

Grand challenges for marine research in the next decade

The logo for EuroOcean 2010, featuring the word "Euro" in blue, "OCEAN" in a larger blue font, and "2010" in a blue box. A yellow wave graphic is positioned behind the text.

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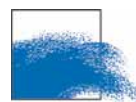
EurOCEAN 2010

CONFERENCE REPORT & OSTEND DECLARATION

EurOCEAN 2010
Grand challenges for marine research in the next decade

Oostende, Belgium
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Organised by



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OSTEND DECLARATION

The European marine and maritime research community stands ready to provide knowledge, services and support to the European Union and its Member and Associated States, recognising that

“The Seas and Oceans are one of the Grand Challenges for the 21st Century”.

In doing so, we acknowledge:

- the critical role of the oceans in the earth and climate systems;
- the importance of coasts, seas and oceans and their ecosystems to our health and well-being;
- the increasing impacts of global environmental change on the marine environment and the significant socio-economic consequences of those impacts;
- the ongoing need for basic research to address major gaps in our fundamental knowledge of coasts, seas and oceans;
- the enormous opportunities for innovation, sustained wealth and job creation in new and existing maritime sectors such as aquaculture, renewable energy, marine biotechnology and maritime transport; and
- the need to translate these messages to all sectors of society.

Furthermore, we underline **the crucial role of marine and maritime science and technology** in providing knowledge and understanding of the seas and oceans and their biodiversity, and in creating new opportunities and technologies which will support and progress:

- Job creation through smart, sustainable and inclusive growth (Europe 2020);
- Implementation of the Integrated Maritime Policy for the European Union (2007), the European Research Area (EC Green Paper on ERA, 2007) and other policies such as the Common Fisheries Policy;
- Good Environmental Status in our marine waters by 2020 (Marine Strategy Framework Directive); and
- Related grand challenges including food, energy and health, as identified in the Lund Declaration (2009).

The marine and maritime research community recognises that significant progress has been made in response to the Galway (2004) and Aberdeen (2007) Declarations, evidenced in the adoption of the Integrated Maritime Policy for Europe (2007), its environmental pillar the Marine Strategy Framework Directive (2008) and the European Strategy for Marine and Maritime Research (2008), and commits to building future progress within this comprehensive policy framework.

Addressing the Seas and Oceans Grand Challenge

The EuroOCEAN 2010 Conference identified priority marine and maritime research challenges and opportunities in areas such as food, global environmental change, energy, marine biotechnology, maritime transport and marine spatial planning, including seabed mapping. The Conference delivered an unequivocal message on the societal and economic benefits Europe derives from the seas and oceans and of the crucial role that research and technology must play in addressing the Seas and Oceans Grand Challenge.

The European marine science and technology community, building on existing achievements and initiatives, is ready to address this challenge in partnership with industry and the public sector, and calls upon the European Union and its Member and Associated States to facilitate this response by delivering the following proactive and integrating actions:

1. **Joint Programming**
Develop an integrating framework, combining the assets of European programmes with those of Member States, to address the Grand Challenge of the Seas and Oceans, including the identification and delivery of critical marine research infrastructures. The **Joint Programming Initiative on “Healthy and Productive Seas and Oceans”** has the appropriate scale of integration and should be actively supported by the European Commission and Member States.
2. **European Ocean Observing System**
Support the development of a truly integrated and sustainably funded “European Ocean Observing System” to (i) re-establish Europe’s global leading role in marine science and technology; (ii) respond to societal needs by supporting major policy initiatives such as the **Integrated Maritime Policy** and the **Marine Strategy Framework Directive**; and (iii) support European contributions to global observing systems. This could be achieved through better coordination of national capabilities with appropriate new investments, in coordination with relevant initiatives (e.g. ESFRI, EMODNET, GMES) and the engagement of end-users.
3. **Research to Knowledge**
Establish appropriate mechanisms to keep under review current marine and maritime research programmes and projects with a view to enhancing their impact by (i) exploiting the results of this research; and (ii) identifying existing and emerging gaps. This should be supported by a **repository for the reports and findings of national and EU marine and maritime research projects, programmes and initiatives**, with capacity for archiving, translating, analysing, reporting and developing integrated knowledge products to facilitate policy development, decision making, management actions, innovation, education and public awareness.

To address effectively the Seas and Oceans Grand Challenge, it is essential to prioritise initiatives and programmes to enhance:

- **Innovation**

Provide enhanced support for innovation and the commercialisation of new marine/maritime products, processes, services and concepts in support of the Innovation Union and the Europe 2020 Strategy;

Promote actions to raise awareness within the marine scientific community of the innovation potential of marine science, and opportunities to make use of it in cooperation with ocean industries.

- **Training and Career Development**

Establish appropriate training and mobility opportunities for marine researchers and technologists and provide stable and attractive career pathways to ensure the highly skilled workforce that will be needed to support expanding marine and maritime sectors;

- **International Cooperation**

Establish at EU level a mechanism to strategically enhance international cooperation (i.e. between European consortia and third country partners) in science and technology, with support for networking initiatives, preparatory phase projects and concrete actions;

Strengthen bilateral/multilateral cooperation with key funding organisations, intergovernmental bodies and marine/maritime science institutions outside Europe to overcome barriers to, and deliver workable solutions for, joint funding of relevant international research programmes and infrastructures.

The European marine and maritime science community is committed to playing its role, in partnership with industry and the public sector, to bridge the gap between science and innovation to support sustainable development.



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INTRODUCTION

The EuroOCEAN 2010 Conference (Ostend, 12-13 October 2010) provided a unique and timely opportunity for the European marine science community to consider, discuss and respond to new policy developments and achievements since the last EuroOCEAN Conference (Aberdeen, 2007), and to highlight new challenges and opportunities for marine research in the next decade. The Conference itself, and the Ostend Declaration (October 2010), which was adopted by the participants during the closing session, enabled the European marine science community to express a clear vision on future marine science priorities and how these should be addressed in Europe in the coming decade. The Conference and Declaration also reinforced the importance of marine science in effective maritime policy making and how it can contribute to Europe's societal and economic development.



The EuroOCEAN 2010 Conference was organised by the Belgian EU Presidency, in close collaboration with the European Commission and the Marine Board-ESF. This 2010 Conference was the seventh in a very successful series of EuroOCEAN & MAST Days Conferences which started in 1994. Over the past 16 years, these conferences have brought together marine scientists from across Europe with science stakeholders, including policy makers and programme managers, and have played a central role in advancing marine science and science policy agendas in Europe.

The previous EuroOCEAN Conferences were held in Brussels (1994), Sorrento (1996), Lisbon (1998), Hamburg (2000), Galway (2004), and Aberdeen (2007). However, it was the EuroOCEAN 2004 Conference in Galway that first delivered an agreed position document which represented the combined voice of the European marine science and technology community. The overarching goal of the "*Galway Declaration*" was to ensure that critical areas in marine science were adequately supported in the 6th and 7th Framework Programmes. The core message of the subsequent "*Aberdeen Declaration*", adopted at the EuroOCEAN 2007 Conference in Aberdeen, was that marine science must be a central pillar of a future European Integrated Maritime Policy (IMP) and that Europe urgently needs a coherent strategy for marine and maritime research as an integral part this IMP.

Over the past six years, the European marine science community has thus demonstrated its ability to communicate effectively to policy makers and advisors, to articulate meaningful and targeted messages, and to deliver these with a common voice.



EuroOCEAN 2010 followed the tradition of the Galway and Aberdeen Conferences with the adoption, during its final session, of an “*Ostend Declaration*”. This Declaration represents a call from the European marine science community for specific actions from the Member States and the European Union in support of essential marine science and technology research challenges and opportunities in the coming decade (2010-2020).

During the EuroOCEAN 2010 Conference, more than 400 marine and maritime scientists and stakeholders from across Europe unanimously agreed that “*the Seas and Oceans are one of the Grand Challenges for the 21st Century*”. This message is the headline of the Ostend Declaration which was adopted during the closing session of the Conference (13 October 2010). The Declaration was developed in the months leading up to the Conference in consultation with the marine and maritime research community and relevant stakeholders in Europe.

This Conference report provides a summary of the main highlights and key messages delivered by the speakers and chairs at the EuroOCEAN 2010 Conference. The overarching recommendations from the Conference are summarized in the Ostend Declaration which calls for the recognition that “*The Seas and Oceans are one of the Grand Challenges for the 21st Century*”. The declaration states that the European marine science research community stands ready to provide knowledge, services and support the EU, and its Member and Associated States, to address critical marine and maritime challenges and opportunities which can, in turn, directly contribute to solving some of the most pressing societal challenges facing Europe and the world today.

The full text of the Ostend Declaration is included at the beginning of this report. Further information on the EuroOCEAN 2010 Conference - including the Ostend Declaration in all official EU languages - is available at:

www.eurocean2010.eu

OPENING SESSION

PRESENTING EuroOCEAN 2010

*Session Chair: **Lars Horn**, Chair of the Marine Board-ESF, Research Council of Norway (RCN), Norway*

Opening remarks from

- **Ingrid Lieten**, Vice-Minister-President of the Flemish Government, Flemish Minister for Innovation, Public Investment, Media and Poverty Reduction
- **Lars Horn**, Chair of the Marine Board-ESF, Research Council of Norway (RCN), Norway
- **Maria Damanaki**, European Commissioner for Maritime Affairs and Fisheries
- **Kostas Nittis**, Coordinator of the Ostend Declaration Drafting Group, Hellenic Centre for Marine Research (HCMR), Greece

On behalf of the Belgian Presidency and the organising institutions, **Minister Ingrid Lieten** (Vice-Minister-President of the Flemish Government and Flemish Minister for Innovation, Public Investment, Media and Poverty) formally opened the EuroOCEAN 2010



Conference, welcoming Commissioner Damanaki and the Conference participants. She highlighted the longstanding tradition of marine research in Ostend leading back to the installation, in 1843, of the world's very first marine research station on the east bank of the port of Ostend by Pierre-Joseph van Beneden of the University of Leuven.

Minister Lieten pointed to the importance of marine research and innovation in addressing the many societal challenges we are facing today in Europe and beyond. She noted that the seas and oceans are of utmost importance for economic and social developments but that the huge opportunities they offer for Europe are increasingly hampered by overfishing, pollution, increased exploitation of resources, litter and many other impacts from human activities. Therefore, she said, *"keeping our oceans and seas healthy and productive presents a Grand Challenge on its own."* *"For Belgium and for Flanders in particular,"* she stated, *"it is very important that sound science underpins current and future marine policies."*

Minister Lieten expressed her support for the three main actions brought forward in the draft Ostend Declaration which was presented for discussion and adoption at the EuroOCEAN 2010 Conference.



Mr. Lars Horn (Research Council of Norway and Chair of the Marine Board-ESF) thanked Minister Lieten for her warm welcome to Ostend and re-emphasised the importance and timeliness of this opportunity to discuss the grand challenges for marine research in the next decade. He noted that *“this is a crucial time in the European research calendar, as work begins to sketch the contours of the next Framework Programme, and to deliver new approaches to funding European research.”* Lars Horn reminded the participants that these discussions will move quickly, urging the science community to ensure that the major scientific challenges we face in relation to our coasts, seas and oceans receive proper attention and are well embedded in future programmes at EU and national level. He also stressed that the seas and oceans are of critical importance for the wealth and well-being of European citizens and that marine and maritime science can contribute to the Europe 2020 strategy, supporting smart and sustainable growth in new and existing maritime sectors.

