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Report on the High-Level Ministerial and Scientific Event *A New Era of Blue Enlightenment*

12-14 July 2017
Lisbon, Portugal

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Report on the High-Level Ministerial and Scientific Event

A New Era of Blue Enlightenment

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Bioeconomy

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"The Sea, the great unifier, is man's only hope. Now, as never before, the old phrase has a literal meaning: we are all in the same boat."

As quoted by Commissioner Moedas during his welcoming speech during A New Era of Blue Enlightenment

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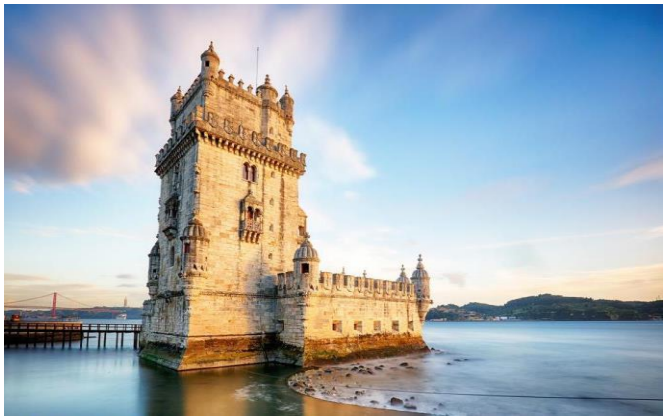
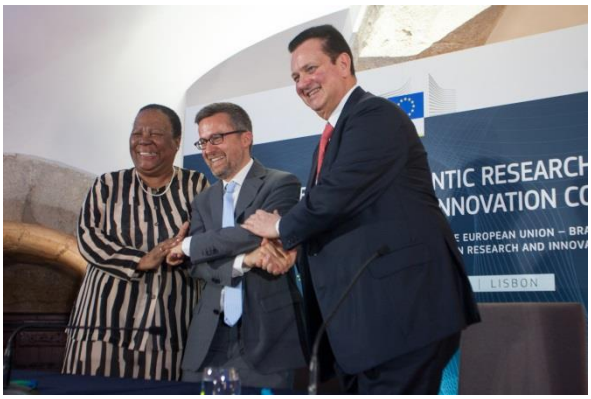
The Belém Statement on Atlantic Research and Innovation Cooperation



The signing of the *Belém Statement on Atlantic Research and Innovation Cooperation* took place in the Belém Tower on 13 July in the presence of His Excellency, Marcelo Rebelo de Sousa, President of the Republic of Portugal. The Belém Tower, which bears testimony to some of the first Atlantic voyages, and marks where many Portuguese explorers set sail to discover unknown parts of the world, proved a fitting setting to celebrate this Atlantic research and innovation cooperation.

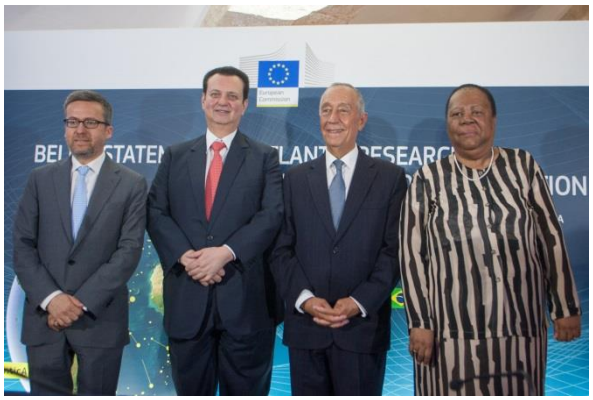
Co-signed by Carlos Moedas, Commissioner for Research, Science and Innovation on behalf of the European Union, with by Naledi Pandor, Minister of Science and Technology, South Africa and Gilberto Kassab, Minister of State for Science, Technology, Innovations and Communications, Brazil, the Belém Statement on Atlantic Research and Innovation Cooperation aims to achieve:

- Better monitoring and forecasting capacities;
- Improved safety at sea, human health and well-being;
- Sustainable use of marine resources;
- New and emerging technologies to service societal needs and new value chains; and
- Ocean-engaged citizens through enhanced ocean literacy activities.



This Statement builds on the *Joint Declaration of Intent between the European Commission and the Ministry of Science, Technology and Innovation of Brazil,* signed on 17 November 2015, as well as on the *Declaration of Intent between South Africa's Department of Science and Technology and the European Commission on Marine Research and Innovation Cooperation*, signed on 3 October 2016. It also takes account of the outcomes of the Atlantic Interactions Ministerial Summit and high-level Industry-Science-Government Dialogue

The Belém Statement will act as a guiding aspiration to advancing the vision of the European Union – Brazil – South Africa Atlantic Ocean Research and Innovation Cooperation, marking the *New Era of Blue Enlightenment.*





Belém Statement on

Atlantic Research and Innovation Cooperation

Conference in Lisbon on 13-14 July 2017

Oceans play a key role in developing national and regional economies, achieving the Sustainable Development Goals, and addressing climate change. The ongoing activities related to the Atlantic Ocean Research Alliance and deepening scientific cooperation in the South and Tropical Atlantic, and Southern Ocean are widely recognised.

The importance of research on the oceans underpins the strategic partnerships on marine research that Brazil and South Africa have with the European Union and many European partners.

On the basis of the Agreement on science and technological cooperation between the Republic of South Africa and the European Community (signed on 5 December 1996, which entered into force on 11 November 1997), the European Union and the Republic of South Africa have established close scientific collaboration, which is coordinated by the Joint Science and Technology Cooperation Committee established under this Agreement.

Equally, close scientific collaboration was established under the Agreement for scientific and technological cooperation between the European Community and the Federative Republic of Brazil (signed on 19 January 2004, which entered into force on 7 August 2007), as renewed in 2012 and coordinated by the Steering Committee on scientific and technical cooperation.

This Statement builds on the 'Joint Declaration of Intent between the European Commission and the Ministry of Science, Technology and Innovation of Brazil', signed on 17 November 2015, as well as on the 'Declaration of Intent between South Africa's Department of Science and Technology and the European Commission on Marine Research and Innovation Cooperation', signed on 3 October 2016. It also takes account of the outcomes of the Atlantic Interactions Ministerial Summit and high-level Industry-Science-Government Dialogue, held at Terceira (Azores) in April 2017.

We, the Commissioner for Research, Science and Innovation of the European Commission, on behalf of the European Union; the Minister of Science and Technology, on behalf of the Department of Science and Technology, a Government Department of the Republic of South Africa; and the Minister of State for Science, Technology, Innovations and Communications, on behalf of the Ministry of Science, Technology, Innovations and Communications of Brazil, would like to take further our collaborative scientific efforts in the Atlantic Ocean, and intend to sustainably cooperate on marine science, research and innovation aimed at:

Realising the mutual benefit that would accrue from linking research activities in the South Atlantic and Southern Ocean with those in the North Atlantic, and exploring synergies with other initiatives such as the interdisciplinary Atlantic Interactions Research Agenda and the AIR Centre; the Joint Programming Initiatives, the Strategic Forum for International Science and Technology Cooperation, the European Union's Earth Observation and Monitoring programme - Copernicus, and the Benguela

Current Commission;

Increasing operational efficiencies by optimising the appropriate use and sharing of research infrastructures, and access to and management of data and platforms; together with emerging methods of data science; and,

Further developing common understanding and deepening scientific knowledge of marine ecosystems and the interrelations between oceans and climate change, oceans and food, and oceans and energy systems, as well as the dynamics of the Atlantic Ocean and its interconnected Circulation Systems from Antarctica to the Arctic.

We also intend to:

- promote and facilitate human capital development and scientific exchange;
- provide a platform and opportunities for scientific and technological cooperation resulting in joint activities; and,
- encourage new models for cooperation on a coordinated and partnership-based approach to tackle the scientific and societal challenges of the Atlantic Ocean based on the principles of shared responsibility and mutual benefit in key common areas of interest such as:
  - ✓ Climate variability and ecosystem approaches;
  - ✓ Ocean observation (including seabed mapping), forecasting and monitoring processes and systems;
  - ✓ Food security, fisheries management, aquaculture and biodiversity;
  - ✓ Oceans technology (including for observation and renewable marine energy);
  - ✓ The effects of emerging pollutants; and,
  - ✓ Polar research (especially interconnections between the Atlantic, the Southern Ocean and Antarctica).

The intention is to achieve:

- Better monitoring and forecasting capacities;
- Improved safety at sea, human health and well-being;
- Sustainable use of marine resources;
- New and emerging technologies to service societal needs and new value chains; and,
- Ocean-engaged citizens through enhanced ocean literacy activities.

We intend to implement this Statement by:

- Sharing information on relevant activities by the partners of each side and identifying, whenever possible, complementarities;
- Engaging in joint priority setting for potential cooperation actions;
- Supporting the development of new science and innovation Atlantic Ocean cooperation platforms;
- Agreeing upon detailed activities and implementing or facilitating them jointly; and,
- Utilising existing structures in the context of bilateral science and technology cooperation (e.g. meetings of the South Africa - European Union Joint Science and Technology Cooperation Committee and the Brazil - European Union Steering Committee on scientific and technological cooperation) and other cooperation frameworks.

Relevant stakeholders and organisations from other countries of the Atlantic basin may be involved, as appropriate, in the implementation activities emerging from this cooperation.

This Statement is not designed or intended to create legal rights or obligations under international law and it has no financial implications.

Signed in Lisbon, on 13 July 2017, in 3 original copies in the English language and 3 original copies in the Portuguese language.

FOR THE EUROPEAN UNION	**FOR THE DEPARTMENT OF SCIENCE AND TECHNOLOGY, A GOVERNMENT DEPARTMENT OF THE REPUBLIC OF SOUTH AFRICA**	**FOR THE MINISTRY OF SCIENCE, TECHNOLOGY, INNOVATIONS AND COMMUNICATIONS OF THE FEDERATIVE REPUBLIC OF BRAZIL**
Carlos Moedas	Naledi Pandor	Gilberto Kassab
Commissioner for Research, Science and Innovation	Minister of Science and Technology	Minister of State for Science, Technology, Innovations and Communications

Executive Summary

On 12-14 July 2017, Carlos Moedas, Commissioner for Research, Science and Innovation, European Commission hosted a High-Level Ministerial and Scientific event *A New Era of Blue Enlightenment* in Lisbon, Portugal, launching the European Union – Brazil – South Africa Atlantic Ocean Research and Innovation Cooperation.

On that occasion, Commissioner Moedas *co-signed The Belém Statement on Atlantic Research and Innovation Cooperation* on behalf of the European Union with Minister Naledi Pandor, in charge of Science and Technology, South Africa, and Minister of State Gilberto Kassab, in charge of Science, Technology, Innovations and Communications, Brazil. The signing ceremony took place on 13 July in the Belém Tower in the presence of His Excellency, Marcelo Rebelo de Sousa, President of the Republic of Portugal. The Belém Statement will act as a guiding aspiration to advance the vision of the European Union – Brazil – South Africa Atlantic Ocean Research and Innovation Cooperation, marking A New Era of Blue Enlightenment.

Over 300 distinguished participants from 25 countries, including political and government leaders, representatives of governments, international organisations, foundations, industry, as well as leading academics, stakeholders and key multilateral actors gathered in Lisbon to take part in the conference. The programme of the event is attached as Annex 1.

Day one of the event was dedicated to advancing with Building an Atlantic Ocean Community: Project and Ideas Meeting Place. This comprised of 13 sessions organised in parallel throughout the day for focused discussions on areas including, amongst others: Aquaculture and Fisheries, Ocean Literacy, Climate and Ecosystem Approaches and Foundations. A summary of the parallel sessions is attached as Annex 2.

Day two of the event started with a plenary session where Commissioner Carlos Moedas delivered the opening address on the mission and purpose of this event. During his address, Commissioner Moedas announced that the European Commission will invest over EUR 60 million under Horizon 2020 from 2018-2019 in calls for proposals dedicated to research in the Atlantic Ocean. This funding will go towards assessing ecosystems, seafloor mapping and developing innovative aquaculture systems with the aim of having, by 2020, more than 500 research teams working from the Antarctica to the Artic.

Supportive statements were subsequently delivered by Naledi Pandor, Minister of Science and Technology, South Africa; Gilberto Kassab, Minister of State for Science, Technology, Innovations and Communications, Brazil; and Manuel Heitor, Minister of Science, Technology and Higher-Education, Portugal respectively, each expressing their thanks and outlining their ambitions for this initiative.

David Walton, Chief Scientist, Antarctic Circumnavigation Expedition (ACE), Switzerland delivered the keynote address, followed by the first roundtable discussions: *From Vision to Action, From Challenges to Opportunities* and *Engaging Foundations and the Private Sector.*
José Apolinárion, State Secretary for Fisheries, Portugal provided the concluding remarks, bringing the plenary session to a close.

The conference proceeded in the afternoon with panel discussions focused on *Enhancing Ocean Observations in the Atlantic: from Antarctica to the Arctic; Striving Synergies* and*; New Marine Value Chains for Atlantic Communities.* A total of 16 panellists delivered remarks across these three dimensions, with the panel discussions on *Enhancing Ocean Observations in the Atlantic: from Antarctica to the Arctic* and; *New Marine Value Chains for Atlantic Communities* beginning with a

project showcase; setting the scene for dynamic discussions. Day two was brought to a close with a Networking Cocktail Reception offered by Manuel Heitor, Minister of Science, Technology and Higher-Education, Portugal.

Day three, the final day of the event, followed a similar suit where the panel discussions *Atlantic Ocean Ecosystems Under Pressure* and*; The Connected Atlantic Ocean: Riding the Next Wave of Ocean Technology and Innovation* began with a project showcase. This was followed by *The Atlantic Ocean Entrepreneur-Ship,* a session dedicated to business opportunities in the Blue Economy.

The conference Rapporteurs; Peter Heffernan, Segen Estefen, and Gilbert Siko provided the key concluding messages from the roundtable discussions, highlighting the key implementation action areas identified in the Belém Statement were reflected in all of the sessions, with great ideas already emerging. It was evident in all the contributions that there is now an opportunity to move from bilateral international operations to truly multilateral campaign scale of actions in our All Atlantic sphere of mutually beneficial collaborations.

In their concluding remarks, Mr Bell, Mr Polejack, and Mr Auf der Heyde emphasised that we have to move quickly from aspiration to realisation, and suggested we now organise ourselves as we did with the *Galway Statement on Atlantic Ocean Cooperation* for the implementation of the *Belém Statement on Atlantic Research and Innovation Cooperation.*

Before bringing the event to a close, it was announced that the first meeting of the European Union – Brazil – South Africa Atlantic Ocean Research and Innovation Cooperation will take place at plenary level in the first quarter of 2018 to move forward with the implementation of the *Belém Statement on Atlantic Research and Innovation Cooperation*. In closing, Mr Polejack offered the city of Salvador, Bahia to host this meeting.

Introduction

"There is no Planet B"

Oceans play a key role in developing national and regional economies, achieving the Sustainable Development Goals, and addressing climate change. The ongoing activities related to the Atlantic Ocean Research Alliance and deepening scientific cooperation in the South and Tropical Atlantic, and Southern Ocean are widely recognised. The importance of research on the oceans underpins the strategic partnerships on marine research that the European Union and many European partners have with Brazil and South Africa.

The event, *A New Era of Blue Enlightenment* celebrated the launch of the European Union – Brazil – South Africa Atlantic Ocean Research and Innovation Cooperation. This initiative will take the collaborative scientific efforts in the Atlantic Ocean further in order to sustainably cooperate on marine science, research and innovation, and aims to achieve better monitoring and forecasting capacities; improved safety at sea, human health and well-being; sustainable use of marine resources; new and emerging technologies to service societal needs and new value chains; and ocean-engaged citizens through enhanced ocean literacy activities.

A key feature of the event saw Carlos Moedas, Commissioner for Research, Science and Innovation, European Commission co-sign, on behalf of the European Union, *The Belém Statement on Atlantic Research and Innovation Cooperation* with Naledi Pandor, Minister of Science and Technology, South Africa, and Gilberto Kassab, Minister of State for Science, Technology, Innovations and Communications, Brazil.
This Statement builds on the *Joint Declaration of Intent between the European Commission and the Ministry of Science, Technology and Innovation of Brazil*, signed on 17 November 2015, and the *Declaration of Intent between South Africa's Department of Science and Technology and the European Commission on Marine Research and Innovation Cooperation* signed on 3 October 2016. It also takes account of the outcomes of the Atlantic Interactions Ministerial Summit and high-level Industry-Science-Government Dialogue, held in Terceira in April 2017.

This report will now present a more detailed account of the proceedings of the 12-14 July 2017 and the recommendations and next steps for the implementation of the *Belém Statement on Atlantic Research and Innovation Cooperation.*

Plenary Session

The conference was moderated by Karen Coleman, award winning Irish broadcaster, journalist and author.

Welcome Speeches

Carlos Moedas, Commissioner for Research, Science and Innovation, European Commission officially opened the conference by welcoming guests to Lisbon; a setting which is so intertwined with the history of the Atlantic Ocean.

Commissioner Moedas stated that the three parties co-signing the *Belém Statement on Atlantic Research and Innovation Cooperation* have committed to forming a partnership to better understand and deepen scientific knowledge of marine ecosystems, focusing on areas of common interest, which include climate, ocean observation, food security, fisheries management, and ocean technology.

