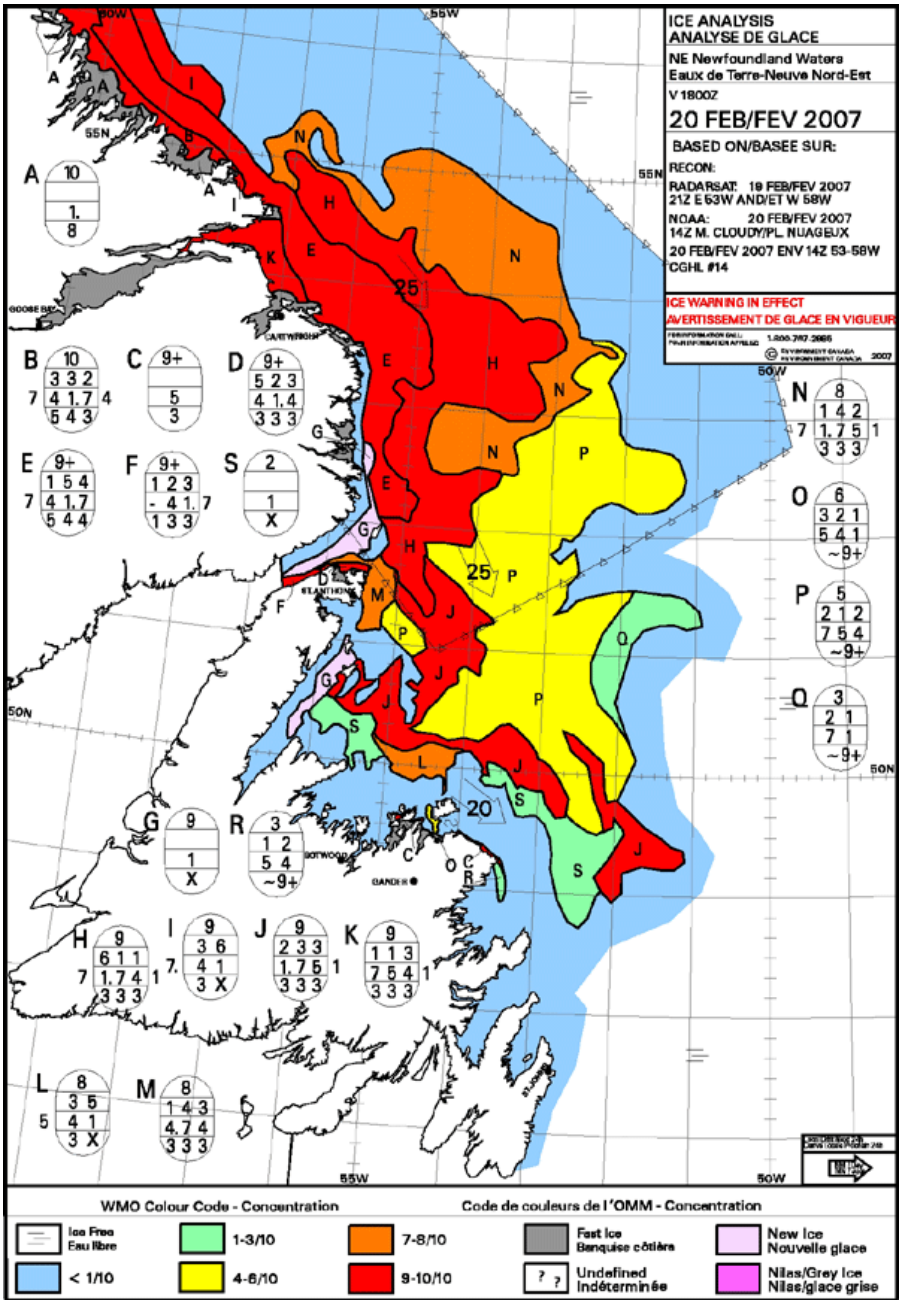


Figure 6:
Continuous measurements of six satellite altimeters: Global mean sea level rise, measured in mm, since 1992. Source: Stan Wilson, NOAA, 2009.

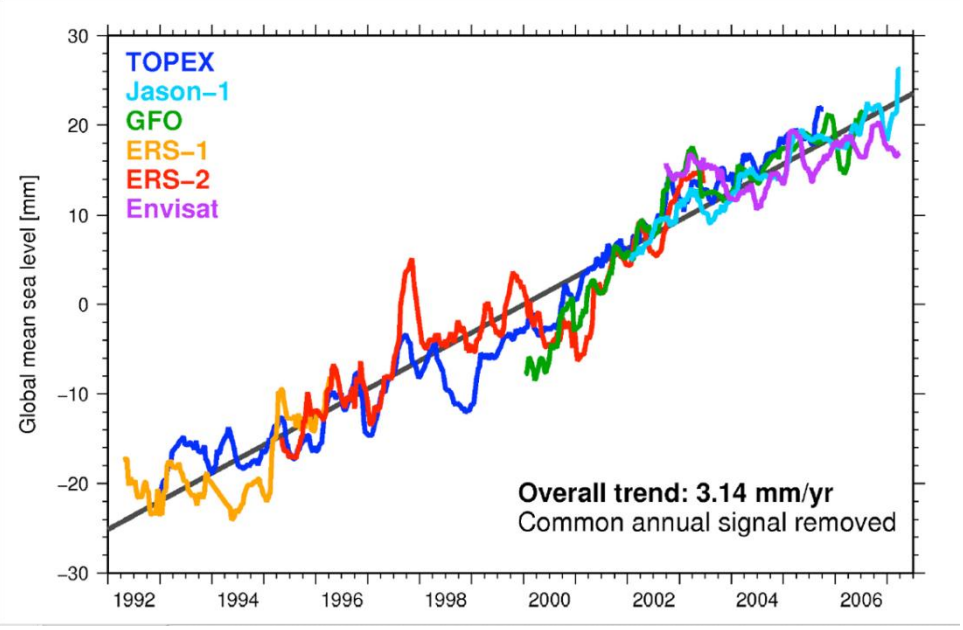


Figure 7:
Regional sea level trends from satellite altimetry for the period of 1992 to 2009, as indicated in measurements of mm per year. Source: Nicholls & Cazenay, Science (18 June 2010).

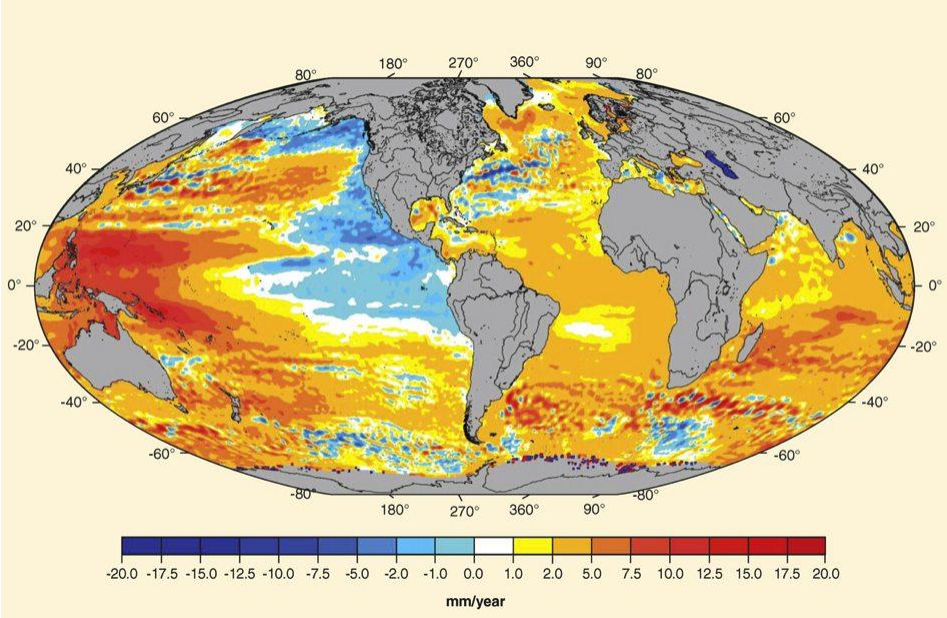


Figure 8:
Composite satellite imagery of sea surface temperatures and clouds associated with Hurricane Katrina in the Gulf of Mexico in August 2005. The sea surface temperatures are based on the AMSR-E instrument on the Aqua satellite, while the cloud images were taken by the GOES-12 satellite. Source: NASA.

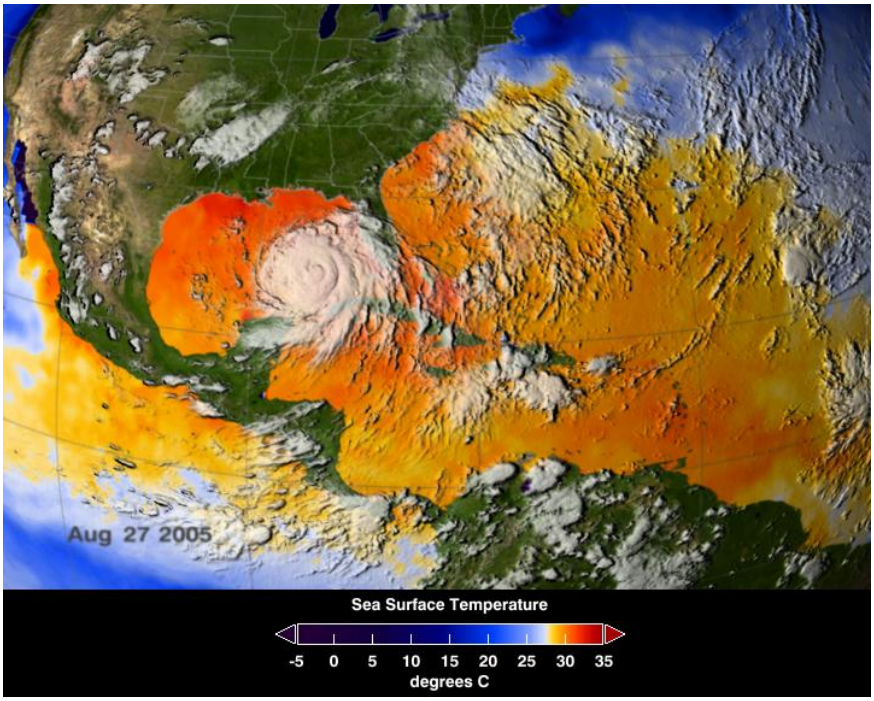


Figure 9:
Hemispheric view and sequence of SST satellite data (2005/06). Source: NASA and US Fleet Numerical Meteorology and Oceanography Center and Navy Coupled Ocean Data Assimilation.

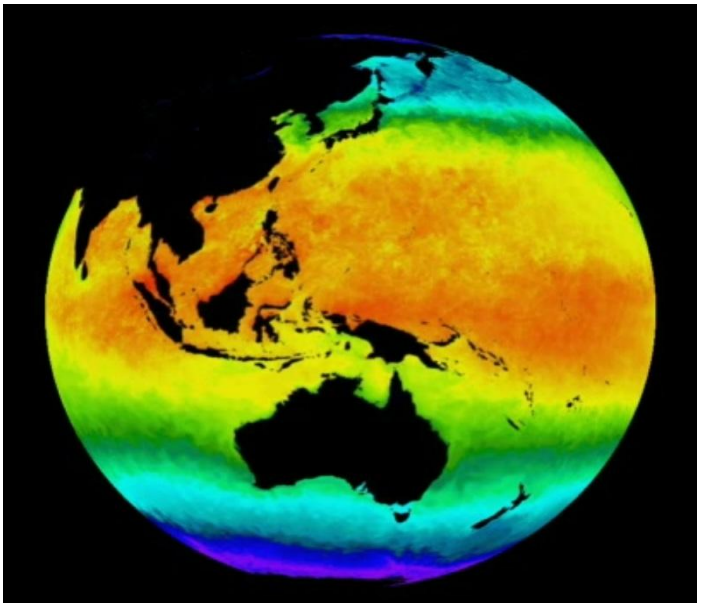


Figure 10:
Global sea surface temperature anomaly conditions in mid July 2006, compared to average conditions (1985-1997). Areas with temperatures cooler than average are blue, places where they are warmer than average are red, and places where temperatures were around average are white. Source: NASA/JAXA Advanced Microwave Scanning Radiometer for EOS (AMSR-E, 2006) and NASA's Advanced Very High Resolution Radiometer (AVHRR, 1985- 1997), NASA Earth Observatory.

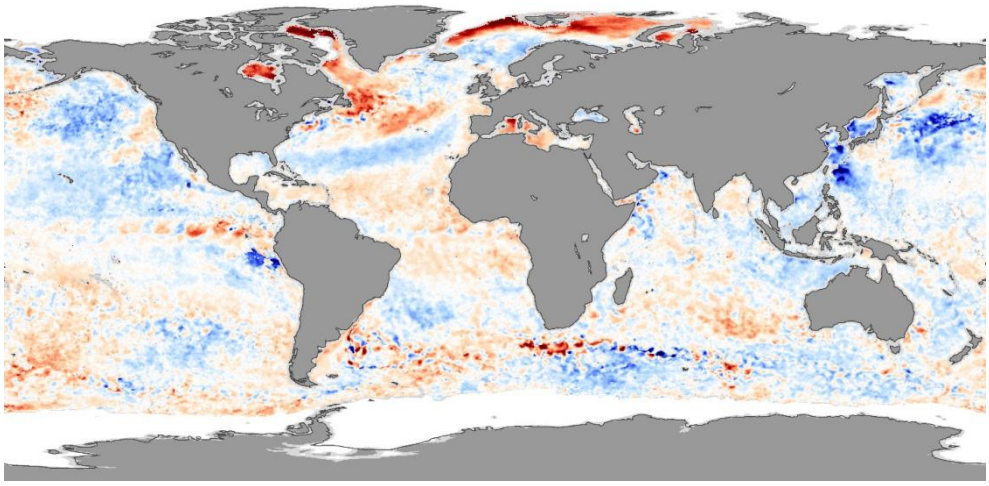


Figure 11:
Example of ocean colour imagery of the Canadian East Coast, collected by the American SeaWiFS instrument. Source: SeaWiFS Project, NASA, Orbimage.

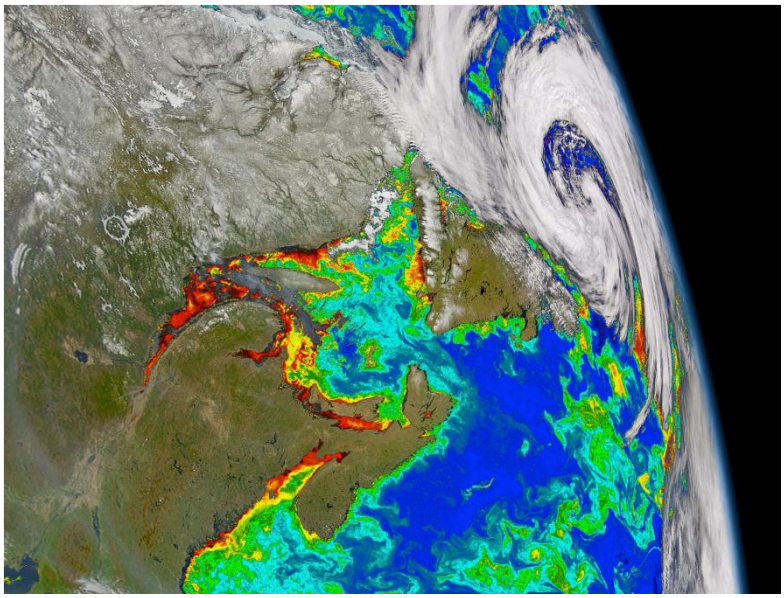


Figure 12:
Changes in SeaWiFS satellite sensor derived chlorophyll concentration, measured in per cent /year, 1997 to 2007. Source: J. Gower, 2008.

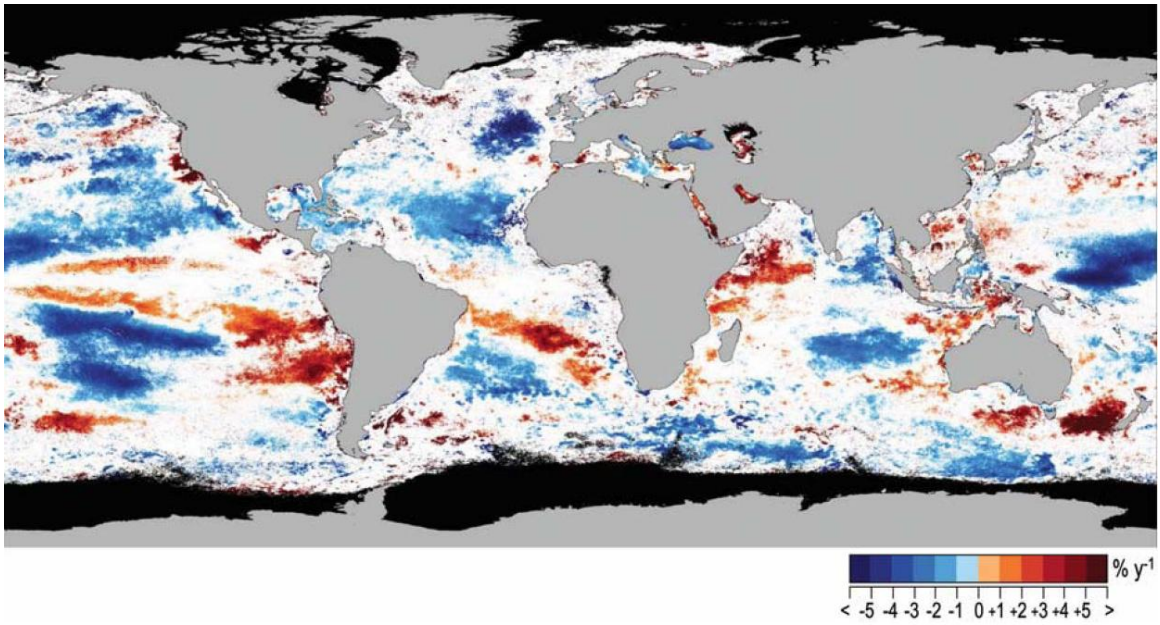


Figure 13:
Example of one day of SeaWinds experimental scatterometer satellite data in 2003 and map of global wind speed and direction (Red indicates high wind speed, blue indicates relatively low speed, arrows indicate wind direction. Source: NASA/JPL, Japan's ADEOS II / Midori-2 satellite.

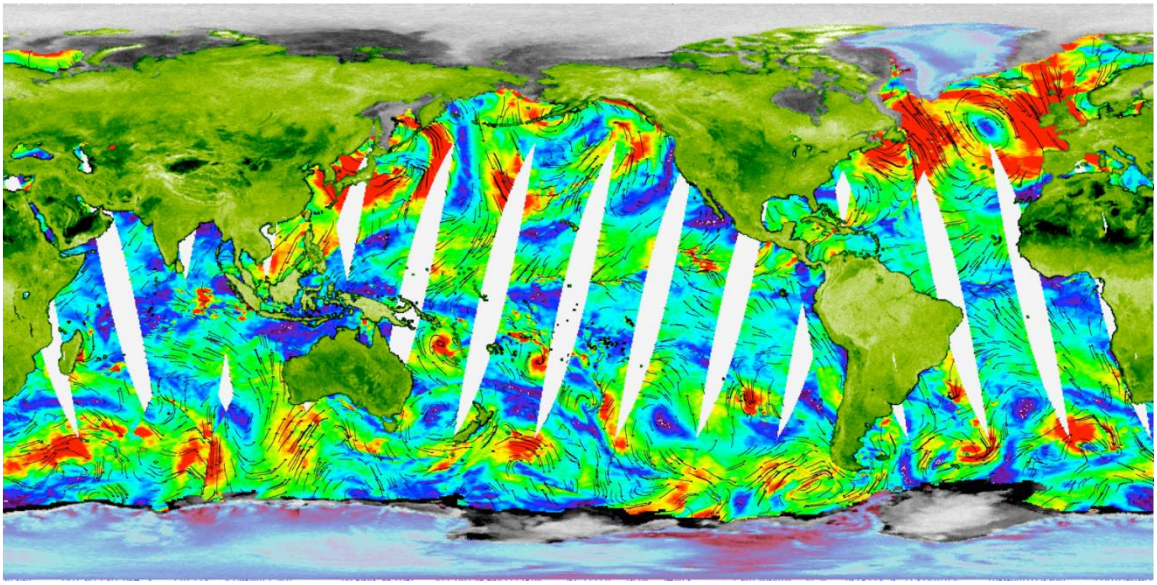


Figure 14:
'Victoria' – the sole vessel of F. Magellan;s fleet to complete the first circumnavigation in 1522 and 'Seasat' – first of the growing fleet of orbiting satellites to image the Earth's oceans in 1978. Credit: Ortelius and NASA / JPL.

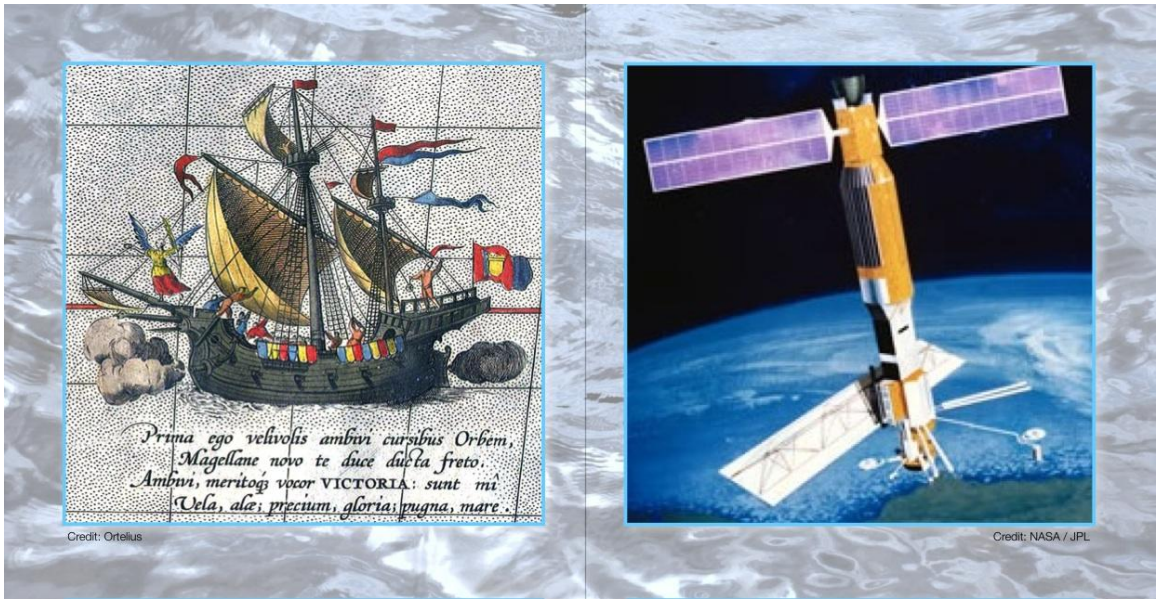
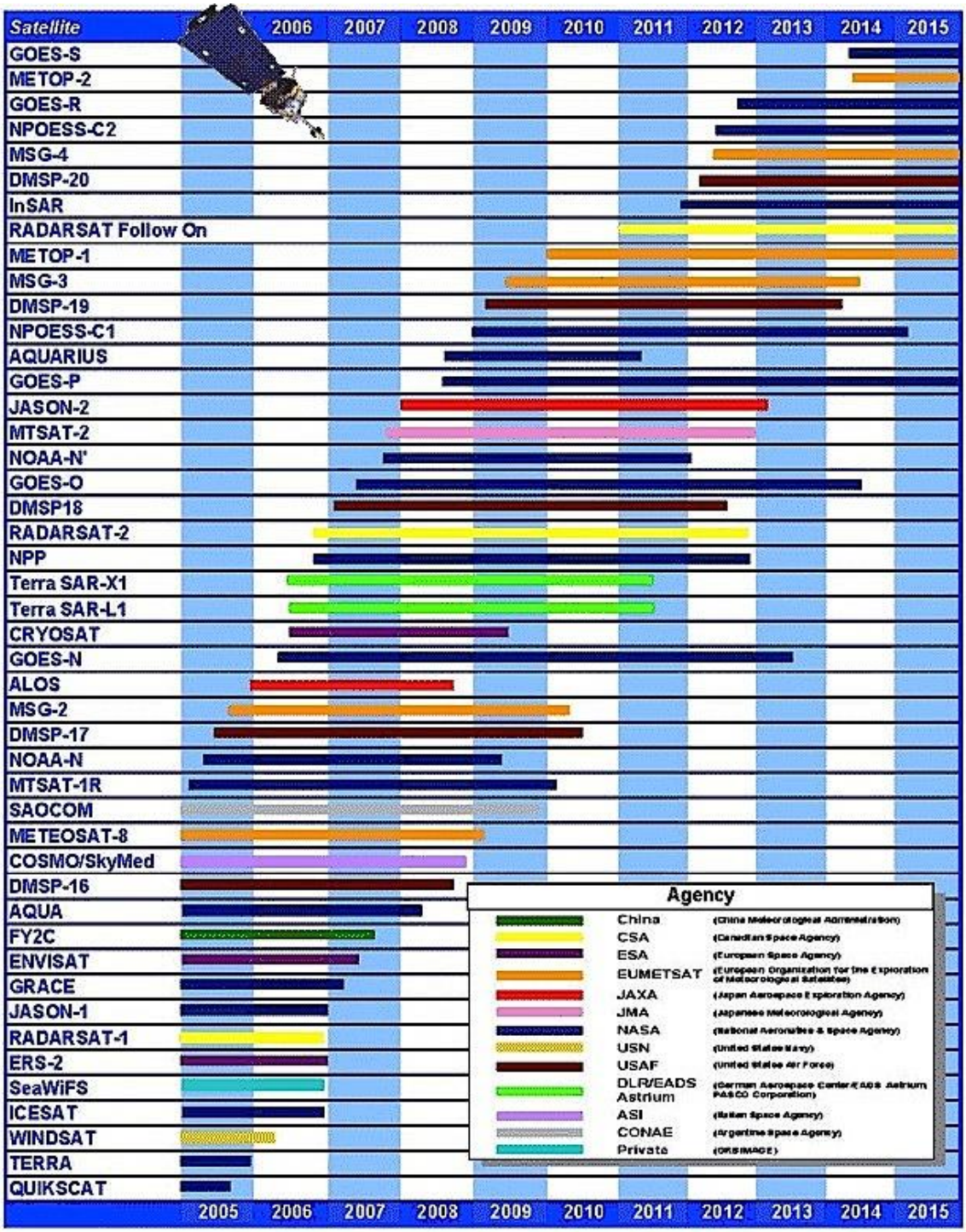


Figure 15:
Listing of currently orbiting and planned launches of Earth observation satellites for the 2005 – 2015 time frame. Source: NOAA Center for Satellite Applications and Research.



Marine Disasters under the Global Change in the China Seas and Near Shore Cities

Prof. Wang Hui
Executive Deputy Director-General, National Marine Environmental Forecasting Center, SOA, China

ABSTRACT

Global change is a complex process interconnected factors can be regarded as either causes or consequences. Climate varies similarly and has causal connections with the geological, biological and hydrological processes. Recent and major events as well as their cumulative impacts highlight the China seas are naturally vulnerable to marine disasters under the global change. Typical marine disasters like typhoon, storm surge, huge ocean wave, tsunami, HABs et al. usually occur in the China seas and cause significant loss to life and property. More people are killed annually by those marine disasters. The vulnerability of communities to hazards refers to their susceptibility to and capacity to cope with marine environmental stresses. Identifying vulnerability and risk according to the above categories will assist in completing scenarios, whether historical and/ or projected, and will enable communities to cope with and adapt to marine disasters.

Based on the data collected in past 30 or so years, the impact of the global change to the marine disasters is reviewed in the China seas and near shore cities. We will show the size and frequency of historical marine disaster events that have occurred in the China seas and related damage estimates. In particular, the marine disasters are hydro-meteorological hazards that affect an increasing number of people and cause increasingly large economic losses. For example, marine disasters resulted in direct economic losses of ten billion Yuan (1.5 billion U.S. dollars) in China in 2009. The southern Guangdong Province was the most hit area by the marine disasters which caused direct economic losses of 4 billion yuan and left 23 people dead or missing. Storm surge causes the biggest damage to China's coastal area. A total of 32 storm surges were reported in 2009, leading to 8.5 billion Yuan in losses and leaving 57 people dead and missing. At the same time, rivers emptying into coastal waters are often contaminated with high levels of nitrates from agricultural and industrial runoff. These nitrates contribute to the red tides of algae that often bloom along sections of China's coastline. Red tide consists of several harmful microscopic algae that may produce toxins or deplete the oxygen content in water to cause massive mortalities of marine organisms. Beside, the toxins may accumulate and pass through the food chain to evoke the seafood poisonings and endanger human lives. The Red tide event in Hong Kong in spring 1998, more than 500 thousand tones of pen fish were killed and the local fishery industry was nearly demolished. Meanwhile, a massive bloom of the green macro-algae occurred in summer of 2008 in the Yellow Sea, resulting in the largest “green tide” event in history in China. Climate change may induce changes in the structure and functioning of marine ecosystems. The responses of ecosystems to perturbations are difficult to predict because they result from complex interactions among the ecosystem components. The climate change and ecosystem response is the cross-disciplinary, integrative scientific project.

It is concluded that it is a critical time that we must contend with ongoing developmental pressures in addition to growing pressures from risks associated with global environmental change and economic liberalization that threaten our physical and economic security. Key directions for future research include identifying key demographic transitions that influence marine disasters dynamics, predicting changes in the community-level impacts of marine disasters, and understanding the scales over which climate will change.

Coastal and Marine Ecosystem Services, their Linkages with the Poverty Alleviation: A Case Study of Vietnam

Mr. Nguyen Van Quan et al.,
Head of Marine Conservation Department, Institute of Marine Environment and Resources, Vietnam Academy of Science and Technology, Vietnam

ABSTRACT

The linkages between ecosystems and human well-being have been the focus of a global scale study – the Millennium Ecosystem Assessment (MEA). The MEA deals with the full range of ecosystems—from those relatively undisturbed, such as primary forests, to landscapes with mixed patterns of human use, to ecosystems intensively managed and modified by humans such as agricultural land and urban areas. Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provides recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling. The human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services (MEA, 2005).

Coastal ecosystems—coastal lands, areas where fresh water and salt water mix, and near shore marine areas—are among the most productive yet highly threatened systems in the world. Coastal ecosystems—coastal lands, areas where fresh water and salt water mix, and near shore marine areas—are among the most productive yet highly threatened systems in the world. These ecosystems produce disproportionately more services relating to human well-being than most other systems, even those covering larger total areas (MEA, 2005). At the same time, these ecosystems experience the heaviest impacts from human uses and environmental changes. These pose critical challenges for the maintenance of ecosystem services and poverty alleviation.

As part of the South East Asia regional efforts, this national analysis for Vietnam aims to assess the state and trends in ecosystem services associated with marine and coastal systems; driven factors; how they support the livelihoods and well-being of human societies and particularly poor communities in Vietnam; and the threats, opportunities and constraints to these. It will also identify the key challenges for research, as well as current gaps in knowledge and capacity in order to inform the development of a research strategy to support the maintenance of ecosystem services explicitly for poverty alleviation (ODG, 2007). The research was carried out by the Centre for Marine life Conservation and Community Development (MCD) in collaboration with external research agencies in Vietnam. The research team consists of multidisciplinary experts including marine biologist, human ecologists, coastal resources managers and climate change professionals.

Coastal Erosion in Vietnam

Tran Duc Thanh, Tran Dinh Lan, Nguyen Van Thao, Dinh Van Huy
Institute of Marine Environment and Resources; 246 Danang Street, Haiphong City, Vietnam
(*thanhtd@imer.ac.vn*)

ABSTRACT

Along the coast there have been 397 eroded sites over 920.21km long, of which there is weak erosion - 196.82km (21.4%); medium erosion - 179.90km (19.6%); strong erosion - 260.67km (28.3%); and very strong erosion - 282.81km (30.7%). The length of eroded sites could be hundreds of meters or even tens of kilometers. The average eroded rate is 6-10m/year generally, but it can reach 200-250m/year in the special cases during critically short periods. In several cases, the coastal erosion has happened on a larger scale of tens of kilometers, a very strong rate over 10m/year and very long periods of up to one century.

The coastal erosion in Vietnam has taken place on a large scale, and its intensity increased by time. The causes are naturally coastal evolution, climate change, and human impact in both coastal zones and catchments. The disasters of coastal erosion have created bad consequences such as loss of human lives, properties and land; and degradation of the coastal environment and ecosystems; unsustainable development, emigration; and unstable thought in life and production of communities.

It is required to build up a national strategy and scientific base for management of these disasters in the framework of integrated coastal management, combined with catchments management. The priority is given to resolutions combined with other benefits, and the combination of controlling coastal erosion and sedimentation. It is also necessary to strengthen legislation and regulations, build databases; establish a network of regular disasters monitoring. The international cooperation must be regarded as an important resolution responding to coastal erosion.

Keywords: Coastal erosion; Vietnam; human activities; climate change.

1. INTRODUCTION

Stretching over 3,200km with 114 small and large river mouths, 12 lagoons and 48 bays, the Vietnam coastal zone has many important economic bases and the highest population density, accounting to 24% of Vietnam's 85 million people. The rapid growth of population and society-economy in the coastal zone needs to have sustainable development. However, the Vietnamese coastal zone has suffered due to heavy natural disasters including coastal erosion which has been increasing in scale and intensity by impacts from human activities and climate change, recently. For this reason, the coastal eroded disasters have become one of the top priorities of the central government, local authorities and communities.

The prediction and control of coastal erosion has become an urgent demand. For the last decades, the investigations of coastal erosion in Vietnam have been carried out by some projects. Although there are limitations of research capacity and funding, the existing results have provided the principal knowledge, proposed the initial resolutions of shore protection, and created the important scientific bases for further researches in coastal eroded disasters in Vietnam.

It can be noted that the results of existing investigations on coastal erosion in Vietnam have not been systematic and synchronous. This paper presents the synthetic results on coastal erosion in Vietnam. It should provide an overall picture on coastal erosion in distribution, scale, intensity and duration of occurrence, eroded causes and tendency. This information is necessary for both the response strategy and constructive solutions.

2. Materials and Methods

This study used mainly the data from the national projects carried out from 1995 – 2005 *(Long B.H., 2000; Nga N.T et al. 1995; Thanh T.D, 2001; Tien PH, 2000; Tien PH., 2005)* and some other projects including the authors' projects from 2005 to 2009. In 2009, the authors had an overall survey along the Vietnamese coast for examination of the situation and status of eroded sites. For the detection of coastline change by erosion, a series of topography maps and satellite data were used in the project as well as thematic studies. The topographic Gauss maps are in different scales in the French time and were used for data in 1930. The UTM maps of 1/50,000 scale which was made from an air photo by the American Army were used for data in 1965. For the periods from 1991 to 2009, the data for detecting coastline change were mainly by satellite images of SPOT, LANDSAT, RADARSAT and some others.

The satellite images were enhanced, geometric rectified to geographical coordinates, and interpreted for coastlines. The GIS analysis method was also used to overlay situations of shoreline changes. The topographic maps provided information on the situation of shorelines before 1991 and were combined with satellite data to detect the changes in coastal erosion. Field surveys were implemented for examination of precision of remote sensing data. Some geodesic surveys were carried out for the important eroded sites. The causes of coastal erosion was assessed and synthesized from many concrete sites of coastal erosion.

3. Results

3.1. Current status of coastal erosion

General estimation

The coastal erosion is expansive in all three coastal parts in Vietnam *(Thanh TD, et al, 2004).* The calculation shows that along the coast there are 397 eroded sites over 920.21km long, of which weak erosion corers 196.82km (21.4%); medium erosion - 179.90km (19.6%); strong erosion - 260.67km (28.3%); and very strong erosion - 282.81km (30.7%). At each site, the length of eroded shores could be hundreds of meters or even tens of kilometers. The mean erosion rate is 6-10m/year generally, but it can sour up to 200-250m/year in the special cases during short periods. In several cases, the coastal erosion has happened on a larger scale of tens of kilometers, very strong rates over 10m/year and very long periods of up to one century. In some cases the shore has been eroded suddenly at the very strong rate. In other sites, the shores are eroded and accreted alternately with time. However, it is defined that the intensity and the unusualness of coastal erosion has obviously increased and the damage of coastal erosion is severe. From detecting data, ten well-known eroded sites in the Vietnamese coastal zones are shown in Figure 1 below.

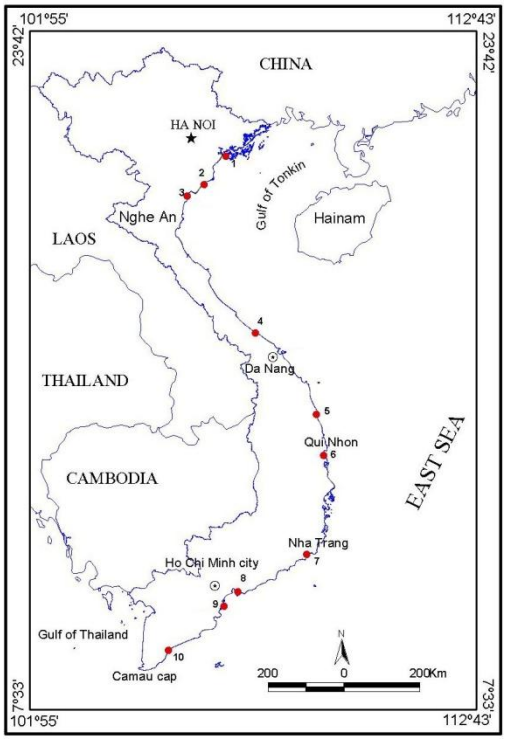


Figure 1: Ten hot sites of coastal erosion in Vietnam

1-Cat Hai (Hai Phong); 2-Hai Hau (Nam Dinh); 3-Hau Loc (Thanh Hoa); 4- Hai Duong (Thua Thien Hue); 5-Sa Huynh (Quang Ngai); 6- Xuan Hai (Phu Yen); 7- Phuoc The (Binh Thuan); 8-Can Gio (Ho Chi Minh); 9-Go Cong (Tien Giang); !0-Ganh Hao (Tien Giang).

In both the Mekong River Delta and the Red River Delta, which are known to be accreting, erosion has nevertheless occurred along one-fourth of the coastline of each delta. In the Mekong River Delta, 36 km of the Bo De coast has eroding at a rate of 30-50 m/year during the last century *(Thinh T.Q., 1992, Thanh TD, 1995; Tien P.H, 2005).* In the Red River Delta, 30 km of the Van Ly coast the erosion has been at a rate of 10-15 m/year from 1930-1990, and thanks to strengthening embankments the eroded length has reduced to 17.2 km length recently *(Thanh TD, et 2005).* See Figure 2 below.

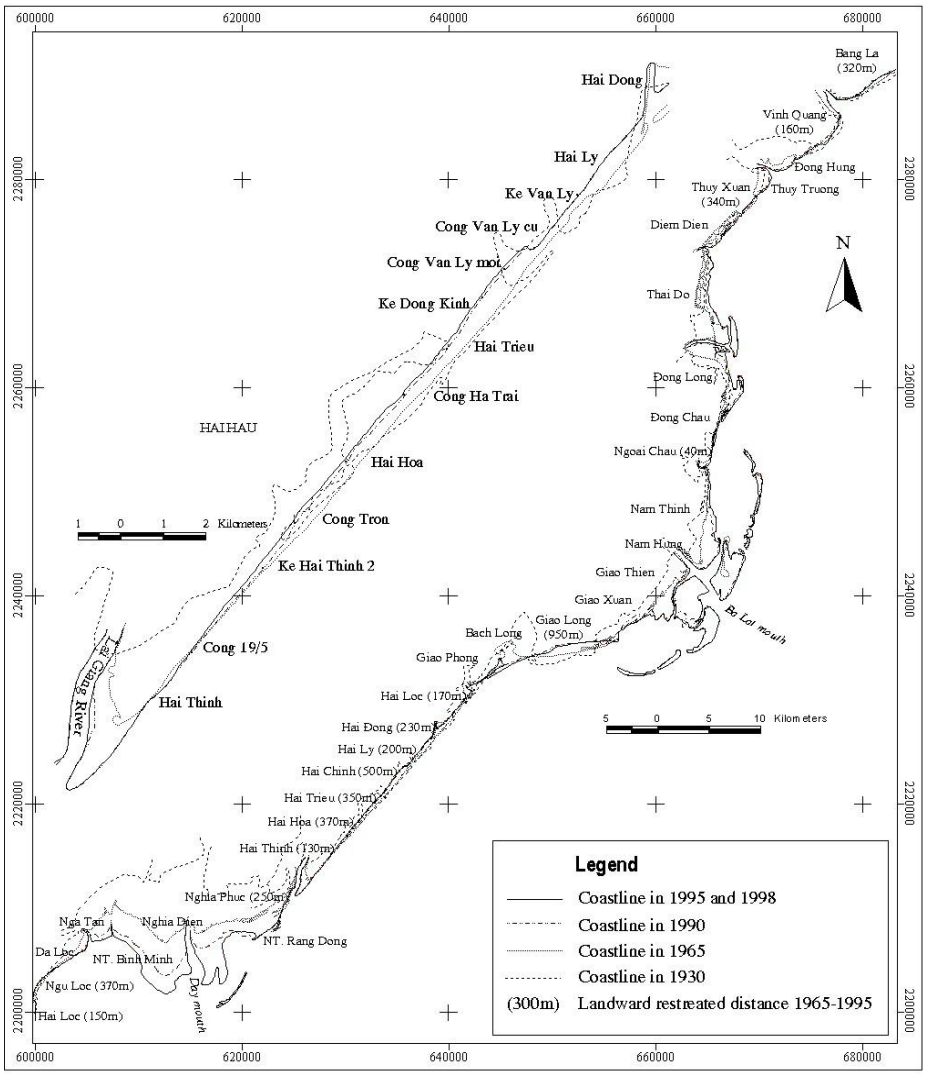


Figure 2: Coastline change by erosion and accretion in Red River Delta and Hai Hau Coast (After Dien et al 2003).

Coastal erosion can be noticed expansively in the islands, for example, Bach Long Vy Island of clastic rocks in the middle of Tonkin Gulf and Spratly Island of coral reef in the middle of the East Sea (South China Sea). Generally, coastal erosion and accretion of small islands are alternatively influenced by the northeast and southwest monsoons, and finally the northeastward coast tends to be eroded and the southwestward coast tends to be accreted. This is especially obvious in the coral reef Islands, which are deformed with the monsoon *(Krempf A., 1927).* Under the influence of this process, the Spratly Island is shorter with a size of 650 x 320m in the southwest monsoon and longer with a size of 700 x 30m in the northeast monsoon *(Thanh T.D. 1994).*

Table 1: Current status of coastal erosion in Vietnam

Coastal part	Number of eroded sites	Total eroded lenght (km)	Degree of erosion (%)				Eroded mean rate (m/year)
			weak	medium	strong	Very strong	
North	51	113.93	22.4	34.2	16.6	26.8	6.0
Centre	275	328.16	52.2	24.3	10.0	13.5	12.0
South Centre and South	71	478.12	0	12.8	43.7	43.5	10.0
All country	397	920.21	21.4	19.6	28.3	30.7	10.2

(Sources: Long, BH (2000); Thanh, TD (2001); and Tien, PH (2000, 2005).

Coastal erosion in North Vietnam

Coastal erosion in North Vietnam from Quang Ninh to Thanh Hoa Provinces has recorded 51 sites with a total length of 113.93km, accounting for 34.2% of the total length of coastline, at the mean rate of 6.0m/year, and 68ha were eroded per year *(Thanh TD. 2001).* There are 4 degrees of erosion intensity. The weak degree is from 0-2.5m/year and makes 22.4% of the total

erosion; medium degree from 2.5-5m/year and 34.2%; strong degree from 5-10m/year and 16.6%; and a very strong degree of over 10m/year and 26.8%. The coastal erosion has happened in a large scale. A lot of eroded sites have been at a strong and a very strong rate, and increased in intensity with time, for example, the Cat Hai site of 6.4km long, Hai Hau site of 30.0km long *(Figure 3*) and Hau Loc site of 5.0km long. The system of sea dikes and embankments has reduced significantly the erosion intensity for the mud and sandy-mud coast.

Figure 3: Hai Hau coastal resort in Red River Delta was damaged by erosion

Table 2: Erosion in Hai Hau Coast

Periods	1930 - 1965	1965 - 1991	1991 - 2005
Total length of erosion (m)	8,600	19,500	17,200
Of which: weak	1,800	1,600	5,200
Average	4,600	900	0
Strong	2,200	4,000	0
Very strong	0	13,000	12,000
Mean rate of erosion (m/year)	3.40	8.6	14.5
Maximum erosion rate (m/year)	6.40	12.0	20.5
Area of erosion (ha/year)	2.95	16.8	25.0

(Source: Thanh T.D. 2001; Tien P.V. 2005)

Recently, the coastal eroded tendency has been decreasing in scale, but increasing strongly in intensity. There are four kinds of accretion that exist – erosion relations as followings: 1-Erosion longtime and going (Hai Hau and Hau Loc sites); 2- Changing accretion into erosion (Thuy Xuan, Hai Thinh, Da Loc); 3- Changing erosion into accretion (Bang La, Vinh Quang, Giao Thuy); 4- Alternately erosion and accretion by the short phases. *(Diem Dien, Dong Chau. Dong Long).*

At the present time, the mean eroded rate at Hai Hau coast is about 14.5m/year, and a predicted calculation has been noted which could be 16.5m/year in 2020 and 17.1m/year in 2050.

The Cat Hai coast in Bach Dang estuary has eroded on the length of 6.4km with the eroded rate increased from 3.5m/year up to 13m/year from 1930 to present.

Coastal Erosion in Centre Vietnam

Coastal erosion in the Centre of Vietnam, from Thanh Hoa to Ninh Thuan provinces, was recorded in 275 sites with the total length of 328.16km, accounting for 21.1% of the total length of coastline, at the mean rate of 11.9m/year, and 389.9ha land have eroded

per year *(Tien P.H, 2001; Tien P.H, 2005).* The weak degree is from 0-5m/year and accounts for 52.2% of the total erosion; medium degree from 5-15m/year and 23.4%; strong degree from 15-30m/year and 10%; and a very strong degree over 30m/year and 13.5%. From 1999-2000, the coastal erosion reached a very high rate, from 40-60m/year and maximum 150-250m/year at some sites. The key sites of erosion are Hai Duong (Thua Thien Hue Province) *(Figure 4*), Sa Huynh (Quang Ngai Province) and Xuan Hai (Phu Yen).

Figure 4: Erosion in sandy coast of Hai Duong Village Thua Thien Hue Province, Vietnam Centre

The sandy coasts without embankments and due to strong waves are reasons for the high-erosion. The erosion on the sandy coasts is unusually high and very dangerous. Coastal erosion creates the shift of small river mouths and lagoon inlets, and sometimes they move in very far, some kilometers and even tens of kilometers over several years or some hundred years. As a typical example, such moves have been recorded at Thuan An and Tu Hien inlets in Tam Giang Lagoon.

Table 3: Erosion in Thuan An coast, Thua Thien Hue Province

Period	Eroded length (m)	Eroded area (ha)	Eroded rate (m/year)
1983 – 1991	6943	34.60	6.2
1991 – 1997	3911	1.40	7.4
1997 – 2002	6906	48.34	14.0
2002 – 2005	5300	22.90	14.4

(Source: Thao, 2004; Thanh TD et. 2010)

Coastal Erosion in South Centre and South Vietnam

Coastal erosion in South Vietnam from Ninh Thuan to the Kien Giang province, was recorded on 71 sites with the total length of 478.120km, accounting for 52% of the total length of coastline, at the rate over 2.5m/year in general *(Long B.H, 2000; Tien P.H, 2005).* The medium degree has been from 2.5-5m/year and occupies 12.8 % for the total erosion; a strong degree from 5-10m/year and 43.7%; and a very strong degree exceeds 10m/year and 43.5%. The coastal erosion has happened on the large scale. The key sites of erosion are Phuoc The and Ham Tien (Binh Thuan Province), Can Gio (Ho Chi Minh City); Go Cong

(Tien Giang Province) and Ganh Hao (Bac Lieu Province). The Ca Mau Cape which is well-known by coastal accretion, is being eroded from 3-5m/year *(figure 5*).

The very strong eroded coast of Go Cong situated between Soai Rap and the Tranh De river mouths (Mekong Delta) has been the coast of the longest eroded site in Vietnam. The mud and sandy-mud coast without sea dikes and embankments have been a reason for the strong eroded intensity in South Vietnam. It is also well known that the Can Gio site in the Dong Nai estuary has been eroding at a rate of 5-10m/year on the length of 8.5km for a long time.

Figure 5: The mangrove forest was destroyed by coastal erosion en Ca Mau Cape, Mekong Delta

3.2. Eroded causes and consequences

Coastal erosion disasters have bad consequences, namely, the loss of human lives, damaged properties and land; degradation of the coastal environment and ecosystems; unsustainable development with the investment of low effectiveness and small scale; emigration; threat and production of communities. Every year, a large number of labors and finance are invested for the prevention and control of coastal erosion. However, it is still a threat to many coastal sites *(Thanh T.D, Huy D.V, 2000).*

In the Red River Delta, North Vietnam, the density of inhabitant areas and important bases are situated in the coastal lowland surrounded by the sea and river dikes which have been built during the last thousand years. It is very dangerous when coastal erosion falls in strong typhoons accompanied by storm surges and spring tides which can break these dikes. In this case, inundation and salt intrusion can expand on very large land. In history, the damage in loss of human lives and properties in such broken dikes were enormous, for example, in 1955 and 1996. Thousands of people died in the broken dike on 26th September 1955. In the Centre of Vietnam, the important settlements and economic areas are situated in the sand coasts and are very sensitive to the coastal erosion created by the conditions of extreme and unusual weather. Some six thousand households belonging to seven provinces have obligated to move due to threatening situation of the coastal erosion *(Tiep N.T. et al, 2001).* In the Mekong Delta, South Vietnam, the damage in loss of human lives and properties are not as that in Red River Delta, however, the damages of ecosystem land resources created by coastal erosion is very great.

In terms of the environment, the erosion reduces coastal habitats, even destroys mangroves. The sediments released from the erosion process can make the water turbid and organic matter polluted at the badly impacted beaches, coral reefs, and sea grass beds. As mentioned above, the sediments supplied from coastal erosion have contributed significantly to the sedimentation of many shipping channels. In Bach Dang Estuary, a calculation showed that every year, the sediment volume of dredging for shipping channels is from 3-5 million tons, meanwhile, the sediment discharge from rivers is some 4 million tons, and the sediment volume released from coastal erosion is some 2 million tons.

The research results show that the intrinsic causes of coastal erosion belong to three groups as natural coastal evolution, including tectonic movement, climate change and human activities in both catchments and coastal zones *(Trinh L.P et al., 2000; Long B.H.et al, 2000; Thanh T.D. et all, 2001a; Tien P.H. et al., 2000).* With the tendency of long periods, the coastal erosion from the cause of natural evolution can be noticed in the Bach Dang and Dong Nai estuaries where the tide is high in range, and the subsiding process has not been compensated by the deposition. The tectonic movement plays a role for the intrinsic cause of coastal erosion. In the two largest deltas, the Mekong and the Red River, the tectonic subsidence is dominated; however, the deltas accrete strongly by the compensative deposition. In a certain condition of locally deficient sediments, the total subsidence of both the tectonic sink and eustatic rise of sea level become the cause of coastal erosion. The lack of sediments in coastal zones and estuaries at the present time mainly concerns the water uses in the catchments, for example damming and irrigation. This can be demonstrated by the influence of Hoa Binh Dam on the upstream Red River. The construction of this dam

was completed in 1989 and every year, the volume of some 40 million sediments accounting for 40 percent of total sediment, discharged from the Red River are trapped at the bottom of the reservoir.

However, the direct cause of coastal erosion belongs to the meteor-hydrology factors such as the actions of waves, currents, typhoons, and sea level rise, including monsoons and storm surges. Recently the turbulence of these factors, which is created by climate changes concerning global warming, has caused this unusual coastal erosion. The data observed in some stations show the sea level rise in Vietnam coastal zone has been at the rate of 1.0-2.2mm/year *(Thuy N.N et Khuoc B.D., 1994).* There were much fewer typhoons before, but they have increased recently in the South of Vietnam and have become an important cause of coastal erosion there.

