EMODnet
European Marine Observation and Data Network

Consolidating the Foundations, Building the Future

First EMODnet Open Conference: Summary Report

20 October 2015, Oostende

"This is, without doubt, the most exciting development in data management in Europe that we've had for the last twenty years"

Richard Lampitt, Coordinator of the FIXO3 project

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EMODnet Open Conference co-organised by:

We would like to thank all the speakers and panellists for their input to the Conference. We wish to acknowledge the support of the sponsors and co-organisers of the Conference, the European Commission and Flanders Marine Institute (VLIZ), without whom this event would not have been possible. We thank the many volunteers who helped to ensure a smooth and pleasant event, and in particular we are grateful for the enthusiasm of the moderators and facilitators who guided thought-provoking breakout sessions. Most importantly, we thank the numerous participants of the Conference for engaging in the proceedings and providing invaluable contributions to the discussions. We look forward to the next steps and hope to see many of you again at future EMODnet events.

Conference report edited by Oonagh McMeel, Belén Martín-Míguez and Jan-Bart Calewaert. Layout by Vikki Gunn

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EMODnet
European Marine Observation and Data Network

The European Marine Observation and Data Network

The European Marine Observation and Data Network (EMODnet) is a network of organisations working together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products. The aim of EMODnet is to help scientists, engineers, policy advisors and all other stakeholders relying on marine data to increase their efficiency, promote innovation and reduce uncertainty about the behaviour of the sea. A fully operational EMODnet will lessen the risks associated with private and public investments in the blue economy, and facilitate more effective protection of the marine environment. EMODnet is an initiative of the European Commission in support of EU's Integrated Maritime Policy.

The EMODnet vision

"A flagship project to prepare a seamless multi-resolution digital seabed map of European waters by 2020 ... of the highest resolution possible, covering topography, geology, habitats and ecosystems ... accompanied by access to timely observations and information on the present and past physical, chemical and biological state of the overlying water column, by associated data on human activities, by their impact on the sea and by oceanographic forecasts. All this should be easily accessible, interoperable and free of restrictions on use. It should be nourished by a sustainable process that progressively improves its fitness for purpose and helps Member States maximise the potential of their marine observation, sampling and surveying programmes."

European Commission's Green Paper Marine Knowledge 2020 – from seabed mapping to ocean forecasting. 2012. DOI 10.2771/4154

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Consolidating the Foundations, Building the Future

First EMODnet Open Conference

1. Background

On 20 October 2015, about 350 European marine experts and maritime stakeholders gathered in Oostende, Belgium, to discuss how to unlock the wealth of marine data that is currently collected and stored in databases throughout Europe. This exciting event marked the first gathering of the European Marine Data and Observation Network (EMODnet) community and stakeholders.

EMODnet is a network of people and technologies that work together to compile and distribute data, metadata and products on European coastal and ocean waters. Since its inception in 2009, EMODnet has evolved considerably. It is now moving towards a fully operational stage with coverage of all European sea-basins and the provision of higher resolution data layers. Consortia have grown both in size and geographic coverage and EMODnet now includes more than 160 partner organisations. Increasingly, stakeholders are also becoming involved in the development of EMODnet tools and services.

A fully operational EMODnet corresponding to user requirements will reduce costs for offshore operators, stimulate innovation and blue growth, improve our knowledge of the marine environment and support effective marine management and maritime policy making.

EMODnet is a long-term marine data initiative from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE) underpinning its Marine Knowledge 2020 strategy. The distributed infrastructure is developed through a stepwise approach in three major phases. This dynamic approach allows testing of the system as it develops, taking into account feedback from users and stakeholders to improve the system and its services and make them more fit for purpose and user friendly. EMODnet is currently in the second phase of development, comprising seven sub-portals that provide access to marine data from the following themes: bathymetry, geology, physics, chemistry, biology, seabed habitats and human activities.

- Phase I (2009-2013): Development of a prototype (so called ur-EMODnet) with coverage of a limited selection of sea-basins, parameters and data products at low resolution;
- Phase II (2013-2016): Evolve from prototype to an operational service with full coverage of all European sea-basins, a wider selection of parameters and medium resolution data products;
- Phase III (2015-2020): Provide a seamless multi-resolution digital map of the entire seabed of European waters providing highest resolution possible in areas that have been surveyed.

As EMODnet moves towards the end of phase II and into its final development phase III (2015-2020), the EMODnet Open Conference provided a unique forum for the marine observation and data community, policy makers, advisors and stakeholders from various sectors and societal domains to meet, discuss and respond to the many challenges and opportunities that lie ahead, both for EMODnet and for the wider European marine observation and data community.

2. Conference programme

Conference Chair: Phil Weaver (Chair of the EMODnet Steering Committee)

Morning sessions co-chair: Matthew King (EC Directorate-General for Maritime Affairs)

09:00 - 09:25 Welcome and Introduction

- Bart Tommelein (State Secretary of the Sea, Belgium)
- João Ferreira (Member of the European Parliament)
- Matthew King (DG MARE): *EMODnet as central driver of Marine Knowledge*

09:20 - 10:30 Opening Session

- Vladimir Ryabinin (Executive Secretary, Intergovernmental Oceanographic Commission of UNESCO): *Global dimension and importance of Marine Observations and Data for science, policy and industry*
- Jan-Bart Calewaert (EMODnet Secretariat), Dick Schaap (EMODnet Bathymetry), Alan Stevenson (EMODnet Geology), Jacques Populus (EMODnet Seabed Habitats), Alessandra Giorgetti (EMODnet Chemistry), Simon Claus (EMODnet Biology), Antonio Novellino (EMODnet Physics) and Alessandro Pititto (EMODnet Human Activities): *EMODnet State of Play and overview of thematic portals*
- Nadia Pinardi (Istituto Nazionale di Geofisica e Vulcanologia and University of Bologna, Italy): *EMODnet Sea-basin Checkpoints: assessing observation capacity and data adequacy for users at the regional sea-basin level - status and future prospects*

10:30 - 11:00 Coffee break

11:00 - 12:30 Session 2: Perspectives from stakeholders and experts

- Cyndy Chandler (Woods Hole Oceanographic Institution, USA): *Opportunities and challenges for marine data management to support Future Ocean Research*
- Gert Verreet (Department of Economy, Science & Innovation, Flemish Government, Belgium): *Reflections on EMODnet from the perspective of collaborative international environmental assessment practice*
- Lyndsey Dodds (Head of Marine Policy, WWF-UK): *Perspectives of WWF as civil society actor on issues related to marine observation and collection, management, access and sharing of marine data*
- Jean-Francois Minster (Scientific Director of TOTAL S.A., France): *How can maritime industry benefit and contribute to an initiative such as EMODnet?*
- Interventions from the public and discussion
- Job van den Berg (Royal Haskoning DHV, The Netherlands): Plenary introduction to the afternoon breakout sessions

