

# Towards an Integrated Marine and Maritime Science Community (MARCOM+)



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### Proceedings of the first MARCOM+ Open Forum

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## 1<sup>st</sup> MARCOM+Open Forum (25 November 2010, Brussels)

### Forum Programme (final)

**9.00**            **REGISTRATION**

**9.30**            **FORUM BEGINS – PLENARY**

- 1. Opening address & Introduction to afternoon session**, Niall McDonough (Marine Board), 10'
- 2. Towards an integrated marine and maritime science community: European Commission perspective**, Pierre Mathy (DG Research), 15'
- 3. MARCOM+ Project Presentation and progress**, MARCOM+ partners, 35'
- 4. Science policy developments in 2010**, Kostas Nittis (HCMR, Greece), 15'  
Q&A – 15'

**11.00 -11.20**    **COFFEE BREAK**

- 5. Consolidated marine and maritime scientific advice: a policy end-user perspective**, Kathrine Angell Hansen (RCN, Norway) for the JPI “Healthy and Productive Seas and Oceans”, 15'
- 6. Consolidated marine and maritime scientific approaches to future challenges**  
A case study from EMAR<sup>2</sup>RES project: “Impacts of underwater noise on the marine environment: application of the Risk Assessment framework for research and management”, René Dekeling (Ministry of Infrastructure and the Environment, NL), 15'
- 7. From marine and maritime science to innovation**  
A case study from a member of MARCOM+ Technology Transfer Panel: “Knowledge Transfer to the Ocean Energy Sector”, Karl Stromsem (European Ocean Energy Association), 15'
- 8. Regional approach for marine and maritime innovation**  
A case study from the Region of Knowledge initiative: European Marine Science Application Consortium (EMSAC), Iain Shepherd (EMSAC coordinator), 15'

Q&A; Panel discussion– 15'

**12.35-13.30**    **LUNCH**

**13.30 RECONVENE IN BREAK-OUT GROUPS****9. Structures for Future Cooperation: brainstorming**

Group A: Policy

Group B: Science Strategy

Group C: Innovation

**14.45 -15.15 COFFEE BREAK****15.15 RECONVENE IN PLENARY****10. Feedback from break-out groups**

Group A: Policy, 15'

Group B: Science Strategy, 15'

Group C: Innovation, 15'

**11. Open discussion, 15'****12. Conclusion and next steps, 10'****16.30 FORUM ENDS**

## Forum Report

Version 14.01.11 – Revision: 25.01.11

### 1. Opening address & Introduction to afternoon session

**Niall McDonough** (Marine Board) opened the 1<sup>st</sup> MARCOM+ Open Forum and welcomed the participants (see list in annex I).

N McDonough clarified a terminology matter:

- “**MARCOM+ Open Forum**” refers to a (series of) event(s) that will be organized in the course of the MARCOM+ project take place in Brussels next Thursday (25 Nov.) At these Open Fora European marine and maritime science representative, policy makers and stakeholders will hear about the project and interact on possible future developments.
- “**European Marine and Maritime Science and Technology Forum**” refers a future mechanism for providing a coherent marine and maritime science advice; contribution to the development of such a Partnership Forum is one of the key objectives of the MARCOM+ project.

Those two Fora are different in scope and objectives but intrinsically linked.

Niall McDonough presented the 1<sup>st</sup> MARCOM+ Open Forum agenda (see page 1-2) and highlighted the two main sessions:

- Morning: Presentations – in order to (i) learn about the overall policy context and about the MARCOM+ progress; (ii) inform the afternoon session through targeted presentations to trigger exchange and discussions.
- Afternoon: Brainstorming – the main aim was to formulate high level recommendations on future collaborative mechanisms for marine and maritime research, to facilitate this exercise the three following themes were highlighted:
  - Science for Policy
  - Science Strategy
  - Science for Innovation

### 2. Towards an integrated marine and maritime science community: European Commission perspective. See presentation in annex II.

**Pierre Mathy** (DG Research) reviewed the chronology of events which, since 2000, has led towards a better integration of the marine and maritime science community in Europe. The latter has been possible thanks to incentives from the European Commission and the commitment of the marine science community itself.

He stressed that the European Strategy for Marine and Maritime Research (ESMMR) was prepared by the European Commission but also endorsed by the EU Member States, which must be reminded of their commitment. The ESMMR proposes a more effective integration, pooling of knowledge and resources and requires new forms of governance in research.

He highlighted that when designing these new forms of research governance, the following would need to be taken into consideration:

- Innovation, which will further drive the way research is governed;
- The necessary dialogue between the science community and policy makers;
- The regional and international/global dimensions of the issues at stake;
- The functions of the future European Marine and Maritime Science and Technology Forum – i.e. identification of research priorities and gaps, foresight, strategic advice delivery, design of innovative financial schemes;
- All actors need to be engaged – i.e. Member States, regions, research, industry, civil society. The European Commission will retain a facilitator role.

When reviewing the different initiatives which would contribute to the development of the European Marine and Maritime Science and Technology Forum (e.g. MARCOM+, EMAR<sup>2</sup>RES, etc.), Pierre Mathy highlighted the importance of interaction between these initiatives. While approaches and resulting conclusions may differ, at the very least complementary ways of delivering strategic advice should be found.

He added that the “juste retour” principle should no longer be pursued. All relevant initiatives (e.g. JPI “Oceans”) should work on the hypothesis of a financial common pot as a prerequisite to scientific excellence.

Pierre Mathy concluded on the importance of developing a coherent vision and agenda, and adopting a common approach; it is a question of credibility for the entire marine science community to demonstrate that it has reached a level of maturity.

### **3. MARCOM+ Project Presentation and progress.** See presentations in annex III.

**Adi Kellerman** (ICES) gave a general introduction to the MARCOM+ project, highlighting that various collaborative mechanisms will be tested throughout the project, capitalising on the consortium expertise and involvement in relevant initiatives.

MARCOM+ Work Package leaders then each gave an overview of the key objectives of their activity and the main achievements to date:

**WP1** “Setting the policy scene” – Tony Morrall (ECMAR)

**WP2** “Testing cross-sector links between research and industry” – Laura Giuliano (CIESM)

**WP3** “Strategic activities and regional links” – Mike Mannaart (EUCC)

**WP4** “Developing/sustaining the network of marine - maritime research representative organizations” – Maud Evrard (Marine Board-ESF)

**WP5** “Communication and networking activities” – Wojciech Wawrzynski (ICES)

**WP6** “Coordination and implementation” – Wojciech Wawrzynski (ICES)

## **Note on the recent outcomes of WP2 activities “Testing cross-sector links between research and industry”:**

### **Specificities:**

The three sectors tested by CIESM (biomedical, maritime transport, fishery industry) were selected largely for their very distinct nature. Not surprisingly they displayed quite different responses to the collaborative exercise proposed.

The maritime industrial sector reacted most pragmatically to the opportunities presented by marine researchers. Obviously intrigued by the broad range of blue (bio)nanotechnological potentials for enhancing performance and eco-compatibility of maritime transport, the industry representatives quickly moved towards concrete collaborative research projects. The biomedical sector response appeared more fragmented, and also less open, due to the diversified, and often competing, range of objectives among the pharmacology industry representatives.

### **Commonalities:**

Complex, inappropriate national bureaucraties, and the lack of harmonized, transparent regulations on issues such as access rights, benefit sharing and intellectual property, clearly hamper innovation and slow down research/ industry cooperation in Europe. Participants expressed the need for new national policies that should be more flexible and inspired by market analyses rather than by top down rigid planning. Another concern was the obsolete insistence on large scale consortium at the expense of more diverse alliances, welcoming SMEs and local expertise. There were stimulating discussions and concrete suggestions for favouring exchange of knowledge and so enhance industrial growth (i.e. the development of a “blue biotech portal”; the notion of incubators for innovation with fast injection of joint government/ private funds...).

## **4. Science policy developments in 2010.** See presentation in annex IV.

**Kostas Nittis** (HCMR, Greece) gave a general presentation on the (marine) science policy developments in 2010. He highlighted how diverse the marine and maritime science community is, and how important was the EurOCEAN 2007 conference in triggering joint work within the community.

He stressed the role MARCOM+ could play in fostering the participation of marine scientists in maritime or more industry focused activities, and also in policy related initiatives.

## **Questions and Answers (I)**

- **On MARCOM+ WP2 activities related to Marine Biotechnologies** (i.e. “Blue Biotechnologies” - WK3), the need to ensure synergies with other related activities at the European level was highlighted:

- EC Collaborative Working Group “Marine Biotechnology” - the Knowledge Based Bio-economy (KBBE) network;
- Marine Board-ESF-COST Conference “Marine Biotechnology: Future Challenges” (20-25 June 2010 Acquafredda di Maratea, Italy);
- Marine Board Position Paper 15 “Marine Biotechnology: A New Vision and Strategy for Europe” (September 2010);
- The FP7 topic for a CSA on Marine Biotechnology (submission deadline: January 2011).

WP2 workshops had a more thematic focus rather than geographical.

- **On the interactions between- and sustainability of - related FP7 projects** such as EMAR<sup>2</sup>RES, MARCOM+, SEAS-ERA, EUROMARINE, etc.

It was reminded MARCOM+ would primarily recommend the creation of collaborative instruments and not of new structures.

The Forum participants were informed that:

- EMAR<sup>2</sup>RES coordinator is also one of MARCOM+ contractual partners (Willem Laros – CESA);
- SEAS-ERA coordinator is a member of MARCOM+ Advisory Board (Joan Albageis – MICINN, Spain);
- EUROMARINE coordinator is also one of MARCOM+ contractual partners (Mike Thorndike – MARS).

- **On the MARCOM+ Research Infrastructure Development (RID) panel** activities *vis a vis* those of ESFRI or the EC Expert Group on Marine Infrastructures, there are still more questions than answers, the approach will have to be refined at the forthcoming 1<sup>st</sup> meeting of the RID panel.

- **On the WP4 identification of representative marine and maritime science networks at the national level**, difficulties were reported: it appears that some attempts to establish such networks at the national level have been undertaken, with in some cases no concrete outcome to date. Forum participants were invited to contact the MARCOM+ partner in charge with possible inputs on that matter.

**5. Consolidated marine and maritime scientific advice: a policy end-user perspective, the JPI “Healthy and Productive Seas and Oceans”.** See presentation in annex V.

**Kathrine Angell Hansen** (RCN, Norway) heads the Secretariat of the Joint Programming Initiative (JPI) “Healthy and Productive Oceans”. She presented the latter which is currently being jointly developed by Norway, Belgium and Spain with the support of 12 other European countries. The JPI differs from other ERA actions in that it is envisaged to be a long-term top down process.

This JPI will respond to societal and policy needs across the EU and contribute towards addressing some of the most pressing Grand Challenges faced by society. It will also facilitate increased outputs from science and technology through better governance and increased innovation.

The JPI will operate under three pillars and one cross cutting area:

- Pillar 1 “Knowledge of the marine system” - what are the scientific gaps?
- Pillar 2 “Sustainable use of marine resources” – framework conditions for industries to work in a sustainable manner
- Pillar 3 “Policy-relevant knowledge”
- Cross-cutting area “Research Infrastructures and Human resources and technologies”

**6. Consolidated marine and maritime scientific approaches to future challenges -**

A case study from EMAR<sup>2</sup>RES project: “Impacts of underwater noise on the marine environment: application of the Risk Assessment framework for research and management”. See presentation in annex VI.

**René Dekeling** (Ministry of Infrastructure and the Environment, NL) took part in an EMAR<sup>2</sup>RES (FP7 CSA) workshop (June 2010) to identify areas of common interest between marine and maritime research communities. The topic for this workshop was “Impact of maritime transport on the marine environment”.