Human activity has been an important cause of coastal erosion. Not only due to damming and irrigation in catchments, but also due to such activities in the coastal zone as land reclamation, building dikes, dredging channels, damaging mangroves and coral reefs, quarrying and mineral exploitation have negatively impacted the coastal erosion. The broken sea dike is a particular type of erosion. The sea dikes defend coastal lowland areas, especially the Red River Delta. Generally speaking, the sea dikes are built in the accreted coastal areas of deltas, However, some of them had been located on the weak grounds where the coastal accretion has not been sustainable yet, and in this case, the damage of dikes are caused by the action of waves, storm surges or spring tides and also by the lack of people's knowledge.

4. Discussion

The control of disasters has been an interest for a long time. However, the implemented resolutions have been passive, responsive to particular situations and lacked definite scientific bases. The existing researches have been exposed to a lot of limitations, especially the potential for application applied availability *(Nga N.T, et al. 1995).*

The control of coastal erosion needs to be enforced with synchronous and comprehensive resolutions, from macroscopic to concrete ranges, direct and indirect, constructive and non-constructive, soft and hard constructions, corresponding to each coastal site. A comprehensive resolution must be in the framework of integrated coastal management, combined with catchments management to have both immediate responses and a long-term strategy. Priority is given to the construction resolutions combined with other benefits and special importance is paid to the combination of controlling coastal erosion and siltation. It needs to apply to the predictive moderns and building a strategy suitable to the Vietnam condition. It is also necessary to strengthen the legislative basis for coastal protection; to build a database; and to establish a network to observe and monitor coastal erosion regularly for the purpose of detecting and forecasting disasters, and making timely decisions.

The control of coastal erosion is a very complicated task, and investment in research needs to be strengthened to respond to the requirements in practice. In order to complete a process responding to the eroded disasters, some important issues need to be paid attention to. At first, a national strategy for controlling the coastal erosion on a large scale of integrated coastal management and planning could be defined soonest. The non-construction resolutions such as monitoring, detecting, warming the disasters, and having a plan to move inhabitants out of the dangerous areas are considered a great significance. Priority is to be given to projects, and constructions combining the control of coastal erosion, sedimentation and floods. An application of modern solutions is considered with special attention to the Vietnamese eco-social factors and concrete natural conditions of the disasters. The ecosystem and environment issues in the responsive solutions to the coastal erosion for example protecting mangroves and coral reefs are of much importance. It is necessary to strengthen the base of legislation and regulation for the management of the erosion-related disasters. An established network on observation and monitoring coastal erosion is very important for the prediction of disasters, and the management of these disasters demands building data bases.

5. Conclusion

Coastal erosion in Vietnam has been increasing in scale, intensity and unusualness. In general, coastal erosion disasters in Vietnam are closely related to the coastal evolution and sedimentary processes, and have recently fallen to a critical situation by human activities and climate change. For the last decades, the coastal erosion in all parts of North, Centre and South of Vietnam has happened complicatedly, and

caused damage in terms of the loss of human lives, properties and land, and has caused serious consequences on the economy-society, environment and ecosystems. In many cases, coastal erosion has become a serious disaster for preventing economic development or making unsustainable development.

The prediction, prevention and the control of this coastal disaster is difficult and are long-term tasks, which require more detailed research. Firstly, a national strategy for preventing and controlling coastal erosion is a basic need to be built for the activities responding to this disaster. For further action, it is necessary to train experts; invest in surveys and analysis equipment; application modeling; build a process for survey, monitoring and applying appropriate technology to control the disaster of coastal erosion. Of course, international cooperation for responding to climate change and sea level rise is a very important solution for the prevention of coastal erosion in the long-term.

References

1. Dien TV, TD Thanh, NV Thao, 2003. Monitoring coastal erosion in Red River Delta, Vietnam – a contribution from remote sensing data. Asian Journal of Geoinformatics. Vol.3.No.3, Published by ARSRIN, P.O. Box.4. Klong Luang, Pathuthani 12120, Thailand.
1. Krempf A. 1927. La forme des récifs coralliens et régime des vents alternant. Memoir 2 de L'Institut Oceanographique de Nha Trang. p.1- 29.
2. Long B.H. (eds.), 2000. Research in prediction and control of coastal erosion in South Vietnam. Technical report. Project KHCN.5c. Reserved at Nha Trang Institute of Oceanography.
3. Nga N.T; An Q.N; Nghia N.K., 1995. Status and causes of coastal erosion and sedimentation in Vietnam, and scientific and technical resolutions for controlling. Technical report of projects KT.03.14. Reserved at Science and Technical Institute of Water Resources, Hanoi.
4. Thanh T.D, 1994. Coastal erosion - accretion and deformation of Spratly coral Island. Marine Resources and Environment. T.II. Sci. & Tech. Pub. House. Hanoi. pp.13-19.
5. Thanh T.D., 1995. Coastal morphological changes concerning the management of coastal zone in Vietnam. Workshop Report No.105 Supplement UNESCO\IOC, p.451-462.
6. Thanh T.D, Huy D.V, 2000. Overview on the risks of coastal erosion and sedimentation in Vietnam. J. Sci. Activities 1: 26–27.
7. Thanh T.D (eds.), 2001. Research in prediction and control of coastal erosion in North Vietnam. Technical report. Project KHCN.5a. Reserved at Institute of Marine Environment and Resources.
8. Thanh TD, Y Saito, DV Huy, NV Lap, TTK Oanh M. Tateishi. 2004. Regimes of human and climate impacts on coastal changes in Vietnam. Reg. Environ Change. No.4. Springer-Verlag. pp. 49-62.
9. Thanh TD, Saito Y., Dinh V.H., Nguyen H.C., Do D.C. 2005 Coastal erosion in Red River Delta: current status and response. In Z.Y. Chen, Y. Saito, S.L. Goodbred, Jr. eds., Mega-Deltas of Asia: Geological evolution and human impact, China Ocean Press, Beijing, pp. 98-106.
10. Thanh TD, Lan TD. Cu NH, Huy DV, 2010. Dynamics and evolution of Tam Giang – Cau Hai Lagoon. Pub. House. Natural Science and Technology. Hanoi, 200p. In press.
11. Thinh T.Q., 1992. Shoreline changes in Vietnam. Proc. National Seminar on Coastal Research and Management. Hanoi. p.135 - 141.
12. Nguyen Van Thao, 2004. Monitoring and Predicting the Thuan An Inlet Movement with Remote Sensing and GIS Technology. Marine Environment and Resources, Tome XI, Vietnam Science & Technology Publish House, PP.241-256.
13. Thuy N.N. and Khuoc B.D., 1994. El - Nino phenomenon, global climate warming, and sea level in Vietnam Sea and South China Sea. Meteorology and Hydrology. $N^0$5. Hanoi, p16 - 23.
14. Tien P.H. (eds), 2000. Research in prediction and control of coastal erosion in Centre Vietnam. Technical report. Technical report of Project KHCN.5b. Reserved at Institute of Geography, Hanoi.
15. Tien PH. (eds.) 2005. Prediction of erosion and sedimentation in coastal and estuarine areas and resolution for its control. Technical report of Project KC-09-05. Reserved at Institute of Geography, Hanoi.
16. Tiep N.T., Que, B.C. An, N.T., Dan, N.T. Luong, N.V., Long, B.H., 2001. Some results of investigation and assessment on geological hazard types in the coastal zone of Vietnam. Marine Science and Technology. No.1. Hanoi. Pp. 44-52.
17. Trinh L.P.; Long B.H., Hieu T.T., 2000. Research in characteristics and prediction for tendency of sedimentation and erosion in the coastal zone and estuaries in Vietnam. Technical report of project KHCN-06.08. Reserved at Nha Trang Institute of Oceanography.

Ocean Observation for Climate Research and Prediction

Dr. Chen Dake
Director of the State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, SOA, China

ABSTRACT

The last few decades have seen significant advances in our understanding of the ocean's role in regulating the Earth's climate, but only recently the crucial importance of the ocean to climate variability has started to be recognized by scientists as well as decision-makers. Because of its vast volume and heat capacity, the ocean contains most of the memory of the Earth's ocean-atmosphere coupled system. It has been suggested that the ocean may delay global warming by absorbing a large amount of heat, that it may cause abrupt climate change due to its disrupted thermohaline circulation, and that it may set the timescales for various climate oscillations. Although the slow pace and persistence of oceanic variations give hope to long-range prediction, there still exist large uncertainties in climate predictability.

The importance of ocean observation for climate research and prediction cannot be overemphasized. For instance, the highly successful TAO/POSEIDON moored array has played a central role in our understanding and forecasting of short-term climate change, especially ENSO. And, the international Argo program, which maintains a global network of about 3000 profiling floats as a core element of GOOS, is helping us to decipher the complex climate phenomena that are operating in the ocean. However, data shortage, especially in deep oceans and over long time periods, is still a serious limitation for describing, understanding and predicting long-term climate change. Here we discuss several ongoing and planned ocean observation programs of China that aims at climate variability on a range of timescales, including a newly launched project called Northwest Pacific Ocean Circulation and Climate Experiment (NPOCE).

Strategy for the Development of Marine Industry in the Time of Climate Change and Global Economic Crisis

Prof. Dr. Yannis Kinnas
Former Ambassador for Environment Greece

ABSTRACT

The Marine Industry has to follow the difficult task after the complexity and global impact of a number of factors. International phenomena particularly with environment, such the climate change or the economic crisis, affect the industry of both: the shipping and the coasts (including the islands). Exploring linkages between and among International, National and Regional climate policy is useful but has to go ahead.

The close and effective cooperation between scientific and technological communities is necessary. There is the need of contribution of Shipping in policy like those of maintenance in the overall industry. Organizing a Conference now in Beijing and, considering in addition the IMO active role, as well as investments, cost-benefit analysis, the importance of stakeholders and civil society constitutes a contribution. Private and Public Partnership are facing developments and envisaging a new step in the 21st century.

The classical approach by Epicurus, the successor of Democritus, was that science, nature and humankind are not separated but, when they do, results are bringing difficulties. Strategy is a composition of positions and forces on reshaping industries, institutions to adjust to developments. Interdependence has also to be taken into consideration although solidarity does not always follow interdependence. Therefore some kind of balance has to be sought regarding the mutual interplay between the trends of economic crisis on the one hand and the nature and humankind on the other. There will be reference to the mentioned issues with impact during this year. Today, in general terms, there are efforts towards the achievement of the MDGs by 2015. According to views on globalization, as expressed ten years ago, the world was made less safe than before ("Financial Times", 24 April 1998, by Nicole Alexander).

The above can raise a number of questions and solutions of problems because of their complex form and can lead to some new kind of problems. Thus, uncertainty is increased and then the marine industry is affected on insurance and risks. The view of the Nobel Prize late Professor Ilya Prigogine has mentioned extensively on "the end of certainties". The impact on transportation by the marine industry is very important and therefore the ICZM developments have also to be considered.

Nowadays the cross cutting issues lead to the link existing climate change and energy, which is affecting transportation. In addition, communication in the marine industry is very important. Professor Colin Cherry, of the London Imperial College of Science, mentioned the 'Communication Explosion' in 1969. Communication developed today to digital technology. However, the digital division brings also concerns. The Human Development Index, which was elaborated by UNDP presented (2003) the rank, includes also selected SIDS.

Keywords

Global economic crisis, climate change, ocean policy, innovation and sustainable development, communication, integration of marine policy, natural disasters.

INTRODUCTION

The coincidence of climate change and the global economic crisis for the need of marine industry and in particular overall Integration of Maritime Policy (IMP) need to be examined and with the overall trends to be considered. Some difficulties, which are mentioned follow. It seems important the role of the regional factor, as emphasized already by the President of the International Ocean Institute (IOI) Dr. Awni Behnam (1). In the Ocean Policy, disadvantages exist against the oceans and the measures in shipping. A set of important questions arises. How things can develop? The economic crisis does

an overall impact and with what kind of reciprocity with shipping and for how long? The Cancun 2010 Conference, will it solve the problems of climate change and not repeat what happened in Copenhagen in 2009?

The coincidence of economic crisis and climate change make the whole issue more complex and the involvement for improvement needs the contribution of a variety of stakeholders, including the private and the public sector, and a set of Intergovernmental Organizations (IGOs). Shipping and transport, but also fishing, are influenced, and research and knowledge contribute towards a more successful outcome (2). Moreover, important natural disasters affect positively and negatively the IMP. Communication and Information are playing a role too.

Innovation and Sustainable Development are of useful contribution to justify dealing with the international developments. The hosts of Beijing Conference in September 2010, was the State Ocean Administration (SOA) of the People's Republic of China. Cosponsors were the International Ocean Institute and the Intergovernmental Ocean Commission. They concluded to the important Beijing Declaration (3), including the outcome of the Conference. All the above lead towards a balanced approach, in order to be satisfied both the Ocean and shipping, have to be covering as a whole: Land, Water, Air and Fire. Fire refers to the variety of Natural Disasters including those against forests.

In the Beijing Declaration is included, inter alia, an attention needed for some "evaluation-based management cultures ensure the effective use of resources in the long term". The Pacific region and major role of the P. R. China cannot be disregarded. Cultural history is as long as the Greek one. UNESCO published an Independent Report, having as Chairman the former UN Secretary General Javier Perez de Cuellar, in 1995. The book's title is: *Our Creative Diversity*. The variety was also confirmed by an approach of Mr. Li Yank, who has included, in the *China Daily* (4 September 2010), inter alia, on the cross-cultural backgrounds and experiences of overseas Chinese. He mentioned also: "More importantly Chinese publishers and writers should not sacrifice their national identity to cater to the Western readers. What really defines modern China is not only something it shares with the West, but also something that makes it different" (4). Cultural issues are important in order to establish a better understanding of the varieties.

The Pacific Ocean and its coasts, including the Small Island Developing States (SIDS) are of major importance, being in greater sensibility and more impact of the sea level rising. The role of the Pacific Ocean during the 21st century was mentioned during meetings of the United Nations (5). It is remarkable, although a science fiction, that Michael Crichton (6), in one of his books (published in 2004), refers to the fear of a future earthquake at the Solomon Islands. The incident happened indeed in 2007 (7).

Time and Space are of vital importance for the major current issues: the Climate Change and the Global Economic Crisis, which unfortunately coincided and, although that balance has to be sought, priorities cannot be disregarded. It develops as rather complex and cross cutting element regarding the issues above. It is indeed normal the priority on climate change by the Pacific islands, and other islands on the planet, of course including the coasts. Security as a concept needs to be considered too (8). Shipping and transport, but also fishing, influenced negatively, and research is contributing with access and accuracy of data on them.

In transport were positive views for new ships, suitable for new kind of needs, after melting of the Arctic Ice (9). Thus, new routes to Asia were opened. Such expansion brings reinforced role for the Asia-Pacific. There is also the fact that part of oceans, almost one fifth, is scientifically unknown, and presents further need for research (10). New marine species are of importance. In addition, a change of the level of temperature leads to movement of certain species.

The Canadian Government, during 2010, has given priority to the measures the global economic crises to be faced (11). The UN Secretary General Mr. Ban Ki-moon has expressed his priority on the issue of climate change and its impact, regarding the measures under the Rio Conventions as they are collectively known (12).

The founder of the IOI, Elisabeth Mann Borgese placed the implementation of Agenda 21 at the forefront of IOI's work focus on oceans. She connected it in an interdisciplinary way. *Agenda 21*, a

result of the 1992 Summit Conference, refers to issues directly influencing the marine industry. During the annual meeting of the UNCSD in New York are considered parts of the *Agenda 21*. Particularly its Section II, Chapter 17, refers to safeguarding the Ocean's Resources with extensive mention of marine resources, the sea-level rise, and the scientific and technological issues.

Communication and information are of major concern for these sectors. Colin Cherry, Professor of Telecommunication of the Imperial College of Science, London, has examined the relevance of the 'Communication Explosion' to the future of the World already in 1969 (13) and he had made distinct research into psychological and social aspects of telecommunications. The development of communications and the technology today brought positive comment for the early reference by Colin Cherry. It is therefore for the Marine Industry to be considered seriously the existing digital revolution but also the digital division. Technology is proceeding fast. The Marine Industry and IMP have to follow the developments. On the other hand, reference has to be made of the IMO and its work. As the Secretary General of the IMO Mr. Efthymios Mitropoulos, has the view that climate change is a challenge for IMO too. He includes that "in 2008 achieved in the efforts to reduce air pollution from ships and the GHGs were limited or reduced from shipping operations" (14).

Shipping at the global level can contribute to the limitation, to some extent, of climate change impact. The efforts of the IMO include, inter alia, a Ship Energy Management Plan for the ships, thus, the connection with Energy. In general, energy is connected with Climate Change. From a technical prospective, energy efficiency issues constitute a field of shipping or marine industry, depending on the ship type and size. Efforts to be reduced fuel consumption, while there is the same power output, are well understood as a target.

It is useful to note what is going on in Europe overall and particularly on IMP. Of course fishing is a common element for the Commission of the EU in Brussels and a major issue of policy by the Chinese SOA. A reference has to be made to one case, which was commissioned by Belgium, including advice to reduce the risk of collisions with whales. The latter constitutes a priority area of work for the International Whaling Commission (15).

During May 2010, in Paris, took place the 5th Global Conference on Oceans, Coast and Islands: Policy and Management. At the Conference were examined the obstacles and approaches to advancing implementation of IMP by the EU's member states. In this Paris Global Conference, H.S.H. Prince Albert II of Monaco praised the IOC and its work. He mentioned the work to link knowledge, awareness and action and also that "acting in a living and complex system, innovation and adaptation in the pursuit of solutions is useful" (16).

The Co-Chair of the same Conference Ms. Watson-Wright, the Secretary General of IOC, mentioned the co-ordination through the Global Ocean Observing System (GOOS) and sharing through the International Oceanographic Data and Information Exchange. She mentioned also, during that closing plenary, to be launched a comprehensive ocean and climate an initiative within and outside the UNFCCC negotiation process.

Furthermore, the view by Urlike Herrmann is an idea that the EU needs more harmony and "what we need is to develop-pan-Europe and solidarity" (17). An approach to a large spectrum can be included towards an effort for IMP. In May 2010, the Commissioner of EU Ms. Hedegaard, responsible for climate change, proposed a reduction by 30% of the CO2 emissions, for 2020. Thus, at first stage was not easily supported by European industries, which are mentioning only on a global perspective. The Commissioner, before the above approach was also in a cooperative meeting with the Secretary General of IMO, in London. In October 2010, the EU did not manage yet a common position in view of the Cancun UNFCCC Conference.

The views expressed on the Millennium Development Goals (MDGs), decided in the United Nations, and pledged to be achieved by 2015 targets. The targets included also the environmental sustainability and the benefits of new technologies, especially information and communications technologies. It appears during the MDGs reviews, that the targets are not yet adequately covered.

The issue of IMP is dominating the approaches of the European Union Commission and is considered by the current Commissioner Ms. Maria Damanaki, as a source of innovation, employment and growth. She is also in charge of fishing issues. The variety of views of EU member states is not yet

compromised. The EU Commissioner continuous to support the already decided priorities existed in the IMP. The EU IMP as established in 2007 covers the period 2011-2013 (18).

These six priorities are:

- Innovation.
- Enhance and coordinated governance of the whole marine sector.
- Development of cross cutting tools as Maritime Spatial Planning. Take attention the knowledge and surveillance.
- Balance of economy, social well-being, and environmental responsibility.
- Development of sea basin strategies.
- Europe as a front-runner improving marine knowledge on infrastructure.

The Report *Our Common Future* (1987) of the Independent World Commission on Environment and Development (WCED) defined 'sustainable development' as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This reference to the needs of future generations is an item, which has to be, to the extent possible, taken into consideration. It is already mentioned, a variation of words accompanying the 'sustainable', which expresses another point of view. For example, a 'sustainable economy' is the product of the sustainable development. The difference in priorities does not mean any disregard of one another.

On the October 2010 meeting, in the Tianjin of China, Climate talks took place among 170 countries preparing for the upcoming UNFCCC Conference in Cancun, Mexico. It did not diminish some kind of optimism for the trends of replacing the Kyoto Protocol of the UNFCCC. Moreover it does not seem yet a clear-cut new path for the coming follow-up of the Copenhagen, which is leading that now decisions are necessary. Division of positions continues to exist. In general the distances between North and South give a difficulty to be faced and reach to an agreement.

A rather recent view of the ex-Executive Secretary of the UNFCCC (in 2004) Michael Zammit Cutajar was that "establishing a robust global regime for addressing climate change is… comparable to the creation of the international trade regime under the World Trade Organization" (19).

It sounds finally that some interdisciplinary approach might be more feasible. Regarding the Climate Change, adaptation, mitigation, financial issues and sound technologies are not yet agreed by the set of stakeholders involved. The most vulnerable groups, impoverished, and with environmental degradation are to be considered on the course of discussion of climate change.

Another view on the impact of shipping and ports areas on urbanization is that in 2025 there will be leading the world eight cities with over 20 million inhabitants each. Megacities at coasts are influencing developments. In 2010 Brazil, Mexico, and Bangladesh are in a position, regarding the urbanization, to be included among the ten top countries with their cities. In general the overpopulation at coasts and ports leads with difficulties to be increased. It has also to be considered the displaced persons by climate change. Environment refugees, after current developments, are either internal in a country or outside a country. Anthony Hill noticed in Beijing, in this connection, that: "It is in cities where industry has thrived, where mass production and consumption, mass transit (private and public) has flourished and from which intercontinental transport by sea, land and air has used the oceans as transits, as theatres of war, of discovery, exploitation and eventually despoliation where the start must be made" (20).

Besides the natural disasters dominated the year 2010 as the volcano in Iceland has made serious negative impact for a period of time on air transport. There was then a positive role of shipping transport. The volcano does not continue to work for the time being, but brought to the consideration of a new set of difficulties affecting both the economic issues and climate change.

The Mexico Bay by oil exploitation, there by the private sector, has presented for a number of months negative impact on the coasts of the region and on Nature in general. Thus, to some extent, the economic activities do not cover the environment or climate change, at least in this issue, by the private sector. Another phenomenon was the floods in Pakistan, where they caused a lot of victims and refugees.

CONCLUSION

As demonstrated above uncertainty exists according to the current economic crisis, climate change, and natural disasters. Thus, stakeholders regarding the marine industry are affected with insurance and risk issues. The view of Nobel late Professor Ilya Prigogine has mentioned extensively on “the end of certainties” (21). The impact on transportation by the marine industry is very important and therefore the ICZM developments have to be also considered.

The element of culture is of major importance for shipping. The IMP is influenced because of the existing variety of cultures. This connection was positive and interesting indicated by Professor Stephen Weiss, York University, Toronto, Canada, who expressed his view “Maxims for the Cross-Cultural Negotiator”. Following is his useful approach:

Maxims for the Cross-Cultural Negotiator

1. *Cross-cultural interaction is potentially creative and enjoyable, not simply a taxing experience.*

2. *There are similarities as well as differences between cultures. Both qualities should be investigated, not assumed. Aspects of a culture are best understood in relation to each other rather with aspects of a second culture.*

3. *Learning about another culture's ways requires some suspension of judgment (certainly separation of observation and judgment) and some experimentation (which can begin in low-risk areas).*

4. *Choosing to use another's ways is not always costly nor appropriate to view as a "concession."*

5. *Implementation of any culturally-responsive strategy demands an ongoing respect for the counterpart's culture and a sensitivity to the individual counterpart's feedback.*

TEXT: “Maxims for the Cross-Cultural Negotiator”, an approach mentioned by Professor Stephen Weiss.

Science and Policy have to go together in order to be covered and faced acute developments. Thus, management and synergies of all actors of IMP and co-operation of public and private sectors stakeholders have to go on. A useful plan of links of the various actors was presented by UNEP as in the following Figure.

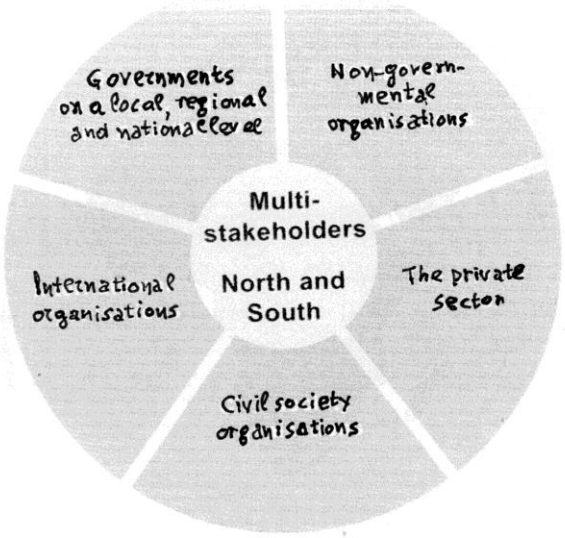


FIGURE: UNEP displaced a scheme internationally with multi-stakeholders, North and South.

Such a kind of a win-win approach, in order "to be promoted a common vision on coastal and ocean governance", is included in the Beijing Declaration. Public awareness and enhanced public participation are indicated as additional targets in the Declaration. The need of management measure is also of reference by the conclusion of the Conference.

The co-operation in the UN system organizations is important. The role of IOI and UNEP, the IOC/UNESCO and its sub-commissions are of greater significance, including also WMO and the role of satellites. The maintenance and innovation play some role for the IMP. In addition efforts are made for the co-operation of scientific disciplines, which for the time being show not adequate share and exchanges among them.

Among the stakeholders institutions is included the Ecosystem Goods and Services (EGS) were introduced in October 2010 to the core of decision-making in the CBD on Diversity. It seems that such a kind of approach can be also introduced in shipping and be considered in the IMP.

Another activity has to do with the Global Meetings of the Regional Seas Convention and Programmes (RSPs) and the Global Programme of Action (GPA) because they contribute reporting on the impact of their seas and consequently the Oceans. Facilitation and cooperation between the RSPs and GPA are going on or are enhanced. On the above the 12th Global Meeting took place in September 2010 in Bergen, Norway.

The European Community Ship-owners Association and other regional bodies in the world, try to serve best not only the European but also the international trade and benefit the shippers and consumers in partnership. Some Training and Education in the Development of Integrated Marine Industry needs to be supported. A sustainable development, balanced in a global view, has to be on the forefront of policy implications in the IMP. In shipping there are views on personnel and/or automatisation on various elements of ships. Such efforts started to be demonstrated in the cars' industry (e.g. the Google Company is extending activities in the cars too).

Shipping and the promotion of IMP are also done on a bilateral basis. The role of China and Greece has on the one hand the Greek stakeholders with orders to the Chinese shipyards, which are going on, and on the other hand the Greek exports from Greece to China. Transport is taking place by Greeks via owned ships, which are keeping the first position globally among the ship owners in the number of ships and dwt.

The IUCN and the Oceania Regional Office of Suva, Fiji, refer to the four major threats already discussed about the oceans and the Pacific including: pollution, habitat destruction, overfishing and overexploitation, and climate change. All stakeholders have to take them into consideration (22).

The Conference in Beijing by PIM33 caused useful co-operation among the participants and thus made contribution of science, security, diplomacy, and sustainable development, regarding studies and future about the oceans.

ACKNOWLEDGEMENT

Appreciation and gratitude is expressed, to the Government and people of China for their kind hospitality and particularly to the hosts: the State Oceanic Administration (SOA) and also to the Shanghai Maritime University, where there was another International Conference on "The Future Challenges to Coastal Cities". The author of this statement, in the past, had also another interesting visit to China on an NGO trip related to environment.

REFERENCES

(1) "Water: Preserving our Oceans", 122nd Assembly of the Inter-Parliamentary Union, 30 March 2010, Bangkok.
(2) Dr. Oliounine, Iouri, IOC/UNESCO, referred to it, during the Beijing Conference PIM33, *Handbook and Programme*, September 2010.
(3) The Beijing Declaration, by Pacem in Maribus XXXIII, September 2010.
(4) In October 2010, H.E. the Prime Minister of the People's Republic of China, Wen Jiabao visited officially countries with eight Ministers of his Government, starting with Greece. In the monthly *Greek Statesman*, No 5, October 1978, it is written that, according to the then Minister of Foreign Affairs of Greece George Rallis was stated also "...we are the first European country with which China is signing a cultural agreement, but because we believe that our two countries, although they are geographically far apart, both have histories of ancient civilizations which have survived to this day". Mr. Huang Hua, then Minister of Foreign Affairs of the P. R. of China, extended to the then Prime Minister Constantinos Karamanlis (later elected President of the Hellenic Republic) invitation on behalf of the China Chairman then Hua Kuo-feng. The exchanges between the two countries were extended and in 2009, before the October elections for the Greek Parliament, the important Chinese company CISCO established co-operation with the Port of Piraeus. In addition, CISCO already supports the work of the Shanghai Maritime University.
(5) United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (including Marine Science), at: http://pemsea.org/pdf-documents/unclos-report2010.pdf, accessed: October 2010.
(6) Crichton, Michael, *The State of Fear*, New York, 2004.
(7) *Le Temps*, Geneva, 3 April 2007.
(8) Kinnas, Yannis N., "Human Security, Climate Change, and Small Islands, in Brauch, Hans Guenter et al. (Eds.): *Facing Global Environmental Change*, Vol. 4, Springer, 2009.
(9) Spiegel on Line, "Boon to Global Shipping: Melting of Arctic Ice Opening up the new Routes to Asia", 27 September 2010.
(10) The BBC notices on the website at, Plankton declining across oceans as waters warm. http://www.bbc.co.uk/go/em/fr/-/news/science-environment-10781621, accessed: October 2010.
(11) Speech from the Prime Minister of Canada Stephen Harper, 10 March 2010.
(12) The three 1992 Rio Conventions with a Joint Liaison Group meetings are: CBD, that is the Convention on Biological Diversity (2010 the Year of Biodiversity); the UN Convention to Combat Desertification; the UNFCCC of the Climate Change. On the other hand, the three so-called 'Trade' Conventions have also to be considered. They are all mentioned MEAs; the Montreal on Ozone, CITES, and the Basel Convention.
(13) Cherry, Collin, "Thoughts on the 'Communication Explosion' to the Future of World Order", *International Relations*, vol. III, No 8, November 1969, in the Journal of the David Davies Memorial Institute of International Studies, London.
(14) The Secretary General is now under his second term of duties reappointed in the IMO.
(15) "Availability of whale ship strikes folder", at: <http://www.iwcoffice.org/sci_com/shipstrikes.htm>, accessed: August 2010. Information provided by Mr. Alexandre de Lichterwelde, Brussels.

(16) The 5th Global Conference on Oceans, Coasts and Islands, UNESCO, Paris, May 2010, <http://www.globaloceans.org>, accessed: May 2010.
(17) *German Times*, May 2010.
(18) http://ec.europa.eu/maritimeaffairs, of the European Commission, accessed: August 2010.
(19) Zammit Cutayar, Michael retired from the position he had in 2005. After the Conference in Copenhagen (2009), the current Executive Secretary for the UNFCCC is Ms. Christiana Figueres.
(20) Hill, Anthony, Pacem in Maribus XXXIII, *Handbook and Programme*, page 34.
(21) Prigogine, Ilya, *Le fin des certitudes*, Editions Odile Jacob, Paris, 1996; Australian Academy of Technological Sciences and Engineering, *Climate Change Science: Current Understanding and Uncertainties*, February 1995.
(22) The Pacific Ocean 2020 Challenge: <http://www.iucn.org/about/union/secretariat/offices/oceania/oro_programmes/oro_initiatives_pac2020/>, accessed: October 2010.

Ocean Water Cycle and Global Warming

Prof. Wu Lixin
Physical Oceanography Laboratory, Ocean University of China

ABSTRACT

Water vapour constitutes Earth's most significant greenhouse gas, accounting for about 95% of Earth's greenhouse effect. The oceans contain 96% of water on the earth, account for 86% of the global evaporation and 78% of the global precipitation, and thus play a critical role in regulating the global water cycle and the earth's greenhouse system. Changes of the source-sink pattern of the ocean water cycle can impact profoundly on the ocean circulation, global heat transport, and the Earth's climate system. Yet, most research programs on the global water cycle so far do not treat properly the oceans' roles.

Observations demonstrate an acceleration of the global water cycle as the global temperature rises dramatically over the recent several decades. This is also revealed in ocean salinity which increases in the global subtropical and declines in the middle and high latitude oceans. This talk will discuss how the changes of ocean water cycle in warm climate affect ocean circulation, climate and greenhouse system from a coupled perspective. Observational platforms to improve our understanding of this key scientific issue will be also discussed.

The Role of the Regional Seas Programme for Climate Change and Oceans

Prof. Nilufer Oral
Faculty of Law, Istanbul Bilgi University, Marine Law Research Centre, Istanbul, Turkey

ABSTRACT

The much anticipated COP 15 of the UNFCCC held in Copenhagen in December 2009 was one of the largest global meetings of States and heads of States in recent history. After two weeks of drawn out negotiations ending in impasse the final result was disappointing. The "Copenhagen Accord" a so-called last minute effort by heads of states of just a select few of the major economies failed to produce the necessary consensus and only with the last ditch attempt to salvage the conference the British delegation proposal to simply "take note" of the Copenhagen Accord was accepted. After spending millions of Euros and thousands of human hours with so little in result the inevitable query was whether the traditional approach of large global negotiation conferences could succeed to meet the herculean task of climate change or whether new Solutions and approaches were called for.

Climate change is a multi-faceted, multi-disciplinary complex environmental challenge the boundaries of which seem to expand progressively. The impacts of climate change are virtually ubiquitous. While it is difficult to make a qualitative judgment as to where the greatest impact of climate change risks will be felt, there is no question that the impact of climate change on the marine environment is, and will be, extremely important. The dire consequences of sea rise on coastal communities coupled with its adverse effects on marine life portend serious threats to the quality and sustainability of the livelihoods of the millions of people living on or near coastal areas. The economic and social difficulties that adaptation to the adverse effects of climate change create and the challenges of mitigation will create new stresses to local and national governments, both developed and developing. The COP 15 meeting may have offered a glimpse into the new stresses of climate change. That is why new approaches to addressing the multiple risks of climate change must be assessed, especially in the aftermath of the failed traditional approach represented by COP 15.

One such approach, especially in dealing with the adverse impact of climate change on the marine and costal environment in enclosed and semi-enclosed seas, is the regional approach that has been implemented by the UNEP Regional Seas since 1974. The advantage, and one of the principal justifications of the regional approach, is it takes into account the special concerns and characteristics of a specific region. Moreover, it offers a more manageable forum with fewer states involved in the negotiation process, especially if they share common concerns. The importance of the regionalism was recognized during the historic UNCLOS III and resulted in the adoption of Part IX of the 1982 Law of the Sea Convention, article 122-123, exhorting cooperation by coastal States bordering the same enclosed or semi-enclosed sea.

The present paper will briefly examine the history of regionalism, how it can be applied in addressing climate change issues with a specific focus on the marine and coastal dimensions. The paper will examine in greater detail the advantages offered by the existing UNEP Regional Seas Programme in addressing climate change issues for regional seas. The paper will conclude by making recommendations as to how climate change can be incorporated into the existing UNEP Regional Seas Programme.

Threats to Coral Reefs, Fisheries and Food Security: A Call for more Marine Protected Areas (MPAs) established and effectively managed under the Coral Triangle Initiative (CTI)

Prof. Nor Aieni Haji Mokhtar
National Oceanography Directorate, Ministry of Science, Technology and Innovation, Malaysia

ABSTRACT

Tropical marine and coral reef ecosystems are vulnerable environment resources that are valuable to marine lives and ecosystems as well as to human beings. They serve as food sources, nurseries and breeding grounds for coral reefs fishes and other marine life such as pelagic and migratory species. They also have important ecological values where coral reefs could protect and maintain the health of mangroves and sea grasses and act as a natural barrier thus preventing shoreline erosion from occurring. Corals and marine life appreciation provide significant economic values in the form of goods and services for the livelihoods, food security and health of millions of people. Many countries benefitted on the fisheries as well as marine tourism industry through an effective management of their Marine Protected Areas. However, the marine and coastal resources of many countries are under significant threats where the stocks are depleting due to the fast expanding population, economic growth and international trade. It is estimated that over 70-80% of Southeast Asia's coral reefs are currently under threat primarily from coastal development, unsustainable, over-fishing related activities and climate change.

This paper addresses our concern on the recent episode of coral bleaching that is associated with the El-Nino and the changing climate due to the rise in sea surface temperature at certain areas of the popular dive sites in Malaysia. Our aim is also to highlight the framework of regional cooperative programs for capacity building in understanding the inter-related roles of the climate and oceans on the state of health and biodiversity of the marine ecosystems. IOC-UNESCO, as it celebrates its 50th year Anniversary provides the platforms through the sub-Commission in the WESTPAC, and others such as APEC, ASEAN as well as Coral Triangle Initiative (CTI) programs that could arise and adapt to this challenge. As a focal point for CTI Malaysia, we will focus on one of the Goals under CTI that has been designated and prioritized under the Regional and National Plan of Action.

PARALLEL SESSION – THEME 2

ROLE OF OCEANS IN SUSTAINABLE DEVELOPMENT

Saturday, September 4th, 2010
08.30 – 12.30 hrs
Beijing Raffles Hotel
Beijing, People's Republic of China

CO-CHAIR: Dr. Werner Ekau, Leibniz Center for Tropical Marine Ecology, Director of IOI Germany

CO-CHAIR: Dr. Shi Ping, Director-General, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences (CAS), China

RAPPORTEUR: Ms. Antonella Vassallo, IOI HQ, Malta

Japanese Initiative on Integrated Ocean Management and Sustainable Development

Mr. Hiroshi Terashima
Executive Director, Ocean Policy and Research Foundation, Japan

ABSTRACT

The UNCLOS regime parceled up vast and originally integrated ocean spaces of up to 200nm from shorelines and entrusted the management of these spaces to individual coastal states. While the preamble to UNCLOS states that "…the problems of ocean space are closely interrelated and need to be considered as a whole," it does not necessarily provide a concrete framework for how states are to coordinate and cooperate in securing a legal order on the oceans, for promoting peaceful use, conserving natural resources, and protecting the environment.

Although Japan is surrounded by the ocean, it has strong fishing and maritime industries, a long tradition of ocean research and development, and entrusted with the world's 6th largest EEZ/CS by UNCLOS, its contributions to ocean governance under UNCLOS and Agenda 21 had been uninspiring. Japan, however, has recently taken rapid, concrete steps to form its own comprehensive ocean policy, with a Basic Act on Ocean Policy proposal being adopted by the Diet after being submitted by MPs from a multi-partisan group. Why change is now starting to come about, is that responses are being demanded to questions about the need for the conservation and management of ocean resources, the need for more ocean anti-pollution measures, the coordination of the increasing and competing claims for ocean and coastal usage, and the need for guaranteeing safety and security in waters around Japan and for maritime transport.

The main impetus behind this movement was "the Proposal for a 21st Century Ocean Policy", prepared by the Ocean Policy Research Foundation and presented to then Chief Cabinet Secretary in November of 2005. OPRF, along with the Nippon Foundation, made a formal application to the ruling Liberal Democratic Party to consider the proposal. The LDP agreed to push for submission of the Basic Ocean Law bill at the next Diet session. Building on this, at the initiative of the LDP, it was decided to form a multi-partisan Basic Ocean Law Study Group, which began meeting in April 2006. The Study Group consisted of many political leaders, scholars and experts in various ocean fields, and observers from relevant government ministries and agencies. OPRF served as Secretariat for the Group.

The Ocean Law Study Group, after an exhaustive discussion of ocean policy, the systems necessary for its promotion, and the contents of a Basic Ocean Law, succeeded in establishing a common understanding and views on the Guideline for Ocean Policy, setting out the goals and enunciating a guiding philosophy and, based on these, presented the general form and substance the Law would eventually take. The text of the Basic Bill on Ocean Policy was then drafted, based on the Ocean Policy Guideline by the Study Group. The bill was presented to the Diet by MPs from ruling and opposition parties and enacted smoothly in April 2007. The Basic Act on Ocean Policy came into force in July 2007. I will introduce the background, contents, and challenge of the new Japanese Basic Act on Ocean Policy in my presentation.

Ocean and Coasts Wealth, Economy and Research

Dr. Iouri Oliounine
IOC/UNESCO, Paris, France

ABSTRACT

All calls to the Governments for financial support will fail or response will be at the lowest level if decision makers do not understand the benefits of investing. Proposals are of little value unless they are supported by concrete justification of the expenditures made.

The purpose of this paper is to demonstrate in what way a huge wealth of the ocean and its coasts can be used to impact the economic growth of the nations and why the high investment in ocean research and monitoring is cost effective.

We know that the ocean resources are huge but how big are huge? We know that marine related activities are often major players in the ocean economy but what is included under the term marine related activities? A comparison is made of the estimate of the ocean wealth as presented in different publications.

Our knowledge of ocean economy is still very fragmented and with many gaps. There is a need for more information and understanding of the economic role and potential of marine resources including the need for the assessment of the non-market benefits of the ocean. An attempt is made to determine and measure the economic input of ocean activity based on the studies made in some developed countries.

Ocean science and research are considered as a bridge between the ocean wealth and economy. Without science and technology, many of the resources of the oceans and coasts remain beyond human reach. It is difficult to achieve economically and ecologically sustainable use of the resources and have a sustainable profitable ocean economy without science and research driven by justified needs and proven benefits.

Their impact on the wealth of the ocean and on national and regional economics is demonstrated through several examples based on public data sources. It is emphasized that there is a need for increased funding for science and improved institutional arrangements to address more effectively the issues related to ocean economy including building the critical mass and human capabilities to conduct relevant research.

INTRODUCTION

It will not be an overstatement to say that the ocean and its coasts are the key to sustainable development of the world.

The oceans can offer us – food, jobs, the potential for alternative energy sources, rich mineral resources that are largely untapped and new science of biotechnology.

In her book “The Oceanic Circle: Governing the Seas as a Global Resource” (1), the founder of the IOI, Elisabeth Mann Borgese, gave the following definition to the wealth: (it is) “a composite of resources, whether living, genetic, non-living or spiritual, capital, labor or services”.

In the same book she presented the list of marine related industries and services which comprise the oceans and coasts wealth, developed on the basis of the state of the ocean exploration and available data, as of the end of the 90-ies. Although a complete and accurate assessment of the ocean and coasts bounty has never been done, in the years after the publication of the Oceanic Circle there were several studies made by which scientists and economists have tried to give their own views on the diversity of the wealth.

The result of a comparison of a dozen available lists is in an integrated list presented in Table 1.

Table 1: Oceans and Coasts Wealth – Resources and Related Services and Industries

- Living Resources (fishing and farming, seafood processing)
- Non-living Resources (offshore minerals, coastal building materials, oil and gas)
- Biotechnology (pharmacology, medicinal products and cosmetics from algae, seaweed, crustaceans and other living creatures)
- Coastal/Marine Constructions (ports and harbors, docks, pipelines, rigs, aqua cities, lighthouses, etc)
- Ship and Boats Building and Repair (civil, naval and recreational)
- Tourism and Recreation (hotels and motels in the coastal zone, marinas, recreational fishing, aquariums, whales watching, diving, underwater photography, etc)
- Renewable Energy (winds, tides, waves, ocean thermal energy conversion)
- Desalinization (fresh water production)
- Transportation and communication (seas-borne trade - passengers and freight, tugboats, cables, related services)
- Research, Technology and Education (educational establishments, scientific institutions, research laboratories, seamanship and aquaculture training, etc)
- Government and Defense (navy; coast guards; ocean related maritime planning, regulation and policy; rescue and safety; mitigation and management of natural disasters, etc)
- Manufacturing of Marine Equipment (marine navigational, sensing and imaging equipment; data collection and transmission equipment, etc)
- Environmental Services (water quality and biodiversity assessment and management; reducing marine pollution, sewage and dumping; management of wetlands, mangroves and coral reefs; development of marine natural reserves and MPAs; preserving coastal resources, etc)
- Financial and Business Services (insurance. coastal real estate)
- Marine Archeology (underwater heritage)

Marine-based activities also provide social security of creating jobs and wealth for people and business directly involved in these services and industries. In fact the ocean economy in many coastal countries is the largest employment area, e.g. in 2004 in USA alone there were 2.3 million people employed comprising of 1.6% of the nation's employment (2). In Europe maritime industries provide jobs and prosperity, and produce an annual income of billions of Euros and generate around 5% of the European GDP (3).

It is obvious that while applying the list to concrete geographical regions national and regional specifics should be taken into account and some other industries may be included, e.g. in Canada it may be logging, in New Zealand the Americas Cup yachting regatta, etc.

There are certain limitations in the use of this list. This list does not distinguish between marine based activities that are extractive or non-extractive, are used or non-used, or that they enhance or degrade the marine environment. It does not include spiritual and cultural values of the oceans and coasts.

There is also a certain overlap and duplication in the list, e.g. pipelines for oil and gas may be included under construction and transportation; marinas – under construction and tourism; search and navigation equipment – under transportation, technology and manufacturing of marine equipment; development of MPAs – under government and environmental protection.

For decision makers, economists, planning institutions and scientists it is not enough just to name ocean related industries and services. There is a need to know the worth of marine and coastal resources in order to justify expenditures for their exploitation and use. By identifying the value of the wealth they are able to decide how much more the oceans and coasts can take. They will also be able, using the value of the ocean and coasts economic contributions, increase understanding on the consequences of the impact of external events (such as climate change, sea level rise, degradation and destruction of natural resources and pollution) on economic growth and prosperity.

In Table 2 there are estimates of the worth of the Global Ocean Economy based on published data. The difference in estimates is huge, results are doubtful and the accuracy is low.

Table 2. Estimates of the Worth of Global Ocean Economy per Year

- USD 1 trillion	GDP, IWCO, 1998
- USD 7 trillion	EMB, 1998 market value of ocean-related and ocean-dependent industries
- USD 18 trillion	Costanza, 1997 (11) coastal and marine ecosystem goods and services
- USD 20 trillion	UNDOALOS, 2002 combined value of ocean ecosystem in goods and services

Elisabeth Mann Borgese estimated the total market value of ocean-related and ocean-dependent industries, on the basis of her table of resources, as being around USD 7 trillion per annum. At the same time the combined value of the ocean ecosystem in goods and services are conservatively estimated by UNDOALOS in 2002 at over USD 20 trillion per annum (4).

We may say a priori that the values are strongly underestimated, as they do not include non-market values for ocean and coastal resources which are at the minimum hundreds of billions of dollars per year and likely much more. In Florida alone, the non-market value of seven selected marine related activities range from approximately USD 16.5 to USD 53 billion per year (5).

The estimates do not reflect the latest findings in fast progressing new ocean-related industries of high economic value such as renewable energy, biotechnology, non-living resources exploitation, new discoveries of deep water creatures of economic value and some others. Here are just a few findings of the last decade to justify my statement:

- Living Resources: After 10 years of research and the work of more than 2,000 scientists from 80 countries nearly 17,650 species of animals, including corals, crabs and starfish, were identified living in the depths of total darkness at least 5 km beneath the surface of the Oceans.

- Non-Living Resources: In 1997, Australian scientists announced the discovery of what they believe to be the richest gold deposit ever found. The gold is contained in “black smokers” – volcanic chimneys found on the ocean floor. They are also rich in arsenic, cadmium, copper, mercury, silver and zinc. India has proved natural gas reserves of 1.05 trillion cubic meters with the bulk coming from offshore regions.

The discoveries made on the shelf of the Russian Arctic raise hope that two gas (Stockman and Rusanov) and one oil (Prirozlomnii) fields will be able alone to produce annually more than 300 billion m3 and about 2-3 million tons, respectively (6).

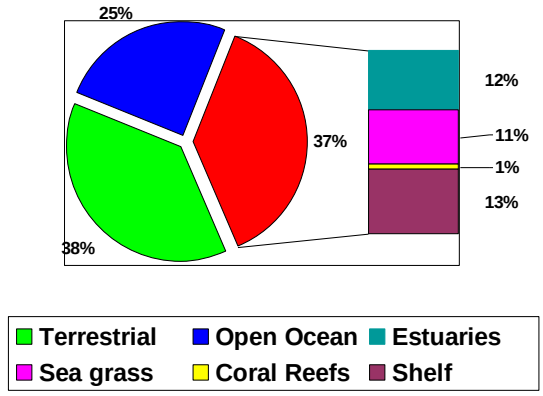
- Renewable Energy: The European Energy Association states that “the global theoretical potential of ocean energy has been estimated at over 100,000 TWh/year (as a reference, the world’s electricity consumption is around 16,000TWh/year)” (7). There is over 100,000 MW of offshore wind capacity under development in European Waters. The European Commission expects the creation of 2.8 million jobs by 2020 from the renewable energy industry in Europe (8).

- Biotechnology: In 1999 the pharmaceutical market was estimated with a value of USD 330 billion, while the cosmetic market was worth more than 200 billion per year (9).

- Desalinization: In 2001, there were more than 15,000 ocean desalination plants with a total production capacity of nearly 6.2 bgd (10).

Comparing the distribution of the global gross domestic product (GDP) between three ecosystems (coastal, marine and terrestrial) one can see from Figure 1 that the total input from the coast and ocean economies is almost two times higher than that from terrestrial and the terrestrial input of 38% equal to that of the coasts (12).

Figure 1. Input of the coasts and ocean economies to the global economy in comparison with the terrestrial input



The extent to and manner in which the world economy benefits from the wide range of marine and coastal activities are still to be understood.

More than 10 years have passed since the publication of the Elisabeth Mann Borgese book. More and more people in the world recognize the ocean sector as an engine to growth. Our appreciation of the ocean economy and its importance is now better comprehended by the public and governments.

However, as Mr. Pavan Sukhdev, the Head of Deutsche Bank Global Markets Business in India said in 2010: “We are still struggling to find the value of nature…This lack of valuation is as we are discovering, an underlying cause for the degradation of ecosystems and the loss of biodiversity”. To close this knowledge gap the valuation of resources and inputs of marine-related industries and services to national economies is now going on in several countries.

The results of some valuations are presented in Table 3.

Table 3. Comparisons of Ocean/Coastal Resources and Services Input to the National Economies

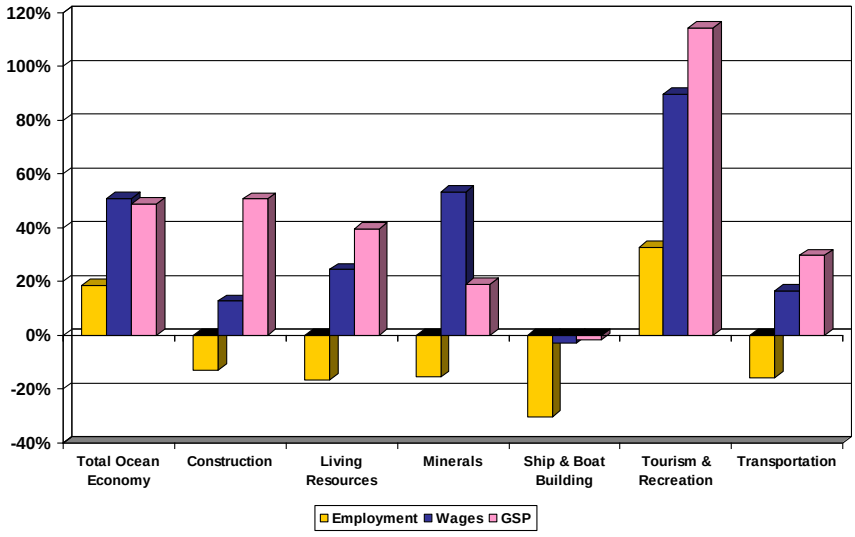
• USA	Colgan	2004	USD118 bln	1,2% GDP
• USA	NOEP*	2009	USD138 bln	
• Canada	RASCL	2004	C$22,7 bln	1,5% GDP
• NZ	SNZ	2006	NZ$3,3 bln	2,9% GDP
• Australia	Allen	2004	A$26,7 bln	3,6% GVA**
• Uruguay	Gorfinkel	1998	USD2,2 bln	8,4% GDP
• UK	Pugh and Skinner	2002	&39 bln	4,9% GDP
EU Total	European Strategy for Marine and Maritime Research	2009	USD140-230 bln	3-5% GVA**
. China	Zun Zhihui	2002	USD 100 bln	

* National Ocean Economics Programme
** The Australian and EU data is gross value added

The comparison shows that the contribution of ocean and coastal industries and services to national economies are very high from 1.2 to 8.4% of GDP and the net annual benefits range from USD 138 billion to 2.2 billion.