12:30 - 14:00 Lunch break

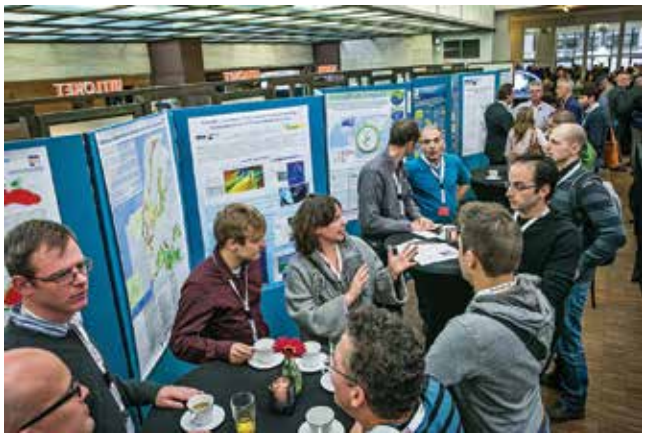
Afternoon sessions co-chair: Job van den Berg (Royal Haskoning DHV, The Netherlands)

14:00-16:00 Session 3: Breakout discussions on future priorities and governance

16:00-16:30 Coffee break

16:30-18:00 Closing Session

- Reconvene in plenary to report on breakout group discussions
- Panel discussion with:
  - Jonathan Williams (CEO, Marine South East Ltd. Maritime Cluster, United Kingdom)
  - Kathrine Angell-Hansen (Director, Joint Programming Initiative for Healthy and Productive Seas and Oceans, JPI Oceans)
  - Jan Mees (Chair of the European Marine Board)
  - Ricardo Serrão Santos (Member of the European Parliament)
  - Iain Shepherd (DG MARE)
  - Conclusions and closing statement by Ricardo Serrão Santos (Member of the European Parliament)



3. Welcome and Introduction

Chair of the EMODnet Steering Committee, **Phil Weaver**, welcomed all the participants to Oostende and remarked on the great turnout of participants. Noting that all attendees had an interest in data management, he called on the participants to engage fully before inviting the opening speakers to take the floor.

Bart Tommelein, Belgium's State Secretary for the North Sea, opened the conference by welcoming all the participants to his home city of Oostende, a city which he described as being intrinsically linked to the North Sea. As Belgian State Secretary for the North Sea, he was very aware of the potential opportunities a healthy maritime economy could offer in terms of sustainable growth and jobs and noted that the maritime sector was developing faster than any other sector. This growth was dependant on access to data - be it for tourism, wind energy or sand extraction for example. Mr Tommelein stressed the need to coordinate access to the data we collect and highlighted the important role EMODnet could play in this regard. Providing a central access point to unlock marine data can positively improve its availability with the result that companies can work more efficiently and save resources. Available and open data can also boost job creation and opportunities for innovation. Summing up Mr Tommelein said that there was every reason to support and provide a full commitment to free use and sharing of marine data between governments and companies and beyond borders.

> ***"Crucial to the development of the blue economy is the access to quality data. EMODnet can play an important role to provide that access"***
>
> *Bart TOMMELEIN, State Secretary of the Sea, Belgium*

In his opening statement, Member of the European Parliament (MEP) **Joao Ferreira** shed light on the efforts of the European Parliament (EP) to support the maritime economy, notably via the EP Resolution 'exploiting research and development potential in the blue economy to create jobs and growth' . Providing a comprehensive definition of the blue economy, he drew attention to the cross-cutting importance of innovation for all activities contributing to the blue economy, be they traditional or emerging. Mr Ferreira highlighted that the resolution also calls on the Commission to 'adopt an integrated and more comprehensive approach, encompassing the challenges of innovation and job creation over the whole varied range of interacting sectors.' The resolution could be summarised under four main headings: 'knowledge, sustainability, constraints and funding.' These key words were to be repeated again and again throughout the remainder of the day. MEP Ferreira pointed

to the serious lack of data, information and knowledge about the behaviour of our seas and oceans, their resources and biodiversity, and the ways in which these interact with human activities. This inadequate knowledge base severely inhibits the sustainable use of marine resources and limits the full potential of the seas and oceans. The EP resolution therefore calls for clear-cut objectives and timeframes to be laid down with a view to making data more transparent and accessible, fully interoperable and harmonised.

Matthew King from the Directorate-General for Maritime Affairs and Fisheries (DG MARE) concluded the session by framing EMODnet in the wider policy context. Explaining why the EC were funding EMODnet, he said that research and knowledge was fundamental to the realisation of the potential of the blue economy while ensuring blue growth occurred in a sustainable way. Whilst this was an important and a difficult balance to achieve, open and transparent data - such as provided by EMODnet - could support policy and decision makers in achieving this balance. Like coastal and territorial waters, countries cannot make appropriate decisions on how to deploy activities in the high seas in a sustainable way in the absence of access to data. Summing up Mr King stressed that the financial future of EMODnet will depend on real political visibility to attain political buy-in. He raised the question of how EMODnet could transform itself into something bigger than it is today to gain this political visibility and appreciation and also to be accountable to the tax-payer. EMODnet, he stressed, must consider how it is presented and made visible to the wider audience, to ensure it becomes so solidly embedded in the landscape that the possibility of its non-continuance becomes inconceivable.

"EMODnet is fundamental to how the blue economy will develop"

Matthew KING, European Commission DG MARE

4. Opening Session

Thanking all speakers for their opening statements, Phil Weaver handed over the chairing for the remainder of the morning session to Mr Matthew King who invited Vladimir Ryabinin, Executive Secretary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, to launch the opening session.