Commissioner Moedas highlighted that the Belém Statement has the potential to multiply, expecting the Alliance to become a global model inspiring others to follow in our footsteps in cooperation and open science.

Commissioner Moedas alluded to the incredibly vast challenges and opportunities of the Atlantic Ocean that alone, each country working separately cannot face. However, the Atlantic Ocean is not only about addressing the threats. The Belém Statement looks to the opportunities the Atlantic Ocean can provide and how international cooperation can realise this potential. Currently, we are only tapping the surface of the richness of the oceans; there are many potential protein sources which could be derived from the oceans and seas, which is especially important as the earth's population is expected to rise by 2 billion within the next thirty years.

The Belém Statement on Atlantic Research and Innovation Cooperation does not just represent good intentions; it comes with concrete actions. It demonstrates the clear steps being taken to build upon the *Galway Statement on Atlantic Ocean Cooperation*[1], signed in 2013. The Galway Statement formed a clear basis for a key partnership towards a healthy, productive, secure and resilient North Atlantic Ocean, and this work is now being complemented through the signing of the Belém Statement by linking the North to the South, towards an All Atlantic.

Commissioner Moedas announced that the European Commission will invest over EUR 60 million under Horizon 2020 from 2018-2019 in calls for proposals dedicated to research in the Atlantic. This funding will go towards assessing ecosystems, seafloor mapping and developing innovative aquaculture systems, with the aim of having, by 2020, more than 500 research teams working from the Antarctica to the Artic.

Commissioner Moedas expressed that this new partnership will also see the development of joint data centres where scientists can share research outcomes, creating a more open approach to

[1] https://ec.europa.eu/research/iscp/pdf/galway_statement_atlantic_ocean_cooperation.pdf

science, not only in the Atlantic Ocean, but for other ocean-related sciences throughout the world. The Belém Statement will continue to develop human capital on all sides of the Atlantic for future research, and as part of this cooperation, a number of "floating universities" will be established which will train young scientists and give opportunities to the next generation of marine researchers. Commissioner Moedas reminded that the signing of the Belém Statement marks a unique moment in international cooperation where we are saying loud and clear that to achieve something that is bigger than ourselves, we have to work together.

The full speech delivered by Commissioner Moedas is available to view here.

Naledi Pandor, Minister of Science and Technology, South Africa thanked her counterparts, Commissioner Carlos Moedas, Minister Kassab and Minister Heitor. She also emphasised how fortunate the South African science community are to be able to count on Commissioner Moedas' good will, friendship and support.

The South-South Framework for Scientific and Technical Cooperation in the South and Tropical Atlantic and the Southern Oceans[2], launched during *A New Era of Blue Enlightenment* is an important milestone for South Africa and also global cooperation in regards to our oceans. This Framework will not only act as a catalyst, strengthening regional cooperation between African and South American countries, but it will also boast a South-North research and innovation cooperation on the Atlantic Ocean system as a whole. The Framework is intended to complement the efforts of the Atlantic Ocean Research Alliance established between the European Union, Canada and the United States.

Minister Pandor stressed that she values the opportunity to cooperate, and in order to safeguard responsible custodianship of the Atlantic Ocean, we need to ensure its resources are managed and sustainably exploited for the benefit of all citizens. Minister Pandor conveyed that the Department of Science and Technology, South Africa will spare no effort to ensure the success of this partnership; which she believes to be a flagship for sustainable development, fully realising the vision and achieving the objectives of the Belém Statement. This work will also include the strengthening of existing partnerships that South Africa have with other African countries such as Angola and Namibia.

Minister Pandor underlined that South Africa is well equipped to contribute to this partnership and add value to the investments of our partners. South Africa's location at the southern tip of Africa, at the confluence of three ocean systems provides South Africa with a strategic, geographic advantage for the marine sciences, most notably in the study of earth systems science in South Africa, with their waters offering unique insights into climate variability and change. In order to maximise the potential impact of these activities, Minister Pandor outlined that the Department of Science and Technology in South Africa has decided to explore institutional improvements which may make their national landscape a much better landscape to respond to these opportunities, and in particular will explore the potential of establishing a national marine and Antarctic research institute which will consolidate major investments in this area of science.

Minister Pandor concluded that Sustainable Development Goal 14 commits us all to conserve and sustainably use the oceans, seas and marine resources, and that the Belém Statement puts the Sustainable Development commitments into practice, ensuring that the spirit of the Sustainable Development Goals will be realised through us, whilst ensuring that no one is left behind. In that regard, Minister Pandor urged that as we set about formulating a set of initiatives that will give effect

[2] https://www.atlanticresource.org/aora/sites/default/files/GalleryFiles/AtlanticFacts/South--South-Framework-for-Scientific-and-Technical-Cooperation-in-the-S....pdf

to the Belém Statement, ensuring no one is left behind. While our initial endeavour may appear to be one that falls within the natural and environmental sciences, we must look at trans-disciplinary activities that would incorporate a humanities and social sciences aspect, focusing on communities that are most impacted upon by the changes we see in our environment and the oceans, so that we ensure that as we do our work, we don't limit our conception of what must be done, but that we also put people at the forefront given our intention not to leave anyone behind - "that this wonderful global resource remains a resource for humanity".

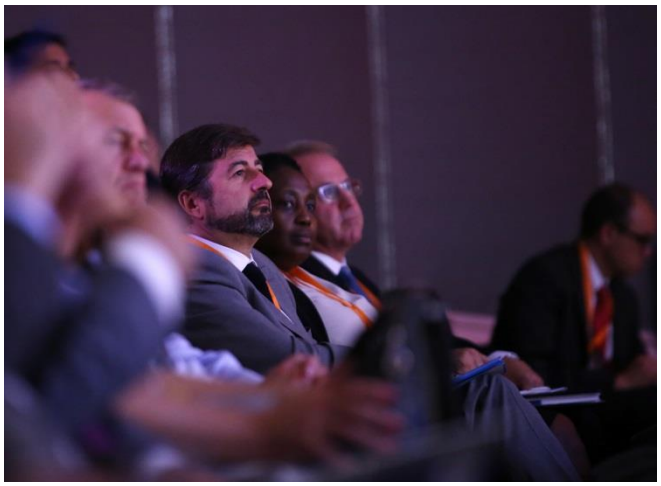
Gilberto Kassab, Minister of State for Science, Technology, Innovations and Communications, Brazil, conveyed that the Portuguese people have a historical identification with the vastness of the oceans. In addition to an extensive and consolidated cultural affinity between the two countries; the common language, a multitude of customs and exchanges, there is also an established trade agenda to expand, and broaden and exchange knowledge. Through this event we debate to contribute to a new era of adventure.

Now in the age of knowledge, Minister Kassab urged us to work together to understand the vastness of the Ocean; to deepen the scientific knowledge of marine ecosystems, the relationships between oceans and climate change, and the particular dynamics of the Atlantic Ocean. To understand better, to deepen instruments that are related to the fishing industry. Minister Kassab emphasised and welcomed that this effort involves the European Union, its Member States, as well as South Africa.

Minister Kassab outlined that the South-South Framework for Scientific and Technical Cooperation in the South and Tropical Atlantic and the Southern Oceans developed in partnership by South Africa's Department of Science and Technology and Brazil's Ministry of Science, Technology, Innovations and Communications is a joint Atlantic assessment Plan focusing on areas of climate variability, ecosystems and living and non-living resources.

Minister Kassab highlighted two actions currently being undertaken in Brazil within the scope of the Ocean, Antarctic and Geosciences Coordination as two examples to affirm their total availability in information exchange and articulated action:

1. Brazil will explore and collect a broad set of information on the Atlantic with the use of hydro-oceanographic vessels, such as the *Vital de Oliveira*; a high-tech research vessel that is undertaking a large mapping of different parameters in segments of the Atlantic Ocean, contributing to a plethora of scientific research.
2. Brazil are rebuilding the Brazilian Antarctic base, *Comandante Ferraz*, which will be an important research centre for the most different areas with an effective impact on Brazilian and international science, and will assess aspects such as climate change and biodiversity.



Minister Kassab expressed that in general, effective international cooperation and the articulation of forces between different countries and the circulation of experiences and knowledge is a benefit to citizens, and something that must be highlighted in today's world. Therefore, this coordinated action with the European Union, Brazil and South Africa must be highly valued and highly celebrated.

Minister Kassab closed by reiterating that we should work together, increase our potential and make efforts in search of scientific knowledge and development.

Manuel Heitor, Minister of Science, Technology and Higher-Education, Portugal underlined that the Belém Statement on Atlantic Research and Innovation Cooperation is a turning point in Atlantic relations. He thanked Commissioner Moedas for his pragmatism and vision for making this happen following the signing of the Galway Statement in May 2013, and acknowledged Portugal's deep commitment to being engaged with the process.

Minister Heitor outlined three ideas which require a collective action to move forward:
Looking at the unknown: The Belém Statement should be a time to bring together researchers to look into the unknown through scientific research. Europe needs more scientists to look across the Atlantic Ocean and this vision is shared with South Africa and Brazil. By enlightening people for the values of scientific research and for bringing research excellence towards the unknown is something that should be conveyed through the Belém Statement.

Tolerance: In the Atlantic, we need to better understand how we can bring to the centre those who have been in the margins of our society. The Belém Statement can be a turning point for a knowledge based economy, based on more research, and also on human values. We need to better integrate deep scientific and engineering sciences with the social sciences and humanities, but more than that we need to open-up our young generations to the culture of questioning to promote scientific culture.

Openness: We need a Europe which is open to the world and that can only be done through open science and through open innovation. Again, this is the turning point by which the Belém Statement should be referenced in the coming years to make science more open, to make the scientific world more tolerant to human-kind, and to make sure scientific research is orientated towards the unknown.

Minister Heitor outlined that Portugal has launched a bottom-up approach to bring researchers together with industry with a dialogue towards better understanding interactions. By doing this, Portugal has thought about how to couple different disciplines of scientific knowledge and different technologies, how can they better integrate space technologies with climate science, with ocean research and more with data science. With all the data we can generate, there is a need to better integrate and better manage cooperation of scientific research infrastructures across the Atlantic Ocean. That is the idea behind building Atlantic Infrastructures and Scientific sites across the north

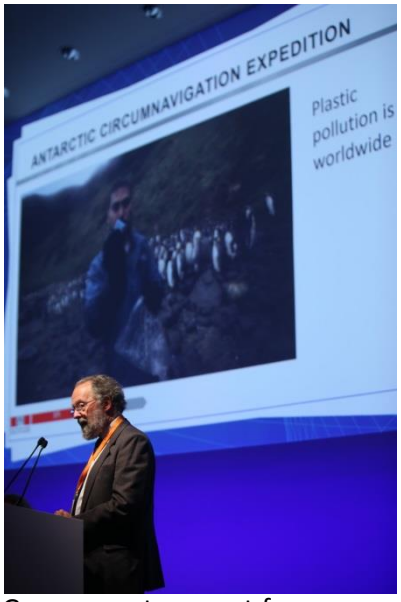
and south Atlantic, building on the different infrastructures that the Azores has to offer and its unique location and coupling that with scientists across the world in the Atlantic and beyond.

Minister Heitor announced plans to build an inter-governmental organisation by next November which will be a practical contribution to the Belém Statement. Minister Heitor closed with reaffirming that his belief in the commitments of the Belém Statement, which he believes is a turning point in Atlantic relations.

Keynote Speech: David Walton, Chief Scientist, Antarctic Circumnavigation Expedition (ACE), Switzerland

The ACE cruise as an example of new marine science initiatives looking at the questions of global importance

Mr Walton gave an informative keynote speech on the Antarctic Circumnavigation Expedition he was recently part of as Chief Scientist. This expedition was truly international with 159 scientists on-board from 23 countries taking part to carry out terrestrial, marine and atmospheric work all on one cruise.



22 projects participated on this cruise which were selected by an international team of scientists from 100 projects that were put forward in an international call. The cruise visited many places in and around the Antarctic which are very rarely visited by research vessels, and so extended the Antarctic database significantly.

One of the key commitments of the approach of the cruise was a promise to education. They sought to extend the experience to young people; empowering the next generation of marine researchers. In doing this they ran a maritime university southbound from Bremerhaven to Cape Town, down through the Atlantic. There were 49 Masters and Post-Doctoral students on-board; giving them a sense of what it is like to work on a Research Vessel.

Government support for an expedition of this sort is highly valuable as it helps with the organisation and with getting over boundaries. In doing research at sea, it is not only the weather that you must compete with but you also have the competing jurisdictions of many different authorities, and the need to cross cultures, cross languages and cross disciplines. It is a melting pot for the future and is an important way of understanding how 21st century science should be done.

What they hoped to achieve with this expedition was to build bridges between science areas, languages and cultures, and gain a more holistic view of the processes in and around the Southern Ocean. The expedition was funded through a mixed funding system which Mr Walton indicated could be a model to use in times of austerity for future funding. He asked participants to think about the oceans as one major facility with many different parts which need to be understood separately and together.

Mr Walton emphasised that the Antarctic is a key element to the earths system and its responses matter to everyone worldwide. International collaboration across cultures and across disciplines is the only way we will answer the big questions on global change, sustainable management of fisheries and on marine pollution and sea-level rise.

From Vision to Action, From Challenges to Opportunities

João Aguiar Machado, Director-General for Maritime Affairs and Fisheries, European Commission stressed that the oceans deserve better governance, and for that the European Union is in the leading role. However, much still needs to be done to unleash the full potential of the seas and oceans. Mr Machado insisted that we must re-double our efforts to further deepen scientific knowledge and boost innovation to invest in new technologies and improve coordination. In this regard, the Belém Statement is a landmark extending this collaboration and coordination on research knowledge and innovation to the Atlantic Ocean.

Mr Machado outlined the EU's strategy for marine and maritime research which envisages how science can support the maritime economy in the sustainable manner, whilst highlighting the importance of integration between established disciplines in order to reinforce excellence in science to tackle multiple sea-related issues, and calls also for strong international scientific cooperation. Mr Machado expressed that this can only be realised by stepping-up our efforts on both sides of the Atlantic, addressing common challenges together and reaching critical mass on issues that cannot be met by any country alone.

Mr Machado highlighted that the Belém Statement fits fully in-line with the Joint Communication on International Ocean Governance which aims at strengthening international cooperation on ocean research and worldwide data sharing accessible to everybody, as one of its three main priorities.

Mr Machado announced that the European Union will host the 4th high-level Our Ocean Conference in Malta on 5-6 October 2017 as part of the continued engagement to safe, secure, clean and sustainably managed oceans. This event in Malta will complement the commitments made in New York in June 2017 at the United Nations Conference on Sustainable Development Goal 14, but is also broader in scope as it embraces all ocean-related issues including science, research and innovation.

Thomas Auf der Heyde, Deputy Director-General: Research Development and Support, Department of Science and Technology, South Africa emphasised the importance of the Belém Statement and the South-South Framework for Scientific and Technical Cooperation in the South and Tropical Atlantic and the Southern Oceans respectively as they now provide a contemporary strategic framework for organising this work. The focus on implementing these frameworks must be to reflect on the existing activities and their alignment with the frameworks, and stated that links exist to all major EU marine nations, and these must form the basis of future work in implementing the Belém Statement.

Mr Auf der Heyde indicated that we must build on these national activities in pursuit of our joint trilateral desire to deepen research on the South Atlantic. Consequently, he stated that an important aspect of implementing the Belém Statement in South Africa will be for the Department of Science and Technology to engage its sister departments to enhance inter-governmental strategic and operational alignment, and ensure institutional synergies. He alluded to the fact that in the short-to-medium term, much of South Africa's contribution to this joint work will come from enhancing economies of scale in their various programmes and research platforms, improved strategic alignment and re-prioritisation within these frameworks, and will use their bilateral relations with these countries to enhance the alignment of joint research in Southern Africa with the South-South Framework for Scientific and Technical Cooperation in the South and Tropical Atlantic and the Southern Oceans, and therefore with the Belém Statement.

Mr Auf der Heyde called for support at political and diplomatic level if the ambitions of the Belém Statement and the South-South Framework for Scientific and Technical Cooperation in the South and

Tropical Atlantic and the Southern Oceans are to be realised, as many marine research cooperation activities straddle international borders, and thus often require formal, diplomatic arrangements secured around agreed protocol to enable the work to proceed. This is especially so for the future work of the Belém Statement, particularly on ocean observing systems. While until now, much of the effort in developing these systems has been invested in developing the technological capacity and best practices basis for routine observation. As these mature, political and diplomatic constraints may begin to emerge as key bottlenecks in rolling out an Atlantic-wide system.

In the meantime, he outlined that we will build on the significant momentum which has been established through the joint efforts of the European Union, Brazil and South Africa to renew the Atlantic research portfolio, assess its alignment with the two frameworks and the agenda for the Atlantic Ocean Research Alliance in order to identify strategic opportunities to maximise sustainably the benefits we all derive from the Atlantic in scientific, cultural and socio-economic terms.