The key challenge of EMAR<sup>2</sup>RES is to create synergies between maritime and marine RTD communities, in order to:

- Establish new scientific knowledge of the physical impacts on the marine environment of maritime technologies and practices;
- Ensure the sustainability and competitiveness of EU maritime transport;
- Develop the means to obtain Good Environmental Status of the Marine Environment using Best Available Technology;
- Promote socio-economic benefit of maritime and marine RTD.

René Dekeling highlighted the main recommendations and ideas for common marine and maritime research priorities and challenges with respect to the impact of maritime transport on the marine environment. It was decided to use a Risk Assessment (RA) framework to consider the impacts and mitigation of hazards such as underwater noise (and air emissions) on the marine ecosystem. The RA framework helps to rationalise the scientific research effort with a goal to best manage the risks and to support the decision-making process (see Marine Board-ESF PP 13).

The proposed approach was:

- Generic (based on a standardised framework)
- Adaptive (mitigation feedback loop)
- In line with the Precautionary Approach (MSFD/GES)
- Structuring (in support of a decision-making process).

The Risk Assessment framework aims to establish a robust research programme, allowing clear identification of research activities and actions with regard to noise (and emission reductions).

## **7. From marine and maritime science to innovation**

A case study from a member of MARCOM+ Technology Transfer Panel: “Knowledge Transfer to the Ocean Energy Sector”. See presentation in annex VII.

**Karl Stromsem** is a consultant at Offtek Norway (Offshore industry) and a member of the Board of Directors of the European Ocean Energy Association. He will participate to the work of the MARCOM+ Panel on Technology Transfer.

He presented various definitions of Innovation:

- » Wikipedia: Innovation, the process of making changes to something established by introducing something new.
- » Business Dictionary: Process by which an idea or invention is translated into a good or service for which people will pay.

He highlighted that although many innovations are created from inventions, it is possible to innovate without inventing, and to invent without innovating.

Karl Stromsem used a case study (SEEWEC project; 2005 – 2007) to illustrate that innovation can be seen as a process which provides concrete solution to move from a given idea (exploiting wave and ocean energy) to a final product (electricity) by using one existing technology, and possibly modifying or improving it.

## **8. Regional approach for marine and maritime innovation**

A case study from the Region of Knowledge initiative: European Marine Science Application Consortium (EMSAC). See presentation in annex VIII.

**Iain Shepherd**, from South East England Development Agency (UK), presented the European Marine Science Application Consortium (EMSAC) which he coordinates.

*Regions of Knowledge* (RoK) is the EC FP7 programme to develop innovation capacity by exploiting the capability of regional clusters. EMSAC is a RoK project focused on coastal water management.

EMSAC works along three key markets/innovation topics - i.e.:

- Management of water quality
- Coastal risk management
- Living resources management

EMSAC also work on the technology and knowledge base to support innovation related to the above topics – e.g.: Biosensors, decision support systems, geographical information systems, etc.

## **9. Structures for Future Cooperation: brainstorming**

Forum participants were then invited to take part in a brainstorming exercise in one of the following parallel break out groups:

Group A: Science for Policy;

Group B: Science Strategy;

Group C: Science for Innovation.

For each of these groups, the expected output was the formulation of high level recommendations (3) regarding the design of future collaborative mechanisms taking into account:

- the specificities of the three selected themes;
- the inputs of the morning session – i.e. tested mechanisms within MARCOM+, policy context, lessons learned from the invited targeted presentations, panel discussions.

## **10. Feedback from break-out groups**

### **10.1. Science for Policy**

To reflect on the theme “Science for Policy”, participants were invited to:

- consider a top down approach, under which research community is responsive to diverse policy developments - e.g. Integrated Maritime Policy, Marine Strategy Framework Directive (MSFD) & Good Environmental Status (GES), Natura 2000, Water Framework Directive, EMODNET, etc.

- consider as key ideas and supporting concepts the following: knowledge transfer for leadership, policy making and response to societal needs;
- conduct a SWOT analysis on the capacity of the European marine and maritime research community to provide a consolidated scientific advice to policy makers at European level – see results of the SWOT analysis in annex IX.

Participants stressed that scientific advice should be assessed against the following: Timeliness, quality, impact and being understandable i.e. fit for purpose.

Their reflection focused on opportunities and threats in order to best advise MARCOM+ consortium on how to contribute efficiently to the development of the marine and maritime science partnership.

The following was recommended/highlighted in trying to foster a two-way dialogue – i.e. from policy to science to policy again:

- More integrated planning of research priorities. Definition of the challenges, the science needed and anticipated benefits (from problem to solution). Inclusion of industry and policy (users) in the preparation planning / phase (when appropriate).
- Contribution to the « science to knowledge » mechanism. Creation of a repository of scientific results and their translation into usable « products », the latter could be achieved using the experience of relevant initiatives (e.g. EurOcean webportal, CLAMER FP7 CSA, MARINET, etc.).
- Development of Science Communication to policy mechanisms.
- Formulation of advice for policy implementation as well as for policy formulation.
- Recognition of value of science for policy - the latter should be instilled in project assessment, peer review, reward for success.

## **10.2. Science Strategy**

To reflect on the theme “Science Strategy”, participants were invited to:

- consider a bottom up approach within which the research community is pro-active in driving/influencing science policy developments and setting scientific priorities. The policy background refers to: the European Strategy for Marine and Maritime Research (ESMMR), the European Research Area (ERA), the Ostend Declaration (October 2010).
- consider as key ideas and supporting concepts the following: Foresight, strategy, filling research gaps, basic and fundamental research, applied research, interdisciplinary, multidisciplinary, etc.;
- conduct a SWOT analysis on the capacity of the European marine and maritime research community to set coherent science strategy(ies) – see results of the SWOT analysis in annex X.

Based on the review of the chronology of events since 2000, it appears that the European marine science community has made encouraging progress. However more challenges lay ahead, thus the following was recommended:

- More balance between top down and bottom up approaches to develop science and strategy. Establish also such balance between basic and applied research to counteract the negative impact that the economic crisis has had on basic research which is the basis for future questions and solutions, and needs to be recognised as such.
- Reduce fragmentation and overcome practical hurdles (sharing of and access to data, model being used, treated, developed and shared)
- Improve the interactions between science and industry – e.g. Joint use of industry infrastructures.

Marine science community should make the best of its long history of working together in an interdisciplinary way, across both science and nations borders.

### **10.3. Science for Innovation**

To reflect on the theme “Science for Innovation”, participants were invited to:

- consider the recent relevant policy developments, e.g. Europe 2020, Innovation Union, European Research Area (ERA);
- consider as key ideas and supporting concepts the following: Technology transfer, property rights, “today’s research is tomorrow’s innovation”; growth and job creation, etc.;
- conduct a SWOT analysis on the capacity of the European marine and maritime research community to deliver and transfer relevant marine/maritime science and technology outputs to create commercial opportunities – see results of the SWOT analysis in annex XI.

Both science and industry perspectives were addressed. Participants highlighted (i) that often in Europe science is seen as servicing industry rather than being an equal partner and (ii) that the real issue for Europe is not a lack of innovation but rather ways and means to reach the market.

The following was recommended:

- Better incentives and training for scientists to engage in entrepreneurship;
- Better incentives and removal of barriers for SMEs to engage in research;
- More mechanisms to bridge the gap between RTD and Industry;
- Better mapping of maritime clusters in terms of technology and identification of strengths, gaps & foresight work to understand potential;
- Analysis of and filling the gaps in intellectual property rights in relation to Marine genetic/living resources;
- Support and branding to take innovation to the market place (Europe Inc.);
- Marine Community to work together to influence policy in order to assure resources for marine innovation.

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## 11. Open discussion

The outcome of the 1<sup>st</sup> MARCOM+ Open Forum was welcomed as a positive step in the MARCOM+ process towards defining the scope of the future Marine and Maritime Science and Technology Forum.

Time to address the key highlighted matters (i.e. Science for policy, Science strategy and Science for innovation, and related possible future collaborative mechanisms) was unquestionably limited. However, the MARCOM+ Forum allowed a first discussion amongst a broader stakeholder community of the key issues and the Forum outcomes will be communicated to and built upon by future MARCOM+ activities (e.g. MARCOM+ panels). MARCOM+ project partners will strive to move the initial Open Forum recommendations forward, reflecting on future structures and processes to address them, and possibly suggest operational solutions.

MARCOM+ partners, invited speakers and all Forum participants have a strong role to play in making use of their networks to channel the Forum recommendations both internally (within the organizations) and externally (towards other stakeholders and policy makers).

Forum participants highlighted the utmost importance to address the international dimension of the issues at stake, but also of marine and maritime science itself.

A key challenge for the MARCOM+ project and the European marine and maritime science community will be to define whether future collaborative mechanisms should be designed at a topical level (i.e. set up a structure around identified topics) or at a more generic and strategic level.

## 12. Conclusion and next steps

The Forum recommendations will be amalgamated and communicated to future MARCOM+ activities.

**Niall McDonough** thanked the invited speakers, the facilitators and rapporteurs, the Forum participants and the MARCOM+ partners for their active contribution.

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## Annexes

**Annex I** – Forum Participants list

**Annex II** - Towards an integrated marine and maritime science community: European Commission perspective, Pierre Mathy (DG Research)

**Annex III** - MARCOM+ Project Presentation and progress, MARCOM+ partners

**Annex IV** - Science policy developments in 2010, Kostas Nittis (HCMR, Greece)

**Annex V** - Consolidated marine and maritime scientific advice: a policy end-user perspective, Kathrine Angell Hansen (RCN, Norway)

**Annex VI** - Consolidated marine and maritime scientific approaches to future challenges; A case study from EMAR<sup>2</sup>RES project: “Impacts of underwater noise on the marine environment: application of the Risk Assessment framework for research and management”, René Dekeling (Ministry of Infrastructure and the Environment, NL)

**Annex VII** - From marine and maritime science to innovation; A case study from a member of MARCOM+ Technology Transfer Panel: “Knowledge Transfer to the Ocean Energy Sector”, Karl Stromsem (European Ocean Energy Association)

**Annex VIII** - Regional approach for marine and maritime innovation; A case study from the Region of Knowledge initiative: European Marine Science Application Consortium (EMSAC), Iain Shepherd (EMSAC coordinator)

**Annex IX** – Group A: Science for Policy, brainstorming outputs, Jacky Wood (NOC, Rapporteur)

**Annex X** – Group B: Science Strategy, brainstorming outputs, Rolf Peinert (KDM, Rapporteur)

**Annex XI** – Group C: Science for Innovation, brainstorming outputs, David Murphy (AquaTT, Rapporteur)

**Annex I – Forum Participants list**

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54. Wawrzynski, Wojciech	ICES	<a href="mailto:wojciech@ices.dk">wojciech@ices.dk</a>
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**Annex II** - Towards an integrated marine and maritime science community: European Commission perspective, Pierre Mathy (DG Research)

## Towards an Integrated Marine and Maritime Science Community

European Commission Perspective

MARCOM+ 1st Marine and Maritime S&T Partnership Forum  
Brussels, 25 November 2010

Pierre Mathy  
Head of Unit  
European Commission  
DG Research  
Management of Natural Resources Unit



## Towards an Integrated Marine and Maritime Science Community

- **January 2000:** launching of the **European Research Area** initiative calling for better coordination and integration of research in the EU
- **May 2004 – Galway declaration:** Highlights that the ocean plays a crucial role in the planet ecosystem function => the role that ERA and FP7 must play in supporting world class excellence in marine science & technology.
- **March 2005 – Commission strategic objectives 2005-2009:** Future IMP supported by excellence in marine scientific research
- **December 2006 – FP7 decision** "special attention to cross-cutting priority areas such as marine science and technologies"
- **June 2007- Aberdeen Declaration:** stakeholders call for integration across scientific disciplines
- **October 2007 – Blue Book 'An Integrated Maritime Policy for the European Union'** gives one more push
- **September 2008 – Adoption of the EU Strategy for Marine and Maritime Research**
- **December 2008 – The Council endorses the MMS**

ATC/RTD I.4 Management of Natural Resources Unit



## A European Strategy for Marine and Maritime Research

- Sets a coherent **European Research Area Framework** in support of a sustainable use of oceans and seas
- It recognizes that a pure thematic and sectoral approach to research is no longer sufficient
- It proposes **concrete measures and mechanisms** to improve the efficiency and excellence of marine and maritime research in order to address the challenges and opportunities presented by the oceans and seas
- It proposes a more effective **integration, pooling of knowledge and resources** and requires **new forms of governance in research**.