Although traditional ocean-related industries like fishing, coastal and marine construction, and shipping continue to remain significant, the ocean economy, in accordance with Charles Colgan's valuations made for the USA (13), is becoming more and more the tourism and recreation economy (Figure 2). This tendency is also valid for other countries.

Figure 2. The Ocean Economy is Becoming the Tourism & Recreation Economy



Only in the Mediterranean the number of tourists as estimated by the World Organization of Tourism, will reach 396 million people annually by 2025 (14).

In the 2007-08 Antarctic summers 45,213 tourists visited the Southern Ocean, compared to 35,552 in 2006-07 (15).

In Australia more than 1.8 million tourists visit the Great Barrier Reef, spending an estimated USD 4.3 billion on reef-related industries from diving to boat rental (16).

In 2004 the annual marine tourism and recreation contributed USD 6.2 billion or 4.9% of New Zealand's total GDP. The number of international visitors participating in marine recreation activities in 2002 was more than 1,694,933 (17).

Although the tourism boom gives great input to national economies it also has negative effects as it increases pressure on the coastal environment, destroying coastal ecosystems, such as wetlands and coral reefs, pollutes beaches and coastal waters, and contributes to depletion of water resources.

The shift towards greater emphasis on marine resources economics mirrors the convergence of several major trends in recent history, and among them the extension of EEZ to 200 nautical miles and integrated management of the marine environment. As it was shown above there is still much to do.

One area of ocean economy that has not been collectively measured or examined is the contribution of marine science/research and education institutions, as enablers of long-term priorities, to provide countries with enduring social, environmental and economic wealth from the oceans and coasts.

As Wendy Watson-Wright wrote (18): "The policy-makers have two particular requirements from science: (1) science advice on actions which will improve the situation in the short term, so they can say (and show to the public) benefits of the policies they implement; (2) science support to make their policies credible to the public, so the public will support adoption of the policies, and compliance with them after they have been adopted."

Environmental concerns will continue to be an increasingly important driver of ocean science. Today, climate change, seasonal events like El Nino, depleted fisheries, nutrient enrichment, harmful algal blooms, dying coral reefs, coastal water pollution, and other environmental challenges are driving a larger share of the investment in marine research. Economic data will be required to take policy decisions.

Researchers are warning that due to business, 60% of coral reefs will be gone, 80 to 100 billion-dollar fishery industry will be devastated which will, as a result, eliminate the prime source of protein for nearly a billion people. Those losses will likely total to trillions of dollars. Over the next 50 years ocean acidification will likely shrink jobs and revenue for commercial oyster, clam, and other shellfish operations.

The changing marine environment and our improved understanding of it are also influencing the focus of marine research. Improvement of the short- to medium prediction services for maritime conditions would improve the value of maritime industries and services by a few percent, e.g. for European fisheries the benefits are of the order of 3%. Only in Australia the fishing industry improved weather information could produce benefits of up to USD 27 million per year (19).

Recent advances of science and research in ocean observation technology, establishment of GOOS, access to high performance computing, advanced robotics, links to remote sensing programmes, modeling of waves, ocean currents and related parameters, the successful demonstration of the systems like BlueLink developed in Australia for ocean and weather forecasting (20), has shown that the ocean forecast can be delivered to users reliably and at affordable costs.

Scientific knowledge and technical capabilities in the marine environment help to expand national economy in order to avoid being confronted with a shortage of raw materials, be unprepared to face coastal and ocean natural hazards, and developing marine resources to advance economic growth. Among governments, industries and private sector enterprises there is a clear understanding of the need to commit financial resources for funding research, education and technology development efforts.

Within the 6th Framework Programme of the European Commission for research and development, more than 600 million Euros of European funding has been provided towards research projects in the marine domain (21). In the new ocean science and technology strategy for Canada published in 2007

(22), which advocates a need for the ocean science and technology partnership, it is proposed to invest USD 75 million for 2013 in order to achieve sustainability of Canada's USD 10s of billions of ocean economic potential.

Science and research help identify the needs and show the ways of meeting them. In their turn education and training as well as technology development are driven by these needs. The global interest indicates a burgeoning market for technology that collects, processes and distributes marine information.

Only in Canada in 2006 a conservative estimate market value of marine technologies to collect ocean data was USD 2 billion per year with the spending expected to be about 5 billion over the next 5 years which gives a profit at the level of USD 1 billion each year (22).

Scientists help raise awareness and make people better understand the consequences of climate change, create adaptation strategies and plans, and develop preventive measures. There is a need to ensure that the role of scientists in effective and sustainable ocean governance is clearly understood and appreciated by decision-makers and sponsoring organizations. Lack of attention to the recommendations of scientists always results in huge socio-economic losses.

Disasters in the last decade, such as the hurricanes Katrina and Rita in 2005 with total damages of USD 85 billion; earthquake and Indian ocean tsunami of December 2004 with a death toll of more than 300,000 lives and total damages and losses estimated by the World Bank at the level of USD 4.45 billion; the Exxon Valdez accident with the value of losses of USD 4 billion; and the 2010 Deepwater Horizon spill which will be many times more costly, proof the above mentioned statement of the importance of listening to and following the recommendations of scientists.

In the 70-ies and 80-ies of the last century it was the Law of the Sea which brought wide recognition to the IOI activities. In the 10-ns of this century it could be the oceanic circle of Elisabeth Mann Borgese which encompasses all individuals and entities that rely on the ocean – to conduct operations, extract raw materials, transport goods and services, pursue leisure activities and derive non-use benefits like the enjoyment of natural scenery and world life conservation.

There may be a few areas where in the years to come the IOI may play a key role and be of profound importance, be innovative, effective and useful:

- promotion of the unique value of coasts and oceans;

- assistance in the valuation/assessment of the value of the ocean and coastal resources, and in bridging the divide between academia and practitioners, between policy and research;

- awareness raising of the importance of science, research and education in the decision making process and in the formulation of marine policies;

- bringing economic issues into the IOI training programmes.

References:

1. "The Oceanic Circle: Governing the Seas as a Global Resource. A report to the Club of Rome. Elisabeth Mann Borgese, UNU Press, 1998, pp 240
2. Report of the National Ocean Economic Programme, 2009, USA
3. A Sea Change for Ocean Management – A European Strategy for Marine and Maritime Research, EC, 2009
4. Ocean Sources of Life. UNCLOS 20th Anniversary publication, UNDOALOS, 2002, N.Y.
5. Environmental and Recreational (Non-market) Values – what you should know (FAQs), NOEP, 2008, http://www.oceaneconomics.org/nonmarket/NMFAQs.asp
6. "Shelf of Barents and Kara Seas – new large resources base of Russia" by A.V. Borisov and others, http://geolib.narod.ru/Journales/OilGasGeo/1995/01/Stat/01/stat01.html
7. Ocean Power: Accelerating innovation in Ocean Energy Development. Proceedings of Power Conference, Lisbon, Portugal, 2-4 November 2009

8. “The Economic Opportunities Presented by Offshore Wind” by Garrett Connell, Proceedings of the NOW of Ireland Seminar on Economics of Ocean and marine renewable Energy Seminar, 21st April, 2010
9. A study into the prospects for marine biotechnology in the UK, London, Institute of Marine Engineering, Science and Technology, 2005, vol. I and II
10. “Supply from the Sea-Exploring Ocean Desalinization” by Jeff Szytel, Water and Wastes Digest, January 2006, vol.46, number 1
11. “The value of the world’s ecosystem services and natural capital” by Constanza, R.R. and Others, 1997, Nature, London, 15 May
12. Why have a Global Programme of Action? UNEP, March 2007, http://www.gpa.unep.org/content.html
13. “The Changing Ocean and Coastal Economy of the United States” by Charles Colgan, Proceedings of the NGA Best Practices Conference, Waves of Change: Examining the Role of States in Emerging Ocean Policy, October 22, 2003
14. Atlas de l’Ocean Mondial by J.-M. Cousteau and Philippe Vallette, Paris, 2007
15. Southern Ocean Economy 2010. Economy Overview. http://www.theodora.com/wfbcurrent/southern_ocean/southern_ocean_economy.html
16. “Coral Reefs and Mangroves have high economic value” by Rhett A. Butler, January 2006 http://news.mongabay.com/2006/0124-reefs.html
17. New Zealand’s Marine Economy, 1997-2002 Report of the New Zealand’s Environmental Statistics Team (www.stats.govt.nz)
18. “Policy and Science: different roles in the pursuit of solutions of common problems” by W. Watson-Wright, Marine Ecology Progress Series, vol.300:241-296, 2005
19. Economics of Australia’s sustained ocean observation system, benefits and rationale for public funding, August 2006, Report for the Australian Academy of technological Sciences and Engineering
20. “Wealth from oceans: Currents of Change. Seven-day forecasts of ocean weather” by Brad Collis http://www.solve.csiro.au/0806/article1.htm
21. A Sea Change for Ocean Management – A European Strategy for Marine and Maritime Research EC, 2009
22. Prosperity through SMART Ocean Management. Enabling Canada’s Economic Future through a New Ocean Science and Technology Strategy for Canada. OSTP Report and recommendations, February, 2007

IOI-Brazil, working from local communities up to the global level

Prof. Eduardo Marone
Director of IOI South Western Atlantic Ocean, Brazil

ABSTRACT

Originally a research institution, CEM is today a full university centre, dedicated also to education at undergraduate and graduate levels and with strong extension actions. These broad activities are reflected at the IOI Operational Centre (IOI OC), which is deeply involved and associated with its host institution doings.

The Brazil OC initiated its work at the beginning of the new century, basically by contributing the spreading of IOI's ideas at the local and regional levels, by supporting educational activities and by attracting young students and scientists to marine related issues. Early after IOI-SWAO begun to act, we were deeply involved with the Women, Youth and the Sea project, which is being carried on by IOI as one of its flags activities.

The IOI team was formed and proper leadership was established and the University hired specialists in social and environmental sciences, attracting students with fellowships, by the program, to complete the group.

After the first year of diagnosis, the local community, at the Peças Island village, in the Paranaguá Bay, Paraná State, Southern Brazil, was selected for project implementation. The second action was to work closely with the local women, mostly fisher-women, and with the youth and children of the local school. Once the bridges were constructed, further actions were proposed in four lines: identifying the village's problems; organizing the village women for community work; organizing the fisher-women association, and expanding the universe of youth and children.

Looking for partnerships, the IOI team was able to solve, with the help of Engineers without borders, among others, the provision of potable water, with the construction of a small but automated water supply and purification system. Other problems, identified and solved, was the sanitation in domestic sewage and solid waste aspects, creating with the direct participation of the community, a treatment system, based in root ponds purification, and organizing the recollection and recycling of solid waste on the Island, with several partnerships, including the State sanitation company. To improve the local populations' livelihood, community kitchens were organized, always targeting local women who operate them, as well as the handicraft association, with the help of government agencies.

The improvements were not just offering some training and giving them some tools, but were also based in empowering the women, which was done by creating the local fisher-women association, helping them to participate at the State Level committees and, finally, at the National Level, where one of the fisher-ladies is today a National leader, with some international new projection.

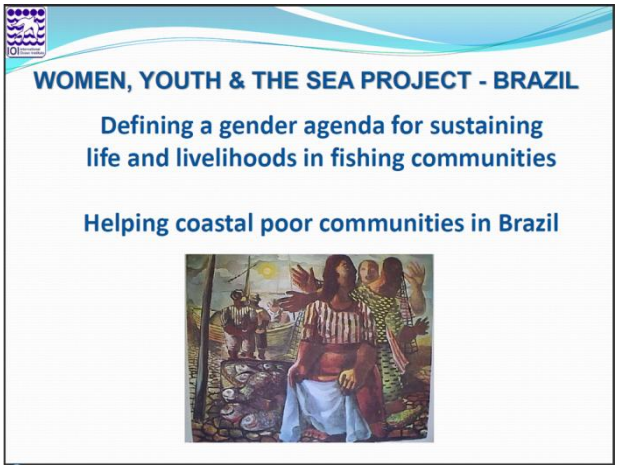
Today, it seems that the "act locally – think globally" behaviour is not enough to face the challenges posed by climate and global changes and that helping the local less favoured coastal population is not sufficient to ensure a better and sustainable livelihood for those human populations.

Because of that, the IOI-SWAO team has expanded its activities, and begun to catalyze works at the regional level, by participating in the Millennium Assessment follow-up Project (UNEP), with India, South Africa and other Brazilian institutions, evaluating the ecosystem services and human well-being at coastal national levels and, once this step is performed, comparing these three tropical/sub-tropical countries in a regional base.

At the global level, IOI-SWAO scientists are now carrying out a research project aimed at evaluating the potential changes in ocean and atmosphere dynamics affecting human activities, as sea transportation, harbouring, coastal and sea oil exploitation, etc., under a Lloyds' Research and Education Trust (LRET) fund, cooperating with similar institutions in Canada, United Kingdom, Australia and others in Brazil.

Due to the slow actions that are being carried out at the higher levels around the world, it is not enough, for individual scientists and institutions, to act locally thinking globally to effectively contribute to improve human well-being while global changes continue to occur, threatening the ocean, and all Earth, environments. Actions at all scales are truly needed.

POWERPOINT PRESESENTATION



GENERAL OBJECTIVE

The general objective of the project is to contribute to poverty mitigation and social inclusion of the small-scale fishing communities.

LINES OF ACTION

1. To develop adequate sanitation solutions as a model to be replicated in isolated coastal communities.
2. To enhance fisher people organization and mobilization, focusing in women as they are key actors for their communities' defense and development.
3. To share our experience with other IOI centers and regional institutions.

IOI/OC-SWAO TEAM:

Coordinators:
Naína Pierri, Man Yu Chang and Tamara Van Kaick.

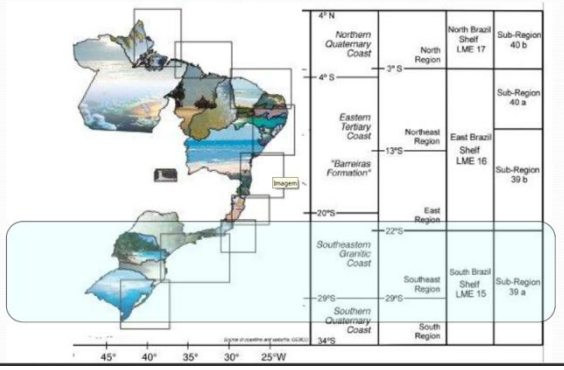
Collaborators:
Ana Franco, Milena Kim, Tathiana Almeida, Juliana de Oliveira, Carolina Mello, Paula Salge, Alexandre Arten, André Cattani Gabriela Santos, André Santiago, Edna Wisnieski, Rafael Engelhardt, Natália Tanno, Samuel Dourado.

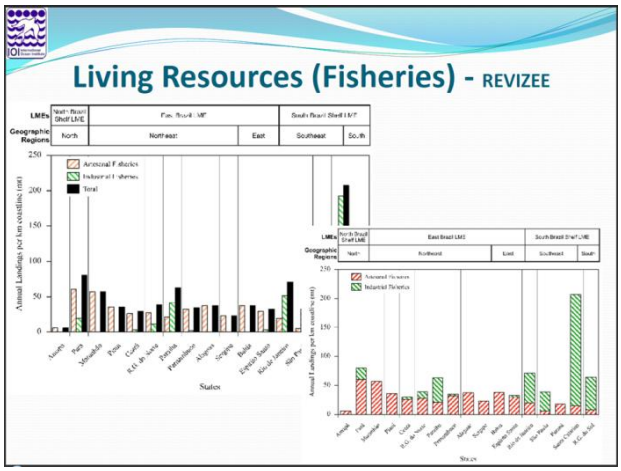
MOVING TO REGIONAL

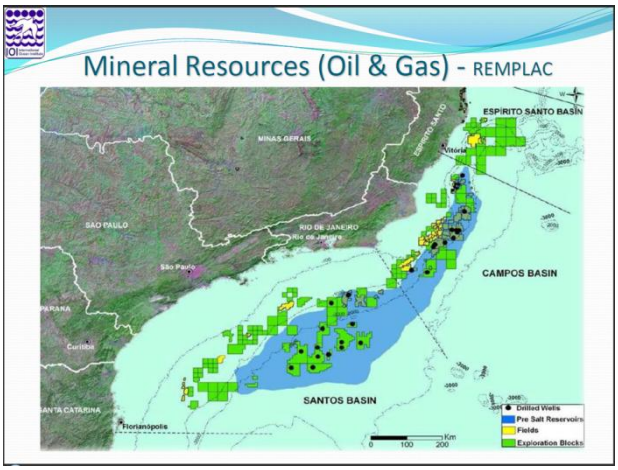
The Millennium Assessment Follow-up IBSA comparative SGAs

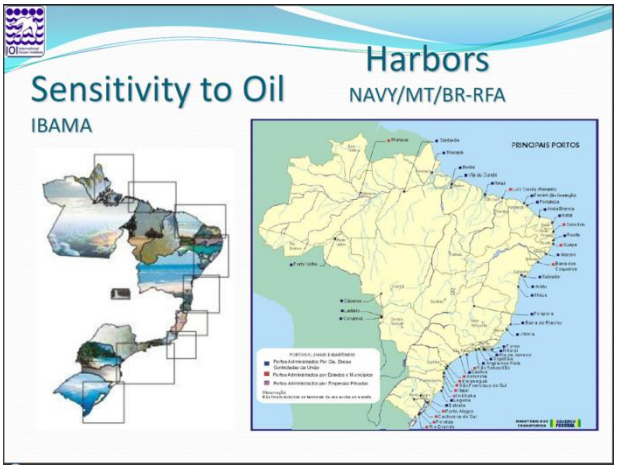
- Comparison of the India-Brazil-South Africa cases would be a powerful "natural" SGA experiment
- The IBSA are similar enough to be compared
- And different enough so that comparisons yield useful lessons
- Scales, and their interactions, from inter-regional to local can be studied

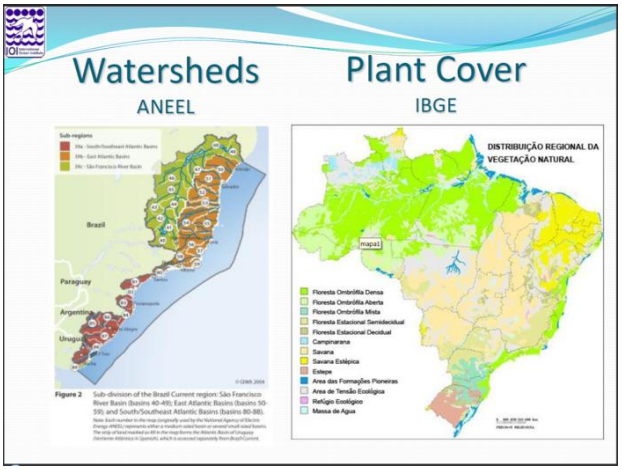
Study area – southern and southeastern coastal areas of Brazil

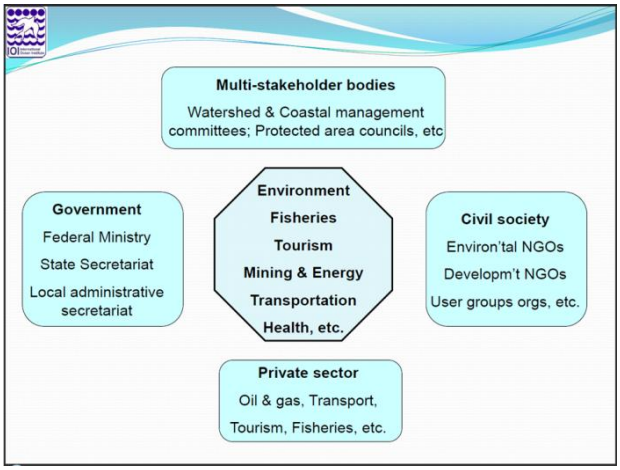



Living Resources (Fisheries) - REVIZEE
LMEs
Geographic Regions
North
Northeast
East
Southeast
South
Annual Landings per km coastline (mt)
Artesanal Fisheries
Industrial Fisheries
Total
States


Mineral Resources (Oil & Gas) - REMPLAC
ESPIRITO SANTO BASIN
MINAS GERAIS
SÃO PAULO
RIO DE JANEIRO
CAMPOS BASIN
PARANA
SANTOS BASIN
SANTA CATARINA
Florianópolis
Drilled Wells
Pre Salt Reservoirs
Fields
Exploration Blocks
Km


Sensitivity to Oil
IBAMA
Harbors
NAVY/MT/BR-RFA
PRINCIPAIS PORTOS


Watersheds
ANEEL
Plant Cover
IBGE
DISTRIBUIÇÃO REGIONAL DA VEGETAÇÃO NATURAL
Brazil
Paraguay
Argentina
Uruguay
mapal
Floresta Ombrófila Densa
Floresta Ombrófila Aberta
Floresta Ombrófila Mista
Floresta Estacional Semidecidual
Floresta Estacional Decidual
Campinarana
Savana
Savana Estépica
Estepe
Área das Formações Pioneiras
Área de Tensão Ecológica
Refúgio Ecológico
Massa de Água


Multi-stakeholder bodies
Watershed & Coastal management committees; Protected area councils, etc
Government
Federal Ministry
State Secretariat
Local administrative secretariat
Environment
Fisheries
Tourism
Mining & Energy
Transportation
Health, etc.
Civil society
Environ'tal NGOs
Developm't NGOs
User groups orgs, etc.
Private sector
Oil & gas, Transport, Tourism, Fisheries, etc.


UP TO GLOBAL LEVEL

LLOYD's RESEARCH & EDUCATION TRUST PROJECT LRET

Global Networking to Improve Prediction of Extreme Marine Events

DALHOUSIE UNIVERSITY
Inspiring Minds

THE UNIVERSITY OF MELBOURNE

General Coordination: Dr. Keith R. Thompson

National Oceanography Centre, Southampton
UNIVERSITY OF SOUTHAMPTON AND NATURAL ENVIRONMENT RESEARCH COUNCIL

UNIVERSIDADE DE SÃO PAULO

CEM UFPR

Marine transportation, oil and gas exploration and exploitation, and the development of coastal infrastructure all depend on the prediction of extreme marine events.

For example, efficient marine transportation depends on accurate short-term (1 to 3 days) forecasts of marine winds and surface waves; safe operation of oil and gas operations requires forecasts of extreme currents with the potential to damage significantly offshore platforms; and coastal communities located in low lying areas are dependent on accurate forecasts of storm surges to mitigate the effect of flooding.

There is growing evidence that extreme marine events are becoming more likely in some regions, and that the problem is likely to increase over the next century.

International Network of researchers from Canada, Australia, the U.K. and Brazil to:

(a) improve short-term forecasts of extreme marine events, and

(b) estimate the frequency of extreme marine events over coming decades with realistic measures of uncertainty. The network will develop new models and statistical methodologies, train graduate students

and postdoctoral fellows, and present the results in a way that is useful for scientists, users and the general public.

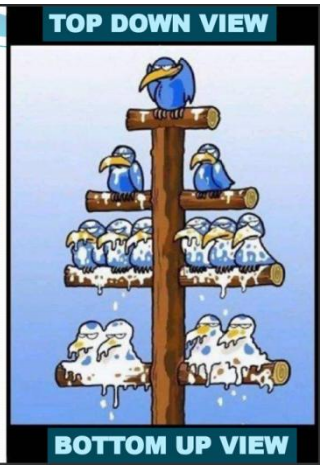
- Top-down & bottom-up
- Think globally act locally

Approaches

Are not enough

MULTI-SCALE THINKING AND ACTIONS NEEDED

THANKS YOU!



Sea Area Management and Marine Economy Sustainable Development

Dr. A. Dong
Deputy Director-General, Department of Sea Area Management, SOA, China

ABSTRACT

China is a big country with both land and sea. Vast marine resources will play a growing important role in easing the contradicted process of the population's constant growth and the growing shortage of resources. In 2009, GOP accounts for the ratio to 9.53% of the GDP, and the marine economy has become an important growth point of national economy. In this paper, we take to ensuring the costal areas' social economy and the sustainable development of the marine economy as the main line. In an objective analysis of the marine economic development status, characteristics and status of marine management, and then objectively evaluate the base, demand situation and obstacles of the marine economy's sustainable development. Finally, from the point of ensuring the sustainable development of the marine economy by sea area management to think about some questions, such as achieve space optimal configuration of marine resources through marine function regionalization.

Towards Integrated Coastal Management (ICM) in Japan

Ms. Masako Bannai Otsuka
Director of IOI Japan & Contracted Researcher, Ocean Policy and Research Foundation, Tokyo, Japan

ABSTRACT

Introducing Integrated Coastal Management (ICM) into the local coastal communities has always been one of the important missions of IOI since Elisabeth Mann Borgese drafted Chapter 17 of Agenda 21 with Alicia Barcena in the early 80's.

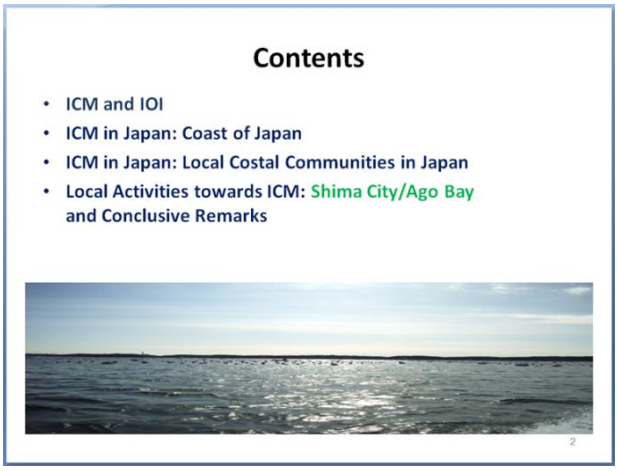
For Japan, a country with a long coastline of more than 35,000km, and half of its population residing in coastal cities, ICM is a major issue to be implemented. From the 1950's to the 80's, when Japan enjoyed fast economic/industrial growth, many of the coastal areas were used for industry. Without being identified as important, eco-systems were ignored under the name of development and disaster prevention. At the same time, first industries were also seen as unexciting fields, as compared to second and third industries. As a result, with economic recessions since the 1990's, small local communities were left behind, as youth migrated to the city, population decreased, the elderly increased, the economy was downsized, and eco-systems deteriorated.

Some people started to become aware of the necessity of ICM, and various trials of Coastal Management were applied, but it was difficult to be "Integrated" for various reasons. In 2007, Japan's Basic Ocean Law was enforced with Article 25 to implement ICM. Under the leadership of Mr. H. Terashima and the strong support from Dr. T.E. Chua, the Ocean Policy Research Foundation initiated the introduction of ICM into Japanese coastal areas.

Among the local governments, Shima City, Mie Prefecture and Hinase, Okayama Prefecture showed a strong interest in introducing ICM to their community in order to revitalize their economy and to sustain their ecology. Being located within the Ise-Shima National Park, Shima has been one of the most popular spots for tourist attractions, blessed by its scenery and seafood, but it is also suffering from the deterioration of the sea after over a hundred years of pearl culture, which was created there. The Mayor, after having participated in a PNLG (PEMSEA Network of Local Governments) meeting in 2009, decided to introduce ICM in their 5-year plan. And Hinase, a fisherman's district where Ocean Farming is about to be introduced, is searching for better integration with other sectors.

The process of introducing ICM into Japanese local communities is expected to strengthen the decision-making process among stakeholders.

POWERPOINT PRESENTATION



1. Integrated Coastal Management (ICM) and International Ocean Institute (IOI)

- ICM has been one of the important missions of IOI since Elisabeth Mann Borgese, the founder, co-drafted Chapter 17 of Agenda 21 with Dr. Alicia Barcena, now UN Executive Secretary of the Economic Commission for Latin America and Carribean.
- It is written in Programme Areas (a) of Chap. 17

  Integrated management and sustainable development of coastal areas, including exclusive economic zones;

3

2. ICM in Japan: Coast of Japan

- Some 35,000 km coastline with 6852 Islands
- About a half of population live in coastal cities

4

ICM in Japan is necessary because…

- Many of the local coastal communities are left behind with various problems:
  - downsizing of economy hits the local communities
  - first industry such as farming/fishery became unpopular among the young generation
  - youth migration to the city
  - decrease of population
  - increase of aged people (aging society)

A Data from a Typical Local Costal Communities in Japan (Himi City)

- Population gradually decreased by 25% in 60 years
  70,149 in 1950 → 53,679 in 2009
- Population growth rate from 1999 to 2000
  Himi -3.59% vs. Tokyo + 2.43%
- Population over 65 years old
  25.8% in 2002 → 27.9% in 2007 cf. Tokyo 18.3% in 2005
- Number of stores and their sales amount
  FY1985 : 1,131 (71.6 bil. yen) → FY2007 : 754 (62.3 bil. yen)

ICM in Japan is based upon…

- UN Convention on the Law of the Sea

"…the problems of ocean space are closely interrelated and need to be considered as a whole…" (Preamble of UNCLOS)

- Chapter 17 of Agenda 21

"The marine environment-including the oceans and all seas and adjacent coastal areas- forms and integrated whole that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development."

- Japan's Basic Ocean Law (July 20, 2007)

Article 25 (1) "The State shall take necessary measures for the coastal areas… in integrated manner upon natural and social conditions…"

7

ICM Project by Ocean Policy Research Foundation sponsored by The Nippon Foundation started in FY2010

- Several model sites will be chosen where local governments show their interests and wills to take initiatives.
- OPRF will provide help the local government to have stakeholders meetings and to plan ICM vision and programmes for implementation.
- OPRF will provide opportunities of human resource development for the local government.
- OPRF will make documentary film to enhance interests and understanding on ICM for local governments and citizens.

One of the first model sites in Japan will be:
Shima City/Ago Bay

Demographic features of Shima City

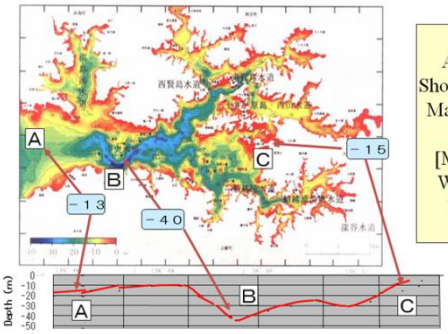
Area:179.7 km2
Population: 51,213 (2006)
Population 2006/1965 : 96.2%
Population over 65: 24.6% (2007)
Population under 15: 12% (2007)

5 towns merged in 2004
The whole city is located in the National Reserved Park Area

Demographic features of Ago Bay

Area: about 26km2
Average depth : 10m
Depth of Bay mouth: 12m
Depth in the middle: 40m
Semi-enclosed Sea

Depth Profile of Ago Bay



Area: 26 km²
Shore line: 140 km
Max depth: 40 m

[Mouth of bay]
Width: 1.7 km
Depth: 12m

10

Shima City/Ago Bay has attracted tourists…

- Famous for pearl oyster cultivation
- Blessed with precious sea food incl. abalones, Japanese lobsters and oysters
- The whole city is located within the National Reserved Area
- Scenic sightseeing spot close to Ise Shrine

11

But… environmental pressure from pearl cultivation

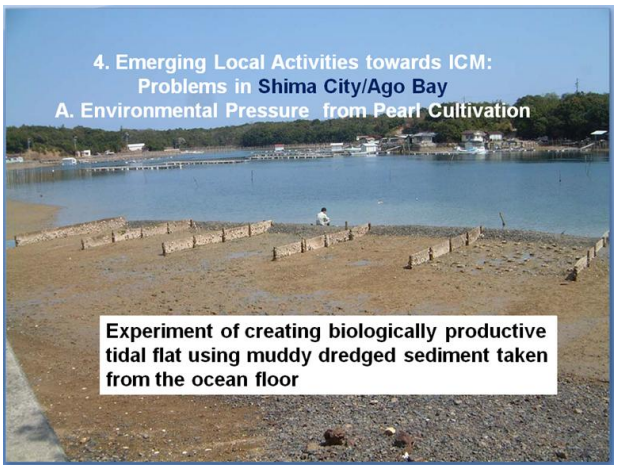
- More than 100 years of pearl oyster culture gave environmental pressure to the Bay
- Red tide and hypoxia occur every year
- Restoration of polluted semi-enclosed sea became essential

12

Shima City

- The Mayor of Shima City decided to introduce ICM :
  - participated PEMSEA Network of Local Governments
  - revised the latter half of their 10-years plan by introducing ICM
  - special team in the city
  - (networking Prefecture, Central Gov.)
  - revitalization of environment by various stakeholders

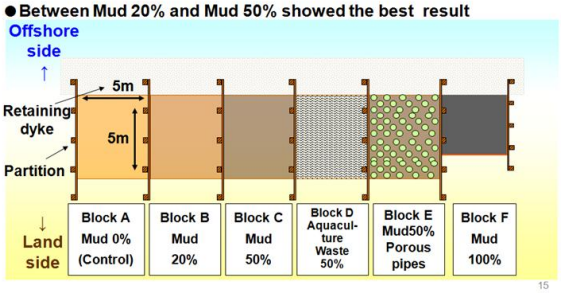
4. Emerging Local Activities towards ICM:
Problems in Shima City/Ago Bay
A. Environmental Pressure from Pearl Cultivation



Experiment of creating biologically productive tidal flat using muddy dredged sediment taken from the ocean floor

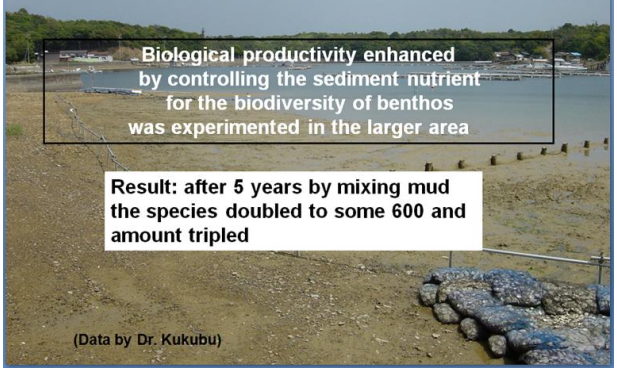
Experiment to find the good sediment condition (Data by Dr. Kokubu)

- Divided into six experimental blocks
- Monitored sediment quality and abundance & diversity of macro benthos for 3 years
- Between Mud 20% and Mud 50% showed the best result



15

4. Local Activities towards ICM: Problems in Shima City/Ago Bay A. Environmental Pressure from Pearl Cultivation

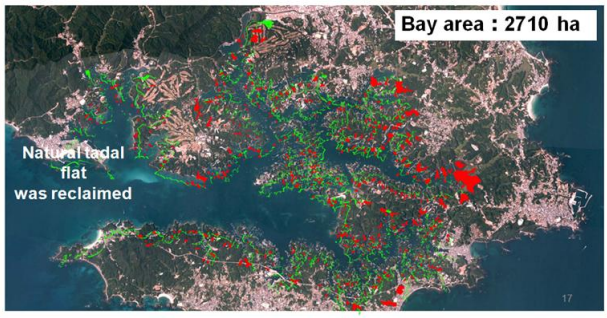


4. Local Activities towards ICM: Problems in Shima City/Ago Bay B. Reclamation of Tidal Flats

: Existent tidal flat : 84 ha

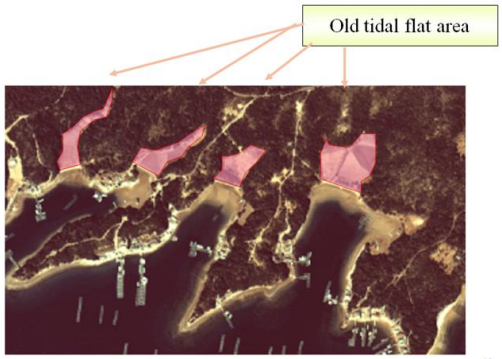
: Reclaimed tidal flat : 185 ha

About 70% of tidal flat and shallow area were reclaimed



17

4. Local Activities towards ICM: Problems in Shima City/Ago Bay B. Reclamation of Tidal Flats (Data by Dr. Kokubu)



18

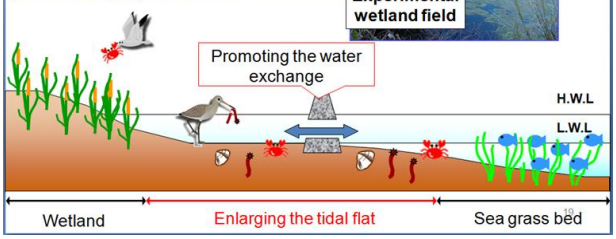
4. Local Activities towards ICM: Problems in Shima City/Ago Bay B. Reclamation of Tidal Flats

Restoration of the Unused Wetland (by Dr. Kokubu)

Problem: inner area - eutrophication and outer area - oligotrophy

By promoting the water exchange by using the pump, water exchange improved both water.

・The tidal flat area increased



19

4. Local Activities towards ICM: Shima City/Ago Bay

Establishment of Ago Bay Nature Rehabilitation Committee after finishing 5 years of JST (Japan Science and Technology Agency) Project

1) Development of New Technologies
2) 5 promises for Ago Bay among residents

1: Decrease the amount of dirty inflow from the land to the Bay
2: Do not pollute the Sea floor
3: Enhance the biodiversity and increase the purification power by the Sea
4: Take fish and shells from the sea
5: Treasure Ago Bay (enjoy the Bay in various forms such as sea-kayaking, observation of lives)

4. Emerging Local Activities towards ICM:
Shima City/Ago Bay

- Community members including pearl oyster breeders recognize their problems as very serious ones and they are the must to be solved, not only from ecological point of view but also from economic development point of view.
- They recognize that the problems should be solved by multiple stakeholders for their economic and eco-system management.
- Community members have made efforts to tackle their problems through: 5 year- JST program + Nature Rehabilitation Program + Health Check Project by Ocean Policy Research Foundation
- Communities are quite ready and active towards ICM including the Mayor, City officers, Fishermen, Researchers, and local NGO members.

21

4. Emerging Local Activities towards ICM:
Shima City/Ago Bay

- There is a lot of possibilities multiple sectors working together: e.g. tourism+transportation+fishery, fishery+environment, tourism+environment+transportation in integrated ways.
- Now the local government is very much keen on applying the PEMSEA ICM system and take initiative.
- The Mayor decided to participate PEMSEA 's PNLG (PEMSEA Network of Local Government for Sustainable Coastal Development) meeting to be held in Nov. 2009 in the Philippines.
- They feel secured to have Basic Ocean Law which is backing up their ICM activities as a domestic legal base.
- The declaration of 25% cut of greenhouse gas emission by 2020 compared to 1990 base by the new government will also be a help. With better communications, individuals in the community will be able to enjoy contributing for all.

22

23

China's Marine Economy and Regional Coordinated Development

Prof. He Guangshun
Deputy Director, National Marine Data and Information Service (NMDIS), SOA
and Prof. Wang Xiaohui
Director of the Marine Economy Division of NMDIS, SOA, China

ABSTRACT

The 21st century is the century of the ocean. Coastal nations have implemented the development of marine economy as the state strategy one after another and marine economy has become a new realm of world economy today. Since the 1980s, China's coastal region has started an upsurge in marine development, with diversified patterns of development. Marine economy with the 12 major marine industries, i.e., marine fishery industry, offshore oil and gas industry, marine mining industry, sea salt industry, marine chemical industry, marine biomedicine industry, marine electric power industry, marine seawater utilization industry, marine shipbuilding industry, marine engineering architecture, marine communications and transportation industry and coastal tourism, as core, has entered a period of rapid development. In 2009, China's gross ocean product was approaching 3.2 trillion Yuan, accounting for nearly 10% of the national GDP. The growing rate of marine economy in 2001-2009 was 1.3 percentage points higher than the national economic growth rate in the corresponding period. The marine economy has become an important part of national economy.

During the "Eleventh Five-Year Plan" period, the Party Central Committee and the State Council planned the implementation of the strategy of the "eastern region taking the initiative in development". Since then, China's eastern coastal region has entered a new stage of historical development. With the successive approval of coastal region plans, the layout of economic regions constituted by-the three major economic zones of the Round-the-Bohai Economic Zone, Changjiang Delta economic Zone and Zhujinag Delta Economic Zone and a number of small economic zones represented by the Liaoning coastal Economic zone, Tianjin New Coastal Zone, Blue Economic zone of the Shandong peninsula, Coastal Region of Jiangsu, Western Coast Economic Zone of Fujian strait, Beibu Gulf Economic Zone of Guangxi and International Tourist City of Hainan has basically taken shape.

In the face of the current situation of China's marine economic development and the unprecedented opportunities for development in the coastal region and how to display the role of marine economy in the coordinated development of regional economy will become the focus of China's marine economic research in the coming period of time. Therefore, this paper elaborates the 2010 marine economy in the regional coordinated development, and the current situation of China's marine economic development and the existing problems, and puts forward counter measures and suggestions on promoting China's marine economy and regional coordinated development.

Progress and Prospect of Climate Change Impacts on Fisheries

Dr. Jin Xianshi
Deputy Director-General of Yellow Sea Fisheries Research Institute, CAFS, China

ABSTRACT

Climate changes affect the overall productivity of marine ecosystems, from the physical environment to plankton, fish and mammals. The impacts occur from the diurnal vertical movement to long-distance migration, from day variation to tens of years' fluctuation in the population dynamics through all life stages of wild stock that directly influence the yield of the fishing industry. Pelagic fish may be more sensitive to climate change than bottom fish, such evidence is typically shown by the Peruvian anchovy, and California sardine. But all species will be affected through ecosystem changes. In the Yellow and East China Sea, many commercially important stocks largely fluctuated, such as the biomass of anchovy varied at 200,000 to 4.2 million in the past 20 years, and the habitat also changed. Yellow Sea stocks of the Pacific herring and Pacific cod also fluctuated mostly due to the climate changes. Meantime, climate changes will also affect the species in mariculture that need to reselect the suitable species to the changing environment, particularly in China, as the world leading mariculture country. Therefore, the relationship between climate changes and stock size, and the impact mechanism of the population dynamics need to be studied for adaptive fishery management.

Development and Promotion of Coastal Zone Management Women Leadership from National Level Policy to Local Management

Dr. Victoria Radchenko
Director of IOI Ukraine

ABSTRACT

Globally urged positive GDP dynamics associated both with traditional industrial growth, increased indices in IT, transport and trade, raise the risk of negative effects on environment. Thus, there is an increasing need in environmental information dissemination that will create a ground for the strategic planning and decision-making process in all of the sectors. To achieve the goals of coastal zone sustainable development and effective environmental protection, the development of partnership and cooperation is essential at all levels from national to local, from governmental representatives to leaders representing NGOs. Successful sustainable coastal zone management and conservation require a broad amount of social reformations able to deliver harmonization in the process of resource management with a principle innovation constituting an approach based on liberal economy ideology.

A clear understanding of differences and inequalities between women and men has to become a basis for new postindustrial economy, because their needs and interests - often quite different in relation to aquatic resources – have to be balanced in the structure of decision-making. Often coastal zone management decisions are made without the perspective and leadership of female stakeholders and professionals. Women are still the minority decision-makers in political processes, because women tend to have less access than men to formal decision-making authorities and to local decision-making structures, including those related to coastal management.

The present political practice demonstrates that in many cultures women are accepted as most successful anti crisis managers. Despite their small representation among governmental and high-level management staff, the role of women is essential in the decision-making process, mostly because they have specific skills to overcome accumulated problems. Gender equity became a part of the governmental policy in Ukraine. There is a set of legal documents supporting gender policy in Ukraine: Constitution of Ukraine (Art.24), Decree of President of Ukraine (On improvement of work of central and local governmental authorities in relation of the equal rights of the women and men) from 26.07.2005, Law of Ukraine (On provision of equal rights and possibilities of women and men) from 08.11.2005, etc. However, gender inequality doesn't disappear after the adoption of provision of the Constitution and other legal documents. A set of factors have an impact on women's leadership. There are political cultures of society, media, social and economical factors, traditions, stereotypes as well as their interaction.

In Ukraine women are leading in the number of employees in healthcare, education, culture, but at the same time women don't have the same possibilities as men. There is inequality in social positions of men and women. Ukraine holds the 117th position in the world by the level of women's participation in the political world and the 61st position by gender equity. There are only 8% of women-deputies in the Ukrainian Parliament. Thus, it is important to have the possibility to share knowledge and experience of women leaders, to discuss most emerging issues and to train women to be leaders in the coastal zone management process at all levels from national to local, from governmental representatives to leaders representing NGOs.

Coastal Community Social Accompaniment and Participative Model in Venado Island by Rose Marie Ruiz Bravo et al (*)

(*) Silvia Rojas Herrera; Oscar Juárez; May Brenes Marín; Isaura González
Andrea Barrantes; Gonzalo Mora; Assistants: Gabriela Ramírez, Raynier Urena, Daniel Lázcarez.

Prof. Alejandro Gutiérrez
Director of IOI Costa Rica, Universidad Nacional, Costa Rica

ABSTRACT

Since the year 2000 in Venado Island, Costa Rica, and more recently, in the Pacific coastal site of Costa Rica, Cabuya *(see figure 1)*, the Coastal Community Social Accompaniment and Participative Model has been developed, leading to very successful results in the context of poverty alleviation and sustained integrated coastal development. This model is what we detail in this paper.

INTRODUCTION

The logo in *Figure 2* shows exactly what this team of work has tried to achieve on this island. Two key elements are shown: a hand inside of which a spiral goes round and deeper into the community. The hand implies the needed but limited assistance the community needs from this team up to the point in which they can cope by themselves; the spiral represents the key methodology involving the main community stakeholders interacting together via a cyclic process; and finally, the deepening of the spiral implies the process going deeper and deeper into the community.

The model`s general background

This model is a result of the extension of cumulative work of all the professionals involved with it since the year 1975 at the Universidad Nacional and the governmental National Institute of Social Aid in an inter-disciplinary, inter-institutional community and participative way. In the year 2010, this model was proposed by the present central government administration as the poverty alleviation programme for the “least privileged communities”.

Guiding ideas

There are four basic guiding and indispensable elements the model requires *(see figure 3)*:

1- Strengthening of the individual’s integrated development;
2- Strengthening of the local organization’s and leaders’ development;
3- Promotion of a harmonious relationship between a human being and his/her natural environment;
4- Improvement of productive capacity.

These guiding ideas require the following strategic elements to be present:

- Income source diversification;
- Local management and organizational strengthening;
- Human training and formation, rescue of cultural values;
- Inter-institutionality;
- Inter-disciplinarity;
- Gender perspective;
- Accountability.

Structure of the Accompaniment Social Participative Model

As previously indicated, we could say this model's structure as shown in *figure 4* is a two way process starting with the guiding ideas, followed by the strategic elements, and the key methodology *(see figure 5)* ending with projects and activities to be developed.

Key methodology

Figure 5 shows the basic methodology we have employed. Note the two way feedback mechanism between steps present, exemplified with effective community work as follows:

- Insertion in the community:
  Sounding and interaction with social and institutional stakeholders.
- Participative diagnosis:
  As a formative process: SWOT, Focal Group, Workshops, Interviews.
- Strategic community action plan:
  A 5 year community participative plan with the local stakeholders.
- Community Assembly:
  Socialization, improvement and approval of the plan.
- Inter- institutional meeting:
  Negotiating the plan: priority projects and actions according to resources available, terms and institutional and community individuals in charge.
- Management and execution of projects:
  With the participation of community and institutional organizations: joint and continuous formative process.
- Human formation and specialized training:
  Permanent and parallel process.
- Follow up and accountability:
  With the community and institutional stakeholders.

Some impacts and achievements of this model

There are many successful impacts this work has accomplished throughout time, as for instance:

Social and educational infrastructure:

1- A road around the island;
2- Tele-high school building for the youth;
3- Two equipped health centres, one for each community of Venado Island;
4- Two kindergarten class rooms and a school dining room in the community of La Florida;
5- A primary school class room in the Eastern part of the island;
6- A 425 line residential telephone exchange, 6 public phones;
7- A community training room;
8- A shipyard in La Florida.
9- A house for the local police;
10- Two workshops for women's organizations, one in each community;
11- A soccer field including walls and nets;
12- A solid waste collecting centre and 4 more collecting sites around the island;
13- Remodeling of the Youth House and furnishing of an eco- tourism youth lodge, partly supported by the Costa Rica Social Aid Institute and UNDP;
14- House building and repair.

Productive projects as new alternatives favouring higher incomes:

15- Micro-enterprise and community organization training for women and youth with new productive ideas. Training on administration and management of these sectors;
16- Specialized training according to those strategic projects prioritized by the community;
17- Strengthening of local management favouring natural resources and solid waste management;
18- Improvement of formal education, by working with the schools' and tele-high school's directors and instructors;
19- A permanent action for establishing youth and productive organizations, in the communities of El Jícaro, Oriente and Florida;
20- Permanent work favouring artistic expression (dance, theater and arts);
21- Priority projects on physical and mental health for men, women, the young and infants;
22- A permanent process of personal and organizational empowerment through the promotion and the development of projects and specific actions in the context of human development according to the community's priorities;
23- Personalized or family care for those individuals with the most needs.

Prizes and Ackowledgements

Some of the following acknowledgements this model's university programme has been given up to now are pointed out in the following:

Local

1- To the Venado Island Youth Association. Prize to young enterprises. Youth office. Minister of Culture, Youth and Sports. 2003.
2- To the Venado Island Youth Association. Prize to Youth Projects. Social Aid Institute of Costa Rica. 2008.
3- Adoption by the Minister of Well-being and Family-IMAS of this model as a participative methodology favouring the current priority communities under poverty conditions. 2010.

International

1- To the Venado Island Eco-tourism Association. Environmental prizes. Ford Motor Company Foundation. Oyster production and preservation in protected areas. 2007
2- To the Integrated coastal community development program. Prize for Academic Innovation. Universidad Nacional and UNAM-México. 2005
3- Publication (being currently translated into English): "Social participative accompaniment: a convergence space for the community development". Ruiz. E.M. et al, Editorial EUNA-2008. Costa Rica.

The following Figures capture and document the Social Accompaniment and participative model in Venado Island.

Figure 1: Map courtesy of the ICT, Costa Rica

PDICC

Programa de desarrollo integral comunitario costero Isla Venado - Cabuya

Figure 2: Logo of the Integrated Coastal Community Development Program for Venado and Cabuya

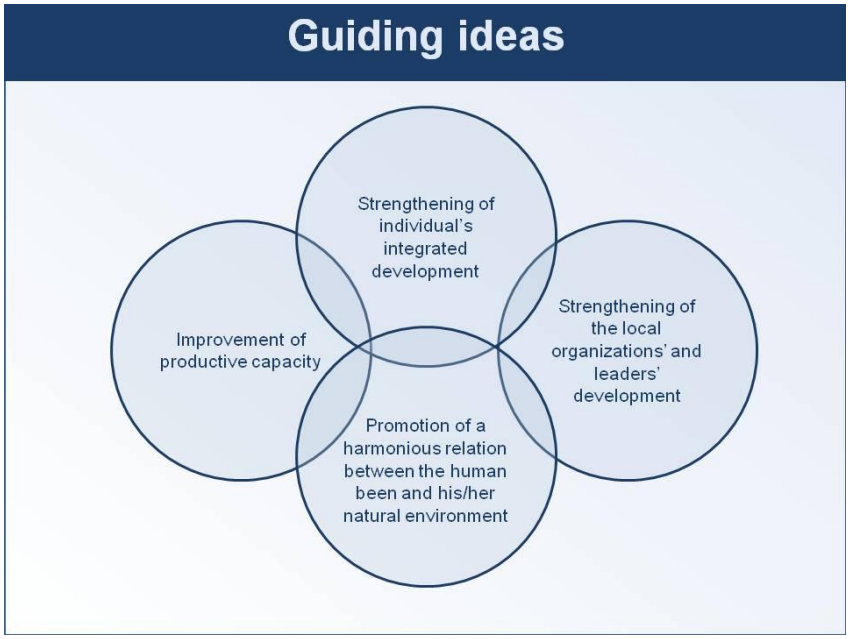


Figure 3: Model guiding ideas

Figure 4: Model structure

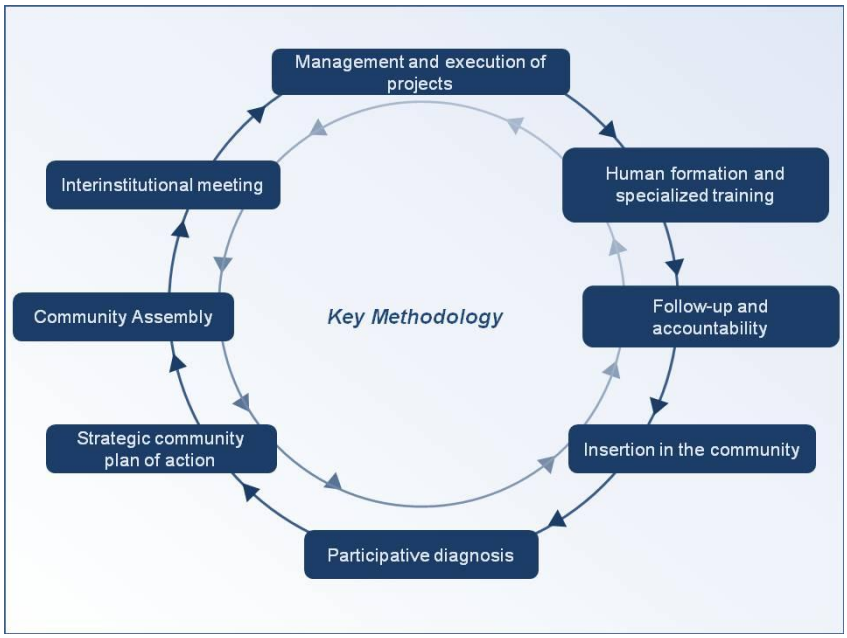


Figure 5: Model key methodology

Ocean and China's Sustainable Development

Dr. Qiu Jun
Research Fellow, China Institute for Marine Affairs, SOA, China

ABSTRACT

China is a major developing country with a large land area and a long coastline. China's huge population and shortage of natural resources are the main factors restricting its economic and social sustainable development. The ocean has played a key role in meeting the demand for natural resources for the development of China, especially in the coastal regions where more than 400 million people live.