Félix García Lausín, Director of the Iberoamerican Knowledge Space, Iberoamerican General Secretariat (SEGIB), Spain highlighted that the Ibero American community is a community embraced and united by the oceans; the Atlantic Ocean and the Pacific Ocean. In 2014, the Heads of State and Governments of Ibero American established three priority areas for their regional cooperation: culture, knowledge and social cohesion. The Ibero American Knowledge Area has been oriented since then to reach four strategic goals: 1) related to academic mobility; 2) strengthening national science, technology and innovation systems; 3) talent circulation; and 4) knowledge, productivity and competitiveness. For all these goals, the Belém Statement is relevant because of what it represents in terms of political priorities for the countries that are involved. As it states in the Belém Statement, "Oceans play a key role in developing national and regional economies contributing to the achievement of the Sustainable Development Goals and addressing climate change". Mr García Lausín stressed that we have to work together and expressed the desire of the Secretariat Ibero American to be involved with the achievements of the objectives of the Belém Statement, and are ready to contribute with the potential of the Ibero American Knowledge Area.

John Bell, Director of Bioeconomy, Directorate-General for Research and Innovation, European Commission conveyed that we are facing a perfect storm; we are facing enormous issues for three billion people on food and nutrition security, on sea-level rise, of problems with heating and cooling, the food chain, the feed chain, the ecosystems, and energy.

Mr Bell highlighted that 2015 will go down as a new moment of enlightenment when there was a realisation that we are not at the centre of the world, we are at the service of the world. A planetary enlightenment has taken place, and we need to find our place in that and if we are going to make this planet a new and sustainable place for all; we need to put the oceans at the centre. Mr Bell stressed that there will not be a sustainable planet unless the oceans are sustainable, and that is where we are starting on this great journey, this *New Era of Blue Enlightenment*.

Mr Bell stated that the Atlantic is not just there to be observed and understood, it is something where we have to work together to make its significance and meaning, and to bring the needs of the ocean into the life of not just science but of public policy and of people themselves. We need to turn what we call this All Atlantic Ocean Research Alliance and Belém Statement into an Atlantic Alliance for All. The commitment we have made and the work that we do will benefit those who are silent in this but who are most affected living and depending on the oceans in a very profound way.

Mr Bell expressed that this is also a moment to move from aspiration to realisation; it is something that will require a great degree of humility from all of us as the task ahead is enormous, requiring a great degree of practical operation.

Mr Bell confirmed that a way of working together will be put into place based on past experience, and that we will depend on all of you to make this happen.

The South-South Framework for Scientific and Technical Cooperation in the South and Tropical Atlantic and the Southern Oceans developed by South Africa's Department of Science and Technology and Brazil's Ministry of Science, Technology, Innovations and Communications was also launched during *A New Era of Blue Enlightenment*.

The Framework outlines the importance of collaborative scientific exploration of these Southern Oceans to the science of global environmental and climate change, to understanding and enhancing the oceans' relationship to national and regional socio-economic development, to technological development and innovation, and to the formulation of policy for the region and the role of science diplomacy.

Engaging Foundations and the Private Sector

Panellists:

1. ***Tiago Pitta e Cunha, Chief Executive Officer, Oceano Azul Foundation, Portugal***
2. ***André Abreu, Head for Environment and Climate, Tara Expeditions, France***
3. ***Michael B. Jones, President, The Maritime Alliance, United States of America***
4. ***Pedro Escudero, Chief Executive Officer, Buggy Power, Portugal***
5. ***Roberto Marcondes, Adjunct Coordinator for Research Collaborations, The São Paulo Research Foundation, FAPESP, Brazil***

This session focused on engaging foundations, the private sector and civil society in helping to implement the vision of the Belém Statement.

Tiago Pitta e Cunha, Chief Executive Officer, Oceano Azul Foundation, Portugal outlined a concrete step to increasing ocean literacy should be to start investing in educating the next generation. Mr Pitta e Cunha highlighted the Oceano Azul Foundation's project *Blue Generation* which focuses on the awareness of school children, and through awareness are mobilised to grow with different relationships with nature, the planet and the oceans.

Mr Pitta e Cunha outlined the Foundations interest in developing public campaigns to bring some of the most difficult ocean challenges to the attention of the public. The Foundation cannot invest in marine research, but they can invest in bridging the huge gap that exists between what scientists know and what the public knows. An example highlighted was the recent study carried out in the United Kingdom (U.K.) by the Gulbenkian Foundation on what the U.K.'s public know and what scientists in the U.K. know about the ocean, and it was found that the gap is very broad. Mr Pitta e Cunha stated that it is through communication and studies so that gaps such as these can be addressed.

André Abreu, Head for Environment and Climate, Tara Expeditions, France outlined that knowledge should be communicated to those without scientific knowhow. The key is to associate capacity building, transfer of technology and outreach tools. Scientists need time to work after one expedition as it takes years to complete analysis on a sampling job. Meanwhile, there is a need to put PhD students and postdocs into these labs and to use this dynamic to communicate with the young, kids, and civil society. Tara Oceans have built the biggest data set of ocean biodiversity with more than 200 scientists working together.

Mr Abreu noted that we are at a critical moment for technological advances to go through policies with these new capacities. With these gaps we are funding postdoc students with €2 Mil Euro from Brazil, Chile, Argentina and African countries and Mr Abreu announced this concrete commitment during the event is to work more closely with Brazilian and South African institutes and researchers to invite them to explore this data set, this knowhow that was developed which is innovate move to disciplinary programme be complementary to all the ocean observations also the advances we have in ocean observations with robots, ROVs, new floats, new ARGO floats – it is a big moment for the oceans. We need lights of science to the South Atlantic – lots of work to do especially with impacts of climate change and anthropogenic. He noted that Tara Expeditions are trying to engage Universities, and more officially with the University of Cape Town, and announced they are organising a workshop in Chile this year and Brazil next year.

Roberto Marcondes, Adjunct Coordinator for Research Collaborations, The São Paulo Research Foundation, FAPESP, Brazil stressed that researchers should start talking to their colleagues that are

interested in initiatives that are foreseen in the Belém Statement so that they start engaging new projects. He outlined that FAPESP also fund research in companies and imminent technology transfer (much work is focused on innovation).

Mr Marcondes also stated that companies receiving funding from FAPESP should collaborate with other companies around the world as researchers do. He stated that we have the problems (this is a challenge), now we need the good ideas. How to engage young people or people who are involved in the research field to take advantage of those problems, take advantage of challenges so we can go from challenges to opportunities. Mr Marcondes alluded to the number of agreements FAPESP has with big institutions: public institutions or private institutions, for example with NSF, FCT, E.Comm, e.g. Microsoft.

Michael B. Jones, President, The Maritime Alliance, United States of America stressed the need to bring society in to understand what is going on. Young people need to understand but it is also about showing them the jobs that exist. There is a wide breadth of jobs and new industries that the oceans have to offer, but there is currently no place to showcase these opportunities. The Maritime Alliance is launching a website containing all this information which they will announce during the Our Oceans Conference in Malta in October and they hope to work with the clusters to create short videos in multiple languages.

Mr Jones also underlined that capacity building is usually unilateral, so the triple helix need to come together to learn what one another are doing; so not just learning singularly about what we are doing but to take a holistic approach to cluster building. It is through regional clusters that we can do something meaningful.

Pedro Escudero, Chief Executive Officer, Buggy Power, Portugal explained the many benefits of marine microorganisms products that his company produce which thanks to the regional government of Madeira islands, have allowed them to develop a unique project with an exportable model to export worldwide.

Mr Escudero explained how these micro algae products are an example of how micro algae can be part of our nutrition and give the benefits of the fatty acids and chemical elements. He stated that Buggy Power wish to share their experience and the benefits of taking care of the oceans to avoid excessive capture of fish, plankton and to allow the oceans to remain biologically viable.

Mr Escudero stated that Buggy Power is open to cooperation with several entities in research centres to expand their knowledge. Mr Escudero extended the invitation to scientists and researchers from Brazil and South Africa including students and post graduates who have an interest in the production of micro algae with high standards and security food standards, as Buggy Power intend to expand internationally. They are currently developing their technology in the Macaronesia region; the heart of the vertebrae of the Atlantic from north to south, and close to all these countries within the context of the Belém Statement to share this knowledge and increase the potential and use of microorganisms for the benefit of society. Mr Escudero also noted that they collaborate with several foundations in Portugal as well as internationally.

José Apolinário, State Secretary for Fisheries, Portugal provided the closing remarks of the morning plenary session. State Secretary Apolinário apologised for Minister Vitorino who was scheduled to participate.

State Secretary Apolinário stated that the theme which links us all is a challenging theme because the ocean is the link between all the countries which are present - a social, economic and an environmental continuous link. The marine environment is one of the most important links for the future for the development of our countries. The promotion of the sea economy and its exploitation is only possible with a strong cooperation of the Atlantic countries at the level of sharing knowledge, and technical resources in a win-win common economy. The achievement of the efforts of all of us will be bigger than the sum of all parts. But even if this is challenging, it is also important that it becomes a central governmental action for the seas in Portugal.

The responsibility included in a sustainable consciousness and based on scientific knowledge in innovation and technology development. Portugal is assuming a clear bet on the Blue Growth orientated to the preservation, sustainability of the resources of future sustainability of our planet is at stake. State Secretary Apolinário highlighted that 2017 is the year of the sea. At the start of the year, the European Union, under the Maltese Presidency saw an oceans dedicated period where Member States reiterated their support to the environment and Blue Growth. At international level, during the first United Nations conference dedicated to the oceans in June 2017 in New York, the Portuguese Minister for Seas led the Portuguese delegation and where the European Union and Portugal had very active participation.

Technical Sessions

Enhancing Ocean Observations in the Atlantic: from Antarctica to the Arctic

Panellists:

1. ***Gilles Bessero, Director, International Hydrographic Organisation, Monaco***
2. ***Pierre Yves Le Traon, Scientific Director, Mercator Ocean, France***
3. ***Emily Smail, Scientific Coordinator, GEO Blue Planet Initiative***
4. ***Paulo Nobre, National Institute for Space Research, Brazil***
5. ***Alakendra Roychoudhury , Geotraces, Stellenbosch University, South Africa***

Rapporteurs:

Sabrina Speich, Ecole normale supérieure, France
Leticia Coltrin, State University of Rio de Janeiro, Brazil
Issufo Halo, Cape Peninsula University of Technology, South Africa

The ocean impacts the climate and weather, provides living and mineral resources and is the place of many economic activities. At the same time, it changes due to changes in climate, plate tectonics and stressors. Our future depends on the sustainability of the maritime economic activities, the changes of the marine ecosystem and its resilience. Furthermore, good forecasting of sea level, weather and tsunamis is essential to protect human activities and properties. Therefore, a performant fully integrated ocean observation system from Antarctica to the Arctic and good services are needed.

What are the essential components of an Atlantic wide (including polar seas) integrated and performing ocean observation system? What is missing for monitoring and predicting the impact of stressors and changes?

All panellists have listed essential points that an Atlantic integrated and performing ocean observation system would include:

- In situ data collection systems (open ocean and coastal)
- Remote sensing data collection systems
- A platform for integrated in situ and remote sensing data
- Data assimilation supporting forecasting and prediction efforts
- Data products and information systems
- New data, especially on tracers that link physics (ocean circulation) with biology
- Seafloor (bathymetry) and deep ocean monitoring - this special topic was the extensively discussed during the "live" panel discussion
- Developing further ocean reanalyses, analyses and forecasts both for physics and biogeochemistry

Other important topics:

- The Caribbean is lacking in terms of infrastructure and capacity building for near-real time ocean observations.

- The Copernicus Marine Environment Monitoring Service implemented by Mercator Ocean under a delegation agreement with the EU integrates ocean monitoring based on satellite, in-situ observations and models.
- A major issue is to improve (e.g. coastal ocean, deep ocean, biogeochemical observations) and sustain the upstream in-situ observing systems.

How can we map the Atlantic and its connections to the polar seas within 5 years with high resolution? Or will that remain utopia?

Panellists highlighted that for many of the monitoring and observation variables listed above, 5 years is an unrealistic deadline. Design of suitable observing systems must be based on an integrated approach taking into account synergies/complementarities between in-situ and satellite observations and models. The examples below illustrate the present difficulty in reaching this 5-year goal:

Biogeochemistry: From this point of view, it is needed a coordinated (not competitive) effort by countries involved in this Statement. A good example would be to look at existing programmes such as GEOTRACES, SOLAS, SOCAT, GLODAP, that are all "multi-country" and are slowly but surely making a concerted impact in enhancing the dataset for various biogeochemistry variables. Coordination with such existing programs would be highly beneficial.

Deep Ocean and Sea Floor Mapping: A difficult task for the coming 5 years, especially if coastal areas are included (depths < 200 m). At present there are a number of initiatives registered by the IHO at the recent UN Ocean Conference (June 2017, USA), e.g. Seabed 2030 project (supported by the Nippon Foundation through the GEBCO programme). A big unknown is how much data has already been collected but has not yet been made available.

However, one of the solutions that may enhance the "connections" is to increase the use of synthetic aperture radars (SAR), complemented by other high-resolution data sets (both satellite and in situ, coupled with models and data assimilation).

Data collected are only fully useful if they are well curated, findable and accessible, preferably also interoperable. How can new technologies, for example cloud technologies, help to use and valorise different data? Are there other ways one good go with the huge amounts of data, which in addition are very diverse (from physical parameters to genomics)?

With the large amounts of data available, the model of analysing data by downloading it from a server becomes intractable. Moving forward, it will be necessary to move towards a model of processing and visualising data on the cloud. Public-private partnerships for the hosting of data on the cloud and developing integrated tools (here we are talking about big-data technology) for data processing will be useful. Here goes an example of two steps that could be adopted for using platforms such as clouds:

a) Standardised data submission;
b) Quality control for specific subjects, trans-disciplinary management of data.

What do you see as next opportunities and necessary steps? What are the technologies that are still needed? What parameters have to be looked at locally in addition to those monitored globally?

To this question, almost all panellists have named "new and lower cost technologies". These would be simple to maintain, to operate, and would be helpful for expanded and sustained observations. Of course there should be an optimum use of the available technology and observation systems.

Here are a few examples of new technologies and parameters that should be taken into account globally:

- Parameters related to water quality need to be looked at globally as well as those related to biodiversity.
- Technologies that would reduce the need for ship based observations. (e.g. biogeochemistry - and that also applies to water quality).
- Time variability of the seabed in coastal areas.
- New miniaturised and cheaper ocean sensors to be embarked on autonomous platforms (e.g. Argo, gliders) or ships of opportunity. This implies in more capacity building as people are needed to operate, calibrate and maintain these devices.

What do we need to know that we don't yet know? Where is the big "dark" gap that needs to be filled?

All panellists agreed that there is a list of in-situ observing variables needed to improve our knowledge. Hand in hand to this, sustainability for the in-situ observing systems remains a big challenge.

Here is a list of the most cited "unknowns" during the discussion:

- Deep ocean observations are lacking and is a data gap. Near real-time data in coastal areas as well as integrated data sets are also lacking in some areas of the Atlantic.
- Biogeochemistry: tracers knowledge is still limited compared to, for instance, macro-nutrients distribution and cycling. These are highly important to estimate appropriate fluxes and ocean circulation (thus climate-change issues).
- Coastal areas, especially those exposed to risks such as tsunamis, storms, oil spills, but also for safety (navigation, cables) and for marine and coastal spatial management.
- Lack of data still hinders good model (coupled models, Earth Systems models) forecasts of **a.** heat budgets for the Western equatorial Atlantic; **b.** remote effects of continental convection and associated atmospheric/oceanic circulation; full knowledge of the Atlantic Meridional Overturning Circulation (AMOC); **c.** rates of fresh water input from the Arctic and from Greenland, but also for the tropical Atlantic Ocean (e.g. Amazon, Congo, Orinoco, etc).

What can be done to improve training, human capacity building and incentivise mobility of researchers?

Investing in human resources (i.e. capacity building) is a key aspect to achieve all the goals proposed by the Belém Statement and discussed here in this panel session.

At present, we have training, education and researchers mobility are done out of individual, temporally finite research projects. Our next generation of marine scientists, engineers and technicians need training and ocean literacy. Here are a few suggestions made by the panellists:

- Funding for early career scientists, beyond the post-doc stage, is crucial for sustained development of human capacity.
- Capacity building could also be tailored based on skill gaps.
- Long term funding process (from the involved countries resources destined to study climate change, mitigation, adaptation, and the observation science needed to achieve this.).
- Reinforce EU instruments (e.g Marie Curie actions such as Innovative and Training actions) and develop specific/targeted actions (e.g. CMEMS training and user workshops, GODAE OceanView Summer Schools).