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## Research Governance

The proposed governance model is expected to:

- Achieve **consensus** among marine and maritime stakeholders on strategic marine and maritime research issues at pan-European and regional levels;
- Stimulate **interdisciplinary** cooperation and generate **integrated** scientific knowledge on marine and maritime issues and **disseminate** research results and knowledge;
- Promote exchanges between marine science and maritime and **marine industries**, as a way to identify issues of common interest and potential cooperation between both sides.

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## Research Governance

The proposed governance model is expected to (cont.):

- Explore ways and means on how scientists can be involved in the **commercial exploitation of the results** stemming from their research;
- Foster a concerted **dialogue** between the scientific community and policy-makers, delivering greater consistency between research objectives and policy goals, and channelling findings of research towards policies;
- Strengthen partnerships with **third countries**, in particular toward countries with which Europe shares sea basins in order to enhance sustainable management of these common seas.

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## Research Governance

Marine and Maritime Research Forum:

- **Involve existing networks and key players** in the **marine, maritime research and industrial sectors**
- Update research **priorities**, identify **gaps**, in consultation with stakeholders, MS and the EU Institutions, deliver **strategic advice**
- Support the implement research priorities, based on new forms of **cooperation, innovative financing schemes, dissemination & exploitation** of research results
- Develop a **foresight** function
- **Sustainable** at the long term

Strengthen **cooperation** with neighbouring countries around large-scale international research programmes and define common regional marine research strategies

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## Research Governance Actors

- The MS, the regions, industry, research institutions, civil society will be the essential actors; MS in particular for joint programming
- EC: facilitator (+ EU instruments) coordination and 'monitoring'

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## Marine and Maritime Research Forum

- MARCOM+ – Towards and Integrated Marine and Maritime Science Community  
The 'Aberdeen Plus interest group' joined forces with the 'Venice Platform group' to take further steps in integrating the marine, maritime and coastal research sectors in Europe. The goal is to establish a sustainable and long-lasting partnership forum - European Marine and Maritime Science and Technology Forum - based on shared interests and shared leadership, and to test it on regional seas and pan-European basis.  
Marcom+ involves 10 EU Research organisations and associations.  
Start: January 2010
- EMAR2RES – Support Action to initiate cooperation between the Communities of European Marine and Maritime Research and Science  
The proposal was developed to investigate and develop cooperation between Marine and Maritime Research Communities with a focus on Maritime Transport. The project is to set up an appropriate, efficient and streamlined cooperation framework to realise the concept of sustainable development (in the context of climate change) while achieving the Lisbon agenda.  
EMAR2RES involves, the European Associations representing the major waterborne R&D stakeholders.  
Start: November 2009

ATC/RTD I.4 Management of Natural Resources Unit



## Marine and Maritime Research FP7 Joint call Ocean of Tomorrow

Launching of two cross-sectorial FP7 Joint call Ocean of Tomorrow (OCEAN-2010 and OCEAN-2011)

- A multi-disciplinary approach and a multi-sectoral partnership were considered essential to achieving the research topics expected impacts
- Joint cross sectorial approach among several FP7 themes (Environment, Energy, Transport, KBBE, Social Sciences & Humanities)

ATC/RTD I.4 Management of Natural Resources Unit



## Marine and Maritime Research FP7 Joint call Ocean of Tomorrow

### Call FP7-OCEAN-2010

Deadline: 14th of January 2010; Budget: 34 million €

- OCEAN.2010-1/ Quantification of climate change impacts on economic sectors in the Arctic (11 M€) - ACCESS proposal
- OCEAN.2010-2/ Vectors of changes in marine life, impact on economic sectors (12,5 M€) - VECTORS proposal
- OCEAN.2010-3/ Sub-seabed carbon storage and the marine environment (10,5 M€) - ECO2 proposal

### Call FP7-OCEAN-2011

Publication: 20 July 2010; Deadline: 18 January 2011; Budget 45 million €

#### Two generic topics:

- Multi-use offshore platforms (14M€)
- Marine microbial diversity – new insights into marine ecosystems functioning and its biotechnological potential (9M€)

#### Two topics of particular relevance to the Mediterranean and the Black Sea (SICA):

- Assessing and predicting the combined effects of natural and human-made pressures in the Mediterranean and the Black Sea in view of their better governance (13M€)
- Knowledge-base and tools for regional networks of MPAs; integrated management of activities together with assessment of wind energy potential in the Mediterranean and the Black Sea (9M€)

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## Research Governance

- SEAS-ERA – Towards Integrated European Marine Research Strategy and Programmes (the marine 'overarching ERA-NET')

The proposal seeks to build upon previous and ongoing ERA-NETs to develop an overarching structure to support marine research on the four main European Seas. It addresses cross-cutting/integrating themes, common programmes, joint calls, infrastructure and capacity building. It will set-up Marine and Maritime Research Agendas both at regional and European level. SEAS-Era involves 22 funding agencies from different regions of Europe. Start: May 2010

- BONUS Article 185 (formerly Article 169) – Joint Baltic Sea Research Programme.  
The objective is to enhance the Baltic Sea region research capacity to ensure a more sustainable development of the region. The Commission proposes to contribute € 50 million to a joint research investment with the eight EU Baltic MS states. The € 100 million programme will provide a framework for the coordination of their environmental research. Adopted by the European Council and Parliament in July 2010. Main partner: Baltic Organisations Network for Funding Science.

- Longer term: Joint Programming on marine/maritime topics - proposed joint programming initiative on European Healthy and Productive Seas and Oceans adoption of recommendation expected by the Council by 2nd/3rd quarter 2011

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## Where are we From FP7 to FP8

- Internal discussions initiating the process of preparation of the Commissions' proposals for the next Framework Programme (FP8) during 2010 and 2011

It will be vital to establish clearly the relevance of research funding at the European level, notably by demonstrating its added value in terms of contributing to the efficiency and effectiveness of the European research system and its contribution to the provision of societal benefits, including growth and jobs.

- Major political initiatives: Europe 2020 Strategy (EC communication March 2010), the Research and Innovation Plan (October 2010), and the Commission proposal for the next financial perspectives (2011) and ERA action plan (2012)

Europe 2020 – a European strategy for smart, sustainable and inclusive growth, main priorities:

- Smart growth: developing an economy based on knowledge and innovation
- Sustainable growth: promoting a more resource efficient, greener and more competitive economy
- Inclusive growth: fostering a high employment economy delivering social and territorial cohesion

ATC/RTD I.4 Management of Natural Resources Unit



### Where are we From FP7 to FP8

- Ongoing initiatives: Commissions' Communication on [Simplification](#) (EC Communication April 2010) and the debate it will stimulate namely in the EP, [FP7 interim evaluation](#) (September 2010)
- Orientations and Strategy for the [future FP7 calls](#) will take on board certain elements of Europe 2020 e.g. work is ongoing on assessing how the innovation (including SME) dimension of the FP7 WP 2011-2013 can be reinforced
- The [budget of FP7](#) might be significantly increased in the last two years of implementation, providing scope for strengthening ongoing initiatives and, as appropriate, for introducing new ones in relation to innovation.

  
COOPERATION  
13

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### Indicative Time line

FP7 work programmes	Dec 2010
2012-2013 finalisation of the orientations and Strategy	
FP7 last calls	July 2011/2012
FP8 orientation paper	Feb 2011
FP8 adoption of proposals	End 2011
FP8 co-decision procedure	2012-2013
ERA communication	2012

  
COOPERATION  
14

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## Thank You for your Attention!



  
COOPERATION  
15

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**Annex III - MARCOM+ Project Presentation and progress, MARCOM+ partners**

ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

**The 'MARCOM+' initiative**

'Towards an Integrated Marine and Maritime Science and Technology Community'



MARCOM+

ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

The European Commission proposed support of a new governance model for M/M research that will take the form of a "Forum" and will advise the EC on policy making

bringing together a partnership sustainable over the long term, involving existing networks and key partners

MARCOM+

ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

**An ambitious goal: who are the key partners? (1/2)**

"The maritime industry": a diverse community

- transport and secondary sectors (shipyards, shipping lines, equipment suppliers, installation facilities, ports),
- offshore operations: mineral extraction, oil & gas, mining other commodities,
- fisheries and mariculture,
- biotechnology: "genetic mining"
- military activities
- leisure activities: cruise ships, sport boats



MARCOM+

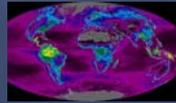
ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

**An ambitious goal: who are the key partners? (2/2)**

"The marine science": another diverse community

- governmental research and academia,
- applied science: fisheries and mariculture,
- life sciences, evolution, ecology and behaviour,
- genetics,
- ocean physics, ocean chemistry and hydrology,
- marine climatology,
- marine geology



MARCOM+

ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

**The goal of MARCOM+**

to establish a sustainable and long-lasting partnership forum  
(**European Marine and Maritime Science and Technology Forum**),

How to bring them together?  
Test of various dialogue and cooperation mechanisms.  
Coping with complexity / reducing fragmentation, avoiding duplication in existing services.