Mr. Horn explained that the high level themes of the scientific sessions move away from the traditional categorization of science according to discipline and domain. Instead, the presentations which make up the EuroOCEAN 2010 scientific sessions reflect the economic, social and policy issues which marine science can and must address such as sustainable supplies of food and energy, climate change, oceans and human health, the greening of maritime transport and safe and sustainable use of marine space. *“More than ever before,”* he said, *“Europe’s marine and maritime scientific communities realize that science has a crucial role in supporting policy, society and economy. This is certainly the case for the marine domain.”*



European Commissioner for Maritime Affairs and Fisheries **Maria Damanaki** commended the European marine and maritime science communities for their valuable contribution to the European Integrated Maritime Policy. Thanks to this contribution, she said, *“the new policy has already proven its added value, creating linkages and facilitating investments in different maritime sectors such as transport, tourism, fisheries, energy and research.”* She added that the focus has now shifted towards unleashing the untapped potential of blue growth and creating new blue jobs.

“Building a maritime policy without a strong maritime research base is like building a sand castle with an incoming tide,” Maria Damanaki stated. For this reason, she explained, in 2008 the European Commission adopted the Communication on *European Marine and Maritime Research Strategy*, which established a coherent European Research Area framework in support of a sustainable use of oceans and seas. This Communication is a direct result of the Declaration adopted at the last EuroOCEAN 2007 Conference in Aberdeen which called for a *“new deal”* for Marine and Maritime Science.

Commissioner Damanaki stressed that in order to achieve sustainable growth in the marine and maritime economy and, in turn, to meet the goals of the EU's 2020 agenda, we need knowledge of the seas and oceans. To create marine knowledge we need marine data and observations. Commissioner Damanaki drew attention to the recent European Commission initiative, Marine Knowledge 2020. This communication is important, she said, *"because knowledge of the oceans can help industry to provide services and products, help public authorities to protect their coastlines or to manage their resources and help researchers to forecast future scenarios."*



The Commissioner described how the Marine Knowledge 2020 initiative represents an important stepping stone towards achieving one of the European Commission's 2020 Strategy objectives: *"we want to connect, in a more constant, steady and efficient way, research and innovation with development, growth and employment. We want to have more applications of your scientific and research achievements in the industry – private and public. In new energy projects for example: for tidal or sea-thermal energy, for biofuels, for clean shipping, for aquaculture and for sustainable fisheries."*

Commissioner Damanaki concluded that marine research is, and will remain, a central pillar of the maritime policy of the European Union, and emphasized the need for a better marine knowledge to deliver both research and policy goals.

"The maritime research community has always been a fundamental support for us and we definitely need its continuous input. I hope that the Ostend declaration will help us a lot. Building a Maritime policy without strong maritime research is like building a sand castle with an incoming tide."

Maria Damanaki, EU Commissioner for Maritime Affairs and Fisheries



Closing the session, **Dr. Kostas Nittis** (Chair of the Ostend Declaration Drafting Group) presented the draft Ostend Declaration for discussion, improvement and adoption during the final session of the Conference. The draft declaration, he explained, was prepared by a dedicated drafting group, coordinated by the Marine Board-ESF, and had been subject to a broad consultation over several months leading up to the Conference.



"Building on the experiences and success of the Galway (2004) and Aberdeen (2007) Declarations, the key messages of the Ostend Declaration (2010) are targeted, not only at the European Commission," he stated, "but also at the European Union Member and Associated States." Its main focus is on securing appropriate support for marine and maritime science in the next European Framework Programme. The Declaration also supports the continued efforts towards development of the European Marine Research Area, and implementation of the Integrated Maritime Policy, including its underlying science and policy instruments.

The main message of the Ostend declaration, Kostas Nittis stated, is that *"The Seas and Oceans are one of the Grand Challenges for the 21st Century"*. The Declaration identifies high-level platforms which, if delivered, can provide a basis for Europe to address this Grand Challenge. These include:

- Support for the JPI *"Healthy and Productive Seas and Oceans"*;
- A truly integrated and sustainably funded European Ocean Observing System;
- A far reaching Research to Knowledge Programme;
- Enhanced support for innovation and delivery of new marine products & services;
- Further improved international cooperation in marine science & technology;
- Improved education, training and career development for marine researchers and technologists.

"If we are successful in adopting this declaration," Dr. Nittis concluded, "it will be a statement of the unified voice of the European marine and maritime science community, delivering a concrete output from the Conference which will have a powerful impact on the future of marine science and marine science policy in Europe."

Short overview of the Conference build-up

The **first session** of the Conference provided the audience with the context and historic background leading up to EurOCEAN 2010. The core of the Conference was built around two scientific sessions. In the first of these sessions (**Session 2**), some of the major challenges we face in understanding the seas and oceans, the functioning of their ecosystems, their role in the earth and climate systems and their contribution to human well-being were examined. **Session 3** focused on how science can continue to support the development of sustainable maritime industries such as aquaculture, marine renewable energy and marine biotechnology. **Session 4** examined a range of critical research support issues, including how we teach, support, fund and communicate marine science and how these issues are becoming more and more important in bridging the gap between science and society. The Conference concluded with a **closing session** dedicated to finalizing and adopting the Ostend Declaration.

1 SESSION

SCIENCE AND THE SEA: LESSONS FOR THE ROAD AHEAD



*Session Chair: **Manuela Soares**, European Commission, Directorate-General for Research and Innovation*

Wendy Watson-Wright

The Intergovernmental Oceanographic Commission: fifty years of international cooperation in ocean science, services and capacity-building

Peter Heffernan

From Galway to Aberdeen... to Oostende – progress in marine and maritime science policy

Jean-Yves Perrot

Marine science contribution to society and industry

Colin Moffat

Science driving a better maritime governance

Valery Forbes

A question of scale – the regional science approach

Dr. Manuela Soares (European Commission, Directorate-General for Research and Innovation) welcomed the opportunity offered by the EurOCEAN 2010 Conference for the European marine research community, policy makers and stakeholders to meet and discuss future challenges for marine and maritime sciences in Europe. She emphasised the importance that the European Commission attaches to marine research, which is reflected in the FP7 “*Ocean of Tomorrow*” initiative, the implementation of which requires a cross-thematic and multidisciplinary approach.



Successful delivery of the European Research Area for marine research will require commitment from all parties, not only the European Commission. The European Commission is, however, ready to play its role and to listen carefully to the collective voice of the science community.

The first session, Dr. Soares explained, will look back at some of the main achievements and developments in marine science and policy which have brought us to where we are today. We can learn from these experiences to do more and better in the future.

“There is a wide recognition that Europe’s and the World’s future economic and physical well being remains closely linked to the ocean and seas.”

Dr. Manuela Soares

Dr. Wendy Watson-Wright (Intergovernmental Oceanographic Commission of UNESCO) presented the main lessons learned from the Intergovernmental Oceanographic Commission's fifty years of international cooperation in ocean science, services and capacity-building. Established in 1960 as part of UNESCO, the Intergovernmental Oceanographic Commission (IOC) is the only intergovernmental organisation with an international oceanographic remit. It provides coordination and expertise on a wide range of issues including climate change and variability of the oceans, consequences of ocean warming and ocean acidification, monitoring of marine biodiversity, marine spatial planning and other management tools and emerging issues.



"Around the world, international and intergovernmental cooperation is absolutely essential if we are to combat the problems facing the world's oceans."

Dr. Wendy Watson-Wright

Dr. Watson-Wright argued that better protection of our oceans in the future will require the IOC and other organisations and stakeholders at local, national, regional and international level to:

- Adopt a focused approach, since not one organisation can do it all on its own;
- Enhance existing, and establish new, collaborations with a common vision;
- Increase the visibility of ocean issues to decision makers.

Dr. Peter Heffernan (Marine Institute, Ireland) presented an overview of the progress in marine and maritime science policy since the landmark EurOCEAN 2004 Conference in Galway.

He reminded the audience that, during the EurOCEAN 2004 Conference, the European marine science community formulated, for the first time, a common statement on the future research priorities in marine science and technology and brought that collective vision to the heart of European policy making in Brussels.



The Galway Declaration had a far reaching effect. Together with the Aberdeen Declaration, it provided a catalyst to encourage and reinforce efforts within the European Commission and Member States to forge ahead with an Integrated Maritime Policy for the European Union, finally adopted in 2007. It also called for a European Strategy for Marine and Maritime Research which was delivered by the EC in 2008 and which reinforced research as one of the main pillars of the Integrated Maritime Policy.



Dr. Heffernan challenged the Conference participants and the European marine science community as a whole to raise itself to another level, to test its ability to understand societal and environmental forces, market drivers for innovation, and the reality of the economic situation. He concluded by asking the audience, *"Where will we be in six years time? What will we have achieved? It will be in our hands."*

"We have to take our [marine science] community out of its comfort zone and bring it right to the engine of policy making in Europe."

Dr. Peter Heffernan



In his presentation on the “*Marine Science Contribution to Society and Industry*”, **Mr. Jean-Yves Perrot** (Ifremer, France) argued that the European research community must do more to convince public opinion and politicians that marine science can play an important part in promoting economic growth in Europe, whilst meeting environmental and social challenges.



There are many examples of marine sciences already making huge contributions to society and industry and there are many opportunities for the future. To secure sufficient and healthy food, for example, marine science can contribute to better management of fish resources while developing a sustainable aquaculture sector with a high potential, both in terms of employment and sustainable development. A viable marine renewable energy sector will also require a strong effort from research, to address both technological and environmental aspects. Marine biotechnology presents yet another area with huge scientific and economic opportunities. A vast repertoire of life and genetic diversity lies beneath the surface of our seas and oceans, calling for increased research and protection. At the same time, the European marine science community should also contribute to the sustained exploitation of short- and long-term opportunities, associated with mineral resources from ridges, abyssal plains and continental margins. All of these opportunities need consistent, sustainable data and scientific information services to inform policy, management, industry, research and planning which can only be realised throughout a coordinated mobilization of relevant public and private actors.

“Green growth must become green blue growth.”

Mr. Jean-Yves Perrot

In conclusion, Mr. Jean-Yves Perrot strongly recommended the marine science community to take up its responsibilities in close collaboration with industrial partners in addressing the most pressing societal challenges through the recommendations put forward in the Ostend Declaration.



Dr. Colin Moffat (Marine Scotland, UK) advocated the importance of science to underpin better maritime governance. *“While we gain prosperity from the marine environment,”* Dr. Moffat said, *“as a result of the use of the seas we ultimately put considerable pressure on them.”* To be able to manage those pressures and to maintain the benefits we reap from the marine environment in the future, scientific support to the governance of our seas and oceans is critical and requires three important iterative steps:

- Assessing the extent to which human pressures are affecting the state of the seas through strong and robust science;
- Passing the results of the scientific assessments to policy makers in an appropriate format for them to define and implement an appropriate response;
- Feeding back to science evaluation on the effectiveness of the implemented policy response, to guide future science goals.