Striving Synergies

Panellists:

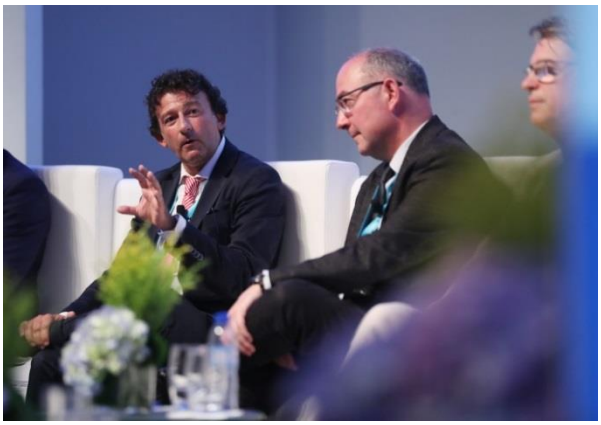
1. ***Dirk Schories, Project Manager, Project Management Agency for the Federal Ministry of Education and Research, Juelich Research Centre, Germany***
2. ***Gilles Lericolais, Director of European and International Affairs, IFREMER, France***
3. ***Pablo Abaunza, Deputy Director, Spanish Institute of Oceanography, Spain***
4. ***Pier Francesco Moretti, CNR, Italy***
5. ***Paulo Ferrão, President of the Board of Directors, FCT – Fundação para a Ciência e a, Portugal***
6. ***Glenn Nolan, Secretary General, European Global Ocean Observing System (EOOS), Belgium***

Rapporteur:

Laura Mc Donagh, European Commission

This session explored the theme of creating synergies, greater networks, greater connections and collaborations. It is very much linked to the Belém Statement on Atlantic Research and Innovation Cooperation as there is a direct reference to synergies in the Statement itself:

'Realising the mutual benefit that would accrue from linking research activities in the South Atlantic and Southern Ocean with those in the North Atlantic, and exploring synergies with other initiatives such as the Interdisciplinary Atlantic Interactions Research Agenda and the AIR Centre; the Joint Programming Initiatives, the Strategic Forum for International Science and Technology Cooperation, the European Union's Earth Observation and Monitoring programme – Copernicus, and the Benguela Current Commission;



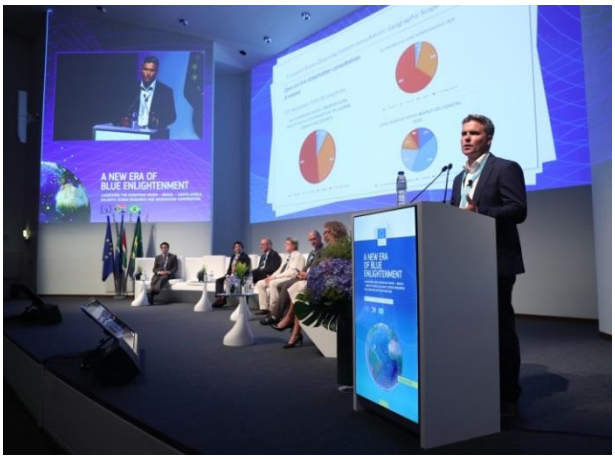
Capacity development is taking part in nearly every programme, but at a certain moment you have to analyse the impact and see the outputs. There is a need for an evaluation process to measure the output and avoid especially that we are not doubling our activities. We really need to combine our efforts, need a good evaluation system for capacity development and we really have to make a platform of how many activities we are actually elaborating in capacity development.

The panellists agreed that a lot of work has been done in the framework of bilateral and trilateral cooperation, which should continue under the implementation of the Belém Statement; the Belém Statement should have a federating role. Though we now need to go from bilateral to multilateral, get the political buy in and to leave no one behind.

This European Union – Brazil – South Africa cooperation is a result of the Galway Statement as well. This is how far we have come in the last several years, and it is obvious that there is a need to work together as we have already started to see the results of working together.

There is a need coming from scientists for equipment and the use of infrastructures. As Infrastructures are very expensive, there is a need to explore the option of Joint Programming and more facilities to answer the questions that society is asking.

There are challenges in terms of having human capacity to make the measurements, infrastructure requirements. The questions was raised as to the countries bordering the south Atlantic that don't have any infrastructure, how do we work with them to enhance the infrastructures that are required to observe the oceans and manage the resources that are in the oceans.



Heterogeneity between the well developed and the under developed blocks needs to addressed. Related to that is the recognition at national level that marine scientific research is important, as it underpins the sustainable development of the country and that embedded in government thinking, it is then that funding and all the different enabling mechanisms can go from there. Through demonstration as demonstration is relevant as it is evidence. There is however a long path from evidence to knowledge.

What is important is to listen to scientists, as sometimes policy makers forget to ask the scientists what they want, and scientists can have a problem with communication; the public don't trust them enough and politicians follow the example. If we collaborate all together and arrive at something sure and communicate and outreach what we have done – this is something that can be really valuable.

Interconnections are very important and to be open to any connection. It would be clever to synthesise all these connections and follow with a specific proposal and projects to society etc. We have been focused on monitoring the physical systems, but not so much the monitoring of marine life – this is one of the gaps.

There is an incomplete understanding of the level of activity that is taking place. There are many bilateral and trilateral activities ongoing, and a first step would be to get a registry of all existing bilateral, build from there and reduce duplication, if any.

New Marine Value Chains for Atlantic Communities

Panellists:

1. ***Courtney Hough, European Aquaculture Technology and Innovation Platform***
2. ***Øyvind Fylling-Jensen, Managing Director, NOFIMA***
3. ***Wagner Valenti, Universidade Estadual de São Paulo, Brazil***
4. ***Fabio Hazin, Federal Rural University of Pernambuco, Brazil***
5. ***Belemane Semoli, Department of Agriculture, Forestry and Fisheries, South Africa***

Rapporteurs:

Jacques Fuchs, Retired Official, European Commission
Rodrigo Roubach, Ministry of Science, Technology, Innovations and Communications – MCTIC, Brazil
Mthuthuzeli Gulekana, Department of Environmental Affairs, SA Oceans Ecosystems Research, South Africa

In order to stimulate the discussion, the moderator invited the speakers to answer four important questions regarding new marine value chains for Atlantic Communities:

1. How can we make better use of the biomass that is wasted?

The panellists all agreed that discard fish a very complex issue. They underlined the following points:

- Discards should not be considered as 'waste' but as 'a value' (O. F. Fylling-Jensen (NOFIMA – Norway)
- Aquaculture is almost producing 'No waste' (C. Hough, EATIP, Belgium)
- Reducing discards in fisheries is a priority and could take different forms:
    - Education young generation to limit waste and close work with the industry (O. F. Fylling-Jensen (NOFIMA – Norway).
    - Developing and improving selective gears (Fabio Hazin, University Pernambuco, Brazil).
    - Implementing discards ban regulation in the EU including monitoring and control.
    - Improving processing on board (O. F. Fylling-Jensen (NOFIMA – Norway)
    - Adding value to discards by extracting new molecules, new compounds (W. Valenti, University of Pernambuco, Brazil) (deep shrimp fisheries extract 5 to 10kg bycatch for 1 kg shrimp).

2. How to develop aquaculture in a sustainable way?

Aquaculture is the most feed-efficient food production sector but still suffers bad public image. Improvement can be achieved through more transparency, use of social Media (C. Hough, EATIP).

Key elements to improve sustainability identified by the panels are:

- Better feed (the incorporation of seaweed in the diet may be an option) – C. Hough, EATIP.
- Better nutritional value and quality of aquaculture products.
- Fight again diseases and development of vaccines (B. Semoli – DAFF – South Africa).

- Moving towards more integrated aquaculture combining the farming of species complementing eachothers (W. Valenti, University Pernambuco, Brazil)
- Better regulation (access to licences is a major issue in the EU - C. Hough, EATIP).
- In Africa, increase seafood consumption and aquaculture production with the support of science (B. Semoli) (African people only consume 9kg fish/capita/year against 40kg in Portugal)

3. What is the potential of new value chains, new products from marine Ecosystems?

Marine ecosystems and organisms are underexplored, understudied and underexploited. New marine value chains have a great potential for innovative applications that could support further the growth of our coastal Atlantic communities.

Opportunities exist in the following domains:

- Use of seaweeds, microalgae (B. Semoli, DAFF, South Africa).
- New sources of protein and other derived products from marine organisms (W. Valenti (University Pernambuco, Brazil).
- Focusing more on native species in particular in Brazil (Fabio Hazin, University Pernambuco, Brazil)

4. How could we jointly support the capacity building and skills development for enhancing the potential of new marine value chains among the Atlantic Communities?

Education and training are considered as a high priority by the panel. The main points discussed concern the following:

- Promote attractive carriers by developing new value chains with new job opportunities, while securing a strong participation of the industry (O. F. Fylling-Jensen (NIFIMA – Norway).
- Training on the farms, training on business (C. Hough, EATIP).
- Long term planning training programmes securing return of experience in the country of origin (Fabio Hazin, University Pernambuco, Brazil).
- Engage more the involvement of women in the seafood business (B. Semoli , DAFF, South Africa).
-

Other points discussed:

Fabio Hazin, Federal Rural University of Pernambuco, Brazil regrets that fisheries sciences are not given enough importance in the Atlantic cooperation.

2.Øyvind Fylling-Jensen, Managing Director, NOFIMA underlined the importance of the accountability to the society by managing properly our marine resources.

Wake up Session: Ana Noronha, Executive Director, Ciência Viva, Portugal and Bernardo Corrêa de Barros, President, Sailors for the Sea, Portugal

Ms Noronha introduced her organisation; a non-profit dedicated to promoting scientific culture and awareness and improving contact between science and society, by hosting a network of twenty science centres across Portugal. This includes developing a programme of scientific internships for students during their holidays.

Ms Noronha introduced two students: Maria Marques de Silva and Valerie Esteves. Ms Marques de Silva presented a project she participated in where they investigated microplastics in the Tagus estuary. This investigation, the first of its kind undertake in the Tagus estuary is important. Although they did not have enough samples to create an estimate, they were able to confirm its presence. This project made a good contribution to ocean literacy activities while also adding to data on plastic pollution.
Ms Esteves presented her project which designed scissors for untangling the Portuguese ROV, with the ability to cut cables underwater. This project gave Ms Esteves and her fellow students the opportunity to gain first-hand experience working with scientists. She also insisted that these types of initiatives must be promoted to encourage future generations' participation with science.

Mr Corrêa de Barros presented his organisation; a non-profit organisation working in ocean sustainability and ocean protection whilst engaging with communities, governments, sailors and ocean-related events. Sailors for the Sea work on two programmes; Clean Regattas and Kids Environment Lesson Plans (KELP).

The Clean Regattas programme is the world's only sustainability certification for water-based events
The KELP programme engages children from 7-12 years old through classes about ocean protection and ocean sustainability which are jointly developed by teachers and scientists.

Atlantic Ocean Ecosystems Under Pressure

Panellists:

1. ***Michael Schulz, Director, MARUM-Centre for Marine Environmental Sciences, Germany***
2. ***Ilaria Nardello, Executive Director, European Marine Biological Resource Centre (EMBRC), France***
3. ***David Johnson, Director, Seascape Consultants, United Kingdom***
4. ***Angel Perez, Professor, Vale do Itajaí University, Brazil***
5. ***Isabelle Ansorge, Head of Oceanography Department, University of Cape Town, South Africa***

Rapporteurs:

Marta García Gato, European Commission
Wagner Valenti, Universidade Estadual de São Paulo, Brazil
Charine Collins, South Aican Environmental Observation Network, South Africa

The co-existence of multiple activities in a limited place exerts a high pressure on ecosystem, which in turn put environmental and human issues at stake. In order to understand ecosystem processes several variables have to be considered in the long run, therefore:

- The scientific community needs to identify the priorities so that the numerous knowledge gaps can be fulfilled, as long as agree on the definitions of the objects and variables under study.
- We have to avoid changing the direction/focus due to changes in politics.
- We need to listen more to the young generation and open up opportunities to instil in them an interest in the marine sector from a young age.
- More women should be involved in the sector.
- We need comprehensive and long-time observation systems and solve the problem of data storage.

Cooperation must be increased at many levels (and the Belém Statement together with the event *A New Era of Blue Enlightenment* provides a useful framework). For instance:

- Cooperation must be increased between policy-makers, researchers and the industry. Through a close collaboration knowledge can be applied in industrial activities.
- Trust-building (and dialogue) with the industry must be enhanced.
- The complexity to reproduce simultaneously all variables involved in ecosystems in experiments and projects intensifies the need for multilateral and multidisciplinary cooperation.

Furthermore:

- Policy-makers should communicate better.
- Researchers need to be accountable to society focusing on its priorities and making the results of public research available.
- A multinational and multidisciplinary team could be established to set an agenda and take stock of project results.
- We need to find infrastructure/sustainable system to collect data and projects results.
- Being in an Era of Blue Enlightenment implies acting with wisdom and responsibility and avoiding repeating the same past mistakes.

The Connected Atlantic Ocean: Riding the Next Wave of Ocean Technology and Innovation

Panellists:

1. ***Ief Winckelmans, Founder and Principal, Ocean Impact Alliance, Ireland***
2. ***Donatella Castelli, Researcher Director at CNR-ISTI, Italy***
3. ***Anna Kristín Daníelsdóttir, Chief Research Officer, Matis, Iceland***
4. ***Janice Trotte-Duhá, Special Adviser to the Director General of Science, Nuclear and Technological Development of the Brazilian Navy, Brazil***
5. ***Pedro Monteiro, Chief Oceanographer, CSIR-SOCCO, South Africa***

Rapporteurs:

Daniel Strugariu, European Commission
José Muelbert, Federal University of Rio Grande, Brazil
Issufo Halo, Cape Peninsula University of Technology, South Africa

What technological developments are needed?

Making technology developments self-sustainable in an economic sense is challenging. One of the challenges is to move technologies from the research space into the market. One of the ways in which this Alliance could implement this really is to become a platform to increase/scale-up demand for these new technologies. The use for robotics are at the beginning stage of their development, so what we need now is the science community to embrace that and start to scale-up that need so in fact it becomes economically valuable to increase the numbers. It's not just about selling more robotics, it's about the labs that do the R&D having more confidence to invest further into the R&D, training etc. Scaling-up is one issue but the other obstacle is the finance gap that exists that takes technologies from the lab to the market. Partnerships between research funding institutions and that ones that do the financing from the research to the market, somehow those partnerships need to be strengthened so that the researchers can see the full trajectory and invest into it and take things all the way through relatively quickly.

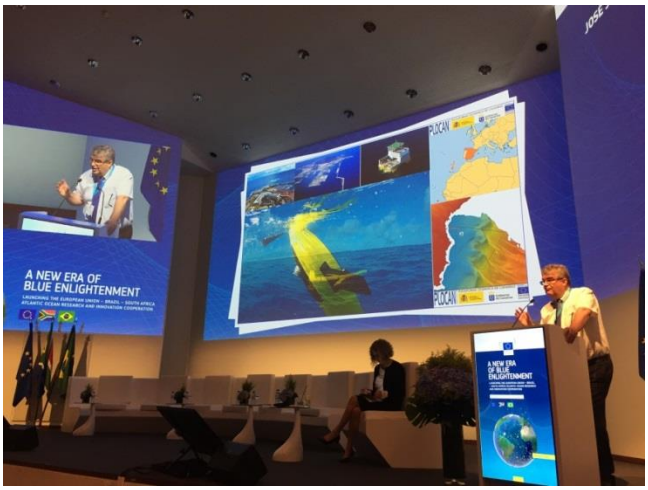
There is a need to connect the people around the Atlantic to the ocean as this is still missing. This goes beyond ocean literacy, it is about using the resources of the marine ecosystems, and to get more out of the marine ecosystems there is a need for transdisciplinary tools and technology beyond the transnational – it is not reinventing the wheel, we need to invent applications for the wheel. This has a lot of potential for driving us forward to a sustainable economy.

A lot of people who have ideas don't understand how the process works, or have the skills or capabilities to get the funding. If you look at the financial instruments that are available for initiatives, it is not only commercial funding, but there is also grant foundations, subsidies, the EU, and in many cases it is making that connection and going to the next phase and bringing it not only to the market but the way you tell your case or tell your story is an important part of how you can get your money.

What we are capable of bringing into perspective in this Alliance is the idea that we're bound to cooperate with a clear sense of purpose based on scientific evidence. What we are trying to do here is too immense for one nation or continent alone for the challenge so it is clear that the Belém Statement resonates with what is being planned in the South Atlantic - a clear sense of purpose is

essential in this case. This ambition goes beyond the science – link finance to institutions actually buying the projects generated by innovation – lower the risk for start-ups then. The focus should be on ensuring the sustainable management of resources in a holistic and multidisciplinary way.

The Belém Statement is a huge development for us in terms of realising that we have one system – the only possible scenario is that of an All Atlantic which we need to deliver on. If we take the Balém Statement as a proof of concept to do the same training courses which are restricted to Europe for use of Copernicus – this could be enlarged to others in terms of marine services and marine observations. Brazil can offer the next PIRATA meeting for such a training – it's up to us to showcase the value of our cooperation.



Let's take the new age of robotics into our science and research; otherwise we won't get there with ships alone due to the economic cost. The benefits of robotics platforms can be huge – new science can emerge, ecosystem services created. An integrated large scale system is the asset that needs to be financed because out of that will spin-off a number of economic and technological opportunities, very much like the SPACE programme did. It needs sustained Public Private Partnerships over a number of years. There is also a need for a different mind-set for the next years so need for long term thinking

Open science – sharing the results of your research create the RI for this, need for a systems of systems, commons – connect existing infrastructures to become interoperable – create virtual environments where r can work together and use these resources. If the virtual environment is created, the problem disappears, as everybody can bring something, all can contribute with their strengths

Through the role of data infrastructures in supporting scientific work (open science) which can be managed by a third party – develop software application - access to data produced by science. There is a lot of potential in this as there are software companies that are taking on the data who know how to use it, and are producing products in order to generate knowledge which can be used by others. This is an example of how science can also be used by innovators and society at large so there is no division as has been in the past.

There is an enormous amount of data available which can be utilised in many different ways, for example, it can be used to calculate quotas, price information thus increasing the value of the business (there is interdisciplinary here as well). However, there is a problem in selecting the useful data as there is an overload of data. Therefore we need to filter what is useful and connect with the right organisations to work with. It is important not to just keep gathering data, but what is the usage of that data to the benefit of society? This is one of the bottlenecks we face. Which brings us to the human dimension – we must not forget our ability to process and interpret data.

What about products and ownerships?

There is a need for jointly licensing products (academia and private sector). "Transition to a farming model from a hunting model" is one of the ways in making marine resources sustainable.

We can only have a sustainable society if it is based on ecological, economic and social foundations; otherwise it is not going to work. There is a need for commercial activities that create jobs, this is also a way to get the support of citizens. Blue Growth activities should be seen in action and need to show the value and go to the public – need to produce local value, especially so in the coastal communities and island communities across and around the Atlantic Ocean. Need for a sense of purpose for evidence based cooperation – there are multiple dots but we need to be pragmatic.

The Atlantic Ocean Entrepreneur-Ship

Panellists:

1. ***Isidro Laso Ballesteros, The Startup Europe Initiative, European Commission***
2. ***Manuel Parente, ABYSSAL, Portugal***
3. ***Irene Díez Ruiz, ECOALF Foundation, Spain***
4. ***Xolisa Ngwadla, CSIR, South Africa***

Rapporteur:

Dina Eparkhina, European Global Ocean Observing System (EOOS), Belgium

The session discussed business opportunities in the blue economy.

Isidro Laso Ballesteros, The Startup Europe Initiative, European Commission outlined that the ocean can drive disruptive technological developments with a much greater involvement of startups. Startups develop minimum viable products pivoting growth. Their experimental nature insures that consumers expect risks. This significantly decreases threats associated with a negative perception of the new products' faults while increasing development opportunities. Collaboration between research and business is critical at the early stages of research, this bridge should be built from the outset instead of waiting for the research results. A startup network can be developed for the South Atlantic, based on the experiences of the existing networks in several other regions, as well as the European Commission's Startup Europe Initiative.

Manuel Parente, Abyssal, Portugal, demonstrated how new technologies can allow augmented reality in the ocean space. The Abyssal technology users can view ocean sub-surface space in real time and in 3D while sitting at their desks. Coupling 3D imagery with geo-spatial information the technology allows monitoring remotely operated vehicles (ROV) operation and significantly increases response efficiency in case of problems. This also removes ship-time normally needed to monitor ROV. Such cutting-edge technology can help control, reduce and mitigate environmental impacts of the industrial activities.

Business can also help increase societal awareness of the threats to the ocean environment, notably, plastic pollution, according to **Irene Díez Ruiz, ECOALF Foundation, Spain.** The brand, through its Foundation, has developed *Upcycling the Oceans*, a scheme for recycling ocean plastic with the help of local fishers and ports. Fishers routinely collect marine debris in their fishing nets. Instead of disposing of this debris, they land it onshore where it is recycled. The PET extracted from the plastic is cleaned and converted into pellets to obtain a high quality yarn from which garments are produced. Among other recycled materials, ECOALF also uses nylon made from discarded nets which prevents ghost fishing. Clothes are branded ecologically conscious and the brand has become popular in Spain as well as the international market. This model allows businesses to contribute to circular economy and ocean literacy while generating profit.

Conference Synopsis and Key Outcomes

Key Rapporteurs:

1. ***Peter Heffernan, Chief Executive Officer, Marine Institute, Ireland***
2. ***Segen Estefen, Professor of Ocean Structures and Subsea Engineering, Federal University of Rio de Janeiro, Brazil***
3. ***Gilbert Siko, Director, Department of Science and Technology, South Africa***

The main elements that emerged during the high-level ministerial and scientific event *A New Era of Blue Enlightenment*, as summarised by the key rapporteurs were the following:

- The Belém Statement builds on the 2013 Galway Statement and the implementation of the Atlantic Ocean Research Alliance.
- Brazil and South Africa are already well connected to the Atlantic Ocean Research Alliance implementation processes in an open and inclusive way.
- The Belém Statement provides a renewed political momentum, focus and framework of opportunity for mutually beneficial collaborations from Pole to Pole in the Atlantic Ocean. All the key implementation action areas identified in the Belém Statement were reflected in all of the session and great ideas are coming out already.
- It was evident in all the contributions that there is now an opportunity to move from bilateral international operations to truly multilateral campaign scale of actions in our All Atlantic sphere of mutually beneficial collaborations.
- The valuing politically, societally and engaging people in understanding and knowing the value of the ocean economy in all its socio-economic and ecosystem services characteristics to the society in all of the regions bordering the Atlantic and beyond was recognised as extremely important.
- Courage and commitment from all parties is required to maximise the immense scale of achievement possible in Atlantic collaborative framework provided by Galway and Belém Statements.
- There is a need to ensure that there is knowledge about ocean floor and ocean waters.
- As there is a requirement to develop Marine Spatial Planning, there is also a need to enable decision making and a concrete plan needs to be developed.
- There is a requirement for open access to data and to ensure that we can share that data. This also applies to historical data which needs to be made available to ensure there is no repetition and to avoid reinvention of the wheel.
- There is a requirement to develop and build capacities, and that was seen in all discussion - we need to entice students and school kids.
- There is a need for a multi-disciplinary approach in all the work that has been done.
- Need to derive the value for research to the community.
- In Fishing, there was agreement that multiple value should be derived from discards
    a. Researchers should work on making better feed;
    b. Promote and market fish consumption in the African continent.
- Social accountability (research must clearly link with what the people need).
- Filling gaps requires prioritisation and a common approach as well as common instruments.
- Need to develop models for science, policy, innovation and societal benefits interface.
- Embracing the digital revolution (seen that we can now google under water)
    a. But there is a need for the interface with community on new tech as there could be an opportunity for innovative use;

b. Development alternative market use;
c. Citizen science principles;
d. Development of sustainable use of the ocean to benefit the community;
e. Develop models to interface science, technology, innovation and societal needs.

- Problems of plastic pollution need to be addressed in the Atlantic region way of involving different countries.

Cooperation was one of the key outcomes of the event and the sessions in the last two days will help us to organise our scientists, engineers and stakeholders to work in the near future to select and prioritise the main subjects to be treated, for example ocean observations – when we have programmes in progress we have to reinforce these programmes and of course create new ones. Ocean technology will support all these efforts.

Concluding Remarks and Summary of Follow-up Key Implementation Actions

1. ***John Bell, Director of Bioeconomy, Directorate-General for Research and Innovation, European Commission***
2. ***Andrei Polejack, General Coordinator for Oceans, Antarctica and Geosciences, Ministry of Science, Technology, Innovations and Communications - MCTIC, Brazil***
3. ***Thomas Auf der Heyde, Deputy Director-General: Research Development and Support, Department of Science and Technology, South Africa***

Mr Bell committed that he, Mr Polejack and Mr Auf der Heyde will take forward the words that are in the Belém Statement in the spirit of enthusiasm that has been present during the event, reaffirming the commitment from the European Community, the Commission and the Institutes to do that. The Belém Statement is about creating the All Atlantic Initiative and as Minister Pandor said, it has to end up in making the Atlantic for All, as there are a lot of people out there, far away from the concept of sustainability whose very lives depend on this.

Mr Bell emphasised that we have to move quickly from aspiration to realisation, and suggested that with his counterparts that we look quickly to get ourselves organised in the way we did with the Galway Statement to move through implementation. What this means to you and for you as a scientific and innovation community and organising the funding and political support to move it forward.

Mr Bell announced that we will convene in the first quarter of 2018 at plenary level and move forward with the implementation of the Belém Statement. This will be a real moment where we set off on a navigation in getting things done, and see where we are for example in Horizon 2020 and the direction this will take for the future as there are a lot of projects in the pipeline which will be of high interest. Mr Bell asked participants to think about how should we organise and lead a limited number of Work Packages to deliver on the five major aspects identified in the Belém Statement in the coming weeks.

Mr Bell expressed that we are coming to a moment where we have to turn Sustainable Development Goal 14 from a code into a place where people live. We need a new ambition for the oceans, and so for the next year, we need to engage all of you to see how we can best make the case for science to policy about the urgency of moving our ambition from the oceans into the "inner space". One of the greatest challenges at policy level is having eight million people who are starving, and three billion people needing to live from the oceans and seas, and the oceans and seas in great difficulties. And so when we meet at the beginning of next year, we can move forward in a very practical way.

Mr Polejack voiced that we are now embarking on a new adventure. We have identified the major challenges that we need to overcome. We have the political will and we are now completely dependent on our technical experts and all the nations that are together with us, and we are going to do it together.

Mr Polejack stated that as this week saw the launch of The South-South Framework for Scientific and Technical Cooperation in the South and Tropical Atlantic and the Southern Oceans, it is a first attempt to identify our priorities as a region; and a first attempt to build this in our own South Atlantic. This week we are striving to have the south linking to the north in what we could call a Belém All Atlantic Alliance.

In response to Mr Bell's announcement of convening at plenary level in early 2018, Mr Polejack offered the city of Salvador, Bahia to host this first meeting.

Mr Auf der Heyde stressed that we need to think about science in the social context; in socio-economic terms as it affects some of us more than others. There are hundreds of millions of people whose lives depend directly on the sea and on the Atlantic in particular, and to a greater or lesser extent on the work that you are doing. Mr Auf der Heyde urged us to reflect on this arising out of the array of projects and initiatives presented over the course of the three days.

Mr Auf der Heyde alluded to the ambitions we have scientifically, socially and economically for developing the value of the Atlantic Ocean, which are gradually and quite soon going to overcome the technological hurdles that you have been working on, and the processes and procedures you have been putting in place to establish best practices so you can share information and develop projects jointly.

Mr Auf der Heyde concluded with his belief that the Atlantic Ocean, which has long served as a corridor for connecting people, is increasingly going to become a symbol of science, of progress and development, and on global humanity.

"If you want to go fast, you go alone, if you want to go further, you go together".

Annex 1: Summary Reports from Building an Atlantic Ocean Community: Project and Ideas Meeting Place

**please note not all summaries have been received as of yet and therefore not included*

Atlantic Ocean Research Alliance – Coordination and Support Action (AORA-CSA)

Organisers: *Margaret Rae and Patricia Killian (AORA-CSA, Marine Institute, Ireland)*

Objective: To demonstrate how progress being made by the Coordination & Support Action in helping to support the Implementation of the Galway Statement on Atlantic Ocean Cooperation and the Atlantic Ocean Research Alliance.

Expected outcome of this event:

- To provide an introduction to the Atlantic Ocean Research Alliance (AORA) and current Research Cooperation Areas to participants at the Belém Conference.
- To show how the AORA-Coordination & Support Action is structured to assist the AORA.
- To demonstrate accomplishments to date in the North Atlantic.

As some work package leaders were required for other parallel sessions and/or the session to be run directly after the first morning session the presentations were staggered to release these individuals as soon as possible.

Report:

The workshop set out to introduce each of the partner organisations within the Coordination and Support, to give an overview of the work to be undertaken by each partner to support the AORA and the accomplishments to date.

- **First Speaker:** Margaret Rae welcomed all present at the session and gave a brief overview of the Galway Statement on Atlantic Ocean Cooperation and the achievements to date by the AORA and the work underway by the official AORA Working Groups on Aquaculture, Ocean Literacy, Seabed Mapping and the Ecosystem Approach to Ocean Health & Stressors and then broadly described the function and structure of the AORA Coordination & Support Action and the types of supports offered by the AORA-CSA to the AORA and the AORA-CSA Working Groups as the AORA evolves over time.
- **Second Speaker:** Mark Dickey Collas gave an overview of his organisation ICES – the International Council for the Exploration of the Sea followed by update on the vision and structured tasks set out by AORA Working Group on the Ecosystem Approach to Ocean Health & Stressors (EA2OHS) and their accomplishments to date.
- **Third Speaker:** Following on from Mark, Wojciech Wawrzynski (ICES) gave two presentations – the first on Aquaculture with an initial overview of his organisation interest in Aquaculture and he then broadly went through the work being undertaken by the AORA Working Group on Aquaculture and their sub-topic research areas of interest as well as the accomplishments to date including linkage to the Ocean Literacy Working Group. Finally, he gave a presentation on the Knowledge Sharing Platform, being developed by his work colleague Neil Holdsworth, to allow for long-term usability of the data, information and knowledge products by the AORA in their selected research theme areas.
- **Fourth Speaker:** Ana Noronha introduced her organisation, Ciência Viva and the work that it does across Portugal, this was followed by an overview of how the AORA Working Group is leveraging cooperation across the US, Canada and the European Union and accomplishments to date including workshops on TransAtlantic Ocean Literacy, Public Perception of Aquaculture, in

the EU and also in USA, as well as building public awareness building of seabed mapping and supporting the G7 Marine Litter Campaign and a side event at the first UN Ocean Conference.

- **Fifth Speaker:** Joaquín Hernandez Brito who gave an overview of the multipurpose scientific infrastructure for the Central Atlantic at PLOCAN in Gran Canaria, Spain. Joaquín then broadly spoke about the objectives of his work package in the AORA-CSA, the supports offered to the AORA and also the bibliography on European Ocean Observing Research Activities and an Ocean Observing Preliminary Assessment and other accomplishments his work package has already delivered.
- **Sixth Speaker:** Aurélien Carbonnière gave a brief introduction to his organisation, the French Marine Institute for the Exploitation of the Sea (Ifremer), and their key activities and objectives. He followed this up with an overview of his work package on mapping Marine Research Infrastructure (MRI) and engagements and the key achievements made on a generic MRIs assessment in the context of the Galway Statement, a Discussion paper on MRIs and the TransAtlantic Cooperation, a Workshop on MRIs at the International Research Ship Operators meeting in Italy 2016 and an outline of future interactions with the Seabed Mapping Research Vessel Coordinator and also with the AORA Aquaculture Working Group.
- **Seventh Speaker:** Pål Buhl-Mortensen gave an overview of his organisation, the Institute of Marine Research (IMR) Norway, the tasks and timelines in his AORA-CSA work package, a bibliography on Mapping the Atlantic Seabed and its Habitats that he has delivered as well as the AORA Seabed Mapping Working Group meetings he attended and finally a workshop he is organising for the AORA Working Group in Bergen, Norway in the last quarter of 2017.
- **Eighth Speaker:** Sigurður Björnsson spoke about his work package in the AORA-CSA on Marine Biotechnology and the description of work to be carried out. He also introduced and gave a brief overview of his organisation, RANNÍS, the Icelandic Research Centre and also ran a little video on the Blue Bioeconomy - a practical approach and cutting edge research for market innovation and sustainable utilisation of renewable resources - an example of Atlantic Cod and value streams was given.
- **Final Speaker:** Margaret Rae gave an overview of the Marine Institute Ireland and the Research Roles undertaken by the Marine Institute as a researcher performer and partner, a research funder, as a catalyst for research, as a research supporter and as a research policy advisor to government. Margaret briefly gave an overview of the Atlantic Ocean Research Alliance (AORA) Priority Areas of Cooperation and how these were linked to the Coordination & Support Action (AORA-CSA). In addition, she outlined coordination role that the Marine Institute has with all the partners within the AORA-CSA itself for the AORA and the three work packages that the Marine Institute is responsible for directly, namely, Governance & Coordination, Networking & Conferences, and the third, Communication & Dissemination and the achievements realised by the Marine institute in support of the AORA.
- A very brief question and answer session completed the end of this session.

AtlantOS

Organisers: *Sabrina Speich (LMD/IPSL-ENS, Paris, France); Johannes Karstensen (GEOMAR, Kiel, Germany) with support from AtlantOS, AORA-CSA*

Objective:

To achieve a transition from a loosely-coordinated and fragmented set of existing ocean observing activities, into a system that is sustained and sustainable, efficient, and fit-for-purpose the current and emerging status of observational programs and projects in the context of climate and ecosystems for the Atlantic needs to be assed.

In particular, a common understanding of requirements across the stakeholders of an Atlantic sustained ocean observing is required. Through a number of meetings in liaise with international conferences we aim to convene a large group of sustained Atlantic Observing System stakeholders with interest in climate, ecosystem and fisheries observing products in order to discuss their expectations and needs.

Expected outcome of this event were thought:

- To provide an introduction to, and examples for, a "*Framework for Ocean Observing* (FOO) – thinking" and see how it links to real ocean observing problems
- To obtain an Overview on expectations, current thinking, strategies from individual, countries & stakeholders
- To assemble information to be used for a summary white paper on the "connecting for better observing process" North/South Atlantic

Report:

The workshop was comprised of three sections:

I) A general introduction to on-going international efforts and strategies for better framing the challenges in multidisciplinary ocean observing;

II) Presentations of on-going international observing efforts in the Atlantic Ocean (the focus was set on Climate and Ecosystems);

III) Updates of ocean observing efforts from a number of southern nations and their expectations linked to the Atlantic Ocean observing.

After Sabrina Speich (LMD/IPSL, ENS, France) highlighted the goals of the workshop (connect and build fit-for-purpose ocean observing system, common understanding of requirements across whole community and entire Atlantic, and collect and discuss stakeholder expectations/needs, with a focus on climate, ecosystem, fisheries), all participants in the room introduced themselves in a *Tour de Table*.

I) The first Session, "A general introduction to on-going international efforts and strategies for better framing the challenges in multidisciplinary ocean observing", chaired by Sabrina Speich, with three presentations followed:

1) Toste Tanhue (GEOMAR, Germany) introduced the Framework for Ocean Observing and indicated the importance of the value chain and societal drivers;

2) Johannes Karstensen (GEOMAR, Germany) provided examples of system design approaches considering single network design and addressing one scientific question (e.g. Argo) and composite networks that consolidate local/regional observing into a global network (e.g. OceanSITES). He noted that for a truly holistic system only the suitable data (considering Essential Ocean Variable and the phenomena to address) matter. Obviously the observing design for a "mixed platform and multiple objective system" is getting very complex and a single solution is unlikely to be found. Recommendations and best practises and the regular review of requirements/observing objectives must be formulated;

3) Brad De Young (Memorial University, Canada) introduced the "BluePrint for Atlantic Ocean Observing System: The vision in practice" (working title), which is meant to summarize the specifics of the application of the "Framework for Ocean Observing" to the Atlantic Ocean- The document was initiated and is leveraging from the activities within the H2020 AtlantOS project but aims for the wider, whole Atlantic Ocean community input.

In the related Roundtable discussion, key issues included: 1) The mandatory requirement of an increased and optimized data sharing; 2) The need of international agreements to ensure that in particular biogeochemical and biology data can be collected across EEZ lines (as agreements for the original Argo program generally allow for physical data); and 3) The outcomes from agreements like Belem (or Galway) will take years to be fully assessed, but they provide a framework on which to encourage collaboration and help overcome at least some barriers – key benefits being optimization/consistency/integration of observing efforts and sharing infrastructure (including shiptime) and expertise.

II) The second Session, "On-going international observing efforts (with focus on Climate and Ecosystems) in the Atlantic Ocean", chaired by Edmo Campos (USP, Brazil), was organized in seven presentations:

1) Brian King (NOC, United Kingdom) discussed the ongoing international efforts to observe the Atlantic Meridional Overturning and its variations related with climate changes, noting that we cannot yet accurately measure the crucial transport of heat, salt, and carbon and this is particularly linked with our incapacity of observing the upper slope-shelf regions (i.e., within the EEZs, particularly at depth shallower than 2000m), these regions turn out to be capital to close the budgets.

2) Bernard Bourles (IRD, LEGOS, France) introduced the PIRATA project and the moorings array, noting that despite its successes, there are still gaps that need to be filled in the Southeast Atlantic, and that capacity building is an ongoing issue.

3) Pedro Monteiro (CSIR, South Africa) discussed observations for a changing carbon budget, noting that ocean observations are needed to get the terrestrial carbon budget (done by difference) correct, and that since the ocean variability is dominated by the interseasonal cycle, we need a resolve a range of timescales including down to 5 days.

4) Peter Brandt (GEOMAR, Germany) discussed the Eastern Boundary Upwelling Systems (EBUS), noting that more physical data are needed to resolve the eastern boundaries where models (including climate earth models) have the largest errors (larger than the observed variability). Also many more biological data is required because of the complexity of the EBUS marine ecosystems. This will also help to improve predictions of fish stocks.

5) Maria Paz Chidichimo (CONICET – SHN, Argentina) discussed exchanges between the shelf and the deep ocean, noting both, the complexity of the local ocean circulation that is influenced contemporarily by winds, tides, current confluences and sharp topography and the role this

boundary region plays in global budgets such as that of carbon, heat and ecosystems (as the export of both carbon and larvae in productive waters to the deep ocean).

6) Mark Dickey-Collas (ICES, Denmark) discussed acoustics, noise, and fisheries observations from the ICES perspective, noting that while there are a number of standards for acoustic data (but none for noise), much work is still needed to manage these standards in integrating data from various sources into a common database.

7) Doug Connelly and Richard Lampitt (NOC, United Kingdom) discussed innovation and technology, especially in the framework of biogeochemical variables, noting that integrated sensors and samplers (modular and able to deploy on multiple platforms) such as lab on a chip and optodes have been developed and will soon be available, and that innovative approaches are also needed for data analysis, providing the example of machine learning via online teaching to recognize species in in-situ photography.

In the following Roundtable discussion, key issues raised included: 1) the lack of (even physical) data in key areas and certain timescales, such as boundary currents in the upper-slope and shelves to close budgets (incl. the EEZ problem), 2) the need for data to be used (preferably through client pull, which requires user involvement in observation design) to ensure sustainability of observational programmes, 3) the need for, and increasing possibility to, integrate various sensors on single platforms, and 4) the need for scientists and users to better articulate the benefits of ocean knowledge (not ocean observing directly) for socioeconomic benefits.

III) The third Session, "Updates of ocean observing efforts from a number of southern nations and their expectations linked to the Atlantic Ocean observing", chaired by Peter Brandt (GEOMAR, Germany), and were South Atlantic neighbouring nations highlighted some successes and challenges of their national programs, as well as expectations for the Belem and AtlantOS initiatives.

1) Vito Ramos (Scientist at INDP, Cabo Verde). Cabo Verde research interests concern, for example, the coastal upwelling, dust deposition (from Sahara), deep-sea volcanism, and oxygen minimum zone. Over the years, Cabo Verde is developing an observing system, and an ocean science centre about to be opened (in Mindelo). Cabo Verde research consortium is part of MESA – a pan-African observing system with a monthly biology bulletin and direct phone communication (sms) on ocean state for artisanal fishers. Cabo Verde expectations are to contribute to international science goals, to improve understanding of national areas of interest (e.g., ocean circulation, sea-bed cartography) and capacity building.

2) Francis Emile Asuquo (Professor at University of Calabar, Nigeria) and Nsikak Benson (Professor at Convenant University, Nigeria). In the 90s, Nigeria started to undertake trawling observations to estimate the state of fish stock in the Gulf of Guinea. Various institutes undertook this observing effort. However, their collaboration and integration was until recently relatively low. Nowadays, there have been established partnerships between Nigerian Institutions as between University of Calabar & NIOMR, University of Calabar & Covenant University, University of Port Harcourt etc. This collaboration enhances a multidisciplinary approach in the monitoring of EOVs (Essential Ocean Variables). Nigeria has started also Master and PhD programs in Marine Sciences.

3) Mthuthuzeli Gulekana (Chief Scientist, DEA, South Africa). The mandate of DEA is defined by the South African constitution. It must use science and innovation to benefit the population: Research, Science, Innovation, Management and Monitoring need to be developed for a sustainable marine environment for South Africa's development. DEA areas of research are: i) Monitoring the Ecosystem Health; ii) Marine Biodiversity; iii) Operational and Observational

Oceanography; iv) Ecosystem Processes and Global Change; v) Data and Information: Generation, analysis, and management. DEA undertake monitoring coastal sections every 3 months. DEA run a coastal ship and a new polar ship fully equipped for any modern and up-to-date ocean observations (including clean wet labs, underway upper-ocean observations, a meteorological mast, etc.). DEA is deeply involved in research and infrastructures in the Indian, Southern and Atlantic Oceans, as they all surround South Africa. In the South Atlantic Ocean, DEA is deeply involved in the South Atlantic MOC – SAMOC – international initiative by participating in the mooring array and monitoring lines. DEA expect, together with DST, to leverage and optimize resources towards sustainable Atlantic Ocean Observations. This in a co-ordinated effort between research agencies, government and society – locally, regionally and globally.

4) Filomena Vaz Velho, (Director, National Fishery Research Institute, Angola). Coastal communities of Angola are heavy dependent on fisheries resources and small scale fishery plays a key socio-economical role but faces important changes associated with climate variability and global change. The National Strategy for Science, Technology and Innovation (NESTI) aims to constitute a coherent and articulated agenda with the National Science, Technology and Innovation Policy (PNCTI). The purpose of NESTI is to establish a set of actions and goals to be implemented in order to achieve effectively the objectives defined in the National Plan for Science, Technology and Innovation in the short and medium term, however human resources skewed to older ages (need replacements). Angola is therefore developing a science plan on capacity building and for this is also collaborating with international universities. Angola is part of *Centro da África Austral para Ciência e Serviços para Adaptação as Alterações Climáticas e Gestão Sustentável dos Solos* – SASSCAL, sponsored mainly by Germany and associating Angola, Namibia, Zambia, Botswana and South Africa. 2013 - 2017 has reached a record subscription of 70 Scientific Research institutions as part of its network and with 80 revised publications, and more than 300 scientific presentations in different Forums of recognized terms of Marine Sciences, Angola has been a partner of the RV Fridtjof Nansen programme throughout its history (42 years of independence and 32 years of participation on the Nansen programme) with related time series. Through collaboration with other institutions, e.g. in the EU PREFACE project, first publications on the long time series records of the Nansen data are submitted (physics only). Angola owns three oceanographic ships (small, medium and large/open-ocean) and is opening these days the Academy of Fishery and Marine Sciences, a first institution that will offer a complete programme of formation in marine sciences.

5) Samuel Mafwila (Director, SANUMARC, University of Namibia, Namibia). Conservation is enshrined in Namibia's Constitution. Agenda 2063 and SDG14 have entered now into national policy. Namibia's fisheries are overexploited (noting that 95% of them is for export). Namibia government agencies and universities are losing trained people to industry. Namibia population is small, but they take responsibility of 3 shelf monitoring lines along the Large Benguela Upwelling System. They are trying to expand them by adding two additional lines in the northern part of the country to improve the overall coverage of the observing. Namibia expectations reside in expanding the existing monitoring lines (towards the open-ocean, in terms of monitoring platforms, i.e., in adding moorings for example, and in their number), in harmonising the large data collection and archiving systems, in encouraging political leaders to allow for easy sharing data policy and to develop national capacities in marine sciences as, for example, in data management and analysis. Namibia expects a tangible impact of AtlantOS to be realized in Southern Atlantic Countries (that is, there is an expectation of impacts happening in the very near future).

6) Maria Paz Chidichimo (Scientist, CONICET-SHN, Argentina). Argentina has capacities and a long experience in open-ocean observing (including in the Southern Ocean; they participate actively in the SAMOC international initiative for which, Alberto Piola is the chair of the Executive committee) and shelf-open ocean observations on a wide spectrum of multidisciplinary variables. Argentina has a well-defined national ocean observing initiative (Pampa Azul www.pampazul.gob.ar). Marine research is backed up with different observing infrastructure, including 5 ships (two large open-ocean vessels). Argentina expectations are in maintaining the existing international collaborations as well as look for opportunities for new ones. Argentina seeks to enhance and expand current boundary arrays in the Southwestern Atlantic. They stress that biodiversity data are essential, in particular those related to fisheries. Capacity development is crucial in both research and technology aspects and a good way to foster cooperation, building networks. Argentina would like to incorporate new technology, as for example, autonomous underwater vehicles.

7) Andrei Polijack (Coordinator of Oceanography, Antarctica and Geosciences, MCTI, Brazil). Brazil is deeply involved in ocean observations across the South Atlantic as the circulation off Brazilian shores is part of the Atlantic-Indian "Super-Gyre". Changes in the "Agulhas Leakage" will fatally affect the Atlantic Ocean and, consequently, the Brazilian coastal zones as well. Brazil participates actively in large international observing programs as PIRATA and SAMOC by providing multidisciplinary observing platforms, ship-time and data analyses capacity. Brazil undertakes also regularly repeated observations along the shelf-upper-slope. Brazil has acquired a new ship that will be fully operational this year. A new marine institute has been created. Brazil that is co-signatory of the South-South plan hopes that other South Atlantic nations will join the plan. Brazil expectations reside in developing a common expertise and scientific knowledge on the Atlantic Ocean and on its dynamical systems, conducting sustainable joint research projects and improving reciprocal access to infrastructures, with a preliminary focus on seven areas of cooperation and a special mention for researchers', technicians' and other marine specialists' mobility and career development

In this session and the discussions that came to conclude it, some points were raised. 1) Countries owning new or operating research are looking to share ship time and other observing infrastructure with other nations and for collaborative observation efforts. 2) A number of nations also indicated that national marine institutes had been, or were about to be, established, noting that the lack of technical capacity as well as public / government understanding of the potential benefits of ocean information made it difficult to integrate smaller-scale (university-level) programs and develop more robust and general national monitoring programs. 3) There was a realization that the (sometimes limited) data that was being collected was not being used to its full potential, particularly noting that sharing regional data (e.g., the individual monitoring lines in Angola, Namibia, and South Africa) would benefit all. 4) The South-South Plan, as well as the Belem Agreement, was seen as a framework to increase this cooperation. 5) In addition to increased collaboration and harmonizing data collection among regional players, other expectations from the Belem and AtlantOS initiatives included: capacity building and incorporating new technology, sharing resources (including those of the Southern Atlantic nations, such as shiptime), inserting of national programs into international alliances, contribution to international science as well as improved understanding of national areas of interest, enhancing monitoring in boundary and coastal areas and of biology / ecosystem variables, and encouraging political leaders to move towards more agreement in areas such as data sharing.

Trans North Atlantic Research and Prospects for South Atlantic Partnership

ATLAS, SponGES, MERCES

Organisers: *Katherine Simpson, Joana Xavier*

Hosted by Ricardo Serrao Santos, MEP, the Trans North Atlantic Research and Prospects for South Atlantic workshop outlined present and emerging issues in Atlantic basin-scale research and governance. The session included presentations from three H2020 projects: ATLAS, SponGES and MERCES followed by discussions on the management of Atlantic deep-water fisheries and finally an overview of ocean-scale marine governance issues that connect research themes between the North and South Atlantic. The session reconfirmed commitment to international marine scientific research efforts, in both the North and South Atlantic.

Anthony Grehan presented an overview of the H2020 project 'ATLAS' - A Trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe (www.eu-atlas.org). ATLAS is providing the first coherent, integrated basin-scale assessment of Atlantic deep-water ecosystems and their Blue Growth potential which will help ensure a balance between societal drivers and environmental sustainability. Dr Grehan began by setting the policy context for the project and drew attention to the importance of the European Maritime Spatial Planning Directive and Area Based Management approaches in the proposed United Nations regulation to protect biodiversity beyond national jurisdictions (UNBBNJ) as tools that will support ecosystem based management. Dr Grehan then highlighted the need to factor climate change into any future zoning decisions. He then briefly showcased current work in the ATLAS project addressing potential changes to the Atlantic Meridional Overturning circulation that controls basin-scale fluxes relevant to marine biodiversity and habitats, and new modelled information about the effect of regional scale hydrographic processes such as the North Atlantic Oscillation on larval dispersion patterns with implications for ecosystem connectivity and resilience, in the face of climate change. He then described how ATLAS intends to develop marine spatial planning at the basin and regional/local scales before finishing his presentation by listing a number of areas where ATLAS could link with South Atlantic research activities.

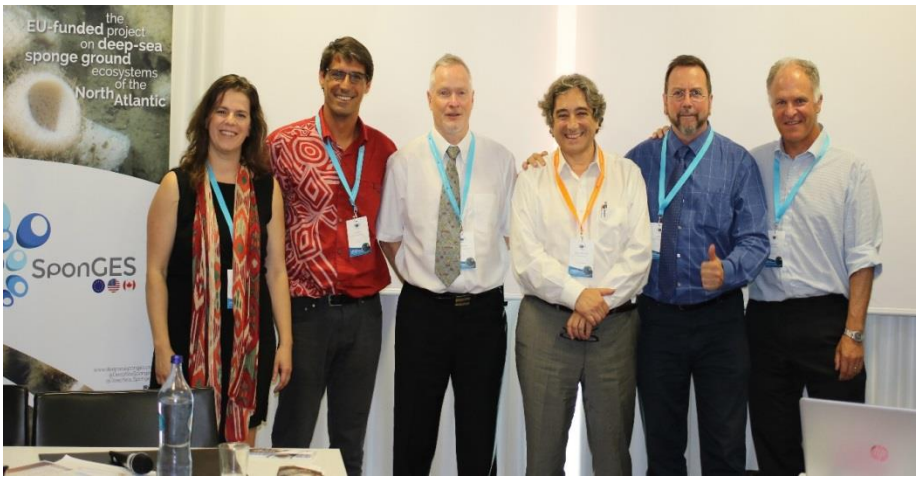
Joana Xavier presented the H2020 SponGES project on Deep-sea Sponge Grounds Ecosystems of the North Atlantic an integrated approach towards their preservation and sustainable exploitation (www.deepseasponges.org). She provided an introduction on sponge ground ecosystems of the North Atlantic, their relevance in ecosystem functioning as well as their biotechnological potential. SponGES is a trans-Atlantic collaboration involving over 20 partner institutions distributed across the EU, USA and Canada primarily aimed at building a solid knowledge base on these ecosystems distribution, function, dynamics, as well as vulnerability in face of multiple anthropogenic stressors. The project is also developing blue biotech innovations in the fields of tissue engineering and drug discovery employing a sustainable approach. Further, it is advancing the science-policy-society interface through the development of tools (e.g. the SponGIS, identification tools, and habitat classification systems) to assist the implementation of EU's Integrated Maritime Policy major strategic instruments (e.g. MSFD, CFP, Galway Statement), as well as international agreements established to conserve VMEs and EBSAs. Dr Xavier also noted that initiatives in the South Atlantic, where similar ecosystems have been found in the recent years, can leverage from the knowledge and innovation developed in SponGES for the North Atlantic. Ultimately SponGES will contribute to the conservation, and sustainable management and exploitation of sponge ecosystems and the goods and services they provide to our shared Atlantic.