MARCOM+

ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

**MARCOM + Consortium (1/2)**

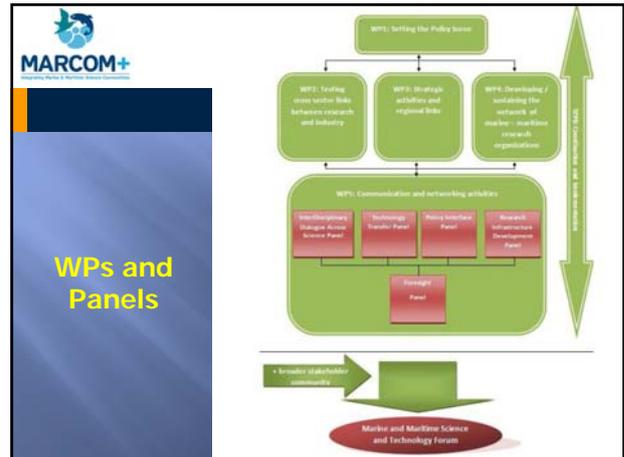
- Coastal and Marine Union
- Community of European Shipyards' Associations (representing the Waterborne Technology Platform)
- European Council for Maritime Applied Research and Development Association
- European Aquaculture Technology and Innovation Platform
- European Fisheries and Aquaculture Organization

MARCOM+ ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

### MARCOM + Consortium (2/2)

- Hellenic Centre for Marine Research (representing the European Global Ocean Observing System)
- International Council for the Exploration of the Sea
- Marine Board of the European Science Foundation
- Royal Netherlands Academy of Arts and Sciences (representing the European Network of Marine Research Institutes and Stations)
- Mediterranean Science Commission



MARCOM+ ICES  
CIEM

MARCOM+ Open Forum, Brussels, Belgium, 24 and 25 November 2010

[www.MarineMaritimeScienceForum.eu](http://www.MarineMaritimeScienceForum.eu)

## WP 1 Setting the Policy Scene

- Task 1.1 Introduction (ECMAR)
- Task 1.2 Regional Specificities (CIESM)
- Task 1.3 Priorities and Commonalities (ECMAR)

**MARCOM+**  
Integrating Marine & Maritime Science Communities

1st MARCOM+ Forum 25.11.2010 Brussels

## Task 1.1 Introduction

- Objective
  - Deliver synthesis of policy scene
  - Examine policies in environment, climate change, energy, research, transport and fisheries having a bearing on marine/maritime partnership
- Achievement to date
  - Deliverable D1.1 (report) issued 30.06.2010 according to schedule, including a systematic review of EU documents and internet searches

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Integrating Marine & Maritime Science Communities

1st MARCOM+ Forum 25.11.2010 Brussels

## Task 1.2 Regional Specificities

- Objective
  - Select the appropriate issue to be used as reference to benchmark national policies for (marine) research and industry
  - Investigate stakeholders' involvement in setting priorities at regional levels' (reference case study)
- Achievements to date
  - Biotechnology has emerged as an innovative issue of common national concern in the Mediterranean region
  - A targeted questionnaire has been drafted to animate an E-Forum (List of participants to the E-Forum in progress)

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1st MARCOM+ Forum 25.11.2010 Brussels

## Task 1.3 Priorities and Commonalities

- Objective
  - Identify priorities and commonalities for interdisciplinary knowledge exchange between marine and maritime communities, by
    - Reviewing existing knowledge exchange
    - Identifying priorities and commonalities, incl. regional specificities (task 1.2)
    - Establishing priorities for interdisciplinary knowledge exchange

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Integrating Marine & Maritime Science Communities

1st MARCOM+ Forum 25.11.2010 Brussels

## Task 1.3 Priorities and Commonalities

- Achievements to date
  - Deliverable D1.3 (report) submitted in draft 30.09.2010
  - Thorough review of existing knowledge exchange projects
  - Identify databases with potential of interdisciplinary research

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1st MARCOM+ Forum 25.11.2010 Brussels



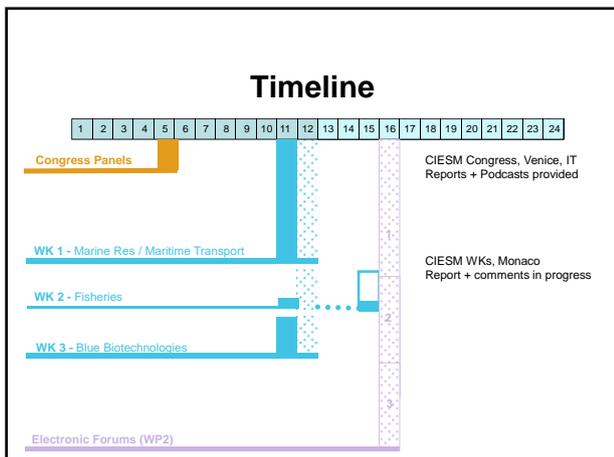
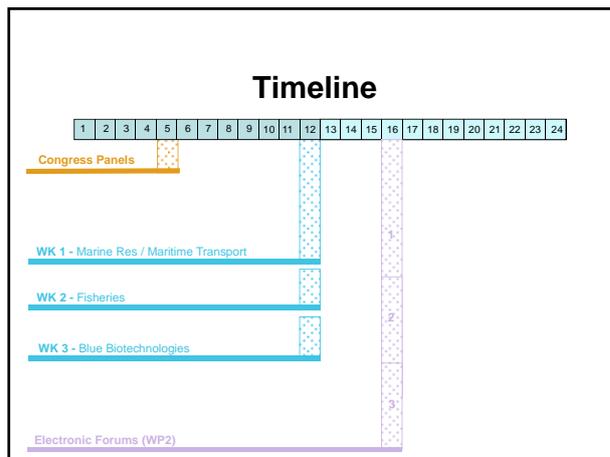

## WP2 progress

Lead #5    Participants 3, 4, 5, 6, 7, 9, 10

**Objectives:**

Promote innovative focused research / industry dialogue leading to joint international R&D projects

Implement joint training and capacity building on sustainable exploitation of marine resources



## Preliminary results & perspectives

Congress Panels + WK 1 - WK 3, and partially WK2

**WKs (20 pax each) format was especially designed to:**

- (i) Involve focused Res & Ind (1:1)
- (ii) Provide large time for debating
- (iii) Experience cross-thematic synergies
- (iv) Compare efficacy of this format according to fields/sectors

**Marine research and maritime transport** were rather new and positively impressed by the experience ; new, important initiatives were drafted (i.e. RoK proposal). Cross-actions will bring to further dialogues.

**Pharmaceutical** sector was intrigued by the potential of marine resources but generally contributed cautiously to the dialogue ("one-to-one" meeting trends). Proposal: to contact EuropaBio for joint developing a targeted informative portal.

# EUCC TASKS



- **WP 3.1**
  - Review of Regional Research Governance Frameworks and Partnerships
- **WP 3.2 (CIESM)**
  - Testing the implication of stakeholders in research priority setting at regional level: case study for the Mediterranean
- **WP 3.3**
  - Assessment of Important Mechanisms and Tools for Research Governance
- **WP 3.4**
  - Report of WP 3.2

Mike Mannaart (EUCC)

Brussels, 25 November 2010



# EUCC TASKS



- **WP 3.1 (Finished by Nov. 2010)**
  - Inventory of key players and key structures at regional seas Level
  - Review of the value of regional seas partnerships
  - Review of the value of stakeholder consultation structures at regional seas Level
  - Review of strenghts and weaknesses in funding mechanisms, specialized infrastructures, data collection, information management and capacity building
- **WP 3.2 and 3.4 (Expected in March 2011)**
  - Electronic Forum
  - Rapid analysis of trends at basin scale, and selection of the research topics
  - Congress Panel on 'Blue biotechnologies policy related issues'
  - IP, benefit sharing and access rights perspectives
  - Report of WP 3.2
- **WP 3.3 (Expected in Aug. 2011)**
  - Assessment of Important Mechanisms and Tools for Research Governance





**MARCOM+ Work Package 4: Developing and Sustaining the Network of Marine and Maritime Research Organisations**

**Objectives**

**Objective 4.1 – Identification of existing European Marine and Maritime research representative organisations**

- Clear picture of European landscape e.g. performing, funding, using, structuring, influencing research

**Objective 4.2 – Organisation of two Open Fora**

- Governance focus rather than scientific
- To discuss futures, concerns, issues in an open and transparent manner

**Objective 4.3 – Assessment of the Modalities and Instruments to best address the sustainability of the Partnership.**

- assessment of the modalities/instruments tested throughout the project (i.e. Panels, Maritime Platforms, Regional Case studies)

[www.esf.org/marineboard](http://www.esf.org/marineboard)

**MARCOM+ partners involved:**  
 MB-ESF [WP Leader] and ALL:  
 ICES, EUCC, ECMAR, CIESM, EATIP, EFARO, HCMR, KNAW, CESA



**MARCOM+ Work Package 4: Developing and Sustaining the Network of Marine and Maritime Research Organisations**

**Activities and Results**

**Task 4.1 – Inventory of existing representative research organisations (jointly with EMAR<sup>2</sup>RES related task)**

- Initial report (inventory, analysis of commonalities): June 2010 (EMAR<sup>2</sup>RES)
- Additions / updates: on going (MARCOM+)

**Task 4.2 – Organisation of 2 Open Fora**

- 1<sup>st</sup> Open Forum *today* to reflect on:
  - MARCOM+ progress to date
  - recent Science Policy developments
  - future collaborative mechanisms → **recommendations**

**Task 4.3 – Assessment of the Modalities and Instruments to best address the sustainability of the Partnership.**

- Monitor progress with relevant initiatives and projects
- Engage with MARCOM+ partners and other stakeholders

[www.esf.org/marineboard](http://www.esf.org/marineboard)

2



**MARCOM+**  
Integrating Marine & Maritime Science Communities



**ICES** International Council for  
the Exploration of the Sea  
**CIEM** Conseil International pour  
l'Exploration de la Mer

**MARCOM+ WP 5 and 6**

WP5: Communication and networking activities

WP6: Coordination and Implementation

- 1. InterDisciplinary Dialogue Across Science Panel**
- 2. Technology Transfer Panel**
- 3. Policy Interface Panel**
- 4. Research Infrastructure Development Panel**
- 5. Foresight Panel**



**MARCOM+**  
Integrating Marine & Maritime Science Communities



**ICES** International Council for  
the Exploration of the Sea  
**CIEM** Conseil International pour  
l'Exploration de la Mer

**MARCOM+ WP 5 and 6**



The screenshot shows the MARCOM+ web portal interface. On the left, there is a section titled 'The voice of marine and maritime science communities in European policy-making' with a sub-section 'Oceans apart'. The main content area features a large image of a ship at sea. On the right, there is a navigation menu with links to 'Home', 'Transport (PT)', 'Institutions/Science Councils (ISC)', 'Policy Interface (PI)', 'Research Infrastructures Development (RID)', and 'Technology Transfer (TT)'. Below the menu, there is a search bar and a 'Welcome to the MARCOM+ web portal' message.



**MARCOM+**  
Integrating Marine & Maritime Science Communities



The voice of marine and  
maritime science communities



**SEVENTH FRAMEWORK  
PROGRAMME**

**Annex IV** - Science policy developments in 2010, Kostas Nittis (HCMR, Greece)

MARCOM+ EUROPEAN SCIENCE FOUNDATION MARINE BOARD

**1<sup>st</sup> MARCOM+ Open Forum**  
25 November 2010

**Science Policy developments in 2010**

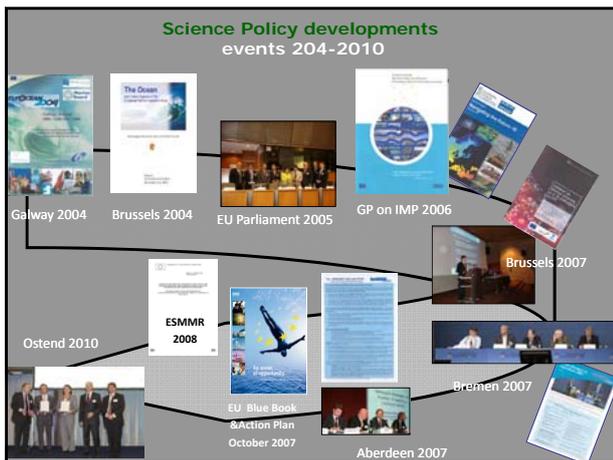
Kostas Nittis  
HCMR, Greece

MARCOM+ EUROPEAN SCIENCE FOUNDATION MARINE BOARD

**Marine & Maritime Science provides the basis for:**

- Economic Growth and Recovery (Green Jobs)
  - Blue biotechnology
  - Marine renewable energy (wind, wave, tide etc.)
  - Sustainable aquaculture
  - Safe maritime transport
  - New technologies (e.g. sensors)
- Sustainable management of marine environment (Marine spatial Planning, Integrated Assessments, Ecosystem Approach, etc..)
- Dealing with Climate Change (understanding, adapting, mitigating)
- Human Health
- Others.....