The EU Marine Strategy Framework Directive (MSFD) provides clear and high-level policy objectives. Its qualitative descriptors for Good Environmental Status need to be made quantitative so that directions, status and trends can be identified. In this way, it is up to scientists to describe what clean and biologically diverse seas actually look like.



There has been significant progress in recent decades to improve the interface between policy and science. Ecosystem status assessments are showing some important successes (and also some failures) and the subsequent implementation of the recommendations and the formulation of new strategies is happening, as demonstrated by the recent adoption of the OSPAR Quality Status Report 2010 and its related strategy. However, important challenges remain to obtain the right scale, assessment criteria and methodologies in these assessments.

"We need to deliver clear, robust and sound messages to policy makers through well integrated assessments."

Dr. Colin Moffat



Prof. Valery Forbes (BONUS EEIG Steering Committee, Roskilde University, Denmark) emphasised the importance of the regional approach to addressing marine environmental challenges in a presentation entitled *"A Question of Scale – the Regional Science Approach"*.

Despite the universality of rules of environmental sciences, Prof. Forbes noted that observations demonstrate an enormous variability in propriety and processes. Using the Baltic Sea as an example, she showed how scale-dependent regional characteristics determine system functioning. Biodiversity in the Baltic Sea is low and food chains are short. Owing to the high inflow of fresh water and long residence time, salinity is also low, thereby creating a unique brackish environment. The spatio-temporal scales of Baltic Sea hydrodynamics, which are small compared to those of the oceans, mean that understanding, adapting to, and mitigating climate change represents a major challenge for Baltic Sea states, and its impacts will drastically differ from other European eco-regions.

Effective management strategies require application at the right spatial and temporal scale. For example, the EU Common Fisheries Policy is currently being reformed and organised at the marine regions level as shared fish stocks cannot be managed by individual Member States acting in isolation. A macro-regional policy, with involvement and integration of stakeholders, is often needed to address both environmental sustainability and economic growth. In the Baltic Sea, the funding cooperation has been formalised through the establishment of the 'Baltic Organisations Network of Funding Science' – BONUS. The latter operates both at the national and regional levels and aims to create a policy-driven strategic research agenda, supported by high quality research and stakeholder involvement.

Prof. Forbes concluded with the hope that the experiences and knowledge gained within the Baltic States through the BONUS initiative could be used as a good example in other EU regional seas.

The **open floor discussions** following Session 1 touched upon important aspects in relation to education and training of the scientists of the future, revealing that one of the main challenges will be to anticipate the next wave of society's needs in terms of skilled employees and to provide, in turn, appropriate training and career pathways. The need to reinforce international cooperation using best practice from existing multi-state cooperation was also re-iterated, in particular with neighbouring countries from the Mediterranean Sea basin which are facing increasing social, economic and ecological challenges. These discussions provided important points that helped to determine and inform the final text of the Ostend Declaration.

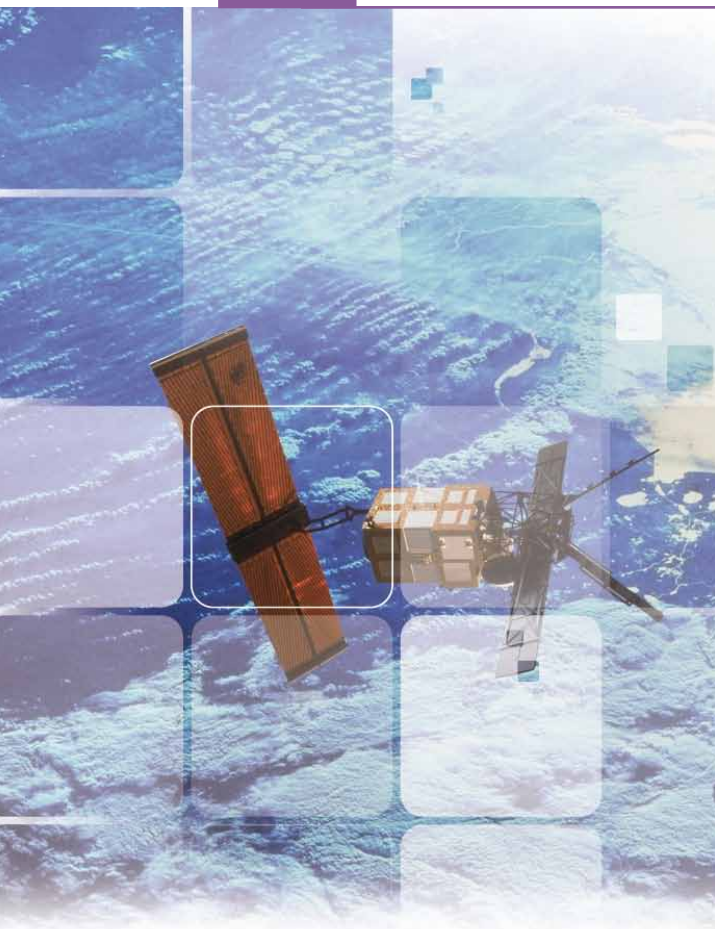
"A regional approach is crucial for understanding and managing marine systems in a holistic way."

Prof. Valery Forbes



2 SESSION

MARINE SCIENCE 2020: GRAND CHALLENGES AND OPPORTUNITIES FOR THE NEXT DECADE (1)



*Session Chair: **Mike Thorndyke**, Swedish Institute for the Marine Environment, Sweden*

Karin Lochte

The role of the oceans in the earth and climate system

Carlo Heip

Creating a better understanding of marine ecosystem functioning

John Stegeman

Oceans and human health, and humans and ocean health; risks and remedies from the sea

Achim Kopf

Deep-sea and sub-seafloor research – understanding the past as a key for a sustainable future

Geoffrey O'Sullivan

New innovations in marine science and technology: emerging technologies... converging on the oceans

Peter Haugan

Real-time, long-term integrated observations of European seas for monitoring and research

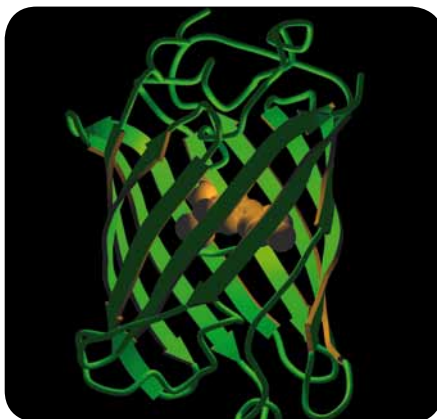
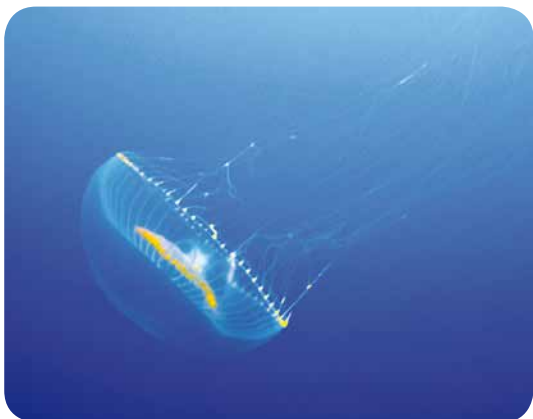
David Connor

Prospects for a seabed and habitat map of Europe

Prof. Mike Thorndyke (Swedish Institute for the Marine Environment) introduced the afternoon session which focused on some of the most fundamental marine science challenges for the next decade. The presentations in this particular session will provide relevant insights in support of what Prof. Thorndyke referred to as the four essential 'I's': "*Integration, Innovation, Interdisciplinarity and Information*". In particular the latter, informing all the relevant stakeholders, will become increasingly important in the future to highlight the relevance of marine research for our economy and our society.



Prof. Thorndyke highlighted the importance of marine biological research in the history of science including several Nobel-prize winning discoveries. Examples of important scientific discoveries include research on squid which was critical in improving our understanding the nervous system, of Alzheimer's disease and human hearing; work with sea urchins which significantly increased our understanding of cell division control; and the discovery of the green fluorescent protein from a jellyfish which is the most widely used gene tag in genomics research today.



According to Prof. Thorndyke, there is a growing sense of community among marine scientists in Europe and beyond, adding that *“acting and speaking as a community will be even more critical in the future to ensure that marine science issues remain high on the political agenda.”*

Presenting *“The Role of the Oceans in the Earth and Climate System”*, **Prof. Karin Lochte** (Alfred Wegener Institute for Polar and Marine Research) reminded the audience that early climate models in the 1970’s and 1980’s largely ignored the oceans. Since then, each IPCC assessment report has used improved ocean models. In the future, the use of well developed models that take into account the biological component of the oceans will be critical to increase the accuracy of future climate predictions and their potential impacts.



Nevertheless, Prof. Lochte said, *“it is already clear that increased CO₂ levels in the atmosphere will continue to cause warming and acidification of our seas and oceans, resulting in considerable impacts.”*

Global warming will alter the biology and physics of the oceans. It will alter ocean currents and stratification, induce changes in the distribution patterns of organisms and ecosystems and induce sea level rise. The oceans remain the largest CO₂ reservoir on the planet, but CO₂ levels have increased considerably over the past 200 years and, as a result, by 2100, ocean pH is expected to decrease further with potentially significant and unpredictable results. Biological functions and biogeochemical processes in the ocean will change, and while some organisms may thrive in higher CO₂ regimes, many others will decline. *“Recent research shows that the polar oceans are particularly sensitive to ocean acidity changes due to various factors,”* Prof. Lochte stated. She stressed that arctic temperatures are rising much more quickly than in other parts of the world and called for research to examine the combined stress results of pH changes, temperature changes and ecosystem changes.

The potential human responses to these changes were also described as some industries will see strong opportunities. As ice retreats, new shipping routes open which can shorten transport over sea to Asia by 30%. Also, enormous mineral and hydrocarbon resources in the Arctic are bound to be exploited when these areas become accessible, with consequent risks to the environment. However, there is limited infrastructure and safety equipment available in these remote parts of the planet to provide assistance if accidents happen.



Prof. Lochte concluded that urgent action is needed to:

- Significantly improve our understanding of the processes and changes in the ocean in order to predict future developments. This requires improved observation infrastructures and systems;
- Develop stronger protective measures without delay and adaption of our science to support societal requirements;
- Safeguard the freedom of research in all ocean areas, in particular now that the ocean is increasingly becoming the target of national interests (following the extensions of several Exclusive Economic Zones).

"The Arctic Ocean may become one of the most dramatically altered marine systems and is likely to trigger climate changes globally."

Prof. Karin Lochte



Prof. Carlo Heip (Royal Netherlands Institute for Sea Research) described our current scientific knowledge and understanding of marine ecosystem functioning. Despite significant progress, Prof. Heip acknowledged that we still know very little about the biology and ecosystem functioning of marine systems. *"There is an enormous discrepancy between the amount of available biological data and biological indicators developed for terrestrial systems and those of the marine environment"* he said.