There is a wide range of ocean resources in the ocean under Chinese jurisdiction. The development of these resources has resulted in an expanded marine industries group, which has become an important component of the general economy. In 2009, the gross product of marine industries was 3196 billion Chinese Yuan, which accounted for 9.5 percent of the national GDP, and 15.5 percent of the coastal GDP. A series of national level development programs for coastal regions have been issued in the last few years. It is believed that the implementation of these programs will bring China into a new stage of rapid development. On the other hand, China's ocean development is facing some problems, such as the marine environment degradation, jurisdictional fragmentation of ocean management, and menaces by marine disasters.

China has put issues of rational utilization and protection of ocean resources and the marine environment into its strategy for sustainable development. As expected, a developed China with blue sky and a clean and productive ocean is coming our way.

PARALLEL SESSION – THEME 3

CHALLENGES TO COASTAL CITIES

Saturday, September 4th, 2010
08.30 – 12.30 hrs
Beijing Raffles Hotel
Beijing, People's Republic of China

CO-CHAIR: Dr. Louis F. Cassar, Director of Institute of Earth Systems, University of Malta

CO-CHAIR: Dr. Jin Yongxing, Vice President, Shanghai Maritime University, China

RAPPORTEUR: Dr. Albert Caruana, Environment Projects Coordinator, Ministry for Resources and Rural Affairs, Malta

What We Know and Don't Know on Harmful Algal Blooms (HABs) in Coastal Eutrophic Systems? – Necessity of End-to-End Studies

Prof. Zhou Mingjiang
Research Fellow, the Institute of Oceanography, Chinese Academy of Sciences (CAS), China

ABSTRACT

Human activities, particularly the increasing production and use of synthetic fertilizer, have significantly changed the biogeochemical processes of the major nutrients, such as nitrogen (N) and phosphorus (P), and lead to nutrient over-enrichment and eutrophication in coastal waters. In many coastal regions, eutrophication has caused undesirable ecological changes and negative consequences, including massive algal bloom, anoxia/hypoxia, green tide, jellyfish bloom, and damage to fishery and aquaculture etc. Recent studies revealed that the phenomena of increased harmful algal blooms in eutrophic coastal waters had a close relationship with the change of nutrient regime in seawater, and that the altered ratio of nutrient supply in some typical eutrophic waters had resulted in more nuisance or harmful blooms of flagellates. Meanwhile, many consequences of eutrophication, such as hypoxia and jellyfish blooms, could be intrinsically related to the massive harmful algal blooms or the substitution of dominant species in the phytoplankton community, which causes the change of food webs in the area. Therefore, it was suggested that end-to-end studies from the source of nutrients overloading to the consequences of ecological changes be carried out in eutrophic coastal waters to understand the nature and impacts of harmful algal blooms, in which a well designed comprehensive field investigation and end-to-end modeling capability are prerequisite to making it realizable.

Contribution of a Coastal City State to National and Regional Mediterranean Vitality: the Example of the Principality of Monaco

Prof. Dr. Alain Piquemal
Vice-President of the University of Nice-Sophia Antipolis (France), Member of the National Council of the Sea (Monaco), Professor of Law of the Sea and Maritime Activities and Director of the Mediterranean Institute for Risk, Environment and Sustainable Development (MIRESuD)

Key words: marine scientific cooperation, Coastal City State, National Council of the Sea, extension of territory offshore, International Oceanographic Museum, International Hydrographic Bureau, ACCOBAMS Agreement, RAMOGE Agreement, PELAGOS Marine Sanctuary Agreement, integrated marine legal approach, protection of marine biodiversity, Mediterranean sustainable development, Yachting Ports.

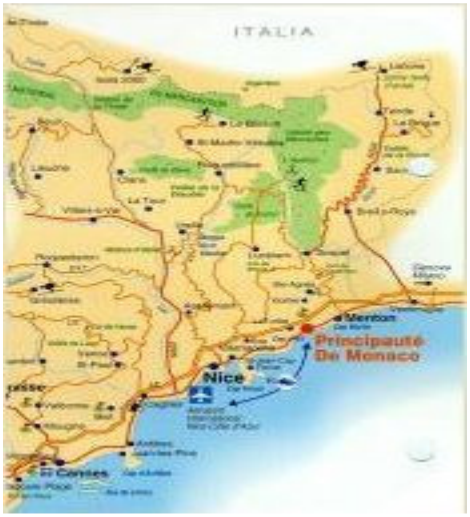
Abstract: Monaco as a Coastal City State, contributes greatly to the Regional Mediterranean Vitality through several actions (political, scientific, economic and legal).

Politics: in terms of regional marine cooperation for environmental protection (headquarters of the ACCOBAMS Agreement, great support for the RAMOGE Agreement, the PELAGOS Marine Sanctuary Agreement, and active participation to the activities of the Mediterranean Action Plan).

Scientific: creation of the Oceanographic Museum of Monaco and in 1960 of the Scientific Centre of Monaco (to equip Monaco with the means of undertaking oceanographic research of coral ecosystems) in relation to the climatic changes and of supporting the action of the governmental and international organizations charged to protect and preserve marine life. In 2008, the SCM was equipped with new missions by S.A.S Prince Albert II. Headquarters of the International Hydrographic Bureau (advisory and technical intergovernmental organization created to promote the safety of navigation and protection of the marine environment). Installation of the IAEA Environment Laboratories (IAEA-MEL) in Monaco (established in 1961 as part of the IAEA's Department of Research and Isotopes). It is the only marine laboratory within the UN system.

Economic: if Monaco is an important financial centre, the links between the Mediterranean Sea and national and regional vitality are growing via several public works: extension of the capacities of the Monaco Ports for the reception of luxury Yachting and Cruise Ships, a project to extend the territory offshore. In the search of processes respectful of the marine environment, Monaco developed maritime works of a new type whose first practical application was made in the work of the protection and extension of Port Hercule.

The Principality of Monaco is an Independent and Sovereign State bordering the Mediterranean Sea with boundaries with France.



Map - Principality of Monaco (photo Prince Palace)

(Photo du Centre de Presse – Monaco)

The Principality of Monaco is an Independent and Sovereign State bordering the Mediterranean sea with boundaries with France. Monaco is not a coastal mega-city: it covers an area of 2 square kilometers. 2 Km^2: about 100.000 acres of which is land reclaimed from the sea over the last 20 years.

The Principality is comprised of one municipality, Monaco: It's a *Coastal City State* and, even if Monaco is not a coastal mega-city its regional and international influence is important with respect to the protection of the Environment.

Monaco is a State and City open to the world, living in its heartbeat. Nearly 125 nationalities are represented. Of the residents, 28% are French, 17% Italian and 6% are British.

In the Mediterranean Sea, a semi-enclosed and very fragile sea, Monaco maintains its engagement with a national, regional and international challenge: to protect the Oceans in the perspective of regional sustainable development. But the challenge relates also to the protection against maritime risk (tsunami) and seismic activity because Monaco is located in a dangerous seismic zone.

Since the beginning of the 20th Century, the Princes of Monaco are distinguished in international fora for the development of Oceanography and the defense of the oceans. Prince Albert II is the only head of State to have visited the North and South Poles and his visit drew the attention of the international community to the effects of climate change.

Consequently, Monaco as a Coastal City State highly contributes to the Regional Mediterranean Vitality through several actions (economic and legal, scientific and politic).

1. Economic and legal maritime approaches contribute to the Regional Mediterranean Vitality:

Banking and finance (with more than 80 banking establishments, finance and management companies) show strong and regular progression in terms of asset management amounting to just over 78 billion Euros in 2007. But, if Monaco is an important Financial Centre, the links between the Mediterranean Sea and national and regional vitality *are growing through the implementation of*

several public works: extension of the capacities of the Monaco Ports for the reception of luxury level Yachting and Cruise Ships, and a project to extend the territory offshore. In the search of processes respectful of the marine environment, Monaco developed maritime works of a new type whose first practical application was made in the work of the protection and extension of Port Hercule.

PORTS LAW OF THE PRINCIPALITY OF MONACO: LIBERALIZATION CAN RECONCILE GENERAL INTEREST AND COMPETITIVENESS

Important port infrastructure work has led to the sensitive extension of capabilities of home ports in Monaco and has resulted in advances in the legal field. In order to maximize economic efficiency of the ports of Monaco, which is essentially devoted to pleasure craft and sports and recreation, legal measures resulted in *law No. 1.303 20 July 2005* laying down conditions of operation of ports, plus two port regulations, a general ports by ministerial order regulation and rules of procedure of ports, taken by the legal entity responsible for the exploitation of the port of Monaco. The Ports Law of 2005 is under the umbrella of the 1994 Code of the Sea, an Act built on an ***integrated approach of marine and maritime questions*.**

In terms of general principles that characterize the law No. 1.303 20 July 2005, two major orientations were chosen in order to ***promote "liberalized" management without sacrificing the general interest at the time:***

- Firstly, with regard to meeting the needs of management adapted to the expectations of users in maritime fora more open to international competition, the Principality ports operating conditions should allow implementers to make ***the best use of the rules of the market economy.*** The experiences and new port schemes in place, including in several European countries, expressed more concern for better satisfaction of growing and diverse user needs.
- Secondly, given the importance of port investment made by the Principality, the legal choice is a ***working structure of private law with a set of guarantees for the purposes consistent with the interests of the Principality management***. To meet an increased degree of competitive Mediterranean pleasure ports, the Ports Law has opted for a type of management entrusted to a “société anonyme monégasque”, a public limited company under the Monegasque law ("SAM").

The Port legal status has evolved substantially in recent years in this competitive perspective and that is how, in 1998, associations of the port law symposium conclusion was made in the following terms: "ports of the 21st century are considered to be more independent while on the other hand they are more subject to coordination and external control of commercial companies". The Port public service thus knows the deep change and the law of 20 July 2005 is part of this substantive perspective for Monaco ports to gain the necessary competitiveness to compete effectively in international competition.

The public limited company “SEPM” (Société d'Exploitation des Ports de Monaco) was founded in 2002 and since then it has provided the technical and commercial management of the ports of the principality. Fully held by the City-State of Monaco, it began its managerial activity on 1 January 2006.

However, both the concessions established legal balance state interference: the choice of the legal structure chosen, namely a limited company, has clearly expressed a choice to distinguish management pursued within a framework of private law and in the framework of a concession, Government and sovereign functions under the administration.

Chapter III of the Law provides the regulatory operation of ports. The device provided for in article 9 shows the ***separation required between exercise powers of police***, within the meaning of administrative law, public power represented by the Maritime Affairs Directorate and the Directorate of public security (titles III and IV of the Code of the Sea) and ***commercial ports management*** to be assured by the "SEPM".

This separation of tasks, duties and legal structures must however be accompanied by a convergence of legal texts of port management. In this respect, the law distinguishes: General Regulation ports from the public authorities by Ministerial Decree and setting out the provisions of the public mission

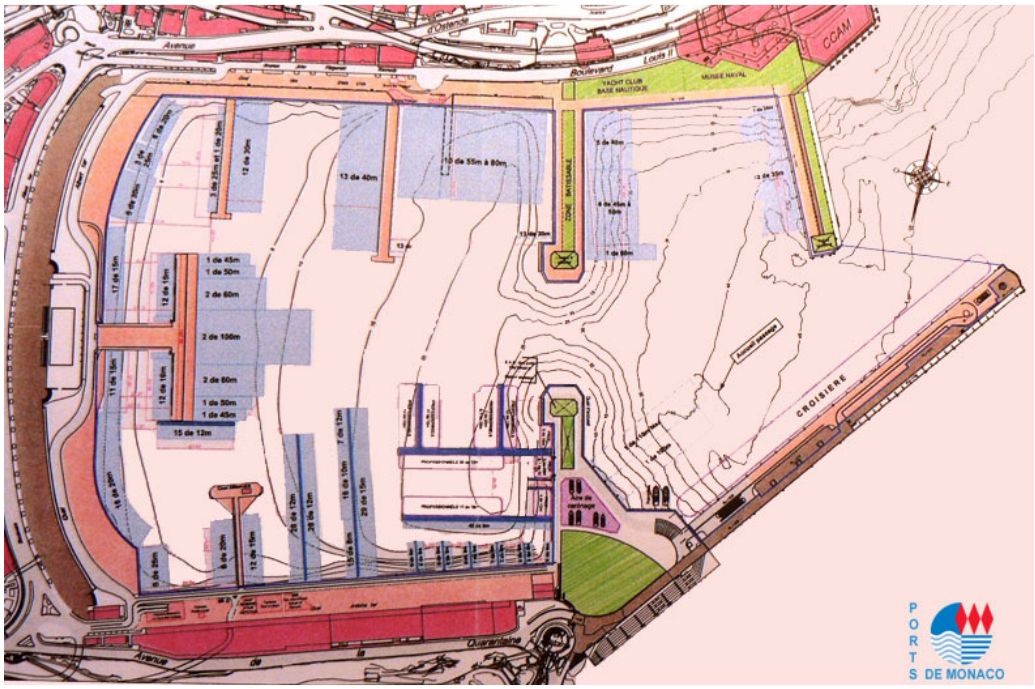
regarding the port State and internal, from the "SEPM" regulation whose purpose is to facilitate commercial ports for the purpose of making the above management more efficient. ***These provisions should not infringe the business management autonomy under the "SEPM" status, but constitute a simple measure application preserving the general interest of the Principality.***

Dualistic port rules reconcile the exercise of sovereign powers and commercial exploitation by an anonymous company.

In relation to the terms of *article 9 of law No. 1.303 of 20 July 2005* laying down conditions of operation of ports, two port regulations were designed in a complementary and "integrated" legal perspective:

- The ***General Regulations***: taken by the public authorities concerned by Decree, expresses the sovereign powers of the State, including police and international provisions. Even if in some points, the rules of procedure is to specify measures for the implementation of provisions contained in the General Regulation, fundamental principles, expressing concerns of general interest related to the public service of the port activity, are set out on the legal basis of a decree by the public authorities.
- The ***Rules of Procedure***: developed by the "SEPM" determines the set of rules for management ports of Monaco, in accordance with the *law of 20 July 2005* above and in accordance with the contract of concession of its specifications. The principle of prior approval of this regulation by the Minister of State allows public authorities to ensure consistency of both regulations as a whole.

The General rules are also an opportunity to translate into national law the obligations for transposition of international texts that Monaco is part of. With regard to port facilities and their uses, two texts drawn up in the international maritime organization have particular consideration: conventions MARPOL and SOLAS, the ISPS code is mentioned.



At the instigation of HRH Prince Rainier III, studies were conducted in the 1970s to better protect the stretch of water by placing, before the two existing piers, a new sea wall and a lee breakwater intended to provide the port with full protection from the swells of the eastern sector.

These studies were to lead to the construction of a colossal structure 352 metres in length and weighing 160,000 tonnes. ***It has the unique feature of being semi-floating in order to conserve the marine fauna and flora.***

The new sea wall also makes it possible to welcome major cruise ships (up to 300 metres in length). More than 206 cruises have been scheduled for 2008 and 245 for 2009. This new outer port also made it possible to create an additional dock for hosting some twenty yachts from 35 to 60 metres and two of 100 metres.

Inside the original port, HRH Prince Albert II, who continued the work his father started, wished to see the stretch of water undergo comprehensive redevelopment to make the port in Monaco the most modern and most practical marina in the western Mediterranean.

In 2006, S.A.S. Prince Albert II launched a ***new project of extension at sea*** with objectives accompanying the long-term development by the Principality of Monaco. On this occasion the Prince declared: *"The project of extension of the town planning of our territory crosses a new course… Our objective is to reach that point while respecting our environment, particularly the fauna and the flora of our marine zone. In this field Monaco must be exemplary and it will be".*

In conclusion to this economic and the legal Sea Approach**,** to facilitate an integrated marine management, we have to mention that Monaco had adopted in 1994 a ***"Code of the Sea"*** which determines in a global legal approach the shipping activities, fishing activities, protection of the marine environment. A Council of the Sea advises the Government on all legal texts relating to the sea and marine activities.

In the Mediterranean which is a semi enclosed sea, surrounded by developed and developing Coastal States, within a fragile ecosystem subjected to many natural and industrial environmental risks, Monaco, a Coastal City State, can be an example of Mediterranean sustainable development, protecting the marine environment and facilitating regional co-operation on the matter.

2. A Scientific approach contributes to the Regional Mediterranean Vitality:

At the instigation of His Serene Highness Prince Albert II, the Government of Monaco promotes sustainable development in the Principality, ***by focusing action on respect for biodiversity, the preservation of resources, the reduction of greenhouse gas emissions and a policy in favour of a sustainable city.***

Prince Albert II demonstrated that if the Mediterranean is threatened, they should study the origin of these threats in ***Antarctica***. In a speech on April 14, 2009 in Monaco, he had developed this synthesis and proactive approach: *"The Mediterranean in which we are is now vulnerable…compromised in particular by climate warming. But these risks affecting the Mediterranean, is Antarctica... we can study to understand and thus otherwise prevent, at least mitigate them... Everyone can act, everyone must act."*

Some examples of initiatives taken by the authorities of Monaco demonstrate that scientific marine contribution to the Mediterranean Area and beyond.

- **Creation of the Oceanographic Museum of Monaco**
  In 1889, Prince Albert I of Monaco, an eminent specialist of Oceanography built the Monaco Oceanographic Museum completely dedicated to the sea with laboratories; reported collection pieces of his explorations, underwater aquariums, funds dependencies and the Mediterranean flora and fauna. The Museum's mission is to develop and disseminate public Oceanography through historical collections of the founder Prince, permanent and temporary exhibitions, or living collections of its aquariums. Close to one million visitors discover this temple of the sea each year.

- **Creation in 1960 of the Scientific Centre of Monaco**
  The creation of ***the Scientific Centre of Monaco*** (SCM) in 1960 was motivated by the wish of ***Prince Rainier III***, to provide the Principality of Monaco with the means to carry out ***oceanographic research*** and support governmental and international organizations responsible for the ***protection and conservation of marine life.*** Since 1989, the SCM has specialized in studying the function of coralline ecosystems (tropical and Mediterranean) with regard to global climatic changes. It supports the action of governmental and international organizations charged to protect and preserve marine life. In 2008, the SCM was equipped with new additional missions by S.A.S Prince Albert II. The SCM is now also responsible to encourage and promote biomedical research in the Principality.

3. **A Political approach contributes to the Regional Mediterranean Vitality:**

In terms of regional marine cooperation for environmental protection, the Principality of Monaco is the headquarters of numerous organizations, very active in the protection of the Mediterranean Sea and its species, or a better utilization of the oceans:

- Headquarters of the ***International Hydrographic Bureau*** (advisory and technical intergovernmental organization created to promote the safety of navigation and the protection of the marine environment).

- Installation of the International Atomic Energy Agency, ***IAEA Environment Laboratories (IAEA-MEL)*** in Monaco: established in 1961 as part of the IAEA's Department of Research and Isotopes. It is the only marine laboratory within the UN system.

- Headquarters of the ***ACCOBAMS Agreement***: The ACCOBAMS (Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area) is a cooperative tool for the conservation of marine biodiversity in the Mediterranean and Black Seas. Its purpose is to reduce threats to cetaceans in the Mediterranean and Black Sea waters and improve our knowledge of these animals. ACCOBAMS is the first Agreement binding the countries in these two sub regions and enabling them to work together on a matter of general interest. It requires the States (23 States Parties) to implement a detailed conservation plan for cetaceans, based first on respect of legislation banning the deliberate capture of cetaceans in fishing zones by their flag vessels or those subject to their jurisdiction, on measures for minimizing incidental capture and, finally, on the creation of protected areas.

- Great support for the ***RAMOGE Agreement***, signed in 1976 with France and Italy to ensure that the coastal areas of the Provence-Alpes-Côte d'Azur Region, the Principality of Monaco

and the Ligurian Region should constitute a pilot zone for preventing and combating pollution of the marine environment.

- ***The PELAGOS Marine Sanctuary, is a Special Protected Area of 87500 km²*** covered by an agreement between Italy, Monaco and France for the protection of marine mammals.

- Monaco is also an active participant in the activities of the ***Mediterranean Action Plan.*** In 1975, 16 Mediterranean countries including the Principality of Monaco and the European Community adopted the ***Mediterranean Action Plan (MAP)***. The MAP was the first-ever plan adopted as a Regional Seas Programme under UNEP's umbrella.

  The main objectives of MAP were to assist the Mediterranean countries to assess and control marine pollution, to formulate their national environment policies, to improve the ability of governments to identify better options for alternative patterns of development, and to optimize the choices for allocation of resources.

  Although the initial focus of MAP was on marine pollution control, experience confirmed that socio-economic trends, combined with inadequate development planning and management are at the root of most environmental problems. Consequently, the focus of MAP gradually shifted to include integrated coastal zone planning and management as the key tool through which solutions are being sought.

  Twenty years later, the ***Action Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (MAP Phase II)*** was designed, taking into account the achievements and shortcomings of MAP in the context of recent developments. Today MAP involves 21 countries bordering the Mediterranean as well as the European Community. Together, they are determined to meet the challenges of environmental degradation in the sea, coastal areas and inland, and to link sustainable resource management with development, in order to protect the Mediterranean region and contribute to an improved quality of life.

CONCLUSION

Coastal zones are recognized as the most urbanized ecosystems in the world and even if Monaco is not a coastal mega-city its population density is very high per km^2.

Also, the challenge of Monaco is doubled:

- First, as a Coastal City-State, Monaco must be an example in its national policy for environmental sustainability. Even if its future is through an extension of territory at sea, these extensions will be in accordance with a strict compliance with environmental standards.
- On the other hand, a Coastal City-State should promote international maritime cooperation and Monaco plays this role on the 3 planes: economic/legal, scientific and political. In the Mediterranean, where Coastal States are developed or developing, one of the challenges of Monaco is to be a link between the two categories of countries for a better marine environment, accompanied by sustainable economic development.

THANK YOU FOR YOUR ATTENTION MERCI 德您注

An Integrated Multi-Hazard Decision Supporting System Supporting Early Warning

Mr. Stanley Goosby
Chief Scientist of Pacific Disaster Center, Hawaii, U.S.A.

ABSTRACT

PDC developed DisasterAWARE for the National Disaster Warning Center (NDWC)–Thailand as an enhancement of the NDWC's early warning capabilities in response to the tragedy of the Indian Ocean Tsunami. PDC is currently providing technical assistance to Vietnam's Department of Dyke Management and Flood and Storm Control/Disaster Management Center to improve its flood and storm early warning capabilities, which includes the development of a decision support system "DisasterAWARE". The system incorporates disaster management-related best practices and procedures, augments the underlying early warning system infrastructure to support multi-hazard analysis, and extends disaster warning notification processes.

PDC developed and implemented an in-place, decision support system for multi-hazard early warning for Thailand. The PDC's solution began with automation of the national disaster management information flow and emergency response by linking sensor data collection systems, Geographic Information Systems (GIS) mapping, scenario modelling, and emergency notification. PDC also developed an integrated architecture for a disaster warning and decision support platform to support tsunami and earthquake early warning in Thailand and flood and storm early warning in Vietnam. The platform includes a user friendly, web-accessible GIS map viewer, hazard event tracking and collaboration tools, and basic hazard modelling systems that are all needed to support disaster management and decision making.

DisasterAWARE ingests complex data from numerous sources and facilitates transmission of complete, useful and effective warning messages to designated recipients. The result is an enhanced and automated analytical capability for "decision support" that is integrated within the NDWC's and Vietnam Concept of Operations.

DisasterAWARE increases the capacity of disaster managers to synthesize multiple data streams. The system integrates data from a variety of sources into an enterprise geospatial application for collaboration and analysis.

Keywords: decision-making support system, DSS, early warning, all-hazards.

Accountability of Government in the Tsunami Early Warning Arrangement in Thailand

Dr. Smith Dharmasaroja
Chairman of Foundation of National Disaster Warning Council, Thailand

Co-Chairs, Excellencies, Ladies & Gentlemen,

It is my pleasure to present to the theme "Challenges to Oceans and Coastal Cities" at this Conference on tsunami early warning arrangements in Thailand which caused over 300,000 deaths and damage to property of about 10 billion US dollars to most East Indian Ocean countries.

Introduction

The 2004 Indian Ocean Tsunami on 26th December 2004 caused 8,347 casualties for both Thais and foreign tourists in Thailand. Thailand has put in place a disaster early warning system through the establishment of the National Disaster Warning Center on 30th May 2005.

The assessment on national capacity on tsunami warning and mitigation system was carried out under coordination with Intergovernmental Oceanographic Commission (IOC) in September 2005. It was found that there was a communication gap between the tsunami warning center and the target coastal populations in six Andaman coastal provinces.

Following the catastrophic tsunami disaster of 26 December 2004 (B.E. 2547), Thailand took immediate action to establish a National Disaster Early Warning System. The planning embraced not only natural disasters but those stemming from human activities.

Planning on National Disaster Early Warning System in Thailand

1. Planning on an improved system

It should be noted that prior to the tsunami in 2004, there was no early warning system in Thailand. The first and major step in the national plan was carried out by setting up of a National Committee on Disaster Early Warning System Administration (DEWSA) chaired by the Prime Minister and by the establishment of a National Disaster Warning Center (NDWC). NDWC is a designated focal agency to perform 24x7 tasks and to receive data from relevant governmental departments such as the Thai Meteorological Department, the Hydrographic Department of the Royal Thai Navy, the Department of Disaster Prevention and Mitigation, the Royal Irrigation Department and other national agencies. NDWC will analyze this information and disseminate the information or warning message to relevant interagency departments in central and government function levels and the general public when there are indications that severe threats are expected to occur. It is also important to receive information from the threatened populations through a call center of the Centre.

The DEWSA consists of about 60 representatives from more than ten relevant departments and is responsible for making the decision as to when and how a warning message should be issued. It should be noted that it would not be necessary to convene the Committee physically, video-conferencing or similar methods being used to ensure that the vital need for a speedy decision can be made. The Committee, in formulating its decision will also benefit by receiving data from international agencies such as the Pacific Tsunami Warning Centre (PTWC), World Meteorological Organization (WMO), Intergovernmental Oceanographic Commission (IOC/UNESCO), Japan Meteorological Agency (JMA), etc.

When the decision to issue a warning message has been made, immediate actions to deliver the message moves to the Warning Studio with its links to television pool broadcasting to log on to 10 stations, 211 AM and 312 FM radio stations, radio amateur, local and cable radio stations, and to the 20 million sets of mobile telephone system and to the selected warning towers now being constructed

in areas prone to disasters. The television, radio and other receivers will give priority to the warning message over their normal functions. The NDWC has been in operation since April 2005 (B.E. 2548). The Standard Operating Procedure for tsunami early warning was firstly developed in June 2005 under the assistance of experts from the Pacific Disaster Center (PDC), U.S.A. and the Japan Meteorological Agency (JMA) in Japan. It was considered the first developed SOP in the Indian Ocean Countries.

2. Warning Towers

In the First phase, the first 80 of the 268 warning towers planned were successfully installed. They were installed in the Southern and in the West Coast of Thailand. This pilot project was completed in mid-April 2005, coinciding approximately with the entry into operation of the NDWC. The tsunami warning tower, of about 20 to 30 meters in height, is built with a standard steel reinforced concrete structure, resistant to strong winds and waves, using power supply from solar cells and automatic control. On the East of the tower will have a stable base, and digital radio transmission systems for the reception of radio signals from the command center (NDWC) in Bangkok.

In the Second Phase, construction of warning towers will be expanded into the area along the west coast from Cha-Am District of Prajuabkirikhan Province southward to the Narathiwat province.

In the Third Phase, the towers will be installed along the eastern coast/Gulf of Thailand.

Another 144 Warning towers will also be installed in the northern central and northeastern part of Thailand in the area prone to landslides, heavy rainfall and floods. The Thai government has already approved the project budget, but the budget allocation in each phase is required for implementation. Some islands located in the Andaman Sea will also be included in this project scheme. In order to transmit a public early warning message, the standard warning towers should be equipped with sirens, audio speakers and flashing lights.

3. Public Awareness and Education

One of the most important aspects of Thailand's scheme to improve public safety, both for local and foreign tourists and visitors, can be significantly enhanced by improving public understanding and preparedness on threats posed by disasters of various types.

Such a programme must involve all sectors of the community from school children to the general public as well as those in more isolated communities and rural areas. Full utilization must be made of all media resources for this purpose. Radio and TV obviously play a primary role but other methods such as information on relevant websites, newspapers and magazine articles, brochures and training to public in the disaster risk-areas of the country are necessary components of the programme.

A particularly important aspect of the programme is to focus on public understanding and awareness. There is the need for regular refreshments of the material and its availability to public. It must be emphasized that any programme of this type is not a one-off operation but must be repeated at regular intervals and especially during periods well before disasters occur (i.e. heavy rainfall and flooding during the southwest monsoon, the typhoon season or other adverse weather periods). Regular disaster drills are recommended.

Attention must also be given to the need to provide materials for visitors and tourists in languages other than Thai such as in English, French, German, Japanese, and Chinese, etc. The use of the internet as a means of communication with business and tourist visitors should also be explored. Hotel staff must be briefed on the necessary steps to take to protect their guests and approximate materials in several languages should be displayed prominently in public areas as well as in guest rooms.

Since 2005, NDWC and its interagency departments and international organizations cooperated with the International Ocean Institute in Thailand (IOI-Thailand) to develop a decision support system, and to implement a tsunami alert rapid notification system, knowledge-based capacity building at the provincial, district, sub-district and village levels to increase awareness and resilience in disaster management for the Government function levels and the community level from 2006 to 2009. IOI-

Thailand is now working under the Memorandum of Understanding between the IOI Headquarters and the Foundation of National Disaster Warning Council under my supervision in Bangkok.

From 2007-2009, the IOC cooperated with NDWC and IOI with financial support from the Belgian Government to implement a two year project entitled the adaptive learning in disaster management for community awareness and resilience in 24 schools and communities in six Andaman provinces. The project was very successfully implemented as a pilot community-based preparedness and response project. It is suggested that the government of Thailand should support applications and expansion of developed best practices on tsunami preparedness and response under the project obtained from these 24 schools and communities in 514 villages in the tsunami prone areas. It is the government's accountability to ensure that these communities are well prepared and ready for future disasters. This is to save lives and property of the Thai communities as well as of foreign visitors.

Excellencies, Ladies & Gentlemen

I would like to conclude that future implementation, replication and scaling up of efforts will be needed as multi-cooperation among countries within the region and among regions. The tasks are too large for any single international or regional agency framework such as UN/ISDR, IOC, UNDP or USAID to solely coordinate on early warning, mitigation and preparedness at the national and local levels, since it will have to deal with a large number of populations at risk in the Indian Ocean region. Sharing of knowledge and lessons learned, planning and implementation of an adaptive management approach will be urgently needed. NGOs such as the International Ocean Institute have a significant role to play in coordination, strategic planning, capacity development and implementation at government function levels and community levels.

Immediate attention for countries and governments is to co-manage disaster management with the local community in disaster management focusing on an adaptive management approach. Sustainable financial inputs will need to be allocated for local adaptive learning on multi-hazards disaster management. A long-term plan should be developed and implemented without any delay. We have learnt many dangerous lessons from the past, national governments should not easily forget them and leave them to the people who are the victims of future disasters. Thank you.

Ecosystem Services as Drivers of Coastal Migration

Dr. Joe Roman
Gund Institute for Ecological Economics, Rubenstein School of Environment & Natural Resources, University of Vermont, U.S.A.

ABSTRACT

Coastal ecosystems are among the most productive on the planet, providing more than 70% of total global ecosystem services and supporting growing human settlements for thousands of years. At the same time, these systems are highly threatened by development and coastward migration. In addition to rising sea levels, changes in the services provided by ecosystems such as coral reefs, marshes, and mangroves have the potential to greatly impact coastal residents and migration patterns. Population growth and migration, habitat alteration, the introduction of invasive species, nutrient runoff, and overfishing are some of the human activities that have the largest effect on these ecosystems. There comes a point when environmental degradation is so severe that individuals are forced to move elsewhere to sustain even modest levels of livelihood. The boom-and-bust cycles of fisheries, for example, known as killer spikes at their most severe, has prompted migration away from the Faroe Islands and coastal communities in West Africa.

Which services are the most probable push factors for environmental migration? Besides a decline in productive fisheries, loss of storm protection and diminishing supplies of fresh water are likely to be primary drivers of human migration away from the coast. Such factors can be catastrophic, especially when compounded by increased storm activity resulting from global warming. High-risk areas include low-lying deltas and islands, such as Bangladesh, the Maldives, and the Mississippi Delta, but include many metropolitan areas throughout the world.

These concerns are consistent with patterns indicating that human well-being is threatened by the loss of healthy ecosystems and natural areas. Four future scenarios are explored, including a focus on world markets and local stewardship. A focus on material economies and growth will likely result in widespread environmental decline and increased risk for hundreds of millions of people settled along the coasts. A focus on global sustainability is likely to do the most to preserve and even improve ecological and human communities on the coast. Some of the most powerful approaches in protecting coastal ecosystems and human life include establishing networks of marine reserves; preserving marshes, mangroves, and other natural infrastructure; reducing the input of sewage and fertilizer runoff; and enforcing strict regulations to prevent the spread and establishment of invasive species.

Beach Nourishment to Improve Coastal City Environment in China

Dr. Cai Feng
Deputy Director-General, the Third Institute of Oceanography, SOA, China

ABSTRACT

China has 18000 km of mainland coastline, about 1/3 of them consist of sandy beaches, and 70% of sandy beaches are experiencing coastal erosion. Coastal erosion has become a major concern for future socioeconomic developments in coastal cities. Traditionally, the response to coastal erosion is mainly “hard engineering” such as seawalls, groins and breakwaters. Due to the potential adverse effects on the beach and dune system from “hard engineering”, more and more governors and coastal engineers recognised the necessity of a “soft engineering” approach to maintain the sustainable development of the coastal environment. As a new technology, beach nourishment was first introduced into China in the early 1990s. The first nourishment project in China was performed in Repulse Bay, Hong Kong, in 1990. In mainland China, the earliest nourishment project was completed in 1994 along Xinghai Bay, Dalian city.

Considering the development of nourishment design and public perceptions, the history of beach fill in China can be summarized into 3 stages: (1) Seasonally sand placement on beach in summer (before 1990); (2) Small scale nourishment without comprehensive engineering study and design (1990~2005); (3) Beach nourishment to protect the coast, improve environment and increase tourism (2005~present). China started its rational beach nourishment program in the early 21st century, with some projects performed in Qinhuangdao city, Xiamen Island and Hainan Island and so on. Nourishment practices are commonly performed in coastal cities which are famous for their holiday resorts and where tourism has grown tremendously. Also, the economic development in these cities is generally better than others.

Based on the difference of environmental conditions and coastal geomorphology where projects have been constructed, beach nourishment projects in China can be broadly classified into 4 types: (1) beach nourishment to design a straight beach; (2) beach nourishment in a bay; (3) beach nourishment along an armoured coast; (4) artificial beach along a muddy coast. And 4 typical nourished sites for each type were selected and described in detail respectively.

Research is in the exploration stage and there is still much to be learned prior to developing adequate guidance for beach nourishment in China. Several beach nourishment research projects are currently underway; the most important one is The National Marine Public Welfare Research Project--“Study on beach nourishment and ecosystem improvement and practice in China” which was lead by TIO (Third Institute of Oceanography, SOA).

Considering the problems coastal engineers met during the project implementation and the issues on beach protection and management, future prospects can be summarised as follows:

(1) Construction of more and larger nourishment projects. Soft engineering implies a new attitude towards nature with the recognition of the value of natural systems and the natural mobility of beaches. Therefore, many local and regional authorities, managers and societies are planning to apply beach nourishment technology in protection and restoration of beaches and dunes. Therefore, more and larger nourishment projects will be performed in the near future.

(2) Beach strategy. China suffers from a lack of an overall long-term coastal management strategy and regular monitoring of its coastline. Monitoring programmes provide a wealth of data, which should be properly documented and stored for future analysis and reference. Even though controlling conditions are quite different between various coastal situations, it will be very beneficial to establish a Chinese strategy and methodology for beach nourishment and management.

(3) Modeling of wave & tide driven sediment transport. Numerical models are frequently used at a scientific level to interpret field data. Their use in coastal engineering is no easy task and requires special skills. Their contribution to the design process is nevertheless considered essential.

(4) Post-project evaluation and monitoring. Post-project evaluation is the assessment of a project and normally covers the engineering performance and the environmental and economic aspects of the project. The purpose of the evaluation is to enable improvements to be made in all aspects of planning, design and implementation of future schemes based on the experience learned from completed projects. The basis for this evaluation lies in the monitoring undertaken before and after the implementation.

(5) Beach nourishment manual. In order to support proper decision-making and implementation of beach nourishment, several manuals or guidelines have been published. Each of them pays attention to aspects such as problem analysis, nourishment design, implementation, monitoring, environmental impact and evaluation. While these manuals also contain elements of national interest only, they are largely of a generic nature and thus of international value. Considering the rapid development of beach nourishment in China, a manual is needed for providing recommendations for the effective design of future beach nourishment projects.

Keywords: beach nourishment; beach strategy; China

Marine Invasive Species and Ballast Water

Mr. Adnan Awad
Director of IOI South Africa

ABSTRACT

Of the various threats facing our marine and coastal environments, the transfer and introduction of marine invasive species has become one of the most serious. Marine habitats already under pressure from coastal developments, pollution or fishing practices are being invaded by all types of marine organisms at increasing rates. Valuable marine resources are being compromised by irreversible invasions that could be prevented given adequate attention to this matter.

The shipping industry remains the primary target for management measures aimed at reducing this threat. As ships have grown larger and faster, and shipping patterns have continued to change, species are increasingly surviving voyages, either in ballast tanks or attached to the submerged parts of the vessels.

The International Maritime Organization (IMO) has developed guidelines and regulations for managing ballast water, which ultimately will require the treatment of all ballast water to high standards of organism removal. In response to this, countries are ratifying the IMO Convention and gradually introducing measures to ensure its implementation. The technologies themselves are also becoming available as they are approved through rigorous testing protocols overseen by the IMO. The issue of biofouling is also being addressed through the IMO in order to comprehensively manage the shipping pathway with regards to species introduction, although this vector is proving to be more difficult to manage.

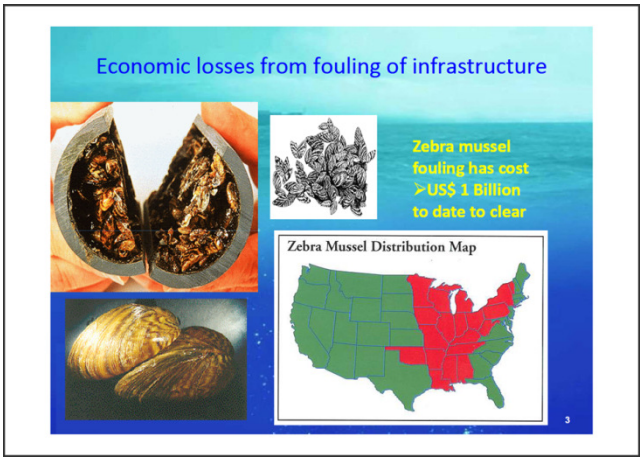
A developing network of partnerships and initiatives have been working to ensure the implementation of the IMO ballast water regime throughout the world, especially targeting developing regions where capacity for such management is often limited. The IOI has been actively participating in these efforts, and has developed some tools to aid countries and regions in their management approaches.

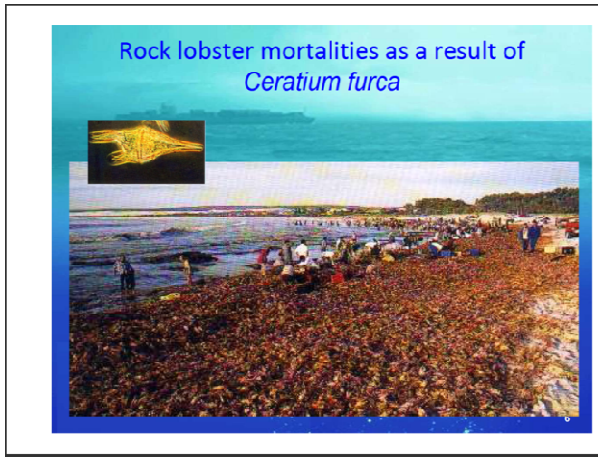
Specific areas where IOI expertise has been, or can be useful include:

• Technical capacity for management (Training courses and development of Guidelines);
• Technologies for treatment & testing;
• Policy support (national and regional);
• Biological survey protocols;
• Risk assessment methodologies.

In order to increase the ongoing effectiveness of the international efforts, a stronger, more sustainable network and approach needs to be developed. The existing partnerships should be expanded, and projects developed and supported to reach further in assisting with management issues of developing countries. With its global footprint and national-level operations, the IOI is strategically suited to help extend the effectiveness of the international efforts on this issue. By combining technical capacity building and research initiatives, realistic on-the-ground Management practices can be realized to continue the fight against marine invasive species.

POWERPOINT PRESENTATION

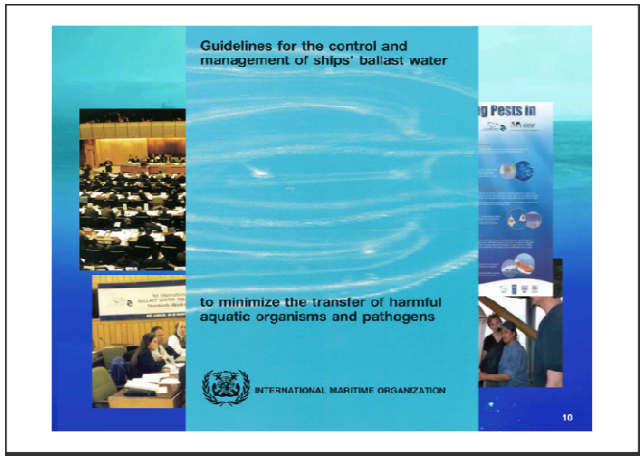





Pathways
Propellers
Sea Chests
Free Flood Spaces
Hull
Pipework
Docking Block Locations
POLAR
COLD TEMPERATE
WARM TEMPERATE
TROPICAL


Coastal Mariculture


Ballast Water
How far have we come?


Guidelines for the control and management of ships' ballast water
to minimize the transfer of harmful aquatic organisms and pathogens
INTERNATIONAL MARITIME ORGANIZATION
10


IMO
Safer Shipping …..
Cleaner Oceans…
International Maritime Organization
CLEANER OCEANS
International Convention on the Management of Ships' Ballast Water & Sediments - 2004
Convention Guidelines
Integrated Technical Co-operation Programme (ITCP)
IMO-GEF-UNDP GloBallast Programme


Ship-board treatment technologies

South African BWT System

Resource Ballast Technologies

10 Inch System

6 Inch System

13

History of Testing

Test Facility

- Quay-side location in Port of Cape Town
- Pump from/to natural coastal waters
- Advanced technologies with broad application
- Suitable for expansion to training centre

Testing for IMO Approval

Active Substances:

- Chronic & acute toxicity
- Health & Safety, corrosivity

Efficacy:

- Compliance with IMO D-2 Standard
- Removal/de-activation of organisms by size class

Current State of Technologies

- 47 Companies currently active
- Capacities ranging from 100-10000 m^3/hr
- +/- 150 systems installed on vessels
  - From 27 different suppliers
- 10 Systems with IMO Certification & Type Approval

17

International Preparedness

Shipping Industry:

- +/- 80,000 vessels in world fleet
- Approx 30 installations/day to comply with IMO Convention

National Administrations:

- Regulatory Framework
- Management capacity
  - Port & Flag State Responsibilities

18

Partnership Approach

Targeting developing countries & regions:

- Raise awareness
- Develop appropriate tools
- Build capacity for management

GISP
The Global Invasive Species Programme

GloBallast Partnerships

IMO GEF UNDP

Policy & Regulations

National level:

- Development of BW Policy (Dept of Environment)
- BW inclusion in Biodiversity & Ports Acts
- Ratification of IMO BW Convention
- Development of SA BW Act (ongoing)
- Concurrent development of regulations
  - Port & Flag State Control

REPUBLIC OF SOUTH AFRICA

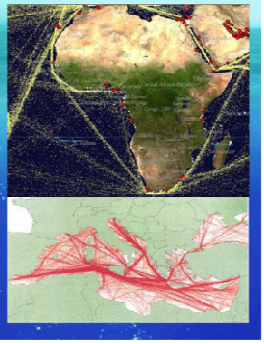
SAMSA

Pacem in Maribus

Policy & Regulations

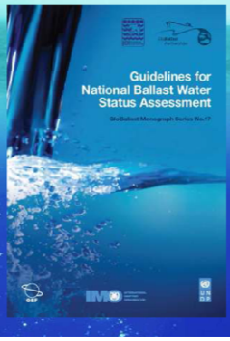
Regional level:

- Assistance with Strategy development for BWM for sub-regions
  - WACAF
  - Southern & East Africa
  - PERSGA
  - Mediterranean
- Institutionalization within operational frameworks
- MED Strategy - Barcelona Convention

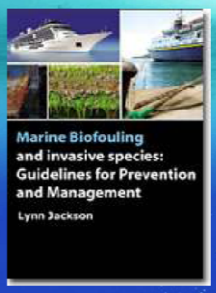


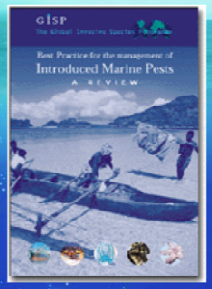
Policy Development & Guidelines

- Review of IMO approach
- Rapid assessment of national ability for implementation of BW regime
- Template for status report to IMO
- Co-published IOI - IMO/GBP
- Available in hard copy or pdf http://globallast.imo.org



GISP Tools



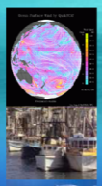


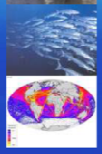
Available in PDF at www.gisp.org

Int'l Port Survey Protocols

Guidelines currently under development

Capacity Building





Short Courses:

- Introductory Course on Ballast Water Management
- Management of Invasive Species in Marine & Coastal Environments
- Training Course on Port Biological Baseline Surveys

25

Projects addressing other vectors

Biofouling:

- Yachts & Marinas
- Oil rigs

Aquaculture:

- Water treatment for land-based facilities pumping to/from coastal waters

Moving forward...

Increase Integration:

- Addressing all vectors
- As part of ICOM
- Between sectors
  - i.e. Environment & Maritime Administrations
- In Partnerships, projects & initiatives

Thank You

International Ocean Institute
Southern Africa

University of the Western Cape
Private Bag X17, Bellville 7535
Tel: +27 21 959 2705
Fax: +27 21 959 1213
Website: www.ioisa.org.za

Estuarine Biodiversity Conservation: Challenge to Coastal Cities

Prof. Wen Quan
National Marine Environmental Monitoring Center of China, SOA, China

ABSTRACT

Estuarine biodiversity issues are of increasing concern in China, which is becoming a new conflict between ecosystem conservation and economic development. China has more than 1,500 rivers with significant basin drainage areas that run into the sea. All have formed discrete estuarine ecosystems. Despite the significance of these highly productive and biologically rich systems, the rapid growth of coastal commercial and industrial activities and associated maritime transport centers, particularly in the larger estuaries, have adversely affected most of China's major deltaic ecosystems. Major threats to the country's estuaries include: non sustainable use of natural resources (e.g. fishery resources), habitat loss due primarily to urban and industrial expansion, pollution loading associated with local and offsite industrialization and urbanization, and the reduction of freshwater inflows due to upstream diversions. The conservation of estuary biodiversity is still nascent in its development and faces a number of constraints. Although the government has achieved a number of milestones in recent years in the conservation of wetland ecosystems, the issues have not been certainly resolved. With the financial support from GEF, the China government prepared and is implementing a country project, named "Project on Demonstration of Estuarine Biodiversity Conservation Restoration and Protected Area Networking in China". It is hoped to improve on existing efforts to conserve biodiversity in China's major estuarine ecosystems, and to develop a series of "best practices" based on experiences derived from project supported field activities focusing on the creation of protected area networks and wetland restoration in the Yellow and Pearl River Estuaries, that can be up-scaled and applied to other estuaries both in China and the region.

Acknowledgement

The presentation is generally based on the Project PIF. Special thanks are given to Dr. Random Dubois from FAO, Prof. Zhou Qiulin and Dr. Du Jianguo from Third Institute of Oceanography of SOA in China, Prof. Yang Shengyun from Xiamen University of China, and Ms. Tang Dongmei from SOA in China, for all working together and great efforts to prepare Project PIF.

Paradigm Shift: Conventional to Green Banking - Way to Promote Coastal Sustainability

Mr. Pran Siamwalla
Industry Specialist, Risk Policy & Planning Development, Bank of Ayudhya Public Company Ltd, Thailand

ABSTRACT

The purpose of this paper is to explain how *Green Banking* can be implemented through the *Co-operative* among stakeholders such as the Royal Thai Navy – government body, Bank of Ayudhya – a financial institution, Maeklong Fishery Co-operative (MFC) – a fishery Association, ship owners, local communities, etc. The Royal Thai Navy provided a small scale bio-diesel machine, training and early-day maintenance, together with the Petroleum Authority of Thailand (PTT) plc providing a lab-test of biodiesel output to ensure quality's consistency. Conventional banking normally focuses on fixed assets as collateral but green banking focus primarily on a cash flow control mechanism and machinery financing. In this case, MFC requires a loan support for working capital to purchase used cooking oil. The structured micro finance funds the working capital requirement of 100% by having bank control of the payment directly to suppliers and collection from customers, using only a bio-diesel machine as collateral.

Keywords

Green banking, Triple Bottom Lines, Co-operative, Structured micro finance, Bio-diesel, Used cooking oil, Cash flow control mechanism.

INTRODUCTION (background & justification):

Sustainability has become an important element in doing business in the 21st century. Many stakeholders within their organization are concerned about how environmentally friendly business and investments of the organization contribute to their societies. Many banks around the world are turning to be eco-friendly banks, which aim to reduce carbon footprints in their banking activities. Green banking has a wide range of implementation, some banks introduced online banking, some integrated ecological principles to their valued chain of activities and some banks promoted or financed eco-friendly projects.

However, Green banking is misperceived as only financing clean, renewable energy and energy efficiency. Ideally, Green banking is applicable to all activities in any organization and is not only energy related. It is based on providing financial support for the sustainability of society, environment, and the economy; the concept known as "Triple Bottom Lines". In order to take care of such stakeholders, the business structure should consciously induce high productivity & efficiency on the society and the environment.