Providing the global dimension of the importance of marine observation and data for sustainable development, **Vladimir Ryabinin** explained that IOC works towards developing ocean research for global benefits. This requires a holistic and multidisciplinary approach towards ocean research. While sustainable development goal number fourteen endorsed by the United Nations specifically addresses the conservation and sustainable use of ocean resources, he noted that in fact the ocean played a direct role in achieving many of the other goals as well. Achieving all of these goals is highly dependent on observations and data and he stressed that we cannot manage what we don't measure or what we don't understand. Focusing on the Global Ocean Observing System (GOOS) Professor Ryabinin noted that whilst many of the elements of GOOS are funded at local or national level, the promotion of global standards and of data sharing will allow for global research and regional and global assessments of the marine environment and these will be key to better stewardship of the oceans and sustained benefit from the ecosystem services they provide. EMODnet was, he said, a true hallmark in marine observation and data and its networking, an important part of the ocean knowledge node of IOC's International Oceanographic Data and Information Exchange (IODE). EMODnet is hugely important, not only for Europe, but also as an example for other regions. Concluding, Professor Ryabinin pointed out that the role of observations and science in decision making is increasing and sustainable development, the blue economy and ocean governance are key drivers for marine observation and data services to 2030.

> ***"EMODnet – a true hallmark in marine observations and data and its networking; it is hugely important not only for Europe but is an example for other regions"***
>
> *Vladimir RYABININ, Executive Secretary, IOC-UNESCO*

Thanking Mr. Ryabinin, Matthew King brought the focus back to Europe and introduced a medley of speakers representing the EMODnet Secretariat and each of the seven thematic portals.

Jan-Bart Calewaert, Head of the EMODnet Secretariat, began by placing EMODnet in the wider policy framework. He explained that EMODnet was a central component of the European Union's (EU) Marine Knowledge 2020 strategy to unlock the social and economic potential of the wealth of European marine observations and data, based on the principle of collecting data once and using it many times. This strategy comes with a very specific target to develop, by 2020, a seamless, digital map of the seabed at the highest resolution possible, accompanied with timely information on the physical, chemical and biological state of the overlying water column, all of which should be

interoperable and made available free of restrictions on use. While EMODnet brings together organisations and technologies to compile and distribute data on Europe's seas and oceans, Mr Calewaert stressed that ultimately EMODnet is a network of people. EMODnet operates on the principle that the data remains as close to the originator as possible at Member State or regional level, but is assembled and made available in a harmonised way by EMODnet as data, metadata and products. The key argument is that EMODnet offers important benefits for both users and providers of data: estimates predict that a fully operational and integrated European marine data infrastructure could save up to one billion Euro a year to offshore operators, as well as providing new opportunities for growth and investment, reducing risks for maritime operators and improving environmental management. Data providers can expect more visibility and wider use of their data which will help justify their investments. EMODnet may be able to assist data providers to comply with their legal obligations in terms of providing open access or by making data available in an INSPIRE-compliant way. Today, as it enters its final development phase, EMODnet comprises seven thematic portals, six regional seabasin checkpoints, a central portal and a secretariat. Recently a new coastal mapping project led by the French Hydrographic Office was launched to complement the EMODnet Bathymetry work and pave the way for a European Coastal Mapping programme. Looking to the future of EMODnet, Mr Calewaert concluded by saying that EMODnet would aim to deliver more data via machine-to-machine communication, improve access to fisheries data and work towards bringing in more data from both research and industry. Finally, EMODnet would establish a means for obtaining more structured input from users and increase coordination with the regional sea conventions.

Dick Schaap introduced the EMODnet Bathymetry portal which collects and makes available bathymetric survey data and a derived product: a medium resolution digital terrain model (DTM) for European seas. Development of the DTM has resulted in an increase of indexed surveys from 3000 at the onset to 13000, and has stimulated providers to share their data. The DTM is now based on 7000 surveys from 31 data providers, but more data would further improve the model and increase its use. Some of the newer features of the portal include the capability to browse the DTM and download it, but also to displays which data underpins the product. Mr Schaap pointed to the success of the portal with 50000 different IP addresses registered as daily users. EMODnet Bathymetry is moving towards high resolution DTMs and some coastal areas are already available at high resolution. Some of the remaining challenges include obtaining more surveys, improving DTM quality and extending the partnership. With increasing datasets there is a need to move towards cloud services to handle the volume of data, optimise the work flow and speed up map production, and this presents both a challenge and an aspiration for the future. Mr Schaap concluded with a call to data providers to come forward and contribute their data.

Alan Stevenson illustrated how the EMODnet Geology portal provides harmonized data on seabed substrate and bedrock geology, including information on coastal behaviour. EMODnet Geology encompasses 36 organisations from 30 countries, including all EU maritime countries. Most of the data, Mr Stevenson explained, were provided mainly by geological survey organisations. The portal already provides a few multi-resolution maps, but to ensure a harmonised, continuous map with no gaps, they also provide a broad scale map at lower resolution. Mr Stevenson stressed that strong linkages between the EMODnet thematic portals were crucial: better bathymetry maps mean better geology maps and better seabed habitat maps. Citing an example in the context of marine spatial planning where EMODnet Geology seabed substrate data was used by planners, Mr Stevenson stressed that dialogue with users was vital to ensure that the data provided by EMODnet was fit for purpose. Providing high quality marine geological data and information allowed planners to make informed environmental management decisions. While accessing third party data remains a challenge for the future, Mr Stevenson was hopeful that the forthcoming data ingestion project might help bring in new data sets from yet unidentified sources. Considering the future sustainability of EMODnet Mr Stevenson concluded that links had to be made between mapping activities at national level and EMODnet, and that this combination could be very powerful in the future.

Presenting the EMODnet Seabed Habitats portal, **Jacques Populus** explained that the main objective of the portal was to provide access to habitat maps in an interoperable way. These maps were based on the EU Nature Information system (EUNIS) - a descriptor of seabed habitats - and one of the challenges the portal faced was a scarcity of these maps. As a result they had embarked on making a pan-European broadscale EUNIS map, building on the maps provided by EMODnet Bathymetry and Geology portals, as well as using various physical parameters from sources outside EMODnet. Describing the broadscale habitat map as filling a big knowledge gap, Mr Populus noted that it was mostly a physical abiotic map and lacked biological information - something they were hoping to address in the future. Some of the uses of the habitat maps included an ecosystem evaluation program, the production of impact maps for Marine Strategy Framework Directive (MSFD) and for Marine Protyected Area (MPA) designation. Summing up, Mr Populus reiterated the need for more biological data pointing out that a large scale benthos survey would improve the quality of habitat maps and if carried out strategically could also inform on changes in benthos in relation to MSFD. Mr Populus concluded with a request for owners of habitat maps to provide them to the portal.

Coordinator **Alessandra Giorgetti** presented EMODnet Chemistry as the largest thematic consortium of the network with 46 institutes working together to collect, standardize and make available information and products for groups of chemical variables covering all European sea basins. Data harvesting and products generation are organized at regional level and the majority of the data was available open access. Explaining that EMODnet chemistry's main use would be to provide fit-for-purpose data for MSFD implementation, Ms Giorgetti said this would be achieved by maintaining a regular and open dialogue with MSFD actors such as the regional sea conventions and by optimising EMODnet chemistry services and products for specific MSFD indicators. EMODnet Chemistry was working towards expanding data coverage by increasing connections with research and monitoring data centres and optimising product generation with a dynamic visualisation of the data. Ms Giorgetti concluded that ultimately EMODnet Chemistry products and services should be fully integrated in MSFD implementation.

Simon Claus presented the EMODnet Biology Portal which provides access to data on the temporal and spatial distribution of marine species and marine species traits from several species groups in all European seas. EMODnet Biology is built on two main information systems: the World Register of Marine Species (WoRMS) as taxonomic backbone and the European component of the Ocean Biogeographic Information System (OBIS) to integrate and standardize the marine biodiversity observation data. EMODnet biology makes available raw observation data but also provides products indicating trends in abundance of selected species, including a range of indicator species. There is now a mature European biodiversity network connecting 159 institutes sharing biodiversity data using common standards and data formats and making available 673 data collections. Mr Claus said that it was thanks to EMODnet that there is now such a wealth of publicly available biodiversity data. Providing examples of specific use-cases for EMODnet Biology, Mr Claus noted that there are still huge gaps in data availability that remain to be filled. Discussing the challenge of the Open Access Data Policy and convincing people to provide and make available biological data, he said that EMODnet has an important role in providing arguments for making data publicly available and the added value to be gained by doing so.

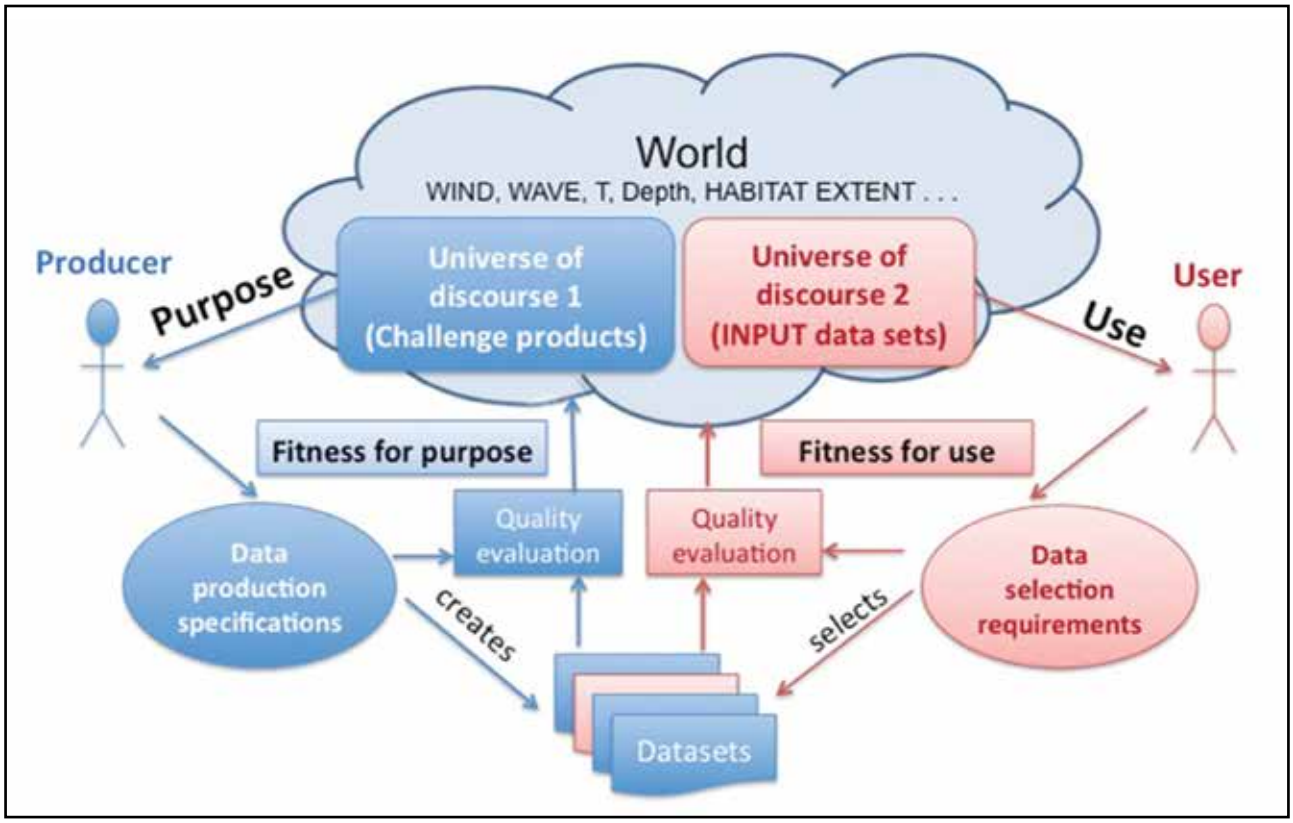
Antonio Novellino presented the EMODnet Physics portal as a single point of free and open access to discover and download marine real-time and archived data on physical parameters of European Seas. Highlighting the synergistic cooperation with the Copernicus Marine Environmental Monitoring Service (CMEMS), the regional elements of EuroGOOS, the SeaDataNet network of oceanographic data centres, he pointed out that their collaborative efforts continue to attract new providers because it increases their visibility. To fully exploit this cross-fertilization and to provide interoperability services, EMODnet Physics is working on more harmonization and standardization

of the dataflow in order to avoid bottlenecks. Providing some examples of the use-cases of EMODnet Physics by both public and private organisations, he highlighted a collaboration with CMEMS to develop key performance indicators to track and monitor performance of the infrastructure. They are trying to develop a data policy and address the issue of a single sign-on procedure, whereby users only have to register once to gain access to all EMODnet portals and related data systems. Mr Novellino noted that there was still considerable work ahead in terms of maintaining engagement with data providers, improving and facilitating data access and discovery, connecting to more historical validated data, improving machine-to-machine operations and making available basic products. Looking to the future, EMODnet Physics will work to include more providers with additional data including from new parameters and sources to reach a wider audience. They will also include more real-time data, cloud services and big data visualization. In concluding Mr Novellino stressed the importance of developing an easier and more direct interaction between providers and users in the EMODnet Physics network.

Alessandro Pittito presented EMODnet Human Activities, the most recent addition to the series of thematic portals, which aims to be the main entry point for spatial data on marine and maritime activities in Europe. EMODnet Human Activities does not collect new data but assembles, harmonises and makes available the wealth of data on human activities in Europe that already exists but which is difficult and laborious to access. The main advantage is that information on many and various human activities in European waters is available at the same time, in the same place and in an interoperable format. This significantly reduces the time taken for an operator to obtain the information they need. Highlighting the diversity of the portal's user base, Mr Pittito cited examples from industry and research, from organisations to individuals and noted that the portal could play a significant role in marine spatial planning. Some of the key challenges faced by the portal were again: encouraging data owners to become data providers, harmonisation of data from different sources and differential regional and thematic data coverage. Mr Pittito concluded that the next phase would aim to increase data coverage, to extend data collection to non-EU neighbouring countries "because oceans have no boundaries" and to have dialogue with actors from Marine Spatial Planning (MSP), INSPIRE and MSFD.

The final speaker of the morning session was **Nadia Pinardi**, Coordinator of the Mediterranean sea-basin checkpoint and in a capacity as representative of both the Mediterranean and North Sea checkpoint projects, both of which were launched in 2013. Professor Pinardi described the innovative concept of the EMODnet sea-basin checkpoints as a means of assessing whether current monitoring systems are fit for purpose. Placing the checkpoints within the complex framework of European monitoring and data collection frameworks, Professor Pinardi illustrated how the checkpoints assess whether the current data is adequate to meet the needs of marine and maritime actors in

specific blue growth areas and stressed that "assessing the fitness-for-purpose of data at the regional sea level basin was key to engaging the stakeholders and to leveraging expertise." In addition to the North Sea and Mediterranean Sea Checkpoints, new checkpoints in the Arctic, Baltic, Atlantic and Black Sea were launched earlier in 2015, which together provided complete coverage of the regions of interest in Europe. Professor Pinardi discussed some of the first results available in the form of data adequacy reports for both the Mediterranean and the North Sea. These showed that accessibility of data sets is generally not INSPIRE compliant, data policy is often not visible and metadata descriptions are limited in scope. Interesting data-gaps were also beginning to emerge in particular areas. Looking to the future, Professor Pinardi concluded that a methodology for data adequacy assessment in line with INSPIRE and ISO standards is being developed, building a metadatabase of input data sets and defining European Environment Agency-like indicators.



Graphic illustration of the Mediterranean Sea-Basin Checkpoint assessment concepts

5. Perspectives from stakeholders and experts

Launching the afternoon session, **Cyndey Chandler** (Woods Hole Oceanographic Institution) provided some thoughts on 'Opportunities and Challenges for Marine Data Management to Support Future Ocean Research from the perspective of a US National Science Foundation (NSF) funded data manager. The presentation considered the ocean science research data lifecycle, highlighting issues around interoperability and the need to make connections between distributed repositories and form strategic partnerships to meet the challenges of building a sustainable infrastructure to support the modern research paradigm. Whilst the concept of data management is not new, there is now a growing demand for open access and machine readable data to magnify the importance and economic impact of collected data which is driving changes in data management. Current challenges in data management are not just technical such as interoperability, metadata and common vocabularies, but also behavioural and a culture shift is required in terms of understanding that there are benefits to sharing and making available data in an open way. Considering the needs of researchers, Ms Chandler said that the infrastructure (people, machines, systems) must be updated to support new research requirements and noted that the EMODnet coordinators had already provided some good examples of these. Researchers are also calling for training in new data technologies both for themselves and for their students to enable them to do better and newer science. The grand challenge of how to address the increasing and rapidly changing needs and expectations of stakeholders - in a sustainable way - with limited time, budgets and skilled personnel could only be met by forming partnerships to develop, share and adopt common strategies and EMODnet was an exceptional example of this approach. She noted also that those communities of practice that had endured and been successful all had long term funding commitment from programme managers and the active engagement of these funding managers. In summing up, Cyndey Chandler stressed the importance of data collection quoting Santiago Ramón y Cajal, "A scholar's positive contribution is measured by the sum of the original data that he contributes. Hypotheses come and go but data remain."

Gert Verreet (Department of Economy, Science & Innovation, Flemish Government, Belgium) reflected on EMODnet from the perspective of collaborative international environmental assessment practice. Commending the work of the data centre at Flanders Marine Institute (VLIZ), he said that VLIZ is living proof that accessible data infrastructures are vital for marine science and technology developments. Providing a perspective both from personal experience of carrying out environmental assessments and as a stakeholder in environmental policy, Mr Verreet said that a key question was what the data mean for the course of environmental policy. Describing the use of the ecosystem approach in environmental policy and the need to base policy decisions on the 'best available scientific evidence' he pointed out that this assumes a transformation process from data to information to

knowledge. This process entails a huge amount of work by multidisciplinary experts but should also include a top-down approach and it cannot be emphasised enough that the quality of the basic data has huge implications for the quality of the resulting policy. Describing the OSPAR Joint Assessment and Monitoring Programme, Mr Verreet said this highlighted the importance of a feedback loop whereby the delivery of assessments are not an end in themselves but provide an opportunity for feedback on the quality of the knowledge being derived from monitoring programmes. Referring to comments made by earlier speakers that data providers do not necessarily appreciate the potential benefits to be accrued from wider use of their data, he said that one of the benefits of the regional sea conventions was that they provided an opportunity for data providers to contextualise the data for their country within their region. Describing data as the bedrock of value creation, Mr Verreet also said that data collection should be driven by policy and management questions and by information needs and that EMODnet could play a role in maintaining the important link between data providers and data users.

Lyndsey Dodds (World Wide Fund for Nature, WWF) focused on the importance of data for civil society organisations. Describing the role of the WWF in influencing policy development and implementation, communicating marine issues and working in partnership with stakeholders, she said that for all of these activities WWF relied on data to strengthen their cases to policy makers. Some of the main challenges include addressing the needs of decision makers who may be required to make challenging decisions often with economic consequences on the basis of inadequate data, and the need to match the scale of data collection and availability with the scale of environmental management that may be reliant on the data. Ms Dodds also noted that in some instances different data sets, provided by different sectors, tell different stories and there is a need for complete alignment in this regard. Finally, she stressed the role of stakeholders as potential providers of data which promotes stakeholder buy-in and support, both for the data that is collected but also for the management decisions that are made on the basis of the data.

Providing the industry perspective, **Jean-François Minster** (TOTAL S.A.) discussed how the maritime industry could benefit from and contribute to initiatives such as EMODnet. Although focusing on the oil and gas industry, he pointed out that the benefits of data access and sharing could be applicable also to other sectors. Describing the various scenarios in the lifetime of an installation which were reliant on data and information - from preliminary prospecting for resources to platform erection and dismantling - he said that safety was of paramount importance. As the scale of activities at sea increase so too does the demand for rapid access to increasing quantities and varieties of data to support these activities. Industry can also play an important role as providers of data and fill gaps in monitoring and observation data for meteorological offices for example. However, industry may not always have

the resources in terms of skilled personnel to ensure the quality of the data. Mr Minster underlined that data-sharing improved the quantity but also the quality of data available and said that the importance of indicating data quality was paramount. EMODnet must consider how to ensure the quality of the data they make available, particularly data underlying products, which will be less visible to the end-user. Mr Minster concluded that that offshore resources exploitation relied on an interplay between observations, knowledge, technology, regulation and governance and that data-sharing played a crucial role in underpinning all of these.

> ***"Exploitation of EMODnet data will not only happen in EU, it will happen all around the world"***
>
> *Jean-François MINSTER, Scientific Director, TOTAL*

Common and emerging themes from the morning session

- The balance that must be achieved between growth in the blue economy and the protection and preservation of our marine resources is reliant on access to accurate and adequate data.
- Policy makers, decision makers and politicians are dependent on reliable and timely access to transparent data in order to make informed choices about how to best develop our maritime space in a sustainable way.
- Significant data gaps exist and more data is needed, from specific parameters in certain areas. Efforts to fill these gaps should be based on dedicated assessment of actual data needs.
- Data owners must be convinced of the value that can be added to their data by making them open and freely available.
- A fundamental change in behaviour and attitude is required to promote an open access data policy.
- Dialogue between EMODnet and intermediate- and end-users is necessary to define user-needs and ensure that EMODnet is developing in a way to best address these.
- Sharing data enhances the quantity and the quality of data that is available for uptake by end-users.
- Training for researchers and students in data collection and data interrogation to allow science to fully exploit the potential of data is needed.

The last speaker of the morning and lead facilitator of the afternoon discussion groups, **Job Van Den Berg** (Royal Haskoning DHV, The Netherlands), introduced the breakout sessions which would see the participants convening in three groups to discuss specific topics. The topics were chosen via a pre-conference survey to establish the most pertinent themes and issues for discussion. On arrival, conference participants were allocated to one of three breakout sessions. The topics discussed in each session are shown in Figure 1.

Figure 1: Themes considered during the afternoon breakout session of the EMODnet Open Conference

6. Closing Session

Conclusions from the breakout discussions

Participants reconvened in plenary for brief feedback from the facilitators on the outcomes of each breakout session. The main messages from the breakout sessions and also from feedback received in advance of the sessions via an online questionnaire are summarized as follows:

- EMODnet requires greater visibility, many potential users and providers are unaware of its existence. Successful use-cases must be identified and used to help promote EMODnet and encourage user and provider engagement;
- EMODnet needs political buy-in at member state level to ensure its longevity in terms of funding. Assuring the longevity of EMODnet would encourage more data-providers and users (particularly from industry);
- EMODnet cannot address all potential end-user needs. EMODnet should address the needs of public authorities / policy makers in the first instance. The relationship between EMODnet and MSFD is particularly important;
- EMODnet lies withiin a complex marine information landscape and there is confusion and overlap between initiatives. The relevant European Commission Directorate-Generals should develop a roadmap in order to clarify complementarities and align different marine data and information initiatives to prevent duplication of efforts and financing;
- The added value of EMODnet is its multidisciplinary nature, and more cross-linkage between thematic lots would be very positive. The central portal is important and should be developed for improved EMODnet coherence and ease of use;
- Data should be preserved at (or close to) original source. There should be one original dataset, not many different versions in circulation. Use of Digital Object Identifiers (DOIs) and citation indexes could help ensure traceability/visibility of data providers;
- Funding bodies should make data deposition in a public repository a mandatory requirement in all projects. Sharing data with EMODnet should be mandatory at national level, and not only as a consequence of EC funding;
- EMODnet should collate and make available information on data-gaps to influence future monitoring programmes accordingly. Among others, land-sea interactions must require more attention;
- EMODnet should concentrate on providing access to high-quality data, providing information about the quality of that data including confidence levels. While EMODnet can also develop a selective range of key data products, it should let others (service–providers, intermediate users) develop added-value products and services;
- EMODnet needs to provide better support mechanisms for users and providers through a service desk and the provision of training workshops.

Closing panel discussion

In the final session of the open conference, four panellists were invited to take the floor and provide their perspectives on the role of EMODnet in marine observations and data.

Jonathan Williams (CEO, Marine South East Ltd Maritime Cluster, UK) highlighted the exciting role of the blue community in sustainably using the resources of our seas and oceans to address the grand global challenges. Focusing on the role of the intermediary added value service providers, he said that information services are critical to this - be they services to assist planning developments, maritime spatialplanning designation, to manage and forecast risk, for infrastructure design optimization or in detecting non-compliance. These intermediary users will take advantage of the resources made available by EMODnet and deliver an enormous range of very specific information services to specific customers and he stressed that this was an entrepreneurial function requiring investment. In so doing, these service providers can add value to the data and information already made available by EMODnet. In terms of how to encourage industry to use and provide data, Mr William said that there is a need to (i) address data discovery for people who don't know what is out there or where to look for it; (ii) provide indications of data uncertainty or confidence in metadata particularly in light of the amount of data becoming available via crowd sourcing, and (iii) develop a business model if we would like industry to fill in data gaps. If these three recommendations were taken into account, it is much more likely that business would engage fully. Mr Williams concluded that pilot activities demonstrating applications that would deliver socioeconomic benefits from EMODnet would help justify past and future investment in EMODnet. Asked about end-user feedback guiding the development of products he stressed the role of intermediaries who know their customers and who should be the liaison partner in terms of translating customer requirements for information services back to the EMODnet community.

"Enterpreneurs will take advantage of the data resources made available by EMODnet and deliver very specific information services to specific customers"

Jonathan WILLIAMS, CEO Marine South East Maritime Cluster

Kathrine Angell-Hansen, head of the Secretariat of the Joint Programming Initiative for Healthy and Productive Seas and Oceans (JPI Oceans) provided the perspective of their Member States, saying there was a real need for marine data to respond to policy obligations in the context of ecosystem based fisheries, MSP and MSFD implementation. This data is costly and JPI Oceans are working to establish for their Member States what data and infrastructures are needed to respond to grand challenges in the longer term. An important issue for JPI Oceans is to try and identify where value can be added to marine data. Ms Angell-Hansen drew attention to the JPI pilot actions to test new ways of cooperation focusing on how infrastructures and data could be shared for different purposes to ensure the most efficient use of these valuable resources. According to Ms Angell-Hansen, another area where JPI Oceans could add value is in the development of protocols to harmonise data. She was optimistic about the future, highlighting that specific use-cases such as had been described by the EMODnet coordinators would allow JPI Oceans to provide compelling examples to their Member States of how EMODnet adds value to their data. Considering open access data policies, she pointed out that whilst JPI Oceans supported open access data there are often compelling reasons why Member States do not make data open access. Finally Ms Angell-Hansen concluded that connectivity between what is happening at Member State level and at the pan-European level is very important.

Providing the marine science perspective, **Jan Mees** (Chair of the European Marine Board) said that EMODnet is a giant step in data availability with potential for innovative, multi- and inter-disciplinary research. Researchers are not just providers and/or users of data, but they also contribute to creating and developing the architecture of the EMODnet system; in addition they help to define end-products that should be delivered to target groups. EMODnet can provide open and free access to high quality data and help researchers to find out what data is there and also what data is not there, but researchers also need assistance with data discovery, data analyses and data interrogation. There is a need for data scientists, preferably within EMODnet, to help researchers extract, integrate and generate new hypothesis that can deliver to innovative science. Whilst machine-to-machine services are important, a human interface is needed to help researchers make the maximum use of the data. The fundamental research community can gain a lot from EMODnet and if fundamental research flourishes in Europe then so too will applied research. EMODnet is identifying interesting data gaps, however certain gaps will not be captured by EMODnet as it is currently constructed, these include gaps in genomic and ecological data. Filling gaps is also a governance issue in that these gaps may be due to a lack of observations. Mr Mees noted that there was a need for interaction with the community progressing the concept of a European Ocean Observing System (EOOS) and explained that the European Marine Board and EuroGOOS were working together

on this issue. Gaps identified by EMODnet should feed into discussions on how to progress operationalisation of EOOS. Considering the need for a culture shift in behaviour towards open access data sharing, Mr Mees concluded that whilst he felt it was a moral duty of scientists to provide open access to their data, different communities were moving towards making data citable to support career advancement for scientists and as an incentive to encourage open access data sharing.

"From a scientific perspective EMODnet is a giant step in data availability"

Jan MEES, Chair of the European Marine Board

According to MEP **Ricardo Serrão Santos** (Member of the European Parliament), Europe had made significant progress in terms of developing usable and interoperable marine data centres over the last decades, but it still lags behind the US in this area. This is largely due to the complexity of Europe with marine data being collected at national, regional and pan-European level and the associated issues of sovereignty of marine territories. In reference to a lack of data sharing by scientists, Mr Santos said this was also a syndrome of how scientists were evaluated on the basis of their publication records. As a result they felt the need to exploit data to the maximum before sharing it. Considering the focus on blue growth and the blue economy, Mr Santos stressed that there were limits to growth and limits to blue growth. Data has a significant role to play in terms of keeping ecosystems sustainable and healthy, particularly in reference to MSFD. If EMODnet does not strengthen itself and the concept of data sharing and transparency does not progress, there is a risk that blue growth proceeds in an unsustainable way.

Panel Discussion: Outcomes and Recommendations

- In terms of identifying end-user needs, there is no one-size-fits-all approach. The user requirements will be many and varied and need to be dealt with on a case-by-case basis.
  - In terms of industry EMODnet should engage with intermediary service providers who can add value to the work of EMODnet by developing specific products for specific end-users.
  - One clear end-user community for EMODnet are those requiring data for effective implementation of MSFD and MSP designation.
  - The research community is a very important end-user for EMODnet because its activities can lead to innovative science, both fundamental and applied.
  - A more informed civil society leads to better ocean governance and greater transparency. Stakeholders

such as local communities often don't have access to the resources which science and industry have and EMODnet must consider how they can contribute to making data available to this important group in a useable way.

- There is a need for a human interface in EMODnet to support users with data discovery and data interrogation in order to maximise the potential of the marine data made available by EMODnet to contribute to societal needs.
- Scientists should be supported in terms of providing open access, often they do not have the will, time or capabilities to deliver data. There is a need for a change in governance so that funding agencies and institutions make open access data a supported and mandatory requirement of publicly funded research.
- Young scientists should be trained in data management and a philosophy of open access data encouraged.
- If EMODnet can continue to grow and demonstrate its worth then it will attract more data.
- Specific use cases demonstrating how EMODnet has contributed to sustainable blue growth or improved environmental management at local or regional level are very powerful towards attaining political buy-in and support for EMODnet beyond 2020.
- It is difficult to prioritise efforts to fill data gaps, i.e. what gaps should be addressed and for who? The data that is required to address todays challenges may not be the same data that is needed in ten years, however data that is not captured today is lost forever. Ideally all available data should be collected however, in the absence of limitless funds, the EMODnet checkpoints will provide the best means of prioritising the data gaps which should be addressed.

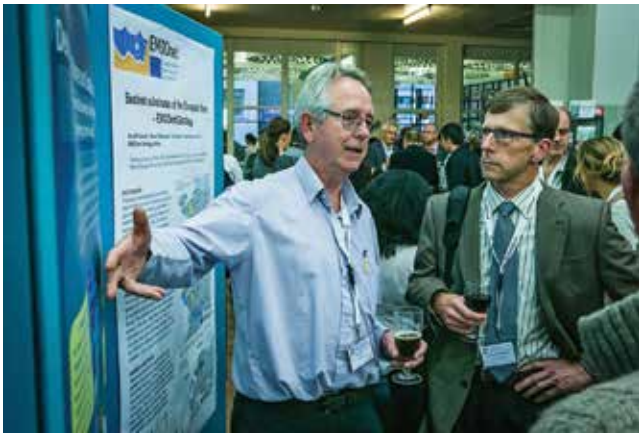
Ricardo Serrão Santos closed the EMODnet conference with a plea to the community to recognise that there are limits to blue growth. Growth cannot proceed in a sustainable way without access to reliable and coordinated scientific data and information to facilitate implementation of the Marine Strategy Framework Directive, the revised Common Fisheries Policy, marine spatial planning and integrated coastal zone management. Our oceans are not inexhaustible, not immune to damage and it is imperative to balance economic benefits with environmental protection and human wellbeing. This highly complex challenge is reliant on information and knowledge together with good governance. To this end, Professor Santos called upon all marine stakeholders to support the important work of EMODnet and make it a sustained success.

"I clearly support the effort of EMODnet and I hope it will evolve to an European Ocean Agency"

Ricardo SERRÃO SANTOS, Member of European Parliament


Sea Basin Checkpoints
Outlook


EMODnet
European Marine Observation and Data Network
Unlocking the wealth of European marine observations and data




EMODnet

7. Profiles of external speakers

Bart Tommelein has been Secretary of State for Privacy, the North Sea and Combatting Social Fraud since 2014. From 1985 to 1992 he was chairman of the VUJO (People's Union youth). He became a counsellor and later spokesman for the Flemish Minister-President Patrick Dewael. In 2003 he was elected to the federal Parliament and later also the Flemish Parliament. He has acted as Parliamentary group leader for VLD and was President of the Benelux Interparliamentary Consultative Council.

João Ferreira, Member of the European Parliament is a Portuguese biologist and politician elected to the European Parliament since 2009 as part of the European United Left–Nordic Green Left, where he is vice-chair. He is a specialist in the ecology of invasive species and mycorrhiza. He worked on water management in the area around Setúbal and has been active in the governance of the University of Lisbon; since 2013 he is also Member of Lisbon City Council. At the European Parliament he is a member of the Commission on Fisheries and Vice-Chair of the Delegation to the ACP-EU Joint Parliamentary Assembly.

Matthew King is the Head of Unit for Maritime Policy in the Atlantic, Arctic and Outermost Regions in the European Commission, Directorate General for Maritime Affairs and Fisheries. The Unit is responsible for developing and implementing a strategy for the Atlantic region, and has developed an Action Plan to take this forward, in partnership with Member States and regional authorities. The unit is also responsible for development of policy on the Arctic and for the wider 'blue growth' agenda, which seeks to improve the rate of job creation and growth from sustainable use of the seas. This involves innovating in a number of traditional sectors, such as shipbuilding, and in emerging sectors, such as ocean energy.

Mr. Vladimir Ryabinin is the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO. Mr. Ryabinin has authored and co-authored a monograph, several articles and publications, in the domains of oceanography, meteorology and climate. He was lecturer at the Moscow State University and has participated in several research and offshore engineering projects including the International Polar Year 2007-2008. More recently, he has been a lead author of the Global Environment Outlook Chapter on the Earth System challenges, and is an expert/member/chair in a number of international working groups, committees and research councils.

Cyndy Chandler is an Information Systems Specialist in Marine Chemistry & Geochemistry at Woods Hole Oceanographic Institution. Her research interests include ocean informatics, database design, data management, online data systems, development of marine ontology, marine metadata standards and the use of information technology to facilitate the process by which information becomes knowledge. She is co-chair elect, UNESCO IOC International Oceanographic Data and Information Exchange (IODE), 2015-2017.

Gert Verreet is a policy officer in the Flanders Department of Economy, Science and Innovation (EWI), working in the Research Division focusing on environmental. He is also a member of the Flemish Committee for UNESCO and oversees funding for projects under the UNESCO/Flanders Fund-in-Trust for the support of UNESCO's activities in the field of Science (implemented under UNESCO IOC, IHP and MAB programmes). Previously he was a Deputy Secretary of the OSPAR Commission, a position he occupied in 1995-2001 and 2011-2014.

Lyndsey Dodds is the Head of UK & EU Marine Policy at the World Wide Fund for Nature. She has been with WWF since 2007, initially working on the delivery of new marine legislation in the UK – the Marine and Coastal Access Act, then managing the PISCES and Celtic Seas Partnership projects. In her current role she focuses on UK and EU marine policy in areas such as fisheries, protected areas, planning and stakeholder engagement. Before joining WWF she was carried out doctoral research on deep-sea corals off the coasts of the UK.

Jean-Francois Minster has been Senior Vice President, Scientific Development of Total SA since October 1, 2006. Before that, Mr. Minster served as Chief Executive Officer of Ifremer and General Science Director of the French National Scientific Research Center. He was Directeur de l'Institut National des Sciences de l'Univers (INSU) of CNRS and Universities from 1996 to 2000 and was charged with developing science strategy and policy at CNRS in 2005. Mr. Minster is an Ecole Polytechnique Graduate with a doctorate in Geochemistry from the Institut de Physique du Globe in Paris.

Job van den Berg is a leading professional in Governance and Sustainability and Senior Strategy and Management Consultant for Royal Haskoning DHV in the Netherlands. He has extensive experience in guiding complex policy, planning and decision making processes relates to the practice of spatial master planning (both urban and rural), environmental and water management. He is an experienced moderator and facilitator of interdisciplinary teams and workshops. As a trainer and coach he co-developed training of process management skills and of the mastercircle methodology. Mastercircle enhances capabilities to cope with challenges in complex development and change.

Jonathan Williams is the CEO of Marine South East (MSE). He is a Chartered Mechanical Engineer (FIMechE, FIMarEST) with a doctorate in mechanical engineering and has specialist skills in consortium-building and definition of novel business models. He has 8 years' experience in marine and offshore industrial engineering and project management in the offshore energy industry, 4 years' experience in innovation policy development at a London-based think-tank, 10 years' experience leading an innovation management company operating at the university/business interface and 8 years' experience creating and leading Marine South East.

Kathrine Angell-Hansen is Director in RCN, Director of the JPI Oceans Secretariat and project coordinator of the CSA Oceans project. She has been responsible for the strategy development and innovation from major marine and maritime industries in Europe as well as covering these fields as a Deputy Director in RCN on research and innovation. She was a Deputy Director General on research in the Ministry of Fisheries and Coastal Affairs. She was seconded to DG MARE in the development of the EU maritime policy prior to her present position.

Jan Mees is the Director of the Flanders Marine Institute in Oostende since its establishment in 1999. He trained as a marine biologist at Ghent University, where he is also a part-time professor. An experienced marine ecologist, he is the author of more than fifty scientific publications, most in international journals with peer review. Jan Mees is Chair of the European Marine Board, a vice-chair of POGO and a member of several European and global oceanography and marine biodiversity networks (e.g. POGO, MARS, MarBEF, EurOcean).

Ricardo Serrão Santos, Member of the European Parliament is an internationally renowned deep-sea biologist and has authored more than 300 published works. From 2012-2014, he was President of EuroOcean and the EuroOcean Foundation, he is a former vice-Chair of the European Marine Board. He was Scientific coordinator, Azores University Centre and from 1997 – 2012 Director of the Department of Oceanography and Fisheries. From 2003-2011 he was Vice-Rector, Horta Campus, Autonomous University of the Azores.

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