Prof. Heip reminded the Conference that we continually acquire important new knowledge about marine ecosystems which can completely alter our views on the ocean and how its ecosystems function. One area that we are slowly learning more about is the marine microbial food web. *"Although we've been modelling the food chain for years,"* he said, *"we've only just realized that there is a microbial food web too, with dissolved organic carbon playing a critical role in linking the microbial food web with the classical food chain"*.

While our understanding of whole ecosystem functioning is changing as we learn more, Prof. Heip believes that predicting the future state of ecosystems with any accuracy is fraught with difficulties, and for several reasons. “For one,” he said “there are too many and still unknown state variables, as is the case for weather forecasts.”

He suggested that scenario building for management and decision making purposes might provide a solution. However, just like models, scenarios require accurate observations of the state of the ecosystem. We therefore need to invest in more and better ocean observations of a wide range of important marine ecosystem parameters if we want to improve our knowledge of how marine ecosystems work.

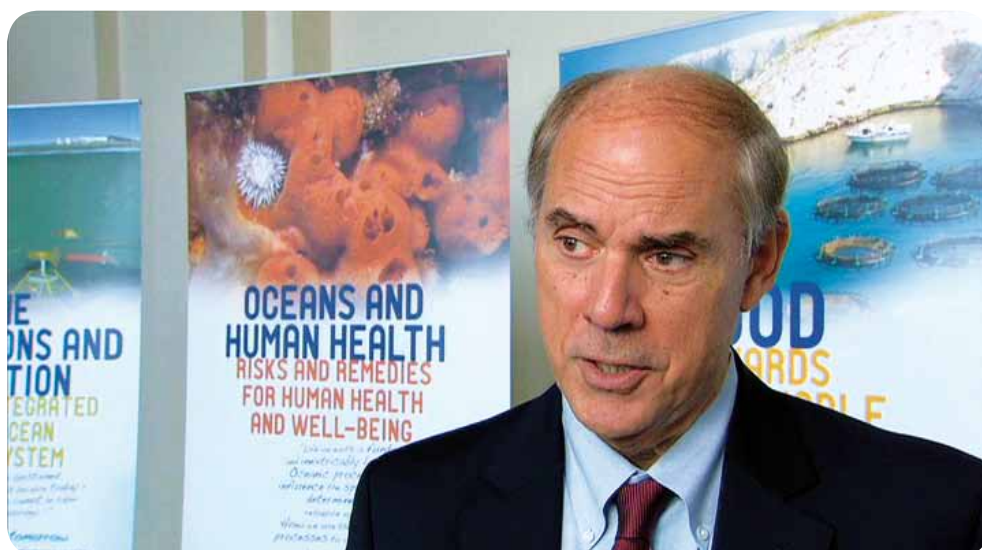
“To achieve good environmental status one needs to understand the environment - unfortunately to understand the marine environment we are lacking critical knowledge. Society needs marine science to get that understanding and obtain new knowledge.”

Prof. Carlo Heip

“Many of the marine research issues relevant today are, in one way or another, linked to Human Health” stated **Dr. John Stegeman** (Woods Hole Oceanographic Institution, USA), who presented on the progress which has been made in the United States in integrating scientific research to obtain a better understanding of the interactions between the oceans and human health.

During the last decade, the US has invested heavily in multi-disciplinary oceans and human health research programmes. This included the establishment of seven Centres for Oceans and Human Health (COHH) and a complementary National Oceanic and Atmospheric Administration (NOAA) Oceans and Human Health Initiative (OHHI) to conduct, coordinate and communicate research in this new integrative field. The research centres focus on a range of human health risks from the sea, including microbial pathogens, harmful algal species and chemicals in the marine environment.

Aside from the health risks, oceans and human health research in the US also looks at the health benefits and remedies originating from the sea. For example, there is much potential for pharmaceutical remedies and nanomaterials from marine sources, but also many challenges, not just in finding the right organisms but also in developing the technology to cultivate them outside of their natural habitat. Other research has shown that people taking exercise close to water can achieve greater health benefits; the so called ‘Blue Gym’ concept developed in the UK.





"Everything having to do with the oceans, at some level, is a global issue requiring a global response"

Dr. John Stegeman

Dr. Stegeman concluded that private investment and biotechnology will become even more important for progress in oceans and human health research. To be successful, marine scientists must engage more fully with clinicians and industry. Advances in the area of oceans and human health research will require multidisciplinary approaches, new institutional partnership and global collaborations. He emphasised that while we make progress, we also need to transfer the acquired knowledge and technology to developing countries so that they can take part in this exciting area of work.



In his presentation, **Prof. Achim Kopf** (Centre for Marine Environmental Sciences of the University of Bremen, Germany) highlighted the importance and future challenges associated with the final frontier on our planet: the deep biosphere.

While the Census of Marine Life has done a wonderful job acquiring many new insights, Prof. Kopf agreed with Carlo Heip's assessment that we still know very little of what is out there, especially when it concerns the deep-sea and the sub-seafloor. *"We are only beginning to learn about the deep biosphere"* Achim Kopf said, adding that *"even 1km under the bottom of the oceans it turns out that there is bacterial life, and scientists now believe the subsea-floor biomass may exceed that of the water column and land surface."*

Deep-sea and sub-seafloor research can and must make important contributions to pending societal challenges. For example, there is an emerging need for technologies to lower the risk of damage to ecosystems which can result from drilling, to prevent or remediate events such as the Gulf of Mexico oil spill in 2010. Understanding deep geological processes will also help us to understand the dangers from natural phenomena such as earthquakes and tsunamis. *"Europe is not invulnerable to natural hazards,"* Prof. Kopf reminded the Conference, pointing to the destruction of Lisbon by an earthquake and tsunami in 1755 and the many historic records of seismic events in the Mediterranean. *"However,"* he added, *"we are now able to punch a hole in the crust below the ocean for a couple of kilometres and install instruments to monitor micro-seismicity and deformations. We need to keep listening with a permanent presence in the sub-seafloor realm which requires long-term support of observation systems and networks."*

"A deeper knowledge of the deep-sea will only be achieved if we go deeper than the deep-sea."

Prof. Achim Kopf

In conclusion, Prof. Achim Kopf called for Europe to work together at the scientific and science policy level and to fund deep-sea and sub-seafloor research over successive calls to enable adequate exploration of the deep frontier.

In his presentation *"New innovations in marine science & technology: emerging technologies... converging on the oceans"*, **Mr. Geoffrey O'Sullivan** (Marine Institute, Ireland) argued that new developments and innovations in areas such as nanotechnology, robotics and biotechnology have the ability to change the future of marine sciences and of our societies completely. These developments give rise to many challenges and also opportunities, for example by providing the knowledge and tools to feed a growing world population while reducing overfishing. Another area with a huge potential is the marine renewable energy sector which by 2050 could produce up to 50% of our electricity. Full exploitation of these opportunities will require the engagement of marine scientists with new communities, for example, in the context of the next European Framework Programme which is currently in preparation.



Mr. O'Sullivan illustrated that marine science has already made important discoveries for the medical sector and that more are underway. *"In return"* he said *"we are using tools and techniques developed in other domains such as Magnetic Resonance Imaging (MRI) and Computed Axial Tomography (CAT) scanners to analyse dolphin responses to underwater noise."*

These digital images and robots are getting better all the time, computing power continues to increase and cloud computing is starting to emerge. Soon, *'lab on a chip'* technology will allow ecogenomics work to be carried out using Argo floats which will significantly increase our capacity to observe the biological component of the oceans.

Geoffrey O'Sullivan challenged the audience to consider what will be the new innovations that will change marine science. If we think of how the sextant, the chronometer or even the shipping container transformed the way we use ships, what else can we think of that will help our work and our lives? He concluded by emphasising that the future is in our hands.





In his presentation, **Prof. Peter Haugan** (University of Bergen) supported the view, already expressed by many other speakers, that we can only gain better understanding of our seas and oceans and improve our monitoring for societal and policy needs through appropriate marine observations. He advocated the importance of real-time, long-term integrated observations of European seas for monitoring and research and the central role of marine observatories as strategic *in situ* observing capacities which provide long-term time-series data.

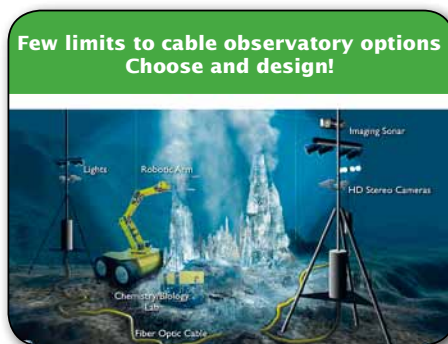
Marine observatories make up the backbone of an integrated ocean observation system and the EMODNET and are of critical importance to facilitate:

- Effective policy making and sustainable management of the seas and oceans;
- Monitoring of the rate and scale of environmental change, including climate change and biodiversity loss;
- Detection of hazards and events;
- Understanding ocean, earth and climate system processes.

"We not only need more marine research infrastructure to observe and understand the impact of human activities and climate change on the marine environment, but also to provide valuable data for existing and new activities which are taking place offshore," Prof. Haugan explained. While national efforts will remain important, Prof. Peter Haugan's key message was that European level collaborations would be more cost effective and able to stimulate the necessary developments.

As illustrated by the recent Marine Board-ESF Forum and the resulting statement, *"Towards a European Network of Marine Observatories"*, Prof. Haugan emphasised that *"there is now a wide support and vision from the scientific community to develop a sustained and integrated network of marine observatories in Europe."* Such a network should integrate observations for research and observations for management purposes and its development requires two urgent actions:

- Implement a Europe-wide mapping exercise and gap analysis on long-term marine data provision to identify and fill the existing gaps in coverage;
- Based on the above mapping exercise, and building on existing national and regional observing systems, develop a comprehensive European strategy for the development of an integrated network of marine observatories.



"Free access to real-time marine observations will generate revenue for business and government, new products, and a leading role for European research and development."

Prof. Peter Haugan

Dr. David Connor (Joint Nature Conservation Committee, UK) presented the prospects for a seabed and habitat map of Europe. Showing high resolution images from the planet Mars and Google street view, Dr. Connor illustrated that our expectations for the quality and level of detail of maps in the terrestrial world and even of other planets are very high. In contrast, he highlighted that we only have a fraction of 1% of the seabed in high quality imagery.

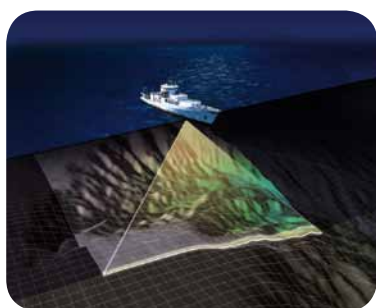
"At present, much of our knowledge is about depth rather than seabed characteristics and the maps we have are not always accurate. For example, using 3D imagery it is not uncommon to discover that a seafloor previously charted as 'gravel' is actually a rocky reef with streaks of gravel in certain places."

"We still have only a fraction of 1% of the seabed in high quality imagery."