Telmo Morato represented the H2020 project MERCES (Marine Ecosystem Restoration in Changing European Seas, www.merces-project.eu/). Dr Morato presented a talk "Towards the integration of deep-sea 'restoration agenda' into policy objectives" where he briefly introduced the MERCES project, emphasizing on aspects of deep-sea restoration. He also gave a brief introduction on the

deep-sea, the largest biome on earth that provides important direct and indirect goods and services but that is under increased human pressures, stressors and consequent impacts and where conservation is better achieved through both the protection of intact habitats and the restoration of degraded habitats. Telmo presented the innovative pilot projects on deep-sea restoration being conducted in the MERCES project. Dr Morato also discussed how lessons learned from the MERCES project could be translated into the South Atlantic marine ecosystems and how effective collaboration under the Belém agreement could be established.

Matt Gianni followed these talks with a presentation on the management of Atlantic deep-water fisheries. This highlighted the international efforts by regional fisheries management organisations in both the north and south Atlantic to implement UN General Assembly resolutions to manage high seas fisheries to protect and conserve deep-sea ecosystems and species and the strong emphasis that the UN General Assembly placed on marine scientific research to effectively do so, in particular in the most recent resolution adopted by the UNGA in 2016 (UNGA resolution 71/123 paras 180 & 181). The discussion also noted recent complementary fisheries regulations for deep-sea conservation taken by the EU, US and Canada within their national Atlantic waters over the past year.

In addition, participants also discussed the emerging issue of deep-sea mining and the need for comprehensive scientific information and input into understanding deep-sea ecosystems and processes in order to better assess the potential environmental impacts of this industry, develop environmental regulations, develop regional or strategic environment management plans. And whether deep-sea fishing, mining or other activities, a better understanding is needed of how best to regulate these activities to ensure conservation and sustainable use within a 'climate changing' deep-sea ocean are required to assist regulators in building resilience in deep-sea ecosystems as countries have committed to do in UN Sustainable Development Goal 14.2.



ATLAS partner David Johnson, Seascape Consultants rounded off the session with a presentation on "Ocean Scale Marine Governance" – "We need to present science messages in a language that decision-makers can understand and use, and take into account different spatial and time scales. Working with relevant industries helps to focus messaging for policy implementation." ATLAS partner Matt Gianni said, "recognising the linkages between the North and South Atlantic, the strengthening of cooperation envisioned by the Belém Statement will help provide a better understanding of Atlantic wide dynamics and ecosystem processes. This will help to address challenges such as integrating basin-wide data with the understanding that any changes to ocean circulation patterns related to climate change in the South Atlantic will affect the North Atlantic and vice versa."

COLUMBUS

Organisers: *David Murphy*

COLUMBUS is a flagship Blue Growth Horizon 2020 project (3 years, 4M Euros, 25 multi-disciplinary partners) intended to help capitalise on the European Commission's significant investment in marine and maritime research by ensuring accessibility and uptake of research Knowledge Outputs by end-users: policy, industry, science and wider society. COLUMBUS identifies projects with the potential to respond to contribute to Blue Growth and the implementation of the Marine Strategy Framework Directive and other marine and maritime legislation, and transfer their knowledge to fully exploit their findings.

Using a methodology developed by AquaTT, COLUMBUS partners are continuing to show that focusing resource on Knowledge Transfer activities will create value and lead to additional impact of research investment.

The COLUMBUS workshop was conceived to:

- Raise awareness of the need for research to be impactful;
- Widen capacity across the Atlantic in a methodology to ensure that research results achieve their potential impact; and,
- Increase confidence in how achievable impact is be providing examples of success.

The project's Strategic and Operational Lead, David Murphy (General Manager, AquaTT), opened the workshop by highlighting the importance of marine research in Europe; provided background on the COLUMBUS project and its achievements thus far; and, the COLUMBUS Knowledge Transfer Methodology. Videos have been produced by COLUMBUS partners to communicate these messages, and these are available for public use:

- The Importance of Marine Science: https://vimeo.com/210573486
- COLUMBUS Introduction to Knowledge Transfer: https://vimeo.com/203077016

The Work Package lead for "Knowledge Collection", Ned Dwyer (Executive Director, EurOcean), helped provide perspective through his presentation of European Union (EU) investments in marine and maritime research and innovation. Illustrated by some interesting statistics on key EU funding programmes, Dwyer demonstrated how a project like COLUMBUS can stimulate return on funders' investment. He also highlighted the open-access values of COLUMBUS, where all collected knowledge is described on the searchable EurOcean's Marine Knowledge Gate (http://www.kg.eurocean.org/), which will be receiving an update and face-change later this year.

The Work Package lead for "Methodology", Georgia Bayliss-Brown (Senior Knowledge Transfer Officer, AquaTT) presented case studies of how the methodology has been successfully applied to EC funded projects and impact measured. Specific attention was paid to presenting knowledge of relevance to the South Atlantic. For each Knowledge Output, Bayliss-Brown outlined the unique application that COLUMBUS had identified; the pathway that was designed to achieve this impact, and the steps along this pathway that COLUMBUS had achieved thus far. These case studies were:

- Raising awareness on legislation surrounding access and benefit sharing of marine biological resources (Knowledge Output sourced from MicroB3. Transferred by the Marine Biological Resources Node, hosted by AquaTT);

- Building capacity in new tools to improve environmental conditions in ports (Knowledge Output sourced from PERSEUS and PORTOPIA. Transferred by the Marine Governance and Management Node, hosted by CETMAR); and,
- Towards the application of vertical-axis wind turbines in offshore aquaculture production (Knowledge Output sourced from DEEPWIND. Transferred by the Marine Physical Resources and Fisheries Nodes, hosted by Aquatera and DTU Aqua, respectively).

Following these presentations, two questions were posed to the attendees:

1. What are the capacity building needs of stakeholders in the South Atlantic, to enable and maximise the impact from research investments? Are they different for different stakeholders: (i) Government, (ii) Funding bodies, (iii) Research institutions, and (iv) Industry?
2. Is there potential of two-way knowledge transfer between Europe and South Atlantic partner countries? If so, what are the key knowledge needs and priority areas for policy and industry in the marine and maritime environment?

The audience agreed that there is a need for Knowledge Transfer in other countries, including Brazil and South Africa, and where opportunities to collaborate or provide training/advice were highlighted, contact details have been exchanged.

COLUMBUS current achievements will be presented at their annual event on 7 November 2017. By the end of the project, it is expected that COLUMBUS will have published 60 case studies of Knowledge Transfer by March 2017, and these will be presented at COLUMBUS Final Conference to be held in Brussels on 24 January 2018. Free training on the methodology will be provided the day before both events.

For more information about COLUMBUS, please visit www.columbusproject.eu or contact the Project Manager, Cliona Ní Cheallacháin (cliona@aquatt.ie; Senior Project Officer, AquaTT).

EuroMarine Network

Organisers: *Isabel Sousa Pinto*

EuroMarine was launched in 2014 from the merger of three former European Networks of Excellence (EUR-OCEANS, Marine Genomics Europe, and MarBEF). EuroMarine's primary goal is to support the identification and initial development of important emerging scientific topics or issues and associated methodologies in marine sciences, and to foster new services relevant to the marine scientific community. As a unique self-sustaining initiative bringing together the best European expertise in marine sciences, EuroMarine has, in the last three years alone, self-funded 52 bottom-up ideas with over €400,000, involving more than 800 interdisciplinary scientists in foresight workshops, capacity building exercises and more. EuroMarine seeks to develop and build on collaborations in the wider Atlantic Ocean Community, working towards forums to empower scientific communities worldwide.

The EuroMarine workshop was conceived to:

- Highlight the contribution that EuroMarine has made to the research community;
- Identify the potential breadth of collaborations and opportunities for cooperation on ocean research available within the network;
- Provide an example of a network model that could be extended to other regions; and,
- Invite relevant parties to explore funding opportunities and collaborations with the network.

EuroMarine Steering Committee member and General Assembly Representative, David Murphy (General Manager, AquaTT), opened the workshop with an overview of the networks history, aim, scope and funding calls, including the new individual fellowship programme. EuroMarine provides valuable insight to enhance partnerships, improve research and data collection and access, and contribute to international cooperation and support. There are opportunities for collaboration and synergies with South Atlantic partners to develop responsive and creative science to tackle current and emerging issues and challenges in the marine environment. An invitation was extended to stay informed and participate in EuroMarine activities and associate with other members, with the potential to run future workshops to facilitate the development of scientific collaborations.

Isabel Sousa Pinto (Researcher at CIIMAR, EuroMarine Steering Committee member, and General Assembly representative) highlighted the range of ways in which EuroMarine can support decision making. The consortium provides for marine research capacity building and innovation, acting as a knowledge hub for a range of initiatives such as EKLIPSE, the Scientific Advisory Mechanism, IPBES, and the support of the Our Ocean Call to Action.

Recipients of EuroMarine funding presented their projects, illustrating the vast breadth of marine science covered by the network, discussing how their ideas are advancing marine science and highlighting the potential to achieve big results with incentive funding.

Michael Steinke (University of Essex, UK), discussed advances made in the chemical signalling process in marine ecosystems. EuroMarine activities have produced a vision of future marine chemical ecology research; understanding chemical sentences and languages can allow us to direct and manage these interactions across various scales. Review this work at: http://www.euromarinenetwork.eu/activities/chemical-ecology-marine-interactions-chemical-language-shapes-future-marine-health

Following events sponsored by EuroMarine and EMBRC, and an article published in Frontiers in Microbiology (2015), a forum for experts in *Vibrio* ecology, evolution and pathogenesis was initiated to stimulate collaboration between fundamental and applied research teams and to address societal

issues involving public health, ocean health and food security. Frederique le Roux (Ifremer, France) presented the key scientific questions and explained the steps needed to move forward in this field. To read more about this work, please see: http://www.euromarinenetwork.eu/activities/emergence-pathogens-natural-vibrio-populations-ecology-evolution-and-pathogenesis

Cristina Pita (University of Aveiro, Portugal) explained her work with fisheries and coastal communities and marine economies. A better understanding of how real and enduring social transformation comes about and how it can be initiated is needed to address today's global challenges to marine ecosystems. Recommendations on applying a method to understand coastal community vulnerability in a European context were provided following a successful workshop. To read more about Cristina's work, see: http://www.euromarinenetwork.eu/activities/social-transformations-small-scale-fisheries and http://www.euromarinenetwork.eu/activities/developing-method-understanding-coastal-community-vulnerability-europe

Jorge Assis (CCMAR, Portugal) discussed the role of citizen science in measuring the impacts of climate change on marine forests, structuring species of large brown algae which are a major support of ecosystem functions. Ongoing climate change is shifting the distribution of marine forests, particularly at low latitudes where refugia and higher genetic diversity is expected. The MARFOR project runs a global web-based citizen science initiative to submit records (photos) in space and time as an open data source to measure changes in ranges. To read more about the outcomes of this work, please see: http://www.euromarinenetwork.eu/activities/marine-forests-stakeholders

The workshop attendees celebrated EuroMarine's model and there was mutual agreement that such a network illustrates how the sustained support of basic research is important to be able to enable applied research that is required to inform policy makers.

For more information please visit the EuroMarine website (www.euromarinenetwork.eu).

The next EuroMarine call for proposals and for fellowship applications will open in 2018. For membership or other queries, please contact Secretariat@euromarinenetwork.eu.

INCOBRA

Organisers: *Sara Medina, André Barbosa*

As an EU-BR priority area, Marine Research is one of the topics addressed by INCOBRA. To this end, INCOBRA has organized a session on EU-BR cooperation in Marine Research that took place on July, 12th as part of the event "A New Era of Blue Enlightenment".

The main goal of the INCOBRA session was to demonstrate how the project can contribute to the EU-BR cooperation in Marine Research, by setting the scene on the current cooperation standards, on one side, and by addressing future perspectives, on the other side.

Moderated by Ana Paula Rossetto from *Sociedade Portuguesa de Inovação (SPI)*, the session counted with the participation of the INCOBRA coordinator and representatives from Brazilian and European policy actors as follows:

- Sociedade Portuguesa de Inovação (SPI), represented by André Barbosa, coordinator of INCOBRA;
- Brazilian Ministry of Science, Technology and Innovation and Communications (MCTIC), represented by Andrei Polejack, General Coordinator for Oceans, Antarctic and Geosciences;
- European Commission (EC) represented by Luciana Santos from DG-RTD;
- Council for State Funding Agencies in Brazil (CONFAP) with the participation of the president Maíra Zaira Turchi and Elisa Natola responsible for International cooperation with Europe;
- President of the State Funding Agency from Santa Catarina (FAPESC), Luiz Sérgio Gargioni.

The first session aimed at providing an overall perspective of the current status of EU-BR collaboration in Marine Research. Such collaboration should be referred in the framework of the ongoing strategic cooperation between Brazil and EU. Key achievements in the past were highlighted and the Belem Statement signature was referred as a relevant outcome of an ongoing and evolving process of bilateral cooperation.

Following, the project was presented by the coordinator André Barbosa from *Sociedade Portuguesa de Inovação (SPI)* that gave a brief overview of INCOBRA, focusing on the upcoming activities that may be of interest for marine researchers, such as the helpdesk tool, the hands-on training and the call for bilateral networks. Brief references to outcomes already produced by the project – and of interest to the marine research community – were made, such as the analysis of the participation of Brazil in Horizon 2020.

Highlighting the Horizon 2020 programme as a tool to strengthen the EU-Brazil cooperation in Marine Research, the EC representative provided a brief and general introduction to Horizon 2020, highlighting how Brazilian organisations may take part in a Horizon 2020 project (particularly as international partner).

The following session focused on the Brazilian programmes and opportunities, with presentations on existent and future support for Brazilian organisations that would like to engage in cooperation activities with European counterparts, notably through H20020. CONFAP presented the co-funding mechanisms available for Brazilian researchers to participate in Horizon 2020 calls, while the MCTIC informed on current programmes such as SAMOC and SAMBA line that are funded by the Brazilian government and are open for cooperation with European institutions and researchers.

Finally, Prof Moacyr Araújo presented the PIRATA project as case of success aiming to have to hear Brazilian researchers their testimonial, based on their experience, on the success factors, potentialities and challenges of such cooperation.

The session counted with over 50 European and Brazilian actors interested in working together and stablishing collaboration through the use of the funding mechanisms presented by the policy actors and thus putting into practice this new political instrument, the Belem Statement.

Last version of the Agenda

Welcome session and overview of EU-BR cooperation on Marine Research (10 minutes) Andrei Polejack – General Coordinator for Oceans, Antartic and Geosciences Department of Science Policies and Programmes, Secretary of R&D Policies and Programmes, Ministry of Science, Tecnology, Innovation and Communications (MCTIC) Luciana Santos – project officer, EC
How can INCOBRA contribute to the EU-BR cooperation in Marine Research? (10 minutes) André Barbosa – project manager, SPI Ana Paula Rossetto – consultant, SPI
Horizon 2020 as a tool to strengthen the EU-BR cooperation in Marine Research (15 minutes) Luciana Santos – project officer, EC
The Brazilian pathway to take part (and get funded) in Horizon 2020 (15 minutes) Maria Zaíra Turchi – President, CONFAP Sergio Gargioni – President, FAPESC Elisa Natola – Advisor for EU-Brazil International Cooperation, CONFAP Andrei Polejack – General Coordinator for Oceans, Antartic and Geosciences, MCTIC
Good practices, challenges and future perspectives for EU-BR cooperation (15 minutes) *Prof. Moacyr Araujo (UFPE) – project PIRATA*
Questions and Answers (15 minutes) *Andrei Polejack (MCTIC) and SPI will briefly share their personal experience and perspective of EU-BR cooperation, as a starting point for the Q&A session*

Ocean Literacy

Organisers: *Celia Quico, Ana Noronha*

The H2020 projects ResponSEAble and Sea Change jointly organized a workshop on ocean literacy. The session was chaired by Luís Menezes Pinheiro, from the University of Aveiro, Portugal, who presently Chairs the COI-UNESCO Portuguese Committtee. The workshop started with the panel "Ocean literacy in Europe and Across Atlantic: opportunities and challenges" with Francesca Santoro, COI - UNESCO, Célia Quico, ResponSEAble, Ana Noronha, Sea Change, and Danilo Calazans, deputy coordinator of the Executive Committee for Human Resources Formation in Ocean Sciences, Brazil.

Francesca Santoro, COI - UNESCO, presented the outcomes of the Ocean Conference held in New York, at the United Nations, where a Call for Action specificaly mentioning ocean-related education and ocean literacy (paragraph 13.e)) was approved. A side event "Ocean Literacy for All", gathering about 90 participants, and a voluntary commitment were organized to (i) Encourage cooperation and best practice exchange related to ocean science education; (ii) Raise awareness of the interactions between the ocean and peoples' daily lives, and empower citizens to adjust everyday behavior; and (iii) Seek and apply innovative ways to make current and future generations ocean literate. Francesca Santoro also briefly presented COI-UNESCO´s Global Ocean Report and the proposal to establish 2021-2030 as the International Decade of Ocean Science for Sustainable Development.

Célia Quico, from Lusófona University, Lisbon, a partner of ResponSEAble, briefly presented the objectives and expected results of the project. Data on the existing knowledge on human-ocean relationships is vast but the traditional awareness raising activities are not enough to induce behavioural change. To investigate the link between knowledge and behaviour, ResponSEAble has elected six challenging environmental pressures for the ocean to address in detail, including their economic relevance and the public´s perception and understanding of the issue: Microplastics and cosmetics; Eutrophication and agriculture; Invasive alien species and ballast water; Sustainable fisheries; Marine renewable energy; Coastal Tourism. These "Key Stories" will be analysed across the EU, including the Black Sea, the Mediterranean, the Baltic and the North-East Atlantic regions. Interactive media platforms, serious games, short films, social media campaigns are being produced, and education actions, for youngsters and for professionals are being organized (maritime academies, actions for fishermen).