Need to establish strong links with society and Policy



MARCOM+ EUROPEAN SCIENCE FOUNDATION MARINE BOARD

**Key Developments:**

**Policy**

- Integrated Maritime Policy (Sept. 2007)
- Marine Strategy Framework Directive (July 2008)
- European Strategy for Marine and Maritime Research (Oct. 2008)
- Europe 2020 (Innovation Union)

**Implementation**

- FP7 Implementation Actions: EMAR<sup>2</sup>RES and MARCOM+
- FP7 "Ocean of Tomorrow" Joint Call
- Progress on EMODNET (European Marine Observation and Data Network)

MARCOM+ EUROPEAN SCIENCE FOUNDATION MARINE BOARD

**Developments in 2010:**

**A. All embracing stakeholder platform for IMP**

**Overview**

- Initiated at EMD 2009 Rome;
- Five pillars: Science, Industry, Environment, Leisure and Public Authorities;
- April 2010 meeting with Commissioner Damanaki about the top priorities of the communities represented on the platform;
- EMD 2010 "Future directions for the EU's Integrated Maritime Policy" discussions on the role of the All embracing stakeholder platform.

On going process: consultation, transparency

MARCOM+ EUROPEAN SCIENCE FOUNDATION MARINE BOARD

**Developments in 2010: (B)**

**EUROMARES Conference, 18-19 May 2010, Gijon**  
**European Maritime Day 19-21 May 2010, Gijon**

**Significant challenges were identified**

- Effective communication to the public and stakeholders (big changes ahead – does everybody know?)
- Methodologies for economic valuation of marine environmental goods and services (essential for decision making)
- Fill the gap between research and use (policy, business, public good)
- European training programmes to meet employment needs and opportunities in expanding sectors (renewable ocean energy, marine biotechnology).





**Developments in 2010:**

**C. Progress on EMODNET**



- Communication “Marine Knowledge 2020”;
- Objectives: a) reduce operational costs b) increase competition and innovation c) reduce uncertainties in knowledge
- Use and improve existing EU instruments (INSPIRE, GMES, WISE)
- Towards and operational marine data architecture:
  - Data close to sources
  - Thematic assembly groups
  - Sea-basin scale
  - Need to define governance





**Developments in 2010:**

**D. EurOCEAN 2010, 12-13 Oct 2010, Ostend**



**Ostend Declaration - Addressing the Seas and Oceans Grand Challenge**

- Joint Programming Initiative** - Healthy and Productive Seas and Oceans
- European Ocean Observing System**
- Research to Knowledge**

And

- Innovation
- Training and career
- International cooperation







**Summarizing:**

- Science-policy partnership evolves rapidly over the past 8 years
- Key-drivers are still in place: ERA, IMP, MSFD, CFP ...
- Interactive process: needs involvement from both sides
- MARCOM+ to play a key role: interface / communicator between policy & the wide marine & maritime science community

**Annex V** - Consolidated marine and maritime scientific advice: a policy end-user perspective, Kathrine Angell Hansen (RCN, Norway)

**Consolidated marine and maritime scientific advice –  
A policy end-user perspective for the JPI  
“Healthy and Productive Seas and Oceans”**



25.11.2010  
Kathrine Angell-Hansen

**JPI Oceans Initiative - WHO**

- **Systemic change**
  - **Top-Down** driven by MS and AC
  - **MS authorities**
  - 15 countries- Core group
  - EU Commission - observer
- **Politically relevant:**
  - EUs MP, MSFD, Com(534)Research, Innovation Union, 20-20-20



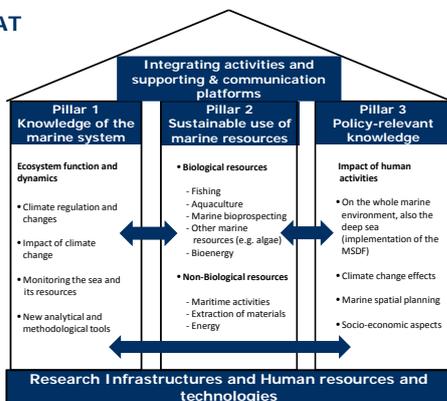
**JPI Oceans - WHY**

- Respond to societal and policy needs
- Grand challenges
- Get more output from science and technology (governance and innovation)
  - In particular in view of the MSFD and MS legal obligations

**WHAT - JPI Oceans Initiative**

- A process more than a tool
- Long term perspective
- Areas where we can create synergies, integration, gaps, added value, avoid duplication, too big for a MS (need for mapping)
- Cross-sectoral, interdisciplinary, and interactive
- Programs/institutionalised capacities
- All types of tools (ERA-nets KIC, ETPS, JTIs, new,...)
  - JPI and other tools can run in parallel
  - If added value then maybe integrated in the JPI

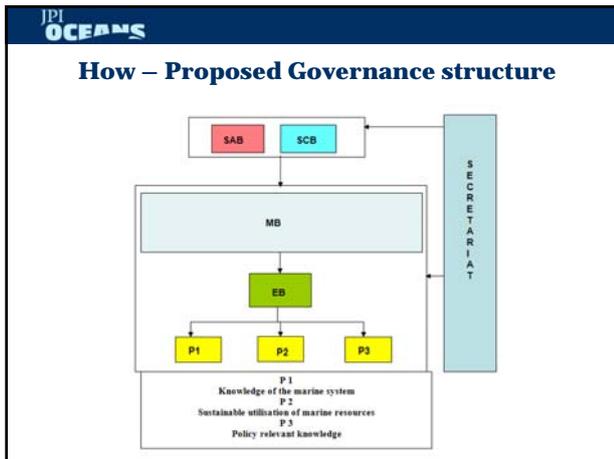
**WHAT**



**Task force - Present phase –Structuring**

- MS and AC internal political organisation – across relevant authorities
- JPI Governance Structure
  - Management Board
  - Scientific Advisory Board
  - Secretariat
  - Stakeholders
- Policy driven secure that we organise well towards the pillars





**JPI OCEANS**

### JPI Oceans - Roadmap

- 2010 - Council 26th of May:**
  - Confirmed Seas and Oceans as a Grand Challenge
  - Established of task force and secretariat
- Prepare for Commission's recommendation in 2011 - maturity**
  - Vision document with ToR
  - Mapping marine and maritime activities in MS and AC
  - MS commitment and participation MS and AC
- Prepare for Management board 2011**
  - Consult - Investigate synergy with ERANETS, MARCOM, BONUS, EMARES, Regional initiatives (avoid reinventing the wheel)

**JPI OCEANS**

### A paradigm Shift – Oestende science converging towards policy relevance

**JPI OCEANS**

Healthy and Productive Seas and Oceans

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**Annex VI** - Consolidated marine and maritime scientific approaches to future challenges; A case study from EMAR<sup>2</sup>RES project: “Impacts of underwater noise on the marine environment: application of the Risk Assessment framework for research and management”, René Dekeling (Ministry of Infrastructure and the Environment, NL)

Ministerie van Infrastructuur en Milieu

## Impacts of underwater noise on the marine environment

Application of the risk assessment framework for research and management

René Dekeling  
Ministry of Infrastructure and the Environment



## Impacts of underwater noise on the marine environment

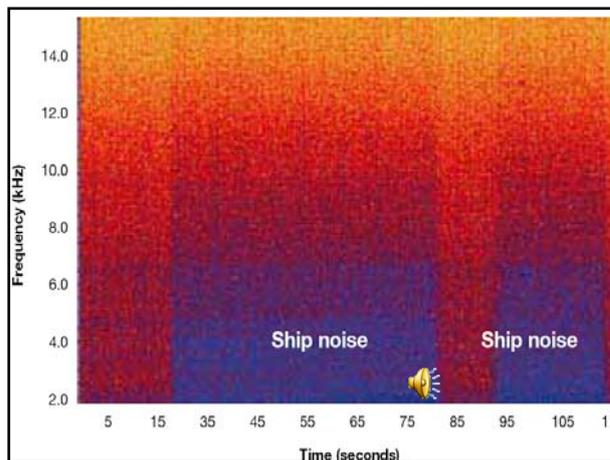
- Why is underwater noise a topic of interest
- Results of the EMAR2RES workshop
- Risk Assessment framework
- Case studies of application of RA framework
- Future developments

Ministerie van Infrastructuur en Milieu

• Jacques Cousteau (1955) was wrong!

• The ocean is full of sounds:

- Natural (biological and non-biological)
- Man-made (intentional and non-intentional)

## Trends in shipping noise

- Deep water ambient noise increased 3 dB/decade
  - Basin wide increases in shipping
- Shallow water ambient noise increase
  - Dependent upon local propagation and local shipping

TRIP-1243, No. of Pages 9

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Review

## A noisy spring: the impact of globally rising underwater sound levels on fish

Hans Slabbekoorn<sup>1</sup>, Niels Bouton<sup>2</sup>, Ilse van Opzeeland<sup>3</sup>, Aukje Coers<sup>4</sup>, Carel ten Cate<sup>1</sup> and Arthur N. Popper<sup>5</sup>

<sup>1</sup>Behavioural Biology, Institute of Biology, Leiden University, Sylviusweg 72, 2333 BE Leiden, The Netherlands  
<sup>2</sup>Evolutionary Ecology Group, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerp, Belgium  
<sup>3</sup>Ocean Acoustics Lab, Alfred Wegener Institute, Am alten Hafen 26, 27568 Bremerhaven, Germany  
<sup>4</sup>Pelagic Regional Advisory Council, Tweedstraat 17, 2238 LH Rijswijk, The Netherlands  
<sup>5</sup>Department of Biology and Center for Comparative and Evolutionary Biology of Hearing, University of Maryland, College Park, MD 20742, USA

The underwater environment is filled with biotic and abiotic sounds, many of which can be important for the survival and reproduction of fish. Over the last century, human activities in and near the water have increasingly added artificial sounds to this environment. Very loud sounds of relatively short exposure, such as those produced during pile driving, can harm nearby fish. However, more moderate underwater noises of longer duration, such as those produced by vessels, could potentially impact much larger areas, and involve much larger numbers of fish. Here we call attention to the urgent need to study the role of sound in the lives of fish and to develop a better understanding of the ecological impact of anthropogenic noise.

The myth of a silent underwater world

the barest insight as to the nature and extent of the behavioural impact of such sounds on fishes (Figure 1). While data on fish behavioural responses to the increase in ambient sound are generally not available, we can use data derived from other vertebrates to suggest that anthropogenic noise may deter fish from important feeding and reproduction areas, interrupt critical activities, or cause stress-induced reduction in growth and reproductive output. The concern about wide-ranging effects is further heightened because sound is of critical importance in the lives of many fish species. Impeding the ability of fish to hear biologically relevant sounds might interfere with critical functions such as acoustic communication, predator avoidance and prey detection, and use of the 'acoustic scene' or 'soundscape' [15,16] to learn about the overall environment. Taken together, these potential effects could

**Changing Oceans**



**NEWS**  
**A Push for Quieter Ships**  
Although sonar and air guns have grabbed headlines, researchers say the cacophony from ships creates far more ocean noise

**FROM A DRIFTING BOAT, THE OCEAN OFF** Massachusetts can seem like one of the quietest places on Earth. But Lela Hatch isn't fooled. Over the past 4 years, the marine ecologist has helped lead studies at the Gorye E. Studds Stellwagen Bank National Marine Sanctuary that are documenting how human activities are ramping up the region's undersea noise—and highlighting just how difficult it may be to turn down the volume. "We're getting a much better understanding of how much sound is in the sanctuary and where it's coming from," says Hatch.

tures are to communicate, find mates, and navigate their watery world. Researchers worry that the cacophony is making it even harder for these creatures to overcome the numerous human threats—from toxic pollution to overexploitation—that have already pushed some to the edge of extinction.