Dr. David Connor

Initial seabed mapping was carried out mainly for navigational and safety purposes, Dr. Connor explained. However, the protection of the marine environment, in particular in the context of the Marine Strategy Framework Directive, is now an important driver to obtain better maps of the seabed and habitats of European seas.

European coastal countries are employing different approaches and investing to different degrees in seabed and habitat mapping activities. However, large areas remain unmapped or in low detail. The benefits are nevertheless clear: a cost-benefit analysis by Price Waterhouse Cooper on the Irish multi-beam seabed mapping survey showed that the project would deliver an estimated €440 million euro return on a €70 million euro investment.



Looking at the prospects of achieving seabed and habitat maps at the European scale, Dr. David Connor highlighted that there are still many issues in terms of data coverage, quality, consistency and accessibility. The European Commission EMODNET initiative is addressing some of these problems in an attempt to compile information at a European level.

To achieve a seabed map of Europe, David Connor concluded that we will need to:

- Invest in new surveys for industry and for environmental management purposes;
- Improve standards of data collection and interpretation;
- Gain a greater understanding of relationships between biology and physical environments;
- Coordinate efforts better at both the European and national level. A European Centre for Seabed Mapping would provide significant impetus for progress.

The session concluded with an open discussion and questions from the floor which raised important issues on bridging the barriers between science and the private sector and how best to communicate uncertainty and aspects of natural variability to policy makers. The discussions also emphasized key issues related to communication and stakeholder engagement which contributed to the final text of the Ostend Declaration. Prof. Mike Thorndyke thanked all of the speakers for a fascinating and thought-provoking afternoon.



3 SESSION

MARINE SCIENCE 2020: GRAND CHALLENGES AND OPPORTUNITIES FOR THE NEXT DECADE (2)

*Session Chair: **Peter Herzig**, Leibniz Institute of Marine Sciences (IFM-GEOMAR), Germany*

Fanny Douvere

Maritime spatial planning – towards a safe and sustainable use of maritime space

Henry Jeffrey

Harnessing renewable energy from the sea

Willem Laros

Charting a Course – Maritime Transport Research Priorities

Ole Arve Misund

Sustainable harvest of biotic ocean resources

Adrianna Ianora

Blue biotechnology: new opportunities for Europe

Maive Rute

Reinforcing the European marine bio-economy

Opening the 3rd session, **Prof. Peter Herzig** (Leibniz Institute of Marine Sciences, Germany) argued that, given the demand for food and raw materials from the world's fast growing population, the exploitation of both living and non-living resources from the sea is certain to increase.



Prof. Herzig observed that a major motivating factor driving interest in maritime resources is the lack of direct access to natural resources in Europe. This resource scarcity affects industrial production (for example in IT and high-tech industries), energy security, imports of seafood and many other areas of maritime relevance. In parallel, he stated, the EU has passed extensive marine environmental protection legislation, with the clear political goal that standards need to be established for the environmentally-friendly production or extraction, transportation and use of resources taken from the oceans and seas.

"The dark-side of the moon is still better known than the 70% of our planet which is covered by oceans. In order to meet the challenges of the next decade, major investments in marine science and technology are necessary. The future of the oceans is the future of mankind."

Prof. Peter Herzig

Prof. Herzig concluded that it was an important challenge for the scientific community to provide models, scenarios and alternative means of balancing the exploitation and protection of marine ecosystems.



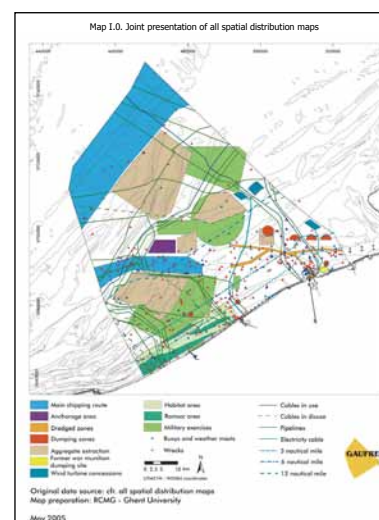
Dr. Fanny Douvere (United Nations Educational, Scientific and Cultural Organization UNESCO) presented the findings of a UNESCO/IOC report on marine spatial planning entitled, *“Marine spatial planning: A step-by-step approach toward ecosystem-based management in mid-2009.”* As part of this initiative, different marine spatial planning approaches around the world were assessed with a view to identifying best practices. She stressed the importance of this initiative given that new plans were continuously being developed. To illustrate this point, she estimated that in the next three to four years, 12 countries would have developed as many as 60 new marine spatial plans.

The main aim of marine spatial planning is to overcome the problems related with single-sector management and to move towards more integrated approaches to utilizing and managing marine space. In practice this involves distributing, in space and time, human activities in the ocean, allowing a variety of activities simultaneously. While marine spatial planning needs to be underpinned by sound data and knowledge, it will provide the additional benefit of an integrated and comprehensive overview of human activities in the oceans.

Dr. Douvere identified the following important short-comings in many marine spatial plans:

- They are often treated as one-off acts or documents, rather than as part of a continuous, adaptive and iterative process;
- They often consider monitoring and evaluation in terms of environmental quality, rather than in terms of the performance of management measures;
- They include general sets of principles and goals (e.g. establishing sustainable economic development and protecting the marine environment), but do not include measurable objectives and indicators to document changes over time.

These issues, Dr. Douvere stressed, need to be addressed or there is a risk of jeopardizing those plans currently being developed.



“While the advantages of Marine Spatial Planning (MSP) become rapidly acknowledged, few recognize the shortcomings of current marine spatial plans. Research will need to focus on those shortcomings if MSP is to deliver its widely anticipated results.”

Dr. Fanny Douvere

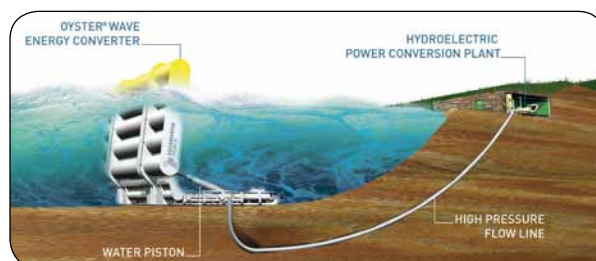
Dr. Henry Jeffrey (UK Energy Research Centre) presented an overview of the status of marine renewable energy technologies to harvest offshore wind, wave, tidal, thermal, salinity gradient and biomass energy from the sea. These various technologies, he argued, are at very different stages of maturity, spanning from an early R&D stage to full commercial application, with wind being the most, and salinity gradient being the least, well developed to date. However, he noted that regardless of the stage of development, all of these technologies will benefit from knowledge transfer and cross-fertilization opportunities.



The renewable energy sector development will create jobs, economic benefits and carbon reductions. To support the success of new energy sectors, Dr. Jeffrey argued, it will be important to develop a more strategic approach to furthering the different technology areas. He identified roadmaps as being particularly important, as they offered an effective means of underpinning policies and measures. They focus RTD activities and business investments to accelerate technology development and to give a coherent approach to engaging with global markets, at national level (e.g. UK Energy Research Centre roadmap) and at a pan-European level (e.g. 2010 Marine Board-ESF Vision Document, *“Marine Renewable Energy: Research Challenges and Opportunities for a New Energy Era in Europe”*).

“Identifying technological commonalities is key for the successful development of activities to harvest marine renewable energies.”

Dr. Henry Jeffrey



Dr. Henry Jeffrey underlined that the potential for ocean energy is enormous, citing the European Ocean Energy Association projections that 26,000 jobs that could be created by 2020, and up to 300,000 by 2050. *“To realize this potential,”* he added, *“the research and technology challenges will have to be addressed collaboratively by the industry and science communities. At the same time, more work is needed on the environmental impacts of tidal and wave energy installations in coastal and offshore waters, to minimise the damage to the marine environment.”*



Mr. Willem Laros (European Technology Platform, WATERBORNE and Community of European Shipyards' Associations, CESA) reminded the Conference of the importance of maritime transport, which accounts for more than 90% of global trade and 85% of all goods entering or leaving Europe. However, the maritime transport sector is not limited to the movement of goods and people, but includes a wide-range of ancillary activities including shipbuilding, maritime equipment manufacturing, dredging and offshore technologies. Given that CO₂ emissions from ships are expected to triple over the next 40 years, Willem Laros argued that developing cleaner and more efficient ships through RTD is a priority in the field.



Mr. Laros described the European maritime landscape and, specifically, the Waterborne European Technology Platform which has brought together all the actors in the field to develop a common vision on RTD priorities. Between 2005 and 2008, Waterborne developed a Vision Document, a strategic research agenda and an implementation plan based on 3 pillars:

"Maritime Transport, as a key driver of the European economy, is an important and still the most environmental friendly form of transport for Europe's trade."

Mr. Willem Laros

- Towards safe, sustainable and efficient operations;
- Promoting a competitive maritime industry; and
- Managing growing trade volumes and changing trade paths.

Willem Laros finished by drawing attention to two ongoing FP7 projects of particular importance to the Waterborne Technology Platform which are aimed at bringing the marine and maritime transport research communities closer together, identifying synergies and modes of collaboration:

- FP7 EMAR²RES is working to identify research areas of common interest to both the marine and maritime science communities (e.g. biomimetics, under water noise);
- FP7 MARCOM+ aims to develop a forum to deliver a consolidated advice on marine and maritime research priorities.

Dr. Ole Arve Misund (Institute of Marine Research Norway) presented some of the most important developments, threats, opportunities and challenges being addressed by current fisheries and aquaculture research. He highlighted the impact of fisheries on wild fish stocks, which many observers consider to be substantial. However, Dr. Misund argued that there is often scope for a different perspective, whereby some fisheries are *"not doing that badly, but there is room for improvement"*. Referring to the example of the Joint Norwegian-Russian cod fisheries in the Barents Sea, he presented data showing that cod stocks in this region have, in fact, started to recover.

Turning to aquaculture, Dr. Misund stressed that the goal must be to produce fish over long time periods with acceptable environmental impacts. He argued that better regulations, determined by carrying capacities, were necessary to enable a further sustainable expansion of aquaculture production.



"Sustainable fisheries and aquaculture in the Northern hemisphere will greatly depend on temperature increase, ice distribution, ocean acidification and biodiversity."

Dr. Ole Arve Misund

Looking at the future, Dr. Misund concluded that the major challenges for fisheries and aquaculture which will need to be addressed are:

- Substantial impacts on both aquaculture production and the distribution of wild stocks due to increases in the temperature of the North Atlantic as a result of climate change;
- Impacts of diminishing ice distribution and ocean acidification on the regional distributions of fish populations; and
- Biodiversity loss due to fishery equipment and practices means that low-impact fishing methods and technologies must be developed.

In a presentation entitled *"Blue Biotechnology: New Opportunities for Europe"* **Dr. Adrianna Ianora** (Stazione Zoologica Anton Dohrn, Naples, Italy) presented the challenges and opportunities for industry and society associated with the use of organisms or their components to provide goods and services through marine biotechnology.