This paper focuses on Small and Medium Enterprises' (SME) which cover roughly 90% of the entire world's business volume with a rate of approximately 90% failing in the 1st year of operation. They are lacking adequate resources, with difficulties in accessing industry information/trend updates, cannot enjoy economy-of-scale in their business activities, and cannot afford advertising their products etc. However, a possible solution could be a collective body that can support these multi tasks for each SME. A large group of these SMEs can co-exist independently but yet share resources among each other to achieve what they are lacking despite standing alone.

The structure of *Co-operative* seems to fit into this current proposed scheme as the collective body performing large corporate functions for each of its members. The purpose of this paper is to explain how *Green Banking* can be implemented through the *Co-operative* among stakeholders such as the Royal Thai Navy – government body, Bank of Ayudhya - a financial institution, Maeklong Fishery Co-operative (MFC) – a fishery Association, ship owners, local communities, etc.

The Maeklong Fishery Co-operative (MFC) has been formed since 1973 in the Samutsongkhram province which is a busy fishing centre located in the southwest of Bangkok, Thailand. The Co-operative is comprised of local businesses, including sugarcane farmers, coconut growers, fishermen and fish sauce/paste manufacturers. The main objectives of MFC have been to provide fuel oil, lubricant oil and rice to the members, and also to act as a fishery products distributor for its members. Due to the rising price of fuel oil since 2004, members of the Co-operative suffered because of the high price of diesel for their operations, especially for many fishing boats which had gone bankrupt. Thereafter, MFC of over 3,000 fishermen seek help from the Government to assist on loan restructuring.

Since 2001, The Naval Dockyard, through the command of his Majesty the King Bhumibol Adulyadej, has developed renewable energy technology programs sponsored by the Defence Research and Development Office (DRDO). The Naval Dockyard successfully invented a small biodiesel pilot-plant with the capacity to produce 50 litres with the maximum of 2,000 litres per day. A variety of raw materials for making biodiesel fuel can be palm, coconut and soybean. Additional to the raw materials, cooking oil and animal fat are used.

To support the Maeklong Fishery Co-operative operation, the Royal Thai Navy provided a small scale bio-diesel machine, training and early-day maintenance, together with the Petroleum Authority of Thailand (PTT) plc who provided lab-tests of the biodiesel output to ensure quality's consistency. Logistic companies in the local area entered into a long-term purchase agreement of the biodiesel output leftovers from the community usage. By processing used cooking oil to usable bio-diesel reduces the dependence of fossil fuel which causes green house gases, helps reduce both health & environmental hazards at the same time.

Conventional banking normally focuses on fixed assets as collateral but green banking will focus primarily on the cash flow control mechanism and machinery financing. In this case, MFC requires loan support for working capital to purchase used cooking oil. The structured micro finance funds the working capital requirement 100% by having bank control the payment directly to suppliers and collection from customers, using only bio-diesel machine as collateral. This will support MFC to be able to generate enough income and after deducting adequate household expenses, most of its member can pay the existing fishing boat financing loan within 2 years.

Methods

The case study of MFC has set a good example for other small operators. Bank of Ayudhya cooperated with the local community of Samutsongkhram in order to understand and to serve their needs and tried to create a financial package that caters precisely to their needs. The final outcome of this exercise gives the Bank a practical product that can service MFC and can replicate to other communities throughout Thailand.

Results

The project has not yet been successfully launched due to the lack of supply of main raw material of used cooking oil caused by ever increasing prices of palm oil. Many fried foods in Thailand use palm oil for cooking. Palm cooking oil after being used for frying food has been sifted, refined and reused as cooking oil again and again. It is very hazardous for consumption which can cause cancer and several other harmful ailments in the body. However, due to the price parity between the two end-uses of the feedstock, i.e., bio-diesel where the price is capped by the government kept at Bht28 per litre and re-used cooking oil priced at Bht40 per litre (at the time of this project), MFC, thus, couldn't find feedstock for its biodiesel machine operation.

Challenges Addressed

Bio-diesel produced from re-used cooking oil will not be possible due to street vendors that use the used cooking oil to fry food to sell which is still rampant. The awareness of this morally wrong doing is widely ignored.

Planning & Activities

Implementing stringent law enforcement to prohibit used cooking oil for cooking must be exercised. Through the Senate's Sub-Committee on Climate Change, the Minister of Health will give a sermon to explain how his Ministry will enforce the law.

Achievement & Outcome

Through this project, banks can now find new ways to provide much needed financial support to communities/co-operatives that improve the health of society, influencing encouragement to doing good for the environment, and economical benefits to the operators, the concept known as Trible Bottom Line (not currently existing in any bank worldwide, except for some micro-finance operators), by focusing on a cash control mechanism instead of conventional secured collateral lending for risk mitigation.

Innovation, sustainability and replicability

With this new method of risk mitigation, the Bank of Ayudhya has implemented this as part of its standard product and can be applied to communities/co-operatives throughout Thailand.

Difficulties

Conventional banking is generally not familiar with the risk mitigation method without secured collateral. It is difficult to shift the paradigm and much more difficult to alter the existing operational system to accommodate clean-base lending by focusing on a cash control mechanism, which in itself, is a brand new operational system.

Partnerships

Maeklong Fishery Co-operative, the Thai Royal Navy, Rotary Club of Bangkok, and Bank of Ayudhya.

Lesson Learned

By going through this project, banks can develop new tools for risk mitigation without having to rely on secured collateral and they can truly support Triple Bottom Line without increasing risk exposure.

Future Plans

The Ministry of Health will be approached to implement stringent law enforcement prohibiting used cooking oil to be re-used for cooking.

Acknowledgement

Dr. Cherdsak Virapat, Ph.D. Candidate Yanida Siamwalla, Maeklong Fishery Co-operative, Thai Royal Navy, Rotary Club of Bangkok, and Bank of Ayudhya

References

http://www.maeklong-fish coop.net/index
http://www.navy.mi.th/dockyard/doced/Homepage/Botkwuam/Navy_Biodiesel.pdf

Challenges to Coastal City Environment by Global Shipping

Prof. Dr. Hu Yihuai
Shanghai Maritime University

ABSTRACT

This presentation describes three main challenges to coastal city environment from global shipping activities. The first challenge comes from air pollution from marine engines including Carbon Dioxide (CO2), Sulfur oxides (SOx), Small Particulate Matters (SPM), Volatile Organic Compounds (VOCs), Nitrogen Oxides (NOx), heavy metals and poisonous chemicals. The second challenge is from harmful liquids from ocean-going ships including ballast water, bilge water, spilled oil and other chemical liquids. These liquids could be very dangerous to coastal waters and urban area. The last challenge is the living disturbances to port residents including machine noise, traffic lights, bad smells, hazardous fertilizers, toxic releases, chemical dusts, discharged garbage. These substances could seriously damage the coastal city environment for people, wild lives, water species, soil and wetlands. Measures are suggested in the presentation to solve these problems mentioned above. These solutions could be due to cleaner diesel fuels, machine idling limits, exhaust gas after-treatment, shore-side power supply for ships at dock, fuel cell generator at berths, garbage assortment and carful harbour location far away from downtown. If these suggestions are carefully taken by the government, it is believed that, the coastal city environment could be well protected and coastal city life could be much better.

Pollution of Marine Zones in Europe - Preview of the EU Policy as applied to the Mediterranean Coast of Cyprus

Prof. Dr. Nicholas Kathijotes
Professor in the Department of Civil Engineering; IOI (Cyprus) Focal Point Cyprus University of Technology; Lemesos – Cyprus

ABSTRACT

Climate change and human activities have a serious impact on coastal zones resulting in changing the face of areas. The need for a more integrated, long term approach is then made evident, something that moved certain initiatives on building on the concept of integrated coastal zone management. Coastal ecosystems are among the most productive, yet highly threatened systems in the world. The EU policy is emphasized in general terms, together with an evaluation of the ecological degradation of the Mediterranean coasts. Serious ecological damages are obvious with a considerable increase of artificial surfaces, and changes in the ecology of the marine part of the coastal zone. The city of Limassol in Cyprus is evaluated, stating the ecological risks and the possible mitigation measures, resulting from the EU directives and policies. Most of marine pollution arises from land-based activities such as urban development and sewage disposal, agriculture, manufacture, transport, energy production and day-to-day domestic activities. Types of pollution include litter and oils, municipal wastewater, nutrients and sediments, radioactive waste, heavy metals and persistent organic pollutants. Once in the marine environment, the pollutants are absorbed by marine life, settle as sediments on sea bed, or follow dispersion. The pollutants pay no attention to national maritime boundaries or the sensitivity of the ecosystems they impact upon. The Mediterranean is a sensitive enclosed area with millions of people living in its coastal cities. Focusing on the Mediterranean Sea in terms of the above mentioned hazards, suggestions, measures and practices need to be taken in the direction of creating model ecological cities, based on an integrated coastal zone management practice. Wastewater reuse as a sustainable resource is linked to this presentation.

Keywords: coastal cities, nutrient inputs, coastal pollution, mitigation measures, ICZM.

Main Statements and discussion:

- ***The immuno-suppressive effects of contaminants arising from agriculture, industrial activity and population growth may have contributed to the severity of mass mortalities among marine mammals in the Mediterranean Sea.***

The Mediterranean Sea is oligotrophic. It is rich in oxygen and poor in nutrients. Oligotrophic conditions increase from west to east.

The fauna and flora is one of the richest in the world in terms of species diversity and there is a high rate of endemism. Compared to the Atlantic, the Mediterranean marine communities have many different species with generally smaller individual specimens.

Eutrophication in coastal areas has almost certainly resulted in an increase in fish catches of some pelagic fish species in the formerly low-nutrient waters of the Mediterranean Sea. However, fishing has resulted in over-exploitation of several fish stocks in the Mediterranean.

- ***Toxic algal blooms have become more frequent too.***

- ***High development rates of some West-Mediterranean coasts have made them increasingly vulnerable to coastal erosion risks.***

- ***Problems related to the concretization (increase of artificial surfaces) of the coastline too are encountered throughout the Mediterranean.***

This is usually due to uncontrolled development, especially tourist infrastructure.

- **The governance of coastal and marine areas has remained fragmented between countries and thematic areas (e.g. sectors) at both national and European level.**

EU policy documents for Integrated Coastal Zone Management (ICZM) are the first to recognize three critical areas, namely: the importance of land/sea interaction; the human dimension in coastal processes; and the need to integrate different sectors and stakeholders in order to avoid the type of conflicts which leads to unsustainable development.

The two main policy documents, as a result of the EU's address of problems related to coasts are:

- The Commission communication on Integrated Coastal Zone Management: the Strategy for Europe (ICZM Strategy, COM [2000] 547 final), and
- The European Parliament and the Council recommendation concerning the implementation of Integrated Coastal Zone Management in Europe (EU ICZM Recommendation, 2002/413/EC).

Coastal zones are certainly addressed in various other legislations.

In practice however, identifying and implementing EU coastal policies has been slow. At national levels the situation has been very similar. This is where the EU should provide leadership and guidance in supporting implementation of these policies.

Coastal zones cannot be managed by a body or legislation. Due to the complexity of coastal zones and their environment, an appropriate blend of different policy instruments is needed.

- ***Industrial installations exist on both sides of the coastline and are growing. They are attracted by logistic opportunities (e.g. oil refineries, port facilities) or coastal resources.*** No heavy industries are operating on the island of Cyprus. In terms of industrial effluents, the bay of Vassilikos, just on the eastern sides of Limassol, where factories operate with chemical effluents, create hot spots with inert materials from industrial activities possibly blanket the bay's sediments and have a negative effect on the benthic community of the area. The thermal effluents from the three power plants of Moni, Vassilikos and Dhekelia, as well as the brine from the two desalination plants in Larnaca and Dhekelia are still reaching the sea.

- ***Eutrophication is very common in sheltered marine water bodies.***
  In the bay of Liopetri and Ayia Napa (eastern coast), nitrogen leaching from the intensely cultivated agricultural areas, because of over-fertilization (150 tons of nitrogen per year) and aquaculture, load sea waters with nutrients that eventually create ecological problems to the marine environment**.** Eutrophication causes**,** oxygen depletion**,** reduction of fish and shellfish populations**,** nuisance algal blooms**,** dieback of sea -grasses and corals and turbid waters.

- ***Urban Metabolism*** is a model to facilitate the description and analysis of the flows of the materials and energy within cities, such as undertaken in a material flow analysis of a city. First used as an exploration and comparison modeling tool by Abel Wolman in "The metabolism of Cities". The use of the Urban Metabolism model offers benefits to studies of the sustainability of cities by providing a unified or holistic viewpoint to encompass all of the activities of a city in a single model. In fact it provides the sum total of the technical and socio-economic processes that occur in cities, resulting in growth, production of energy, and elimination of waste. This model method may be proved as a valuable tool in the planning and policy forming process in managing coastal cities.

Coastal Policy framework in Cyprus

Cyprus has not yet adapted Coastal Zone Management Policy as a separate and self contained document. These Policies however are included in various sectoral policies which apply to different administration areas. The main policies are:

Land use Policy: Land use planning policy in Cyprus is under the responsibility of the Town Planning and Housing Department, Ministry of Interior and it is controlled mainly by the Town and Country Planning Law, which came into force in 1991. The development in the main urban areas is controlled by the Local Plans and in the rural areas through the Policy Statement for the Countryside. The land uses and the development zones are defined through these two planning tools, which are revised every approximately 4 years.

Tourism Policy: The Cyprus Tourism Organization (CTO), a semi- Governmental Organization under the Ministry of Commerce Industry and Tourism is the authority responsible for the Tourism Policy. Several policies and measures for the regulation of tourism development and tourism establishments are in force on the basis of the CTO legislation. As mentioned in the introduction, in 2000 a Strategy for Tourism was prepared by the CTO containing the main strategic goals for Cyprus tourism for the decade 2000 – 2010, aiming in a 40% increase of the number of tourists "*Cyprus Tourism Organization***,** (2000)".

Environmental Policy: The responsibility for the Environmental Policy lies mainly at the Environment Service of the Ministry of Agriculture, Natural Resources and Environment. At this moment, environmental policy in Cyprus is focused on the harmonization with the EU Acquis and the incorporation of EU Directives into the legislation of Cyprus. Environmental policy is expressed in sectoral policies of various natural resources (water, air, forests etc). Except from the Environment Service, more than 10 Governmental Departments and authorities from different Ministries involved in Environment Policies are rather creating a complex system.

Conclusion

At present, and regardless of the pollution risks around the coastal zones, Cyprus does not face serious coastal pollution problems. The pressure however becomes evident and serious measures should be taken in order to avoid and control undesirable situations. ICZM is a well balanced management program which should be implemented without further delays. Tourism places most of the pressure on coastal areas, and the lack of concrete policy for tourism on behalf of the EU is a serious drawback.

Specific ICZM policy elements should act as catalysts in facilitating links between sectoral and broader integrated policies.

The principle of "urban metabolism" is a key factor in helping to direct policies in a sustainable direction.

The principles of ICZM have to move the process of coastal integration. Leadership on behalf of the EU is necessary, in order to avoid complications due to the diversity of the involved parties as well as to the interests they represent.

References:

- Cyprus Tourism Organization, 2000, Strategic Plan for Tourism 2000 – 2010, Nicosia.
- Delft Hydraulics, Coastal Zone Management for Cyprus, Phase III Report, 1995 X.I. Loizidou et al, Coastal Zone Management for Cyprus, ProceedingsMEDCOAST 95.
- EEA, 1999. State and pressures of the marine and coastal Mediterranean environment. E. Papathanassiou and G. P. Gabrielidis (Eds.).
- EEA 2006, Priority issues in the Mediterranean environment 2006 - 88 pp. ISBN 92-9167-812-0.

- Karakassis, I., Tsapakis, M., Hatziyanni, E., et al. 2000. Impact of cage farming of fish on the sea bed in three Mediterranean coastal areas. ICES Journal of Marine Science, 57, pp. 1462–1471.
- Loizidou, X,I Iacovou N, G 1995 The Cyprus Experience in coastal zone monitoring as a basis for shoreline management and erosion control, Proceedings of MEDCOAST 95.
- Stergiou, K.I. and Koulouris, M., 2000. Fishing down the marine food webs in the Hellenic seas, pp. 73–78. In: Fishing down the Mediterranean food webs CIESM Workshop Series 12, p. 99.
- State of the Environment Report, Integrated Assessment, and Aquatic Environment, marine and coastal, Department of Fisheries-Cyprus 2005.
- World Bank, 1993, Republic of Cyprus- Environmental Review and Action Plan, Nicosia.
- Kathijotes N. 2010 "Evaluation and Control, of Marine Pollution due to Land-Based Activities – A Preview of the Cyprus Case" Journal of Coastal Marine Science (Japan) ISSN 1349-3000, 34(1) pp195-197, Tokyo.

POSTER SESSION

Saturday, September 4th, 2010
14.00 – 15.00 hrs
Beijing Raffles Hotel
Beijing, People's Republic of China

Poster Session

NAME	TITLE
Ahmed, Fahmy Mamdouh	The utilization of technology in developing the production of natural foods of high nutritional value from fisheries by-products urgently required for aquaculture, IOI-Egypt
Anuratpanich Kunjapong; Tipsakorn Aiadmusik; Usa Kerdsiri; Nopparat Nasuchon, and Bandid Wongchampa	Women, Youth and the Sea Programme in Thailand on Adaptive Learning in Disaster Management for Community Awareness and Resilience, IOI-Thailand
Busuttil, David Raphael	Fondation de Malte, Malta
Butler, Michael	The Annual Training Programme on Ocean Governance: Policy, Law and Management at IOI-Canada, Dalhousie University, Halifax, Nova Scotia, Canada, IOI-Canada.
Chegini, Vahid	Shoreline Management Plan of IR. of Iran
Conrad, Elisabeth	Institute for Earth Systems, Malta
Conrad, Elisabeth; Busuttil, David Raphael; Cassar, Louis F.; Micallef, Anton; Vassallo, Antonella and Virapat, Cherdsak	Building Human Capacities for Adaptation and Resilience in Coastal Zone (CARE), Malta
Dinh Lan, Tran and Luc Hens	Response to Environmental Problems of Seaports in Indochina: A Critical Issue to Develop Integrated Coastal Management, Vietnam
Drago, Aldo	IOI-KIDS: The Online Learning Resources on the Sea, Malta, IOI-Malta
Drago, Aldo	The IOI Malta Course: Promoting a Holistic Approach to Regional Ocean Governance, Malta, IOI-Malta.
Duc Thanh, Tran; Tran Dinh Lan; Dinh Van Huy, and Nguyen Van Thao.	Coastal Erosion in Vietnam, Vietnam
Gutiérrez, Alejandro B.	Integrated Coastal Community Development Program: Nicoya Gulf and Peninsula, Costa Rica, IOI-Costa Rica
Kairo, James	Enhancing Community Participation in Mangrove Resource Management, IOI-Eastern Africa (Kenya).

IOI Headquarters	Elisabeth Mann Borgese Biography and Contributions
IOI Headquarters	Arvid Pardo Biography and Contributions
IOI Headquarters	Pacem in Maribus Conferences.
Iyer, Lata	"Small Steps" Cloth Bags for Preventing Use of Plastic Bags and Providing Livelihood for Women in Tsunami Affected Coastal Villages of Tamil Nadu State in South India, IOI-India
Iyer, Lata	Coastal Erosion along Tsunami Affected Coastline due to Man-Made Structures in Tamil Nadu and Pondicherry States of South India, IOI-India
Marone, Eduardo	International Ocean Institute South Western Atlantic Ocean Centre Helping Small Scale Fishery Communities under Women, Youth and the Sea Programme, IOI-South Western Atlantic Ocean (Brazil)
Muller-Karger, Frank and Hendrix, Mara	Coastal Cities Summit II-November 7-10, 2011-St Petersburg, FL, U.S.A., IOI-U.S.A.
Oyewo, E. Olusegun	Socio-economic Empowerment of Youth and Women in Some Western African Rural Coastal Communities, IOI-Western Africa (Nigeria)
Radchenko, Victoria	Public Mind Change as Way to Sustainable Development: Women, Youth and the Sea Programme 5 Years in Ukraine
Soepardjo, A. Harsono	Women, Youth and the Sea Programme-Reusing Plastic Waste into Useful Materials/Souvenirs, IOI-Indonesia
Trong Do, Binh; Harry Leach; Vassil Roussenov; and Jason Hoh.	A Numerical Study on the Indonesian Throughflow. Vietnam
Vassallo, Antonella	The International Ocean Institute and Its Mission, IOI-Headquarters, Malta
Veitayaki, Joeli	Making a Difference in the Lives of Pacific Islanders: IOI's Women, Youth and Sea Supporting Resource Management and Alternative Sources of Livelihood. IOI-Pacific Islands
Virapat, Cherdsak and Kunjapong, Anuratpanich	Tsunami Prevention and Preparedness Practices for Tourism Sectors and Private Entrepreneurs in Khao Lak, Phang Nga Province of Thailand (TPPP), Thailand, IOI-Headquarters & IOI-Thailand

INTERNATIONAL CONFERENCE ON
THE FUTURE CHALLENGES TO COASTAL CITIES

6th – 7th September 2010
Shanghai, People's Republic of China

Organised by:
IOI, the State Ocean Administration of China (SOA) and
The Shanghai Maritime University (SMU)

Group Photo, courtesy of the IOI Shanghai Focal Point and the Shanghai Maritime University

PIMXXXIII in Beijing was followed by a conference held in Shanghai, PR China, which took up the topics explored during PIMXXXIII and completed the endeavours of PIMXXXIII. The INTERNATIONAL CONFERENCE ON THE FUTURE CHALLENGES TO COASTAL CITIES was co-organised by IOI, the State Ocean Administration of China (SOA) and the Shanghai Maritime University, host institute for the IOI Focal Point in Shanghai. During this one day event, KEYNOTE ADDRESSES on the three PIMXXXIII Conference Themes were presented by the Conference Theme chairpersons:

- Oceans & Climate Change - Ms. Robbin Peach, Collaborative Institute for Oceans, Climate and Security, U.S.A.
- Role of Oceans in Sustainable Development – Dr. Werner Ekau, Leibniz Center for Tropical Marine Ecology, IOI Germany
- Challenges to Coastal Cities – Dr. Louis F. Cassar, Institute of Earth Systems, University of Malta, Malta

Afternoon parallel sessions included also the 48th Meeting of the IOI Governing Board and Steering Committee as well as an official review of the PIMXXXIII Conference by experts from SOA and IOI.

Dr. Awni Behnam at the opening of the INTERNATIONAL CONFERENCE ON THE FUTURE CHALLENGES TO COASTAL CITIES.

The Theme Chairpersons: Dr. Ekau, Ms. Peach and Dr. Cassar

The parallel session review of the PIMXXXIII Conference by Experts from SOA and IOI.

KEY CONCLUSIONS FROM THE 1ST PLENARY SESSION (3rd September 2010)

Co-chair: **Dr. Biliana Cicin-Sain, Director, Gerad J. Mangone Center for Marine Policy, University of Delaware, U.S.A., Co-Chair and Head of Secretariat, Global Forum on Oceans, Coasts and Islands**

Co-chair: **Prof. Wu Dexing, President, Ocean University of China**

Rapporteur: **Ms. Mara Hendrix, IOI USA**

The Role of Oceans in Climate Change by Prof. E. Huang, Senior Research Scientist of the First Institute of Oceanography, SOA, China

- Oceans are the largest source of water vapor- the largest greenhouse gas, ranking above CO2
- Oceans transport heat - polar bound – which moderates temperature; circulation determines climate patterns
- Warming trend started before we began to see anthropogenic effects
- Oceans have larger specific heat = longer memory = larger role in determining climate patterns

---

Moving toward an United Nations Regular Process for Assessing the State of the Marine Environment by Dr. Wendy Watson-Wright, Assistant Director-General for UNESCO and IOC Executive Secretary

- Need for assessment for policy and whole society
- Apply knowledge for sustainable management of the oceans
- Why do we need to assess oceans on a regular basis?
  - Limited ability to predict cumulative effects - pressures = fishing, invasive species, climate change, ocean acidification, pollution, habitat loss
  - Need international cooperation to address knowledge gaps
  - Low information level leads to only a partial picture
- Assessment of Assessment (AoA) findings
  - Marine resources and water quality assessments strongest
  - Little funding for data collection, mainly sectoral assessments are found
  - Social and econ. Assessment lacking
  - Global coverage limited
  - Poor understanding of conditional and political analysis
- Need to strengthen relationship between science and policy
  - Informed decision making
  - Identity cost and inform where resources need to be invested in terms of ocean monitoring
  - ID tech solutions
- Value of regulatory procedures
  - Ensure global overview of oceans
  - Focus initiatives
  - Proper policy development
  - Appropriately address human activities and impacts
  - Guide capacity building

** Framework should draw on the best science available, be in an integrated view and include economic and social analysis

- Scope
  - Full geographical coverage needed
  - Sustainability including econ. And social aspects
  - Analytical framework – DPSIR
  - Assess human vulnerability
  - Forward looking prognosis, indicator-based
- Deliverables
  - Integrated assessment – incl. econ. and social aspects
  - Improved process – esp. to benefit developing countries
  - Promote capacity building and transfer of technology
  - Guiding principles
  - Regular evaluation
  - Provide regular and proactive analysis
  - Continue to increase capacity

- Institutional arrangements
  - Steered by UN General Assembly
  - Management and review body
  - Expert panels
  - Pool of experts
  - Secretariat
  - Focal points at national and regional levels
- Regular process
  - will lead to higher return on expenditures
  - Provide global picture of the environment
  - Be more fully integrated
  - Better focus on capacity building

Ocean Impacts on the Formation, Variation and Projection of Climate by Prof. Wu Guoxiong, State Key Laboratory of Numerical Modeling for Atmospheric Science and Geographical Fluid Dynamics (LASG), Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences (CAS), China

Ocean plays an important role in energy, momentum and hydrological cycle and leads to the formation of climate patterns.

Policies and Strategies of the Marine Economy Development in the Next Decade by H.E. Amb Anthony Hill, Former Ambassador of Jamaica to GATT and WTO and UN, Switzerland

- The transition of natural systems of the earth, especially the rise in temps and its effect on the ocean has been largely ignored
- Sea level rise as a threat to humankind has turned geopolitical with climate change, movement of people and completion for scarce resources
- "better city, better life" theme = lowering carbon output = reduction in fossil fuel use = reduction greenhouse gases
- Urgency not attracting the attention of governments
- Not purely out of ignorance that we have not looked ore comprehensively at ocean health
- Externalities of production are not costed
- Important for global issues to be addressed at the international level

*** We must improve conditions of production and consumption in order to improve the conditions of the ocean
*** We must lower production of carbon dioxide
*** We should start with comprehensive coastal zone management at the national level

---

Technology Development for Ocean Science in the Next Decade by Mr. Richard Burt, Sales and Marketing Director, Chelsea Technologies Group Ltd., the United Kingdom

- Need to take measurements over long periods of time in order to improve assessments
- Instrumentation has been getting smaller in last 10 year
- Currently meters are deployed on commercial ships
- Need better assessment of chlorophyll photosynthesis
- Need better geographical coverage
- Future requirements = science, environments and climate studies and validation of satellite data
- Need long-term unattended deployment of devices and lower cost

- Future sensors need to include hydrocarbons
- Alliance for Coastal Technologies = need to question if technology is appropriate for the area being monitored; need highly reliable, low cost sensors (lab in a chip)
- IOC opportunities
  - Workshops for scientists, industry and end users
  - ID scientific drivers
  - ID technical requirements
  - ID capability gap – technical, spatial
  - Brokerage and coordination
- Develop new data products

KEY CONCLUSIONS FROM THE 2ND PLENARY SESSION (3rd September 2010)

Co-chair: **Prof. Raphael M. Lotilla, Executive Director, PEMSEA (Philippines)**

Co-chair: **Dr. Qiao Fangli, Deputy Director-General, First Institute of Oceanography (FIO), State Oceanic Administration (SOA), China**

Rapporteur: **Ms. Elisabeth Conrad, Institute of Earth Systems, University of Malta**

The report below is a synthesis of the main points emerging from the 2nd plenary session. The synthesis is based primarily on the content of the presentations listed below, which were delivered during this session, together with other points raised during discussions. The points have been grouped into key themes, all of which fit within the overarching conference focus of *Challenges to Oceans & Coastal Cities.*

- Mr. Pan Shijian, Vice Mayor of Xiamen Municipality, China *Sustain Xiamen's economic growth through scientific use of marine resources*
- H.E. Ambassador Anthony Hill, Former Ambassador of Jamaica to GATT/WTO/UN *Policies and strategies of the marine economy development in the next decade*
- Dr. Chua Thia-Eng, Malaysia *Healthy oceans and human health: an approach to integrated coastal management*
- Dr. Fanny Douvere, UNESCO Dr. Charles Ehler, President of Ocean Visions Consulting *Marine Spatial Planning and its role in sustainable development*
- H.E. Ambassador Daniel Chuburu, Ambassador and Permanent Representative of Argentina to UNEP and UN-HABITAT. *Challenges to coastal cities in developing countries: role of international cooperation – the UNEP/UN-HABITAT Partnership Agreement*
- Dr. Gunnar Tietze, Maritime Pavilion Dr. Fabienne Vallee, International Cooperation Science Park, Brest Iroise, France *Maritime communities and climate change – role of public authorities and cooperation networks*
- Dr. Biliana Cicin-Sain, Director, Gerard J. Mangone Centre for Marine Policy, University of Delaware, USA, Co-chair and Head of Secretariat, Global Forum on Oceans, Coasts and Islands *Integration of ocean issues in climate change negotiations*

1. The challenges which coastal cities face

- Coastal areas are increasingly characterized by rapid urbanization, a substantial proportion of which is often unplanned and lies outside legal planning systems (e.g. slum settlements).
- Coastal cities are facing several threats, including many relating to climate change impacts, as well as to climatic and other hazards. Some coastal cities are particularly threatened by sea level rise, whilst the productivity of several areas will be affected by ocean acidification.
- Coastal cities in Less Developed Countries have a higher level of vulnerability than coastal cities in More Developed Countries.
- Oceans provide several economic benefits to people, including populations within coastal cities. The most productive marine and coastal ecosystems, of most importance to humankind, are, however, also the most threatened. Marine communities, people living close to and in most cases dependent on the sea, are affecting the oceans' health by overexploitation and degradation of marine resources. There are also impacts on the seas from the various activities of people living further inland. This degradation of the coastal and marine environment will in turn impact negatively on the lives of people living in coastal cities.
- Most coastal and marine environments will be affected by multiple stressors, which may interact producing synergistic and cumulative impacts; such environments are thus characterized by a high level of uncertainty.

2. Coastal cities and climate change

- Many coastal cities stand to be severely affected by the impacts of climate change, particularly cities in less developed parts of the world.
- There is likely to be a significant threat of displacement of coastal populations as a result of climate change impacts.
- There is a strong link between urbanization and increased carbon emissions, with cities contributing heavily to the global carbon footprint. There is thus a need to seek to minimize carbon emissions from city populations.
- Whilst all countries have a responsibility to address global carbon emissions, a principle of common but differentiated responsibilities should apply.
- Ocean concerns need to be better integrated into the global climate change dialogue and negotiation processes.
- Specific necessities relating to climate change include the following:

    - Disseminating best practice solutions via networks of communities;
    - Adapting solutions to the geographical specificities of a region, including socio geographical and economic conditions;
    - To identify new financing sources for maritime communities to develop R&D to address their own needs;
    - To develop and adapt education and training programmes;
    - To develop effective communication with the public at large, including professionals.

3. Insights for managing coastal cities

- Notwithstanding the numerous problems which coastal cities face, there are also 'success stories' (e.g. Shijian in Xiamen municipality, China), where management has produced observable benefits.
- Public awareness is a necessary component for the sound management of coastal cities. Informed public opinion is important for monitoring government's work, providing for enhanced accountability.
- Effective management of coastal cities may need to involve a 'give and take' strategy, which provides for intensive human uses in some areas, but gives priority to natural concerns in others.
- In some cases, this may involve taking difficult decisions, such as to withdraw human activities from certain areas and/or to allow some land areas to revert to the sea.
- Management strategies need to address both mitigation of existing impacts and adaptation to changing environmental, social and economic conditions. Specific general considerations should include:

    - The enactment of ICM legislation where this is presently lacking;
    - Enforcement of all existing regulations;
    - The establishment of coordination mechanisms which bring together relevant agencies and other stakeholders;
    - Establishment of a scientific and technological support system;
    - Enhancement of linkages between scientists and policy-makers;
    - Public participation in decision-making;
    - Risk reduction and preparedness;
    - Sound biotic knowledge, enabling ecosystem-based planning.

- Additionally, managers should look to (i) original solutions (e.g. new incentives) and (ii) the innovation capacities of people themselves, particularly the ability of maritime communities to organize themselves to improve current practices and techniques.
- Public authorities and cooperation networks have a crucial role to play in facilitating coordination, particularly because of (i) their impacts on local maritime policies, and (ii) their capacity to transfer experiences and knowledge. This can take place at local, regional and international levels.
- Marine Science Parks also have a specific role to play, providing coordinated support for the development of advanced techniques and services.

- The management of coastal cities should also specifically address important stressors through the following:

    - Integrated Water Resources Management;
    - Sewage treatment;
    - Restoration of important habitats (e.g. mangroves), where these have been damaged;
    - Integrated management of land-based pollution sources (including considerations of
    - nutrient loading);
    - Control of alien species

- There also needs to be specific evaluation of the effectiveness of any efforts being implemented, as per principles of adaptive management.

4. The specific role of Marine Spatial Planning

- Given the density and variety of human uses in marine areas, there is a need for development and adoption of a comprehensive Marine Spatial Planning system, which regulates sea area use.
- There is a related need for evaluation of practices, specifically addressing the following questions:

    - Where are we now?
    - Where do we want to be?
    - How do we get there?

- Marine Spatial Planning is based on the premise of heterogeneity, i.e. that certain areas are more important than others ecologically/economically/socially.
- There is presently a lack of a good system for handling trade-offs and managing conflicts between environmental, economic and social considerations.
- A major challenge with Marine Spatial Planning involves its overlay with political jurisdictions, e.g. national and sub-national units. Ecological functions often span these boundaries and for Marine Spatial Planning to be effective, it needs to be based on ecosystem considerations. Effective Marine Spatial Planning may thus require transboundary planning and the adoption of a holistic systems perspective.

THEME 1: OCEANS AND CLIMATE CHANGE

Co-Chairs: **Dr. Robbin Peach, Executive Director, Collaborative Institute for Oceans, Climate, and Security, the Venture Development Center, U.S.A.; Prof. Mao Bin, Department of International Cooperation, State Administration, China Oceanic**

Rapporteur: **Mr. Michael Butler, Director of IOI Canada**

The Oceans and Climate Change session of PIMXXXIII was co-chaired by Robbin Peach and Mao Bin. Approximately 50 people attended the session. The eleven presentations in the Ocean and Climate Change session provided much of the substantiating evidence for the opening statement of the Beijing Declaration:

> *"We the delegates of the Conference wish to call the attention of the people of the our globe to the potential threats to their future peace and wellbeing resulting from climate and ocean changes and the widespread degradation of coastal and marine systems."*

The session provided an overview of the major physical and biological parameters associated with climate change, the interrelationship with the oceans, the impact of the changes on ecosystems including coastal communities and some of the current and planned remedial responses. The following summary represents brief highlights from each the presentations. For more detailed information, please refer to the cited abstract, or contact the presenter directly.

Bio-Physical Perspectives

The critical interaction between the oceans and climate change includes the increasing anthropogenic production of green house gases (GHGs), the absorption by the oceans of increasing volumes of carbon resulting in an increase in acidification (lower pH), changes to the atmospheric composition resulting in warmer water, sea level rise, and altered weather patterns (Ronald Menzel, "Network of Marine Protected Areas to Mitigate Climate Change Impact on the Oceans").

Because of its vast volume and heat capacity, the ocean contains most of the memory of the Earth's ocean atmosphere coupled system. The importance of ocean observation, such as the Argo program, for climate research and prediction were emphasized. However, data shortage, especially for deep oceans and over long periods, is still a serious limitation for describing, understanding and predicting long term climate change (Chen Dake, "Ocean Observation for Climate Research and Prediction").

Water vapor constitutes Earth's most significant green house gas (GHG), accounting for about 95% of Earth's greenhouse effect. The oceans contain 96% of water on earth, accounting for 86% of the global evaporation and 78% of global precipitation, and thus play a critical role in regulating the global water cycle and the earth's greenhouse system. Changes in the source-sink pattern of the ocean water cycle can profoundly impact the ocean circulation, global heat transport and the Earth's climate system. Observations demonstrate an acceleration of the global water cycle as the global temperature rises (Wu Lixin, "Ocean Water Cycle and Global Warming").

Because the ocean covers three quarters of the global surface, it is essential to correctly model the ocean mixed layer (ML) so that climate can be better simulated and predicted. Further, by adding the effect of non-breaking wave-induced vertical mixing (Bv), a much better agreement with observed climatologic data has been achieved (Qiao Fangli, "The Improvement of Ocean Circulation Models and Climate Models through Surface Waves: From Mean State to Long-Term Variations").

A new Rapid Response Assessment report was described, entitled Blue Carbon - The Role of Healthy Oceans in Binding Carbon, which was released in October 2009 at the Diversitas Conference, in South Africa. The report highlights the critical role of the oceans and ocean ecosystems in maintaining our climate and in assisting policy makers to mainstream an oceans agenda into national and international climate change initiatives (Zhang Shigang, “Assessment of Assessment Report”).

Earth observation systems have helped to attain important monitoring, surveillance and compliance goals. The current suite of satellite based sensors have provided applications for sea floor mapping, monitoring sea surface temperatures and ocean productivity on a global basis; wide area as well as near-shore wind and wave field analysis; global tidal and current dynamics, as well as sea ice monitoring. However, one of the main challenges is the measurement of parameters associated with the ocean-atmosphere interface in order to better assess the impact on global environmental change. The need for cooperation at the institutional level among space agencies was emphasised (Dirk Werle, “Earth Observation and the Oceans - A New Age of Discovery”).

Impacts of Climate Change

The responses of ecosystems to perturbations are difficult to predict because they result from complex interactions among ecosystem components. The vulnerability of communities to hazards, such as typhoons, storm surges, huge ocean waves and tsunamis, refers to their susceptibility and capacity to cope with these hydro-meteorological stresses. In addition to the general public, an increasing number of industries, such as shipping, are affected, causing escalating economic losses (Wang Hui, “Marine Disasters under Global Change in the China Seas and Near shore Cities”) and (Yannis Kinnas, “Strategy for the Development of Marine Industry in the Time of Climate Change and Global Economic Crisis”).

The linkages between ecosystems, ecosystem services and human well-being have been the focus of a global scale study, the Millennium Ecosystem Assessment (MEA). The national analysis for Vietnam aims to assess the state and trends in ecosystem services associated with marine and coastal systems, explicitly associated with poverty reduction (Nguyen Van Quan et al., “Coastal and Marine Ecosystem Services, Their Linkages with Poverty Alleviation: A Case Study of Vietnam”).

Responses to the Impacts

It is proposed that a network of Marine Protected Areas (MPAs) would help to maintain and restore ecological resilience and the capacity to provide ecological goods and services. The Antinea Foundation’s oceanic expedition is seeking to promote this network (Ronald Menzel, “Network of Marine Protected Areas (MPAs) to Mitigate Climate Change Impact on the Oceans”). The ecological and economic importance of coral reefs and the current threats, argue for the establishment of additional MPAs within the Coral Triangle Initiative (CTI). One thousand five hundred MPAs are planned within the CTI. Malaysia will focus on a goal of more than 200 MPAs within the CTI’s Regional and National Plan of Action (Nor Aieni Haji Mokhtar et al., “Threats to Corals, Fisheries and Food Security. A Call for more Marine Protected Areas established and effectively managed under the Coral Triangle Initiative (CTI)”).

A new approach is proposed to address the multiple risks of climate change to replace the failed traditional negotiations represented by COP15, held in Copenhagen in December, 2009. A regional approach is advocated, based on the UNEP Regional Seas model, which offers a more manageable forum with fewer states involved (Nilufer Oral, “The Role of the Regional Seas Programme for Climate change and Oceans”).

THEME 2: ROLE OF OCEANS IN SUSTAINABLE DEVELOPMENT

Co-Chairs: **Dr. Werner Ekau, Leibniz Center for Tropical Marine Ecology, IOI Germany;**
Dr. Shi Ping, Director-General, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences (CAS), China

Rapporteur: **Ms. Antonella Vassallo, IOI HQ, Malta**

Introduction to the theme
by Dr. Werner Ekau

The ocean covers almost 70% of the Earth's surface and provides a variety of products and services to mankind. About 115 million tons of seafood products are landed each year from the sea (FAO 2010), 90% of this coming from coastal waters. The length of the coastline is 356 000 km (this is the length given by the CIA factbook, which doesn't mean that it is correct!) and it is estimated that by 2025 about 75 percent of the world's population could be living within 100 km of its coasts and thus depend on processes that occur along the coast and are driven by the ocean. We begin to understand that the ocean and especially its coastal part is of increasing importance for humankind. The combined value of the ocean ecosystem in goods and services is estimated at over US$ 21 trillion per year (UNEP 2006). Perhaps a conservative estimate as we never may be able to fully and accurately assess the total economic and especially the social value of the ocean.

The declining tendency of catches in the marine environment is camouflaged by the large fluctuations of small pelagic fish species such as anchovies or sardines. Catches of demersal species are decreasing since 20 years and have to be compensated by species of a lower trophic level ("Fishing down the foodweb"). In 2007, about 28% of stocks were overexploited (19%), depleted (8%) or recovering from depletion (1%) and thus yielding less than their maximum potential owing to excess fishing pressure. A further 52% of stocks were fully exploited and, therefore, producing catches that were at or close to their maximum sustainable limits with no room for further expansion (FAO 2010). Overfishing is taking place at different scales. Besides the pessimistic situation in the large single species stocks, the multispecies fisheries along tropical coasts also suffer from overexploitation. Increasing numbers of fishermen, migrants from inland flooding the coasts and invading small scale fisheries, use of destroyable fishing techniques, degradation of coastal habitats, and pollution are the main threats to the tropical coastal fish stocks.

We note a growing conflict of interests between different stakeholders along the coasts! The traditional use of living resources by fisheries is out-competed more and more by growing interests of industries investing in e.g. non-living resource exploitation, transport, tourism, and wind-parks for the new energy. This drives fishermen into ruin or into unsustainable fishing practices.

Sand and oil mining destroy the habitats of fishes and other exploitable living resources. An important side-effect in these activities is pollution, an extreme example given by the Deepwater Horizon accident in the Gulf of Mexico in late April 2010. Wide-ranged closure of fisheries will have consequences for the region yet unforeseeable. The coinciding pollution of the water masses and coasts will have deep impact on biodiversity, fisheries and tourism.

Marine biodiversity is accepted to provide a variety of products (goods) and functions (services). Besides serving as resource for food or ingredients for biotechnology and pharmaceuticals, marine organisms play a crucial role in most biogeochemical processes, they metabolize organic material and degrade pollutants and waste products from land, and they are involved in the storage of carbon buffering from climate change and coastal protection (mangroves, dune-beach systems, coral reefs) (Rönnbäck 1999; UNEP 2006).

Despite the current international economic situation, maritime trade and transport will register increases in the coming years. Maritime pollution will be commensurate with this growth. In no other human endeavour is the nexus of exploitation and extraction, trade, and sustainable development so

completely interdependent at the micro- and macroscopic levels. To take maritime transport services as an example: currently, 90% of all world trade is seaborne trade and 60% of all oil transported moves by tankers on the high seas. The world's shipping freight bill reached US$380 billion and the bill developing countries pay for shipping their seaborne trade amounted to US$185 billion. The accident of the Chinese coal carrier in the Great Barrier Reef in early 2010 has shown the risks connected to the increasing shipping and pressure on the ship crews.

The distribution of marine invasive alien species is closely related to the globally expanding shipping activities. It has been recognized as one of the four biggest threats to the world marine environment. Ship's ballast water is a major vector for the introduction of these species into the aquatic environment (GEF et al. 2009). It is estimated that some 3-5 billion tones of ballast water is transferred throughout the world each year with an individual ship carrying anything from several hundred litres to more than 130 000 tones of ballast water, depending on the size and purpose of the vessel.

Fisheries and aquaculture, directly or indirectly play an essential role in the livelihoods of millions of people around the world. In 2006, an estimated 43.5 million people were directly engaged; part time or full time, in production of fish either in capture from the wild or in aquaculture, and a further 4 million people was engaged on an occasional basis (2.5 million of them in India). About 86% of fishers and fish farmers worldwide live in Asia, with China having the greatest number (8.1 million fishers and 4.5 million fish farmers). Most fishers and fish farmers are small-scale, artisanal fishers, operating on coastal and inland fishery resources (FAO 2010).

Presentations

The impact of all these threats on the growing coastal societies is enormous and asks for soon and decisive response. The loss of fish stocks, fishing grounds and healthy environments does not just create a sentimental flashback into traditional landscapes and colorful fishing villages that may disappear. It is a loss of food resources, wealth, job opportunities, stability of the coastline, social stability, social equity, etc. that we are facing. The following presentations given in the plenary and parallel sessions were related to the theme of this session and included in the discussion of the problem. A grouping of the presentations according to their spatial and temporal level has been done to facilitate the discussion:

Global scale:

- Policies and Strategies of the Marine Economy Development in the Next Decade by H.E. Amb Anthony Hill
- Marine Spatial Planning and Marine Sustainable Development by Dr. Fanny Douvere & Mr. Charles Ehler
- Healthy Oceans and Human Health: an Approach to Integrated Coastal Management by Dr. Chua Thia-Eng
- Ocean Wealth – Research – Economy by Dr. Iouri Oliounine, IOC/UNESCO, Paris, France

Regional scale:

- Japanese Initiative on Integrated Ocean Management and Sustainable Development by Mr. Hiroshi Terashima, Executive Director, Ocean Policy and Research Foundation, Japan
- Sea Area Management and Marine Economy Sustainable Development by Dr. A. Dong, Deputy Director-General, Department of Sea Area Management, SOA, China
- Towards Integrated Coastal Management (ICM) in Japan by Ms. Masako Bannai Otsuka, Director of IOI Japan & Contracted Researcher, Ocean Policy and Research Foundation, Tokyo, Japan
- China's Marine Economy and Regional Coordinated Development by Prof. He Guangshun, Deputy Director, National Marine Data and Information Service (NMDIS), SOA and Prof. Wang Xiaohui, Director of the Marine Economy Division of NMDIS, SOA, China
- Progress and Prospect of Climate Change Impacts on Fisheries by Dr. Jin Xianshi, Deputy Director-General of Yellow Sea Fisheries Research Institute, CAFS, China
- Ocean and China's Sustainable Development by Dr. Qiu Jun, Research Fellow, China Institute for Marine Affairs, SOA, China

Local scale:

- IOI-Brazil, working from local communities up to the global level, by Prof. Eduardo Marone, Director of IOI-South Western Atlantic Ocean, Brazil
- Development and Promotion of Coastal Zone Management Women Leadership from National Level Policy to Local Management by Dr. Victoria Radchenko, Director of IOI-Ukraine
- Coastal community social accompaniment and participative model in Venado island by Rose Marie Ruiz, project leader and her team presentation by Prof. Alejandro Gutierrez, Director of IOI-Costa Rica, Universidad Nacional, Costa Rica.

Discussion

The discussion aimed at answering the following key questions:

- What are the most burning issues at the coast?
- Which groups have to be supported?
- What instruments are needed to work towards sustainable solutions?
- ICZM or MSP?
- The role of capacity building?
- What are the scales to be addressed

General issues:

It became very clear from the contributions that the ocean is the key for a sustainable development on earth. Three elements are needed to achieve a sustainable development: economic sustainability, environmental sustainability and social sustainability. The importance of the ocean in these three sectors is undoubtedly acknowledged. In China as in other countries the maritime sector is the driving engine for the national economies. The many different services from this sector creates high employment and at the same time an enormous pressure on coasts and ocean that produces an instability in the balance between the three pillars of sustainable development (Economy, Ecology, Sociology). This imbalance can result in social or ecological disasters, an example given from the oil spill in the Gulf of Mexico in April 2010).

At the global level we have to develop better mechanisms to link science to policy and make scientific results more available and understandable to politicians. It turned out that the issue of Ocean Policy should ideally be placed and coordinated in one hand/ministry to avoid competition between ministries and enhance an equal discussion of problems. International organizations such as IOI and IOC can play a substantial role in bringing the message for sustainable development plans to the decision makers.

Regional/national issues:

A number of presentations addressed the efforts of many countries to implement an Integrated Coastal Management. Notwithstanding the diverse mechanisms for coastal and marine protection, planning and management which are presently in operation, there is a need for these to be integrated within a comprehensive and integrated framework, firmly based on ecosystem considerations. Both established and emerging approaches, such as Integrated Coastal Management (ICM) and Marine Spatial Planning (MSP) offer complementary perspectives for the development of such a framework. Regulation constitutes a key element of ocean and coastal management, and must be coupled with effective enforcement. In tandem, there is a need to build public awareness of the value of our coasts and oceans, and to enhance public participation in decision making. Cooperation between relevant stakeholders is a prerequisite for effective planning and management. Evaluation of the effectiveness of management efforts is a crucial element.

A striking reason for ICZM is the economic benefit of such a management which estimated to be 4.9 times higher in an area with ICZM than in an area without. A successful ICZM calls for a good cooperation between countries and regions! For example is the Action Plan for oil spill response in Strait of Malacca incorporated in the local government ICM plans in the different countries. A solid Marine Space Planning as presented in one of the talks may be an instrument used in ICM to manage

space requirements by different sectors. Environmental Impact Studies (EIS) should be a prerequisite for any significant development at the coast.

Local issues:

A number of examples were given on local management in coastal areas. Gender issues are a crucial theme in coastal management. Women are not given their adequate role in the changing communities. Even if women are included in the local management, they are trapped in traditional roles such as anti-crisis managers. Existing laws have to be implemented and education of women improved to overcome this misbalance. Disadvantaged groups in general have to be strengthened to act as full stakeholders in ICZM. Concerning these issues especially NGOs are asked to engage with specially designed programs such as IOI's "Women Youth and the Sea". On the other hand NGOs are overcharged implementing their work on regional level. They normally work on local level. Good practices of NGO programs should be taken up by governments and upgrade them from local to regional scale.

All levels:

It became very clear from all discussions that there is a very strong need for capacity at all levels to understand the problems we are facing and find solutions. Cross sectoral capacity building is needed to analyze the complex correlations within systems and between sectors and enable integrated and sustainable management. Only if we understand the systems and their problems in a comprehensive way we will be in the position to develop and apply tools to withstand the degradation of our coastal seas and the undermining of human rights in coastal communities.

The European Union has adopted ICZM as a tool in its new Marine Policy. The Eight Principles of Good ICZM as defined by the European Union are given here:

Principle 1: A broad overall perspective (thematic and geographic) which will take into account the interdependence and disparity of natural systems and human activities with an impact on coastal areas.

Principle 2: A long-term perspective which will take into account the precautionary principle and the needs of present and future generations.

Principle 3: Adaptive management during a gradual process which will facilitate adjustment as problems and knowledge develop. This implies the need for a sound scientific basis concerning the evolution of the coastal zone.

Principle 4: Local specificity and the great diversity of European coastal zones, which will make it possible to respond to their practical needs with specific solutions and flexible measures.

Principle 5: Working with natural processes and respecting the carrying capacity of ecosystems which will make human activities more environmentally friendly, socially responsible and economically sound in the long run.

Principle 6: Involving all the parties concerned (economic and social partners, the organizations representing coastal zone residents, non-governmental organizations and the business sector) in the management process, for example by means of agreements and based on shared responsibility.

Principle 7: Support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate.

Principle 8: Use of a combination of instruments designed to facilitate coherence between sectoral policy objectives and coherence between planning and management.

THEME 3: CHALLENGES TO COASTAL CITIES

Co-Chairs: **Dr. Louis F. Cassar, Director of Institute of Earth Systems, University of Malta; Dr. Jin Yongxing, Vice President, Shanghai Maritime University, China**

Rapporteur: **Dr. Albert Caruana, Environment Projects Coordinator, Ministry for Resources and Rural Affairs, Malta**

This report presents the salient points that were discussed during the session 'Challenges to Coastal Cities'. The presentations can be grouped under five main themes, namely marine pollution, ecosystem services, early warning systems, beach nourishment and legal and financial mechanisms to address challenges to coastal cities.