A brief presentation of Sea Change was presented by Ana Noronha, from the partner Ciência Viva, Portugal. Social innovation methods are used by Sea Change to work with stakeholders in order to promote behaviour change in the way Europeans relate to the ocean in their daily life. The project aims to empower citizens to take informed and responsible decisions about the ocean and its resources and services. A range of tools and resources are being produced for education and societal stakeholder engagement targeting schools, policy makers and the public at large. Examples include small videos, an European Database of Good Examples in Marine Education and Outreach (Ocean EDGE Directory), fact sheets, an E-Learning Book, MOOCs, on-line seminars and a toolkit for World Ocean Day. Sea Change is actively building a legacy by enhancing links through networks dedicated to the ocean, like the recently created EMSEA, European Marine Science Educators Association, EUROGEO, EMB, WON, IOC-Unesco and NMEA – North American Marine Educators Association, and other international institutions through the participation in a voluntary commitment and side event at the UN Ocean Conference, in New York. Another strategy for legacy consists in making advocacy for the ocean within other European networks like Ecsite, the European Association of Science Centers and Museums, and FEE, the Foundation for Environmental Education.

The panel continued with an overview of ocean literacy developments in Brazil by Danilo Calazans, Federal University of Rio Grande and deputy coordinator of the Executive Committee for Human

Resources Formation in Ocean Sciences (PPG-MAR). Short-term objectives consist in adapting the principles and concepts of ocean literacy to the Brazilian reality, involving the relevant stakeholders and interested parties. Mid-term objectives include the development of a (i) Teacher Training Course of Basic Education on the principles of Ocean Literacy; (ii) Providing a forum for communication between Brazilian key players and (iii) Developing a web-based plataform offering educational resources organized according to the Ocean Literacy Principles and grade levels. Danilo Calazans also briefly presented the project of 4 oceanographic vessels specificaly designed for the training of undergraduate students. The delivery and test of the first ship was due in July.

The session continued with a lively debate started by Gonçalo Calado, also from ResponSEAble and Lusófona University, who invited the participants to share their experiences on ocean literacy, difficulties and lessons learned. The audience (about 40 participants) consisted in members of other EU funded consortia (other elements from Sea Change, MARLISCO, MARINA, SponGES), EurOcean, EMB, JPI Oceans, EMBRC, FMI, NSF (USA), members of Brazilian research and policy bodies, marine scientists from Portuguese laboratories (CIIMAR, MARE, IPMA, CIMA, CESAM, EMEPC) and elements from Oceano Azul Foundation and Portuguese Ciência Viva science centers.

There was a consensus among the participants on the importance of reinforcing ocean literacy in basic education, namely by producing appropriate Teachers Development Courses and resources. The need to engage with businesses, universities and the media was also referred as a priority.

One of the topics addressed was the concept of ocean literacy itself. The EU concept evolved from the initial Canadian and North American one and was clearly presented by the ResponSEAble and Sea Change representatives. It was pointed out that in some latin languages like Portuguese the direct translation “literacia do oceano” might be associated to academic knowledge and in Brazil the term used is “Descobrindo o oceano” (“discovering the ocean”). However, Portuguese and Italian participants have adopted the term “literacia” for practical reasons, due to the widespread and non-ambiguous use of the ocean literacy concept.

With the Call for Action approved at the UN Ocean Conference, the concept of ocean literacy is evolving, as more regions and different existing initiatives are included. The need to take into account heritage, cultural and even ethnic aspects into ocean literacy was one of the conclusions that emerged from the debate as particularly important for the South Atlantic participants.

Ocean Impact Alliance

Organisers: *Ief Winckelmans, Peter Royers*

Introduction

"No Oceans, No Life, No Blue, No Green"

- Dr. Sylvia A. Earle -

Mankind is rapidly becoming the victim of its own success. Overcrowding, inefficient management and parasitic consumption of Earth's natural resources are leading to the irreversible destruction of our global habitat. The negative impact of mankind's activities has disturbed the balance and we are rapidly running out of time to rescue this planet for ourselves and future generations. Our current rate of consumption and polluting is simply not sustainable.

OCEAN IMPACT ALLIANCE started a global quest for eco-friendly alternatives and solutions for the massive environmental challenges we are facing. We accomplish our mission by connecting eco-change-makers to the expertise, resources and funding-sources that will help them succeed.

Challenges are an opportunity for progress

"Not fear but opportunity is the engine that drives the development of a sustainable society. "

A thriving, sustainable society is based on strong ecological, economic and social foundations and the transition to a sustainability blue economy is probably the biggest wealth-generating opportunity since the industrial revolution.

- The entire global economy exists to address the needs and discomforts of mankind. We now start to experience the consequences of climate change, overfishing, pollution and depleted natural resources. Alternatives and solutions are urgently needed.
- Awareness for the global environmental issues is rapidly growing among the general public, consumers expect sustainable responsibility from their leaders and their brands.
- Scientists, engineers, artists, students and aspiring entrepreneurs all over the world are attempting to create sustainable businesses and they need all the support and resources we can find to help them succeed.

How We Make a Positive Impact

1. Together with our allies we go on a global quest to find valuable, transformational eco-initiatives.
2. We connect eco-friendly projects to the experts, resources and funding-sources that will help them succeed.
3. We develop a pipeline of high-yield investment opportunities with a positive impact on the oceans and our planet.
4. The OCEAN IMPACT Algorithms generate innovative ideas for eco-friendly projects based on all data available, such as current and expected environmental challenges, and current available expertise and expertise in our network.

How We Reach Our Objectives

1. We reach out to individuals, organizations and corporations and invite them to tell us about their eco-friendly initiatives, the environmental challenges they are facing, the eco-solutions

they are implementing.

2. We invite every eco-responsible individual, organization and corporation to provide us with a list of the expertise, resources and funding they need to make their projects even more success- and impactful.
3. With state-of-the-art data-analysis tools we connect what is being offered with what is needed, effectively creating a global eco-innovation co-creation hub, a matchmaking service and marketplace for sustainable progress.

Why We Succeed

- We leverage the combined strength of leading investors, scientists, entrepreneurs, corporations and non-profits to help eco-friendly initiatives succeed.
- Funders, both non- and for-profit no longer need to worry if they are making the right environmental decisions, we provide the tools and expertise to assess the ecological impact of investment opportunities.
- Investors will always focus on making money, we provide them with opportunities they cannot ignore, we find, support and develop eco-friendly investment opportunities with ROI's and TTV similar to traditional investments.
- Corporations benefit from the eco-solutions we generate, lowering their costs and helping them greening their operations and their corporate image.
- Non- and for-profit 'ecopreneurs' move significantly faster from idea to success through the expertise, resources and funding we can provide.
- Service-Providers, Consultants, Business Coaches & Mentors, experts in their field, can offer their expertise to meaningful, eco-friendly projects
- Charity foundations find in OCEAN IMPACT ALLIANCE a trusted partner to source of eco-friendly projects that lead to a significantly bigger impact.

Sustainably Harvesting our Marine Resources

Organisers: *Guðmundur Stefánsson, Lisa Borges, Rosa Chapela, Malcolm Beveridge*

Sustainably Harvesting our Marine Resources is one of the 13 parallel sessions dedicated to advancing "Building an Atlantic Ocean Community: Project Ideas and Meeting Place", that took place on day one (12th of July) of the A New Era of Blue Enlightenment.

The hour-and-a-half session focussed on showcasing a number of EC Horizon 2020 and FP7 Projects – DiscardLess, PrimeFish, ClimeFish and MareFrame - all dedicated to addressing various aspects of sustainable exploitation of marine resources. The opening address was made by the Session Chair, Jacques Fuchs, Former Deputy HoU of the Marine Resources Unit in the Bioeconomy Directorate in charge of the coordination of marine research in DG Research and Innovation, EC DG Research. The series of project-specific presentations was introduced by a presentation on behalf of the FAO on Blue Economy and Blue Growth and was concluded by a presentation on stakeholder engagement, which cut across the projects presented and others.

Marine resources are under heavy pressure, yet they also have a high potential to produce healthy food. How to improve the situation? By harvesting better (less discards, **DiscardLess**; better management **MareFrame**); improving competitiveness (**PrimeFish**), adapting to climate change (**ClimeFish**), improving public perceptions, using guidelines (**FAO**). Also, reinforcing cooperation in the Atlantic, with a focus on food security, improved fisheries management, aquaculture and biodiversity, as identified in the Belem Declaration.

A presentation focused on **the Blue Economy and FAO's Blue Growth Initiative**, given by Malcolm Beveridge, FAO, Rome, was the first of the session talks. The global oceans are under increasing threats from a variety of anthropogenic impacts, resulting in stock depletion, erosion of biodiversity, and numerous other problems. There is a growing acceptance that in order to fully address the two key global challenges of our time – to manage climate change within acceptable limits and to eradicate poverty and hunger by 2030 - there is a need to implement a wide variety of actions to clean up the oceans and control over-fishing. FAO's Blue Growth Initiative, aimed at the sustainable development of fisheries and aquaculture in close collaboration with communities, is rooted in the FAO Code of Conduct of Responsible Fisheries, launched some 20 years ago. The BGI is being implemented at global, regional and country levels. In coastal Africa, for example, a joint exercise among coastal African countries, the African Development Bank and the World Bank, carried out in preparation for COP 22, Morocco, November 2016, estimated that investment in the Blue Economy in the region is around $3.5 billion. FAO is also a partner in a number of the Horizon 2020 projects presented at this session, including DiscardLess and ClimeFish.

DiscardLess (2015-2019), introduced by Lisa Borges, FishFix, Belgium, is a multidisciplinary H2020 research project with 31 partners, which aims to provide the knowledge, tools and technologies as well as the involvement of stakeholders to achieve the gradual elimination of the discarding of unwanted catches in European fisheries. These are integrated into Discard Mitigation Strategies (DMS), proposing cost-effective solutions at all stages of the seafood supply chain. The first focus is on preventing the unwanted catches from ever being caught. The second focus is on making the best use of unwanted catches that cannot be avoided. DiscardLess evaluates the impact of discarding on the marine environment, on the economy, and across the wider society, before during and after the implementation of the EU obligation policy (discard ban), allowing comparison between intentions and outcomes.

PrimeFish (2015-2019), presented by Gudmundur Stefánsson, Matis, Iceland, is a H2020 research project with 16 participants, thereof 14 from Europe, two from outside Europe (Canada and Vietnam) and a large number of stakeholders within an "industry reference group." The aim of the

project is to enhance the economic sustainability of European fisheries and aquaculture sectors. The outcomes from the project will be various decision support tools that are expected to help both public authorities and production companies in understanding and predicting seafood market behaviour. For instance in gauging the competitiveness of sectors or benchmarking the competitiveness of companies and to give early warning signs for “boom and bust” price cycles; for strategic positioning within the value chain, on success analysis for new products and for innovation and price analysis for specific seafood products.

MareFrame (2014-2017), presented by Anna Kristin Danielsdottir, Matis, Iceland, is a FP7 funded project, with 28 RTD, SME and ORG participants from 14 countries, off which 10 come from Europe and 3 from South Africa, Canada and Australia. MareFrame seeks to increase the use of an ecosystem-based approach to fisheries management to improve governance within European fisheries. A decision support framework, containing improved ecosystems, was developed, adapted to the needs of decision makers, managers, operators, and other stakeholders with the aim of supporting the implementation of the new Common Fisheries Policy, Marine Strategy Framework Directive and Habitats Directive. The ecosystem approach is based on responsiveness, flexibility, and stakeholders’ involvement. An interactive learning tool has been developed for training key stakeholders in using the decision support tools.

ClimeFish (2016-2020), also presented by Anna Kristin Danielsdottir, Matis, Iceland, is a Horizon 2020 funded project with 21 RTD, SME and ORG participants from 16 countries, off which 13 come from Europe and 3 from Canada, Chile and Vietnam. The overall goal of ClimeFish is to help ensure that the increase in seafood production, comes from areas and species where there is a potential for sustainable growth, given the expected developments in climate. The focus is on three main sectors: marine aquaculture, marine fisheries, and lake and pond production. ClimeFish will in co-creation with stakeholders, develop guidelines, good practice recommendations and a voluntary European standard outlining how to develop climate adapted management plans in the future. Through training and dissemination to stakeholders, active utilization of the developed tools and guidelines will be ensured.

The cross-project topic of **Stakeholder** Interaction, was introduced by Rosa Chapela, CETMAR, Spain. CETMAR uses front running participatory approaches for impactful science in marine research as environmental and marine challenges are multifaceted and complex. On the one hand, a growing number of stakeholder organized in multi-layer dimensions want to have their say on public policies. On the other hand, at European level, strategic actions have been taken to increase the impact of research beyond science, reaching business, policy makers and the society. MareFrame, PrimeFish and ClimeFish address both needs by enabling progressive, adaptive and effective engagement of stakeholders. By designing tailor-made approaches, from consultation to co-creation, integration of local knowledge and social learning, the projects are achieving transparency, increased acceptance and uptake of project outputs for decision-making and strategic planning.

Although some 20 minutes was allocated for questions at the end of the formal presentations, very little time proved available. A scientist from Brazil asked whether the DiscardLess project was trying to identify any novel valuable biomolecules from by-catch and was informed that a Belgian biotech company was one of the project partners. The issue of aquaculture disease was also raised as a problem and the question asked whether any of the EC funded projects was investigating this. Finally another questioner from Brazil raised the issue of marine spatial planning, which prompted a discussion about the need for a multi-sectoral planning approach at different geographic scales.

Tara Oceans

Organisers: *André Abreu*

From 2009 to 2012, the schooner Tara sailed around the globe, equipped with technology for sampling an 11 organism size-range covering entire plankton communities from viruses to animals, and benthic diversity in coral reef ecosystems. During the two-and-a-half-year expedition, high quality and standardised genetic (total DNA/RNA), morphological, and physico-chemical (contextual) samples from 210 stations across the world oceans were collected. The sampling locations were carefully selected using near-realtime remote sensing, numerical models and in-situ hydrographic criteria.

After the expedition, a team of international scientists is currently analysing samples from this €10 million public/private scientific expedition (Tara Oceans 2009–2013): the total of ~35,00 biological samples and ~13,000 contextual measures from three depths constitutes the largest modern-day worldwide collection of plankton sampled 'end to end' around the world.[3] Metagenomes and meta barcodes from stations are being built as well as well as quantitative and high-resolution image databases. Genomics data are published in open access as soon as they are validated at EMBL-EBI, correlated with environmental data stored at Pangaea.

Opportunities for Scientific Cooperation in South Atlantic Ecosystem

The biology of the South Atlantic, a very important crossroad of the global oceans, is relatively unknown while the ocean physics are being monitored by several scientific endeavours and programmes. At this regards, the Tara Oceans expeditions had an exceptional coverage of the South Atlantic oceanography and biology, with a detailed mapping of South Africa and South America coastal and open ocean waters (see figure below). In particular, 5 stations were positioned within the waters around South Africa, with three of them describing the coastal regions, including the Benguela upwelling system, one of the most important world fishery. The south American side of the South Atlantic is also very well covered by a long transect of stations covering from the tropics down to the Patagonian shelves, including six stations in the waters in front of the Brazilian coasts. The dataset is thus very adapted to provide an in depth description of the region open ocean biology and ecology with unprecedented depth and coverage.

Challenges for Marine Science in South Atlantic

The preliminary analysis of Tara Oceans - 5 papers published in a 2015 SCIENCE magazine special issue – showed the importance of the long-range transport of the ecosystem components, with several species being moved around for thousands of km by the currents. First, there are strong similarities between the open ocean sub polar regions (subantarctic frontal region) and the coastal plankton ecosystems around South Africa. Secondly, thanks also to the Agulhas Rings traveling, coastal African species are transported on very long distances and may reach the Brazilian coast. There are thus long range connections which superimpose on the local general circulation, with a large subtropical gyre at the centre of the basin, with coastal and Equatorial upwelling sites on the eastern side of the basin and the sub polar and polar regions at south.

Within this exceptional crossroad, the exchange might now be characterized by using the metagenomic and metatranscriptomic dataset (over 160M genes, with their abundance and

[3] SCIENCE Magazine, May 2015

expression in 400 environmental conditions), where single genes or species (their DNA and RNA) can be followed across the basin during their travel. In addition, the change of metabolic rates with varying environmental conditions could be analysed as well as any sign of evolutionary response to the anthropogenic impacts.

In addition, the use of enhanced genomic allows to understand the structure of the local planktonic food web, which is essential to understand fisheries migration, depletion and risks for ecosystems and species. Finally, these studies will help to generate data and knowledge about new species with potential for biotechnology uses in medicine, pharmacy and energy.

EU-South American Cooperation for Excelency and Capacity Building

Since 2015 the Tara Expeditions Foundation is funding a capacity building program with Brazil, Argentina and Chile, with postdoctoral students now working in France and Germany with the Tara Ocean's coordinators in EMBL, CEA, CNRS and ENS. The objective for this program is to share knowledge, technology and access to datasets including the South American research institutions in the Tara Oceans Consortium. A strong potential scientific collaboration is thus set with this program for a regional project based on the Tara Oceans DATA and information system. The program is funded by the French Environment Fund (FFEM) and will be completed with future participation of local foundations as FAPESP from São Paulo, Brazil.

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