The current interest in marine biotechnology, she explained, is driven by the fact that marine biodiversity is greater than terrestrial biodiversity and because the chemicals produced by marine organisms tend to be different and often more active than those produced by terrestrial organisms. *"In fact"* Dr. Ianora added, *"biological activity of marine organisms is thought to be two times greater than that of terrestrial organisms."* Some notable successes of marine biotechnological research include the development of anticancer drugs, food and feed applications, biomaterials for cosmetics, enzymes for industrial use and biomaterials for a wide range of applications.

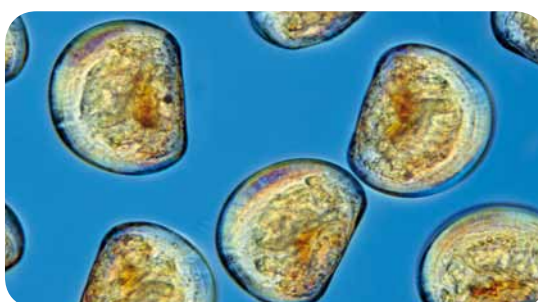


Looking ahead, a new position paper from the Marine Board entitled, *“Marine Biotechnology: A New Vision and Strategy for Europe”* (September 2010), identifies four major areas of research for the future:

- Health, focusing on pharmaceuticals as well as nutraceuticals and cosmeceuticals;
- Improved aquaculture production;
- Marine environmental protection, including bioremediation, monitoring of toxic blooms, habitat restoration, country of origin identification, etc.; and
- Making energy alternatives more economically viable through biotechnology.

To make significant progress in these areas, there are still major scientific challenges to be addressed, including developing technologies to access deep-sea organisms, gaining a better understanding of the physiology of microorganisms as well as the cultivation of microorganisms and related genetic resources. In order to further strengthen the field of marine biotechnology, Dr. Ianora recommended:

- An active communication strategy to raise the profile and awareness of European marine biotechnology research;
- The development of research strategies and programmes for marine biotechnology research at the national, regional and pan-European level;
- An improved technology transfer between academic research and industry, which includes common European positions on regulations for access, benefit sharing and exploitation of marine genetic resources; and
- Improved training and education.



“In the field of marine biotechnology, the time has come to move away from strategies toward concrete implementation steps.”

Dr. Adrianna Ianora



Closing the session with a keynote address on the European Marine Bio-economy, **Dr. Maive Rute** (European Commission, Directorate-General for Research and Innovation) described the European Commission's goal to "*maximise the potential of the European bio-economy in a sustainable way.*" Worth nearly two trillion euro, the bio-economy provides around 22 million jobs in Europe, across sectors as diverse as agriculture, forestry, fisheries, food and biofuels. A strong bio-economy is important to address complex challenges such as nutrition and health, decarbonisation of agricultural production, supply of sustainable and safe food products, or adapting to climate change. "*The European Commission,*" she stated, "*is convinced that research and innovation focused on the bio-economy could have a strong leveraging effect to stimulate new modes and smart, sustainable and innovative solutions, as envisaged in the Europe 2020 Strategy.*"

Dr. Rute described the marine bio-economy as a coherent ensemble of economic activities encompassing knowledge and technologies related to marine biology, genomics and the environment. Its principal aims are to:

- Secure the supply of safe seafood products from aquaculture and responsible management of fisheries; and
- Explore and exploit the diversity of marine organisms for industrial applications in a great variety of sectors.

Dr. Rute stressed that the marine bio-economy could offer great opportunities related to the development of aquaculture and to the sustainable exploitation of the resources of the deep-sea. To capture these opportunities, she announced that the Commission was planning to issue a communication in 2011, outlining a common strategy for developing the bio-economy in a coherent way at EU level.



In conclusion, Dr. Maive Rute shared some observations on the importance of moving beyond research and emphasizing the knowledge transfer and the dissemination of research results. *“Innovative research activities are not enough”* she said, adding that *“we all have a responsibility in making sure our societies and economies are able to use these bright new ideas.”* For this reason, creating a business environment conducive to innovation would also be a key element of the Commission’s planned bio-economy strategy. She acknowledged the Ostend Declaration’s claim that it was now *“time to seize the opportunities for additional wealth and job creation that maritime sectors such as aquaculture and marine biotechnologies can provide.”*

“There is an urgent need to well balance economic and environmental interests in order to safeguard finite resources for future generations.”

Dr. Maive Rute

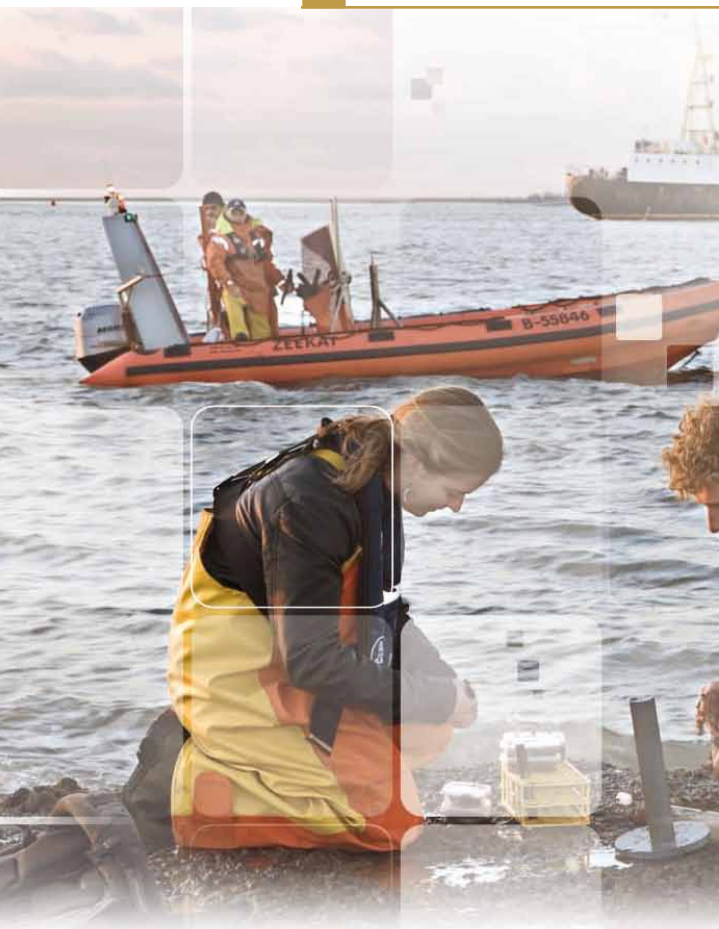


The **open floor discussions** following Session 3 were mainly focused on the European Commission plans to stimulate the marine bio-economy, the importance of reforms to the Common Fisheries Policy and the main infrastructural needs to support marine biotechnology research in the coming decade. These discussions provided important clarifications and recommendations feeding into the Ostend Declaration.



4 SESSION

SECURING CAPACITY AND IMPACT: TOWARDS A COMPETITIVE EUROPEAN MARINE RESEARCH AREA



Session Chair: Sybille van den Hove, Visiting Professor at the Institute of Environmental Science and Technology of the Autonomous University of Barcelona (ICTA-UAB), Spain

Telmo Carvalho

Communication and outreach – Getting the right message to the right people

Jean-Pierre Henriët

Training the next generation of marine scientists

Rudy Herman and Hervé Pero

European marine research infrastructures for the next decade

Supporting the science – future look at a new marine science funding landscape:

- **Joan Albaigés**

Towards Integrated Marine Research Strategy and Programmes (SEAS-ERA)

- **Christina Abildgaard**

Joint Programming Initiative ‘Healthy and Productive Seas and Oceans’

- **Philip Weaver**

A scientist’s perspective

Prof. Sybille van den Hove reminded the Conference that the world is currently facing not only an economic crisis, but also an energy, climate, biodiversity and ecosystems crisis. Although these are all interlinked and have many common causes, she pointed to an important difference: while the economic crisis is ultimately reversible, the climate crisis and biodiversity crisis might lead to irreversible damage. They cannot be tackled sequentially or by using the same thinking which created them. Secondly, economic problems cannot be solved at the cost of our natural resources and capital. Strategic considerations in science, research and innovation must be based on longer term perspectives, allowing “outside the box” solutions and completely new approaches to help solve the current problems.



To create societal relevant knowledge, Prof. van den Hove argued that “*there is a need for better science-policy, science-stakeholder and science-society interfaces, better education and training opportunities, but also appropriate funding opportunities and research strategies.*” These are some of the main issues that were addressed during this session of the EuroOCEAN 2010 Conference.

Mr. Telmo Carvalho (EurOcean Internet Portal, Portugal) highlighted the challenges of communicating science and effectively disseminating the correct information to the right audience in an era where huge information flows are part of daily life.

He argued that the profile of the audience determines the appropriate type of dissemination, identifying the three main types as:

- Dissemination for awareness: intended for targeted audiences that do not require detailed knowledge of a certain subject, but to whom it is helpful to be aware of the general message;
- Dissemination for understanding: intended for an audience that may be affected by the message, and thus need a deeper understanding of the subject;
- Dissemination for action: intended for groups that are in a position to *“influence”* or *“bring about change”* resulting from the effective use of the disseminated information.

Mr. Carvalho provided examples of the use of these different types of dissemination tools for different kinds of public audience. Movies and websites are efficient tools for the general public while decision makers, who need more accurate information to make the right decisions, benefit more from policy briefs, fact sheets and statistical reports.

To illustrate the importance of creative communication, Mr. Carvalho revealed that the audience had been served jellyfish-toasts as an appetiser before lunch to draw attention to a possible future with less fish and more jelly's in our seas.



Prof. Jean-Pierre Henriët (Ghent University, Belgium) highlighted that training the next generation of marine scientists presents new challenges in the context of important policy changes in this area. The EU Innovation Strategy, for example, recognises that education is essential for the creation of an innovation-oriented society.

Prof. Henriet identified a three-stage process necessary to optimise the training of the next generation of scientists:

- Raising the awareness and sparking the curiosity of youngsters starting at the small-scale, through “*bottom-up initiatives*”, but which may receive “*top down*” support;
- Guiding young people who wish to dedicate their life to the sea towards the professional horizon which will optimally meet their personal expectation;
- Developing education and training schemes and opportunities towards delivering the highest standards in science and technology, to properly match the personal expectations of youth with the expectations of society.



“We need to build upon the European ocean science and technology momentum to design the high level, green and clean fleets of the future, whether scientific or commercial, to serve as joint platforms for marine science and maritime training and education.”