Marine Pollution

"Marine pollution includes a range of threats from land-based sources, oil spills, untreated sewage, heavy siltation, eutrophication (nutrient enrichment), invasive species, persistent organic pollutants (POP's), heavy metals from mine tailings and other sources, acidification, radioactive substances, marine litter, overfishing and destruction of coastal and marine habitats" (McCook 1999, Nyström et al 2000, Bellwood et al. 2004). *"A polluted coastal area creates many problems for the cities it hosts. Damage to mangroves, coral reefs, seagrass beds and sand dunes destabilises the coastline, leading to erosion in some cases and excessive siltation in others. Overuse of fertilizer can result in eutrophication, and in extreme cases the creation of dead zones. In recent decades, large areas of coastal waters with harmful algal blooms, severely depleted oxygen levels and disappearing seagrass beds have been identified and clearly linked with increased inputs from the nitrogen cascade"* (UNEP, Coastal Area Pollution – The Role of Cities, Sep 2005).

Professor Zhou Mingjiang discussed the undesirable ecological changes and negative consequences of nutrient over-enrichment and eutrophication in coastal waters caused by human activities particularly through the increasing production and use of synthetic fertilizer. The studies presented showed a relationship of increased harmful algal blooms in eutrophic coastal waters with the change of nutrient regime in sea water. The level of nutrients was shown to be a key environmental issue in coastal waters. Further studies were recommended to understand the effects of nutrient overloading on the consequences of ecological changes as an increase in harmful algal blooms could disrupt/degrade ecosystem structure (What We Know and Don't Know on Harmful Algal Blooms (HABs) in Coastal Eutrophic Systems? – Necessity of End-to-End Studies, Professor Zhou Mingjiang).

"As coastal cities grow they become detached from their environmental surroundings, while still requiring services from their local ecosystem. The demands placed on the host ecosystem threaten the viability of the cities themselves. The health, well being and, in some cases, the very survival of coastal populations depends upon the health and well being of coastal systems such as estuaries and wetlands. However, almost 80% of the pollution load in the oceans comes from land-based activities, both in coastal areas and further inland. Municipal, industrial and agricultural wastes and run off, as well as atmospheric deposition, affect the most productive areas of the marine environment, including estuaries and near shore coastal waters. Physical alterations to the coastal zone also threaten the marine environment. One of the most damaging ways in which cities pollute coastal areas is the discharge of wastewater and sewage" (UNEP, Coastal Area Pollution – The Role of Cities, Sep 2005).

The affect of climate change and human activities on coastal zones was discussed by Prof. Dr. Nicholas Kathijotes. Most of marine pollution arises from land based activities and once in the marine environment, the pollutants are absorbed by marine life, settle as sediments on the sea bed, or follow dispersion. Coastal ecosystems although highly productive are the most highly threatened in the world and an integrated long term approach based on integrated coastal zone management practice is needed (Pollution of Marine Zones in Europe - Preview of the EU Policy as applied to the Mediterranean Coast of Cyprus, Prof Dr Nicholas Kathijotes).

International shipping represents a substantial and growing source of emissions of air pollutants, including greenhouse gases. Emissions of air pollutants are regulated by Annex VI to the International Convention on the Prevention of Pollution from Ships (MARPOL) which came into force in May 2005. Professor Dr. Yihuai discussed the impacts of ship operation on coastal cities. Ship operation has an effect on maritime pollution through the generation of air pollution, liquid discharges and living disturbances. Mitigation measures such as cleaner diesel fuel, machine idle limits, exhaust gas after treatment, etc were discussed (Challenges to Coastal City Environment by Global Shipping, Prof. Dr. Hu Yihuai).

Presentations:

1. What We Know and Don't Know on Harmful Algal Blooms (HABs) in Coastal Eutrophic Systems? – Necessity of End-to-End Studies by Prof. Zhou Mingjiang, Research Fellow, the Institute of Oceanography, Chinese Academy of Sciences (CAS), China

2. Pollution of Marine Zones in Europe - Preview of the EU Policy as applied to the Mediterranean Coast of Cyprus by Prof. Dr. Nicholas Kathijotes, Cyprus University of Technology, Cyprus

3. Challenges to Coastal City Environment by Global Shipping by Prof. Dr. Hu Yihuai, Shanghai Maritime University

Ecosystem Services

"The coastal zone has several valuable and important resources both in economic and biological terms, such as coral reefs, mangroves and sea grass beds. These resources provide numerous functions and services to support a variety of livelihoods and provide the backbone to many local economies" (Regional Training Manual on Disaster Risk Reduction for Coastal Zone Manager – Asian Disaster Preparedness Centre). "Marine ecosystem services refer to benefits that people obtain from marine ecosystems, including the open ocean, coastal seas and estuaries. More than one third of the world's population lives in coastal areas and people throughout the world depend intimately on the oceans and coasts, and the resources they provide, for survival and well being" (Marine Ecosystem Services, J Emmett Duffy 2006). Coastal ecosystems are among the most productive and yet they are highly threatened by development and coastward migration. Population growth and migration, habitat alteration, the introduction of invasive species, nutrient runoff and overfishing are some of the human activities that have the largest effect on these ecosystems. Environmental migration can result when environmental degradation is so severe. A focus on global sustainability is likely to do the most to preserve and even improve ecological and human communities on the coast. Some of the approaches include establishing networks of marine reserves; preserving natural infrastructure; reducing dead zones and controlling invasive species (Ecosystem Services as Drivers of Coastal Migration, Dr. Joe Roman).

The transfer and introduction of marine invasive species has become one of the most serious threats to our marine and coastal environments. As ships have grown larger and faster, and shipping patterns have continued to change, species are increasingly surviving voyages, either in ballast tanks or attached to the submerged parts of the vessel. The mitigation measures discussed included technology that has developed for treatment of ballast water; awareness raising such as the development of tools by IOI to aid countries and regions in management approaches; the publication by IOI of guidelines and the need for integration (Marine Invasive Species and Ballast Water, Mr. Adnan Awad).

Prof. Wen Quan discussed how estuarine biodiversity issues are of increasing concern in China due to a conflict between ecosystem conservation and economic development. Major threats include: non sustainable use of natural resources, habitat loss due to urban and industrial expansion, pollution loading and reduction of freshwater inflows. A recent initiative through a project by the Chinese Government named 'Project on Demonstration of Estuarine Biodiversity Conservation Restoration and Protected Area Networking in China', should improve existing efforts to conserve biodiversity in China's major estuarine ecosystems leading to the creation of protected area networks and wetland restoration (Estuarine Biodiversity Conservation: Challenge to Coastal Cities by Prof. Wen Quan).

Presentations:

1. Ecosystem Services as Drivers of Coastal Migration by Dr. Joe Roman, Gund Institute for Ecological Economics, Rubenstein School of Environment & Natural Resources, University of Vermont, U.S.A.

2. Marine Invasive Species and Ballast Water by Mr. Adnan Awad, Director of IOI South Africa

3. Estuarine Biodiversity Conservation: Challenge to Coastal Cities by Prof. Wen Quan, National Marine Environmental Monitoring Center of China, SOA, China

Early Warning Systems

"Every year, disasters caused by weather, climate and water related hazards impact on communities around the world, leading to loss of human life, destruction of social and economic infrastructure and degradation of already fragile ecosystems. One of the most effective measures for disaster preparedness is a well functioning system that delivers accurate information dependably and on time" (Early Warning Systems, Maryam Golnaraghi). Early warning systems provide real time early warning alerts to protect lives and property from the damaging effects of natural disasters. Natural disasters cannot be prevented, but their impact can be mitigated through community preparedness, timely warnings and effective response.

DisasterAWARE is an early warning system that was developed for the National Disaster Warning Centre in Thailand to improve flood and storm early warning capabilities following the tragedy of the Indian Ocean Tsunami. The presentation delivered by Mr. Goosby gave details of information integration for early warning systems and of real time information through GIS using satellite and numeric modeling. GIS is used as a means to support the early warning system. The system incorporates disaster management related best practices and procedures, augments the underlying early warning system infrastructure to support multi hazard analysis and extends disaster warning notification processes (An Integrated Multi-Hazard Decision Supporting System Supporting Early Warning, Mr. Stanley Goosby).

Dr. Smith Dharmasaroja presented a case study regarding the Indian Ocean Tsunami. The presentation mainly covered early warning systems and ways of communication in Thailand following the 2004 disaster. *"One of the most important aspects of Thailand's scheme to improve public safety, both for local and foreign tourists and visitors, can be significantly enhanced by improving the public understanding and preparedness on threats posed by disasters of various types"* (Accountability of Government in the Tsunami Early Warning Arrangement in Thailand, Dr. Smith Dharmasaroja).

Presentations:

1. An Integrated Multi-Hazard Decision Supporting System Supporting Early Warning by Mr. Stanley Goosby, Chief Scientist of Pacific Disaster Center, Hawaii, U.S.A.

2. Accountability of Government in the Tsunami Early Warning Arrangement in Thailand by Dr. Smith Dharmasaroja, Chairman of Foundation of National Disaster Warning Council, Thailand

Beach Nourishment

"Coastal erosion has become a major concern for future socioeconomic developments in coastal cities. Main response was traditionally through seawalls, groins and breakwaters. However this had an adverse effect on the beach and dune system and soft engineering such as beach nourishment has been employed to maintain sustainable development of coastal environment. Several beach nourishment projects are underway in China and a classification system of beach nourishment projects in China was presented. The establishment of a long term coastal management strategy, modeling of wave and tide driven sediment transport, post project evaluation and monitoring and the preparation of a beach nourishment manual represent measures that should be taken to mitigate the problems that project engineers meet during beach nourishment project implementation." (Beach Nourishment to Improve Coastal City Environment in China, Dr. Cai Feng).

Presentation:

1. Beach Nourishment to Improve Coastal City Environment in China by Dr. Cai Feng, Deputy Director-General, the Third Institute of Oceanography, SOA, China

Legal and Financial Mechanisms

Professor Dr. Alain Piquemal presented a case study of how Monaco contributes to the Regional Mediterranean Vitality by several actions: politic - in terms of regional marine cooperation for environmental protection, scientific - through the creation of the Oceanographic Museum and the Scientific Centre with the objective of undertaking research in relation to climate change and supporting the action of the governmental and international organizations to protect and preserve marine life, economic – through several public works which respect the environment, particularly the flora and fauna of the marine zone and legal – through the adoption of a legal framework to facilitate integrated marine management (Contribution of a Coastal City State to National and Regional Mediterranean Vitality: the example of Monaco, Professor Dr. Alain Piquemal).

"Sustainable development can best be achieved by allowing markets to work within an appropriate framework of cost efficient regulations and economic instruments. One of the major economic agents influencing overall industrial activity and economic growth is the financial institutions such as the banking sector. The banking sector influences the economic growth and development in terms of both quantity and quality, thereby changing the nature of economic growth. Banking sector is one of the major sources of financing investment for commercial projects which is one of the most important economic activities for economic growth" (Green Banking in India – Pravakar Sahoo, Bibhu Prasad Nayak). Green banking is based on providing financial support for sustainability of social, environmental and economic scenarios. The presentation explained how Green Banking can be implemented through a co-operative so that economies of scale can be enjoyed in case of SME's. Loan collateral is not required as a guarantee to the loan as green banking focuses on a cash flow control mechanism and machinery financing. Green banking results in environmental benefits (Paradigm Shift: Conventional to Green Banking - Way to Promote Coastal Sustainability, Mr. Pran Siamwalla).

Presentations:

1. Contribution of a Coastal City State to National and Regional Mediterranean Vitality: the example of Monaco by Prof. Dr. Alain PIQUEMAL, Vice-President of the University of Nice-Sophia Antipolis (France), Member of the National Council of the Sea (Monaco)

2. Paradigm Shift: Conventional to Green Banking - Way to Promote Coastal Sustainability by Mr. Pran Siamwalla, Industry Specialist, Risk Policy & Planning Development, Bank of Ayudhya Public Company Ltd, Thailand

RECOMMENDATIONS BASED ON THE PRESENTATIONS AT PIM XXXIII AND THE SUBSEQUENT REVIEW OF THE PROCEEDINGS AT THE SHANGHAI MARITIME UNIVERSITY 6th September, 2010

Overarching Principles

- Improved integrated understanding of science and technology, communication and governance structures
- Highlighting the critical linkages between oceans and climate change; and between the sciences (natural and social) and policy/decision-making
- Transparent and collaborative research, data collection, sharing, analysis, and modeling is needed at the global, regional and local levels
- Appropriate science-based recommendations for governance mechanisms to shape mitigations and adaptation strategies
- Socially-just policies that take into account the adaptation needs of vulnerable populations
- Framing and communicating the issues so that they are understood and actionable by all peoples

Categories of recommendations

- Observation Systems and Data Integration
- Governance
- Coordination and Communication
- Partnerships

Observation and Integrated Data

1. Support global and regional observation networks for geospatial data collection via satellite, in-situ sensors, and submarine sensor systems.
2. Populate data sparse areas via wider use of existing platforms, wider use of maritime vessels, and new approaches to sensor technologies: low cost, low maintenance, environmentally friendly and expendable
3. Coordinate monitoring of global observation systems to ensure relevant data is applied to short, medium and long term environmental challenges.

Governance

1. Identify critical knowledge gaps and appropriate science-based recommendations for governance mechanisms to shape our mitigation and adaptation strategies.
2. Consider appropriate regional characteristics (biophysical, socio-political, economic, etc.) when creating and enacting environmental agreements at the local, national and international scale.
3. Examine the role of networked protected areas to protect marine ecosystems rich in biodiversity or other critical ecosystem services
4. Pursue adaptation funds to target most vulnerable coastal and island peoples and countries.

Coordination and Communication

1. Identify an international body that can provide an important assessment, coordination and messaging for the acquisition and analysis of environmental data sets relating to the oceans
2. Issue a challenge to the ocean community to initiate and organize the equivalent of an "International Ocean Year" within the decade.
3. Initiate extensive capacity development, public education and awareness programs at all levels to prepare national and local officials and coastal citizens for climate change.

Partnerships

1. Strengthen current collaboration and establish future collaboration between SOA, IOC, IOI and partners
2. Create non-traditional alliances to solicit the opinions of unrepresented and vulnerable populations in a just and equitable way.
3. Promote a new era of public-private partnerships to develop and apply tools to withstand the degradation of coastal seas and communities engaging scientists, technologists, stakeholder communities and governments.

Implementing the Beijing Declaration through Action

A half-day workshop of approximately thirty IOI Directors was held at Shanghai Maritime University, facilitated by Robbin Peach and Louis Cassar, co-chairs of the PACEM in Maribus *International Conference on Oceans, Climate Change and Sustainable Development: Challenges of Oceans and Coastal Cities.* The purpose of the workshop was to recommend action items to implement the Beijing Declaration, based on findings from the PACEM in Maribus Conference. A several-hour brainstorming session led to approximately a dozen recommendations, and the following four were chosen and elaborated upon, as the most appropriate path given the appropriateness of the issues to the Beijing Declaration and capacity of UNESCO, IOI, SOA and partners.

I. Sustainability education needs at all levels (formal, informal, extended – including general public and business – should be linked to livelihoods and public benefits; leading by example)

- Engage network of alumni
- Carry out joint activities with NGOs
- Involve school representatives
- Identify 'climate champions' model…
- Encourage the establishment of museums and aquaria
- Work through existing network of management agencies to disseminate information
- Provide information posters to diving schools, swimming schools, beaches, boat clubs, etc
- Identify niche tourism opportunities
- Disseminate information through IOI network
- Create relationship between IOI and tourism operators
- Disseminate information to food industry (relating to e.g. endangered species)
- Research public perceptions, attitude surveys, etc. to understand most effective means for/drivers of public education
- Network with existing organizations/initiatives
- Work with national Ministries of Education for education at level of schoolchildren
- Provide community-level training on subjects of concern.

II. Based on forthcoming World Oceans Review (IOI), IUCN report, Millennium Ecosystem Assessment and other relevant literature, identify knowledge and awareness gaps and science-based recommendations (including ocean-climate change metrics)

- Use systematic review approach for identifying gaps
- Establish monitoring programme to follow up, based on indicators (e.g. creation of databases)
- Involve foundations (notably 'Google Foundation') to research knowledge gaps.

III. Enhance the effectiveness of coastal reserves and Marine Protected Areas (including transboundary jurisdictions and taking into account implications of climate change)

- Base initiative on IUCN/WCPA prior work and developed criteria
- Recognize role of customary owners; include influence of culture (including cultural diversity)
- Take into account climate change resilience
- Share benefits
- Create more community-managed areas
- Develop better approach for dealing with MPAs
- Use bottom sediments for profiling
- Examine parallels between MPAs and biosphere reserves
- Explore having seminar/conference focused on MPAs – scientific experts and communities.

IV. Capacity building/training of trainers

- Train people working in museums, etc. to talk to patrons (COSEA model)
- Take ocean science into the classroom
- Develop an interactive approach
- Use networks to identify geographical gaps in capacity and related topical gaps
- Use information and communication technologies (ICT) more widely
- Build on existing programmes
- Continuously update curricula for training programmes
- Focus more on alumni follow-up
- Seek cooperation from faith-based/religious organizations
- Ensure training is applicable to new trends (in renewable technology, etc.) to ensure relevance and potential for job creation
- Ensure objective external review of IOI training courses.

The priority list of recommendations:

- *Identify knowledge and awareness gaps and science based recommendations (including ocean-climate change metrics)*
- *Environmental education needs at all levels (formal, informal, extended – including general public and business – should be linked to livelihoods and public benefits; leading by example)*
- *Examine the effectiveness of coastal reserves and Marine Protected Areas (including transboundary jurisdictions and taking into account implications of climate change)*
- *Capacity building/training of trainers*
- *Funding resources directed at coastal sea grass beds, wetlands and mangroves*
- *Controlling/managing land-based activities affecting the oceans*
- *Use of ships of opportunity to collect scientific data – directed to liner conferences (include ballast water)*
- *Promote new area of public/private partnerships (including financing of green projects)*
- *Look through lens of "triple bottom line" (social, economic, environmental)*
- *Issue recommendation to international community to create an International Ocean Year*
- *Support global and regional observation networks*
- *Coordinate monitoring of global observation systems for short, medium and long term*

The Shanghai meetings were followed by a visit to the EXPO 2010 in Shanghai were the IOI directors were invited as special guests of the UN pavilion, the China Pavilion and the Monaco Pavilion amongst others.

Visit to the UN Pavilion, in the foreground, Dr. Awni Behnam, UN Assistant Secretary General and Commissioner General for the UN Pavilion at the EXPO 2010.

BIOGRAPHIES OF DISTINGUISHED CONTRIBUTORS AND EXPERTS

Mr. Sun ZHIHUI
Administrator of State Oceanic Administration
Co-Chair of the Conference

Mr. Sun Zhihui was assigned to the State Oceanic Administration (SOA) of the People's Republic of China in 1974 when he was graduated from the Geophysics Department of the Ocean University of China in 1974. Mr. Zhihui has been Administrator, SOA, since 2005. Prior to this appointment, Mr. Zhihui held a number of senior positions within SOA. He was appointed Director of the Planning Division, the Department of Finance and Planning in 1987, Deputy Director-General, the Department of Science and Technology in 1992, Director-General, the China Ocean Press, 1994, Deputy Administrator, SOA in 1999. Mr. Zhihui has extensive experience of ocean governance and planning.

****

Dr. Awni BEHNAM
IOI President/Assistant Secretary General of the United Nations Commissioner General for World Expo 2010
Co-Chair of the Conference

Dr. Awni Behnam began his early public schooling and cadetship in the United Kingdom (1953-1959). He served as Commanding Officer in the Navy (1962-1969) and held executive post in the Shipping Administration in Iraq (1969-1971). He joined the University of Wales (UK) in 1972 and, as member of the academic staff, lectured in the Department of Maritime Studies (1974 - 1977). He joined the United Nations at UNCTAD, Geneva in 1977 as Economic Affairs Officer and became Assistant to the Director in the Shipping Division of UNCTAD and was instrumental in the adoption of several international maritime conventions (Multimodal Convention, Ship Registration Convention, Mortgages and Liens and Arrest of Vessels Conventions) before assuming responsibility as the Chief of Liaison with Developing Countries (Group of 77) for the Secretary-General of UNCTAD. In 1986 he was responsible for the political and diplomatic relations of the Secretary-General with the Permanent Representatives of developing countries and provided support and advice for negotiations and consensus building in multilateral diplomacy on trade and development. He was promoted to the rank of Principle Officer in 1992 as the Secretary of the Trade and Development Board of UNCTAD. In addition, he assumed the responsibility of Chief of Intergovernmental Support Services of UNCTAD, (Conference Services) and was responsible for the management of intergovernmental processes and the organization of intergovernmental conferences and meetings in UNCTAD.

In 1996, he was appointed Secretary of the Ninth United Nations Conference on Trade and Development (South Africa), Secretary of the Nyon Summit in 1998, Secretary of the Tenth Conference of UNCTAD (Thailand) 2000, Secretary of the Third United Nations Conference on the Least Developed Countries (Brussels) 2001 and designed and supervised the Eleventh Conference in Sao Paulo in 2004 and acted as spokesman with oversight on the conference protocol. He was accredited with renovating the General Debate by hosting live video casting and freeing the plenary for interactive debates; he was also accredited for introducing video conferencing to the UN System and interpretation for distance Conferencing. The UNCTAD video conferencing facility in Geneva which he established was inaugurated by the former UN Secretary General. Mr. Kofi Annan.

In 2000 he assumed the position of Senior Advisor to the Secretary-General of UNCTAD, a post he held until leaving UNCTAD in 2004. As a UN diplomat, Dr. Behnam accumulated some 27 years of experience in the diplomatic service of the United Nations and in organizing international conferences and major events. He was instrumental in the successful negotiations of several international conventions and multilateral agreements under the auspices of UNCTAD. He served on request as Secretary of the Ministerial meetings of the G77 prior to UNCTAD in Tehran, Havana, Morocco, and South Africa and as Secretary of the G77 regional meetings in Bangladesh, Jordan and Lebanon. He assisted and advised the Government of Qatar in the organization of the South Summit in Doha, 2004, and other numerous events including the GATES conference in Shanghai and GPA in Beijing.

A long-time associate and close friend of the founder of IOI Professor Elisabeth Mann Borgese, he devoted a life time to advocacy in favour of the genuine link and in promoting ocean governance. He lectured at the IOI training course in Halifax Canada for 29 consequent annual courses.

On leaving the UN, he was elected President of the International Ocean Institute (IOI) headquartered in Malta, with responsibility for 26 (IOI) Operational Centres worldwide, succeeding his predecessor, Judge Warioba, former President of Tanzania. Dr. Behnam assumed full-time responsibility for leading the Organization (IOI), a position he currently holds (www.ioinst.org), presiding and directing its flag ship conferences *Pacem in Maribus* in Ukraine (2004), Australia (2005) and Malta (2007) and representing the organization in major international events. He promoted and instituted the first Youth Ocean Arts Exhibitions in Ukraine and Malta. As the chairmen of the IOI Board of Governors he has gained major experience in financial and budgetary programming and management of a civil society organization and developed a well-recognized capacity for outreach and advocacy skills and capacity-building. He was also responsible for the signing of several MOUs with international organizations such as the UNEP/GPA and RAMSAR Convention, and executing joint projects such as the Children's Art Publication entitled "Skies and Ocean" with the World Meteorological Organization (WMO).

In 2008 he was invited by the UN Secretary General to assume the responsibility of Commissioner General for the UN Pavilion at the Shanghai Expo 2010 at the level of Assistant Secretary-General.

He is a member of a number of Professional Societies and was awarded the Life Achievement Award from the ILD, recipient of the General Assembly's South – South Cooperation Day award for South - South Solidarity on behalf of IOI's work in India in the Tsunami area. He was presented by the President of Malta, the Honourable E. Fenech Adami, with the Fondation de Malte Gold Cross Medal for outstanding leadership (November 2007).

Dr. Behnam has published widely; his most recent publications are "Twilight of Flag States Control", «Unfulfilled Promises of the Seventies", "The Ocean Trade in the New Economy", "Developing Countries in the Group of 77, a Journey in Multilateral Diplomacy"; "Towards World Constitutionalism", "Whither IOI?", "Achieving the MDGs – a Stake Holder's Contribution", "Biodiversity – an Issue of Governance", "Millennium of Paradox",Telos 2009

Dr. Behnam holds a first degree in Business Administration (BA Mustensiriya University – 1968), a Masters (MSc.) in Development Economics and a Doctorate (PhD) from the University of Wales (1974 and 1976 respectively).

Born in Mousel, Iraq in 1940 and having left his country of birth in 1972, he became a Swiss citizen in 1994. On the occasion of the entry of Switzerland to the UN, the Swiss Authorities honoured him with Swiss Diplomatic Passport for the duration of his service in the UN. He is married with two children and four grand children.

****

Dr. Wendy WATSON-WRIGHT, Ph.D.
Assistant Director General and Executive Secretary, UNESCO Intergovernmental Oceanographic Commission
Co-Chair of the Conference

Dr. Wendy Watson-Wright has been Assistant Director General and Executive Secretary of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO) since January 2010. Headquartered in Paris, IOC-UNESCO promotes international cooperation and coordinates programmes in marine research, services, observation systems, hazard mitigation and capacity development in order to better manage the nature and resources of the oceans and coastal areas.

From 2001 to 2009, she was Assistant Deputy Minister, Science, in the federal Department of Fisheries and Oceans Canada (DFO) where she was responsible for providing the leadership, as well as policy and scientific direction for all science activities in the department, including oceanography, hydrography, and fisheries, aquaculture, habitat, climate and aquatic ecosystem science.

Other positions she has held within the Canadian federal public service include research scientist (shellfish toxins) DFO in Halifax, Nova Scotia; Director of the DFO St. Andrews (Marine) Biological Station in New Brunswick, Director General of DFO Audit and Evaluation (Ottawa, Ontario), and Director General of Strategic Policy in the Population and Public Health Branch of Health Canada. Dr. Watson-Wright holds a Ph.D. in Physiology from Dalhousie University in Halifax, Nova Scotia.

****

Mr. Chen LIANZENG
Deputy Administrator, State Oceanic Administration
Chair, Local Organizing Committee

Mr. Chen Lianzeng has been Deputy Administrator of the State Oceanic Administration (SOA) of China since 1999. Prior to this appointment, Mr. Chen held a number of senior positions within SOA. He was appointed Deputy Director, Division of Marine Science Research, 1984, Director, Division of Scientific Application 1989, the Department of Science and Technology; Director, Division of Comprehensive Management, the Department of Science and Technology, 1993; Deputy Director-General, Department of Ocean Management, 1996 (March); Deputy Director-General, South Sea Branch, 1996 (October); Director–General, Research Institute of Sea Water Desalination and Comprehensive Sea Water Use, 1997. Mr. Chen was graduated from the Department of Oceanography, Xiamen University in 1980 and joined SOA in the same year. He conducted his advanced study at the South Carolina University, USA, during 1983-1984.

****

Mr. Kunjapong ANURATPANICH

Mr. Kunjapong Anuratpanich is currently a Director of Satellite and Radar data Analysis Division, Thailand‘s Meteorological Department (TMD). He has been appointed as a Director of the International Ocean Institute of Thailand in December 2009.

He obtained his graduate degree from the Faculty of Science (Mathematics), Srinakharinwirot University in Bangkok, Thailand. His experiences include the Advanced in Meteorology Course at the Meteorological Department; training Program on Seismology and Tsunami Warning, Bangkok, Thailand organized By the U.S. Geological Survey (USGS) during May 15-22, 2006; training Program on the Weather Long Range Forecast Intermediate Course at Pune, India during August - November 1989. He was a senior forecaster of the Central Weather Bureau, TMD during in 1978-2001. He worked at Thailand’s National Disaster Warning Center on the Rattanathibet road, Nonthaburi During from year 2005 to 2009.

****

Mr. Richard BURT
Chelsea Technologies Group Ltd, West Molesey, UK

Mr. Richard Burt graduated from Swansea University with a degree in Chemistry and Oceanography and joined the scientific civil service / Ministry of Defense. Specialized in non acoustic detection in anti submarine warfare and under ice oceanography. Conducted and participated in international military oceanographic programmes. Joined Chelsea Technologies in 1989 with responsibility for business development. Appointed to the Board in 1992 as sales and marketing director. International experience in North America, Asia, China and the Former Soviet Union. Particular experience includes establishing business relationships between research organizations and industry, technology transfer and the development of oceanographic sensors and systems for operational oceanography. Recent activities include the application of oceanographic sensor technologies to monitor and protect drinking water supplies.

Positions

- Institute of Marine Engineering, Science and Technology	Fellow Chartered Marine Scientist Chartered Marine Technologist
- Association of Marine Scientific Industries	Chairman
- Society of Maritime Industries	Board Member
- NOAA Alliance for Coastal	Board Member
- Technologies (USA)	Co-chair Stakeholder Council
- SCOR OceanScope	Associate Member

****

H.E. Ambassador Salvino BUSUTTIL
IOI Host Country Representative and President of the Fondation de Malte

Professor Salvino Busuttil, former Ambassador of Malta to France and Portugal, is currently the President of the Fondation de Malte, Chairman of La Valette Funds Sicav plc and of Wignacourt Funds Sicav plc., AROS Paridigm Fund SICAV plc. AROS Paradigm, Master Fund SICAV, Director of Corinthia Hotels International, of Trafigura Ltd (and of its several subsidiaries based in Malta). He is also President of the consulting company Taktos Limited.

A former Director of the UN Mediterranean Action Plan and of UNESCO's Division of the Socio-cultural Environment, he was President of the International Centre for Higher Studies in Mediterranean Agronomy; Vice-President of the International Commission for the Scientific Exploration of the Mediterranean, Emeritus Professor in Economics at the University of Malta where he served as Dean. He was also Director of the Malta Development Corporation, President of the Economic Council of Malta, and the United Nations' Adviser to the Prime Ministers of the Bahamas and of St Vincent and the Grenadines. He is also an adviser to Malta's Minister of Foreign Affairs.

He has written extensively on Mediterranean Affairs and on the problematique of future generations and their environment, having led Malta's delegation to the 1972 UN Environment Conference in Stockholm.

****

Mr. Michael J.A. BUTLER

Mr. Michael Butler holds the current position as Director, International Ocean Institute – Canada and Director, Secretariat of the Atlantic Coastal Zone Information Steering Committee, Dalhousie University at 6414 Coburg Road,Halifax, Nova Scotia CANADA B3H 2A7, Tel: 902-494-1977; Fax: 902-494-1334, Email: michael.butler@dal.ca. He attended McGill University (Marine Sciences Centre, Ph.D programme); Memorial University (M.Sc); University of British Columbia; University of London (B.Sc).

Some selected publications are:

- Butler, M.J.A. and C. LeBlanc. 2009. "The Atlantic Coastal Zone Information Steering Committee's Role as a Catalyst and Incubator". In: Proceedings of the 8th Bay of Fundy Science Workshop, 26-29 May 2009 in Wolfville, Nova Scotia.

- Butler, M.J.A., P.R. Boudreau, C. LeBlanc and K. Baldwin. In press.

- "Spatial Data infrastructures in Support of Ecosystem Based Management and Ecosystem Approach to Fisheries in the Caribbean". In: Proceedings of the Workshop on Marine Ecosystem Based Management in the Caribbean: an Essential Component of Principled Ocean Governance, University of West Indies, Barbados, 10-12 December 2008.

- Butler, M.J.A. and C. LeBlanc. 2006. The Ocean Technology Sector in Atlantic Canada - Volume 2: Potential Public Sector Demand. Study prepared for the Atlantic Canada Opportunities Agency, Moncton, New Brunswick, May 2006. 72+p. http://aczisc.dal.ca/oceantech-2.pdf

- Butler, M.J.A. and C. LeBlanc (eds). 2001. Climate Change Impacts and Adaptation Inventory for Canada's Coasts, report prepared for the Geological Survey of Canada, Natural Resources Canada by the Atlantic Coastal Zone Information Steering Committee.

****

Dr. Cai FENG, Ph.D
Third Institute of Oceanography
State Oceanic Administration, Xiamen 361005, China

Education:

- Ph.D. in Marine Geology, Ocean University of China, Qingdao, China, 2005.
- M.S. in Marine Sedimentary, Xiamen University, Xiamen, China, 1989.
- B.S. in Marine Geology, Ocean University of China, Qingdao, China, 1986.

Research experiences:

- 2002 – present, Deputy Director, Third Institute of Oceanography, State Oceanic Administration,
  Xiamen, China.
- 1997 – present, Professor, Third Institute of Oceanography, State Oceanic Administration, Xiamen, China.
- 1999, Visiting Scholar, Australian Atomic Energy Commission, New South Wales, Australia.
- 1997 – 1998, Visiting Scholar, University of Hanover, Germany.
- 1995 – 1997, Associate Professor, Third Institute of Oceanography, State Oceanic Administration, Xiamen, China.
- 1994 – 1995, Visiting Scholar, Sanyon Marine Research Co.,Toyko,Japan
- 1989 – 1995, Assistant Professor, Third Institute of Oceanography, State Oceanic Administration, Xiamen, China.

Membership in Professional Societies:

- Division of Marine Geology, Chinese Society of Oceanography.
- Division of Estuary and Coast, Chinese Society of Oceanography.
- Division of Coastal development and Management, Chinese Society of Oceanography
- Xiamen Society of Marine and Fisheries.

Areas of Research Interest:

- Coastal erosion and protection.
- Integrated coastal management.
- Coastal morphodynamics.
- Coastal engineering and management.

Main Grants and Contacts in Recent Years:

- Evaluation of coastal erosion and protection technique, 2007.1--2009.12. (908 Special Project)
- Research project of coastal hazards: coastal erosion, 2006.01--2009.12. (908 Special Project)

- Extending study on the storm effect of morphodynamical process of beach, 2007--2009. (National Science Foundation)
- Morphodynamic mechanism of macro-tidal beaches in the west coast of the Taiwan Strait, 2010.1--2012.12.(National Science Foundation)
- Protection technique of beach and demonstration project in China, 2010--2012.
- Beach nourishment project on Xiangshan-Changweijiao coast in Xiamen, China.

Main Publications in Last 5 Years:

1. Hongshuai Qi, Cai Feng, Xianze Su, et al. 2009. Study on geomorphologic process of beaches under tropical storm action [J]. Acta Oceanologica Sinica, 31(1): 168-176. (In Chinese)
2. Guanglu Wang, Cai Feng, Huimei Cao, et al. 2009. Study on the practice and theory of beach replenishment of Xiangshan-Changweijiao beach in Xiamen [J]. The Ocean Engineering, 27(3):66-75. (In Chinese)
3. Cai Feng, Xianze Su, Jianhui Liu, et al. 2009. Coastal erosion in China under the condition of global climate change and measures for its prevention. Progress in Natural Science, 19(4), 415-426.
4. Cai Feng, Hongshuai Qi, and Dongxing Xia. 2008. Morphodynamic processes of sandy beaches in south China [M]. Ocean Press, Beijing. (In Chinese)
5. Cai Feng, Huimei Cao, Xianze Su, et al. 2007. Analysis on morphodynamics of sandy beaches in South China [J]. Journal of Coastal Research, 23(1): 236-246.
6. Cai Feng, Gang Lei, Xianze Su, et al. 2006. Study on process response of Fujian beach geomorphology to typhoon Aere [J]. The Ocean Engineering, 24(1):98-109. (In Chinese)
7. Cai Feng, Gang Lei. 2005. Typhoon response model of sedimentary and geomorphological associations on Xiasha beach, Jiangtian, Fujian [J]. Journal of Oceanography in Taiwan Strait, 24(3):395-403. (In Chinese)
8. Hongshuai Qi, Cai Feng, Gang Lei, et al. The response of beaches to tropical storms in south China [J]. Marine Geology. (In Press)
9. Jianhui Liu, Cai Feng, Gang Lei, et al. Recession of soft coastal cliff in Fujian Coast--In case of northeast coast of Pingtan Island[J]. Marine Environmental Science, (In Press). (In Chinese)

****

Dr. Albert CARUANA

Dr. Albert Caruana Ph.D. is currently employed as an advisor on major EU projects within the Ministry for Resources and Rural Affairs in Malta. Prior to his appointment as advisor, Dr. Caruana worked as a consultant in management, project management and environmental risk assessments. During this time he also served as a member on the board of the Malta Tourism Authority.

Previous posts held in Malta include his employment as Chief Executive Officer of Grand Harbour Marina Ltd, a super yacht marina that was developed under his supervision; and Head of Secretariat at the Ministry for Tourism and Culture with the principal responsibility of coordinating major projects in Malta such as the VISET cruise liner terminal project.

Dr. Caruana holds a first degree in Mechanical Engineering from the University of Malta, a Masters Degree (with distinction) in Petroleum Engineering from Imperial College, University of London and a Doctorate Degree in Petroleum Engineering from the University of London. Dr. Caruana also worked as a reservoir engineer in the North Sea for a number of years during his employment with Texaco.

Current projects related to the conference topics include the national flood relief project and waste to energy projects. Dr. Caruana is also a part time lecturer on environmental risk assessments with the Institute of Earth Systems at the University of Malta and is Environment Projects Coordinator, Ministry for Resources and Rural Affairs, Malta.

****

Dr. Louis F. CASSAR

Dr. Louis F. Cassar Ph.D. is a landscape ecologist and environmental planner by training, with experience in environmental appraisal (ecology and vegetation analysis) and land-use evaluation. Dr. Cassar is currently the Director of the International Environment Institute of the University of Malta, whose role is to provide multidisciplinary training in areas of environmental science, and environmental planning and management. His research interests are in environmental management and conservation, as also in aspects of entomology, with key specialization in:

- coastal management, in particular, the dynamics and conservation of coastal dune systems;
- landscape ecology, primarily corridor ecology, fragmentation and ecological restoration;
- participatory methods for stakeholder involvement in conservation and decision-taking;
- Orthoptera (Insecta) of the circum-Sicilian island complex and the Maghreb.

Over the years, he has lectured and carried out research in the areas across the Mediterranean, in Europe, South America and West Africa, as also conducted conservation management audits and landscape appraisals, in the Maltese Islands, the Maghreb (Morocco, Tunisia and Algeria), as also in Italy (The Maremma) and Sicily. In his capacity as consultant to a United Nations agency (ICS-UNIDO) he was responsible for setting up the coastal management programme for the International Centre for Science & High Technology in 1998/99 as well as led a number of courses, with a view to building human resource capacity, in Latin America, West Africa and throughout the Mediterranean over a span of almost a decade. Together with colleagues from the University of Reading, he was recently involved in the development of a coastal landscape appraisal methodology for UNEP, using the Cap Bon promontory in Tunisia as key example.

Moreover, he has participated in and/or led more than 110 environmental appraisal/impact assessment assignments, both in the Maltese Islands and overseas, with terrestrial ecology being the main focus. Between 2001 and 2007, he served as Independent Member on the Board of the national environment and planning agency (MEPA), as well as on other boards, notable amongst which is that of the Centre for Environment & Development in the Arab Region & Europe (CEDARE), based in Cairo, on which he has served since 1993.

****

Dr. Vahid CHEGINI

Dr. Vahid Chegini is the director of IOI-OC Iran and the director of the Iranian National Institute for Oceanography and director of Iranian National Committee for oceanography.

He holds a Ph.D. in Coastal Engineering from the University of New South Wales, Australia (1995), a M.Sc. in Hydraulic Structures from Tehran University, Iran (1989), and a B.Sc. in Civil Engineering from Amir Kabir University of Technology, Iran (1985). He was appointed as the director of the Iranian National Center for Oceanography in 2007. He has started work at the institute since 2001 as the research deputy and a scientific member of the Marine Engineering & Technology Department. He has also worked as the research deputy of Soil Conservation and Watershed Management Research Center (SCWMRC) for one year, as the director of Jihad Water and Watershed Management Company (JWRC) for five years and as the head of Shore Protection Section of SCWMRC for two years. He has published 9 books in the field of coastal engineering and Physical Oceanography in Persian and approximately 80 papers in Persian and English.

Moreover, Dr. Chegini has cooperated as a professor of Physical Oceanography with Khoramshahr University of Marine Sciences and Technology, University of Tehran, Faculty of Marine Sciences and Technologies of Northern Tehran Branch Islamic Azad University, Faculty of sciences of Tarbiat Moalem University, Hormozgan University, nonprofitable Kish University and Faculty of Marine Sciences and Technologies of Science and Research Branch of Islamic Azad University.

His research interests are as follows:

- Water wave theories
- Wave modeling
- Wave forecasting
- Coastal processes and sediment transportation
- Breakwaters and coastal protective structures
- Integrated Coastal Zone Management
- Coastal oceanography

****

Dr. Chen DAKE

Dr. Chen Dake is currently the director of the State Key Laboratory of Satellite Ocean Environment Dynamics in Hangzhou, China, and also a Lamont Research Professor at the Lamont-Doherty Earth Observatory of Columbia University in New York, USA. He received his Ph.D. in physical oceanography from Stony Brook University in 1989, and has worked in the fields of oceanography and climate science ever since.

Dr. Dake's research interest is wide-spreading, ranging from turbulent mixing in estuaries and shallow seas to global climate fluctuations associated with ENSO. His most significant contributions include a number of high-impact studies of ENSO prediction and predictability, a novel approach to the parameterization of oceanic vertical mixing, and a series of work on costal ocean dynamics.

At present, Dr. Dake serves as the president of AOGS Ocean Science Section, and a member of PICES POC committee, WCRP China sub-committee, and SCOR China sub-committee. He plays an instrumental role in promoting and organizing several national campaigns in ocean and climate research, with an emphasis on the roles of the upper ocean in short-term climate change and in the development of tropical cyclones.

****

Dr. Biliana CICIN-SAIN

Dr. Biliana Cicin-Sain (Ph.D in political science, UCLA, postdoctoral training, Harvard University) is Director of the Gerard J. Mangone Center for Marine Policy and Professor of Marine Policy at the University of Delaware's College of Earth, Ocean, and Environment. She is a leader in the field of integrated coastal and ocean governance, both in the United States and around the world, and has forged international collaboration among all sectors of the international oceans community to advance the global oceans agenda.

Dr. Cicin-Sain is the organizer, Co-Chair, and Head of Secretariat of the Global Forum on Oceans, Coasts, and Islands, initially mobilized in 2001 to place issues related to oceans, coasts, and island states on the agenda of the 2002 World Summit on Sustainable Development and to agree on a detailed set of global ocean targets and timelines. Since 2001, the Global Forum has brought together ocean leaders from governments, nongovernmental organizations, UN agencies, the private sector, and scientific associations from 105 countries to promote the implementation of international ocean agreements, analyze emerging policy issues, and advance international consensus on unresolved ocean issues.

Dr. Cicin-Sain has served (or is serving as) as a policy advisor to: International organizations--UNESCO's Intergovernmental Oceanographic Commission, World Bank, UN Environment Programme, Inter-American Development Bank; national governments--Governments of Albania, Canada, Colombia, Ecuador, Indonesia, R.O. Korea, United States, Vietnam; and U.S. coastal states and counties. Since 1991, she has frequently participated in United Nations negotiations on oceans and coasts, especially in the 1992 Earth Summit, the 2002 World Summit on Sustainable Development, and annual UN negotiations on oceans. Since 2009, she has been playing a prominent role in bringing the oceans issues into the global climate negotiations in the context of the UN Framework Convention on Climate Change.

Among her advisory appointments, Dr. Cicin-Sain has served on various boards of the U.S. National Research Council (National Academy of Sciences and National Academy of Engineering), including the Marine Board and the Ocean Studies Board; on the Department of Interior's Scientific Committee on the Outer Continental Shelf; as a senior policy advisor in the International Program Office of the US National Oceanic and Atmospheric Administration; as a scientific advisor to the U.S. Commission on Ocean Policy; as an advisor to the Independent Oceans Commission, Portugal; as an advisor to the Ocean Policy Research Foundation in Japan; on the Academic Committee of Xiamen University in China; and as a Visiting Professor of Marine Policy at the United Nations University-Institute of Advanced Study in Tokyo.

Dr. Cicin-Sain is the author of over 100 publications in marine policy, with an emphasis on cross-cutting issues related to integrated ocean and coastal governance. Her 1998 book on Integrated Coastal and Ocean Management: Concepts and Practices has been used in academic and governmental training efforts around the world. Her 2000 book, The Future of U.S. Ocean Policy: Choices for the New Century which has been called "…the ultimate guide to the emerging debate on U.S. ocean governance," presented a blueprint for national ocean policy reform in the United States. Integrated National and Regional Ocean Policies: Comparative Practices and Future Prospects (forthcoming in 2010), brings together analyses of the experiences of 15 nations and 4 regions of the world that have taken concrete steps toward cross-cutting integrated oceans governance.

In 2007 Dr. Cicin-Sain was awarded the Elisabeth-Mann-Borgese Meerespreis ("Prize of the Sea") by the Ministry of Science, Economics and Transport of the Land Schleswig-Holstein in Germany. The Honorary Prize is awarded to prominent personalities that advocate the protection and preservation of the sea in politics and society. The first time the Honorary Prize was given, in 2006, it was awarded to Professor Dr. Klaus Topfer, former director of the UN Environment Programme and German Minister for the Environment. The Meerepreis is named after Elisabeth Mann-Borgese, informally known as "the Mother of the Oceans." The daughter of noted German writer Thomas Mann, Professor Borgese worked incessantly to promote integrated management of oceans and to build the capacity of developing nations to manage their ocean resources. She had a major impact on the UN Convention on Law of the Sea and was the founder of the International Ocean Institute, with 25 teaching centres around the world. The Meerespreis Jury cited Professor Cicin-Sain's "political and scientific engagement for an ecosystem-based integrated management of the oceans [which] has been instrumental in promoting a responsible and sustainable use of marine environment within the international public."

In 2007 Dr. Cicin-Sain was also awarded the Coastal Zone Foundation Award for leadership in coastal management, and in 2002, she was awarded the Ocean and Coastal Stewardship Award at the California and the World Ocean Conference together with the late Robert W. Knecht, her husband and co-author, first director of the US Coastal Zone Management Program.

Earlier in her career, Dr. Cicin-Sain served in two US federal agencies: NOAA and the Department of Housing and Urban Development; was a professor of political science at the University of California, Santa Barbara (UCSB); founder and director of UCSB's Ocean and Coastal Policy Center; and a researcher at the Woods Hole Oceanographic Institution, the Intergovernmental Oceanographic Commission, and at the East-West Center in Hawaii.

Dr. Cicin-Sain was born in Italy and spent her early years in Argentina, prior to immigrating to the U.S. She speaks English, Spanish, and French fluently, as well as some Italian, Serbo-Croatian, Russian, and Portuguese.

****

Ambassador Daniel CHUBURU

Ambassador Daniel Chuburu was born in Buenos Aires, Argentina, on August 3rd, 1955. He obtained a degree in Economic and Business Sciences at Universidad Complutense, Madrid, Spain. He graduated from the Argentine Ministry of Foreign Affairs Academy in 1981. He has been appointed to the Permanent Mission of Argentina before the International Organizations in Geneva and twice to the Embassy of Argentina to the United States of America, the second time as Deputy Chief of Mission. In Buenos Aires he has served in the Multilateral Economic Affairs Division and as Director for Neighbouring Countries and Deputy Head of the Argentine Delegation to the Administrative Commission of the Rio de la Plata. He has participated and headed delegations to international conferences, bilateral and multilateral meetings, seminars and workshops in various countries and different political, economic, social and environmental matters.

He is currently the Argentine Ambassador to Kenya, the Argentine Permanent Representative to the United Nations Environment Programme (UNEP) and to the United Nations Settlements Programme (UN-Habitat). He was Chair of the Group of 77 and China, Nairobi Chapter in 2008. Chair of the Committee of Permanent Representatives to the UNEP for the period 2009/2011 and Co-Chair of the UN Habitat Governance Review Implementation Team. Douche

****

Dr. Elisabeth CONRAD

Dr. Elisabeth Conrad is an academic member of staff with the International Environment Institute of the University of Malta. She has held this position on a full-time basis since January 2009, after having served as a visiting lecturer/research associate since 2002. Her previous job positions include that of environmental management consultant in the private sector and of environment protection inspector with the Malta Environment and Planning Authority. In the former role, she was responsible for the coordination and compilation of Environmental Impact Assessments and environmental management plans. She holds a first class honours undergraduate degree in earth sciences (geography) from the University of Malta and a Master of Science degree (with distinction) in environmental management from Imperial College, University of London. She is currently completing her doctoral research, on aspects of stakeholder involvement and perception, with the Institute of Biological, Rural and Environmental Sciences, University of Aberystwyth. Dr. Conrad is also an associate member of the Institute of Environmental Management and Assessment. Her specific research interests include coastal management, stakeholder involvement, landscape systems and environmental ethics, and she has participated in several international research projects, particularly in the Mediterranean basin. She has also published a range of papers, books and book chapters on related subjects.

****

Dr. Smith DHARMASAROJA

Dr. Smith Dharmasaroja is currently a Chairman of the Foundation of National Disaster Warning Council, Former Chairman of the Committee for the Development of an Early Warning System, Former Chairman of the Committee on the National Disaster Warning Administration, Former Vice Minister to the Office of the Prime Minister, Proficiency Adviser to Bureau of Royal Rainmaking and the Honorary Adviser to Rajaprajanugroh Foundation under the Royal Patronage.

He obtained his Ph.D. (geography) from Thaksin University, Songkhla, Thailand and BSEE (Electrical Engineering) from University of Vermont, U.S.A. He obtained Master of Arts in National Defense College of Thailand, Studies, Research and Training on Meteorology, Geophysics, Climatology, Hydrometeorology and Meteorological-Telecommunication System, in Australia, China, England, Japan, New Zealand and U.S.A.

His work experiences include an Electrical Engineer Harco Engineering, a, California , U.S.A, Vice Minister to The Office of The Prime Minister, Director-General, Meteorological Department for 8 years, Director-General, Post and Telegraph Department, Deputy Permanent Secretary, Ministry of Transport And Communications. His international organization positions include a Permanent Representative of Thailand with World Meteorological Organization; Coordinator, WMO/ESCAP Panel on Tropical Cyclone for the Bay of Bengal and the Arabian Sea; Chairman, ASEAN Subcommittee on Meteorology and Geophysics; Expert, The Working Group on Metrological Telecommunication System for WMO Regional Association II (Asia).

While serving the Government of Thailand, he obtained the Royal Decorations, namely; Knight Grand Cordon (First Class) of the Most Noble Order of the Crown of Thailand; Grand Companion (Third Class, Higher Grade) of the Most Illustrious Order of Chula Chom Klao; King Bhumibol Adulyadej's Royal Cypher Medal (Rama IX) (Third Class); Knight Grand Cordon (Special Class) of the Most Exalted Order of the White Elephant; Knight Commander (Second Class, Lower Grade) of the Most Illustrious Order of Chula Chom Klao.

****

Dr. Tran DINH LAN

Dr. Tran Dinh Lan, Ph.D., 23 year experience in marine and coastal research, working at the Institute of Marine Environment and Resources (IMER) as a researcher and acting as the vice director of IMER . He has been the leader and PI of national and international projects on coastal environmental protection in Vietnam and Cambodia, sustainable utilization of coastal and marine natural resources, funded by Vietnam government and other countries (European countries and USA) and International Organization (UNEP, UNDP, UNESCO), particularly related to Ha Long Bay Heritage site, Cat Ba World Biosphere Reserve (North Vietnam), Phu Quoc National Park and International Marine Protected Area (South Vietnam). He is now the vice chairman of the IMER scientific council. He has over 80 scientific publications on environmental issues and natural resources in national and international journals and books.

****

Dr. Fanny DOUVERE

Dr. Fanny Douvere is currently leading the World Heritage Marine Pogramme at UNESCO's World Heritage Centre in Paris. Between 2005 and 2009, she co-initiated the Marine Spatial Planning Initiative at UNESCO's Intergovernmental Oceanographic Commission (IOC) with Charles Ehler. During this time, the majority of her work focused on documenting and analyzing existing marine spatial planning practices with the aim of designing a methodology for practical application. She has published over 20 articles on the topic and is co-author of the UNESCO-IOC guide, Marine Spatial Planning: A step-by-step approach toward ecosystem-based management. In May 2010, she received the degree of Doctor and published her first book called Marine Spatial Planning: Concepts, Current Practice and Linkages to other Management Approaches.

****

Dr. Tran DUC THANH

Mr. Tran Duc Thanh is director of Institute of Marine Environment and Resources (IMER) belonging to Vietnam Academy of Science and Technology (VAST). He got the M.Sc in geology (1976) and Ph.D in geology (1994) at Hanoi National University with the special interests in the influences of climate change and human activities on the coastal and marine disasters. By his position, he also pays much attention to Vietnam – China co-operation on the field of marine environment and resources.

****

Dr. Werner EKAU

Dr. Werner Ekau is Director of the Operational Centre Germany of IOI, the International Ocean Institute, member and chair of the Committee of Directors.

Dr. Werner Ekau is a fisheries biologist trained at Bochum, Hamburg and Kiel universities. He worked in Antarctica, Argentina, and the Azores. Since 1991 he works on fish biology and ecology in tropical ecosystems. In the 1990ies he was coordinator for the bilateral co-operation in Marine Research between Brazil and Germany. His research interests lie in the wider field of “Adaptations of different life stages of fish to their environment". This includes activities in:

- Growth and population dynamics
- Migration pattern of fish in coastal environments
- Ichthyoplankton
- Fisheries biology
- Ecology

Recent projects are:

- GENUS (Geochemistry and Ecology of the Namibian Upwelling System) aims to clarify relationships between climate change, biogeochemical cycles, and ecosystem structure in the Benguela Large Marine Ecosystem off northern Namibian (SW Africa)
- Developing fisheries science in Papua New Guinea'. A cooperative project of ZMT/IOI-Germany with GTZ on the development and implementation of a Bachelor of Science Degree programme at Vudal University in Papua New Guinea.
- Evaluation of Integrated Coastal Zone Management (ICZM) in Europe. A contribution of IOI-Germany to a joint project of Rupprecht Consult, Köln, and IOI-HQ, Malta

****

Mr. Charles N. EHLER

Mr. Charles N. Ehler is the President of Ocean Visions, a consulting company specializing in integrated coastal and ocean management and marine spatial planning. He works in Paris, France, primarily as a consultant to UNESCO’s Intergovernmental Oceanographic Commission (IOC) and the Man & the Biosphere (MAB) Programme, as well as other international organizations, national governments, and non-governmental organizations. Before moving to Paris in 2005, he worked as a senior executive for the U.S. National Oceanic and Atmospheric Administration for 27 years leading national and international programs in integrated coastal management, strategic environmental assessment, marine pollution monitoring and assessment, oil spill response and natural resource damage assessment. He worked for the U.S. Environmental Protection Agency’s Office of Research and Development from 1973-78 and taught regional planning and natural resources management at the University of Michigan, the University of California at Los Angeles (UCLA), and the State University of New York at Stony Brook. He was the Marine Vice-Chair of IUCN’s World Commission on Protected Areas (WCPA) from 2000-2005. In 2007 he received an award from the Intergovernmental Panel on Climate Change for his work on coastal adaptation and its contribution to the award of the Nobel Prize to the IPCC. He is the author of over 90 publications, including most recently a 2009 UNESCO guide to marine spatial planning. http://web.mac.com/charles.ehler

****

Dr. Ranier FSADNI

Dr. Ranier Fsadni is Director-Operations at the European Commission-League of Arab States Liaison Office (Malta). He is Advisor to the Prime Minister of Malta on Mediterranean and Maritime Affairs and a member of the European Commission's Member States Expert Group on the Integrated Maritime Policy and of the Working Group for an Integrated Maritime Policy in the Mediterranean. He is a member of the Anthropology Division of the Mediterranean Institute of the University of Malta, with special reference to the Arab world, and a member of the Editorial Working Group of Journal of Mediterranean Studies. He was a member of the European Commission's Expert Group on the Governance of the Mediterranean Sea (2009) and was a contributor to the ensuing report on 'The Role of Maritime Zones in Promoting Effective Governance for Protection of the Mediterranean Marine Environment'. As Chairman (2001-09) of the Academy for the Development of a Democratic Environment (AZAD; a Euro-Mediterranean think tank based in Malta), he organized a pan-European conference on maritime affairs and labour relations (2007) to promote better understanding of the maritime issues relevant to workers' organizations. Mr Fsadni has a special interest in the relations between cultural identity and the sea, and has been an advisor to the Commonwealth Youth Forum (2005) and keynote speaker addressing issues of cultural diversity at conferences organized by the OSCE, CESEDEN (Madrid), British Council and the European Centre for Workers' Questions (EZA). This autumn he will be the rapporteur for the Working Group on Energy and the Environment at the Summer University organized by the European Ideas Network in Budapest and a keynote speaker at the OSCE meeting in Malta.

****

Mr. Stanley GOOSBY

Mr. Goosby is Chief Scientist providing direct oversight of the Applications Development Group for the Pacific Disaster Center (PDC). His responsibilities include investigating and prototyping new and emerging science and technology relevant to disaster management; collaborating with academic, scientific, and other organizations to identify models or modeling activities that could provide PDC with enhanced simulation capability, and establishing criteria for evaluating the models.

He has been involved in modeling and hazard impact analysis in American Samoa, Vanuatu, Thailand, and the Republic of the Philippines since 2001. Mr. Goosby's experience includes: formulating and coordinating the application of the modeling resources to support the development of products simulating the impacts and consequence of hazards on communities and community resilience; developing and implementing an integrated risk reduction framework to assess and mitigate the social, economic, and infrastructure impacts of natural hazards on communities in the Pacific and Asia Pacific regions.

Mr. Goosby managed a major project for Hawaii Dept. of Land & Natural Resources modeling dam-break scenarios and developed the concept of operations to increase the tsunami early warning capability of the National Disaster Warning Center, Thailand.

In addition, Mr. Goosby has extensive experience providing workshop briefings and training to community groups, key stakeholders, and disaster managers on tools, analysis techniques, and applications for assessing, mitigating, and managing the risk. He participated on the monitoring and evaluation team for the "Community Risk Program" of the South Pacific Applied Geoscience Commission; provided technical expertise and training to local and regional organizations in the use of the various tools to estimate the losses and impacts resulting from earthquakes and tsunamis.

Mr. Goosby has participated in several workshops as an expert using the HAZUS loss model to project damage and losses resulting from earthquakes occurring in Los Angeles, Alaska, and Hawaii. He also conducted workshops on various tools and applications for assessing damage in Thailand and the Philippines. In 2005, Mr. Goosby served as a tsunami expert on a damage assessment team led by the University of Pittsburg to assess tsunami damage in Thailand and Indonesia, resulting from the December 26, 2004, Indian Ocean Tsunami.

Mr. Goosby earned a B.S. in Physics from California Polytechnic State University, San Luis Obispo; an M.S. in Physics, from Washington State University; and in did additional graduate studies in advanced signal process at the University of California, San Diego.

****

Prof. Dr. Alejandro B. GUTIÉRREZ

Prof. Dr. Alejandro Gutiérrez has a theoretical and practical background in marine climatology, physical oceanography, coastal management and a practical background in applied science – alternative energies.

Since 1989 he has been nominated as follows:

- Co-organizer of the Wider Caribbean Sea Level Network (together with Dr. George Maul from Florida Institute of Technology). From 1989.
- Co-ordinator of the joint UNA/Instituto Meteorológico Nacional (IMN) project: Mareographic and Sea State Service of Costa Rica. From 1991.
- Director of the International Ocean Institute (IOI) Operational Center for Latin America and the Caribbean. From 1994.
- General co-ordinator of the NOAA/CRRH Central American Sea Level Observing System. From 2002 – 2007.
- Co-founder, Co-ordinator and member of the Costa Rica National Commission of Emergency Coastal Hazards Advisory Committee. From March 2010.
- Co-executor of the joint NOAA/OEA/CRRH marine-meteorological stations installation and training program – RONMAC – in Central America after Mitch. 2000.

He has also been awarded with:

- The World Bank Development Market Place 2005 Award – also won by Edio Ricci.
- The Energy Globe: the award for sustainability 2006. 1st Prize Costa Rica – shared by Edio Ricci.

He has:

- A Bachelor Degree in Physics; Universidad de Costa Rica (UCR), 1972.
- A Diploma in Informatics; Università di Pisa, Italia, 1979.
- A Doctorate in Physics; Università di Trieste, Italia, 1981.
- Postgraduate Diploma in Marine Science; RSMAS, University of Miami, 1987.
- And over 60 publications on marine climatology, physical oceanography, coastal management and applied science divulgation documents.

****

Prof. He GUANGSHUN

Prof. He Guangshun, Vice-Director of National Marine Data and Information Service, Professor, Ph.D supervisor. Prof. Guangshun committed himself to integrated ocean management and planning, marine economy for many years and has done a lot of pioneering work in these fields. Prof. Guangshun has created the marine economy accounting system, created the method of marine GDP accounting, presided over the preparation of a national standard "classification of the marine and related industries" and the marine industry standard "coastal zone classification and code". Prof. Guangshun also presided over the completion of many topics, such as the marine environment information database system, and the research of China's marine economy development strategy, etc.

****

Ms. J. Mara HENDRIX

Ms. Mara Hendrix is currently the Executive Assistant for the International Ocean Institute – USA and has been with them since August 2007. In that position she also served as the Secretariat and principal organizer for the Coastal Cities Summit in November 2008, hosted by IOI-USA and is currently organizing the Coastal Cities Summit II for November 2011. Before coming to IOI-USA she worked for a non-profit in marine conservation, Blue Frontier Campaign, in Washington D.C. Ms. Hendrix holds a Masters degree in International Environmental Policy with a marine emphasis from the Monterey Institute of International Studies and a Bachelors degree in Political Economics with an international emphasis from Colorado College.

****

Ambassador K.G. Anthony HILL

H.E. Ambassador K. G. Anthony Hill C.D was born into a Jamaican family of political reformers, journalists and trade unionists who were among the pioneers in the country's independence movement in the early decades of the 20th Century. His undergraduate degree in economics, followed by a post-graduate degree in public administration led to a teaching post at the University of Guyana, followed shortly after by a thirty-year career in his country's public service, mostly diplomatic.

His diplomatic service began in the 1960s and ended in Geneva at the turn of the 21st century when he retired as Ambassador and Personal Representative to the United Nations Offices in Europe and Ambassador to Austria, Egypt, Italy, Yugoslavia, among other countries. These were challenging times as developing countries pressed for major structural changes in the functioning of the international economic systems through international commodity arrangements to stabilize prices, improve their terms of international trade in goods and services, industrialization through unbundling technology transfers, financing for rural development, telecommunications, information and communications technologies and environment. As a representative of Jamaica in international forums, he served as Chairman of Conferences, member of Executive committees and spokesperson for developing countries and was his country's chief negotiator on trade.

He served as High Commissioner to Canada, as deputy Chief of Mission in Washington and political and economic Counsellor in Britain, enlarging the scope of the bilateral relationships during important changes in his country's socio-economic development; organized his country's first official heads of government visits to Argentina, Chile and the People's Republic of China, establishing formal co-operation agreements with these countries.

He was the civil service head of the Office of Prime Minister and President of the National Investment Bank responsible for the government's policy of divesting major public assets.

He is Convener of the informal non-governmental organization, the Reflexion Group of former diplomats and international civil servants. He is engaged actively in promoting national responses to 'Climate Change', especially in developing mitigation initiatives and adaptation measures through energy efficiency and the use of alternative energy technologies.

****

Dr. Hu YIHUAI

Dr. Hu Yihuai from the Shanghai Maritime University obtained his PhD at Wuhan University of Technology in 1993 and majored in marine engineering. He worked at the University of New South Wales in Australia as a visiting professor in 2006 and he is now a professor at the Shanghai Maritime University. He is also a member of Shanghai Society of Internal Combustion Engine, member of the China Ship Building Society and a member of Shanghai System Simulation Society. His research interests are in faults diagnosis of marine power-plant system, system simulation of marine engine room and environment protection. Over the past two decades, he has published 52 academic papers and 2 books, guided 6 research projects and participated in 14 projects. He has obtained 11 awards and honors for teaching, research and technical development by the Shanghai Education Committee and Communications Ministry of China.

****

Dr. Norden E. HUANG

Dr. Norden Huang is a senior research scientist at the First Institute of Oceanography, SOA, Qingdao, China, and an advisor to State Ocean Administration, PRC. Concurrently, he also serves as a Gou-Ting Chair professor at the Central University and the funding director of the Research Center for Adaptive Data Analysis. He held a BS degree in Civil Engineering from the National Taiwan University (1960) and a doctoral degree (1967) in Fluid Mechanics and Mathematics from the Johns Hopkins University. His past position includes Faculty at NC State University (1969-1974); Faculty Associate in the Engineering Division, the California Institute of Technology (1997 to 2003); Research Scientist and Senior Fellow at NASA Goddard Space Flight Center (1975-2006), and the Chief Scientist for Ocean Sciences NASA from 2000 to 2006, when he retired and assumed the teaching job at NCU. In the past, he has been working on nonlinear random ocean wave statistical properties. Recently, he has developed a new method, the Hilbert-Huang Transform, specifically to analyze nonstationary and nonlinear time series. Over the last few years, he has applied this method to analyze data in the following areas: climate change and long term environmental data such as ice core and Earth orbital parameter variations; nonlinear ocean wave evolution data; earthquake signals and structure responses; bridge and structural health monitoring; biomedical signals such as blood pressure fluctuations; hydro-machinery design and machine vibration data.

For this invention, he was awarded the 1998 NASA Special Space Act Award with the citation, '[Dr. Huang's new method] is one of the most important discoveries in the field of applied mathematics in NASA history.' The details of HHT are covered in 12 US patents (8 granted and 4 pending) by NASA; and his initial paper on HHT has been cited more then 3000 times. For his work on HHT, he was also the winner of the 1999 Federal Government Technical Leadership Award; the 2001 R&D 100 Award and the Federal Laboratory Development Award, the 2006 Service to America Medal, and, for his contribution in the field of nonstationary and nonlinear data analysis, elected as members of the US National Academy of Engineering, 2000; Academia Sinica, 2004; and a Foreign Member of the Chinese Academy of Engineering, 2007.

Dr. Huang is a funding Co-Editor-in-Chief (with Thomas Y. Hou, the Chair of Applied and Computational Mathematics at of California Institute of Technology) for the new journal, Advances in Adaptive Data Analysis, published by the World Scientific. He has lectured extensively in the US, Europe and China; published more than 140 refereed papers on subjects covering data analysis methodology, the applications of Remote Sensing techniques in physical oceanography, air-sea interaction processes, statistical structure of ocean surface micro-scale phenomena, coastal processes, engineering and biomedical problems; and edited two books on HHT. Currently, he is engaged in establishing the theoretical foundation for HHT together with Professor Ingrid Daubechies, the Chair of the Program on Applied and Computational Mathematics, Princeton University, and developing applications in biomedical areas with Professor Chung Kang Peng, the Co-Director, Margret and H. A. Rey Institute for Nonlinear Dynamics in Physiology & Medicine, Division of Interdisciplinary Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, where he is a guest investigator.

****

Ms. Lata IYER

Ms. Lata Iyer is a Planner, Architect and GIS Analyst living and working in Auroville (www.auroville.org), an international community in southern India aspiring to be a living embodiment of human unity. In Auroville, she's been involved in the Planning and Development of Auroville, and has also worked as one of the coordinators for Auroville's efforts post-tsunami in 2004. Prior to coming to Auroville in 2003, she was a project manager at ESRI (Environmental Systems Research Institute), a private company devoted to building GIS (Geographic Information Systems) software and applications for many industries. She has served as the director of the Regional Conservation Analysis Program at Conservation International that works in many countries around the world for the conservation of biodiversity. She practiced Architecture for several years before going to the US for her Masters in Regional Planning in 1992.

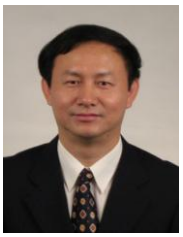
Currently, she's involved in efforts to integrate planning in post-disaster rehabilitation, understanding of water and its management in rural and urban settings and prevention of coastal erosion due to man-made structures.

****

Dr. Jin XIANSHI

Affiliation: Yellow Sea Fisheries Research Institute, CAFS, 106 Nanjing Road, Qingdao 266071, China Position: Deputy Director of Yellow Sea Fisheries Research Institute, CAFS. Dr. Jin Xianshi is a fisheries biologist with a background in research of stock assessment, fisheries ecology and fisheries management, and has centred on long-term changes of species composition, population dynamics, food web for the high trophic levels in the ecosystem of the Yellow Sea, Bohai Sea, and East China Sea.

****



Prof. Jin YONGXING

Prof. Jin Yongxing, born in 1958, studied in undergraduate program on nautical technology in Shanghai Maritime University from 1978 to 1982, and postgraduate program on shipping management from 1995 to 1997. He has been on board ship for 3 years as an ocean-going vessel's Chief Officer. His main research fields are modern seamanship and ship's safety management. He now works as Vice President, Professor and doctoral supervisor in Shanghai Maritime University. At the same time, he is appointed as a Commissioner to National Guidance Committee for Transportation and Communications Specialty in higher institutions, Vice-Chairman of National Education Committee for Nautical Science Specialty, Honorary Secretary of International Maritime Lecturers Association. He also serves as Deputy Director of Compilation Group for the journal Ship Engineering.

Prof. Jin has been devoted to research and investigation on ship operation safety and supervision, navigational environment safety evaluation, as well as on characteristics of ship structure and operation.
He has conducted and accomplished over 20 research projects, such as Supervision and Evaluation System for Container Ship Structural Condition, Safety Research on Railway Ferry System of Bohai Bay, Research on Emergency Pre-proposal for Shanghai Port Waterway Transportation and Discipline Criteria for Nautical Science Specialty.

His publications include over 20 papers and 5 books, such as Marine Signals and Radiotelephony, Ship Structure and Equipment published by China Science and Technology Press and China Communications Press. The English-Chinese Maritime Dictionary compiled by Prof. Jin has been selected as Shanghai 11th Five-Year Plan Key Books.

****

Dr. James KAIRO

Dr. James Kairo is a Principal Research Officer with the Kenya Marine and Fisheries Research Institute (KMFRI), where he heads a research team dedicated to mangrove restoration and management. When not working in mangroves, Dr. Kairo teaches botany at Kenyatta University; and supervises M.Sc. and Ph.D. students working on mangrove environments in Kenya and abroad. Further, Dr Kairo is the Operational Director of IOI – Eastern African office.

During 2002 to 2003, Dr. Kairo was an international mangrove management consultant for the Food and Agriculture Organization of the United Nations (FAO), coordinating the preparation of the Development Plan for the Mangroves in Egypt. In May 2002, he received an International Cooperation Prize Award from the European Union in recognition of the relevance of his work in promoting international development cooperation and sustainable development. Dr. Kairo was also involved in the development of the World Bank's Code of Conduct for mangroves, and he is currently the mangrove restoration consultant for the United Nations Environment Programme project in Mozambique. In 2006, Dr Kairo received WWF Practitioner fellowship award from the Alcoa Foundation (USA); and in 2009 Dr Kairo received Honorary Membership of the Western Indian Ocean Marine Science Association (WIOMSA) Dr. Kairo has authored and co-authored 36 scientific articles on mangrove ecology, restoration, and management. He has received grants from Western Indian Ocean Marine Science Association (WIOMSA), ALCOA, UNDP, WWF, European Union, and UNEP.

****

Prof. Dr. Nicholas KATHIJOTES

Prof. Dr. Nicholas Kathijotes is a professor in the Department of Civil Engineering. He received his first degree in Civil Engineering (BSCE), from the University of Massachusetts (USA). After a Fulbright scholarship he received his Master's degree in Environmental Engineering from the University of New Haven (USA). His Doctorate research was carried at the University of Architecture, Civil Engineering and Geodesy in Sofia (BG), and was received with the highest distinction. He investigated the effects of irrigation with treated wastewater on various soils of Cyprus.

He attended professional courses on air pollution management and Lysimetry at the Harvard School of Public Health (USA), and at the Universitat Autonoma De Barcelona (SP), respectively. He represented Cyprus as member of the Management Committee of European research programs (Cost 629, Med Campus and others), and is a member of The Lysimetry Research Group in Austria. Currently he participates in research, as research associate at Poushkarov Institute for Soil Science (BG) and is a partner in FP7 EU project NOVIWAM. He is a Member of the Cyprus Scientific and Technical Chamber (ETEK), and currently Member of the Management Committee of European Cost Action 637.

As research interests, he is working towards efficient application of wastewater and sludge on soils, with emphasis on the enrichment and restoration of polluted or contaminated land. Investigations lead to developing methods for application of wastewater and wastewater sludge on soils by minimizing ecological risks and taking full advantage of nutrients and micronutrients available in these resources. In his capacity as Focal point of IOI, investigates nutrient pollution of coastal areas and mitigation measures.

He has various articles in international scientific journals, expert invitations (UNEP, Marie Curie, and other), speaker invitations and participations in conference scientific committees.

****

Prof. Dr. Yannis KINNAS

H.E. Former Ambassador for Environment, Prof. Dr. Yannis Kinnas holds a Ph.D. in International Relations of the University of London, and a Political Science Doctorate from Athens Pantios University. He was born in Greece. He was teaching in the United States and Europe universities. In 1990 he was Radford Distinguished Visiting Professor at Baylor University (USA). From 1978 to 1997 he worked with the Greek Ministry of Foreign Affairs and between 1987and 1996 he served with the Greek Mission in Geneva with Environment Affairs and Economics. He followed all negotiations for the UNFCCC preparation and other environmental issues too. After MFA he was a freelance expert (he finished the hierarchy at the MFA). Between 1964 & 1978 he worked with transnational banks including in Greece, USA and Dutch Banks. During that period of time he was in London scholar of the British Council working for the Ph.D. only for two years. He has written on environmental issues and European integration, including ten books. The one edited in Greek with Dr C. Bailey, of the USA, was referring to the Nuclear Energy and Proliferation. In 2009 there was a contribution to a volume which analysed the situation of Climate Change, Human Security and SIDS.

****

Representative of HSH The Sovereign Prince Albert II of Monaco
H.E. Ambassador Patrick VAN KLAVEREN
Permanent Representative of Monaco International Scientific, Environmental and Humanitarian Bodies and a Member of the Scientific and Technical Committee of Foundation HSH Prince Albert II De Monaco

As a teenager particularly interested in the sciences of the sea, he frequents the Oceanographic Museum of Monaco and participates in numerous activities of the Museum in parallel to his education. It is during this time that he discovers new gorgonian specie (Echinomuricea) that carries today the name of "klavereni".

He obtains a Master in Animal Biology in 1970 that he completes by diplomas in Geology and Ethnology and then as teacher in natural sciences in Monaco, he succeeds, in 1976, his "CAPES" and his Aggregation in Biological Sciences.

In the eighties, he becomes Deputy to the Captain Jacques Yves Cousteau, then Secretary General of the International Commission for the Scientific Exploration of the Mediterranean (CIESM).

In 1987, he is charged with the Direction the Scientific Centre of Monaco, which develops oceanographic research and monitoring programs for the account of the Principality of Monaco then he creates the Monaco Environment Office, which he will run until 1998; establishing the national policy for the monitoring and the protection of the Environment.

Within these functions, he assumes the follow-up for his country of the environmental International Conventions. He launches the first national bilateral cooperation policy with Countries like Lebanon, Tunisia and Bulgaria and was coredactor of the Protocol of the Barcelona Convention related to Specially Protected Areas and the Biodiversity in Mediterranean. He initiates the creation of the UNEP/CMS/ACCOBAMS Agreement and the hosting of its Permanent Secretariat in Monaco as well as the implementation of the Agreement between France, Italy and Monaco for the marine mammals, the "Pelagos" Sanctuary. This marine protected area is currently the only one worldwide covering international waters. From 1999 to 2001, he chairs of the Bern Convention related to the conservation of wildlife and natural habitats in Europe.

He is named, in 1998, Technical Advisor to the Plenipotentiary Minister in charge of the International Cooperation for Environment and Development, then, in 2003, Delegate for the International and Mediterranean Environment affairs, and, in March 2007, Minister-Counsellor. Currently, with the title of Ambassador, he is in charge of the diplomatic relations between the Principality of Monaco and the International Organizations and Agreements related to the protection of environment and science. Besides this, he is the Permanent Representative for Monaco to the United Nations Environment Program in Nairobi and to the Mediterranean General Fishery Commission of FAO in Rome.

In the frame of intergovernmental organizations, inter alia, he has, in the name of the Principality, contributed to bring forward the concerns on the sustainable management of the marine biodiversity and the preservation of marine Mammals involving Monaco as one of the first supporter of the conservation of biodiversity in marine waters beyond national jurisdiction through the Jakarta mandate of the CBD and the Johannesburg's Plan of Action. In this respect, he developed a bilateral agreement between Monaco

and Costa Rica advising and sponsoring the establishment of the East-Pacific biological marine corridor linking Costa-Rica, Panama, Colombia and Equator cost and their respective oceanic islands.

Lastly he was charged of polar issues including representation of Monaco in the Antarctic Treaties System.

He is also Ambassador of Monaco in Spain and Member of the Scientific Committee of the Prince Albert II of Monaco Foundation for the Environment.

****

Dr. Li HAIQING

Dr. Li Haiqing has been the Director – General for General Affairs and Finance, SOA since 2007. Prior to this appointment, he had served respectively as Director, Division of International Organizations, Deputy Director-General and Director-General of the Department of International Cooperation, SOA.

From 1993-1998, Dr. Li worked in the IOC Secretariat, Paris, as the Responsible Officer for the Law of the Sea, Integrated Coastal Area Management (ICAM) and the Western Pacific Region. He also served as the Deputy Chairman of the IOC Sub-Commission for the Western Pacific, National Focal Point for the GEF programmes on the Yellow Sea Large Marine Ecosystem (YSLME), SCCBD and PEMSEA. Presently, he is the Chairman of the Intergovernmental Session of East Asian Sea Council.

Dr. Li Haiqing was graduated from the Beijing University for Foreign Studies, China in 1982, got his Master's Degree for Marine Affairs from the University of Rhode Island, USA and Ph.D Degree for Marine Law from the China Ocean University. He is an alumnus of IOI and received IOI Diploma for Deep Sea Mining in 1987.

****

Prof. Raphael P.M. LOTILLA

Prof. Lotilla is the Executive Director of PEMSEA Resource Facility (PRF). He has a strong background in law, legislation, ocean law and marine affairs, energy, power sector reform, privatization, sustainable development, and justice and development.

Before joining PEMSEA, Prof. Lotilla has the following experiences, among others:

- Secretary, Department of Energy (DOE);
- Deputy Director-General, National Economic Development Authority (NEDA);
- Coordinator, Philippine Council for Sustainable Development;
- Law Professor, University of Philippines, College of Law

Prof. Lotilla has a Bachelor of Laws at University of the Philippines College of Law, Bachelor of Arts in History, University of the Philippines College of Arts and Sciences (Cum Laude), Bachelor of Science in Psychology, University of the Philippines of Arts and Science, and Master of Laws, University of Michigan Law School.

****

Prof. Mao BIN

Professor Mao Bin worked for the State Oceanic Administration of China since1969 and successively held senior governmental and diplomatic posts: Secretary-General, the China Ocean Mineral Resources R&D Association (COMRA), 2001—2008; Deputy Permanent Representative of the People's Republic of China to the International Seabed Authority, Kingston, Jamaica, 1998-2001; Advisor and Deputy Representative of China to the Preparatory Commission for the International Seabed Authority and for the International Tribunal on the Law of the Sea during 1986-1994, and then to the International Seabed Authority during 1995-2008; Deputy Director-General, the International Cooperation Department of the State Oceanic Administration of China (SOA), Beijing, China, 1994-1998. During this period of time, he concurrently served as National Program Director successfully implementing the Integrated Coastal Zone Management (ICZM) Demonstration Program in Xiamen, China, in cooperation with the United Nations Development Programs (UNDP) and Global Environment Facilities (GEF); As senior research fellow enjoying the special allowance of the State Council of China, he is now senior consultant for the Department of International Cooperation, SOA, and also honorable professor, guest professor, and senior research fellow for several universities and research institutions.

****

Prof. Dr. Eduardo MARONE

Prof. Dr. Eduardo Marone is a CNPq Fellow - 1D. BSc in Physics at Universidad Nacional de San Luis, Argentina (1979); graduated at Facultad de Ciencias Físicas Matemáticas y Naturales from Universidad Nacional de San Luis, Argentina (1981) and Ph.D. on Physical Oceanografy from Universidade de São Paulo, Brazil (1991). He was the Dean of the Marine Sciences Faculty (undergraduate course on oceanography) and Director of the Marine Studies Center (CEM/UFPR), and acts as Director of the International Ocean Institute Operational Centre for the region (South Western Atlantic Ocean). He was Vic-chair of the Coastal GOOS Panel of UNESCO/IOC, member of SCOR and LOICZ working groups and Leading Author of the Millennium Assessment. Has experience in Coastal Oceanography, acting on the following subjects: coastal dynamics, tides and tidal analysis, coastal monitoring, numerical modelling and remote sensing, mainly at the State of Paraná, with focus on Paranaguá and Guaratuba bays. He is author or coauthor of more than 41 papers on international journals, 3 books, 12 book chapters, having presented more than 105 works in congresses, advised 11 MSc and 2 PhD Thesis, as well as 4 Undergraduate monographe and 8 Undergraduate research works during the last 7 years. He has coordinated or participated in more than 30 national and international research projects in the same period. Address to access detailed CV: http://lattes.cnpq.br/2865151109319074.

****

Prof. Mamdouh Amin Fahmy Mohamed AHMED

Prof. Mamdouh Amin Fahmy Mohamed was born in Alexandria, Egypt. He is a Director for the International Ocean Institute (IOI Egypt) since August 2004. He also works as Director for the National Institute of Oceanography & Fisheries, Mediterranean and Northern Lakes Branch, Alexandria since 9 August 2009, a Project Manager for the Environmental and Information Monitoring programme (EIMP) for the Red Sea coastal waters between EEAA (Egypt) and Danida (Danish) since 2001 and Deputy Principal Investigator for the monitoring programme for the Egyptian Northern lakes since July2009. He has been supervisors and examiners for many of M SC and Ph D thesis in chemical Oceanography. He has about 35 publications in the National and International Journals regarding Environmental and marine chemistry.

****

Prof. Nor Aieni Haji MOKHTAR

1. PERSONAL DETAILS

Name: PROF. DR. NOR AIENI HJ. MOKHTAR
Citizenship: MALAYSIAN
Present Appointment/ Position: UNDER SECRETARY/ DIRECTOR NATIONAL OCEANOGRAPHY IRECTORATE
Address: NATIONAL OCEANOGRAPHY DIRECTORATE
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION
LEVEL 6, BLOCK C4, COMPLEX C
GOVERNMENT ADMINISTRATIVE CENTER
62662 PUTRAJAYA
Tel No 03-8885 8201 Fax No 03-8889 3008
E-Mail noraieni@mosti.gov.my

2. ACADEMIC/PROFESIONAL QUALIFICATIONS

- BSc in Physics from the State University of New York, Binghamton, New York, USA (1980), Sigma Pi Sigma Honors Award from American Institute of Physics
- Masters in Ionisation Physics from the University College of Swansea, United Kingdom (1983).
- PhD in Physics-Laser Technology from Universiti Teknologi Malaysia (1992).

3. AREA OF EXPERTISE

Computer and Physical modelling studies, Hydraulic and Coastal Engineering, instrumentation, Oceanography and Marine Science, Islands and Marine Environment Studies: Policy, experimental design and field studies such as Integrated Coastal Zone Management, coastal processes, structures design and feasibility studies.

R & D Commercialisation for MOSTE, University-Industry Partnership and technology transfer, Ministry of Science Technology & Innovation & Ministry of Higher Education, respectively.

R & D planning, Management of Intellectual Property, Knowledge Management, University–Industry Collaboration, Research excellence, Innovation and Creativity, Technology Management, R & D Commercialisation and Entrepreneurship.

MOSTI's Task Force/Technical Committee on Energy, ICT – Innovation-Led Economy.

4. LIST OF PUBLICATIONS

- Noraieni Hj. Mokhtar, "Some Medical and biological Applications of laser Radiation", MSc. Thesis,Univ. College of Swansea, Wales, UK, 1980.

- Noraieni Hj. Mokhtar, "Development & Studies on Laser-Doppler Velocimetry Technique for Fluid Flow in Small Ducts", PhD Tesis, Faculty of Science, Universiti Teknologi Malaysia, 1992.

4.1 Journal (International & National)

- Noraieni Hj Mokhtar, A .K. A. Wahab, A.I. Carmerlengo, Rremoval of the barotropic mode in a N-layer ocean model" SCI. iNT. (LAHORE), 14 (1), 27-28, 2002, ISSN 1013-5316; CODEN:SINTE8
- ALEJANDRO LIVIO CAMERLENGO, A.K.A WAHAB & NOR AIENI MOKHTAR "RAINFALL DISTRIBUTION IN THE COASTAL AREAS OF SARAWAK", SCI. iNT. (LAHORE), 14 (1), 79-81, 2002, ISSN 1013-5316; CODEN:SINTE8
- ALEJANDRO LIVIO CAMERLENGO, LIM Y. RANG, NOR AIENI MOKHTAR & A.K.A WAHAB "COMMENTS ON THE BEHAVIOUR OF CERTAIN METEOROLOGICAL PARAMETERS", SCI. iNT. (LAHORE), 14 (1), 59-62, 2002, ISSN 1013-5316; CODEN:SINTE8
- NORAIENI HJ. MOKHTAR, ALEJANDRO CAMERLENGO, L.Y.RANG " THE 1991-95 ENSO EVENT IN MALAYSIA", SUBMITTED TO JOURNAL OF TECHNOLOGY, UTM
- ALEJANDRO LIVIO CAMERLENGO, LIM Y. RANG, NOR AIENI MOKHTAR AND NASIR SAADON " PRINCIPAL CHARACTERISTICS OF THE PRECIPITATION IN SABAH", SCI. iNT. (LAHORE), 14 (2), 119-123, 2002, ISSN 1013-5316; CODEN:SINTE8
- NORAIENI MOKHTAR, A. CAMERLENGO, LIM Y.R,"DIURNAL RAINFALL IN THE EASTERN HALF OF PENINSULAR MALAYSIA" SCI. iNT. (LAHORE), 14 (2), 179-182, 2002, ISSN 1013-5316; CODEN:SINTE8

4.2 Proceedings (International & National)

- Mohamed Amin Alias, Noraieni Hj. Mokhtar, "Using Computer for Scientific and Engineering Experiments" Proceedings Malaysia Council for Computer in Education (MCCE), Faculty of Engineering, University Malaya, August 1985.
- Noraieni Hj. Mokhtar, "Laser-Doppler Velocimetry Systems and Applications" Proceeding National Seminar on Laser Technology II, Physics Dept., National Univ. Malaya (UKM), Bangi, 18 Oct. 1990.
- Noraieni Hj. Mokhtar, "Laser-Doppler Velocimetry Systems and Applications" Proceeding National Seminar on Laser Technology II, Physics Dept., National Univ. Malaya (UKM), Bangi, 18 Oct. 1990.
- Noraieni Hj. Mokhtar, R.A Hasan, A. Ibrahim, M.A. Alias "Development and Studies on Laser-Doppler Velocimetry Technique for Fluid Flow in Small Ducts" Proceedings Asia Pacific Physics Conference, August 10-15 1992, Kuala Lumpur.
- Noraieni Hj. Mokhtar, "Laser Safety in Research Laboratory and Industry", Proceedings National Seminar on Radiation Protection 1992, 16-17 September 1992, Kuala Lumpur.
- Noraieni Hj. Mokhtar, "Investigation of velocity profiles in fluid flow by optical methods", Proceedings National Science & Technology Congress'93, 12-14th August, 1993.
- Noraieni Hj. Mokhtar, "Safety use of Lasers in Medicine", 1st National Conference on Medical Technology Instrumentation and Safety, Pan Pacific Hotel, Kuala Lumpur, 17-18 November 1993.
- Noraieni Hj. Mokhtar, "Multi-Media system for investigation fluid flow pattern "RCCACE '94 , Hotel Istana, Kuala Lumpur, 2-4th August, 1994.
- Noraieni Hj. Mokhtar, M.Amin Alias, Moh Chai Wei, "Using a Multi-Media system for study of particle flow, COSTAM '94 , Ming Court Hotel, 15-18 August, 1994.
- Noraieni Hj. Mokhtar "Research at COEI", International Workshop on Trends in Flow Instrumentation for Laboratory & Industrial Research, TIFILIR'94, 27-29th October 1994, Hotel Istana, Kuala Lumpur.
- Noraieni Hj. Mokhtar, Hadibah Ismail, A. Aziz Ibrahim " Experimental Investigation on efficiency of submerged berm as countermeasure to siltation "Kongres Sains & Teknologi Malaysia '95,(COSTAM '95) 22-25 Ogos, 1995, Universiti Malaya
- Noraieni Hj. Mokhtar, M. Santhanam, A. Aziz Ibrahim, M.N. Saadon, H.C. Liew"An artificial reef as tool for coastal protection, beach formation and enhancement of marine life" Malaysian Science & Technology Congress '97, 13-15 Sept. 1997, Awana Golf & Country Resorts, Genting Highlands.

4.3 Manuscript (International & National)

- Noraieni Hj. Mokhtar, Johari Adnan, Jalil Ali, Kadim Suaidi, "Design and Construction of a Nitrogen Laser" Buletin Fizik, Fakulti Sains, UTM, Vol.1, No. 1, 1988.

4.4 Seminar/ Conference/ Workshop Participation (International & National)

National focal point (Executive Council member) for Malaysia

- UNESCO – Intergovernmental Oceanographic Commission (Paris)-40/136 countries
- IOC/WESTPAC - 2nd Vice Chairman and Advisory Council, 20 countries
- Coral Triangle Initiative (CTI) National Coordination Committee, Head of Senior Officers Meeting (SOM), 6 countries
- ASEAN-Committee on S & T, Sub-Committee on Marine & Science Technology (SCMSAT), 10 countries
- Confederation of Science and Technology Associations Malaysia (COSTAM) (until August 2008) more than 20 associations, representing Malaysian Society for Marine Science (MSMS)-Vice President
- Chairman and joint chairman on various Scientific Promotion and Community Awareness Seminar/ Conference/Workshop at national and international level.

i. Co-Chairman, International conference IOC/WESTPAC 7th Scientific symposium and IOC/WESTPAC Inter-Sessional Meeting, May 2008
ii. Co-Chairman, 8th IOC/WESTPAC Scientific Symposium 2011
iii. International Hydrographic and Hydrographic Conference and Exhibition, KLCC, KL, August 2008.
iv. International Conference and Workshop on South China Sea, Kuantan Pahang, November 2008.
v. Head of delegation, World Ocean Conference 2009 and Coral Triangle Ministerial Meeting and Leaders Summit, Manado Sulawesi, Indonesia, May 2009
vi. Advisory Panel-International Conference on Underwater Technologies, USYSO8, USYS 2009
vii. Co-Chair, International Conference on Marine Ecosystem (INCOME'09), Langkawi
viii. Project designer/leader: Resource Management for Seafood Security and Sustainable Ecotourism for Coastal Communities in Kota Marudu.
ix. Chairman,Expedisi Pelayaran Saintifik Perdana (EPSP'09) bersama PHN, TLD, IPTA dan Pusat Penyelidikan Perikanan.
x. Chairman, Penganjuran Seminar Ekspedisi dan CTI Senior Officers Meeting SOM4, Kota Kinabalu, 19 – 23 Oktober 2009.
xi. Chairman, Terengganu Sustainable Marine Awareness Program TSMAP, Marang, Terengganu, Nov 2009
xii. Head of delegation, Chair SOM5 and 2nd Ministerial meeting for CTI, Solomon Islands, Nov 2009.
xiii. Head of Delegation, Malaysia-China Cooperation Agreement in Marine S & T and IOC/WESTPAC Workshop, FIO-Qingdao and SOA-Beijing, Dec 2009
xiv. Commercialisation of Oceanographic Research in the Era of New Emerging Technologies" presented at the National Workshop on Oceanography R & D Priority Setting in Malaysia organised by National Oceanography Directorate (MOSTE), MIMA, UKM, UTM and RMNavy on 15 February 2001.
xv. Syarahan Perdana Profesor UTM " Innovative approaches for physical considerations in research and development of coastal structures", UTM 14 Dis 2002, CD
xvi. "Commercialisation of R & D in the public sector"-Recommendations and Action Plans, MOSTE, Mac 2003
xvii. The Role of University in the Innovation Process", Presentation to SMIDEC & Malaysian-German Chamber of Commerce and Industry (MGCC) Seminar on Competitiveness through Innovation, 10 Sept. 2004,PWTC.
xviii. "Sine-Slab Revetment System For Coastal Protection", Presentation to MWWD 2004 – 3rd International Conference on Marine Waste Water Discharges and Marine Environment, on 30th Sept 2004, University of Catania, Italy.

xix. SEMINAR ON INVESTMENT OPPORTUNITIES FOR GLCS IN ENHANCING COMPETITIVENESS FOR ICT INDUSTRY – "COMMERCIALISATION OF R & D FOR ICT INDUSTRY", 14DEC 2004, EQUATORIAL HOTEL, BANGI, SELANGOR

xx. MALAYSIA STRATEGIC OUTLOOK CONFERENCE 2005 – "THE ECONOMICS OF INNOVATION" 3 FEBRUARY 2005, RENAISSANCE HOTEL, KUALA LUMPUR, ORGANIZED BY ASLI

xxi. UNESCO- IOC EXECUTIVE ASSEMBLY, JUNE 2009:THE ROLE OF OCEAN, CLIMATE CHANGE IMPACTS DUE TO SEA-LEVEL RISE, UNESCO, PARIS

xxii. R & D EXCELLENCE, THE ROLE OF MOSTI FORMULATES POLICY IN THE INNOVATION –LED ECONOMY, ELSEVIER, SEPT. 10, 2009

5. MALAYSIA PROFESIONAL HONOURS AND AWARDS

- UTM's Discovery Gold Medal Award in 1999 from YAB Tun Dr Mahathir Mohamad, Universiti Teknologi Malaysia (1999)
- National Inventors Award for 1999 from Dato' Seri Abdullah Ahmad Badawi, from Ministry of Science Technology and Environment, (2002)
- Special Award "R&D Manufacturing Category" R&D IPTA Expo'05. Ministry of Higher Education, MOHE (2005)
- National IP Award, Best Industrial Design, April 2007 MDTCA/MyIPO, by PM Ministry of Domestic Trade & Consumers Affairs (2005)
- Anak Terengganu Cemerlang YAB Dato' Seri Abdullah Ahmad Badawi, dari Badan Pertubuhan UMNO, Terengganu (2004)
- Tokoh Wanita Terengganu (Isteri Menteri Besar Terengganu, Yayasan Wanita & Pembangunan Masyarakat Terengganu) (Nov 2007)

6. FOREIGN PROFESSIONAL HONOURS AND AWARDS

- Gold Medal at the 27th International Inventions Exhibitions, New Techniques and New Products, Geneva, Switzerland for the Construction/Civil Engineering category, World Intellectual Property Organization (WIRO), Geneva Switzerland. (1999)
- Gold Medal, World Intellectual Property Organization (WIPO) Geneva, Switzerland, for Best Woman Inventor, World Intellectual property Organization (WIRO), Geneva Switzerland (1999)
- 3rd Prize, 13th Khwarizmi International Award for Iranian Research Organization for Science and Technology (IROST), from President Rep. of Iran, Muhamad Khatami.

****

Ms. Patricia O'BRIEN

Ms. Patricia O' Brien was appointed the Under-Secretary-General for Legal Affairs and UN Legal Counsel in August 2008. She oversees the Office of Legal Affairs, the overall objectives of which are to provide a unified central legal service for the Secretariat and the principal and other organs of the United Nations; to contribute to the progressive development and codification of international public and trade law; to promote the strengthening and development as well as the effective implementation of the international legal order for the seas and oceans; to register and publish treaties; and to perform the depositary functions of the Secretary-General.

Ms. O'Brien has extensive experience of legal and international affairs. Prior to her appointment she held a number of senior legal positions in Ireland. Immediately before taking up her position at the UN she served for five years as Legal Adviser to the Department of Foreign Affairs of Ireland where she advised on legal issues arising in Irish foreign policy, in particular public international law, human rights law and European Union law. She also served as a Senior Legal Adviser to the Attorney General of Ireland and as Legal Counsellor at the Irish Permanent Representation to the European Union in Brussels;

Earlier in her career Ms. O'Brien practiced law at the Irish Bar (1979-1988) and for one year at the Bar of British Columbia, Canada. Between 1989 and 1992 she held academic positions at the University of British Columbia, Canada;

Ms. O'Brien was conferred with a B.A. (Mod) Legal Science in 1978 and an M.A. in 1987 from Trinity College, Dublin; a B.L. (Barrister-at-Law) from Kings Inns, Dublin in 1978 and an LL.B. from the University of Ottawa Canada in 1990. She is a member of the Irish Bar (1978) and of the Bar of England and Wales (1986). She is a Fellow of the Society for Advanced Legal Studies, Institute of Advanced Legal Studies, London;

Ms. O'Brien has three children.

****

Dr. Iouri OLIOUNINE

Dr. Oliounine was born on 30 May 1939 in the Russian Federation. He graduated from the Institute of Foreign Languages in Gorky (ditto, Nijnii Novgorod) with the Diploma of Teacher of English and German Languages, Master of Arts in Linguistics. He was a Professor of English at the Polytechnic Institute in Gorky, Leningrad State University; Graduated with the Diploma of Master of Science in Marine Geophysics, Arctic and Antarctic Research Institute in Leningrad.

He participated in more than 20 national and international research cruises as engineer, head of scientific group, head of expedition; formulation of the scientific programmes of the expeditions and fully in charge of their implementation. As some of the expeditions were implemented by groups of foreign and national RVs I was in charge of the coordination of their work.

He obtained a PhD in Geophysics for the research in the area of statistical and spectral analysis, forecasting and modelling of sea waves and swell. He was the First Deputy of the Head of the Central Directorate of the State Committee for Hydrometeorology, Soviet Union; Assistant Secretary of the Intergovernmental Oceanographic Commission of UNESCO, Head of Ocean Services Section in charge of data collection and management systems, and of IOC programmes related to natural hazards mitigation (P5); Deputy Executive Secretary of IOC (D1); Coordinator of the International Year of the Ocean in charge of coordinating related activities of UN and other governmental agencies, NGOs, Member States and industries; IOC Consultant; Executive Director of the International Ocean Institute in Malta. He obtained a Honorary Doctor of the Nijnii Novgorod University in 2008.

At present, he is employed as the IOC Consultant in charge of the coordination of the 50th anniversary of the IOC. He published around 100 papers in Russian and English. He received several awards and diplomas of recognition for the input to the ocean science and international cooperation.

****

Prof. Dr. Nilufer ORAL

Prof. Dr. Nilufer Oral is a member of the Faculty of Law at Istanbul Bilgi University, where she teaches courses on law of the sea and international environmental law. She is co-chair of the IUCN Commission on Environmental Law's Specialist Group on Oceans, Coasts and Coral Reefs, and is a member of the Board of Governors of the International Ocean Institute in Malta. Professor Oral served as a legal advisor to the Turkish Foreign Ministry delegation at the International Maritime Organization, and recently served as legal advisor to the Chief Negotiator for Turkey at the COP 15 Climate Change meeting held in Copenhagen. She also acts as a legal advisor to the marine environment division of the Turkish Council of Science.

Professor Oral has published extensively on transport issues and protection of the marine environment, with a focus on the Black Sea, the Turkish Straits and the Mediterranean Sea. Selected recent works include co-editing an Oceans Specialist Group special issue of the International Journal of Marine and Coastal Law entitled " International Ocean Governance in the 21st Century: Perspectives from the IUCN Commission on Environmental Law's Specialist Group on oceans, Coasts and Coral Reefs", "Integrated Coastal Zone Management and Marine Spatial Planning for Hydrocarbon Activities in the Black Sea", 23 International Journal of Marine and Coastal Law 453 [Special Issue]; "Oil Transportation Security in the Black Sea and the Turkish Straits" in the Journal of International Logistics and Trade (Vol. 5 No. 1, June 2007); "Straits Used in International Navigation, User Fees and Article 43 of the 1982 Law of the Sea Convention" in Ocean Yearbook (Vol. 20, 2006); "Protection of Vulnerable Marine Ecosystems In Areas Beyond National Jurisdiction: Can International Law Meet the Challenge?" in Unresolved Issues and New Challenges to the Law of the Sea: Time Before and Time After (Martinus Nijhoff, 2006); and "Oil Transportation in the Black Sea and Regional Marine Environmental Policy" in The Journal of International Maritime Law (Vol. 11, 2005). Professor Oral has also spoken at numerous international conferences and symposia.

Professor Oral has been a lecturer at the Rhodes Academy of Oceans Law and Policy, and has held visiting scholar positions at the University of California, Berkeley and the University of Virginia. She received her B.A. from the University of California, Berkeley, her J.D. from Santa Clara University, and a D.E.A. (LL.M. in private international law) from the University of Paris, Pantheon.

****

Ms. Masako BANNAI OTSUKA

Ms. Masako Bannai Otsuka was born in Kyoto, brought up in Kobe and currently lives in Tokyo. She received her BA from Tokyo University of the Sacred Heart and MA from Columbia University (Comparative Education), NY.

After serving as a research assistant at the Tokyo Institute of Technology, an interpreter for the US government in Tokyo and Osaka, a researcher at a think-tank, and a coordinator/interviewer/caster of business TV programs, she established her own company Intercom to provide communication services in 1987. In 1993 Intercom organized the PIMXXI conference in Takaoka, Japan. Since then she has been involved in IOI activities, assisting Elisabeth Mann Borgese on her visits to Japan and serving as a liaison between IOI and the Japanese Government /Private Organizations. In 1996, she organized the First Plenary Session of the Independent World Commission on the Ocean (IWCO) at UNU in Tokyo. She was appointed Deputy Director of IOI-Japan in 1998 and Director in 1999. She attended the IOI Training Course in Halifax, Canada in 2000. As the Director of IOI-Japan, her activities first focused on fundraising for the IOI network and then on project based activities, including the Introduction of Fixed Net Fishing of Himi to Costa Rica. In 2003, with the help of IOI-HQ, and co-sponsored by the Ocean Policy Research Foundation (OPRF), UNESCO-IOC and WMO, she organized the session “Dialogue between the Ocean and the Freshwater Communities” at The Third World Water Forum, to discuss integrated water management from the Hilltop to the Ocean and the role of Ocean Meteorology. Since 2003, she has been working closely with UNITAR Hiroshima and became one of the resource persons of the workshop “Sea and the Human Security” since 2007 under the leadership of Dr. Gunnar Kullenberg. She has served as a member of the Committee of the Japanese Government on Ocean Development since 2003. She has also been an active member of the Japan Council of Sustainable Development (JCSD) since 2005. Her recent projects include the translation of “The Oceanic Circle” written by Elisabeth Mann Borgese, with Mr. Hiroshi Terashima, Executive Director of OPRF, and facilitating the introduction of Integrated Coastal Management (ICM) into Japanese coastal communities as a contracted researcher of OPRF. She is a member/auditor of Japan the Society of Ocean Policy.

****

Dr. Emmanuel O. OYEWO

Dr. Emmanuel O. Oyewo is a Director, Research and Head, Biological Oceanography Department at the Nigerian Institute for Oceanography and Marine Research (NIOMR), Lagos, Nigeria. He is also the pioneer and present Director, Western Africa Operational Center of the International Ocean Institute (IOI) hosted in Nigeria by NIOMR. He has worked as a research scientist with NIOMR for more than three decades with research interests in oceanography, marine pollution, marine ecology and ecotoxicology. He is the author of about 50 publications in these research areas. He has, at different times, been an associate lecturer in some Nigerian Universities and was, in 2006, also senior visiting scholar in Environmental Analytical Chemistry: State University of New York at Binghamton, USA. He has participated in numerous local and international workshops, advanced Courses, Specialist Courses, Conferences and symposia in different parts of the World from 1975 to date. He has similarly participated in several local and international Sea Cruises, Research Surveys, Radio Discussions and Television Appearances contributing to topical and emerging environmental issues. He has worked/consulted for many international bodies including; International Ocean Institute (IOI), Advisory Committee on Protection of the Sea (ACOPS), GEF GOG – LME Programme, IOC of UNESCO, Global International Waters, Assessment (GIWA), WACAF, IAEA, IMO. He is also a member of some professional bodies including;

Nigerian Conservation Foundation, Fisheries Society of Nigeria, National Geographic – Washington DC. In 2002, he received a merit award for excellence in Research & Development; Marine & Environmental Pollution; followed by a fellowship award in 2006; both from the Fisheries Society of Nigeria. He is married with three adult children.