Stellwagen's monitoring program, one of the world's most intensive, has implications well beyond the marine sanctuary. It has helped focus attention on the growing acoustic clutter created by the world's nearly 100,000 transoceanic ships. Although

**Sound pollution**  
The Stellwagen sanctuary's intensive monitoring effort is sure to get attention at the meeting. Almost from the moment the U.S. government announced its plan in 2002, the program

**A shifting soundscape.** Increased shipping has made the ocean noisier, potentially disrupting communication among whales and other marine life. seems like we spend most of our time talking about the other 5 or 10% of the problem," says Brandon Southall, a former leader of U.S. government efforts to study and regulate ocean noise and now a consultant with SEA Inc. in Santa Cruz, California. In part, that's because ships typically aren't covered by the world's few laws that deal with ocean noise. The assessment, however, is shifting. Recently, a group of shipping industry officials, scientists, and government regulators began to examine strategies for slashing low-frequency shipping noise. Engineers say such a reduction is technologically feasible, but the costs—and opposition from some shipping companies—could be formidable. Still, "Shipping noise is an issue that is getting more attention," says acoustician Arthur Popper of the University of Maryland, College Park, who studies the effects of sound on fish and is organizing a major international conference on ocean noise set for Ireland in August.

**Why is underwater noise an issue for us**

- Underwater sound is essential for most marine life
  - Communication, locating food, detecting threats, navigation, etc.
- Many anthropogenic sounds of concern:
  - Piling, seismic, sonar
  - Shipping noise
- Shipping: Increase of ambient noise level observed
- Societal concern
- Legal: the Marine Strategy Framework Directive

**EU Marine Strategy**



to protect Europe's oceans and seas

**'pollution'**...the introduction of substances or energy, including human-induced **underwater noise**, which results or is likely to result in deleterious effects ...

EUROPEAN COMMISSION  
<http://europa.eu.int/comm/environment/water/marine.htm>

**Recent developments**

- OSPAR: Quality Status Report 2010
- ISO, ASA preparing standardisation of units, measuring
- EU-MSFD: technical (sub)-group noise
- Working groups initiated by IMO, CEDA, ASCOBANS
- IOOE workshop URI, October 2010
- EMAR2RES workshop ESF-Marine Board

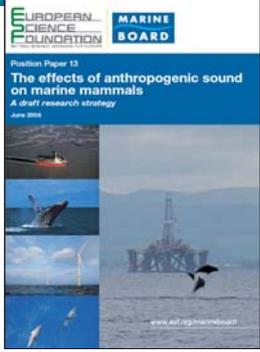
**EMAR2RES Workshop, Ostend June 2010**

- Workshops to identify Areas of Common interest between the marine and maritime RTD communities
- Impact of maritime transport on the marine environment
  - Workshop 1: "biological/chemical" relationships
  - Workshop 2: "Physical" relationships (noise, air emissions)

**MARINE BOARD**

**EMAR2RES Workshop, Ostend June 2010**

- Create synergies between maritime and marine RTD communities:
  - To establish new scientific knowledge of the physical impacts on the marine environment of maritime technologies and practices;
  - To ensure the sustainability and competitiveness of EU maritime transport;
  - To develop the means to obtain Good Environmental Status of the Marine Environment using Best Available Technology;
  - To promote socio-economic benefit of maritime and marine RTD.
- Main recommendation
  - Use a **Risk Assessment (RA) framework** to consider the impacts and mitigation of hazards such as noise on the marine ecosystem



**ESF Position Paper (2008)**

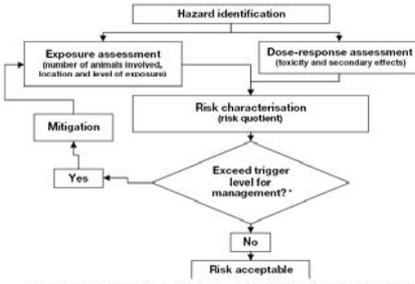
**The effects of anthropogenic sound on marine mammals**

Main recommendation: use analytical risk framework process to assess and identify priority research topics

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### Risk Assessment framework

- Four-step analytic process
- Rationalize research effort



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### Hazard Identification

- Identification of sound sources and circumstances
- What is the range of frequencies, intensities and duration of exposure (that causes risk)?
- Are there unique habitat characteristics that create a hazard?

15

### Exposure assessment

- Where are the sensitive species (and when)?
- What is the overlap of sensitive species with the distribution of sound sources?
- What is the effect of propagation conditions?
- What are the received sound characteristics at the location of marine life?

16

### Assessing/measuring exposure-response

- Quantitative relation between dose and response
  - Is the response a direct physical effect?
  - What is the behavioural response?
  - How are behavioural and physiological responses related?
  - Is there habitat displacement and over what temporal and spatial scales?

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### Risk characterisation

- What is the probability of impacts on individuals?
- What proportion of the exposed animals is affected?
- What is the probability of adverse population impacts?
- How are populations and their vital rates affected?
- Ecological significance?
- Good Environmental Status achieved
  - (if not: mitigate)

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### Risk management/mitigation

- Change the acoustic source, operational characteristics and location of the source
- Detection of sensitive species (in real time)
- Prevent/reduce overlap between sensitive species and sound sources

19

Research questions addressing the higher-level question "how does pile driving noise affect marine mammals?"

Arrows between sub-questions indicate the result of the analysis of the dependencies between the different sub-questions.

Dependencies between questions

IMPORTANT QUESTIONS

### Example: NL Defence research program on sonar

- Goal: ensure long term capability to operate essential systems while preventing harm
- Recognized research topics
  - Sensitivity of sea life
  - Detection, classification, localisation
  - Distribution data
  - Development of a 'mitigation tool'
- Structural program since 2004, reviewed 2009 (DSM 2009)
- New program structured i.a.w. RA-framework

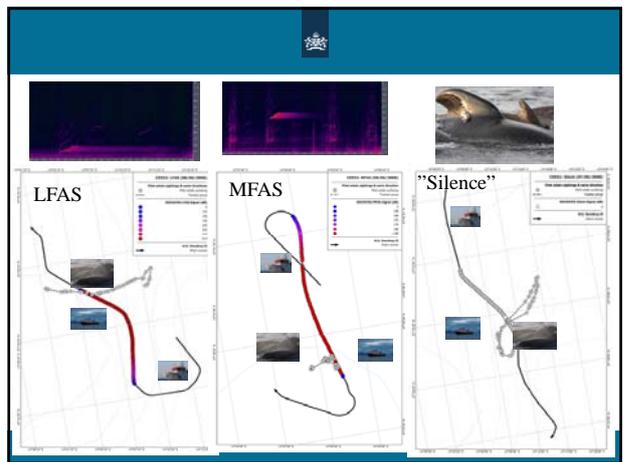
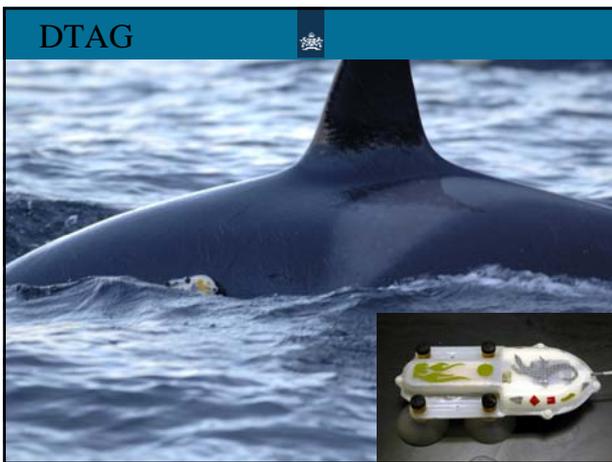
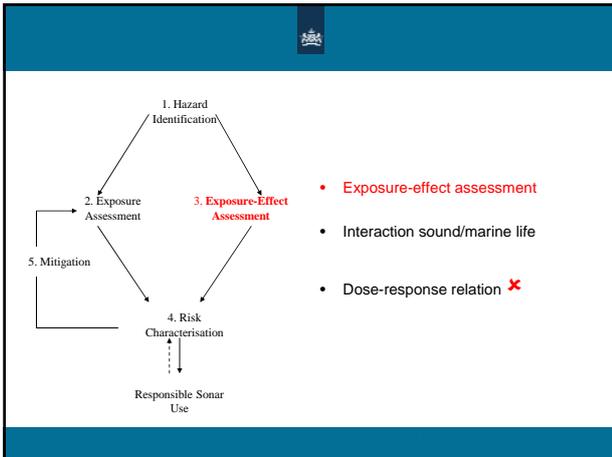
- Hazard Identification:
- Potential sound sources ✓

- Exposure assessment:
- Determine (potential) exposure
  1. Sound sources ✓
  2. Propagation ✓
  3. Distribution/density of animals ✗

Identified data gap:

EDA-project:

- Establish database marine life
- Coop NL-DU-NO-IT-UK
- Duration 2010-2013



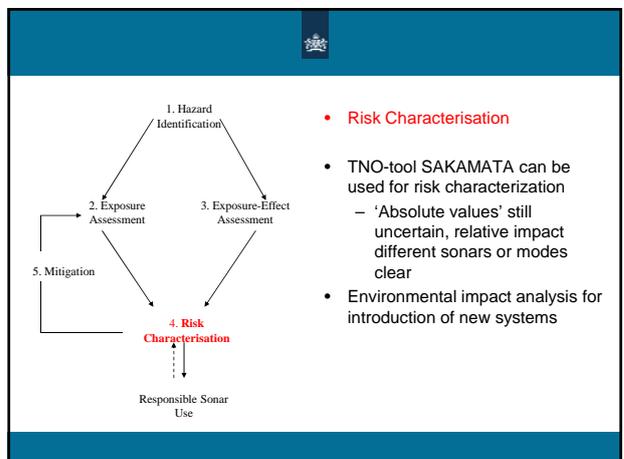
### Exposure experiments on feeding herring - 2008

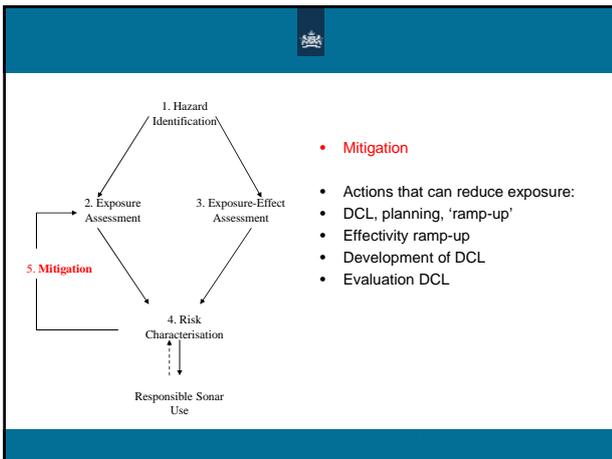
- Block design with LFAS-MFAS-control blocks and killer whale playbacks
- Observation vessel with SH80 sonar track (speed, course, depth) herring shoal

a) Source ship wash  
 b) Herring shoal  
 c) Observation vessel with SH80 (110kHz)

-LFAS 1-2 kHz @ 214 dB re 1 μF  
 -MFAS 6-7 kHz @ 199 dB re 1 μF  
 1 s hyperbolic up-sweep  
 20s pulse interval  
 -Killer whale playbacks

The image shows a photograph of a ship at sea on the left, with arrows pointing to different parts of the ship labeled 'a', 'b', and 'c'. On the right is a circular sonar display showing a herring shoal as a bright green and red area.



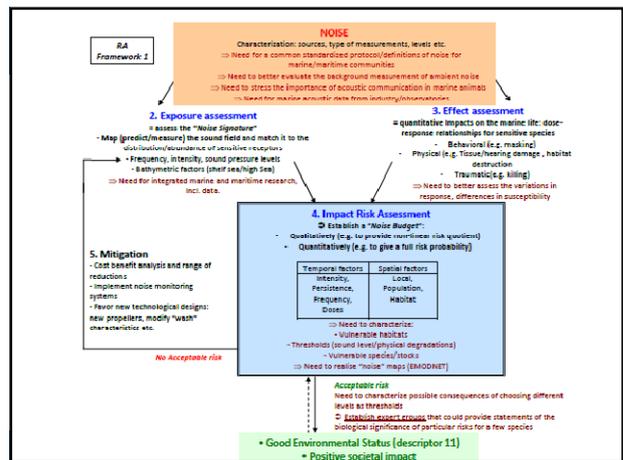


### Use of RA framework for evaluating sonar ops

- Enables analysis of impact of operation
- Focused approach
- Identifies data gaps
- Describes relationships
- Important for sponsors: generic vs operation specific data, planning research and international cooperation
- Used for regulation and on-board tools

### Main recommendations of the EMAR2RES workshop:

- Use a Risk Assessment (RA) framework to consider the impacts and mitigation of hazards such as noise on the marine ecosystem



### Using of RA framework for shipping noise

- Rationalise the research effort with a goal to best manage the risks and to support the decision-making processes
- This proposed approach is:
  - Generic (based on a standardised framework)
  - Adaptive (mitigation feed back loop)
  - In line with the Precautionary Approach (MSFD/GES)
  - Structuring (in support of a decision-making process)
- Enables establishing of a robust research program allowing clear identification of research activities and actors with regards to noise and emission reductions

### Conclusions

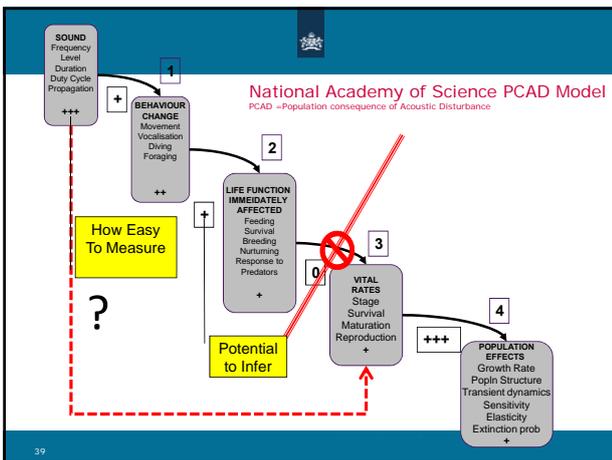
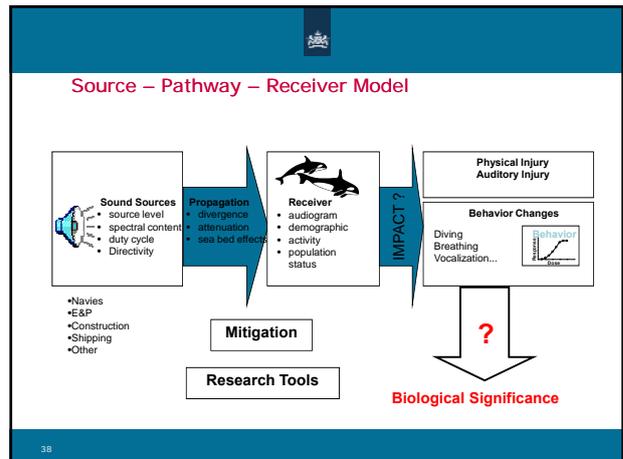
- Underwater noise will be addressed within Europe (MSFD)
- Shipping noise is priority issue
- There are management and decision-making related data gaps that need to be solved
- RA framework can be used to rationalise the research effort

With support of:

Ian L. Boyd  
(Scottish Oceans Institute)

Aurélien Carbonnière  
(ESF-Marine Board)

MARINE BOARD SCOTTISH OCEANS INSTITUTE



**Annex VII** - From marine and maritime science to innovation; A case study from a member of MARCOM+ Technology Transfer Panel: "Knowledge Transfer to the Ocean Energy Sector", Karl Stromsem (European Ocean Energy Association)



**From marine and maritime science to innovation**  
**A case study**  
**Dr Ing Karl C Strømsem**  
**Director EU-OEA**

[www.eu-oea.com](http://www.eu-oea.com)

## European Ocean Energy Association (EU-OEA)

- Started in 2006 - 60+ members strong and growing
  - 5 Lead Sponsors (Alstom, DCNS, EDF, EVE, Statkraft)
  - 2 Associations (WavEC, RenewableUK)
- Goals & Objectives:
  - To strengthen development of OE sector in EU
  - Act as the single OE sector voice to the EC
  - Act as the representative for our members towards the EC
- 2010 Ocean Energy events
  - Mar 22, Brussels – Marine Renewables: “Turning The Tide”
  - May 6-7, Brussels – “Ocean Energy”, 1<sup>st</sup> Annual Event
  - May 19-20 - EU Maritime Days, “OE Open House”
  - Oct 6-8, Bilbao – ICOE 2010, Exhibit coordinator
  - Q4 Hosting various stake holder conferences and meetings
- 2010 EU-OEA has started to gain momentum
  - Delivered “European Ocean Energy Roadmap, May 2010
  - Continuous dialogue with the EU – commission and various member states
  - Focal point for developers, and industry entering into the ocean energy area

2

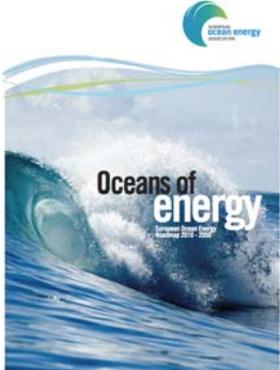
## Who is KCS

- Siv.ing NTH 1984, Civil engineering, Marine slender structures
- Dr. ing NTH/IFP (Institute Française du Petrole, Paris) 1990, Marine Engineering, specialist on Flexible risers and advanced analysis.
- Worked in offshore industry, Coflexip (Technip), Conoco Inc, OffTek AS, Noble Denton Consultants with projects and engineering. Snorre project, Heidrun Project, Varg FPSO, PGS Banff, Bourbon Dolphin.
- Worked for power industry (InDec AS) delivering advanced analysis and services to parties operating at NordPool
- Worked for renewable industry offshore wave projects and offshore wind projects. Fred Olsen Ltd, Ocean Power Technology, AWS, Thanet Wind Farm.
- Funded two companies OffTek AS, InDec AS. Latter together with Hafslund ASA which was sold to Noble Denton Consultants Ltd, in London
- Last 2 years Projects Director Europe in NDC London before returning to Norway and working as an independent consultant in OffTek AS.
- Member of the board in European Ocean Energy Association

[www.offtek.no](http://www.offtek.no)

www.offtek.no

## European Ocean Energy Roadmap 2010 – 2050



- GENERATE > 15% of the EU energy demand
- CREATE > 470,000 new jobs
- AVOID > 136 MT/MWh OF CO2
- WILL NEED 450 000 €m of investment by 2050

Can be downloaded from EU-OEA website <http://www.eu-oea.com>

4

## From marine and maritime science to innovation

### Knowledge Transfer to the Ocean Energy Sector

#### A CASE STUDY: SEEWEC PROJECT

([HTTP://WWW.SEEWEC.ORG/](http://www.seewec.org/))

Ghent University	UGent	Belgium
Spiromatic NV	SMC	Belgium
ABB	ABB	Sweden
Standfast Yachts	STY	The Netherlands
Brevik Engineering A.S.	BRE	Norway
Marintek (SINTEF)	MAR	Norway
Norwegian University of Science and Technology	NTNU	Norway
Instituto Superior Técnico	IST	Portugal
Chalmers University of Technology	CTH	Sweden
Fred Olsen Ltd.	FOL	UK
Natural Power Consultants Ltd.	NPC	UK

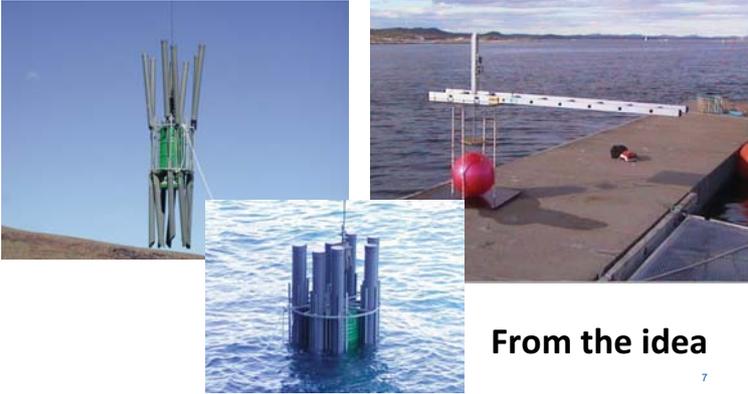
## What is innovation ?

- Definition
  - Wikipedia: Innovation, the process of making changes to something established by introducing something new
  - Business Dictionary: Process by which an idea or invention is translated into a good or service for which people will pay.

Although many innovations are created from inventions, it is possible to innovate without inventing, and to invent without innovating.

6

**SeeWec**  
Sustainable Wave Energy Converter  
The innovation process



**From the idea**

7

**SeeWec**  
Sustainable Wave Energy Converter  
The innovation process



**Using THIS existing  
Marine Technology**

8

**SeeWec**  
Sustainable Wave Energy Converter  
The innovation process



**To develop THIS  
system**

**SeeWec**  
Sustainable Wave Energy Converter  
The innovation process



**Which exposed to  
THIS environment**

**SeeWec**  
Sustainable Wave Energy Converter  
The innovation process



**Should deliver  
THIS product**

11

**Fred Olsen FO3 and SeeWEC project**

- Started by Fred Olsen and Hans Øigarden in mid 90 on vacation periods at the Canary Island.
- Tested various ideas and solutions for several year
- Internal Fred Olsen project started in 2001
- SeeWEC kicked off in 2005 completed in 2007
- Fred Olsen is continuing the development.

**Technology transfer from MARINE industry  
to renewable industry ?**

**A definite YES but probably well as much  
transfer of know how back !**

12

- New GRP rig with sophisticated damping and control systems



13

- Coupled model tests with point absorbers and new damping devices



12/1/10

- Implementation of land based test station for testing of various type of point absorbers and development of control system and energy production methodology



- Testing in Storm



16

- Development of new GRP point absorbers planned for serial production

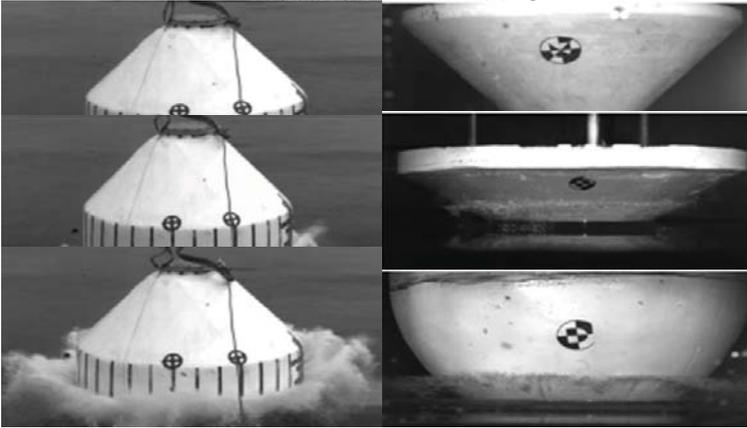


17

- Development of slamming theory and testing for GRP point absorbers



● **High speed measurements of slamming matched with theory**



● **Sometimes innovation stopped due to unforeseen events. Not always easy to do testing**



20

● **To summarize the innovation aspects of the SeeWEC project**

- First GRP mini-semi with sophisticated damping systems, full scale production system, LAB rig
- Extensive knowledge about Point Absorbers both from theoretical models, model tests, testing in land based test rig and offshore testing on GRP mini-semi
- Computer models where non-linear behaviour of point absorber, coupled with motions of semi and control systems for production of energy developed, tested and verified.
- Several types of Point Absorbers tested for serial production using filament winding and GRP.
- Slamming models developed, tested and verified against high speed measurements.
- Global power systems control for several WEC systems with irregular input into grid.
- AC/DC DC/AC philosophy developed for wave power systems
- Large series of "full" scale operational data for WEC systems
- GRP testing and verification for use in WEC and PA
- Development of coupled models (structural and hydrodynamic) to handle
- Testing of use and development of control strategies for use in wave energy conversion systems
- Testing of conventional electrical and hydraulic motors for power generation
- ....
- ....

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● **Summary**



Did the project deliver the vision namely THIS ?

**No!**  
But due to the innovation in SeeWEC Fred



**Annex VIII** - Regional approach for marine and maritime innovation; A case study from the Region of Knowledge initiative: European Marine Science Application Consortium (EMSAC), Iain Shepherd (EMSAC coordinator)

## Maritime Cluster Collaboration: EMSAC Case Study

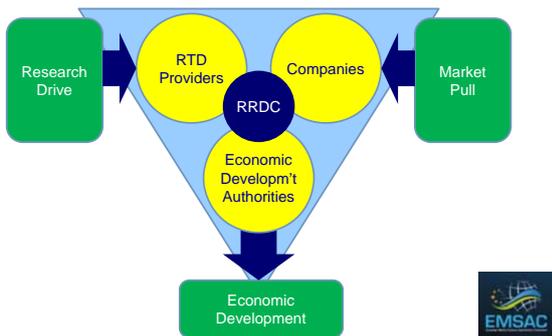


## EMSAC Scope

- Regions of Knowledge is the EC programme to develop innovation capacity by exploiting the capability of regional clusters
- EMSAC (European Marine Science Application Consortium) is a RoK project focused on coastal water management
- What is the wider potential to utilise the maritime cluster resource to stimulate innovation?



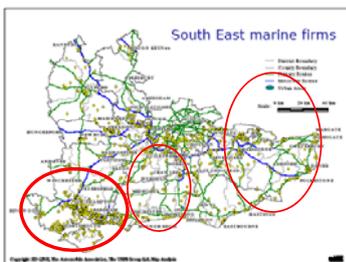
## Triple Helix Cluster Perspective



## EMSAC Cluster Partners



## SE Maritime Economy



- ~ 20% of UK maritime economy
- £12B turnover
- ~4,000 businesses
- 3 Local Enterprise Partnerships



## Marine SE Cluster Profile

- 2,200 members mainly businesses operating in or with the maritime industries
- Strong collaboration links with leading universities:
  - University of Southampton (Ship Science, National Oceanography Centre etc)
  - University of Portsmouth
  - Southampton Solent University (Warsash maritime training centre etc)
  - Chichester University
- Supports economic development strategies of public authorities (local, regional, national)
- Covers a geographic area across southern UK, centred on Southampton



## Marine SE Activities

- Creates, manages and/or participates in collaborative projects:
  - Currently 5 Interreg IV projects & 1 FP7 project
  - Also 1 business improvement project & 1 knowledge networking project
- Facilitates investment in business growth & profitability
  - Supports overseas trade missions and inward investment activities (investor meetings, meet-the-buyer events etc)
  - Economic analysis on maritime activities & contribution to economy (maritime = 25% of Solent economy)
  - Innovation prioritisation with input to UK and EU technology road-mapping exercises
- 7 members of staff, turnover ~£600k



## EMSAC Innovation Topics

- 3 key markets identified:
  - Management of water quality
  - Coastal risk management
  - Living resources management
- Technology & knowledge base to support innovation in the above areas:
  - Biosensors, decision support systems, geographical information systems etc



## Key Early Results

- Cluster characterisation criteria to measure innovation impact
  - Input to EU Cluster Observatory?
- Megatrends & policy drivers analysed
  - Major market opportunities for innovation
- RTD inventory analysis (national & EU) against keywords
  - Mapping onto major market opportunities



**Annex IX** – Group A: Science for Policy, brainstorming outputs, Jacky Wood (NOC, Rapporteur)



**1<sup>st</sup> MARCOM+ Open Forum**  
25 November 2010

**Brainstorming**  
**Group A: Science for Policy**

Chairman Kostas Nittis HCMR  
Rapporteur: Jacky Wood National Oceanography Centre, UK



**CONTEXT** (May be complemented, revised, ...)

- **Top down approach**, research community **responsive** to diverse policy developments, e.g. :
  - Integrated Maritime Policy
  - Marine Strategy Framework Directive (MSFD), Good Environmental Status (GES)
  - EMODNET
  - ...



**CONCEPTS** (May be complemented, revised, ...)

Knowledge transfer for:

- leadership
- policy making
- societal needs
- ...



**SWOT Exercise**

On the capacity of the European marine and maritime research community to provide a **consolidated scientific advice to policy makers** at European level

Timeliness, quality, impact, understandable ie fit for purpose (even where that purpose may not be well defined yet)



**STRENGTHS**

- Science policy Links exist
- In most cases (IMP, MSFD) there is a clear call for science based advice (already built into the policy)
- Regulatory frameworks are already there (developed in collaboration between sci-pol)
- Science has, in some cases, (e.g iczm) provided the tools for implementation
- Best practices are there .....



**WEAKNESSES**

- Links are still sectorial .....
- Communication of science results to policy makers still weak
- Timing & @language@ issues
- @best science@ is not always available or willing to contribute to policy making. Need additional effort/investments or new training
- Fragmentation at both sides (many projects, many results, not coordinated)
- Science push and policy pull are not in-phase in many cases
- Identification of problem doesnt always come with the solution



### OPPORTUNITIES

- identify and further develop the existing tools esp. at regional level
- .....
- .....



### THREATS

- ....
- ....
- ....



### RECOMMENDATIONS on possible future collaborative mechanisms

- More integrated planning of research priorities. Define the challenge, the science needed and anticipated benefits (from problem to solution). When appropriate Industry & policy (users) to be included in the preparation planning / phase
- Contribute to the @science to knowledge@ mechanism. Respository of scientific results and their translation into usable 'products' How to contribute to that ? Use experience of eurocean, clamer etc.
- Science Communication to policy to be considered – mechanisms?
- Implementation advice as well as in policy formulation
- Recognition of value of science for policy – not a poor relation (instill in project assessment, peer review, reward for success)

**Annex X – Group B: Science Strategy, brainstorming outputs, Rolf Peinert (KDM, Rapporteur)**

1<sup>st</sup> MARCOM+ Open Forum  
25 November 2010

**Brainstorming  
Group B: Science Strategy**

Rapporteur: Rolf Peinert

**CONTEXT** (May be complemented, revised, ...)

- **Bottom Up approach**, research community **pro-active** in driving/influencing science policy developments and setting scientific priorities
- European Strategy for Marine and Maritime Research (ESMMR)
- European Research Area (ERA)
- Ostend Declaration

**CONCEPTS** (May be complemented, revised, ...)

- Foresight,
- strategy,
- filling research gaps, identifying future research priorities
- basic and fundamental research, applied research,
- interdisciplinary, multidisciplinary,
- etc.

**SWOT Exercise**

On the capacity of the European marine and maritime research community to set coherent science strategy(ies)

**STRENGTHS**

- .....
- .....
- .....

**WEAKNESSES**

- .....
- .....
- .....



### OPPORTUNITIES

- .....
- .....
- .....



### THREATS

- .....
- .....
- .....



### RECOMMENDATIONS on possible future collaborative mechanisms

- need to balance top-down and bottom-up approaches to developing science and strategy
- reduce fragmentation and overcome hurdles (sharing of and access to data, models)
- improve interaction between science and industry (eg by joint use of industry infrastructure)

**Annex XI** – Group C: Science for Innovation, brainstorming outputs, David Murphy (AquaTT, Rapporteur)



1<sup>st</sup> MARCOM+ Open Forum  
25 November 2010

**Brainstorming  
Group C: Science for Innovation**

Rapporteur: David Murphy

### STRENGTHS

- Have a high potential and large marine resource in Europe (diversity: geographical, genetic)
- Large Science community (vertically integrated) (public, HE and private)
- Diverse Marine and maritime industrial sectors
- Diversity (different strong sectors in different MS & Regions)
- Cultural diversity to problem solving
- A lot of work has gone into structuring sectors and RTD community
- Established ethos for transnational collaboration & partnerships for mutual benefit
- Recognition of the importance of entrepreneurship
- Legislative driven innovation
- Good historical access to many diverse overseas markets
- Framework programmes allows major investment in focused projects

### WEAKNESSES

- Not fast to respond to change due to over regulation which inhibits innovation and creativity
- Not effectively using legal mechanisms (IP, patents etc) to protect and drive innovation
- Diversity (dispersed and don't fully understand areas where we have excellence) – need to map our excellence
- Europe is "less" market and innovation driven compared with USA
- Not enough cross-cutting research and sharing of knowledge taking place even though many sectors are exposed to same marine resource pressures
- Scientists are rewarded for scientific publications and funding income but not for innovation (reform at many institutional levels required) – New incentive mechanisms are required
- Branding Issue (Made in Europe vs. Made in USA) and therefore less competitive in market place

### WEAKNESSES (2)

- Industry and Research are not partnering for mutual benefit
- Not enough people are orientated towards translating and transferring knowledge to Industry
- *Is there a lack of innovation or a lack of taking innovation to application?* Effectively taking innovation to market is a weakness
- SMEs with innovative ideas are inhibited from RTD participation due to barriers (e.g. administrative, suitable and flexible programmes for SMEs, fund variation of innovative projects)
- European Investment in RTD is less than major competitors
- In Marine Sector, a lot of innovation comes from US Navy, via EC at MS level
- Lack of acceptance of failure in forefront research vs. competitors

### OPPORTUNITIES

- A strong scientific basis that can adapt and grow new marine sectors
- Sustainable use of the diverse marine environment
- MSFD legislation is an opportunity to innovate and respond
- Policy drivers for new sectors (e.g. renewable energy)
- Policy drivers to collectively try and respond to "Grand Challenges"
- A highly trained deployable workforce across Europe
- An educational system able to adjust training to respond to new market needs and provide a competent workforce
- Diversity will allow us to cluster and respond to challenges

### THREATS

- By harmonising Europe we may lose the strength of diversity
- Competitors with a larger population, critical mass and less regulation
- Major weaknesses in international policy and legislation related to managing marine genetic resources
- Major Multinational companies out competing...
- Current economic downturn is resulting in losing focus on long-term obligations and investments
- Lack of coordination and large scale investment to exploit major opportunities (e.g. blue biotechnology)

## RECOMMENDATIONS

- o Better incentives and training for scientists to engage in entrepreneurship
- o Better incentives and removal of barriers for SMEs to engage in research
- o More mechanisms to bridge the gap between RTD and Industry
- o Better mapping of maritime clusters in terms of technology and identification of strengths, gaps & foresight work to understand potential
- o Analyse and fill the gaps in intellectual property rights in relation to Marine genetic/living resources
- o Support and branding to take innovation to the market place (Europe Inc.)
- o [Marine Community to work together to influence policy in order to assure resources for marine innovation](#)