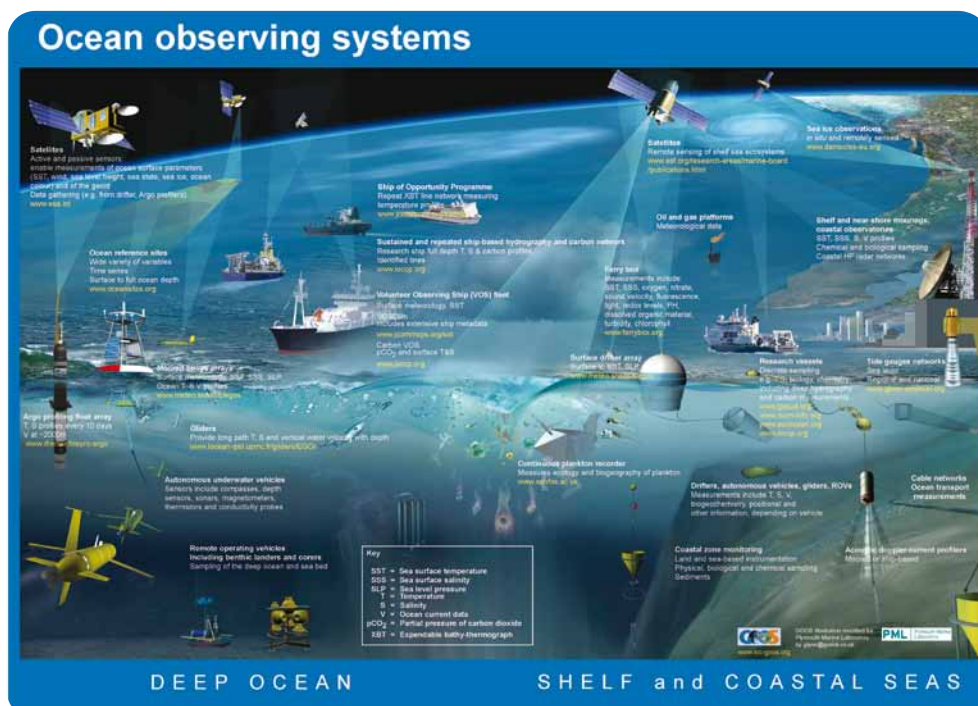
Prof. Jean-Pierre Henriet



The clustering of programmes on a regional level or around specific research infrastructures (e.g. coastal stations, research vessels) can contribute to better training of marine scientists in the short

term. However, Prof. Henriet raised the issue of “*brain loss*” in Europe as a result of the mismatch between the number of trained marine scientists and the number of recruited staff in the maritime sector. One solution, he suggests, would be to “*build stronger bridges between the marine science and the maritime sector with regards to training and education.*”

In a shared presentation on “*European Marine Research Infrastructures for the next Decade*” **Mr. Hervé Pero** (European Commission, Directorate-General for Research and Innovation) highlighted that European research infrastructures are a critical component of the European Research Area which is at the core of the EU Innovation Union and the Europe 2020 Strategy. Improving the efficiency and access to research services, including e-infrastructure is important to be competitive. However, he said, “*there is a lack of commitment from member-states as only one third of the ESFRI roadmap projects have been implemented so far, and not even one from the list of environment infrastructures.*”



According to **Dr. Rudy Herman** (Department of Economy, Science and Innovation of the Flemish Government, Belgium) the two major challenges for marine research with regards to research infrastructures are to:

- Foster a European approach, ensuring that future marine research initiatives build on, and align with, past and ongoing initiatives such as ESFRI, the ERA-NET, SEAS-ERA, and the new Joint Programming Initiative “*Healthy and Productive Seas and Oceans*”;
- Develop a pan-European strategy and sustainable governance of marine research infrastructures.

According to Dr. Herman, this will require:

- Agreement between relevant stakeholders on the objectives and priorities;
- The pooling of resources and filling the gaps to develop a “*European Ocean Observing System*”;
- Full and open access to data, interoperability and full use of e-services to further progress the development and use of e-infrastructures;
- The capacity and willingness to work together to face more complex problems and research internationalization.

“To advance European marine research infrastructures, we need the capacity and willingness to work together in the face of more complex problems and research internationalization.”

Dr. Rudy Herman

Supporting the science – future look at a new marine science funding landscape

In a first of three presentations looking ahead at the future of marine science funding in Europe, **Prof. Joan Albaigés** (Council for Scientific Research, Spain) described the EU Framework Programme ERA-NET scheme, which aims to improve coordination of national and regional research investments in selected research domains.



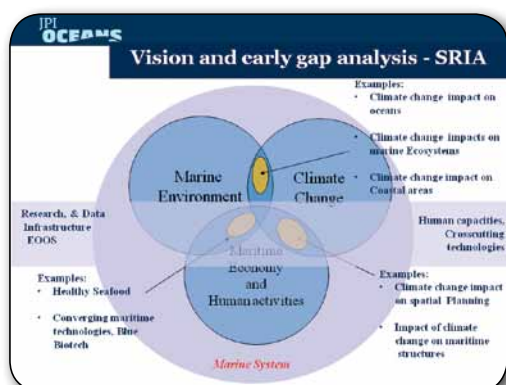
According to Prof. Albaigés, following their introduction in the sixth European Framework Programme, ERA-NETs have become a key instrument for reducing research fragmentation and fostering progress towards the European Research Area. “However”, he said, “the European Research Area (ERA) still faces some weaknesses including legal, administrative, and political barriers, the most important being the creation of common pots for joint calls.”

The following objectives must be pursued towards better integration:

- Fostering cooperation/integration between marine research funding agencies, thereby developing a stable European overarching operational cooperation in marine research;
- Developing and implementing common research strategies and programmes related to the European sea basins and common strategies and programmes for European coherence in developing and implementing globally important marine research;
- Building up a coherent vision of the planning and use of research infrastructures, in line with the ESFRI opportunities list and the actions undertaken within the FP7 Capacities Programme.

Prof. Joan Albaigés concluded by presenting SEAS-ERA (Towards Integrated Marine Research Strategy and Programmes) a new ERA-NET that has been launched under FP7. This ERA-NET will be instrumental in promoting the integration of a European Maritime Research Strategy and enhancing and consolidating the marine component of the European Research Area.

Dr. Christina Abildgaard (Deputy Director General, Norwegian Ministry of Fisheries and Coastal Affairs, Norway) presented the Joint Programming Initiative, “*Healthy and Productive Seas and Oceans*”, which is currently in development. “JPI Oceans” will provide a European platform to deliver integrated knowledge which will not only contribute to gaining a better understanding of the fundamental processes in the oceans, but also to support integrated marine/maritime policies.



Dr. Abildgaard described how JPI Oceans will take a holistic approach towards the sustainable management of European seas and the responsible exploitation of marine resources. A prerequisite is the integration of scientific knowledge from different sectors and interdisciplinary research.

Referring to previous EuroOCEAN presentations, Dr. Christina Abildgaard informed the participants that the JPI Oceans intends to build on prior and on-going initiatives such as SEAS-ERA, BONUS and relevant FP7 projects, and envisages coverage of both the pan-European and regional seas dimension.

According to Dr. Abildgaard, a successful JPI Oceans will have many benefits. For example, it will facilitate the optimal use of relevant research infrastructures across Europe and secure long-term research projects. However, to be successful, substantial commitment is now required from the highest level of Member State Governments in order to join the efforts to meet the Seas and Oceans Grand Challenges.

Closing the series of funding presentations, **Prof. Philip Weaver** (National Oceanography Centre, United Kingdom) sketched the long history and success of EU research funding, illustrating that the EU funding model is unique and has often resulted in high quality and coherent science projects.



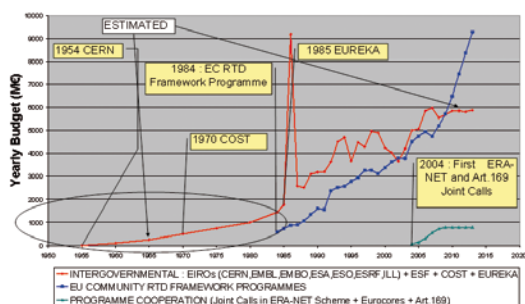
Prof. Weaver highlighted the many advantages of large-scale projects at the European level which allow the building of multidisciplinary teams, the mounting of complex field campaigns, the sharing of equipment and expertise, and the use of professional project office staff to cover the administrative management of the project. Large scale projects can also achieve greater impact and offer higher visibility which allows scientists to represent the wider scientific community towards EU policy makers. In addition, these projects have the ability to

be more responsive to user demands as they are large enough for NGOs and industry to take an interest. An important advantage which resonates earlier EuroOCEAN 2010 talks is that these projects offer huge opportunities to train young scientists in a dynamic environment, and have the ability to be more innovative in ways to connect to policy makers and the wider public.

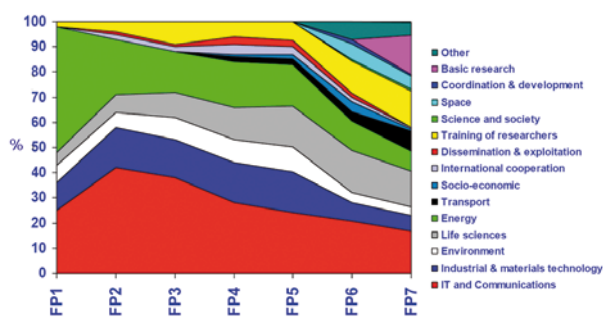
Taking these advantages into account, Prof. Weaver added, *“the leverage effect of large scale European Framework Programme projects equals up to four times the EU contribution.”* In conclusion, Prof. Weaver identified the following key requirement for future funding of marine and maritime research:

- Develop a coordinated approach for marine science;
- Increase the relevance of research by linking to industrial and non-governmental stakeholders, EU policies and environmental action plans;
- Build stronger links with the public;
- Enhance international cooperation.

EU funding – a success story (so far)



EU research: changing priorities



€1.9Bn for Environment in FP7

CLOSING SESSION

A CALL FROM THE MARINE SCIENCE COMMUNITY: APPROVAL OF THE OSTEND DECLARATION



*Session Chair: **Edward Hill**, National Oceanography Centre (NOC), United Kingdom*

Closing remarks from

- **Máire Geoghegan-Quinn**, European Commissioner for Research, Innovation and Science
- **Wim De Vos**, Representative of the Belgian Federal Minister for SMEs, Independents, Agriculture and Science Policy, Sabine Laruelle
- **Jan Mees**, Vice-Chair, Marine Board-ESF, Flanders Marine Institute (VLIZ), Belgium

Prof. Edward Hill thanked all the participants for their valuable comments and suggestions throughout the Conference, leading to important refinements to the final text of the Ostend Declaration. With these changes, Prof. Hill believed that the Declaration reflects what had been heard over the course of the Conference, i.e. that the community recognises the need to address the grand challenges that society faces, and that the oceans and seas are of the utmost importance for all our collective futures.

In response to Prof. Hill's call for support for the Ostend Declaration, Peter Heffernan proposed that, *"as the host of the Galway EuroOCEAN 2004 Conference, this meeting should accept and endorse the Ostend Declaration."* This call was seconded by Rudy Herman from the Flemish Government Department of Science, Economy and Innovation, representing the Belgian EU presidency. On the basis of the support from the floor, Prof. Hill announced that the Conference had approved the Ostend Declaration. The announcement was greeted with sustained applause from the audience.





Prof. Edward Hill welcomed EU Commissioner Máire Geoghegan-Quinn (European Commissioner for Research, Innovation and Science) and Wim De Vos (representative of the Belgian Federal Minister for SMEs, Independents, Agriculture and Science Policy, Ms. Sabine Laruelle).