****

Mr. Pan SHIJIAN

Mr. Pan Shijian, a native of Jieyang, Guangdong Province, was born in Xiamen in October, 1953 and is of Han nationality. He, now a senior engineer, graduated from Wuhan Institute of Water Transport Engineering.

- 1983-1993: Deputy Director of Xiamen Bureau of Communications;
- 1993-December 1999: General Manager of Xiamen Road and Bridge Construction Investment
  Corporation;
- December 1999-March 2000: Assistant to the mayor of Xiamen Municipal Government and general manager of Xiamen Road and Bridge Construction Investment Corporation.

****

Ms. Robbin PEACH

Ms. Robbin Peach is the founding Executive Director of the Collaborative Institute for Oceans, Climate and Security - a collaborative "think tank" and research institute created at the University of Massachusetts Boston to address the emerging interconnected challenges presented by global climate change, altered coastal oceans, and related evolving human and national security needs. Coordinating a cross-section of academic, private industry, non-profit and government experts, the Collaborative Institutes seeks to translate and communicate the critical interdependent intersections between oceans, climate and security - increasingly important, yet not yet well understood politically or scientifically by civilian sectors.

An entrepreneurial leader with key accomplishments in organizational development, private/public partnerships, strategic planning and developing complex multi-stakeholder programs, Ms. Peach specializes in marine ecosystem management issues and has provided advice to government, foundations, not-for-profits, private consulting firms, and institutions of higher education. Most recently Ms. Peach co-founded, with a member of the U.S. Commission on Ocean Policy, the Massachusetts Ocean Partnership – an initiative that has supported the first-in-the-nation integrated multi-use ocean management plan, setting the stage for marine spatial planning in the United States. She was executive director of a quasi-public environmental philanthropy for eighteen years, and has worked for the City of Boston in roles of senior planner and director of urban design. Ms. Peach has served on many ocean-related, urban planning, and philanthropic boards.

Ms. Peach holds a Master in Public Administration from Harvard's John F. Kennedy School of Government where she was Robert F. Bradford Fellow awarded for "Excellence in Public Service", a Master in Arts in Landscape Design and Land-use Planning, and a Bachelor of Science in Horticulture. Most recently she completed a graduate certificate in Mediation and International Conflict from UMass Boston.

****

Prof. Alain PIQUEMAL

- Member of the National Council of the Sea of Monaco and
- IOI Governing Board Member
- Vice President in Charge of Environment and Sustainable Development
- Maritime and Law of the Sea Centre, University of Nice-Sophia Antipolis
- Vice-President of the University of Nice-Sophia Antipolis (France), in charge of Environment and Sustainable Development
- Professor of Law at the University of Nice-Sophia Antipolis (France), specialities: law of the sea and maritime law, international law, environmental law, oil and mineral resources law; Director of the Yearbook “Espaces et Ressources Maritimes”;
- Member of the National Council of the Sea of the Principality of Monaco;
- Member of the Governing Board of I.O.I. (International Ocean Institute) and of its Executive Committee;
- Legal Consultant since 1978 to the United Nations and Specialized Agencies (UNO, WHO, FAO, IMO, UNEP), the World Bank Group, O.E.C.D in several members States of U.N (drafting of laws and regulations regarding the maritime and environmental sectors), UNITAR (training legal seminars);
- Missions as Legal Adviser for various French Departments (Foreign Affairs, Justice, and Environment). Drafting at the request of the qualified French Ministries of the French Memorandum aiming to the compensation for the ecological damage within the framework of the Funds of compensation for FIPOL (London, meeting FIPOL/OMI, Doc. 92FUND/WGR.3/8/8 of June 12, 2001).
- Consultations and work in the field of international maritime safety (in particular several reports for the Secretariat General of National Defense, France, Prime Minister).
- Invited member of the American authorities (USIA), « International Visitor Program » (I.V.P), in the United States, on the topic « Environmental Protection Efforts in the U.S » (1996),
- Senior Lawyer in several international Law Firms, in charge of specialized Departments (maritime law, environmental law, banking law, trade and investment law, privatization law). Experience before International Courts (International Court of Justice, The Hague; Court of Justice of the European Union, Luxembourg)
- Arbitrator and President of Arbitration Tribunals;
- Senior Lawyer before the UNCC (United Nations Commission for Compensation), first Gulf War), F4 Claims (Maritime Environmental Law), Geneva/Switzerland, (2001 / 2003).
- Several publications in French and English in international law, environmental law, law of the sea and maritime activities. (Last publications on marine matters : « The Barcelona Convention for the Protection of the Mediterranean Sea against Pollution and the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources and activities » and « European Community Policy and Legislation on Water Pollution » (Reports to the Workshop of UNITAR, « National Capacity Building for the Republic of Croatia for the Prevention of Marine Pollution from Land-Based Sources », Zadar, Croatia, December 2003; Reports to the Workshop of UNITAR and the Government of the Republic of Lebanon “Integrated Management of the coastal zones and sustainable tourism”, 26 / 29 October 2004, Beyrouth, Lebanon. 3 Reports presented : “A framework of management integrated of the littoral, the example of the European Union”, “the Community Action plan for the conservation and durable exploitation of the resources halieutics in the Mediterranean”, “The Evolving Legal Structure of the Mediterranean Action Plan (MAP)”; « The role of the International Court of Justice in the settlement of maritime disputes” (International Conference “The maritime disputes in Northeast Asia”, Séoul, Corée, 6/9 décembre 2005. Published in « The Political,

Legal and Historical Implications of the Dokdo Issue: Searching for Cooperation in Northeast Asia » (The Korea Association for Political and Diplomatic History, the
Korea Foundation, the Chosun Ilbo, the French minister of Foreign Affairs, Séoul 2005).

****

Dr. Qiao FANGLI

Dr. Qiao Fangli, a Research Fellow in the First Institute of Oceanography (FIO), State Oceanic Administration (SOA), China, Concurrent Professor and Ph. D. candidate supervisor of Ocean University of China, Deputy Director of the FIO, Director of the Key Laboratory of Marine Sciences and Numerical Modelling, SOA, Director of the UNESCO/IOC regional training and research center on Ocean Dynamics and Climate, was born in 1966. He also is Editorial member of Ocean Modelling, Journal of Hydrodynamics, Advances in Marine Science, Marine Forecasts, and other academic journals. He is the Science Board Member of North Pacific Marine Science Organization (PICES). Dr. Fangli's main research interests include air-sea interaction, numerical modeling of ocean circulation and climate system. He was honored as the Advanced Individual in 973 Program by Ministry of Science and Technology of China. In 2004, he enjoyed the Special Government Subsidy from the State Council. He is chief scientist of a State Key Program of Basic Research of China (973 Program). He has published more than 150 papers.

Dr. Fangli's main academic achievements include: Wave-circulation interaction theory is established, and a new generation wave-circulation coupled numerical model is developed. The ability to simulate and forecast the upper ocean environments is significantly improved. This achievement is scientifically important for ocean environment forecast and climate change study.

****

Dr. Qiu JUN

Education

- 2004-2008 Ph.D., Environmental Management, Research Center for Eco Environmental Sciences (RCEES), the Chinese Academy of Sciences (CAS)
- 2001-2004 M.S., Ecology, RCEES, CAS
- 1997-2001 B.S., Resource and Environment, Department of Geography, Double major program, Economy, China Center for Economic Research, Peking University (PKU)

Professional career

- July 2004-Present: Research fellow, China Institute for Marine Affairs (CIMA), State Oceanic Administration (SOA)
- Jul. 2009 Participated the Rhodes Academy, Rhodes Research areas include:
    - Marine environment management
    - The outer limits of continental shelf beyond 200 nautical miles
    - United Nations Convention on the Law of the Sea

Honors

Outstanding research achievement award:	SOA 2009
Model Research Fellow CIMA:	From 2005-2009 consecutively
Honor's Degree:	PKU 2001

Papers

- Qiu Jun, Enclosure movement in ocean: the development and impact of marine protected areas, Dokdo Research Journal, 2010(9):92-97
- Qiu Jun, Liu Wenhua, Should Okinotori Shima be entitled to have continental shelf: a comparative study on the delimitation of continental shelf of uninhabited, China Oceans Law Review, 2009(2):19-32
- Qiu Jun, Gao Zhiguo, Zhao Jingzhu, Ecosystem approach to management of the Bohai Sea region: towards sustainable development of coastal urban areas, International Journal of Sustainable Development & World Ecology, 2008(15) :S25–S34
- Qiu Jun, Zhao Jingzhu. Deng Hongbin, Ecosystem-based marine management: Principles, practices and suggestions. Marine Environmental Science, 2008(27):74–78
- Qiu Jun, Liu Rongzi, Zhao Jingzhu, Deng Hongbing, Applying eco-compensation under the framework of ecosystem approach to Bohai sea management, China's Population , Resources and Environment, 2008(18):60-65
- Qiu Jun, Li Mingjie, The problems and countermeasures of marine natural reserves management of China, Ocean Development and Management, 2005:31-35

****

Dr. Victoria N. RADCHENKO

Dr. Victoria N. Radchenko is Head of the Marine Biological Resources Chair in Ukrainian Maritime Institute, marine biologist and international programs manager for Oceanological Center of National Academy of Science of Ukraine (OC NASU) in Sevastopol. Prior to this position, she served as marine biologist for Institute of Biology of Southern Seas (IBSS) of NASU where she managed research from the level of Ph.D. work to joint academic project with Lund University (Sweden) later on gradually developed into applied fish farming aquaculture engineering in Ukraine (Crimea). Dr. Radchenko joined OC NASU in 2000 and established International Ocean Institute (IOI) Operational Center in Ukraine (IOI-Ukraine) Now Dr. Radchenko works as a Director of IOI-Ukraine performing a variety of projects aimed at integration of national marine science research into internationally recognized efforts and public awareness in environmental issues increase in Ukraine.

Dr. Radchenko joined OC NASU from IBSS NASU in Sevastopol where she served as Technical Assistant, Ph.D. student, Post-doc and Research Biologist and Program Manager from 1989 till 2005. During her tenure at IBSS NASU, she worked with a variety of projects which included general marine biology, fish physiology, histology, biotechnology, aquaculture and marine environment protection as well as risk management.

Dr. Radchenko received her Ph.D. degrees from University of St. Petersburg, Russia in 1994, and University of Kharkov, Ukraine in 1997. Later on she entered and graduated from World Maritime University in Malmo (Sweden) with Masters in Maritime Affairs. Her awards include Sasakawa Foundation scholarship and the President of Ukraine research fellowship.

Dr. Radchenko published over 55 manuscripts, 1 patent, co-edited Conference Proceedings book, several articles and given over 55 presentations to national and international audience. She also serves as technical advisor for Sevastopol and Ilyichevsk Municipality from 2005 till now. She is ethnic Ukrainian and a citizen of Ukraine, married, with a son and two daughters.

****

Dr. Joe ROMAN

Gund Institute for Ecological Economics, Rubenstein School of Environment and Natural Resources, University of Vermont, 617 Main Street, Burlington, VT 05405, USA, jroman@uvm.edu, www.joeroman.com, office: 802.656.0517, cell: 617-312-2241

Dr. Joe Roman obtained Bachelor of Arts, magna cum laude, Visual and Environmental Studies from Harvard College, Cambridge, MA in 1985; Master of Science, Wildlife Ecology and Conservation from University of Florida, Gainesville, FL in 1997 and Ph.D. in Organismic and Evolutionary Biology from Harvard University, Cambridge, MA in 2003.

His present positions include Adjunct Assistant Professor, Rubenstein School for the Environment and Natural Resources, University of Vermont; Fellow, Gund Institute for Ecological Economics, University of Vermont; Research Associate, New England Aquarium, Boston, Massachusetts; and Editor, Solutions Journal (www.thesolutionsjournal.com).

SELECTED PUBLICATIONS - Refereed journal articles

- Costanza, R, I. Kubeszewksi, J. Roman, P. Sutton. 2010 Changes in ecosystem services in low-lying coastal areas over the next fifty years. Foresight Project, submitted.
- Roman, J., T. Croner, L. Forcier, W. Raap, W. Jackson. 2010. Perennial agriculture: Roots of Sustainability. Solutions, in press.
- Roman, J., P. E. Ehrlich, R. Pringle, J. A. Avise. 2010. Facing extinction: Nine steps to save biodiversity, Solutions 1:32-45 (www.thesolutionsjournal.com).

****

Dr. Shi PING

Dr. Shi Ping is research professor and director for Yantai Institute of Coastal Zone Research (YIC), Chinese Academy of Sciences (CAS). He graduated from Ocean University of China (OUC, formerly the Shandong College of Oceanography) with B.Sc. in physical oceanography in 1982 and University of Southampton in England with Ph.D. in oceanography in 1988. He worked in South China Sea Institute of Oceanology (SCSIO), CAS as research professor and director before joining YIC as the founding director in 2006. He has mainly been working on physical processes over the South China Sea and remote sensing information retrieval and applicational analysis on coastal environment processes, having published 90+ research papers. He has been PI's for 10+ major research projects, served various offices of scientific committees and panels.

****

H.R.H. Princess Maha Chakri SIRINDHORN

Her Royal Highness Princess Maha Chakri Sirindhorn was born Her Royal Highness Princess Sirindhorn Debaratanasuda on 2 April 1955 to His Majesty King Bhumibol Adulyadej, King Rama IX, and Her Majesty Queen Sirikit of Thailand.

Her Royal Highness Princess Maha Chakri Sirindhorn has rendered public service continuously since her early youth. Due to her work dedication, on the occasion of the 50th Birthday of His Majesty the King, 5 December 1977, His Majesty the King conferred the Royal title of Somdech Phra Debaratanarajasuda Chao Fa Maha Chakri Sirindhorn Rathasimagunakornpiyajat Sayamboromrajakumari upon her.

Upon being acknowledged of her distinguished service to the nation and to humanity worldwide, His Majesty the King has graciously conferred the Orders of the Kingdom of Thailand upon Her Royal Highness Princess Maha Chakri Sirindhorn, who has also received the Orders of Other Nations which were conferred upon her in recognition of her significant contribution to relations between nations.

Education

Her Royal Highness Princess Maha Chakri Sirindhorn began her schooling when she was three years old, she joined kindergarten with other classmates at Chitralada School in Dusit Palace, the private school founded by His Majesty the King where all royal children were not treated differently from any other students. From the very beginning of her education, Her Royal Highness developed her scholarly ability, showing aptitude for learning which substantiated her consistent academic progress. Adopting the habit of reading from Their Majesties the King and Queen and being guided by her own nature to explore and seek knowledge, she becomes passionately interested in reading and studying Thai and foreign literature. Around the age of twelve, Her Royal Highness started writing prose and poetry. Not only was she keen on academic subjects, she also enjoyed school activities such as sports, music, school fairs and
social events.

After completing high school education in 1972, being ranked number one in National School Examination, Her Royal Highness Princess Maha Chakri Sirindhorn enrolled in Faculty of Arts, Chulalongkorn University, with focus on history,Thai and oriental languages. Although Her Royal Highness often had to accompany Their Majesties the King and Queen on royal up-country visits, she has put more effort into her study and class assignments. In addition, she regarded the university experiences as invaluable for it gave her knowledge while at the same time provided her great opportunity to get to know people from all walks of life. Her Royal Highness also enjoyed extra-curricular activities on campus just the same as other college students, i.e. "Welcome Freshmen" Party, faculty sports day and cleaning day. She graduated with a Bachelor of Arts Degree, first class honour, gold medal in History in 1976.

Her Royal Highness Princess Maha Chakri Sirindhorn continued her studies in two Master's programmes concurrently, obtaining Master of Arts in Oriental Epigraphy (Sanskrit and Cambodian) from Silpakorn University in 1978, and Master of Arts in Pali and Sanskrit from Chulalongkorn University in 1980. Her Royal Highness continued her studies for a doctorate with a slightly shifted focus of interest from arts and humanities to social sciences and education, she enrolled in a Doctor of Education programme in Development Education, an inter-disciplinary degree for her professional development at Srinakarinwirot University (former College of Education) in 1981 and graduated in 1987.

The principle of using education as a means of community and social development which Her Royal Highness has acquired during her doctoral studies, together with her former experiences in the field, has served as a solid base for her subsequent involvement in community development activities ever since. In addition to her formal education, Her Royal Highness Princess Maha Chakri Sirindhorn continued to pursue lifelong learning by attending several training courses and workshops to enhance her knowledge and skills in effective integrated development. These subjects include computer, cartography, meteorology, survey and photogrammetry, remote sensing and geographic information system and nutrition. In her own wide-ranging academic pursuits, Her Royal Highness has ensured what she has learned can benefit the people with whom she works.

Work Experiences

Her Royal Highness Princess Maha Chakri Sirindhorn started her academic career teaching history at Chulachomklao Royal Military Academy (CRMA) in 1980. From the starting point as a lecturer in the Department of Law and Social Sciences in the Academic Division of CRMA, Her Royal Highness had duties and responsibilities just the same as other CRMA's personnel. The Department of History was formally established in 1987 and Her Royal Highness has become the Director of the Department until now. In 1996, Her Royal Highness was promoted to the highest military rank "General", and following in 2000, was granted the professional title as "Professor" due to her insights and knowledge. Some listings of her taught courses are Thai Studies, Thai History, South East Asian History, Eastern Asia History and Contemporary World History. She occasionally gives special lectures at several other institutions such as Chulalongkorn University, Thammasat University, Chiangmai University and Silpakorn University. She also regularly attends academic conferences and seminars both in and outside the country.

Royal Duties

In addition to the teaching career in CRMA, Her Royal Highness Princess Maha Chakri Sirindhorn has many different duties to perform every day. Some are familiar public duties, such as ceremonies, receptions or visits within Thailand or abroad. Besides, Her Royal Highness carries out official duties and public engagements as her Royal Duties for the benefit of the Thai people. She also represents Their Majesties in various royal functions and performs The Royal Duties Assigned by Their Majesties the King and Queen especially the duties in overseeing the management of philanthropic organizations and foundations. Since 1977, she has been the Executive Vice President of the Thai Red Cross Society ; and the Executive Chairman of several foundations including the Chaipattana Foundation (in charge of His Majesty the King's development and environmental conservation projects), the Anandha Mahidol Foundation (to promote higher education), and the King Rama II Foundation (to conserve and promote Thai culture). She is also the President of the Prince Mahidol Award Foundation (to provide international recognition to individuals who have made outstanding contributions in the fields of medicine and public health).

Imbued with a sense of responsibility and caring, Her Royal Highness Princess Maha Chakri Sirindhorn went on to foster several significant initiatives: providing basic education for school children in remote border areas, promoting plant genetic preservation and gene bank projects, instituting IT efforts to assist the handicapped to achieve independent living, and developing nutritional campaigns to improve the well-being of Thai people. Some of these projects, begun more than three decades ago when she was in her twenties, continue to this day.

Since 1990, Her Royal Highness has led cooperation programmes in the Lao People's Democratic Republic, following by the development for post-primary education in the Kingdom of Cambodia, and presently, her initiatives extend to more cooperation in many countries such as educational and academic cooperation with the People's Republic of China, royal scholarships for students in the People's Republic of China and Tibet, to name a few. Among all her initiatives implemented, most of them are well funded and managed. Moreover, she is not a distant benefactor, her consistent visits to the project sites to monitor their progress help her gather the latest information and assess programme developments.

Her Royal Highness Princess Maha Chakri Sirindhorn has inspired those who have followed her life and work to be a part of this charitable deed. Many people, companies, associations and organizations, including those from foreign countries, continuously present her with money or essential resources for implementing her initiatives. Hence, Her Royal Highness founded the H.R.H. Princess Maha Chakri Sirindhorn Charity Fund with aims to support projects that improve people's life condition including programmes that relieve those suffering from catastrophe.

Modern living and hi-technology gadgets have drawn the young generation away from Thai traditional culture progressively. Fortunately, Her Royal Highness Princess Maha Chakri Sirindhorn has expressed her concern in saving and reviving valued Thai traditions. With an intensive effort to preserve Thai art and cultural heritage, Her Royal Highness has conducted many activities including reconstructing monuments and preserving antiques, supervising the restoration of national treasures and promoting Thai classical music. Her accomplishments have been acclaimed by many universities, both local and international, through their bestowal of Honorary Doctorates in several disciplines upon her. In addition, Her Royal Highness' dedication is also acknowledged worldwide, she therefore was granted Honorary Awards and Honorary Titles from many institutions and organizations.

Thai people have acknowledged Her Royal Highness Princess Maha Chakri Sirindhorn's longstanding efforts to help people in distress and her unselfish service to humanity, regardless of socio-economic status, creed, race or nationality. Her achievements have not only been known among the Thai people, but also people from around the world. In honour of their beloved Princess, many individuals, associations, foundations and organizations have proposed their requests for Her Royal Highness' royal title and her naming for the new species of plants and animals including places and many others. One of
her active role is patronage of many humanitarian charities, philanthropic foundations and organizations which were founded by her initiatives or for public service.

Recreation

In her spare time, Her Royal Highness Princess Maha Chakri Sirindhorn enjoys various leisure activities. One of her favourite pastimes is reading which includes her interests in going shopping for books and collecting books in her personal libraries. Her love of reading leads to her talent in writing articles, poetry, short stories and travel books. Proceeds from her written accounts of her overseas travels are the main source of income of the Princess Maha Chakri Sirindhorn Foundation which was set up in 1979 to support needy students in schools, vocational colleges and universities.

Her Royal Highness Princess Maha Chakri Sirindhorn enjoys playing Thai classical instruments and practicing Thai classical dancing. She sometimes paints. She is also keen on sports: jogging, swimming, biking and trekking, which give her an opportunity to learn about plants, trees and geographical features of the areas.

In addition to her knowledge of Pali, Sanskrit and Cambodian, Her Royal Highness is communicative in both English and French and has been learning Chinese, German and Latin.

****

Mr. Pran SIAMWALLA

Industry Specialist, Risk Management Group, Bank of Ayudhya (a subsidiary of GE Capital)

Mr. Pran Siamwalla currently holds a title as an Industry Specialist, generating lending to new industries covering Renewable Energy, Property Fund, Micro Finance, etc. With his extensive background in Securitization, having launched AAA & Aaa rated notes, he capitalizes on such knowledge to mitigate risk from these new lendings. He has been in financial arena more than twenty years starting from the Wall Street career in New York during 1980's. His early days have already provided him with valuable experiences such as company liquidation of a commodities-trading firm, Conti-Trade, an affiliate of Continental Grains, Inc., and investment firm, McAndrews & Forbes, Inc. which took over companies such as, Revlon, CBS Fox, Inc., etc.

He's been working in various posts as a Strategist, Secretary to the Board of Directors, Controller, VP title in Private Banking, Investment Banking, Business Development, Representative, Consultant, etc., for numeral financial institutions such as Dow Jones & Co, Inc., MBIA, Nomura Securities, etc.

Mr. Siamwalla has dedicated his time to share his knowledge and insight through seminar events, universities, including United Nations where he contributed his comment on the subject under "Rejuvenating Bank & Finance for Development in Asia and the Pacific" using Islamic Bank as the role model. He also gave interviews to Forbes Global, Business Weeks, Bloomberg, Grant Publications, etc. He also chaired several high-profile international professional seminars under the topics such as Private Jets, Fund Management, E-Trading, Floating Breakwaters, Coastal Erosion Prevention, etc. He earned a Master of Management from SASIN, a joint program between Kellogg, & Wharton, with a Bachelor in Accounting from St. Francis College in New York.

****

Dr. A. Harsono SOEPARDJO

Dr. Soepardjo, A. Harsono has several chairman positions in Jakarta, Indonesia.

1. Chairman of Post Graduate Sciences in Marine Sciences in the Faculty of Mathematics and Natural Sciences, University of Indonesia
2. Chairman of Center Marine Sciences in The same Faculty
3. Chairman of Sea Grant Program in province of Jakarta
4. Director of International Ocean Institute Operational Center Indonesia

He has many activities in that institution since 2000, which are Youth and Sea Program for elementary and high school in remote islands (North of Jakarta), Women and Sea Program in coastal area, implementation photovoltaic for electricity in several small islands in Indonesia, training for researcher about coral reef, Basic Safety Training (BST) for ship crews, etc. He is a senior lecturer in Physics Department in The University of Indonesia, Jakarta. He finished his doctoral program from The University of Montpellier II, France in 1993. He also interested in other renewable energies, such as: wind energy, micro hydro energy, and ocean energy (tidal, OTEC, and wave energy).

****

Prof. Su JILAN

Prof. Su Jilan, physical oceanographer, Honorary Director of the Second Institute of Oceanography and a senior scientist at the State Key Laboratory of Satellite Ocean environment Dynamics. Prof. Jilan has Ph.D. from the University of California at Berkeley, is a member of the Chinese Academy of Sciences, a fellow of the Third World Academy of Sciences, and a foreign member of the Russian Academy of Natural Sciences. Prof. Jilan is currently serving as a member of the Advisory Group for the National Basic Research Program of China and a member of the Committee on Capacity Building under the Scientific Committee on Oceanic Research (SCOR). Prof. Jilan previously served as the Chairman of the Intergovernmental Oceanographic Commission (IOC), a member of the Executive Committee of SCOR, Vice-Chairman of the Division of the Earth Sciences of the Chinese Academy of Sciences, and Vice-Chairman of the Chinese Society of Oceanography, etc.

****

Mr. Hiroshi TERASHIMA

Education: Faculty of Law, University of Tokyo, Japan

Mr. Terashima joined the Japanese Ministry of Transport in 1965. He held positions as the Director-General of the Chubu District Transport Bureau and the Assistant Vice-Minister, Minister's Secretariat, retiring in 1994. During his service, he was involved in many national and international maritime transportation projects. He served as the Executive Director of the Nippon Foundation from 1994 until 2002. He is engaged in supporting the building of a cooperative structure to ensure safety in the Malacca and Singapore Straits, anti-piracy initiatives, and human resources development for ocean governance. He is also engaged in developing various proposals related to ocean policy, including The Nippon Foundation's "Oceans and Japan: A Proposal on Ocean Policy for Japan in the 21st Century" (2002), The Ocean Policy Research Foundation's "A proposal for 21st Century Ocean Policy"(2005) and The Study Group on the Basic Law on the Oceans' "Outline for an Ocean Policy – Towards the establishment of a new ocean state"(2006) . He has written numerous papers and given lectures on the issues above.

Other Qualifications:

- Visiting Professor, Yokohama City University
- Member, Managing Council, Tokyo University of Marine Science and Technology
- Member, Board of Governors and Executive Board, World Maritime University
- Member, Council for Science and Technology, Japan
- Technical Session Chair, PEMSEA East Asian Seas Partnership Council

****

Dr. Chua THIA-ENG

Dr. Chua Thia-Eng is the former Regional Programme Director of Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and currently serving as the Chair of PEMSEA's Governing Council. Dr. Chua is also serving concurrently as a member of Research Council and Visiting Fellow of the Ocean Policy Research Foundation of Japan (2008-), Chair of the International Academic Committee and Chair Professor at the Coastal and Ocean Management Institute of Xiamen University (China) (2008-). He served as Associate Editor of the Oceans and Coastal Management Journal until 2008 and managing editor of Tropical Coasts until 2007. He was a former academic staff member of University of Singapore, University of Science Malaysia and University of the Philippines. He had served in various capacities with UN and international organizations including FAO, IMO, GEF/ UNDP and ICLARM (now World Fish Centre). He has published more than 220 scientific papers, articles, reports and books. Dr. Chua completed his high school in Malaysia (1957) and undergraduate studies at Nanyang University (1963), postgraduate studies (Diploma in Fisheries, Master's and doctorate degree) at the University of Singapore (1964-71).

****

Dr. Gunnar TIETZE

After studying mathematics and physics Dr. Gunnar Tietze, 58 years old, specialized in marine geophysics. His professional career began 1977 with Preussag Meerestechnik in metalliferious ooze exploration. He was a research fellow at Kiel University before founding Geophysik Consulting for shallow subsurface reconnaissance. He developed scientific services and data acquisition systems. 1994 he became managing director of Geomar Technologie engaged in marine deep sea equipment among others. 1998 he founded GeoTopic Hydrographic Services. Teamed with other companies, he established the German Hydrographic Consultancy Pool proving his strong networking capabilities. In recent years he
was engaged in coastal surveillance and worked with Raytheon.

****

Dr. Binh T. DO

Dr. Binh T. Do works as a physical oceanographer at Institute of Marine Environment and Resources (IMER), Hai Phong city, Vietnam since 1995, right after completed undergraduate at Ha Noi National University, Vietnam. He received M.Sc. degree at Asian Institute of Technology (AIT), Thailand in 2002, and hold Ph.D. degree in physical oceanography from the University of Liverpool, United Kingdom in 2008. Since 2008 after received Ph.D. degree he returned to work at IMER, and promoted to be Head of Department of Physical Oceanography in July 2009. Since working at IMER he has paid his attention on numerical ocean modeling, processes in coastal zone, and water circulation and dynamics of the marginal sea. At present he is PI of a bilateral project with Belgium on numerical ocean modeling, and acts as scientific secretary of a national project aimed to promote the marine research cooperation between Vietnam and China.

****

Mr. Nguyen VAN QUAN

Mr. Nguyen Van Quan positions as the Head of Department of Marine Biology and Conservation. He got the M.Sc in Marine Biology (2002) and PhD in Marine Biology (2010) with the special interests on the tropical marine ecosystems, marine protected areas and coastal resources management.

****

Dr. Fabienne VALLÉE

Dr. Fabienne Vallée is doctor in physics and engineer in telecommunication systems. She has been working for 14 years for the telecom and space industry as project and program manager. As independent consultant, she worked then for 3 years for economic development agencies, public authorities and with the advisory groups of European Commission on the new maritime, innovation and clusters policies.

She is currently responsible for international cooperation at the science park of Brest, working in tight relation with overseas maritime territories and cooperation networks. She has developed R&D programs in particular for the marine environment, maritime safety and climate change. She has set up an international network “MITS” (Maritime Information Technologies and Services) to accelerate research and usage of standard information technologies by the maritime sector.

****

Ms. Antonella VASSALLO

Ms. Antonella Vassallo has an academic background in Chemistry and Biology with specific experience in environmental appraisal (ecology and vegetation analysis). She is currently the Programme Officer with the International Ocean Institute at its Headquarters in Malta. In this capacity, she is responsible for coordinating the Annual Training Programme on Regional Ocean Governance for Mediterranean and Eastern European Countries in Malta; assisting the IOI Executive Director in the organization and implementation of PIM Conferences, the network-wide Women/Youth and the Sea Programme and implementation of any Women/Youth and the Sea Projects on behalf of IOI HQ; she is responsible for the organization of the annual Danielle de St. Jorre Scholarship and the liaison with and nomination of candidates; and the initiation, development and implementation of projects and partnerships with other universities, centres and organizations as necessary.

Ms. Vassallo is currently a Board Member of the Malta Resources Authority (MRA); the Board is responsible for regulatory oversight on mineral, water and energy resources and for policy, planning and advisory and she is also a Member of the Natural Heritage Advisory Committee (NHAC) of the Malta Environment and Planning Authority (MEPA); the committee advises on the environmental implications of development applications in environmentally sensitive areas or in sites outside the development zone. Other work also includes lecturing, research and organization of fieldwork activities with the University of Malta.

****

Dr. Cherdsak VIRAPAT

Dr. Cherdsak Virapat has been appointed as Executive Director of the International Ocean Institute since May 2008. He served as an officer of the Royal Thai Government for 28 years since 1981. He worked as Fishery Biologist for the Department of Fisheries, Ministry of Agriculture and Cooperatives during 1981-2002 and 2007-2008. He was responsible as Chief of Small-Holder Rural Aquaculture Development and Royal Initiative Projects Sub-Division from1996 to 2002. He was appointed a Director of International Ocean Institute-Thailand Operational Center by the Office of the Thai Marine Policy and Restoration Committee under the Office of Prime Minister and worked voluntarily on this position during 2000-2008; Chief of Public Sector Development Group, Ministry of Natural Resources and Environment during 2003-2005; Chief of International Coordination and Assistant Executive Director of Thailand's National Disaster Warning Center under the Office of Prime Minister and Ministry of Information and Communication Technology during 2005-2008.

He obtained B.Sc. in Fishery Management from Kasetsart University, Bangkok, Thailand, M.Sc. in Fishery Science from University of Helsinki, Finland and Ph.D. in Fisheries Management from Dalhousie University in Halifax, Nova Scotia, Canada. While serving the Royal Thai Government, he obtained the Royal Decoration, namely; the most Exalted Order of the White Elephant and the most Noble Order of the Crown of Thailand.

****

Prof. Wang HUI

Prof. WANG Hui Employment record:

- July, 1983 to September, 1986 - Assistant in Math Department of An Hui Normal University
- July, 1992 to June, 1994 - Postal Doctor/associate professor funded by Postdoctoral research station on Atmospheric Science at Department of Geophysics, Peking University
- June, 1994 to April, 2004 - Director/Professor at Marine Science Division of Department of Earth Science in National Natural Science Foundation of China
- May, 2004 to June, 2008 - Deputy Director/ Professor of Chinese Academy of Meteorological Science
- (During January, 2007 to December, 2007)
- Deputy Director/ Professor of Heilongjiang Meteorological Bureau - July, 2008 till now
- Executive Deputy Director/Professor of National Marine Environmental Forecasting Center, Professor

Education:

- September, 1979 to July, 1983 - Bachelor Degree Study, major in Physics, in An Hui Normal University, Reference: Prof. Jiaqi Mo
- September, 1986 to July, 1989 - Master Degree Study, major in Oceanography, in QingDao Ocean University, Reference: Prof. Shizuo Feng
- July, 1989 to July, 1992 - Doctor Degree Study, major in Oceanography, in QingDao Ocean University, Reference: Prof. Shizuo Feng

Relevant Professional Activities:

Overseas Visit:

- November, 1995 to January, 1996 - Visiting Scholar in Institute of Oceanography, University of Hamburg, Germany
- November to December, 1997 - Visiting Scholar in Lab of Oceanography, University of Portsmouth, England
- December, 1997 to March, 1998 - Visiting Scholar in Institute of Oceanography, University of Hamburg, Germany

- January to April, 1999 - Visiting Scholar in Department of Marine Science, University of Georgia, USA
- May to July, 2002, - Visiting Scholar in Center for Climate Research, University of Wisconsin, USA

Projects (recent):

- The National Marine Commonweal Program, named “High quality technique of storm surge prediction and its application in the typical area”(2009-2014)
- The Special Program on Climate Change, named “Research on Innovation of Climate model system”
- The Key Program funded by National Natural Science Foundation of China, named “Marine primary productivity response to the Monsoon change in the South China Sea” (2006-2009)
- The Key Projects in the National Science & Technology Pillar Program during the Eleventh Five-Year Plan Period, named “Research on observation of air water source” (2006-2010)
- The National High Technology Research and Development program ("863" Program) of China, named” Research on Air-Sea flux and Wave observation system” (2007-2009)
- “Research on Development Plan of Marine Science and technology of China” and “Research on Trend and Relative Policy of Marine Science of China” funded by National Natural Science Foundation of China (2005-2006)

Paper published (recently):

1. Liu Guimei, WANG HUI et al.,2003, Numerical Study on Density Residual Currents of the Bohai Sea in Summer, Chinese Journal of Oceanology and limnology,Vol.21,No.2,106-113.
2. LIU Guimei,WANG HUI et al. Velocity Structure around Tidal Fronts in the Yellow Sea, Advances in Atmospheric Sciences,Vol.20,No.3,453-460(SCIE).
3. WANG HUI, and Mo Jiaqi, 2003, The Nonlinear Singularly Perturbed Problems for Elliptic Equations, Journal of East Normal University, 3,9-12.
4. Haijun Yang, Zhengyu Liu, WANG HUI, 2004, Influence of Extra tropical Thermal and Wind Forcings on Equatorial Thermocline in an Ocean GCM, Journal of Physical Oceanography,Volume 34.,174-187(SCI).
5. WANG HUI, 2004, Marine science Research and sustainable Marine resource utilization management Policy in China, Coastal Canada 2004
6. JIANG Hua, WANG HUI, WU Dexing, 2005, Evaluation of monthly turbulent heat fluxes from WHOI analysis and NECP reanalysis in the tropical Atlantic, Acta Oceanologica Sinica, Vol.24, No.5,14-26.
7. WANG HUI and Huihua Wang, 2006: Impact on regional climate by air-sea interaction in South China Sea, The Foreland and Expectation of Atmospheric Science in 21 Century, China Meteorological Press, 121-125 (in Chinese)
8. WANG HUI, Yihua Lin and Jiaqi Mo, 2006: Air-sea interaction oscillate model of SST between Subtropical zone and equatorial Pacific. Journal of Lanzhou University, 42(5), 137-139 (in Chinese)
9. WANG HUI et al ,2007: A 3-D coupled physical-biological model study in spring of 1993 in Bohai Sea, China, Acta Oceanologica Sinica, Vol.26, No.6, 1-12.
10. WANG HUI, Guimei Liu and Liying Wan, 2007: Application and development on data assimilation in marine ecosystem model. Advances in Earth Science, 22(10), 989-996.
11. Wan L., J. Zhu, L. Bertino, and HUI WANG, 2008: Initial Ensemble Generation and Validation for Ocean Data Assimilation using HYCOM in the Pacific. Ocean Dynamics, 58:81–99. DOI 10. 1007/s10236-008-0133-x
12. Jiang Hua, R. X. Huang, and HUI WANG, 2008, The role of gyration in the oceanic general circulation, Part 1: The Atlantic Ocean, Journal of Geophysical Research (oceans), 113, C03014, doi:10.1029/2007JC004134. (SCI)
13. Li Xiang, WANG HUI, Zhang Zhanhai, Wu Huiding, 2008, Simulation of arctic surface radiation and energy budget during the summertime using the single-column model, Acta Oceanologica Sinica, 27(1):11-12 (SCIE)
14. Gao Shan, WANG HUI, 2008, Seasonal and spatial distributions of phytoplankton biomass associated with monsoonal influences and oceanic environments in the South China Sea, COAA 2007. Acta Oceanologica Sinica, 27(6); 17-32 (SCIE)

15. WANG HUI, Jin Qihua, Gao Shan, 2008, A Preliminary Study on the Response of Marine Primary Production to Monsoon Variations in the South China Sea -- Basic Characteristic, Acta Oceanologica Sinica, 27(5): 1-15. (SCIE)
16. Wan L., J. Zhu, HUI WANG, C. Yan and L. Bertino, 2008: Dressing Ensemble Kalman Filter Scheme by using HYCOM in Pacific, Advances in Atmospheric Sciences Accepted.
17. WANG HUI, H. Jiang and Z. H. Zhang, 2009: Seasonal Cycle of latent heat flux in SCS, Acta Oceanologica Sinica. Accepted.

Books:

- Feng Shizuo and WANG HUI, 2001: Marine Science, Ocean Press. 1-152 (in Chinese)
- Yang Wenhe, Boyong Chen and WANG HUI, 2003, 20th Century Marine Events in China, Ocean Press, 1-588. (in Chinese)
- Feng Shizuo and WANG HUI, 2004, Status and Prospect of Oceanography in China, China Ocean University Press (in Chinese).

****

Prof. Wang XIAOHUI

Prof. Wang Xiaohui

Unit:	National Marine Data and Information Service (NMDIS)
Position:	The chief of the Marine Economy Division of NMDIS
Research Field:	Marine economy statistics, checking and analysis
Main Achievement:	Responsible for editing the China Marine Economic Statistics Communique, *China Marine Statistics Yearbook and China Marine Yearbook*; published *Research on Environment Legislation of Bohai Sea Based on Regional Economic Development, Marine Economy Plan Evaluate Method and Practice, Research on Coastal Region Economy and Industry Arrangement*, accomplished one national standard—*Industrial classification for ocean industries and their related activities,* two ocean professional standards—*Coastal administrative areas classification and codes, and Classification for ocean high-tech industries*; undertaking many marine economy survey and research projects, in which *Marine Economy Checking System and National Ocean-Related Employment Survey* have won the first prize in the national marine innovation achievements.

****

Prof. Wang YING

Professor Wang Ying, coastal geomorphologist and sedimentologist, was born in Feb. 1935 in China, and graduated from Deptartment of Geography, Nanjing University in 1956, then completed postgraduate study in Dept. of Geology & geography, Peking University during 1957 to 1961. She was awarded an honorary Ph. D Degree on Environment Studies from the University of Waterloo, Canada in June 2001. She was elected to be the Academician of Chinese Academy of Science in November, 2001.

Her predominant contribution of the coastal ocean science includes the research on the evolution of muddy flat coasts, the drumlin coast, the river-sea system and the sedimentation of continental shelf, etc. She has summarized tidal dynamic environment, sedimentary processes and ecological coast patterns, and then applied the result to the analyses of ancient tidal environment of muddy-silty strata of the Mesozoic and Cenozoic period. Her research on tidal flat sedimentation has reached the leading edge of the world coastal science. The study on major river inputs to the continental shelf of China seas has developed further to the river-sea system, sediment transport and terrigenous fluxes to the world coastal ocean, and the study on evolution of radiative sandy ridge field of the South Yellow Sea. As a result, it has improved a multi-disciplinary science of “Marine Geography” in China. Recently, she combines the land-sea study with the global changes together, and applies it to China’s coastal development. She is one of the active members of international marine science. She has published 150 papers and 16 Volume of books, by 2010.

****

Mr. Dirk WERLE

Mr. Dirk Werle is a geoscientist with a Master of Science degree in Physical Geography from McGill University. He has been a managing partner ÆRDE Environmental Research, an environmental consulting bureau in Halifax, Canada, since 1987. His professional career as a geographer has focused on the use of Earth observation satellites for remote sensing of land and marine areas, natural resource management, and environmental monitoring. He has served as an advisor for several government and non-governmental organizations. He received a 2-year appointment from the Government of Canada to chair the National Remote Sensing Working Group for the Environment. He is a founding member and former president of the Alliance for Marine Remote Sensing. He is a member of the Canadian Remote Sensing Society and served as Officer and President of the Society for six years. In 2010, he was appointed as a director of the International Oceans Institute Canada Association. Throughout his career, he worked as an Adjunct Professor at several universities teaching Remote Sensing of the Environment. He has been contributing remote sensing lectures to the International Ocean Institute Training Program for ocean governance over the past 15 years. His talk today will focus attention on Earth observation satellites and their increasing role in monitoring changes in the ocean, contributing to a new - and different - ‘Age of Discovery’ in our own time.

****

Prof. Wen QUAN

Prof. Wen Quan is a Research Professor, working in National Marine Environmental Monitoring Center of China. And now he is also:

- Chief Scientist in SOA Key Laboratory of Coastal Ecosystem and Environment Research
- Member of National Expert Committee of Marine Plan Consulting and Evaluating
- Chairperson of Regional Working Group on Pollution Component of UNDP/GEF Yellow Sea Project
- Chairperson of National Expert Committee for China implementing GEF/UNDP/UNOPS PEMSEA 3rd Phase Plan
- National expert for GEF/UNDP/SOA Biodiversity Management in the Coastal Area of China's South Sea
- National Expert for GEF/UNDP/SOA Project on Demonstration of Estuarine Biodiversity Conservation Restoration and Protected Area Networking in China

Since 1982, he had been researching on marine pollution monitoring, ocean dumping siting, sediment quality criteria, analytical methodologies for pollutants in marine environment, technologies of sustainable utilization of coastal resources, integrated coastal management tools, ecological survey and ecosystem assessment, and ecosystem-based approaches, laws and policies of marine environmental protection and marine economy development, etc.

He has been involved in amending the Law of Marine Environmental Protection, preparing the Law of Sea Use Management and drafting the Regulation of Prevention Marine Environmental Pollution from Ocean Engineering.

He has participated to the planning of China Ocean Development Framework, the preparing of National Development Plan of Marine Science and Technology and the drafting of National Plan for Transforming Marine Science and Technology to Development of Marine Economy.

And now he is as team leader to the national research project of the Development of Methodology for Principle Function Zonation in Coastal Area, and in charge of expert group for preparing the 12th 5-Year Plan for National Development of Ocean Science and Technology.

****

Dr. Wu DEXING

Dr. Wu Dexing, born in Shandong Province, China in 1952, graduated from department of oceanography at Shandong College of oceanography. He earned his PhD degree in physical oceanography at Ocean University of Qingdao in 1992 and worked as a professor of physical oceanography at the university. He has been serving as the President of Ocean University of China (OUC) since 2005.

Dr. Wu, a lead scientist of the Major Project of Chinese National Programs for Fundamental Research and Development (Project 973) and a member of the 11th National People's Congress, is concurrently deputy director of Steering Committee of Higher Education for Earth Sciences, Ministry of Education of China(MOE), director of Sub-Steering Committee of Higher Education for Marine Science and Engineering, member of the Third and Fourth Expert Advisory Committee of Department of Earth Sciences under Natural National Science Foundation of China, and member of the Fifth Science & Technology Commission of MOE .

In addition, President Wu is the vice-chairman of Chinese Society for Oceanology and Limnology, standing director of Chinese Society of Oceanography as well as China National Association of Ocean Engineering Consultants, member of China Oceanic Research Committee under Scientific Committee on Oceanic Research. President Wu also serves as the contributing editor or member of the editorial boards of five academic journals including Science China and Chinese Science Bulletin.

Dr. Wu has long been engaged in the research of physical oceanography. He has made significant achievements in such areas as Mechanism of Formation of Equatorial Deep Jets, Wave-induced Tropical Circulation, Dominant Factors Causing Salinity Increase in the Bohai Sea as well as Dynamic Mechanism of the Formation and Maintenance of the Warm Current in the Yellow Sea and East China Sea.

Dr. Wu has won one first prize of Award for Science and Technology Advancement of China's Institutions of Higher Learning, one second prize of Award for Natural Sciences of China's Institutions of Higher Learning, one second prize of Award for Science and Technology Advancement of Tianjin Municipal Government and one third prize of Award for Science and Technology Advancement of Ministry of Environmental Protection of P.R.China.

In 2008, he was awarded the National Order of Culture Merit by Mr. Lee Myung-Bak, President of the Republic of Korea.

****

Prof. Wu Guoxiong

Prof. Wu Guoxiong, PhD, academician of CAS
Address: LASG, Institute of Atmospheric Physics Chinese Academy of Sciences P.O. Box 9804, Beijing 100029, China

Education

- Dept. of Physics, Imperial College of Sci. and Tech., London University, PhD. 1983
- Dept. of Meteorology, Nanjing Institute of Meteorology, Bachelor, 1966

Professional Experience

- Visiting scientist, European Center for Medium-Range Forecasts, 1983—1984
- Senior Professor, Institute of Atmospheric Physics, Chinese Academy of Sciences, 1985—present
- Senior Visiting Research Professor, Geophysical Fluid Dynamics Laboratory, Princeton University, 1989 –1991
- Director, State Key Laboratory of Numerical Modeling of Atmospheric Sciences and Geophysical Fluid Dynamics (LASG), 1993–2000
- Director, Academic Committee of LASG, 2000-present
- Member of the Executive Committee of IUGG, 2007-
- President of IAMAS, 2007-
- Vice President of IAMAS, 2003-2007; Chair of the local organizing committee of the 2005 IAMAS Sci. Assembly in Beijing, China
- Member of the Executive Committee of IAMAS, 1995-2003
- Member of International Commission of Dynamic Meteorology (ICDM) of IAMAS, 1991-2002; organizing an ICDM/LASG Join Workshop in Shanghai in 2001, China
- Member of the Science Steering Group (SSG) of International Program “Climate Variability and Predictability (CLIVAR/WCRP)”, 1999-2002; helped to host the 11th SSG in Xi’an, China in 2002;
- Member of SSG of International Program “Global Energy and Water Cycle Experiment (GEWEX/WCRP)”, 2001-2005; helped to host the 17th SSG in Kunming, China in 2005
- Officer of the Joint Science Committee (JSC) of the World Climate Research Program (WCRP)
- Member, Roger Revelle Medal Committee, American Geophysical Union (AGU), 2002-2004;
- Member of Committee for International Participation (CIP/AGU), 2005 to 2006; helped Pres. Yuntai Chen, the President of CNC-IUGG, in hosting the WPGS-2006 in Beijing.
- President, China National Committee for IAMAS, 1998-2008;
- Vice President, China National Committee for IUGG, 2003-;
- Member of the 4th Consultancy Committee of National Basic Research Program (973), Ministry of Science and Technology (MOST), China

Research Interests

Climate dynamics, weather dynamics, and numerical modeling, in particular, the effects of the Tibetan Plateau, the formation and variation of the subtropical anticyclones, and the dynamics of the Asian monsoon. I have published more than 200 papers on domestic and international academic journals.

****

Prof. Dr. Wu LIXIN

Wu Lixin, Ph.D - Professor/Director, Physical Oceanography Laboratory Ocean University of China, Qingdao, China.

Prof Dr. Wu Lixin obtained his Ph.D from Peking University, and worked at Center for Climatic Research of University of Wisconsin-Madison for a decade. He moved back to Ocean University of China in 2005 and was honored with a named professorship. He is the chief scientist of the National Basic Research project NPOIMS funded by Chinese Ministry of Science and Technology (973), and leader of The Innovation Team in Physical Oceanography honored by the China National Natural Science Foundation. He is a member of the International CLIVAR Pacific Panel, and Scientific Committee of NPOCE International joint research program, and has chaired and co-chaired several international conferences on ocean and climate.

His research interests include dynamics of large-scale ocean-circulation, ocean-atmosphere interaction, decadal climate variability, and modeling global climate system. He and colleagues developed a “Modeling Surgery” framework to understand the roles of ocean dynamic processes in climate variability and changes. His recent interests extend to interaction among water cycle, ocean circulation and climate from a coupled perspective. He has published over 40 articles in Journals such as Journal of Climate, Journal of Physical Oceanography, Climate Dynamics, and Geophysical Research Letters etc.

****

Dr. Zhang ZHANHAI

Dr. Zhang Zhanhai is Director General of the Department of International Cooperation under the State Oceanic Administration (SOA) of China. He graduated from the Peking University in mathematics in 1984 and received his PhD in oceanography in the University of Helsinki. Dr. Zhang has been the National Focal Point of China to UNESCO/IOC since 2007 and was elected as the Chairman of the UNESCO/IOC Sub-Commission for the Western Pacific in 2008.

Dr. Zhang served as Director of the Polar Research Institute of China from 2003 to 2007. He also served as the Vice-President of Scientific Committee on Antarctic Research (SCAR) from 2005 to 2008, Executive member of Forum of Arctic Research Operators (FARO) from 2004 to 2008. He is Professor and PhD student supervisor of the Ocean University of China. Dr. Zhang received a Chinese Government Special Allowance awarded by the State Council in 1995.

Dr. Zhang has research experiences in polar oceanography. As the expedition leader and chief scientist, he conducted "The 2nd Chinese National Arctic Research Expedition" in 2003 and "The 21st Chinese National Antarctic Research Expedition in 2004/2005. His research interests mainly focus on ocean-ice-atmosphere interaction processes in polar region, including sea ice geophysics, coupled ocean-ice modeling, response and feedback of sea ice variation to climate change.

****

Prof. Zhou MINGJIANG

Prof. Zhou Mingjiang is a Distinguished Professor in the Institute of Oceanology, Chinese Academy of Sciences (CAS) in Qingdao, China. He was elected as the Chair for the Chinese LOICZ since 2005 and served as members in the GEOHAB SSC from 2004-2010 and in the SCOR WG 132 since 2008. He was actively involved in PICES activities in the WG 8 as co-chairs and in the FIS and the WG 15 as a member. He received several academic awards including the Second Prize of Natural Science Award of CAS in 1996 and the First Prize of the Ministry of Education of China in 2003. In the last decade, his research has focused on the ecological and oceanographic mechanisms of large scale HABs repeatedly occurring in the Chinese coast. He is now taking the role as the PI again for second phase of the CEOHAB (Chinese Ecology and Oceanography of Harmful Algal Blooms, a project in the National Basic Research Priorities Programme, 2010-2014 – "973" project) sponsored by the MOST (Ministry Of Science and Technology) of China.

****