Prof. Hill stated that the meeting had taken place at a watershed time for marine and maritime science. *“Good science by itself is no longer enough”* he said, adding that *“we now recognize that this is a time when the efforts of science need to focus on the Grand Challenges which face society.”* These challenges include sufficient and healthy food supply, fresh water, energy, sustainable transport, health and living with global environmental change, and all of this while ensuring a sound economic recovery and future for Europe. We recognize that our science has already made an important contribution to addressing these grand challenges, and that our ocean offers exciting prospects for providing solutions to some of these issues in the future. Not only are ocean sciences able to make this enormous contribution, but thus far, the oceans have not been recognized for their contribution to solving societal problems. This means that the seas and oceans themselves present a Grand Challenge; *“a Grand Challenge that can contribute to solving other Grand Challenges”*.

Prof. Hill highlighted that the Ostend Declaration (see full text at the beginning of this report) would now deliver two key messages: (i) that the seas and oceans are one of the Grand Challenges for the 21st century; and (ii) that the European marine scientific research community stands ready to advise, help and support the EU and Member and Associated States in addressing this and other grand societal challenges. Key priorities are identified which will be necessary to deliver holistic approaches to addressing major challenges such as the achievement of Good Environmental Status under the Marine Strategy Framework Directive. These include Joint Programming, the European contribution to the Global Ocean Observation System, and the development of mechanisms to ensure that the outcomes of our research will be accessible to other researchers, and end-users so that full value can be extracted from research investments.

There is the need for innovation to bridge the gap between science and industry, to provide training for the knowledge economy and to deliver attractive career pathways for future marine and maritime employees. This cannot be done by individual researchers or countries. We can achieve more by working together within the European Union, at programme and government level, to achieve maximum added value for our science.

Prof. Hill concluded that the marine science community now stands ready to play its part in meeting the Grand Challenges that face European society.



Mr. Lars Horn (Chair of the Marine Board-ESF), presented the Ostend Declaration to Commissioner Geoghegan-Quinn and Wim de Vos, representative of Belgian Federal Government. He stated that the two previous EuroOCEAN Declarations had big impacts on developing priorities and marine scientific research programming and expressed his wish on behalf of the marine science community that the Commissioner would find this document useful in her work.

Keynote address by Máire Geoghegan-Quinn, EU Commissioner for Research, Innovation and Science



Commissioner Máire Geoghegan-Quinn began by stating that science and research are at the heart of the Innovation Union – the “2020 Flagship” – to address the societal and economic challenges that face us over the next decade. Many of the aspects of the EU Innovation Union have a direct link to marine sciences, recognising that European marine science and technology has much to contribute to solving the grand societal challenges such as climate change, food security, clean energy and health.

Commissioner Geoghegan-Quinn acknowledged that the EuroOCEAN series of Conferences is now well established with the European Commission, as a forum that enables it to interface with the marine scientific research community. *“Over the last two days you have explored how scientific research can help address the issues facing the oceans and seas; the way you have pulled together provides a model of how to address other areas”* she said.

The Commissioner noted that while the EU target is to devote 3% of its GDP to R&D, currently it is less than 2%, so we must obtain the maximum value for money from that investment. To contribute to this, the European Commission will simplify access to European research programmes, remove barriers to entrepreneurs in gaining access to markets and find new ways to meet social needs and societal challenges. The European Commission will also launch a series of European research partnerships to bring together resources and policy actors to fast track innovation and use these partnerships to make Europe a world leader in science. *“Research leads to innovation, which leads to jobs”* she stated.

“As an impetus for new ideas to boost marine research, to innovate, and address the challenges presented by our seas and oceans the Ostend Declaration proposals will feed into the preparation of Framework Programme 8.”

Máire Geoghegan-Quinn, EU Commissioner for Research, Science and Innovation

“Looking towards the future, there are many challenges ahead for the marine science community in Europe,” Máire Geoghegan-Quinn noted. Climate change impacts on marine ecosystems and ocean acidification are important and will need an even greater scientific focus. Marine science will be critical to achieving Good Environmental Status of our marine environment which is required by 2020 under the Marine Strategy Framework Directive. At the same time, we need to maximize the value of what we extract from our seas. To achieve this we need to strengthen the bridges between industry and science, to encourage the convergence we are beginning to see in several areas such as biogenomics, deep-sea resources, carbon capture and storage, and to develop technology that will work at high pressures and low temperatures in the deepest parts of the ocean.

Commissioner Geoghegan-Quinn concluded that EurOCEAN 2010 will be seen as a point where we reinvigorated the research community: *“Our researchers are a precious resource and we need more of you.”*

Address by Mr. Wim de Vos, representative of the Belgian Federal Minister for SMEs, Independents, Agriculture and Science Policy, Sabine Laruelle



Mr. Wim De Vos noted that the recent oil spill in the Gulf of Mexico had been a timely reminder of how humans impact the ocean ecosystem. He advocated that Europe should continue to support marine scientific research in parallel with Joint Programming Initiatives which will be an important platform to facilitate future collaborative research in Europe. The *“Healthy and Productive Seas and Oceans”* JPI, launched by Norway and Spain is supported by Belgium and is gaining momentum.

“Belgium will continue to pursue its tradition of funding marine science” he said *“which currently stands at more than 30 projects from the North Sea to Antarctica.”* He also indicated that his minister will bring the Ostend Declaration to the attention of all other relevant ministers.

Closing Remarks by Prof. Jan Mees, vice-Chair of the Marine Board-ESF and Director of Flanders Marine Institute (VLIZ)



Prof. Jan Mees thanked all participants for their interest and involvement over the two days of the EurOCEAN 2010 Conference. He noted that the Conference had attracted more than 450 registrations; a very high attendance which ensured a broad representation of the pan-European marine research community. Through its proactive participation and common voice, this community has shown that it is well-organized, well connected, and willing and able to serve European society in addressing its biggest challenges. *“While we are acquiring new insights every day,”* Prof. Mees said, *“there is still much that is unknown about the oceans, especially the deep-seas.”*

With a look towards the future generation of marine scientists, Prof. Jan Mees addressed the students in the audience: *“we will need your skills to make the Ostend Declaration a reality in the coming years.”* With a final thanks to the Commissioner, the Conference speakers and chairs he declared the Conference formally closed.



EuroOCEAN 2010 high-level pre-event at the European parliament (Brussels, 11 October 2010)

To optimise the visibility and awareness of the importance of European marine science and technology research at the EU policy level, the Belgian EU Presidency organised a high-level EuroOCEAN 2010 pre-event at the European Parliament. This one-hour policy briefing, hosted by Belgian MEP, Kathleen Van Brempt, ensured that the key messages to be delivered by the EuroOCEAN 2010 Conference and Ostend Declaration, were heard at the highest political level in Europe. Among the 100 attendees were Members of the European Parliament, Members of the European Commission, representatives of relevant European organisations such as the European Environment Agency (EEA), leading marine scientists and policy experts.



The Programme of the high-level pre-event included an introduction from Lars Horn (Chair of the Marine Board-ESF) and short keynote presentations on the following four selected topics:

- Understanding the Oceans – A Grand Challenge, an Imperative (Prof. Edward Hill, National Oceanography Centre, United Kingdom)
- Blue Biotechnology for Europe – Challenges and Opportunities for Industry and Society (Dr. Adrianna Ianora, Stazione Zoologica Anton Dohrn, Italy)
- Research & new Technologies for Maritime Activities (Prof. Arne Hubregtse, Maritime Research Institute, The Netherlands)
- Monitoring the Oceans – Essential Knowledge for a Sustainable Maritime Economy (Dr. Pierre Bahurel, Mercator Ocean, France)



EuroOCEAN 2010 Poster exhibition

A series of ten bespoke EuroOCEAN 2010 posters was developed prior to the Conference to illustrate critical marine science and technology research priorities and challenges for the next decade. The ten high-level themes or challenges for the posters also formed the basis of the EuroOCEAN 2010 Conference programme and were selected by an expert Marine Board-ESF foresight working group. The poster-exhibition was displayed at the EuroOCEAN 2010 high-level pre-event in the European Parliament (Brussels, 11 October 2010) and at the main event (Ostend, 12-13 October 2011).



EuroOCEAN 2010 Research Showcase

To present the diversity of European marine and maritime science stakeholders and to highlight the wide range of marine and maritime research and networking activities taking place in Europe, the Marine Board-ESF initiated and organized a research showcase (exhibition) at the EuroOCEAN 2010 Conference venue (12-13/10/2010).



More than 40 exhibitors took part in the research showcase, including 10 national organisations involved in marine scientific research, 10 pan-European networks, 19 EU Framework Programme projects, and four inter-governmental organisations. The Showcase was an integral part of the Conference, providing a platform for interaction among the Conference participants.



EuroOCEAN 2010 film (© European Union, 2010)

The EuroOCEAN 2010 Conference was covered by two dedicated film crews. The first crew from an external media company (Media Consulta, Germany) was commissioned by the European Commission to produce a short conference film to publicize its main outputs and the Ostend Declaration. A second local film crew (VLIZ, Belgium) was mandated by the Local Organising Committee to ensure that perennial footage of the event would also be taken as well as to support the external crew, where necessary.

The EuroOCEAN 2010 film script was developed based on the key challenges facing marine science in the next decade. Over the two days of the Conference, the two crews filmed the Conference presentations and discussions, and conducted interviews with speakers and attendees. Circa 25 persons were interviewed, including most of the Conference speakers as well as the Máire Geoghegan-Quinn, European Commissioner for Research, Innovation and Science, and Maria Damanaki, European Commissioner for Maritime Affairs and Fisheries. These interviews were based on a set of questions prepared by the Marine Board Secretariat addressing (i) why scientists, decisions makers and the public at large should care about our seas and oceans in Europe and globally; (ii) the main challenges for marine research in the next decade and possible ways to address these challenges; and (iii) the expected impact of the the Ostend Declaration.



The resulting product is a 10 minute film (© European Union, 2010) which provides a dynamic and attractive insight on the reasons why *"The Seas and Oceans are one of the Grand Challenges for the 21st Century"*.

The EuroOCEAN 2010 film can be downloaded from:
www.eurocean2010.eu/downloads



The organising committee extends a special thank you to:

The EuroOCEAN 2010 Conference Rapporteurs:

- Florence Coroner, French Research Institute for Exploration of the Sea (Ifremer), France
- Jan-Stefan Fritz, German Marine Research Consortium (KDM), Germany
- Stephen Hall, National Oceanography Centre, UK
- Nina Hedlund, Research Council of Norway, Norway
- Jacky Wood, National Oceanography Centre, UK

The EuroOCEAN 2010 Ostend Declaration Drafting Group Members:

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- Niall McDonough, Marine Board-ESF
- Jan Mees, Flanders Marine Institute (VLIZ), Belgium
- Geoffrey O'Sullivan, Marine Institute, Ireland
- Waddah Saab, European Commission Directorate General for Research and Innovation
- Michael Thorndyke, Swedish Institute for the Marine Environment, Sweden
- Jacky Wood, National Marine Coordination Office, United Kingdom
- Jan-Bart Calewaert, Marine Board-ESF – Drafting Group Facilitator







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THE OCEAN, IT'S IN YOUR HANDS

*70% of our
planet. A largely
undiscovered wealth,
a major driver of our
climate... Worth a
closer look!*

Organised by:

