DG MARE

Elaboration of the Atlantic Action Plan

Maritime space management and Climate Change Mitigation under the Ecosystem Approach - Workshop Atlantic Forum (Bilbao, 11 & 12 November 2012)

Thematic report – 4 November, 2012 (Version 3 (final version))

A project undertaken by the Consortium comprising:

- COWI
- Ernst and Young
- BIOIS.

This report has been drafted by the Consortium, on behalf of DG MARE.

Contents

1 Foreword

The EU Directorate General for Maritime Affairs and Fisheries (DG MARE) and the Atlantic Forum have initiated a stakeholder process for the development of an action plan for the Atlantic Ocean.

During the development of the action plan, five workshops will be held. For each workshop, a thematic report will be provided to inform the discussion.

The purpose of the thematic reports is to inform each workshop by providing background information on the workshop's discussion topics. The thematic reports pose questions and provide potential recommendations for the Atlantic Action Plan that can be used as a starting point for discussions. After the workshops, conclusions and comments will be incorporated into the thematic reports.

After completion of the workshops, DG MARE will compile recommendations on priority research, investment and policy actions in the Atlantic Action Plan. The Atlantic Action Plan will implement the five themes of the Atlantic Strategy (COM (2011) 782):

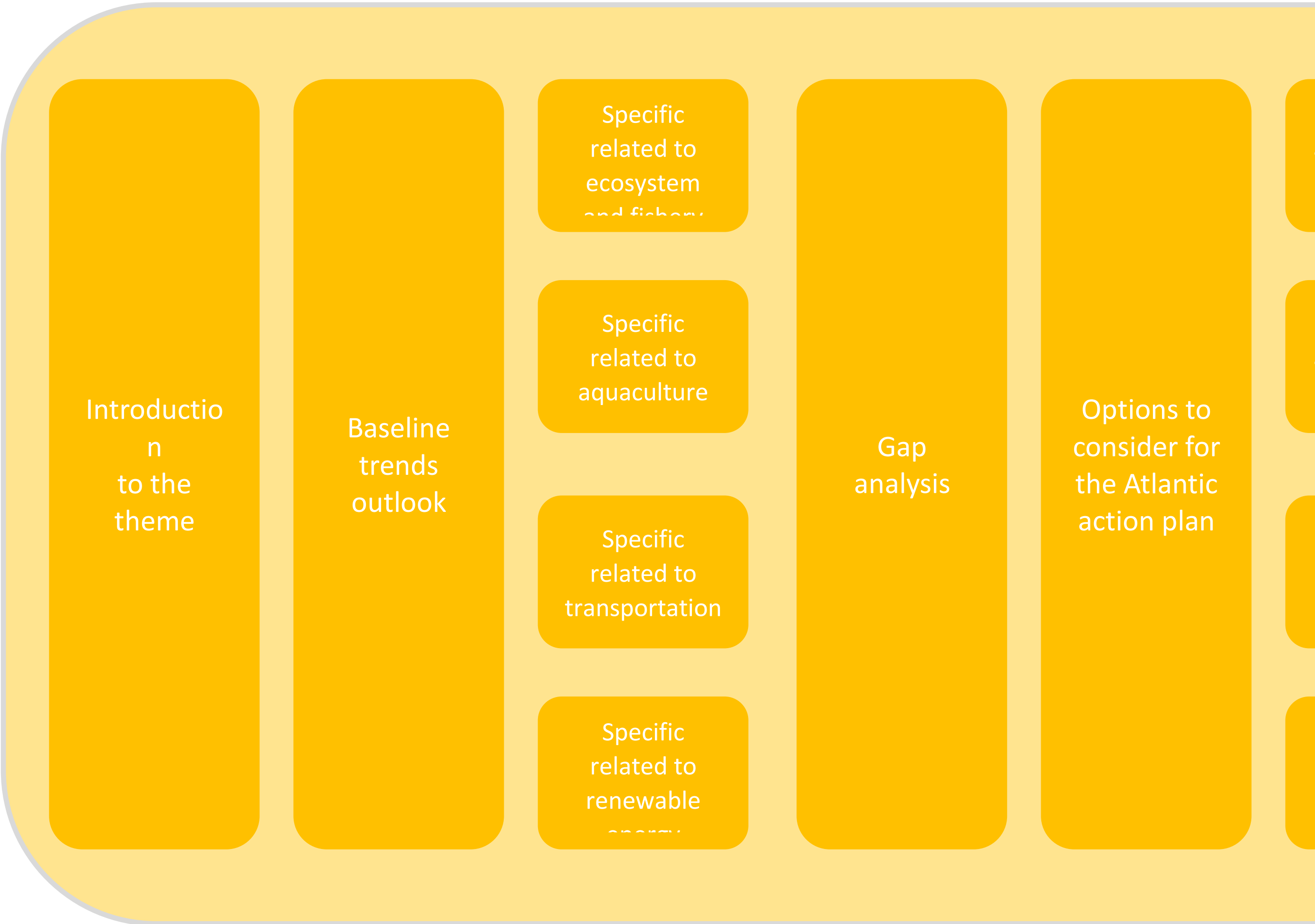
1. Implementing the ecosystem approach
2. Reducing Europe's carbon footprint
3. Sustainable exploitation of the Atlantic seafloor's natural resources
4. Responding to threats and emergencies
5. Socially inclusive growth.

DG MARE has commissioned COWI and E&Y to assist with the development of the Atlantic Action Plan. The work has been launched under the framework contract for impact assessments and evaluations, the MARE/2011/01 Lot 1 Maritime Policy.

The objectives of this assignment are to:

- support the development of the Atlantic Action Plan
- prepare its performance monitoring and evaluation modalities (performance framework and indicators)
- undertake its ex-ante evaluation.

This report is structured as follows:



Chapter 2 includes an introduction to the theme. The overall theme of the workshop and this report is "Ocean Services and Climate Change Mitigation under the Ecosystem Approach".

Chapter 3 provides an overview of the baseline, trends and outlook for sectors treated at this workshop. The first part of the chapter provides some general considerations whereas the second part is divided according to the four subthemes.

Chapter 4 provides a gap analysis for each of the four subthemes. This analysis is followed by chapter 5, which proposes what issues to address in the action plan and what concrete actions to include.

Finally, for each of the subthemes, an annex is included containing an analysis of the specific aspects of each subtheme.

Any suggestions for the thematic reports are most welcome. Please do not hesitate to contact Ernst & Young (christina.castella@fr.ey.com or tom.farrant@fr.ey.com) or COWI (Christina van Breugel, cvbr@cowi.dk) if you have ideas or comments that may encourage and support the further development of the thematic reports.

2 Introduction and context

The aim of this report was to inform the discussion at the workshop in the Bilbao that was held on 11 and 12 November 2012. The theme of the workshop was "Ocean Services and Climate Change Mitigation under the Ecosystem Approach" and the topics of discussion included:

- ecosystem approach for fisheries management
- offshore aquaculture
- marine renewable energies
- intermodal transport and maritime safety.

Each topic is discussed in the subtheme annexes of this report. The thematic report synthesises baseline, trends and outlook into an analysis of gaps and possible recommendations for the Atlantic Action Plan.

The overall topic for the workshop was the ecosystem approach. This approach involves focusing on the sectors and activities benefiting and impacting the marine waters. Examples include fishing where the benefits are the value added from being able to fish in marine waters, and the negative impact from removing fish from the stock if not done at a sustainable pace. All sectors using the waters benefit from the ecosystems that the water provides. The value of the use of the water may differ a lot between the sectors and some depend directly on the quality of the water whereas others are only affected by the possibility of having access to the waters. Some of these sectors are presented in this report.

The present challenge is that the overall aim of the ecosystem approach is not directly in line with the Action Plan's aim to create growth. The ecosystem approach is a strategy for the integrated management of marine water and living resources in the water, promoting conservation and sustainable use in an equitable way. In other words, how do we obtain growth without compromising the value of the ecosystem services?

Furthermore, the marine water ecosystem is seen as a mean for climate change mitigation by exploiting the water or the marine space to produce renewable energy.

Focus is on the major trends as local interests will not be part of the Atlantic Action Plan, which aims to be a general and generic action plan for the whole region. However, inspiration may be found in local initiatives which have the potential of being implemented on a larger scale.

This document is revised based on the discussions at the workshop and will be used in the process of developing the Atlantic Action Plan. The final thematic report will also be used as input to the project's evaluation document.

3 Baseline situation – trends – outlook

In the following, an overview is given of the major trends which are not sector-specific such as employment effects, economic growth and the policy framework. Funding mechanisms could also be non-sector-specific, but funding will be discussed in the general document related to the process of the development of the Atlantic Action Plan. Afterwards a short analysis is provided for each of the four subthemes dealt with in the annexes. The aim is to provide insight into the state of play and the potential for future development of the sectors.

3.1 Sector indicators

To create growth in the Atlantic region, activities in the area are needed. The following focuses on the sectors included in this thematic report. As specific data on the employment rate and the value created in the sectors in the Atlantic region is unavailable, the point of departure is data for the entire EU.

Figure 1: Socio-economic indicators in the European Atlantic

MARNET: Marine Atlantic Regions Network

Research institutions in the five Atlantic Member States have joined to develop a framework to assemble socio-economic data in the region. One outcome of the EU funded project that runs from 2012-2014 is an Atlantic atlas of marine socio economic indicators.

The focused knowledge will be useful in the context of developing and evaluation the Atlantic Action Plan.

Source: www.marnetproject.eu

The sectors differ greatly in size, and the below figures indicate the level of sector activities across the whole EU.

Figure 2: Value-added and employment level of maritime transport and shipbuilding in the EU

Function / activities	Current size		Sources & Comments
	Value added (€ bn)	Employ-ment (in 1000)	
1. Maritime transport and shipbuilding			
1.1 Deepsea shipping	98	1,204	Eurostat database (2012); Data 2008; share in total shipping based on freight volumes
1.2 Shortsea shipping (incl. RoRo)	57	707	Eurostat database (2012); Idem
1.3 Passenger ferry services	20	200-300	Eurostat database (2011) (passenger statistics), Annual reports of operators (staff data); Data 2009; employment calculated based on staff/pax for several large operators. GVA share assumed relative to employment
1.4 Inland waterway transport	8	36	Eurostat database (2011); Data 2007

Source: DG MARE, "Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts – final report", 2012

When looking at the specific figures for Ireland and Portugal, which only have coastline towards the Atlantic, we see that the shipping sectors only employs around 4,000.[1] For port activities, the pattern is the same with around 4,000 employed in this sector. When looking at France, the UK and Spain, we see that the same sectors employ a significantly higher number of people, due to the activity in the other marine areas.

[1] DG fisheries and Maritime Affairs, Employment trends in all sectors related to the sea or using sea resources, summary, 2006

Figure 3: Value-added and employment level of fisheries in the EU

Function / activities	Current size: Value added (€ bn)	Current size: Employment (in 1000)	Sources & Comments
2. Food, nutrition, health and eco-system services			
2.1 Catching fish for human consumption	8.7	200-240	Anderson and Guillen 2009; Data 2007
2.2 Catching fish for animal feeding	0.3	6.0	Eurostat database (2011); Data 2007
2.3 Marine aquatic products	0.5	80	Eurostat database (2011); Framian 2007; Production data 2007, employment data 2005
2.4 Blue biotechnology	0.8	<0.5	Lloyds Evans (2005) (turnover), own estimate for employment; Assumed 1/3 of world production in EU
2.5 Agriculture on saline soils	<0.25	<0.5	no data, own estimate based on literature

Source: DG MARE, "Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts – final report" 2012

The fisheries sector shows a very different trend; Many people are employed in the fisheries sectors in Portugal and Ireland, around 45,000. France, the UK and Spain also have many employees in this sector, and it is expected that they also have a high activity level in the Atlantic Ocean.

Figure 4: Value-added and employment level of specific marine energy and raw materials sectors in the EU.

Function / activities	Current size: Value added (€ bn)	Current size: Employment (in 1000)	Sources & Comments
3. Energy and raw materials			
3.1 Offshore oil and gas	107-133	25-50	Eurostat database (2011) + own estimate for offshore share; Data appear unreliable; probably much larger
3.2 Offshore wind	2.4	35	EWEA (2010), Eurobserver (2010), EWEA (2011); Share based on MW installed offshore compared to onshore; 2010 investment data as a proxy of GVA only
3.3 Ocean renewable energy (wave, tidal, OTEC, thermal, biofuels, etc.)	<0.25	1	Own estimate based on installed power. Data IEA (2011)
3.4 Carbon capture and storage	<0.25	<0.5	No data, own estimate based on literature
3.5 Aggregates mining (sand, gravel, etc.)	0.6	4.3	Eurostat database (2011); British Geological survey (2007); Offshore share estimated. Employment estimate based on UK data
3.6 Marine minerals mining	<0.25	<0.5	No data, own estimate based on literature
3.7 Securing fresh water supply (desalination)	0.7	7	Global Water Intelligence (2010); EU share estimated at 10% of global industry

Source: DG MARE, "Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts – final report" 2012

The renewable energy sector is still relatively small. National activities exist, but still on a small scale. Based on these figures, it is evident that the shift from the dominant traditional sectors to newer sectors is yet to come in terms of number of employees and turnover.

When comparing the sectors in terms of the ratio of value added per employee, significant variation is seen, between the sector of renewables and in the traditional fisheries sector being much lower. And with the transport sector in between still with much low ratio compared to the renewables. The level of value added is influenced by many factors, such as the balance between knowledge and labour intensity. To obtain reliable results from which to draw conclusions, a sector needs to have a certain size; otherwise, a few small, but very successful companies could give the impression that a sector is particularly advantaged.

Against this background, it can be concluded that the Atlantic region has indeed a strong, but still small shipping sector, which creates economic value added to the region. At present, the number of employees is relatively limited, however, with expectations of an increasing amount of goods needing transport, this position should be explored further with a view to creating new jobs.

The fisheries sector has a weaker position when it comes to creating value added. However, the sector employs many people in the region. It should be noted that the sector has many part-time employees, and this makes the value added per employee look less attractive.

Finally, the renewables energy sector still has a limited number of employees, and value added in the region by the sector is limited. The sector has a tradition for making very high earnings, and combined with the high level of energy available in the waters of the European Atlantic region, it has a great potential for creating new jobs.

3.2 Policy and legislation

To define the framework for developing the sectors in the European region, a number of policies and legislations have been launched.

3.2.1 EU2020

The EU launched EU2020, a growth strategy aiming at making European societies global leaders in terms of competitiveness and sustainability. With the strategy, emphasis is put on three mutually reinforcing priorities; smart growth, sustainable growth and inclusive growth. To support the priorities, the Commission has put forward seven flagship initiatives, one of them being Horizon 2020, the financial instrument to implement the Innovation Union in which all research and innovation funding of the current framework programmes will be bundled. Horizon 2020 aims at bringing more good ideas to market and promoting competitive industries based on scientific research. Under Horizon 2020, nearly €32 billion will be distributed to projects aiming at addressing major concerns shared by all Europeans, among them sustainable transport, affordable renewable energy and safe food supplies.

Specifically relevant to renewable energy is the initiative of the Strategic Energy Technology (SET) plan, which establishes an energy technology policy for Europe. It is a strategic plan to accelerate the development and deployment of cost-effective low-carbon technologies. The plan comprises measures relating to planning, implementation, resources and international cooperation in the field of energy technology.[2].

3.2.2 Common fisheries policy

The Common Fisheries Policy (CFP) is the European policy concerning the management of fisheries and fish stocks. In 2008, the Marine Strategy Framework Directive 2008/56/EC (MSFD) was adopted by the European Union and set a framework for community action in the field of marine environmental policy. It aims at achieving good environmental status in all marine environments and at bringing back the stocks of commercially exploited fish and shellfish to safe biological limits. The CFP is currently being reformed to become more aligned with the MSFD and to achieve the objective of balancing safe fish stocks with supplying safe and healthy sea food to consumers across Europe. Among other things, the reformed CFP will support small-scale fisheries that are dominant also in the Atlantic and give increased responsibility for its implementation to Member States. Through these initiatives, new prosperity should be brought to the fisheries industry, and jobs and growth created in coastal areas.

[2] http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm

3.2.3 Environmental policy framework

The environmental policy framework seeks to protect the environment from the possible negative impacts caused by activities. A number of policies need to be considered when contemplating exploring and exploiting resources from the coastal and deep-sea areas of the European part of the Atlantic Ocean.

The environmental frameworks need to balance the wish to protect the environment and the wish to support operating possibilities and economic growth.

The environmental framework includes policies at different levels, including specific national legislation which may be the implementation of an EU directive, or which may derive from a wish to protect national interests. Together with OSPAR, a voluntary cooperation between the countries bordering on the North Sea or the Atlantic Ocean, these policies provide guidelines for the use of national waters. In international waters, the UN has launched a number of initiatives, such as conventions that provide directions for the right to operate in those waters. Specific requirements in these legislative frameworks might limit the possibilities of exploiting resources from the seabed; however, other activities are also likely to fall under these legislative instruments.

The environment needs to be protected against the negative impact of such activities. The legislation in place uses different tools to preserve the marine environment and puts limitations on the activities.

Other sectors operating in the European part of the Atlantic Ocean might have other interests, such as tourism, which depend heavily on clean water and undisturbed coastal areas. The conflict of interest relating to the use of the space available is also important to consider in the formulation of the action plan.

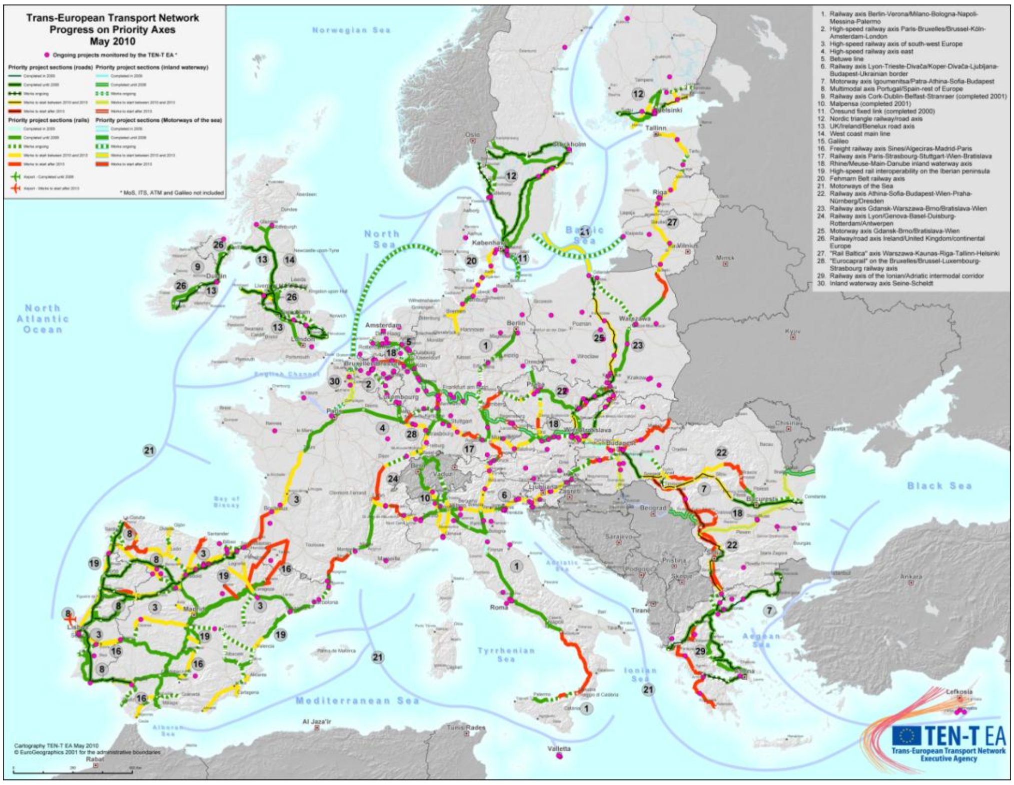
On the other hand, there are policies in place to support such a development of the maritime area by providing infrastructure, education of skilled employees and funding.

3.2.4 Infrastructure

Infrastructure on land to support maritime activities is fairly well developed throughout the entire European Atlantic coast. Most of this infrastructure, in the form of ports and associated road and rail links, is primarily geared towards maritime freight transport and fisheries and, to a lesser extent, maritime tourism and related leisure activities.

Large-scale investments in infrastructure development in Europe are framed by the EU transport policy, in particular by the Trans-European Transport Network programme (TEN-T). Of the recently approved 30 priority projects (see map beneath), close to 20 pertain directly to maritime links in the Atlantic Arc. In conjunction with these investments in large-scale infrastructure, efforts are being directed at improving the integration of maritime with land-based modes of transport, involving, among other things, enhanced information exchange and simplified customs procedures. Because of the peripheral geographical position of the Atlantic regions, such investments are seen as necessary for their integration with the larger EU industrial and consumer markets.

Figure 5: Map of the 30 priority projects under the TEN-T programme



Source: TEN-T Executive Agency, online at http://tentea.ec.europa.eu/en/ten-t_projects/30_priority_projects)

As regards strategies for port development, the EU has published a "Communication on a European Ports Policy[3]". The ports are key points of modal transfer and are of vital interest in the handling the vast majority of Europe's international trade and a significant share of the intra-Community trade.

Commission action seeks to ensure sustainable development of all ports in Europe, promoting industrial efficiency, reducing environmental impact and safeguarding working conditions and the smooth integration of ports in the overall transport chain[4].

Figure 6: European port policy: port competition

Competition between and within ports is increasing for a number of reasons, highlighting factors that distort trade flows between Member States:

- liberalisation of the internal market;
- technological changes (application of information technology, standardisation of loading units);
- development of the trans-European network, which provides users and operators with greater choice in an intermodal environment.
- A Community framework is needed to ensure the principle of free and fair competition.

Source: http://ec.europa.eu/transport/maritime/ports_en.htm

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[3] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0616:FIN:EN:PDF

[4] http://ec.europa.eu/transport/maritime/ports_en.htm

3.3 Ecosystem approach to fishery management

Fisheries in the EU are governed by the Common Fisheries Policy (CFP), which is currently being reformed. The reformed CFP aims at bringing fish stocks back to sustainable limits and at providing consumers across the EU with safe and healthy food from the seas. Even though the exact details of the CFP reform are not yet clear, the reformed policy will give Member States increased responsibility for its implementation. This opens the opportunity for enhancing cooperation between Member States in fora such as the Atlantic Forum. Such increased cooperation in the Atlantic Forum could cover, e.g., shared institutions that manage the closely linked waters, stocks and fleets or that market Atlantic fish. The demand for fish is increasing across Europe, and consumers are becoming more health and environmentally conscious. On a global scale, the demand for food is rising and fish is an important resource in this respect. As the Atlantic is a fisheries region characterized by many small operators and low levels of pollution compared to other regions in Europe, the Atlantic region could capitalize on this trend by marketing its products under e.g. a common Atlantic label. Discussions at the workshop also addressed the possibility of using existing labels or establishing a common European label to promote European fish.

3.3.1 Sector overview

In the following, an overview of sector characteristics is given.

- The Atlantic accounts for about 80 per cent of all catches within European waters, but stricter quotas in the last years have led to decreasing catches.
- The industry is dominated by small and medium enterprises.
- The fisheries industry suffers from a bad image and low job attractiveness.
- Despite strict quotas, there is a potential for increasing profitability through high-quality catches from sustainable fisheries.

3.3.2 EU legislation

- The Common Fisheries Policy governs European fisheries and sets the overall policy goal of providing customers across Europe with safe products and of bringing fish stocks back to safe biological levels.
- The Marine Strategy Framework Directive[5] sets the overall policy framework for European action in the marine environment. Its goal is to achieve good environmental status in all marine environments and to restore populations of commercially exploited fish and shellfish.

3.3.3 Research

- Research on the ecosystems approach to fisheries management will most likely focus on the development of relevant ecosystem indicators on fish stock health and on the dynamics between human activities and ecosystem effects. At this stage, there is still limited knowledge in the Member States as to how the ecosystem approach can be adopted.

3.3.4 Assessment

The successful application of the ecosystems approach to fisheries management will depend on the use of relevant indicators for measuring fish stocks and the effects of human activities, and on a sound policy for implementation in the Atlantic waters. Ensuring sustainable fisheries is crucial to the future of the sector. The sector has the potential for continuing activities, and the demand for food is increasing. However, the sector will not experience a growth in the number of employees, as it is not likely that there is more fish to be caught than today. On the other hand, the fishing fleet can be adapted to the kind of fishery that will be performed in the future to make the sector more efficient. When the new CFP is implemented, it will become clear how these new targets can be met in the most efficient manner. As mentioned above, the sector has a

[5] 2008/56/EC

high number of employees, however, only few young people choose a career in fisheries, and efforts should be made to make the sector more attractive to young people. Research will need to be undertaken on these issues, as a successful implementation of the ecosystems approach offers a strong potential for Atlantic fishers to market their catches as high-quality, sustainable products to European consumers. Further, the possibility of differentiating the European or Atlantic fish from fish caught in other waters by introducing labels should be explored.

3.4 Offshore aquaculture

Offshore aquaculture refers to the farming of aquatic organisms off the coasts. It is hence different from the more traditional coastal aquaculture that has existed in Europe for a long time and is a very mature industry. Offshore aquaculture is still in the development phase and has only been tested commercially in Ireland and Spain. As the demand for fish and shellfish products is rising across the EU and the world and as the European supply has not been able to meet this increase in demand, imports of non-European, especially Asian, aquaculture products have increased substantially in recent years. There is, however, a large potential for European aquaculture as colder waters allow for the farming of different species, just as we have higher ecological standards that meet the demands of consumers across Europe. Offshore aquaculture offers the advantage of having a lower visual impact on coastal regions and thereby being more socially accepted in local communities. Furthermore offshore aquaculture structures allow increased cultivation loads, offer a more stable environment and often require less maintenance than non-fully submerged coastal structures. As the offshore aquaculture industry is at a low maturity level, there is a pressing need for R&D and a strong potential for cooperation across, e.g., the Atlantic region. And finally the discussion on the implantation of a labeling scheme could also apply here as in the fisheries sector.

3.4.1 Sector overview

In the following section gives an overview of the sector and its characteristics.

- Offshore aquaculture in Europe is still in the development phase and commercial test projects have only been implemented in Ireland and Spain.
- There is a strong demand for aquaculture products across the EU, but heavy competition from abroad.
- There is increasing competition for offshore marine environments that require sound spatial planning.
- Offshore aquaculture requires big investments and poses high risks – development is hence not likely to be driven by SMEs, which currently dominate coastal aquaculture.

3.4.2 EU legislation

- Aquaculture in the EU is governed by the basic council directive 2006/88/EC on animal health requirements for aquaculture animals, and on the prevention and control of certain diseases as amended.
- Council directive 2006/88/EC defines minimum control measures in the event of an outbreak of certain diseases in aquatic animals, minimum preventive measures and animal health requirements for sale and import of aquaculture products.

3.4.3 Research and innovation

- Research on new species for offshore aquaculture is needed in order to render the sector competitive.
- Research will be needed on appropriate infrastructure and equipment for offshore aquaculture sites.
- Initial research has been undertaken on the integration of offshore aquaculture with other spatial uses such as offshore wind power.

3.4.4 Assessment

Offshore aquaculture is still in its very early stage and marine aquaculture has been stagnant in the Atlantic region during the past decade. The high demand for fish and shellfish products in Europe is currently met by strong, but often unsustainable production outside of the EU. Besides heavy competition from non-EU countries, European offshore aquaculture is also challenged by increasing competition from other spatial uses. The success of offshore aquaculture in the Atlantic region will hence depend on further technological development and sound spatial planning.

3.5 Marine energy renewables

Marine renewables, i.e. marine ocean energy (tidal range, marine current, wave, ocean thermal) and offshore wind, present significant potential to respond sustainably to the future energy demand in Europe.

The European Commission’s commitment to develop marine renewable energies, through the Energy Strategy 2020, is one of the key features of its policy to achieve the EU 2020 targets and make Europe’s economy greener. The EU is seeking to source 20 per cent of its energy from all renewable sources by 2020.

Significant potential for offshore wind, wave and tidal energy has been identified on the open Atlantic seaboard, given its deep waters, strong winds and big differences between tides. A number of different technologies providing renewable energy are being tested, and some are on the market on a large scale. Given the potential of renewable energy sources, in recent years, marine energy has attracted large-scale utilities, energy agencies and industrial companies investing in the sector.

However, there are challenges that need to be addressed to encourage the development of this sector. One of these is the EU power grid, and the concern that it will not be able to cope with the added capacity as more projects near full-scale sea trials and supply electricity to the grid. This issue is not limited to the Atlantic region. Furthermore, legislative and regulatory challenges exist due to different technology and regulatory standards, and the lack of a comprehensive policy framework.

This potential will therefore only be realised by coordinated action and governance putting the right regulations and supports in place to facilitate the sustainable development of this new emerging industry, mobilising the significant economic, technical and scientific capabilities of the region and ensuring interconnectivity to transport energy from where it is produced (Atlantic coast) to where it is needed (the urban and industrial centres of Europe).

3.5.1 Sector overview

The following givesan overview of the sector and its characteristics.

- The only mature marine energy technology (that has reached the stage of full-scale industrial and commercial deployment) is fixed-base wind turbines, using either piles driven into the seabed, space-frame substructures or a gravity base that sits on the seabed floor.
- Tidal range energy can be categorized as a relatively mature technology; however, market deployment continues to be slow.
- The development of other marine energy technologies, such as ocean thermal conversion energy (OTEC), has accelerated in the past few years, although most are still at the prototype or demonstration stage.
- The best prospects for growth in the next ten years concern offshore wind power (fixed-base and floating) and tidal energy.
- Floating wind turbines will initially benefit from operational feedback from fixed-base wind turbines.
- Wave energy is less likely to reach the commercial stage for several years, and is positioned for medium- to long-term market development.
- OTEC development will concentrate on tropical zones.

3.5.2 Marine spatial planning considerations

- Offshore wind, wave and tidal energy in particular share synergies in relation to governmental marine policies, marine stakeholders and spatial constraints.
- Offshore space is a limited resource and the increasing offshore capacity would necessarily reduce the available space (offshore space used for marine renewable would be around 2,400 km2 out of 25,000 in 2020).
- In the Atlantic Ocean, little progress has been made towards the adoption of a comprehensive MSP policy framework taking into account all sea users in an effort to achieve ecological, economic and social objectives.
- Portugal and the UK have made the most progress towards integrated and comprehensive information and data management systems.
- Within the European Atlantic, most countries have developed sector plans for offshore renewables, identifying both opportunity zones with minimal conflicts and areas with a high level of potential conflicts.
- All countries in the European Atlantic basin are signatories to the most important initiatives in regional cooperation on the protection of the marine environment, including the OSPAR convention.

3.5.3 Barriers to large-scale deployment

- Mostly large entities invest in marine energy, as the operating costs are still beyond the capacities of small and medium enterprises. However SMEs still benefit from supply chain development.
- Market 'pull' measures, such as incentives for investors (investment tax credits), incentives for end users (investment and production tax credits) and feed-in tariffs, are necessary to facilitate the transition from demonstration to commercial deployment.
- Appropriate grid infrastructure and connections are important for further development.
- Licensing and authorisation costs and procedures can be very high and complex. It can take several years and high costs to obtain permits from administrations[6].
- There are also technical barriers due to insufficient experience and demonstration; there is a lack of information and understanding regarding performance, lifetime, operation and maintenance of technologies and power plants.
- Public acceptance may create another barrier to large-scale development.
- Large-scale deployment can be facilitated through the convergence of technologies, thus reducing the number of isolated actors and allowing technology development to accelerate.

3.5.4 Assessment

Although current energy generation from ocean energy technologies remains marginal, these technologies offer strong development potential in the longer term. In the medium term, large-scale deployment will depend on the sector's ability to meet a number of technological and economic challenges, and to face competition from other non-renewable energy sources (fuel, gas...).

The success of current full-scale projects being implemented is essential in demonstrating the reliability of these technologies at scale, as well as their price competitiveness. Developers continue to focus on options that reduce the cost of equipment, installation, operations and maintenance, in order to reduce the cost of electricity generated to a level that is acceptable for the end consumer. This will require substantial public support as well as reinforced cooperation efforts between research organizations and technology developers.

[6] Source: http://setis.ec.europa.eu/newsroom-items-folder/2011-technology-map-of-the-set-plan-now-available

3.6 Intermodal transport and safety

Shipping is a major sector in the European Atlantic, and intermodal transport has a significant blue growth potential. In addition, technological developments and regulation foster safer shipping. However, the maritime transport sector is larger in the Mediterranean and the North Sea, and strategic cooperation is needed between Atlantic Member States, regions, ports and businesses to overcome barriers, optimize infrastructure, promote R&D in maritime safety and growth in the sector.

3.6.1 Sector overview

- Waterborne transport is a key player in worldwide economics. More than 70 per cent of the European Union's external trade and 30 per cent of the internal trade is handled by maritime transport.
- The EU is already involved in several projects to improve the monitoring of sea areas and vessel traffic. These include SafeSeaNet, EUROSUR, and ARCOPOL +.

3.6.2 EU framework

- Many infrastructural initiatives promote intermodal and maritime transport, for instance TEN-T and Motorways of the Seas.
- The framework for maritime safety has been established through a number of policy communications and legal instruments.

3.6.3 Research and innovation

- Research in the area of maritime safety has focused on developing operational and technological concepts capable of meeting the changing needs of the demand side while enhancing safety and environmental protection.
- Research in maritime safety and transportation can be divided into development of logistic concepts and systems; introduction of innovative designs, technologies and working practices for safer ship operations; and development of efficient traffic management systems for sea.

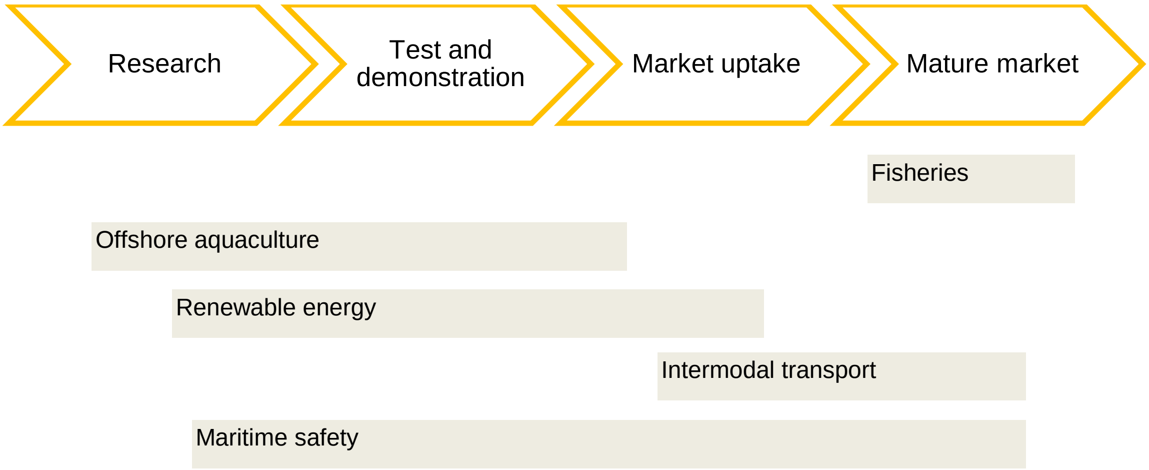
3.6.4 Assessment

The maritime transportation sector is mature and well-developed, but action is needed to further promote intermodal transport and short sea shipping, especially in the Atlantic region. Also, technological strengths within maritime safety need to be identified and developed. Maritime transportation will benefit from further support in terms of cooperation and infrastructure for intermodal transport. The EU has initiated a number of policies that address safety as well as maritime and intermodal transportation.

3.7 Overview

Each subtheme/sector that is a focus for discussion in the annexes has been placed in the stage diagram, indicating its level of maturity.

Figure 7: Stages of exploration and exploitation of marine natural resources in the Atlantic



This assessment shows that the level of maturity is developed to a varying degree. There is clearly a need to raise the general level of knowledge, especially of the presence of minerals and bio resources.

From today's activity levels, trends in research, technology and market can push the development in the area forward. Relevant baseline trends can be seen in Table 1 and the role of the Atlantic Action Plan can be regarded as aiding an intensification of the baseline development. The examples of trends in the table are based on the information available at a generic level.

For each of the four themes, the examples have as far as possible been grouped according to current activities, research trends, technology trends and market trends. For some themes, not all categories are relevant, and some of the subthemes overlap.

The table shows that a number of trends overlap for several subthemes.

Table 1: Examples of baseline trends for each subtheme

Subtheme	Current overall activity	Research trend	Technology trend	Market trend	Other
Subtheme 1: Ecosystem approach to fisheries management	High, but declining fisheries activity, contributing to 80% of EU catches	Restoration of fish stocks, based on best available knowledge		Growing demand for fish within the EU and internationally	Decline in attractiveness of employment in the fisheries sector
Subtheme 2: Offshore aquaculture	High, but declining fisheries activity, contributing to 80% of EU catches	New species for aquaculture, infrastructure development	Combination of aquaculture with other offshore activities	Strong and growing demand within the EU and internationally	Conflicting uses of marine spaces
Subtheme 3: Renewables	High, activity mainly in other oceans so far	Algae biomass to fuels Wave		Great potential – provide electricity for EU Spatial competition	Energy security; Conflicting uses of marine spaces
Subtheme 4: Intermodal transportation and safety	High maritime transport activity, but lower in the Atlantic compared with other European waters. Many EU policy initiatives on maritime safety, however, technologies have to be further developed and implemented.		Prevention and remediation technologies	Increased trade and seaborne traffic imposing challenges on maritime safety	

4 Gap analysis

This chapter includes an overview of the gaps identified in the analysis of the individual subthemes. The aim of the chapter is to provide an overview of the gaps concerning:

- Research
- Funding
- Policy framework
- Coordination and cooperation.

The following bulleted lists sum up the gaps identified during the analytical assessment of literature and other publicly available information and data, during consultations with stakeholders during the workshop and in a number of subsequent target interviews. The lists of gaps should be seen as gross list, and the listed order does not signify any rating according to relevance. This list of gaps is used for the formulations of suggestions for actions to consider including in the action plan. The list also serves to capture some of the non-sector specific areas, such as multidisciplinary research and the challenges of marine special planning…

4.1.1 Research

The following gaps have been identified across the sectors in the area of research:

- Formalised sharing of research results
- Lack of projects involving researchers from businesses and research institutions
- Multidisciplinary research centres
- Limited public outreach activities related to marine research in general and deep-sea research in particular
- Definition of appropriate ecosystem indicators and related fisheries quotas
- New species for offshore aquaculture
- Spatial integration of fisheries and aquaculture with other marine activities
- Environmental impact on marine ecology of wide-scale implementation of marine renewable
- Research into mitigating impacts on local supply quality and network infrastructure
- Established methodologies that allow a greater understanding of the nature and magnitude of the recoverable, sustainable and deliverable marine energy resource
- Work to increase the reliability, functionality, accessibility and acceptance of new and existing design software
- Creation and validation of robust lifetime economic models applicable to marine renewables.
- Adequate, coherent, streamlined financing mechanisms and schemes to bring down costs and accelerate marine renewable commercialisation

4.1.2 Funding

The following gaps have been identified across the sectors in the area of funding:

- Funding for regional research and technological development activities specific to the Atlantic area (the SEAs-ERA FPT consortium has started doing this, with a dedicated call earlier this year, and this will probably become clearer when its maritime research plan for the Atlantic is adopted).
- Setting renewable energy objectives and decarbonisation targets beyond 2020.

- Supporting technological development up to maturity (pre-production), in a context of uncertainty concerning technology and high development costs.
- Expanding collaborations between research initiatives in different Atlantic countries, as well as with other EU member states.
- Strengthening industry-research collaborations.
- Synthesising research results and accumulated knowledge to improve uptake by the public, businesses and policy makers.
- Demonstrating renewable energy parks and energy storage schemes.
- Mapping Portuguese continental shelf for renewable energy potential.
- Improving port infrastructure in a large net of small, secondary ports and securing hinterland infrastructure.
- Adequate, coherent, streamlined financing mechanisms and schemes to bring down costs and accelerate marine renewable commercialisation.

4.1.3Policy framework

The following gaps have been identified across the sectors in the area of policy framework:

- The Nature Directive[7] and MSFD[8] may set requirements to the way the sea is utilised.
- The exact outcome of the CFP reform is not yet clear.
- Increased responsibility of Member States for the implementation of the CFP.
- The need to ensure strong and stable political framework for marine energy renewables to attract investor confidence, covering (i) Legislation and policy (payment mechanisms), (ii) Grid access, and (iii) Environmental policies.
- Policy clarity on the post 2020 regime in order to generate real benefits for researchers, investors in industry and infrastructure.
- Long-term grid access planning to cope with increased marine energy renewables.
- Establishment and use of marine spatial planning to identify optimal installation sites.

4.1.4Coordination and cooperation

Th following gaps have been identified across the sectors in the area of coordination and cooperation:

- Interaction, sharing and corporation between different sectors and/or business associations
- Limited uptake of research results by companies for development of new businesses
- Regional coordination of research and technological development activities in the Atlantic Ocean
- The need to expand trans-Atlantic partnerships involving the USA and Canada
- Science policy interface for knowledge/evidence-based policy-making
- Cooperation in the implementation of the CFP across the countries of the Atlantic
- Cooperation on R&D of offshore aquaculture (between Member States and public-private)
- The need to overcome barriers to intermodal transport
- Promotion of strategic cooperation between ports, businesses, regions and Member States in order to optimise infrastructure.

[7] 2006/105/EC
[8] 2008/56/EC

- Scattered nature of Atlantic collaboration and cooperation between researchers, test facilities and industry
- Interaction, sharing and knowledge transfer between different sectors and/or business associations
- Science policy interface for knowledge/evidence-based policy-making.

5 Potential ideas for future action

In the following are listed the key outcomes and ideas for Atlantic Action Plan that arose from the discussion during the workshop. These lists are the sum of the analysis made of literature and information available and the presentation and discussion at the workshop. These are very sector specific as they follow the structure of the workshop. The gap analysis in chapter 4 will supplement these suggestions for actions with the inclusion of some more cross-sector gaps, such as lack of multi-disciplinarity and the challenges of spatial planning.

5.1.1 Ecosystem approach in Fisheries management

- Support the development of a tool that allows Member States to establish marine spatial planning at national or at local level. The tool should provide the framework for plans that are less costly to draw up than if the assessment and the associated plan were made on site. Furthermore, a common tool will allow comparison across borders and combining plans where relevant.
- Provide guidelines for calculations and for improving the understanding of the value provided in the form of ecosystem services.
- Explore the possibilities of implementing certification or labelling in the sector.
- Support a sound adjustment of the fishing fleet. Provide a holistic approach to how the fishing fleet can be adjusted in size to allow the sector to become economically sustainable.
- Facilitate coordination of the process of appointing MPAs in Member States
- Support research to model the effects of climate change on fish species prevalence in the Atlantic for the coming decades.
- Strengthen the network of clusters, including the industry, academia, technology centres and authorities.

5.1.2 Offshore aquaculture

- Develop an offshore strategy involving practical collaboration and knowledge sharing: it must address marine spatial planning, opportunities for multi-purpose and sector shared sites, etc.
- Develop a Legal Framework for open ocean aquaculture with “clear standards and thresholds according to best environmental practice, best available technologies, definition of offshore areas ownership and liabilities”
- Explore the feasibility of creating a permanent Governance group (i.e., forum, platform, working group, advisory group) including consideration of its terms of reference and long-term funding. This could take the form of a comprehensive spatially-referenced Atlantic group (making it available to the EU research community, the public, policy makers and other interested end users).
- Explore the feasibility of the development of a series of pilot offshore aquaculture demonstration tests by each Atlantic Member State; addressing the assessment of *its whole value chain* approach (including product quality and consumers’ perception) and its sustainability aspects. The success of the trials could allow, in the short to medium term, the validation and subsequent declaration of “safe” offshore production parks by country. Production parks where ownership should be public.
- Address the licensing process and other administrative procedures. In Ireland, BIM assists in developing the Irish Seafood Industry by providing technical expertise, business support, and funding, training and promoting responsible environmental practice. Instead of a fish farming licence being granted directly to private companies, in October 2012 BIM applied for a salmon farm licence, which, if issued, will be franchised to a commercial operator. This type of arrangement may provide a solution to both financing issues for SMEs, as well as the delays in the granting of aquaculture licences (528 aquaculture licence applications have been awaiting a decision for more than a year in Ireland).
- Organise EU research and development platforms involving countries active or intending to initiate Open Ocean Aquaculture development projects, and develop multi-disciplinary approach on research and innovation. Examples of projects from which lessons can be learnt include:
    - Aquainnova: Supporting governance and multi-stakeholder participation in aquaculture research and innovation (FP7 project)

- OATP (offshore aquaculture technology platform): 16 partners from 7 countries -Ireland, Norway, Spain, Italy, Malta, Belgium and the UK, to support a technological platform on offshore aquaculture (FP6 project)
- EU Coexist (FP7 project): Multidisciplinary project with 13 partners from 10 European countries, specifically to address competing activities and address the potential conflict for space allocation. Participants have undertaken a case study on the Atlantic Coast Areas. Due to the proximity of different jurisdictions, it has been recognised that the area presents potential opportunities for beneficial interactions between aquaculture, fisheries and offshore wind farms. In addition, the possible interactions between new technologies, such as wind farms and artificial reefs with fisheries and aquaculture will be investigated.

  There is a need for further investigation into the significant potential for synergistic development by way of multi use structures (wind energy/ mussel and seaweeds aquaculture), e.g. potential utilization of Open Ocean Aquaculture sites as potential environmental quality monitoring stations.

- Improve partnerships between potential investors, producers associations, research organizations and local or regional planners, to balance 'agendas' and find solutions at regional/national levels
- Promote the sound and good scientific knowledge of EU products and increase competitiveness through clear differentiation of high standard EU products from low-standard products
- Support societal transparency through providing society with trusted sources of information on food production and environmental impacts

Furthermore, the following suggestions have been made by DG MARE, to address the above challenges:

- Address circumstantial challenges: cooperation is needed on identifying what ocean knowledge would be useful to develop aquaculture
- Address competition between Member States: coordination between structures that grant licenses is needed
- Address the strategic challenges: commitment from all Member States is needed to support offshore aquaculture (conchyliculture) as well as determine who will be dealing with genuine "offshore" aquaculture
- Potentially the future Directive on MSP should specifically address offshore aquaculture, particularly in terms of how other offshore sectors can cooperate

Address societal acceptance: there should be a focus on existing, native fish species (those that tend to be accepted by the public), creating a list of current species as well as those that could be developed in the Atlantic.

5.1.3Marine renewable energy

- Political will: there is a need to develop binding 2030 renewables targets in order to provide increased direction for national strategies and investors. In addition, given potential spatial conflicts, there is a strong need for the development of a European framework for Maritime Spatial Planning. Finally, cooperation is required among Atlantic Member States to simplify permitting and licensing procedures
- Grid network infrastructure: there is an urgent need to act to develop the European energy infrastructure and there should be a coordinated effort by Atlantic Member States towards this. Each Member State needs to renew its commitment to offshore grid development in 2013.
- There is a need to consider the development of a network of Atlantic open-sea facilities to reduce demonstration costs, technological risks and technological uncertainties
- An industrial strategy for marine renewable energies is required to drive forward industry development. This must be reinforced by the industrial strategies at national and regional levels. Four key pillars must be addressed in this strategy: Technology & innovation (testing facilities, new technologies,…), Supply chain bottlenecks (ports, vessels), Skills and training, and Access to financing
- In terms of Atlantic research needs, there is a need for authorization and administrative procedures; otherwise very similar or duplicated research projects will be undertaken in an uncoordinated manner

5.1.4 Intermodal transport and maritime safety

- Full, green logistical packages: Create port alliances building on the experiences from the Motorways of the Seas projects, including a common approach to land logistics, IT systems, logistic platforms, liquefied natural gas infrastructure, and land-based power supply.
- Technology platform: Create a common platform for maritime safety technology that unites public and private actors, broadens regional expertise and ensures market uptake.
- Emergency response: Intensify existing cross-border and regional cooperation. Create clear guidelines for sharing responsibilities and resources, and conduct drills coping with major spills and cruise ship accidents in shared waters.
- Strategy and network for Atlantic maritime business cooperation: Enhance cooperation and exchange between private actors, clusters and ports, respectively, in order to promote green ships, intermodal transport etc.
- Develop infrastructure and reduce barriers: Ensure continued and strategic development of land-sea infrastructure and logistic platforms as well as reducing customs (cf. Schengen) and other administrative burdens to facilitate short sea shipping as an alternative to road-based transport. Consider options for port and corporation co-finance of infrastructure as a means to ensuring commercial viability. Finally, scrutinize the concept of an Atlantic mega-hub, e.g. offshore, to receive 18,000 TEU vessels of the future.

The table overleaf presents an overview of the suggestions for priority action and research priorities to be considered in the further work on the development of the Atlantic Action Plan. This combines ideas from the workshop and the development of this report.

Table 2: Overview of selected, possible recommendations for Atlantic Action Plan

Subtheme	Research priorities	Investment/policy actions
Subtheme 1: Ecosystems approach to fisheries management	▶ Identify well-suited areas of Member State cooperation in the Atlantic ▶ Ecosystem dynamics between human behaviour and ecosystem effects ▶ Modelling of climate change effects on fish species prevalence in the Atlantic ▶ Strengthen network of clusters, industry, academia, technology centres and authorities	▶ Development of a tool for establishing marine spatial planning at national or at local level ▶ Provision of guidelines for calculation and improved understanding of ecosystem services ▶ Explore certification or labelling possibilities ▶ Sound and holistic adjustment of fishing fleet ▶ Investments in increasing the attractiveness of the fisheries industry ▶ Facilitate coordination of appointment of MPAs in Member States ▶ Stakeholder dialogue for designing appropriate ecosystem indicators
Subtheme 2: Offshore aquaculture	▶ New species for offshore aquaculture ▶ Environmental impacts of intensive offshore aquaculture ▶ Integration with other spatial uses ▶ Explore feasibility of developing pilot offshore aquaculture demonstration tests in the Atlantic Member States to test and validate safe production ▶ Organise EU R&D platforms on open ocean aquaculture and develop multi-disciplinary approach on R&D	▶ Development of R&D infrastructure ▶ Promotion of aquaculture education and research ▶ Platform for exchange of knowledge and experience ▶ Development of offshore strategy including maritime spatial planning and multi-purpose platform development ▶ Develop clear legal framework of offshore aquaculture ▶ Explore feasibility of creating a permanent Governance group for Atlantic offshore aquaculture ▶ Ease licensing and administrative procedures ▶ Improve partnerships between investors, producers, researchers and planners ▶ Promote and differentiate high standard EU aquaculture products ▶ Increase societal transparency on aquaculture production and impacts

Subtheme 3: Renewable Energy	▶ Focus on innovative components and equipment that offer advantages when used at scale ▶ Research into equipment or methods that assist in scaling-up technology into farms or arrays ▶ Develop new manufacturing processes to reach high volume productions ▶ Develop installation, operation and maintenance methodologies to provide further cost reduction ▶ Encourage demonstration programmes of full-scale projects, coastal onshore prototype test sites and facilities ▶ Strengthen industry-research collaborations ▶ Increase cooperation between national and European technology platforms (Coordination of research projects through authorization and administrative procedures to avoid duplication) ▶ Network of Atlantic open-sea facilities for R&D	▶ Development of binding 2030 renewables targets in a framework of coordinated European maritime spatial planning and simplified, coordinated licensing procedures ▶ Development of European grid network infrastructure ▶ Demonstrate grid integration techniques at an industrial scale and address long-term grid access planning ▶ Development of an industrial strategy for marine renewables at European and national level ▶ Reform national support programmes to promote cost reductions. There is a need to achieve better consistency and simplification across the EU ▶ Increase number of testing facilities to test marine energy devices components and systems ▶ Establish and use marine spatial planning to identify optimal installation sites. ▶ Increase cooperation through working groups covering public administrations and industry to address measures to overcome barriers
Subtheme 4: Intermodal transport and safety	▶ Indentify Atlantic strongholds within technology for maritime safety ▶ Development of Atlantic platforms for optimizing infrastructure and promoting modal shift	▶ Continued, strategic investments in maritime infrastructure and use optimization of existing infrastructure ▶ Development of short sea shipping including the West Atlantic Motorway of the Seas ▶ Creation of port alliances with common approach to land logistics, IT, LNG infrastructure and power supply ▶ Development of a maritime safety technology platform ▶ Intensify cross-border and regional emergency response ▶ Create strategy and network for Atlantic maritime business cooperation ▶ Development of infrastructure and reduction of burdens to improve competitiveness of short sea shipping as alternative to road-based transport

6 Annexes

7 Workshop report

This annex reports from the Atlantic Forum workshop on “Maritime space management and Climate Change Mitigation under the Ecosystem Approach" held in Bilbao, 11 & 12 November 2012. The annex includes:

- Summary of key topics discussed at the workshop sessions
- Key outcomes and ideas for the Atlantic Action Plan

7.1 Key topics of discussion

7.1.1 Ecosystem approach in Fisheries management

The two working sessions addressing ecosystem approach in fishery management shared the same aim. The ecosystem approach lies at the heart of the EU’s Marine Strategy Framework Directive, the objective being to achieve ‘good environmental status’ in each EU sea basin. The workshop sought to review the basis for applying the ecosystem approach and the experience acquired so far in order to identify needs and actions for its implementation in European Atlantic waters, with a particular emphasis on fisheries. The key points discussed are presented below:

- **Marine spatial planning is a national matter**, and Member States are very sensitive to ‘external’ intervention in this field, which is why planning should be initiated at the national level. Still, there is a need for **trans-border planning**, which could be facilitated by the development of a common tool allowing for integration and optimisation of national plans. There is a need for an action plan to define areas, priorities and instruments that is coherent with legislation and the ecosystem approach.

- **Marine protected areas (MPA)**: MPAs are geologically defined areas appointed for each Member State that have a higher degree of protection than in other areas through legal or other effective means. The role of the action plan in this field is therefore suggested to be more of an obligation to share information and plans in the future, as MPAs often have an impact on cross-border interests.

- **Adjustment of the fishing fleet**: There is a general understanding of the need to adjust the size of the fishing fleet if the sector is to be economically sustainable. This is expected to make the sector more attractive to the coming generations and would create an incentive for skilled people to choose work in the sector. Diversification of economic activities in coastal communities and recognition of the role of women in these areas are other important elements.

- **Climate change**: So far, research in this field has focused on the migration of species from the south to the north in response to the warming of waters.

- **The market for fish and shellfish**: There is potential for a European eco-certification scheme supported by the EU and Member States, including mechanisms for ensuring independence of industry, and limitation of cost to industry. This could take the form an Atlantic label for all fish caught as part of legal Atlantic European Fisheries, or the promotion of the use of existing labels.

- **Innovation and research**: There is a need to develop new gear and to raise awareness of existing equipment to ensure that the fisheries sector minimises its environmental impact, e.g. minimising fish discards and disturbance of the seafloor.

- **Fishing is an old profession** with a distinct culture and many traditions attached to it. The cultural heritage and traditions in fishing need to be assessed and included as part of the valuation of the sector.

- The ecosystem approach needs to be **communicated to the practitioners**, as there is still much uncertainty about the added value using this approach rather than the traditional approach in the fisheries sector, which aims at MSY (maximum sustainable yield). Closer integration of practical skills with theoretical skills through education and training could be improved, which would make the education more attractive.

Development of multidisciplinary databases (with biological, ecological, economic and social data) accessible to stakeholders that enable the identification of policy impacts - fisheries, coastal management, natural or anthropogenic disasters, carbon footprint, marine pollution. An example is the socioeconomic database to be created by MARNET in the Atlantic area.

7.1.2Offshore aquaculture

The two working sessions addressing offshore aquaculture shared the same aim. Offshore aquaculture is both an opportunity and a major technological challenge. This workshop sought to review the current status and possible future of the European aquaculture sector (offshore aquaculture in particular). Technological needs were reviewed and the state of the art showcased. Stakeholders from Atlantic Member States were asked to share their experience on offshore aquaculture, identifying potential local/national/regional projects.

The two working sessions addressing offshore aquaculture raised a number of key points and ideas that should be addressed in the Atlantic Action Plan. Each of these points is developed below, and followed by a list of potential actions.

The overall conclusion was that offshore aquaculture presents future opportunities for European (and particularly Atlantic) aquaculture production growth and a reduction in the reliance on imports. According to figures provided by the EATIP, only 9% of EU consumption is from aquaculture, and 63% is from imports from Asia. In addition, as shown by a survey conducted in Ireland in 2006 and presented by the Irish Marine Institute, offshore fish farms present a number of advantages in terms of better quality, lower-fat fish; lesser impact from algal blooms; lower and more stable temperature, and less social and environmental impacts on stakeholders.

Participants quoted the Bremerhaven Declaration (March 2012) which enabled the identification of nine recommendations to be considered in the Atlantic strategy.

This said, a number of challenges need to be overcome.

- **There is a need for a coordinated international / EU strategy involving practical collaboration and knowledge sharing** (as shown by an Offshore conference and report produced in Ireland in 2004 (“Farming the deep blue”)). At this stage, there is no overall European or Atlantic coordinated offshore strategy. The 2009 EU aquaculture strategy failed to provide impetus for the development of marine production activities, as it relied upon Member States to address these issues, without providing tools to harmonise them.

- **Circumstantial challenges** have to be considered: there is no one Atlantic model that can be trialed and deployed generically in different geographical areas. All depends on ocean conditions, species prevalence, weather conditions, etc. It appears that priority should be given to the culture of species well-established in aquaculture (preferably natives), which can provide large quantities of seafood for which aquaculture technologies are known and have the potential to become acclimated to offshore farming conditions. Models can help in site selection and assess stock density and environmental effects.

- **Marine spatial conflicts** need to be addressed in a planned manner since competition for space might become a critical limitation. In some areas (e.g. west of Ireland) conflicts are relatively minor at this stage; however in other areas there may be conflicts with resource uses such are fisheries, maritime transport, leisure sailing, offshore wind farms, and future spatial conflicts need to be anticipated. It is also important to address social concerns regarding visibility of farms and the potential negative interaction with coastal areas, including disease, although this is more of a concern for open ocean fish farming in closer waters.

- **Legal challenges:** Better consideration of aquaculture in Directives and better inclusion in policies – there is a perceived imbalance between the focus on fisheries versus aquaculture. The interpretation of Directives (especially regarding Environmental Impact Assessments) is an example where the European Institutions can share best practice and seek to harmonise interpretation to create a level playing field.

- **Technological challenges**: overall, offshore aquaculture is at an early stage of technological development. There is no clear technological trend, in terms of developing a new concept versus the adaptation of existing concepts, most systems being fully or partially submergible structures. There is a need for a technological leap in this area through coordinated research and development. Technological aspects that need to be addressed include capture, transmission of data, ship engines, studies on the viability of systems, etc. These technological challenges of the open sea will be reflected in business costs, including insurance, which might require some support to ensure profitability of businesses.

- **Operational and logistical challenges**: even more importantly, there are many operational and logistical aspects that need to be addressed, such as access for continuous feeding of the fish, surveillance and remote control, fish storage, etc. These aspects have not been sufficiently taken into consideration to date. This would require a multi-disciplinary approach on research and working more closely with ports and other stakeholders. *As underlined by recommendation 4 of Bremerhaven declaration: There is an urgent need to plan for the comprehensive development of land- and water-based infrastructures needed for the technical and logistical support and supply of Open Ocean Aquaculture that incorporates the multi-dimensional interacting factors for successful operations.*

- **Administrative challenges and access (including finance) barriers** to businesses.
  - It is first essential to find solutions to deal with administrative/legal rules relating to **licensing**. State control could facilitate license applications, which involve considerable costs (as is the case in Ireland, where BIM directly applied for an aquaculture license).
  - Investors expressing interest in developing aquaculture businesses also find it difficult to secure (i) the access to the marine space (without publicly disclosing their business models); (ii) the access to the financial support. Thus, there is a need for enabling **mechanisms that facilitate access to space (with less legislative burden), financial sources and preservation of market opportunities** for the investors or joint venture capital groups. Strong governance/all-in-all-out plus fallowing will help offshore ventures succeed.

- Given that in Europe, **there are social limitations** (social acceptability (visibility…) and competition for space are critical limitations), the possibility of combining different activities (as for instance offshore wind farms and aquaculture) **through the development of multi-purposes platforms** should be considered. Another example is given by *recommendation 9 of Bremerhaven declaration, according to which utilization of Open Ocean Aquaculture systems as potential environmental quality monitoring stations should be promoted as part of the international ocean observing systems networks; recommendation 3 mentions that there is an urgent need to address how societal values and policies affect the acceptance, structures, and types of offshore aquaculture.*

7.1.3 Marine renewable energy

The two working sessions addressing renewable energies: industrial development shared the same aim. The workshop sought to bring forward the experiences of Member States in setting up an industrial sector around marine renewable energy. The discussion was intended to focus on how the development of this sector could be accelerated to make it a significant player in electricity generation, job creation and economic growth.

The two working sessions addressing renewable energies complemented the sessions held during the Brest workshop. A number of additional points were raised, and other points were reaffirmed. A summary of key points and ideas that should be addressed in the Atlantic Action Plan is developed below, followed by a list of potential actions.

Each of the presentations provided a specific focus into the different Member States and regions, in terms of the barriers to be overcome and the level of progress towards commercialisation of the marine renewable energies sector. The high potential of this industry is not questioned and is particularly demonstrated through the ambitions of the offshore wind sector, which seeks to have 40GW installed capacity in Europe by 2020 (150GW by 2030), meeting 4% of the EU electricity demand in 2020 (14% in 2030), and representing 170,000 jobs in 2020 (300,000 in 2030).

Europe, and particularly the source of potential energy provided by the Atlantic, is a leader in the field, however, this position is at risk if commercialisation is delayed. The overall view is that there are a number of key barriers to the commercialisation of the sector that need to be addressed:

- **Political will, stability and regulatory framework**: Coherent political support is required at regional, national and EU levels. There is an urgent need in several Member States to establish a regulatory framework favouring the development of marine energy (provided within Renewable Energy Plan 2020). In addition, government policy needs to be stable to encourage investment, e.g. Portugal was the first Member State to introduce a specific feed-in tariff in 2001, which was withdrawn in 2005 and reinstated in 2007.

- **Administrative and bureaucratic procedures**: licensing procedures and durations are still unclear, which make it difficult for potential investors to have confidence in the sector and particularly to invest across borders.

- **Grid connection**: progress is required towards the reinforcement of onshore networks, and the development of an integrated European offshore grid. It has been demonstrated that €14bn would be saved by 2030 with clustering versus radial connections.

- **Cooperation along the chain**: the Biscay Marine Energy Platform is an ocean infrastructure for research, demonstration and operation of offshore Wave Energy Converters (WEC) on the open sea. In the future, it could be extended to provide services to offshore wind energy.

- **High costs of technology, operations, administration**, etc: Costs are still posing high barriers to large-scale deployment of technologies. Networks of open-sea facilities have the potential to reduce demonstration costs, technological risks and technological uncertainties.

- **Financial uncertainty:** despite strong investments in research and development phases, there is financial uncertainty of the future commercial phase, which provides additional investors' risk.

7.1.4 Intermodal transport and maritime safety

The two working sessions addressing intermodal transport services and maritime safety shared the same aim, addressing services at port, supply connections, pollution prevention (improving prevention and response to accidental maritime pollution), cooperation between public administrations and private sector, maritime surveillance as a pillar for maritime safety and environmental protection.

The workshop also sought to showcase experiences and strategies of Member States on Short Sea Shipping and Intermodal Transport. The workshop focused on how these services could be improved, and it tackled ways of addressing marine pollution, namely by showcasing the experience gained by the Spanish Technology Platform for coastal protection and for the marine environment.

The workshop discussed both maritime transport and safety from the perspective of ports infrastructure and connectivity and technology platforms for maritime safety and emergency response.

The main message was the need for **increased cooperation**. There is a need for port cooperation and complementary specialisation. Intermodal projects can be further developed between Atlantic ports and maritime clusters and the project of a railway corridor connecting the Atlantic Arc was presented (CA EFFIPLAT). Furthermore, emergency response between Member States and regions must build on improved cooperation to cope with major accidents.

On a general note, there is a need to define clear priorities, and strategic initiatives within maritime transport must build on wider European Atlantic considerations and not local interests. Intermodal projects should be developed around existing private initiatives, and the administrative burden should be reduced in order to attract more private sector activity.

The Spanish platform for maritime safety technology (PT PROTECMA) brings together public and private institutions in partnerships, and it has led to a list of concrete projects. Maritime safety is an area in which regional expertise in the Atlantic area has further blue growth potential.

Subtheme 1 – Ecosystem approach to fisheries management

Introduction

This section provides an overview of the status of knowledge of the ecosystem approach to fisheries management in the European Atlantic basin. Based on this status assessment, recommendations are made for policy intervention and investment actions.

Context

In 2009, the EU produced about 5 million tons of fish, of which 3.5 million tons were fished in the north-east Atlantic, mostly in the EU EEZ. The total value of landings can be estimated at €7.9 billion. The EU fishing fleet is composed of some 84,000 vessels, of which 80 per cent are smaller than 12 metres. The vessels over 12 metres in length generate more than 70 per cent of the total landings value. An important part of the small-scale fleet is located in the Mediterranean[9]. Marine fisheries contribute about 0.07 per cent of the EU employment and 0.02 per cent of EU GDP[10].

Marine ecosystems contain all structures of and processes between elements, whether small or large. Discussing the ecosystem approach can therefore result in a 'Babylonian confusion' as everyone may have a different perception of what is or should be discussed. Therefore, it is fundamental to first agree on what is to be included in the ecosystem approach. Such choice, however, leads to a contradiction, as any selection of topics means that the holistic ecosystem concept must be reduced to a small (and manageable) number of topics, leaving out the vast majority of all other issues, some of which may still be highly important. The way in which we look at the ecosystem approach is fundamentally determined by the current state of knowledge, which is a result of past choices in knowledge production (research). In view of these limitations, every 'definition' of the ecosystem approach, and particularly the indicators used, cannot be absolute. It is time-bound and needs to be adapted on the basis of new knowledge, but also according to policy choices.

Ecosystem-based fisheries management (EBFM) has been 'defined' by various organizations:

- FAO:
  - The EAF's main purpose is to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems. An ecosystem is a functional unit consisting of a collection of plants, animals (including humans), micro-organisms and non-living components of the environment, and the interactions between them[11].
  - A management approach that "strives to balance diverse social objectives, by taking into account knowledge and uncertainty about biotic, abiotic, and human components of ecosystems and their interactions and applying an integrated approach to fisheries with ecologically meaningful boundaries"[12]. In its practical application, this means applying a fisheries management that takes into account the various stakeholders and future generations, and that uses the goods and services provided by the marine ecosystem in a sustainable way.

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[9] G. Macfadyen, P. Salz and R. Cappell, Characteristics of small scale fisheries in Europe, Study for the European Parliament, 2011

[10] STECF, The 2012 Annual Economic Report on the EU Fishing Fleet (STECF-12-10) and Eurostat.

[11] FAO 2005, Putting into practice the ecosystem approach to fisheries

[12] FAO 2003, The Ecosystem Approach to Fisheries, FAO Technical Guidelines for Responsible Fisheries, No. 4, FAO

- ICES: The ecosystem approach to fisheries management takes into account the effects of fisheries on the ecosystem and the effects of the ecosystem on the fish stocks[13].
- *CFP review:* “ecosystem-based approach to fisheries management” means an approach ensuring that benefits from living aquatic resources are high while the direct and indirect impacts of fishing operations on marine ecosystems are low and not detrimental to the future functioning, diversity and integrity of those ecosystems[14].
- *Marine Strategy Framework Directive (MSFD[15]):* It aims at establishing good environmental status in all marine environments and to restore the populations of all commercially exploited fish and shellfish to safe biological limits[16].

The above overview shows that EBFM can be defined differently, broader or narrower. However, what really matters is that EBFM is an ‘anthropogenic concept’, determined in practice by various levels of objectives and indicators, which are a result of scientific knowledge and political choices. EBFM can be summarized in Table 3[17]:

Table 3: Hierarchy of EBFM objectives and indicators

High-level objective	Broad statement of intent
Component	A major issue of relevance
Operational objective	Objective with direct and practical interpretation
Indicator	Something measured to track an operational objective
Reference point	Target and limit benchmarks for indictors
Performance measures	Relationship between indicator and benchmark

An evaluation of the achievements of EBFM will in the end be determined by the choice of indicators and reference points and calculation of performance measures. The choices themselves already express perceptions of what is ‘good environmental status’.

Various (groups of) indicators have been proposed and are put in practice. In the EU, the ecosystem indicators collected under the Data Collection Framework include[18]:

- Conservation status of fish species
- Proportion of large fish
- Mean maximum length of fishes
- Size at maturation of exploited fish species
- Distribution of fishing activities
- Areas not impacted by mobile bottom gears
- Discarding rates of commercially exploited species
- Fuel efficiency of fish capture.

The EBFM in the NE USA uses three groups of indicators[19]:

- Climate and physical: salinity, temperature, wind stress etc.
- Biotic: zooplankton, biomasses of stocks, length, pelagic/demersal ratio etc.

[13] ICES, Acronyms and terminology
[14] COM(2011) 425 final, Brussels, 13.7.2011
[15] 2008/56/EC
[16] DIRECTIVE 2008/56/EC of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)
[17] Presentation by Keith Brander, Ecosystem Indicators in a varying environment, based on Sainsbury and Sumaila 2003 in FAO Responsible Fisheries in the Marine Ecosystem
[18] EC Decision 2008/949, Annex XIII
[19] ICES, WGNARS report 2012, Report of the Working Group on the Northwest Atlantic Regional Sea (WGNARS) 6–8 March 2012, Falmouth, USA, ch. 4.4

- Human related: landings per stock, effort per area, revenues by gear.

In the EU, protection of marine ecosystems (beyond fisheries) is implemented through the obligation of the Member States to designate Natura 2000 areas by 2012 as required by the bird and habitat directives[20]. In these areas, fishing may be either entirely prohibited or restricted only to certain gears and levels of fishing effort.

Baseline – trends

The Atlantic is the most important fishing area within the EU, as approximately 80 per cent of all catches in the EU comes from this area. Figure 8: Catches in major EU fishing areas (tonnes live weight) shows the distribution of total EU catches among the major fishing areas, pinpointing the north-east Atlantic as the single most important fishing area.

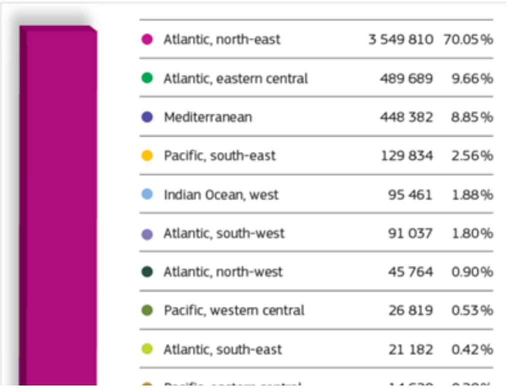

Figure 8: Catches in major EU fishing areas (tonnes live weight)

Source: Facts and figures on the Common Fisheries Policy, Basic Statistical Data 2012

Fishing affects fish stocks directly. Marine ecosystems are affected at a ‘higher level’ by anthropogenic causes, leading to global warming, which in its turn affects the reproduction capacity of stocks and leads to changes in species composition as warmwater species move northward[21].

Marine ecosystem concerns have been expressed in the Bergen Declaration[22]:

- Pollution by hazardous substances
- Eutrophication
- Direct and indirect effects of fishing
- Effects of climate change
- Release of GMOs
- Introduction of non-indigenous species
- Environmental impact of shipping
- Impact of offshore installations.

Fishing is only one out of eight main causes of degradation of marine ecosystems and while its effects may be most direct and clearly visible (having been intensively studied), the effects of the other processes should not be underestimated.

Fish stocks

The strict total allowable catches (TACs) and fishing quotas of the past years have proven to have considerable effect on the state of fish stocks in Europe. As Figure 6-2 shows, fish stocks in the north-east Atlantic that are inside safe biological limits have increased from 30 per cent in 2006 to 56 per cent in 2012. In addition, it should be noted that by 2011 almost half of the catches of stocks under TACs originated from stocks with spawning stock biomass (SSB) above MSYBtrigger (a sustainability threshold)[23]. This implies that long-term reduction of catches (TACs) and effort is beginning to deliver the desired results.

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[20] 92/43/ECC

[21] Parmesan and Yohe, Nature 421:37-42 (2003)

[22] Bergen Declaration, Fifth International Conference on the Protection of the North Sea, 20–21 March 2002, Bergen, Norway

[23] P. Salz, Socio-economic benefits of a bold EU fisheries reform, discussion paper prepared for WWF, in print

Figure 9: Fish stocks in the north-east Atlantic and adjacent waters

Table 1. Scientific advice about the state of the stock	**Number of fish stocks**										
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Average**
Outside safe biological limits	30	29	26	26	26	28	27	22	19	14	25
Inside safe biological limits	12	10	14	11	12	13	12	15	15	18	13
% of stocks inside safe biological limits	29%	26%	35%	30%	32%	32%	31%	41%	44%	56%	35%
The state of the stock is unknown due to poor data	48	53	53	57	58	55	57	60	61	60	56
% of stocks of known status	47%	42%	43%	39%	40%	43%	41%	38%	36%	35%	40%

This improvement in the number of fish stocks that are inside safe biological limits, which to large extent is due to strict TACs, is reflected in the development of catches from European waters. Despite an increase in the demand for fish and shellfish in the EU, catches in the Atlantic have remained stable.

Figure 10: Atlantic Catches – tonnes live weight (Source: Eurostat)

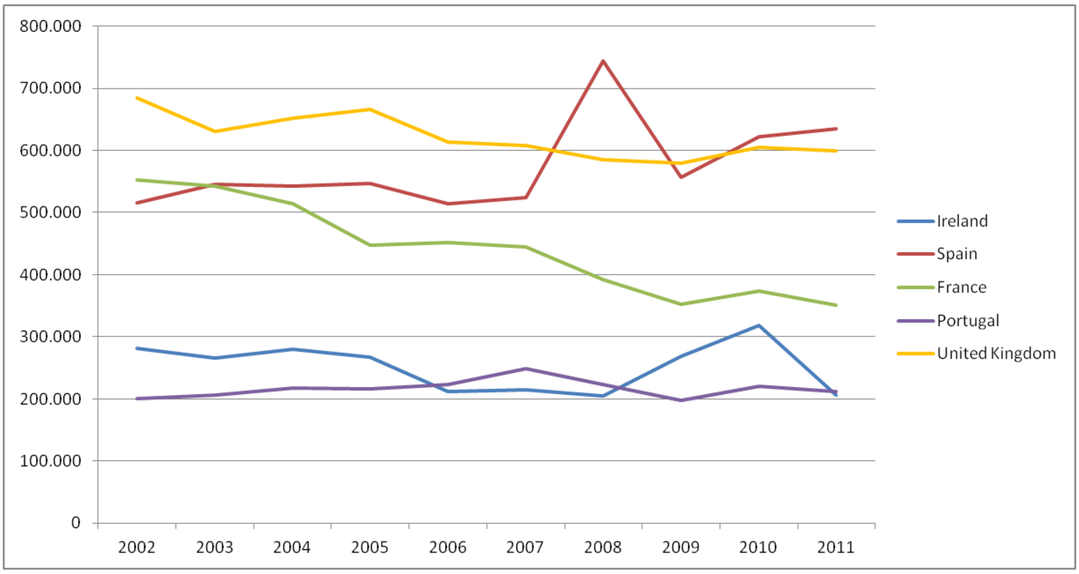
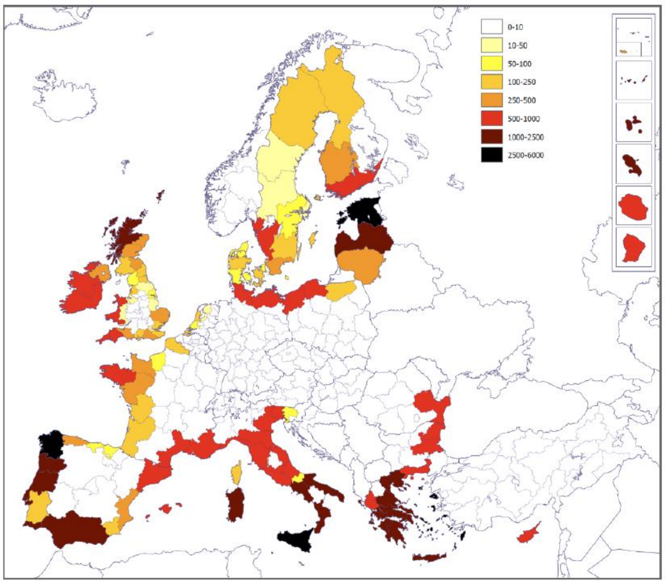
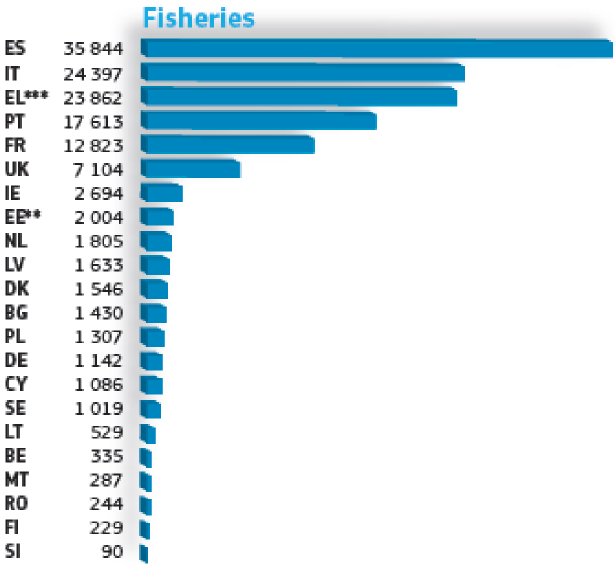


Figure 11: Shipping fleet by length, Source: Eurostat



Socio-economics

Figure 12: Employment in fisheries (full time equivalents), Source: Facts and figures on the Common Fisheries Policy, Basic Statistical Data 2012



Along with the past decline of EU catches, there was an almost proportionate decline of the sea fishing fleet and employment. A large part of the EU fishing fleet is still relatively small scale, about 80 per cent of the vessels being below 12 metres in length. This means that a large proportion of people working in the fisheries industry in Europe are employed in SMEs. The figures below illustrate the absolute number of people employed in small-scale fisheries, and the distribution of shipping fleets in Portugal, Spain, Ireland, the UK and France by vessel length.

Employment in the fisheries sector has declined in the past years and the fisheries industry suffers from low attractiveness. The lack of attractiveness of the fisheries industry is caused by a combination of average earnings per fisherman being relatively low compared to many other professions and hard working conditions. The decrease in the number of European fishing vessels has furthermore led to concerns about jobs not being viable in the future.

In Spain, the number of full-time equivalent employees in the fisheries sector is 35,844. Portugal and France are also among the top five in the EU in terms of employment in fisheries.

EU funding for fisheries

Following EU structural funds (FIFG, EFF, EMFF) support the fishing industry and coastal communities in adapting to changing conditions. EMFF (as proposed) will aim for growth, jobs and sustainability in line with the Common Fisheries Policy and the Integrated Maritime Policy. For the 2014-2020 period, it has a budget of €6.5 billion. This amount will be matched by about €4 to 5 billion in national co-financing. Protection of ecosystem, e.g. through introduction of selective/low-impact gears, will most likely play an important role.

Figure 13: Example of EU policy initiative on aquaculture and fisheries

Coexist: A roadmap to sustainable integration of aquaculture and fisheries

The Coexist project under the 7th Framework Programme is an EU initiative to create a roadmap towards the integration of aquaculture and fisheries with other competing activities in the marine space. While there is increasing conflict between, e.g., aquaculture and spatial uses, there is also a great potential for integrating aquaculture with offshore wind farms. Spatial plans considering the various uses of the seas and their potential integration will form the basis for successful growth in European aquaculture.

International trade

The EU is a large fish consumer, with about 60 per cent of the fish consumption being covered by imports from third countries. Consequently, EU's appetite for fish has ecosystem consequences in other parts of the world, where fisheries management is less developed than in Europe. EBFM is already complex within the EU institutional context, but the international dimension should not be disregarded. In order for the European Atlantic fisheries industry to compete with high imports from third countries, the use of a common Atlantic label could be a way to differentiate itself and to increase appeal to European consumers. This would allow the fisheries sector to market itself as a sustainable producer of high-quality fish and shellfish.

Assessment

EBFM has been introduced to ensure protection of the environment and long-term sustainability of fish stocks and fisheries. However, potential fish catch is by definition limited to the 'maximum sustainable yield' (although this value is not known for most stocks).

Table 4: ***Ecosystem approach to fisheries management: baseline***

Subtheme	Current overall activity	Research trend	Technology trend	Market trend	Other
Ecosystem approach to fisheries management	Reduction of TACs and fishing effort to restore stocks Definition of Natura 2000 areas	Restoration of fish stocks towards MSY Single- and multi-species assessments	Towards low impact gears	Growing demand for fish within the EU and international ly	Decline in attractiveness of employment in the fisheries sector

EBFM is primarily a basis for 'blue sustainability', but much less so for 'blue growth'. The challenge of EBFM is to identify a set of core indicators, representative of the ecosystem, along with cause-consequence relations between these indicators and human processes which affect them, be it fishing or other processes. Once the indicators and processes are known, policy measures can be taken to stabilise economic activities like fishing and potentially promote new ones, within the ecosystem constraints.

Possible recommendations

Research priorities

- What are the relevant ecosystem indicators in relation to fish stock health? And how causal is their relation?
- Ecosystem dynamics in relation to policy – i.e. policy manages human behaviour and only thereby the anthropogenic effects on ecosystems.
- Selection of Natura 2000 areas/MPAs in relation to fish stock recovery (e.g., nursery grounds).
- Fisheries in relation to the food chain (trophic levels) – which fisheries fish down the food web and how can this be prevented?
- Impact of various anthropogenic effects (other than fishing) on fish stocks and their reproductive capacity.
- Avoidance of post-harvest losses – mainly at retail and consumer level.
- Potential of large-scale artificial restocking (comparable to rivers).
- Monitoring of Natura 2000 areas in relation to ecosystem health.
- What are the costs and benefits of EBFM?

Investment/policy actions

Investment/policy actions may include:

- Stakeholder dialogue to design acceptable ecosystem indicators
- Development and introduction of low impact fishing gear and low energy fishing vessels
- Use of fishing fleets for monitoring of environmental status
- Design and introduction of early-warning systems on ecosystem degradation (related to fisheries)
- Creation of EBFM forum/database to exchange information and promote discussion on various aspects of EBFM.

Suggestions for questions to be asked at the workshop

- **How can the ecosystems approach to fisheries management boost blue growth?**
- **What are the specific opportunities and challenges for ecosystems management of the Atlantic fisheries specifically, and what regional measures are necessary?**
- **How can we define politically and scientifically relevant and broadly accepted ecosystem indicators for the Atlantic?**
- **How can the fisheries fund (EMFF) be used to strategically implement ecosystem management (EBFM) in the Atlantic region?**
- **What can the Atlantic Action Plan do to stimulate blue growth within fisheries (value chain, infrastructure, niche products, technology and equipment, ship building etc.)?**
- **Can the Member States benefit from creating common research and management bodies (as a response to the CFP reform)?**

Subtheme 2 – Offshore aquaculture

Introduction

Aquaculture refers to the farming of aquatic organisms (plants and animals) using techniques to increase the production of the farmed organisms beyond the natural capacity of the environment[24]. Aquaculture can be conducted in freshwater onshore, in coastal waters and offshore. Offshore aquaculture implies that the installations are located relatively far from the coast to avoid intervening with other users of the coastal area (e.g. shipping and wind energy) and possibly also to avoid 'horizon pollution'. The installations are placed in exposed locations, not sheltered by the natural protection of the coastline.

The total aquaculture industry in Europe produced 1.3 million tonnes of fish and shellfish and employed approximately 65,000 full time staff in 2009. The largest aquaculture producers in the EU are France, the UK, Spain, Italy and Greece, accounting for about 75 per cent of the total value and volume. However, only 28 per cent is marine fish, mainly salmon followed by sea bass and sea bream. About 50 per cent of the production is shellfish (mainly mussels and oysters) and 22 per cent is freshwater fish. More than 90 per cent of the businesses in the European aquaculture sector are SMEs[25].

The past years have seen a strong increase in the demand for seafood, both inside the EU and worldwide. Sustainable production from wild fish stocks is limited by their natural ability to reproduce. Aquaculture offers an alternative to meet the demand and provide higher supply security. Also, in case of (offshore) aquaculture, ecological sustainability must be explicitly considered and appropriate measures taken as there are clear indications that intensive aquaculture can also lead to ecological degradation[26].

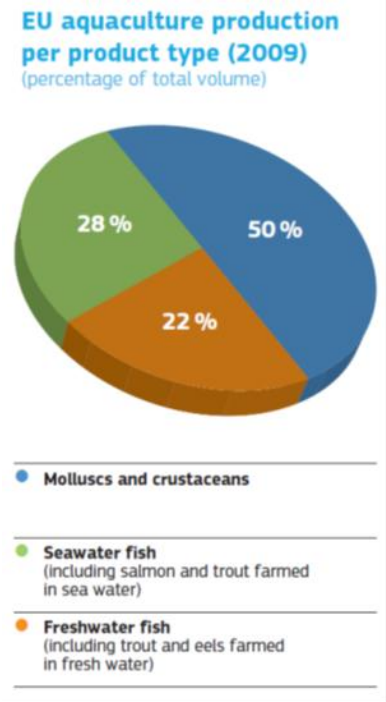


Figure 14: EU aquaculture production per product type (2009), Source: Facts and figures on the Common Fisheries Policy, Basic Statistical Data 2012

Context

Worldwide, fish provides about 16 per cent of the total animal protein consumed. FAO estimates indicate that about half of this fish protein is provided through aquaculture and that the share of aquaculture production will rise to about 65 per cent in 2030[27]. Worldwide aquaculture production experienced annual growth rates of 6.1 per cent in 2000-2010 and even 7.9 per cent in 1970-2010. The European aquaculture sector has been stagnant for the past ten years[28]. Currently, the share of aquaculture in total European fresh and marine aquatic production only amounts to around 25 per cent[29]. The figure below visualizes the development of aquaculture production in the north-east Atlantic between 2000 and 2009 in the countries of the Atlantic Forum. As a reference, the development of Norwegian aquaculture in the north-east Atlantic is included.

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[24] Commission of the European Communities, 2009: Working Document accompanying the "Building a sustainable future for aquaculture" Impact Assessment

[25] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Blue Growth, opportunities for marine and maritime sustainable growth, 2012

[26] Disappearance of mangrove forests and coastal nursery areas related to shrimp farming in Asia and pollution due to salmon farming Europe.

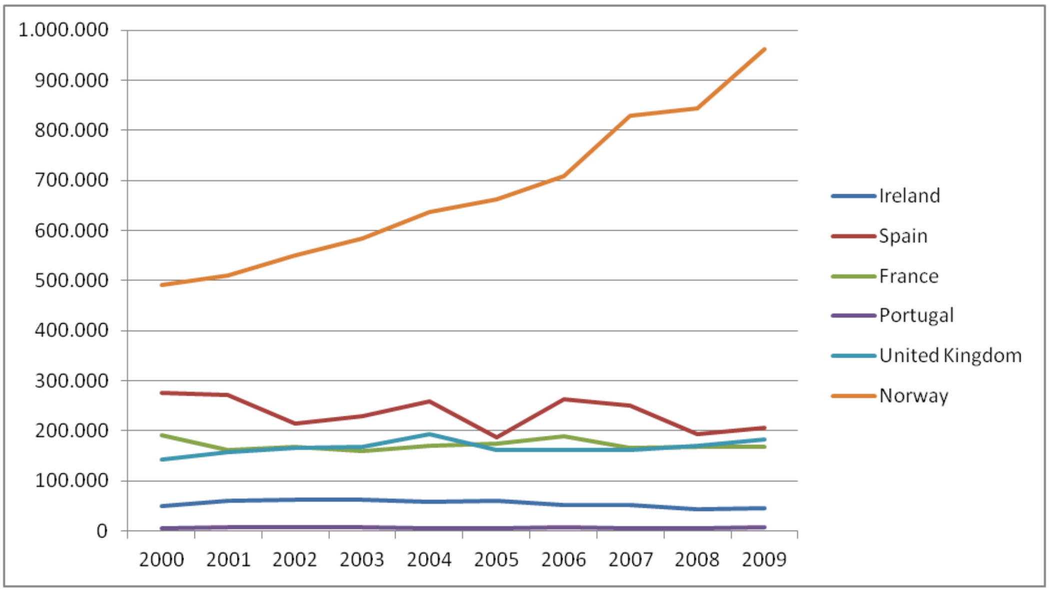
[27] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Blue Growth, opportunities for marine and maritime sustainable growth, 2012

[28] FAO, SOFIA 2012, p.27

[29] Sustainable and environmentally friendly aquaculture for the Atlantic region of Europe, Factsheet

The most important species in European marine aquaculture are salmon, sea bass and sea bream, mussels, oysters and clams.

Figure 15: Northeast Atlantic aquaculture production – tonnes live weight (Source: Eurostat)



European coastal and offshore waters are used very intensively for a large variety of activities ranging from tourism to shipping, mining and, more recently, wind energy production.

Offshore aquaculture is a relative 'latecomer' so its claim on marine space remains to be established. In view of its small size, its economic, political and legal leverage in the public decision-making processes is relatively small. Regulations and legislation regarding offshore aquaculture are almost non-existent.

The following table presents a selection of research projects more or less related to offshore aquaculture. It shows, on the one hand, a broad spectrum of topics where further knowledge must be developed and, on the other hand, a fundamental lack of focus on specific topics related to offshore aquaculture.

Figure 16: Cumulated ship detection reports (using ENVISAT/ASAR products) Source:http://esamultimedia.esa.int/images/EarthObservation/Cumulated_Ship_Detection_Reports_H.jpg

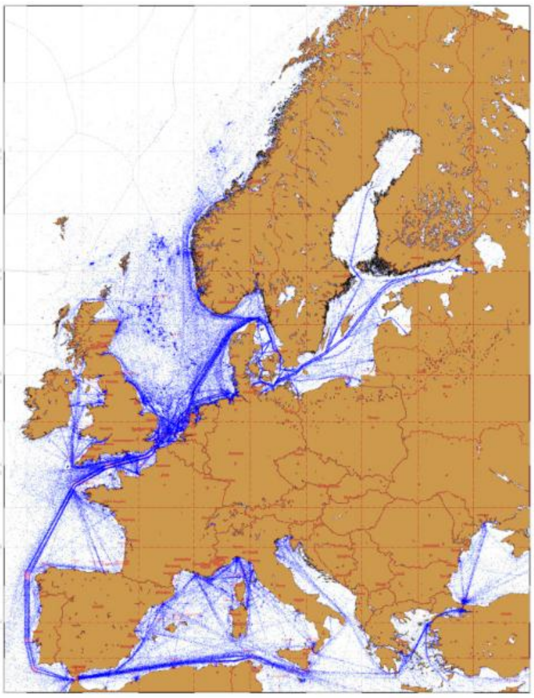


Table 5: Overview of FP6 and FP7 projects related to offshore aquaculture in the Atlantic (Source: EurOcean Marine Knowledge Gate [http://www.kg.eurocean.org]

Project	Lead partner	Duration
Environmental management reform for sustainable farming, fisheries and aquaculture	Università del Solento	2007-2010
Improved immunity of aquacultured animals	Technical University of Denmark	2005-2010
Multi-stakeholder platform for sustainable aquaculture in Europe	European Aquaculture Society	2005-2008
Sustainable aquafeeds to maximise the health benefits of farmed fish for consumers	NIFES – National Institute of Nutrition and Seafood Research	2006-2010
Interaction in coastal waters: A roadmap to sustainable integration of aquaculture and fisheries	IMR – Institute of Marine Research	2010-2013
Building a biological knowledge-base on fish lifecycles for competitive, sustainable European aquaculture	University of Gothenburg	2009-2013
Assessing the causes and developing measures to prevent the escape of fish from sea-cage aquaculture	SINTEF Fisheries and Aquaculture	2009-2012
Microbes as positive actors for more sustainable aquaculture	UGent – Gent University	2009-2013
From capture based to self-sustained aquaculture and domestication of bluefin tuna, thunnus thynnus	IEO – Spanish Institute of Oceanography	2008-2010
REsearch to improve PROduction of SEED of established and emerging bivalve species in European hatcheries	Ifremer – French Research Institute for Exploitation of the Sea	2010-2014
Supporting governance and multi-stakeholder participation in aquaculture research and innovation	EATiP – European Aquaculture Technology and Innovation Platform	2010-2012
Innovative multi-purpose off-shore platforms: planning, design and operation	Technical University of Denmark	2012-2015

The EU's research funding programme Horizon 2020 focuses on food security and the bio-based economy and aims at promoting leadership in enabling and industrial technologies. Research on aquaculture fits into the Horizon 2020 line on addressing major concerns shared by Europeans, which is funded with €31.8 million. The societal challenge of food security is linked to marine and maritime research and covers offshore aquaculture.

Baseline – trends

Baseline trends related to EU offshore aquaculture can be summarized as follows:

- In general, EU aquaculture is stagnating.
- It is difficult to point to successful offshore projects in Europe.
- It proves difficult to domesticate new species suitable for European marine conditions.
- Heavy competition on world market, with prices depressed by low-cost production of pangasius in Southeast Asia.

- Dominance of SMEs among the aquaculture firms leads to high sensitivity to financial risks, insufficient commercial infrastructure (low capital, small-scale organization of production, marketing and sales, lack of collateral for loans) for investments in large scale production and R&D and reluctance of investors. Offshore aquaculture may not be suitable for SMEs, in view of high risks and required investments.
- Current credit crisis makes banks even more cautious to provide loans.
- Under the European Fisheries Fund, many countries have stressed aquaculture in their national programmes, focusing often on intensive farming on land. Despite these political choices, the FIFG and EFF have not produced a highly visible breakthrough triggering large-scale development.

Table 6: Offshore aquaculture: baseline

Subtheme	Current overall activity	Research trend	Technology trend	Market trend	Other
Subtheme A: Offshore aquaculture	Very limited investments, due to lack of viable business models. Exceptions are sea bass/sea bream and tuna fattening, but still on a small scale only.	Little or no focus on specificities of offshore activities.	Development of large-scale cages able to withstand offshore conditions. However, lack of suitable species/products and uncertainties about total production process.	Strong and growing demand for marine products within the EU and internationally. Potential markets for non-food uses, but still in their 'infancy'.	Conflicting use of marine spaces – see map of shipping intensity.

Assessment

Offshore aquaculture can help to increase security of supply of fish and shellfish to European consumers and to decrease pressure on fish stocks that are outside of their safe biological limits.

There are several reasons behind the described stagnation of European aquaculture, the most important ones being:

- Limited access to space and water

European aquaculture in freshwater and coastal sites faces limited access to space and water and low public acceptance. Marine aquaculture in coastal areas faces increasing competition over marine space from other marine economic development, such as tourism, urbanisation or industry. Furthermore, public acceptance of visible coastal aquaculture is low and often inversely proportional to population density and tourist attractiveness. Moving aquaculture offshore is a good way of reducing this negative visual impact.

- Red tape

With the exception of salmon farming (and to some extent sea bass and sea bream), the European aquaculture sector is strongly dominated by SMEs. Transparent and clear conditions for licence awarding and renewals are important in reducing uncertainty and encouraging investments.

- Industry fragmentation

As mentioned above, the aquaculture industry in the EU is highly fragmented, but at the same time competing on a global market.

- Pressure from imports

As demand for fish and seafood has increased in the EU during the past years and domestic aquaculture production has remained stable, imports have increased.

Table 7: Assessment – SWOT analysis

Strengths	Weaknesses
Development of new knowledge and technology Limited visual impact	Neither economic nor technical feasibility have been demonstrated yet. SME structure of present aquaculture (industry fragmentation) Ecological impact unknown Worldwide still in experimental stage
Opportunities	**Threats**
Theoretically large potential – for food as well as non-food raw materials. Tapping unused resources	Competition for space with other users Red tape Pressure from imports/global trade Lack of legislation and regulation Hygiene and diseases Genetic pollution

Possible recommendations

Research priorities

- New species suitable for offshore farming – and first, how should they be selected for domestication?
- Rearing of juveniles
- Efficient feeds, without fishmeal (or only low fishmeal input)
- Industrial uses of algae – bio fuel, pharma, fish and cattle feeds…?
- Environmental impact of intensive off-shore aquaculture (e.g., additives, nutrients, disease prevention)
- Combinations with other uses – wind farms.

Investment/policy actions

- Development of R&D infrastructure
- Promotion of aquaculture education (vocational and academic)/design of curricula.
- Platform for exchange of knowledge and experience (aquaculture technology platform exists already) – how can it be strengthened and made more effective?
- Attracting knowledge from outside EU
- Spatial planning based on clear definition of offshore aquaculture.

Suggestions for questions to be asked at the workshop

- **Are there any potential spatial conflicts between offshore aquaculture and other Atlantic activities (e.g., heavy marine traffic)?**
- **What barriers have to be overcome for Atlantic offshore aquaculture to grow? What can we learn from experiences from other geographies?**
- **Is the current legal framework supportive of growth in offshore aquaculture?**

- **How can the Atlantic Action Plan support the development of a value chain for, e.g., high-value, sustainable Atlantic seafood?**
- **Which role can a centre of excellence in Atlantic offshore aquaculture play in the development of the value chain?**

Subtheme 3 – Marine energy renewables

Introduction

The overall theme of the event in Bilbao on November 11-12th is “Maritime space management and Climate Change Mitigation under the Ecosystem Approach”. This section refers to the third working session on “Marine renewable energies”, and will focus on the experiences of the Member States in setting up an industrial sector around marine renewable energy. The discussions to be held during the workshop should focus on how to accelerate the development of this sector and address current challenges to large-scale deployment in order to make it a significant player in electricity generation, job creation and economic growth. A list of potential questions to be raised is provided in the Assessment section of this annex.

This report differs from the thematic report of the Brest event, which focuses more on research and development of the technologies through cooperation mechanisms. However some relevant sections of the Brest report will be mentioned in this Bilbao report as a reminder.

Context

Marine renewable energies present significant potential to respond to the future demand for energy in Europe in a sustainable manner. In fact, it is estimated for example that only 0.1% of the energy in ocean waves could be capable of supplying five times the entire world’s energy requirements.[30] In addition, marine energy renewables present the potential to reduce greenhouse gas emissions, enhance autonomy of European energy supply, and produce significant economic and social benefits through the creation of jobs.[31]

In the context of this discussion, marine renewable energies are considered as the ocean energies in addition to offshore wind. In other words:

- Offshore wind (fixed or floating)
- Marine current (tidal energy)
- Wave
- Tidal range
- Ocean Thermal (OTEC)
- Osmotic

What is the development stage of these technologies?

Each of these technologies is at a very different stage of development.

The most advanced is fixed-based offshore wind, which has reached the stage of full-scale industrial and commercial deployment. The total installed offshore wind capacity amounted to 3.8 GW in 2011, including a 31% growth rate in 2011[32].

The ocean energies on the other hand are less mature, despite acceleration in development over the past few years, and remain at the research, prototype or demonstration stage. At a global level, total installed capacity of ocean energy in 2011 is 519 MW, most of which related to tidal power plants.[33]

Apart from fixed-based offshore wind , there are good prospects for growth of floating offshore wind power, which could benefit from operational feedback from fixed-base wind turbines, as well as for marine current (tidal energy).

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[30] EC, Research and Innovation: Ocean Energy, http://ec.europa.eu/research/energy/eu/research/ocean/index_en.htm

[31] COM(2012) 271 final, “Renewable Energy: a major player in the European energy market”

[32] Source: European Wind Energy Association

[33] Implementing Agreement on Ocean Energy Systems (OES), Annual Report 2010, International Energy Agency.

Wave energy is less likely to reach the commercial stage for several years, and is positioned for medium- to long-term market development, along with OTEC, which is focused mainly on tropical areas.

Therefore the technologies that should be considered for potential commercialisation within a 2020 horizon are floating offshore wind, and marine current (tidal energy).

What is the potential?

Although there are many technologies still in the demonstration stage, the potential for ocean energy development, estimated at 748 GW by 2050[34], is significant.

In Europe, the potential of these technologies is considerable, since about 80% of Europe's "combined energy" potential (from wind, waves and ocean currents) is in deep-water areas (over 60 meters), and 50% is more than 100 kilometers away from the shore.[35] The European Commission's roadmap foresees an installed capacity of 3.6 GW by 2020 and 188 GW by 2050 (not counting fixed-base and floating wind turbines). Offshore renewables (except offshore wind power) also offer substantial employment potential of 160,000 direct jobs by 2030,[36] and more than 470,000 direct and indirect jobs by 2050[37] according to the European Ocean Energy Association (EU-EOA).

In terms of the Atlantic seaboard, significant potential for offshore wind, wave and tidal energy has been identified. The very significant potential value of the European / Atlantic seaboard marine renewable energy resource in terms of turnover, value-added and employment, has been described in a number of recent reports (EWEA, 2009, EU-OEA, 2010, Marine Board-ESF, 2010) and is reflected in significant investments by industry along the European Atlantic coast.

What is the focus of EU Member States, and particularly those in the Atlantic?

The UK is currently the world's leading market for marine energy, with 300 MW of ocean energy projects in the pipeline to be installed over the next five years. Their strategy has a particular focus on developing and deploying wave and tidal energy, as well as offshore wind.

Denmark is the number 2 offshore wind country with a current offshore capacity of 854 MW, 22,9% of the total wind capacity. Offshore wind turbines represented 62% of the capacity added in Denmark in 2010.

France is continuing to support the development of marine energy technologies, and has only relatively recently pursued a focus towards offshore wind, after awarding a first round of offshore wind tenders in 2012. There are also strong plans for tidal energy (marine current), including an objective to install 2.5GW.

Ireland has continued to focus on wave energy, including a full scale grid connected wave energy test facility. The average wave power in Europe is highest near the west of Ireland with an average wave power of 76kW occurring of the Irish coast.

Spain has had late deployment of marine energy in comparison with other countries with a similar ocean power potential, such as UK or Portugal. It however possesses a number of test sites for prototypes in wave energy (growing since 2005) and floating wind turbines.

Portugal is a world leader in wave energy technology, having developed since 2005, with a number of wave energy plants and prototypes in operation. Since 2010, Portugal has turned some of its attention to offshore wind.

What are the challenges to be addressed collectively?

From an Atlantic Member State viewpoint, these technologies are actively growing, as governments implement more stringent renewable targets and direct policy support. However there are challenges that need to be addressed to encourage the development of this sector.

Firstly, there is a concern that the EU power grid will not cope with the added capacity as more projects near full-scale sea trials and supply electricity to the grid.

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[34] OES Vision Brochure, October 2011, An International Vision for Ocean Energy

[35] European Offshore Renewable Energy Roadmap, ORECCA, September 2011.

[36] An international Vision for Ocean Energy, Ocean Energy Systems, October 2011.

[37] Ocean Energy, European Ocean Energy Roadmap 2010-2050, European Ocean Energy Association, 2010.

Secondly, there are legislative and regulatory challenges, due to varied technology and regulatory standards, and the lack of a comprehensive policy framework.

Thirdly, these emerging technologies face cost-competitiveness issues due to the initial state of development.

Finally, offshore space is a limited resource, and therefore the expansion of offshore activities and the development of new uses of the sea will enhance the need to discuss maritime spatial use and conflicts.

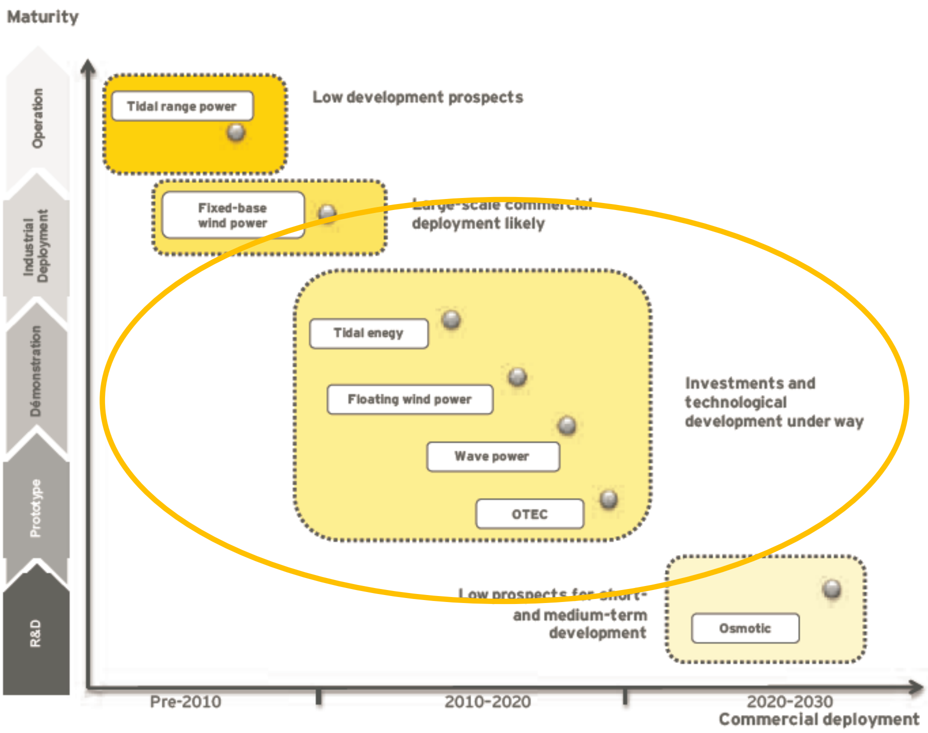
The potential will only be realised by coordinated action and governance putting the right regulations and supports in place to facilitate the sustainable development of this new emerging industry, mobilising the significant economic, technical and scientific capabilities of the region and ensuring interconnectivity to move energy from where it is produced (Atlantic coast) to where it is needed (the urban and industrial centres of Europe).

Baseline – trends

Marine renewable status and development potential in the Atlantic area

The various marine renewable energy technologies have a different development status and not all of them are sufficiently mature to allow full-scale commercialisation in the short-term. Today, the main mature marine energy technology (that has reached the stage of full-scale industrial and commercial deployment) is fixed-base wind turbines, using either piles driven into the seabed, or space-frame substructures, or a gravity base that sits on the seabed floor. Tidal range energy can be categorized as a relatively mature technology; however, market deployment continues to be slow. The development of other marine energy technologies has accelerated in the past few years, although most are still at the prototype or demonstration stage.

Figure 17: Marine energy maturity and development prospects



Source: Ernst & Young, 2012, "Marine energy Opportunities in the French market" based on data from France Energies Marines

Given the maturity level and the potential of the different resources, it is clear that several of these technologies could contribute significantly to a more diverse global energy mix in the medium to long term. The best prospects for growth in the next 10 years are offshore wind power (fixed-base and floating) and tidal energy. Floating wind turbines will initially benefit from operational feedback from fixed-base wind turbines. Wave energy is less likely to reach the commercial stage for several years, and is positioned for medium- to long-term market development. OTEC development will concentrate on the tropical zones.

The table below provides an overview reminder of the different marine energy technologies in terms of their stage of development, potential for the Atlantic region, specific challenges, and overall prospects for commercialisation prior to 2020. ***For further information on each of the technologies, please refer to the thematic report for the Brest Atlantic Forum event.***

Table 8: Overview of selected offshore marine energy technologies

Technology	Technological development	Industrial development in the EU and in the Atlantic Sea Basin	Potential MS	Challenges	Overall prospects for 2020
Floating wind turbines	Developing – many different designs and concepts, suited to a variety of site specificities and depth characteristics	Many projects are under way to develop and test technical innovations, but not yet commercialisation Nevertheless, there are two full scale grid-connected floating turbines	Portugal, France, UK	Competition is necessary to decrease costs	Strong potential for 2020 (+ +)
Marine current (tidal energy)	Proliferating tech development – pilot plants in operation or planned	Imminent market launch and commercial deployment as early as 2015	France, UK	Prototypes being developed in context of proliferating technological development – however path to commercialisation is not yet known	Strong potential for 2020 (+ +)
Wave energy	High development potential – technologies allowing operations in water are still in R&D stages	Some devices already being tested. Very promising source in long term.	France, Portugal , UK	Some technologies allowing operations in shallow and deep-water zones are still in the research and development stages Diversity of concepts, difficult to assess their costs and market schedule	Strong potential but not before 2020 (+)
Tidal range	Mature technology approaching commercialisation.	Few current projects due to to their high investment costs and impacts on the environment	France, UK	Despite level of maturity, at present only 4 tidal barrages operate as commercial power plants worldwide. 2nd largest is in France – La Rance – operating since 1966 UK has cited high costs in comparison to strategic importance/need	Limited growth potential (/)

Technology	Technological development	Industrial development in the EU and in the Atlantic Sea Basin	Potential MS	Challenges	Overall prospects for 2020
Ocean thermal energy	Feasibility studies, onshore prototype	OTEC demands systems engineering competencies and industrial capacities that limit the number of players	Overseas territories of France	Prototypes only recently under way or being planned – commercialisation seems a long way off	Promising, but not before 2020 (/)
Osmotic energy	Early stage R&D	World's first prototype osmotic power plant in Norway	N /A	The key to further development lies in optimizing membrane characteristics. Costs are high.	Promising, but not before 2020 (/)

National state of play for marine renewable energy sector

All 27 Member States submitted (during 2010 and early 2011) a National Renewable Energy Action Plan (NREAP) as provided by Article 4 of the Renewable Energy Directive (2009/28/EC), in which the contribution of renewables are quantified in order for each Member State to reach its binding 2020 target. The 17 Coastal States of the 4 European sea basins (North Sea, Baltic Sea, Mediterranean Sea and Atlantic Coast) covered by the project announced quantitative objectives for offshore renewable energies and some of them identified the area dedicated to Offshore Renewable Energy (ORE) activities.

The table below shows the Atlantic States target, compared with their potential sea area (EEZ area), and where a geographical zone for ORE has been identified, the proportion this area represents in the sea area.[38]

Table 9: Atlantic Member State Offshore Renewable Energy targets in National Renewable Energy Action Plans

MS	2020 target	ORE area needed to meet 2020 target	EEZ area	ORE area	% of ORE area in EEZ	Installed OWF	% of installed capacity vs 2020 target
UK	18 GW *UK target for 2020 as currently expressed by the Government is 18 GW by 2020*	3300 km²	773 676 km²	So far approx 49.2GWe of leases issued (39602 km²)	5.1%	1525 MW	8.5%
Ireland	Wind: 550 MW Wave & Tidal: 75 MW	55 km²	410 310 km²	6 areas identified for potential ORE deployment: 9800 to 12500 MW	0.3%	25.2 MW Consented OWF: 1600 MW	4 %
France	6000 MW	600 km²	AC & EC: 334	AC & EC: 533 km²	0.2%	0 MW	0 %

[38] Seanergy 2020, October 2011, "Offshore Renewable Energy and Maritime Spatial Planning: Recommendations for Adaptation and Development of Existing and Potentially New International Marine Spatial Planning Instruments"

			604 km² MS: no claimed EEZ				
Spain	3000 MW	300 km²	AC: 683 236 km² MS: no claimed EEZ	Not delimited A zoning exercise identified potential areas in accordance to environmental restrictions	-	0	0 %
Portugal	Wind: 75 MW Wave & Tidal : 250 MW	7.5 km²	1 714 800 km²	Wind: 1300 km² (fixed WT) + 16100 km² (floating WT) Wave&Tidal: 3800 km²	1.2%	Wind: 0 MW Wave & Tidal: 0.4 MW	0 %

The percentages of installed capacity with regard to the 2020 targets highlight the early stage of ORE deployment.

The column “Needed ORE area to meet 2020 Target” verifies whether enough has been zoned to satisfy the 2020 target. France it is the only country for which the ORE area currently delimited is not sufficient to satisfy the2020 target.

The UK

- Policy and regulatory framework:
  - the UK Government has established a Marine Energy Programme, focusing on enhancing the UK marine energy sector’s ability to develop and deploy **wave and tidal energy** devices at a commercial scale, and enable the UK Marine Energy sector to move from prototype testing to commercial deployment over the coming 5 years.
  - In a bid to identify and overcome barriers to **offshore wind development**, the government’s Offshore Wind Cost Reduction Task Force has set out a number of key actions and specific recommendations that must be implemented to try to cut the cost of generating electricity in the sector to £100 (€125)/MWh by 2020 from around £140 (€176)/MWh today.[39]
- R&D: The UK is one of the leading centres for research and development in marine energy technology, with many **renowned universities working in conjunction with technology developers**. These include the University of Lancaster (UK), University of Southampton (UK), and University of Strathclyde (UK).
- Test centres: The UK has **comprehensive test facilities,** including:
  - European Marine Energy Centre (EMEC) in Orkney, Scotland: established to speed up the development of marine power devices from the prototype stage to the commercial market place. The Government and other public sector organisations have invested around £15 million in EMEC and its two marine laboratories. Currently, it has five grid-connected wave-testing berths and five tidal testing berths, with a total capacity of 20MW.[40]
  - New and Renewable Energy Centre (NaREC) in the North East of England: leading land based research and development facility for new, sustainable and renewable energy technologies. It works to support the evolving energy industry and transform new technologies into commercial successes.
  - Wave Hub, off the coast of Cornwall, England: provides shared offshore infrastructure for the demonstration and proving of arrays of wave energy generation devices over a sustained period of time.

[39] Renewable energy attractiveness indices, Ernst & Young, August 2012
[40] UK Department of Energy and Climate Change, Research and Development in Wave and Tidal Energy, http://www.decc.gov.uk/en/content/cms/meeting_energy/wave_tidal/research/research.aspx

- Energy developers: The main players in terms of technology demonstration and project development in the UK are E.On, Scottish Power, SSE Renewables, RWE npower, EDF, International Power, and ESB International.

- Support schemes and incentives

Support for research and development has been available through the Research Council, Technology Strategy Board, the Carbon Trust, the Energy Technologies Institute and the Scottish Government. The Government also provides early-stage research and development funding for marine energy through the Research Council's SuperGen Marine programme.

In addition to grant support, to help develop and commercialise **wave and tidal technology**, the UK provides revenue support to the deployment of wave and tidal technologies through the Renewables Obligation (RO). In 2012, wave and tidal projects received a boost from the increase of support from 2ROCs/MWh to 5ROCs/MWh, subject to a 30MW limit. Offshore wind retains 2ROCs/MWh until April 2015, when support will be cut by 5%, with a further reduction in the following year. [41]

Wave and tidal energy projects are among priorities for the £103 million **Renewable Energy Investment Fund (REIF)**. A key focus of the REIF will be to support marine energy projects from the single-prototype demonstration stage as are being tested at EMEC to small-scale multi-device arrays around Scotland's open waters.

The **Marine Renewables Commercialisation Fund (MRCF)** is a Scottish Government fund administered by the Carbon Trust. £18m million is available, providing capital support for projects that will accelerate the deployment of commercial-scale wave and tidal stream energy arrays in Scottish waters. The MRCF will initially provide capital support to commercial-scale arrays of multiple devices.

The UK is also taking Electricity Market Reform (EMR) measures. The reforms are likely to limit the increase in electricity bills for domestic, non-domestic and energy intensive consumers, to counter The rising wholesale electricity and carbon prices.

Ireland

- Policy and regulatory framework

In 2008 the Irish Government set up the Ocean Energy Development Unit (OEDU), as part of the Sustainable Energy Authority of Ireland (SEAI), to advance the sector, implement the ocean energy strategy, administer the Prototype Development Fund to industry, support the Hydraulics and Maritime Research Centre (HMRC), develop a **grid connected wave test site**, manage the conduct of an SEA for **Wave, Tidal and Offshore Wind** and stimulate supply chain mobilization.

- R&D

There are numerous **Irish Universities, Institutes and Bodies undertaking research projects** related to Marine Energy. SEAI has funded 31 projects aimed at bringing designs from prototype stage to fully operational pre-commercial devices, four of which have continued into 2012.[42] The Atlantic Ocean Energy Alliance (AOEA) is an alliance of individuals, companies, institutes and representative bodies established in early 2011, to realise the significant economic and social benefits offered by the coast of Ireland.

- Test centres: In 2006 SEAI and the Marine Institute created a scale prototype test site at Galway Bay near An Spideal. Two devices have been installed at the site: Ocean Energy Ltd.'s Seilean oscillating water column (OWC) device, and the Wavebob device. The site forms part of a wider research infrastructure – SmartBay – supporting innovation in the field of marine ICT – sensing, data management and communications.[43] To complement this existing test site, a **full scale grid connected wave energy test facility** is being developed in County Mayo. The Atlantic Marine Energy Test Site will enable assessment of performances of wave energy devices under open sea conditions in terms of electricity generation and survivability.

- Energy developers: There are several Irish companies that have invested significantly in the marine energy sector. These include ESB International, Bord Gais Eireann, Wavebob, Open Hydro, Mainstream, Oriel and

[41] Renewable energy attractiveness indices, Ernst & Young, August 2012

[42] Energy Ireland, Outlook for ocean energy, http://www.energyireland.ie/outlook-for-ocean-energy

[43] Marine Institute, Galway Bay Wave Energy Test Site, http://www.marine.ie/home/aboutus/organisationstaff/researchfacilities/Ocean+Energy+Test+Site.htm

Ocean Energy Ltd. Under the Prototype Development Fund in SEAI and other grant programmes from the national Enterprise agency, some 15 Irish ocean energy companies have received funding support.

- Support schemes and incentives

The Irish government allocated a financial package for marine energy administered by a new Ocean Energy Development Unit (OEDU) based within the Sustainable Energy Authority of Ireland (SEAI), covering support for device developers, enhancement of test facilities and development of grid-connected test facilities. The Irish government has financed or is financing a total of 15 Irish companies, for the most part through the **Prototype Development Fund** administered by SEAI.[44]

The Government recently launched an integrated marine plan, which identifies offshore renewable energy as an emerging business development opportunity. The incentive to develop marine energy is supported by the **€220 per MWh REFIT** price for ocean energy, lasting 15 years (from 2009 to 2024).

France

- Policy and regulatory framework

In 2004 the French Agency for the Environment and Energy Management (ADEME) undertook an analysis of the different types of ocean energy technologies. The French Government developed a Multi-Annual Investment Plan (PPI) in 2009 to identify the resources required to develop renewable energy sources, including marine energy.

The French Government is continuing to support the development of marine energy technologies actively, in addition to **offshore wind**. The national authorities have disclosed a road map for **tidal energy**, including an objective of installing 2.5GW and a possible tender in 2014. GDF Suez is studying the possibility of installing turbines at two sites, including plans to install a pilot plant of three to six turbines from 2015. [45]

- R&D: Several R&D projects and structures are ongoing in France. The most significant players in the area of R&D are the Pôle Mer Bretagne and PACA clusters and IFREMER. IFREMER is leading the France Energies Marines project involving a broad 54-member consortium of businesses, research and higher education organizations and institutional partners. This project aims to support the development of marine energy technologies (**floating wind turbines, wave turbines, tidal turbines and OTEC**) and their market deployment.
- Test centres: In France there are five test sites: SEM-REV **wave** power site at Le Croisic, **offshore tidal** site off Paimpol-Bréhat, SEENEOH **estuarine tidal** site near Bordeaux and **floating offshore wind power** sites at Fos-sur-Mer and Groix.[46]
- Energy developers

Alstom Group entered the **wave energy** market in 2011 by taking 40% equity share in Scottish renewable energy company, AWS Ocean Energy. The first units of a new generation of 6 MW turbine were planned to be installed in 2011 (onshore) and 2012 (offshore) and Alstom and EDF Energies Nouvelles (EFD-EN) announced that they would bid jointly for the French offshore wind tender. Furthermore, AREVA intends to play a key role in developing the 6 GW of **offshore wind** capacity planned by the government for 2020.

Project developers in France include EDF Energies Nouvelles, Enertrag France, Iberdrola Renovables, DONG, Nass & Wind Offshore, Neoen Marine, Valorem, DCNS and wpd Offshore France.

- Support schemes and incentives

France introduced feed in tariffs (FIT) in 2001. For Marine energy there is a **20 year FIT of 150 €/MWh**. In addition, there is a tender system for large renewable projects, incentives (Fiscal and investments), and indirect schemes (e.g. tax on polluting activities).[47]

France's wind tariffs (2008 wind power FIT Order) are currently being assessed by the country's Supreme Court on the basis of state aid; a negative outcome could mean the cancelation of FITs for the wind sector. [48]

[44] European Ocean Energy Association, "Position Paper Towards European industrial leadership in Ocean Energy in 2020"
[45] Renewable energy attractiveness indices, Ernst & Young, August 2012
[46] France Energies Marines, http://www.france-energies-marines.org/
[47] Rousseau, N. "Ocean Energy: A European Perspective"
[48] Renewable energy attractiveness indices, Ernst & Young, August 2012

The call for tenders for the development of 3 GW of **offshore wind** power capacity, which closed in January 2012, represents a market estimated at €10 billion for the various players. In April 2012, four wind farm contracts worth approximately €2b and totaling approximately 2GW of capacity were awarded. [49] EDF and Alstom came out as winners of three and Spain's Iberdrola along with French nuclear reactor maker Areva were awarded the fourth.

There are also concerns that the Government's second offshore tender looks likely to be delayed until early 2013.

Spain

- Policy and regulatory framework

The Spanish Government has implemented a series of cost cutting measures as it seeks to reduce the feed in tariff deficit by more than €4.6b over the next three years, while also protecting consumer energy bills.[50]

The Spanish Government's "Renewable Energy Action Plan 2011-2020" aims to have 10MW of installed capacity of marine energy by 2016 and 100MW by 2020. Regional Governments of several areas (the Basque Country, Cantabria, Asturias, Galicia and the Canary Islands) are promoting the installation of test facilities and demonstration projects. Two of them have set targets on Marine energy so far: the Basque Country plans 5 MW of installed power by 2010, and the Canary Islands considers 50 MW by 2015.

- R&D

Spain is participating in several international initiatives on promoting marine energy, including WAVEPLAM, which seeks to create conditions to speed up introduction of Marine energy into the renewable energy market. At national level, PSE-MAR is a strategic marine energy research project coordinated by TECNALIA, comprising three developers (HIDROFLOT, PIPO Systems and OCEANTEC), industrial companies, R&D centres and universities.[51]

Perhaps the most important project is the OceanLider programmehttp://www.oceanlider.com/. Led by Iberdrola Ingeniería y Construcción, includes several marine energy R&D activities including resource assessment, site selection, operation and maintenance, technology development, grid connection and environmental aspects. It brings together 20 industrial partners, 24 research centres for a total budge of 30M€ (15M€ public funding).[52]

Finally, there are innovation and competition clusters, such as the **Sea of Innovation Calabria Cluster**, that brings together 42 companies and 18 research institutions.

- Test centres: Test centres in Spain include:
  - Santoña, Cantabria: test site for prototypes of Wave Energy Converters. The Testing Field Area would accommodate up to 10 WEC devices with a maximum combined power of 1.5MW.
  - Ubiarco, Cantabria**:** develop a testing site for prototypes of WECs and Floating Wind Turbines (FWT). The Testing Field Area will allocate up to four Floating Substations, up to 4MW each, which will provide connection to a maximum of four devices.
  - bimep (Biscay Marine Energy Platform), Basque country**:** will allow full-scale prototype testing and demonstration of renewable marine energy converters up to 20MW. bimep is integrated into the EU funded MaRINET programme.
- Energy developers: Major players in Spain include GM Renovables, Ocean Power Technologies, Abencis, Wedge Global, Tecnalia, and Iberdrola.
- Support schemes and incentives: In January 2012, the Spanish Council of ministers implemented a temporary suspension of the renewable energy feed-in-tariffs (FIT) for new installations in Spain, due to fiscal challenges and lower credit ratings. The government will not give any economic incentive to fund new renewable installations, and the relevant administrative and funding systems will be suspended.

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[49] Rousseau, N. "Ocean Energy: A European Perspective"

[50] Renewable energy attractiveness indices, Ernst & Young, February 2011

[51] European Ocean Energy Association, "Position Paper Towards European industrial leadership in Ocean Energy in 2020"

[52] Ruiz-Minguela, P (2012), Ocean Energy Activities in Spain, Head of Wave Technology at Tecnalia

Portugal

- Policy and Regulatory framework

Portugal has created a series of financial and fiscal measures to support investment in renewable energy. These measures have been dynamised further with the creation of differentiated tariffs for electricity produced in renewable plants, feed-in tariffs (FIT), according to the degree of maturity of the various technologies that are available in the national market.

Redes Energéticas Nacionais, the network operator, has signed a contract with the Government, providing a concession which allows the potential development of 250MW of wave energy near the port of Peniche. The project is likely to attract over €500m of investment and will strengthen Portugal's status as a **world leader in wave energy technology**.

- R&D

Portugal is participating in several R&D activities and projects through the Wave Energy Centre (WavEC), Instituto Superior Técnico (IST) and Laboratório Nacional de Engenharia e Tecnologia (LNEG). About 25 full-time researchers are active in these three R&D centres.[53]

In addition, there is the PCTE – "Pólo de Competitividade e Tecnologia da Energia" ("Competitiveness and Technology Centre for Energy" - ENERGYIN), which was set up in 2009 as non-profit association to promote Technology Development and Innovation in the Portuguese Energy Sector.

- Test centres: Support infrastructures for offshore renewable energy in Portugal include: [54]
  - Pico wave energy plant: owned and managed by the Wave Energy Centre, a private not-for-profit organisation. Pico plant is part of the European network of R&D infrastructures on marine energy under the MARINET project.
  - Aguçadoura site: open ocean test site where the AWS prototype in 2004 and the Pelamis farm in 2008 were tested. It consists of a land station with electric power equipment to deliver energy to the grid and data acquisition equipment.
  - Pilot Zone: developed for wave energy. The pre-commercial phase applies between 4MW and 20MW per technology with a total of 100MW at national level. The total installed capacity in the commercial phase will reach 250MW.
- Energy developers: AW Energy, is a Finnish company that, in association with the Portuguese Eneólica, is developing a Waveroller 300kW project in Peniche, Portugal, under the €3 million funded SURGE FP7 project. The Portuguese company Kymaner has secured a national €1.2 million from QREN to develop components for oscillating water columns.Other project developers include Wavelinx, Grupo Generg, Efacec, A Silva Matos, Consulmar, Irmaos Cavaco, and Martifer Energy Systems.
- Support schemes and incentives: The Portuguese Government promotes energy renewables mainly via feed-in tariffs for renewable electricity, direct subsidy payments (PRIME-Programme) and tax incentives. For wave energy, there is a 15 year maximum support amounting to 26 -7.6 €cents/ kWh, whilst for offshore wind it is 7.4 €cents/ kWh.[55]

Main barriers to large-scale deployment of marine renewable energy

The potential of marine energy is significant whist the barriers to large-scale deployment can be described as modest, and are mainly due to high technology costs. The level of government support and interest from private investors in terms of technology and project deployment is motivated by the success of demonstrating prototypes.

At this stage, **large industries** are more prevalent in marine energy (with the exception of offshore wind), as the operating costs are still beyond the capacities of small and medium enterprises. Maintenance and plant

[53] European Ocean Energy Association, "Position Paper Towards European industrial leadership in Ocean Energy in 2020"

[54] European Ocean Energy Association, "Position Paper Towards European industrial leadership in Ocean Energy in 2020"

[55] EREC, "Portugal : Renewable Energy Policy Review"

construction costs can also be very high, especially in the start-up phase. Also due to the lack of experience, operations in offshore infrastructures are often carried out by the oil industry and are therefore costly.

Market "pull" measures, such as incentives for investors (investment tax credits), incentives for end-users (investment and production tax credits) and feed-in tariffs, are necessary to facilitate the transition from demonstration to commercial deployment.

Another barrier to acceleration of the market is **cost-competitiveness** due to the initial state of development. **Appropriate grid infrastructure and connections** are important for further development. Grid connections to onshore grids can also be problematic, as in some cases the grid is too weak to absorb the electricity production from wave energy power stations. Except for coastal countries, such as Portugal and the SW region of the UK that have high voltage transmission lines available close to shore, coastal communities lack sufficient power transmission capacity to provide grid access for any significant amount of electricity that can be generated from marine energy.

The UK has noted that "the best wave and tidal resources lie in some of the most remote parts of the UK, which tend to be areas with very little access to the high-voltage transmission grid. If marine renewables are ever to make a significant contribution to the UK's energy system, it is clear that investment in grid infrastructure will be needed in order to allow electricity to be transported from wave and tidal generation sites to end consumers".[56] A further problem for marine energy is the requirement for generators to underwrite the cost of new grid connections (that is, generators who wish to connect to the transmission system are liable to pay the cost of building the grid connection in the event that their projects to build new power plants are cancelled).

Furthermore, **licensing and authorisation costs and procedures** can be very high and complex. It can take several years to obtain permits from administrations, with costs up to one million euro. A lack of dedicated or experienced administrative structures causes long permit procedures. In addition, with the advent of the deployment of marine energy technologies, coastal management is a critical issue to regulate potential conflicts for the use of coastal space with other maritime activities.

In the UK, to some extent, this is an unknown quantity since no large-scale projects have yet gone through the consenting process and so there is no experience on which to judge the likely speed of the process. The industry is keen for the process to be as streamlined as possible.[57]

There are also **technical barriers due to insufficient experience and demonstration** - there is a lack of information and understanding regarding performance, lifetime, operation and maintenance of technologies and power plants. For marine technologies to succeed, attention needs to be paid to technical risks in design, construction, installation and operation. Importing knowledge and experience from other industry sectors, such as off shore oil and gas, including risk assessment procedures and engineering standards is important. Rigorous and extensive testing, including single components, sub-assemblies and complete functional prototypes are still necessary to establish the new technologies.

The UK claims that a lack of people following careers in scientific and engineering disciplines in the UK could potentially threaten the successful development of the wave and tidal workforces. Some have suggested that that skills could be transferred from other existing industries, such as maritime and offshore engineering (that is, offshore oil and gas and offshore wind), consultancy and marine services.[58]

Large scale deployment can be facilitated through the **convergence of technologies**, thus reducing the number of isolated actors and allowing technology development to accelerate. Industrial R&D should be moving in parallel with continuing academic R&D. Large farms should demonstrate their performance and reliability and become technical evidence to industries, academia, associations, governments and the public.

Public acceptance may create another barrier to large scale development. In the UK, although projects to date may not have experienced much local opposition, the situation may change when commercial-scale projects begin to be deployed.[59] Involving the public (and other stakeholders) ahead of deployment could identify key public concerns and ensure they are properly addressed in the development of new projects. This may avoid delays to projects further down the line. More engagement would also provide an opportunity to set out the

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[56] http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/1624/162409.htm
[57] http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/1624/162409.htm
[58] http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/1624/162409.htm
[59] http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/1624/162409.htm

potential benefits associated with marine energy, for example the fact that tidal power is predictable (unlike some other renewable sources of energy) as well as any local economic benefits that may arise.

Marine spatial planning related to offshore energy

Marine spatial planning (or maritime spatial planning (MSP)) is a practical way to establish a more rational organisation of the use of marine space and the interactions between its uses, and to balance demands for development with the need to protect marine ecosystems. It is thus defined as a process that relates to planning and regulation of all human uses of the sea while protecting marine ecosystems[60].

Maritime spatial planning in the EU

Whilst traditionally, management of marine resources and associated uses occurs on a sectoral basis, the IMP[61] clearly recognised that everything relating to Europe's oceans and seas is interlinked and, consequently, there is a need for an integrated approach to maritime governance and new tools to deliver this type of approach. As regards MSP and given that competency resides at national level, the Commission acknowledged the need for a common approach between MS.

Through its 2008 Communication **entitled "Roadmap for Maritime Spatial Planning: Achieving Common Principles in the EU" (COM(2008) 791 final), the Commission has thus set up common principles in developing MSP to ensure consistency across MS** and respect of regional marine ecosystems, including those that transcend national maritime boundaries. Derived from existing approaches in some MS and other international examples (such as the UN Law of the Sea Convention, or Regional Seas Conventions as OSPAR), it puts forward a rationale for the benefits of a European approach stating that, ultimately, the use and implementation of MSP will "enhance the competitiveness of the EU's maritime economy, promoting growth and jobs in line with the Lisbon agenda, in line with ecosystem requirements".

Other Policy Developments have Implications for MSP Implementation, notably the Marine Strategy Framework Directive (2008/56/EC) which aims to achieve 'Good Environmental Status' (GES) of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend.

MSP is an essential tool for the sustainable development of maritime regions and has long been developed without consideration of marine energy. However **marine energy development now increasingly needs to be considered alongside maritime spatial planning at a European level.** This is because offshore wind, wave and tidal energy in particular share more and more synergies in relation to governmental marine policies, marine stakeholders and spatial constraints.

Some international Maritime Spatial Planning instruments have been developed in the last years but they do not necessarily take into consideration the specific features of offshore renewable energies, nor are they currently constraining the construction of offshore wind farms or their connection to shore. Therefore the expansion of offshore activities and the development of new uses of the sea will enhance the need to discuss maritime spatial use and conflicts. [62]

Still an heterogeneous status in the EU MS, with rather low level of integration of marine renewable energy requirements

Many MS across Europe are only in a preliminary stage to develop an appropriate legal framework for MSP. In the Atlantic Ocean and Irish Sea, little progress has been made towards the adoption of a comprehensive MSP

[60] In principle, from an EU perspective, the MSP process does not include coastal management or planning of the land-sea interface, which is to be addressed through the implementation of Integrated Coastal Zone Management (ICZM).

[61] COM(2007) 575 final

[62] Seanergy 2020, October 2011, "Offshore Renewable Energy and Maritime Spatial Planning: Recommendations for Adaptation and Development of Existing and Potentially New International Marine Spatial Planning Instruments"

policy framework taking into account all sea users in an effort to achieve ecological, economic and social objectives.

Inclusion of marine renewable energy requirements also varies, mainly according to the status of the industry on the different countries. Generally speaking few existing maritime spatial plans currently include a dedicated area for marine energy development.

Within the Atlantic, most countries have developed sectoral plans for offshore renewables identifying both opportunity zones with minimal conflicts and areas with a high level of potential conflicts. These exercises have often been accompanied by SEAs. All countries in the Atlantic basin are signatories to the most important initiatives in regional cooperation on the protection of the marine environment, including the OSPAR convention.

Synthetic Overview by MS :

- In the **UK**, England, Wales and Northern Ireland have made some progress in terms of planning, with the development of a comprehensive Marine and Coastal Access Act (MCA 2009) and in Scotland with the Scottish Marine Planning Act (2010). The UK approach provides an interesting example of establishing a comprehensive legal framework for marine planning policy, since it does not exclude any zones in the territorial seas (within 12 nautical miles of the coast) nor in the EEZ (from the edge of the territorial seas out to 200 nautical miles). In Scotland, the Pentland Firth and Orkney Waters and the MSP approach taken by Marine Scotland allows marine energy development in a dedicated area which has significant marine energy resources and is also of high environmental quality. The area is host to a range of other uses and sectors such as fishing and shipping.
- Progress has been made by **Portugal** through the adoption of the POEM, an MSP exercise initiated in 2008 and recently finalised that considers all sea users and includes offshore renewables. Portugal has made progress towards integrated and comprehensive information and data management systems. Although the data is not fully comprehensive, efforts are being made to extend its coverage and integrate it into a single Geographic Information System (GIS).
- **Ireland** has carried out a sectoral MSP exercise via its Offshore Renewable Energy Development Plan (OREDP), which includes a number of defined areas for wind only, wind and wave, and wave and tidal. Ireland's data sets appear to be sectoral and lacking in socio-economic data. Consultation seems to take place mostly on individual projects and is not actively sought.
- **France** has defined zones to tender for offshore wind, but has not carried out a full MSP process. France has extensive data sets, but these are not always available in a GIS, although there have been significant improvements in France recently.
- **Spain** has designated go and no-go areas for offshore wind, but, as in France, this is not part of integrated, forward looking planning. Spain also has extensive data sets, but these are not always available in a GIS.

It is essential that the marine energy industry engage fully in the Maritime Spatial Planning process to ensure that conflicts are minimised and that the industry can progress in a sustainable manner. Strategic development zones have to ensure room for growth, based on existing support infrastructure (e.g. proximity to grid connections, ports, suppliers) as well as device type/depth;

On the other hand, it is essential that research is undertaken to understand the extent to which marine energy developments can be deployed and co-located with other users of the sea, which could help lessen the need for 'exclusion zones' within MSP systems.

According to information available, it appears that the deployment of offshore renewable energy in the different EU Coastal States is more constrained by limited MSP policy and related legal framework or complex permitting and incentives procedures at national level than by MSP Instruments at International or regional level.

A few initiatives have been launched in the past years to address MSP issues at EU level so as to allow taking a regional or pan-European approach, reflective of the approach suggested in the IMP. Some are funded under various EU research programmes such as FP7, Intelligent Energy Europe and INTERREG.

Many projects have a transversal approach including marine renewable energy. Table below presents a selected sample of three **projects which have a clear marine renewable energy focus**. Among them, two have a clear regional approach focused on the North Sea regions, but they could provide good practice for the Atlantic Area.

Table 10: Overview of projects related to Marine Spatial planning and energy renewable in Europe

Project	Aim and objectives
INTERREG III POWER: Pushing Offshore Wind Energy Regions	The central aim of POWER is to unify North Sea regions, to learn from each other, to set up common strategies overcoming economic changes, to respond to new educational needs and thereby give a positive impetus to continuing sustainable development of the region.
EACI/IEE SEAENERGY 2020	The project will formulate concrete policy recommendations on how best to deal with MSP and remove MSP obstacles that hinder the deployment of offshore renewable energy. It will provide policy recommendations for a more coordinated approach to MSP and larger deployment of marine renewables (wind, wave, tidal).
EACI/IEE WINDSPEED: Spatial Deployment of Offshore Wind Energy in Europe	Windspeed aims to assist in overcoming existing obstacles to deployment by developing a roadmap defining a realistic target and development pathway up to 2030 for offshore wind energy in the Central and Southern North Sea. This includes delivering a decision support system (DSS) tool using geo-graphical information system (GIS) software. This will also facilitate the quantification of trade-offs between electricity generation costs from offshore wind and constraints due to non-wind sea functions and nature conservation, thereby assisting policy makers in terms of allocating space for the development of offshore wind the Central and Southern North Sea.

Source: Marine energy system website

Assessment

Although current energy generation from marine energy technologies remains marginal, these technologies offer strong development potential in the longer term. In the medium term, large-scale deployment will depend on the sector’s ability to meet a number of technological and economic challenges, and to face competition from other energy sources, including other renewable technologies.

The success of current full-scale projects being implemented is essential in demonstrating the reliability of these technologies at scale, as well as their price competitiveness. Developers are continuing to focus on options to reduce the cost of equipment, installation, operations and maintenance, in order to reduce the cost of electricity generated to a level comparable with fixed-based offshore wind. This will require substantial public support as well as reinforced cooperation efforts between research organizations and technology developers.

This section addresses key challenges and issues that will need to be addressed as an Atlantic region (or even at EU level) in order to ensure the acceleration of the industrialisation of marine energy renewables.

Effective policy and regulatory framework

Effective regulation in the renewable energy is important as it can facilitate development and sustainable deployment of renewable energy technologies. Directive 2009/28/EC of April 2009 deals with energy from renewable sources. It contains an obligation for Member States to prepare National Action Plans. In this context, MS spell out the expected contribution to their 2020 target.

Despite the strong framework to 2020, the Energy Roadmap 2050 suggests that growth of renewable energy will **drop after 2020 without further intervention due to their higher costs and barriers compared to fossil fuels**. **Early policy clarity on the post 2020 regime will generate real benefits for investors in industry and infrastructure as well as for renewable energy investors directly**.[63]

A major challenge is that technology is advancing at a faster pace than policy. There are few coherent and considered regulatory frameworks. Even leading jurisdictions such as the UK (and Scotland in particular) face a number of issues, and obtaining consents for a project can take years and cost millions.

Some marine renewable energy technologies are at the key stage of commercialisation, so it is essential to develop an appropriate regulatory/legislative framework. Success of the industry depends on government policies to support development and deployment and the development of a comprehensive policy framework.[64]

On top of this, the economic crisis has made investors cautious about the energy sector. In Europe's energy markets, the growth of renewable energy depends on private sector investment, which in turn relies on the stability of renewable energy policy.

Suggestions for questions at Session 3 of the workshop:

- **What are the key factors for an appropriate regulatory framework that encourages the development of the marine energy renewables sector?**
- **How can Atlantic MS address investor confidence in the current economic crisis to make marine renewable energy investment more attractive?**
- **What post-2020 planning can be done now at an Atlantic level to reduce uncertainty and increase confidence?**

Improving support schemes

The cost of renewable energy is not determined solely by the resources - project costs are also driven by **administrative costs and capital costs**, such as complicated authorisation procedures, lengthy planning processes and fear of retroactive changes to support schemes, which combine to increase project risk. Such high risks, particularly, in countries with stressed capital markets, result in a very high cost of capital, raising the cost of renewable energy projects and undermining their competitiveness.[65]

Furthermore, the **success of demonstrating prototypes** motivates the support of government and private investment in both technology and project deployment. However, development and operating costs are still beyond the capacities of small and medium enterprises, and therefore only the largest industries are involved in marine energy.

An **appropriate balance of revenue support and capital grants** is necessary to facilitate the transition from demonstration to commercial deployment. This includes incentives for investors (investment tax credits), incentives for end-users (investment and production tax credits) and feed-in tariffs that would make high-cost, precommercial installations attractive to investors and the end-users.

Simple administrative regimes, stable and reliable support schemes and easier access to capital (for example, through public supports schemes) will contribute to the competitiveness of renewable energy. In that context, the European Investment Bank and national public institutions can play a key role. Today, most renewable energy technologies benefit from national support schemes, but these cover only a small share of the energy market (less than a third of the 19% of electricity from renewable energy).[66]

In some Member States, changes to support schemes have lacked transparency, have been introduced suddenly and at times have even been imposed retroactively or have introduced moratoriums. For new technologies and

[63] COM(2012) 271 final, "Renewable Energy: a major player in the European energy market"
[64] Clean Energy Council, Marine Energy Sector Report, 2011
[65] COM(2012) 271 final, "Renewable Energy: a major player in the European energy market"
[66] COM(2012) 271 final, "Renewable Energy: a major player in the European energy market"

investment still dependant on support, such practices **undermine investor confidence in the sector**. For example, in January 2012, Spain temporarily suspended all feed-in tariffs for new installations of renewable due to the financial crisis.

Moreover **diverging national support schemes**, based on differing incentives may create barriers to entry and prevent market operators from deploying cross-border business models, possibly hindering business development.[67]

Suggestions for questions at Session 3 of the workshop:

- **How can the success of prototypes be leverage to gain government and investor support at an Atlantic level?**
- **What are examples of successful support schemes? What are the key components? Can these good practices be applied elsewhere?**
- **Is there scope for improving and/or standardising support schemes to encourage cross-border market operators?**

Improving grid connections

All marine renewable technologies need infrastructure, and many also need sea cabling and connections. Marine renewables are different from traditional models for transmission, in that resources can be far from the grid and therefore transmission charges can pose an issue.

The increase in energy renewables will require **further investment in distribution grids**, which have been designed to transmit electricity to final consumers, but not to absorb generation from small producers. The majority of the existing power grid was built in an era in which electricity systems were predominantly national, power generation was sited relatively close to the points of consumption, and power flows and supplies were relatively controlled.

With the exception of coastal countries, such as Portugal and the south west region of the UK that have high voltage transmission lines available close to shore, coastal communities lack sufficient power transmission capacity to provide grid access for any significant amount of electricity that can be generated from marine energy.[68] A key area of research is focusing on the development of smart grids.

Suggestions for questions at Session 3 of the workshop:

- **What pan-European initiatives provide an opportunity to address grid connection in a coordinated manner?**
- **Where are investments most needed in the Atlantic?**

Spatial use conflicts

With the advent of the deployment of marine energy technologies, coastal management is a critical issue to regulate potential conflicts for the use of coastal space with other maritime activities. Some international Maritime Spatial Planning instruments have been developed in the last years but they do not necessarily take into consideration the specific features of offshore renewable energies. Several factors in the development of marine energy technologies will have maritime spatial planning implications.

[67] COM(2012) 271 final, "Renewable Energy: a major player in the European energy market"

[68] Strategy Energy Technologies Information System (SETIS), Marine Energy, http://setis.ec.europa.eu/newsroom-items-folder/ocean-energy

Suggestions for questions at Session 3 of the workshop:

- **How can we ensure a successful relationship between coastal populations, users of the sea and energy professionals?**
- **How can marine spatial planning instruments be coordinated to resolve conflicts, regulate competing uses, and achieve optimal site selection?**

Possible recommendations

Research priorities

- Focus on innovative components and equipment that offer advantages when used at scale
- Research into equipment or methods that assist in scaling-up technology into farms or arrays, such as specialist installation and maintenance vessels and electrical connection equipment.
- Develop new manufacturing processes to reach high volume productions
- Develop installation, operation and maintenance methodologies to provide further cost reduction
- Encourage demonstration programmes of full-scale projects, coastal onshore prototype test sites and facilities
- Strengthen industry-research collaborations
- Increase cooperation between national and European technology platforms

Investment/ policy actions

- Setting Atlantic region renewable energy objectives and decarbonisation targets beyond 2020
- Reform national support programmes to promote cost reductions. There is a need to achieve better consistency and simplification across the EU, thereby reducing administrative costs for the industry.
- Increase number of testing facilities to test marine energy devices components and systems
- Demonstrate grid integration techniques at an industrial scale and address long term grid access planning
- Address more efficient consent procedures to build on past experience that are proportional to the size of projects
- Establish and use marine spatial planning to identify optimal installation sites.
- Increase cooperation through working groups covering public administrations and industry to address measures to overcome barriers

Subtheme 4 – Intermodal transport and safety

Introduction

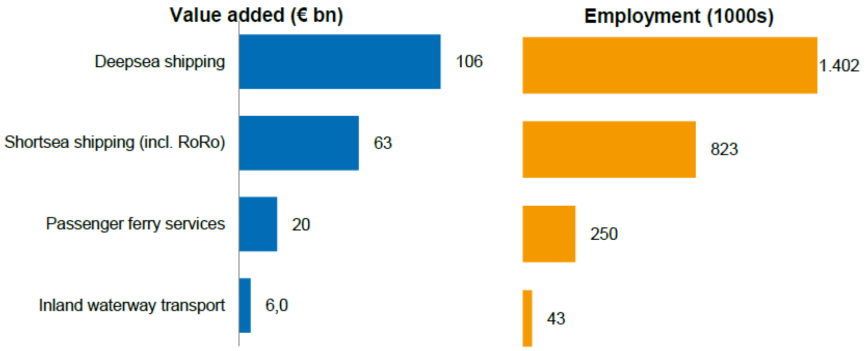
The subtheme deals with two main topics:

- Intermodal transport; the land-sea interface of shipping and its relation to ports, roads and railways
- Maritime safety; the great number of vessels that pass the Atlantic Member States involve a risk of accidents and consequently pollution of marine and coastal environments.

Context

Maritime transport is key in creating blue growth and connecting the European economies to each other and the world markets. In Europe, the sector generates some €200 billion annually in added value and employs 2.5 million people (cf. figure below). Especially, deep and short sea shipping are major economic subsectors for which most employment is on land[69]. Transport on rivers and other inland water bodies is not discussed further here.

Figure 18: Value added and employment of maritime transport and shipbuilding in the EU



Source: DG MARE, "Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts – third interim report" 2012

Maritime transport is a major direct employer, but it is equally important in securing employment, e.g., in businesses that supply the sector. In France, for instance, merchant vessels and passenger ships alone employ some 20,000 people directly, but there are also 40,000 employees in both French ports and the shipbuilding industry. In addition, approximately 3,600 work in maritime research[70].

Parallel to this, the UK maritime sector – ports, shipping and maritime businesses services – accounts for 230,000 direct jobs and almost the same number via indirect employment[71]. Indirect jobs are found in companies

[69] DG MARE, "Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Maritime Sub-Function Profile Report. Short Sea Shipping (1.2)" 2012

[70] 2009 data; The French Maritime Cluster; http://www.european-network-of-maritime-clusters.eu/publications/18.pdf

[71] 2009 data; Maritime UK: *The economic impact of the UK's Maritime Services Sector*, 2011, prepared by Oxford Economics

supplying goods and services for the maritime sector (raw materials, shipping services, communications and accounting). In Spain, the maritime sector provides employment for roughly 460,000 and another half a million indirectly[72]. This indicates that the sector's direct activity generates at least the same amount of jobs in supply sectors etc.

Economic effects of the Port of Southampton, UK

The activities of the Port of Southampton involve cruises, roll-on/roll-off vehicle transport, container shipping, bulks as well as import of fresh produce. It handles 300 cruise ships and 37 million tonnes of cargo. Excluding defence and oil activities, the port generates:

- Direct jobs: 5,100
- Nationwide total of direct and indirect jobs: 14,160
- Turnover of port businesses: £772 million per year
- GDP effect: £1.75 million per year.

The main sectors benefiting from the port’s supply chain include the purchase, maintenance and repair of equipment and the distribution of fuel.

Source: Marine Southeast: Economic impact of the Port of Southampton, 2011. Prepared by Atkins.

The water bodies of Europe cater to a substantial range of traded goods: the short sea transport sector – intra-European shipping – is responsible for some 40 per cent of all transport within the EU[73]. Short sea shipping connects Atlantic ports with other European ports and road and rail networks across the seas.

Growth in short sea cargo volumes results from two main drivers: economic development, but also a modal shift as short sea shipping is an alternative to road and rail-based transport. From a sustainability point of view, shipping is promoted as a means to reduced traffic emissions and congestion on land. Still, moving goods on sea rather than land also involves emissions of harmful substances, often close to densely populated areas.

In order to promote a modal shift of transportation towards shipping, links between ports must be well developed, barriers in the logistics sector overcome and port and hinterland infrastructure in place. There is a ongoing need to optimize infrastructure with a view to lowering costs and strengthening the competitive edge of shipping.

Maritime accidents off the Atlantic coast such as those involving the vessels Erika and Prestige have caused huge environmental damage. Following these two disasters, the EU called on Member States to take urgent and decisive action to counter the threat of oil spills. They also acted as a reminder to decision-makers that Europe needed to invest in better preparation for a large-scale oil spill, i.e. above-and-beyond the resources available at individual Member State level. Proposals for stricter shipping controls followed immediately.

Maritime safety is both an element of and a necessary condition for blue growth. Greater levels of economic activity and transportation in marine environments must be safeguarded effectively, and the development of enabling systems and technology has an inherent growth potential.

Baseline – trends

Maritime transport

Seaborne trade has been affected by the recent economic downturn. The European amount of loaded goods has, nonetheless, remained almost constant since 2006 (approx. 1,100 million tonnes), whereas the amount of

[72] 2005 data; includes some 39,000 employed in fisheries; Clúster marítimo español: *A shared platform to achieve the future*

[73] DG MARE, “Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Maritime Sub-Function Profile Report. Short Sea Shipping (1.2)” 2012

unloaded goods fell from approx. 2,100 million tonnes in 2006 to 1,700 million tonnes in 2009 after which small increases were seen. Especially, dry cargo dropped during the crisis[74].

The below maps show the high density of ships off the European Atlantic coasts. However, most of these vessels have their call elsewhere and only pass through the Atlantic. In terms of short sea shipping, the Atlantic area accounts for approximately 14 per cent of European totals, which is roughly half of the contribution from North Sea and Mediterranean short shipping, respectively.[75]

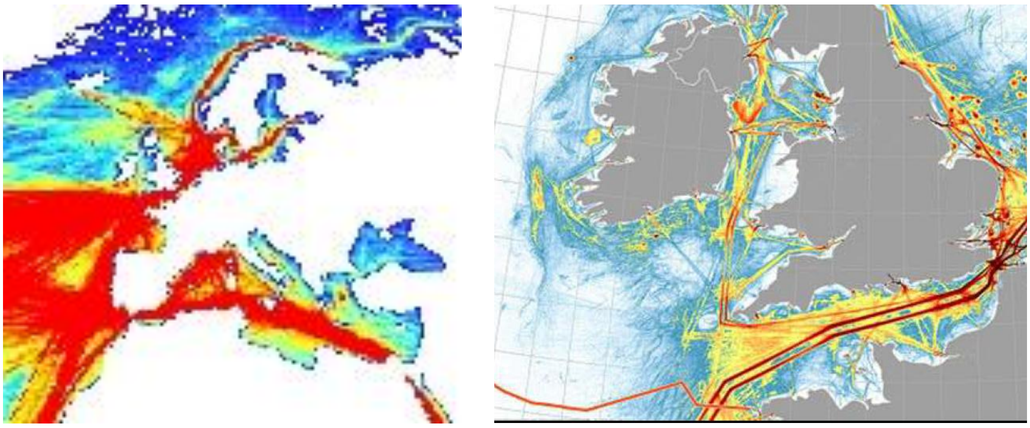


Figure 19: Maps of ship density in Europe (left) and the English Channel and Irish Sea (right). Darker colour indicates greater density of maritime transport (AIS-data).

The table beneath lists the major Atlantic ports in comparison to their European counterparts. Four ports in the Atlantic Member States rank in between the 20 largest cargo ports (short and deep sea freight), and they are relatively small compared to the largest maritime hub in Europe, Rotterdam. Other significant Atlantic ports include Nantes Saint-Nazaire, Sines and Rouen. Still, marine transportation is dominated by few major ports and shipping companies and a host of smaller ports and SMEs. Economics of scale are very important in logistics and goods concentrate in transportation hubs.

Table 11: Atlantic ports between the 20 largest European ports in 2010; the freight they handle, their size compared to the largest European port – Rotterdam – and their ranking in terms of size.

Atlantic port	Gross weight of goods, thousand tonnes, 2010	Size compared to Rotterdam	European rank in 2010	European rank in 2002
Le Havre, FR	65.771	17%	6	6
Milford Haven, UK	42.788	11%	14	16
Southampton, UK	39.365	10%	17	17
Dunkerque, FR	36.309	9%	18	12

Source: Eurostat (mar_mg_am_pwhc)

The Atlantic Member States cover approximately 20 per cent of all European passenger dis-/embarkments to which the ferries across the English Channel contribute substantially.

[74] UNCTAD: Review of maritime transport 2011

[75] In 2009, Atlantic short sea shipping catered 231 mtonnes out of 1,685 mtonnes of the European short sea shipping sector. (DG MARE, "Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Maritime Sub-Function Profile Report. Short Sea Shipping (1.2)" 2012)

Shipping has low unit cost in comparison to other transport modes and is competitive at large distances. Fuels make up some 30-40 per cent of operating costs[76], and costs are thus largely affected by fuel price fluctuations, but increases in the transport sector's operation costs can enhance shipping's competiveness relative to road on shorter distances. This tendency can be intensified by congestion on land infrastructure and environmental regulation. Still, a crucial question for the future is how the sector's ability to compete will be affected by increased costs due to, e.g., environmental requirements.

Atlantic rail corridor

The Atlantic Arc has begun developing the concept of an Atlantic rail corridor for freight. The corridor will be a backbone of the European Atlantic from the Strait of Gibraltar to the North Sea, promoting intermodal freight. A manifesto suggests priority projects in Portugal, Spain and France as well as the UK and Ireland among others, and includes improved port infrastructure "Adaptation for efficient goods transport of the rail lines connecting the corridor with Atlantic ports: Seville, Huelva, Sines, Porto, Vigo, A Coruña, Gijón, Santander, Bilbao, Bayonne, Bordeaux, Nantes, Lorient, Brest, Saint-Malo, Cherbourg"

Source: Gobierno Vasco: Manifesto of the Atlantic Rail Corridor for Freight

EU initiatives on maritime transport

The European Maritime Transport Space without Barriers aims at simplifying administrative procedures for maritime transport, acting as a stepping stone for a 'Blue Belt' of free maritime movement in and around Europe[77].

Four Motorways of the Sea corridors are set up under the Trans-European Network (TEN-T) in order to establish floating infrastructures as competitive alternatives to land transport. In the Atlantic area, the Motorway of the Sea of Western Europe leads from Portugal and Spain via the Atlantic Arc to the North Sea and the Irish Sea.

Example of EU policy initiative on sustainable maritime transport

'Motorways of the Sea' is a transport concept of the EU aimed at improving networks through sea transport and port communications between peripheral regions of the European continent. It will help implement the policy initiatives on the European maritime space without barriers and the maritime transport strategy for 2018.

The motorways should compensate for congestion on roads and help reduce energy consumption and emissions. The motorways include a link via the Atlantic Arc.

The EU Marco Polo programme funds sustainable freight focused at projects and actions that promote a shift in transport modes from road to ship and rail; this includes Motorways of the sea. An attempt to remove several billion tonnes of kilometres from the French road network was established by the Fresmos project between St. Nazaire in France and Gijon in Spain. The parallel Ro-Ro Past France project was set up as a seaborne motorway between Bilbao, Spain and Zeebrugge in Belgium where each sailing carries up to 200 unaccompanied trailers[78]. Together with the Gulf Stream (Santander, Spain to Poole, UK) and Reefer Express (Bilbao, Spain to Tilbury, UK and Rotterdam, Netherlands) projects, these routes are very likely to have increased interconnectivity among the Atlantic economies and moved great amounts of goods from land to sea transport modes.

In addition to Motorways of the sea, the land-based infrastructure development under TEN-T has improved connections to hinterland, thus investment in maritime transport will benefit from hinterland connectivity and vice versa.

The TEN-T will develop infrastructure at two levels in the 2014-2020 period towards a comprehensive and a core network, respectively. The core network to be completed by 2030 is shown in the map below. The core network aims at connecting 83 main European ports with hinterland (rail and road links) along ten priority corridors. The map illustrates the prioritised land corridors and port infrastructure in the Atlantic area. It is clear that major investments along the Atlantic can be expected towards 2030 and pre-identified core projects comprise both a

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[76] DG MARE, "Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Maritime Sub-Function Profile Report. Short Sea Shipping (1.2)" 2012

[77] COM(2012) 494 final: Blue Growth – opportunities for marine and maritime sustainable growth

[78] http://ec.europa.eu/transport/marcopolo/files/success-stories/motorways_of_the_sea_ro_ro_past_france_en.pdf

port/rail upgrades between Lisbon (Sines port) and Strasbourg and between Dublin via the Channel to Paris and Brussels[79].

Figure 20: TEN-T core network in 2030 (bold lines indicate projects completed in 2011)

Source: DG MOVE: Connecting Europe: Putting Europe's economy on the move. 2011

Figure 21: CAMIS: INTERREG project across the English Channel

CAMIS: INTERREG project across the English Channel

The Channel Arc Manche Integrated Strategy project is a Franco-British co-operation that in 2009 through 2013 brings together 13 partners in establishing an integrated marine strategy. On transport and intermodality, the projects seek to:

- establish a co-ordinated mapping tool of freight and passengers transport links and transport investment.
- identify synergies between road, rail, air, and sea investments.
- promote joint planning and investment in hinterland connectivity.
- Research the logistics connections.

Maritime safety

Maritime safety is a multilevel topic involving the shipping industry, national and international policy initiatives in combination with regional and local involvement in enforcement, response etc. Furthermore, data needs to be generated, policies implemented and technologies developed. Successful action on all levels is needed to ensure safe maritime transport in the Atlantic. Much of the work on prevention and surveillance is carried out at the EU and IMO level, whereas coordination of search and rescue, emergency response and clean-up is organized at national, regional and local level. The Atlantic Action Plan can play an aligning and cooperation-enhancing role in maritime safety, especially on the latter aspects.

Ensuring maritime safety requires technological developments with inherent blue growth potentials. Examples of priority areas for future development are enhanced exchange and sharing of information in general, and specific developments within advanced detection systems of oil spills and refined oil recovery systems among others. One specific initiative of technological development within the maritime safety sector is the Spanish-based Technology

[79] DG MOVE: List of pre-identified projects on the core network in the field of transport, 2011 (http://ec.europa.eu/transport/themes/infrastructure/connecting/doc/revision/list-of-projects-cef.pdf)

Platform for Coastal and Marine Environment (PROTECMA) that develops and implements an R&D strategy for protection, pollution prevention and control. Through gathering of science, technology and businesses, the platform seeks to develop technology. The Atlantic Transnational Network highlights the possibility of improving assessment of risks and appropriate mitigation measures supported by improved traceability of dangerous goods through information sharing and surveillance systems.

Safety is on the maritime agenda and is given political attention, not at least on the EU level where measures include the following:

- Improved identification and monitoring of all ships approaching and sailing in European waters and ports
- Simplified and harmonised procedures for the provision and use of information on hazardous or polluting freight, through the use of electronic data interchange
- The mandatory use of voyage data recorders (maritime black boxes) and automatic identification systems to facilitate accident investigation and traffic monitoring and control
- The establishment of common databases and methodologies for maritime safety and accident investigation.

Research in the area of maritime safety has focused on developing operational and technological concepts capable of meeting the changing needs of the demand side while enhancing safety and the protection of the environment. Research can be divided into several categories[80]:

- Introduction of innovative designs, technologies and working practices for safer ship operations
- Development of efficient traffic management systems for sea and river operations
- Education, human factors and improvements to the working environment
- Reduction in environmental risks and the promotion of environmentally friendly operations.

Given the size of the Atlantic, there are significant opportunities to improve the efficiency and effectiveness of MS operations in these areas, both within the agencies within each jurisdiction and across jurisdictions through greater cooperation, information exchange and shared analysis.

Future trends that will highlight the need for a coordinated approach include:

- Increased shipping
- Maritime spatial planning: increased competition for space and keeping dangerous ships away from protected areas etc.
- Incentives for quality: good standard/record gives better routes (including the use of certificates, 'above compliance' standards).

Atlantic cooperation on maritime safety

Green Atlantic for Sustainable Development was part of the 2000-2006 Atlantic Area programme and served as both a process of integration and development of competences and methods aimed at creating a European platform of expertise and action for maritime and environmental safety issues.

Emergency Response to Coastal Oil, Chemical and Inert Pollution from Shipping: The project has worked to strengthen the shoreline response to such incidents, minimising the potential environmental and socio-economic impacts. Partners from along the Atlantic Coast of Europe have worked together to improve existing coastal pollution response plans.

EU initiatives on maritime safety

[80] EXTRA consortium for DG Energy and Transport, (2001) "Maritime Safety: Results for the transport research programme"

The EU has created regulation that addresses maritime safety, including:

- Traffic monitoring and information system (Directive 2002/59/EC)
- Ship-source pollution and the introduction of penalties, including criminal penalties, for pollution offences Directive (2005/35/EC)
- Port State control (Directive 2009/16/EC)
- Ship inspection and survey organisations and for the relevant activities of maritime administrations (Directive 2009)
- Ban on single-hulled oil tankers carrying heavy grades of oil from entering the waters of the European Union from 2015.

Furthermore, the MARPOL conventions at the international level include regulations aimed at preventing and minimizing pollution from ships – both accidental pollution and that from routine operations.

Specific to the Atlantic Region, the OSPAR convention for the protection of the marine environment of the North-East Atlantic also provides the framework for marine safety issues.

Integrated Maritime Surveillance is a part of the Integrated Maritime Policy, and is about providing authorities with ways to exchange information and data, thereby making surveillance cheaper and more effective. Currently, the EU and national authorities responsible for different aspects of surveillance – e.g., border control, safety and security, fisheries control, customs, environment or defence – collect data separately and do not necessarily share them, resulting in duplication of data collection activities. Therefore, at European and at national level, there is a need to integrate the co-ordination and inter-operability of the Member States' ability to exercise sovereignty in European waters. In this regard, good progress has been made with Member State co-operation in the area of maritime safety, security and surveillance, in particular in relation to:

- emergency at sea responses (including search and rescue).
- pollution response (including catastrophic events), environmental protection, fisheries enforcement.
- improved vessel traffic management and information.
- maritime security and surveillance at sea (including border control, counter-narcotics, human trafficking, smuggling and other forms of organized crime).

The EU is already involved in several projects to improve the monitoring of sea areas and vessel traffic in the Atlantic. These include ARCOPOL +, which is a project that aims to further improve maritime safety and Atlantic regions' coastal pollution preparedness and response to oil and hazardous and noxious substance (HNS) spills through technology transfer, training and innovation[81]. Previously identified gaps in HNS knowledge will be addressed and further incorporated into local and regional contingency planning to contribute to building a reasonable and efficient response. Innovative tracking, forecasting and decision-making support tools will be adapted to the needs of local and regional authorities that will be trained in their application. In addition, the EU has taken various maritime safety actions:

- The European Maritime Safety Agency in Lisbon provides technical assistance and has also been given operational tasks in the field of oil pollution response, vessel monitoring and in long-range identification and tracking of vessels.
- CleanSeaNet is a satellite-based monitoring system for marine oil spill detection and surveillance in European waters.
- SafeSeaNet is a European platform for maritime data exchange
- Long Range Identification and Tracking identifies and tracks EU flagged vessels worldwide and integrates them into the wider international Long Range Identification and Tracking system.
- THETIS is the inspection database on Port State Control.

[81] ARCOPOL: The Atlantic Regions' Coastal Pollution Response, 15th February 2012

Table 7-12 Baseline trends for maritime transportation and safety

Subtheme	Current overall activity	Research trend	Technology trend	Market trend	Other
Maritime transportation and safety	High maritime transport activity, but lower in the Atlantic compared with other European waters. Many EU policy initiatives on maritime safety, however, technologies have to be further developed and implemented.	-	Prevention and remediation technologies	Increased trade and sea borne traffic imposing challenges on maritime safety	-

Assessment

Many of the challenges and opportunities that the Atlantic maritime transportation sector faces are common across the EU. Many of these issues are focal points for ongoing international, national and EU initiatives. However, some aspects are more specific to the Atlantic areas. Below, a list of characteristics and requirements for sustainable and intermodal transport is given.

- Well-regulated and mature, privately driven sector. Trade and logistics are very much driven by economic activity and transport patterns and modes are direct results of operators' drive to serve transport needs and lower cost. Nonetheless, maritime transport is a backbone in the Atlantic economy and adequate policies and framework must be ensured.
- Maritime transportation in the Atlantic area is significant, but ports, amounts of goods handled and the development of intermodal transport is lower than in the North Sea and Mediterranean, which reveals an Atlantic potential for growth, but also indicates the major completion from neighbouring regions.
- Lack of adequate infrastructure in secondary ports is a constraint to further growth[82], as the ports of the Atlantic area are only attractive if they are well equipped and adequately connected to hinterland. The civil society cooperation platform, the Atlantic Transnational Network, highlights this need for an adequate connection to the hinterland through rail networks, river transport and multimodal logistics platforms in its “contribution on maritime transport” and considers it essential to the Atlantic Strategy to support the development of such hinterland infrastructure.
- For short sea shipping to be competitive, the preservation of a larger number of smaller but well equipped ports is essential. Consolidation, optimisation of existing infrastructure and coordination between ports are necessary to target investments.

[82] DG MARE, “Blue Growth – scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Maritime Sub-Function Profile Report. Short Sea Shipping (1.2)” 2012

- There is a need for increased coordination between European and national authorities and regions. The Atlantic strategy should build on existing initiatives, including data management and enforcement of legislation.
- Increased maritime transportation in Atlantic waters involves increased risks, which calls for further initiatives on maritime safety and implementation of existing policies. Atlantic technological competencies needs to be positioned and developed to support a safe development within maritime transportation.

Possible recommendations

The workshops of the Atlantic Forum are essential in providing recommendations that are directly linked to the prevailing reality that Member States face along the Atlantic coast.

Research priorities

- Development of Atlantic platforms (networks, ICT etc.) that optimise infrastructure and promotes modal shift
- Further development of the concept of an Atlantic rail corridor and its link to ports and maritime transport
- Gathering of regional and national strategies, initiatives and experiences with intermodal transport as a basis for a more coordinated, transnational transport policy
- Study of existing technology strengths within maritime safety that can be advanced in the Atlantic area.

Investment/ policy actions

- Continued, strategic investments in maritime infrastructure and optimisation of existing infrastructure.
- Development of short sea shipping including the West Atlantic Motorway of the Sea: closer organisation between Atlantic ports (inter-port services, regional shipping lines, shared facilities) and operators is needed to ensure competitive capacity.
- Take actions to establish an Emission Control Area (ECA) in the Atlantic to deal with sulphur and nitrogen emissions from shipping. Strengthen MS and EU action in IMO negotiations.
- Promote the concept of technology platforms for maritime safety technology.

Suggestions for questions to be used at the workshop

- **What infrastructure investments and reduction of barriers can improve intermodal transportation in the Atlantic? Best practice examples of cooperation between ports and operators?**
- **Can the European Atlantic host high-value niches of maritime transport? For instance, green ports that are certified and set high requirements to the way products are handled and transported and the social and environmental performance of businesses.**
- **Would it be beneficial to initiate Atlantic partnerships and projects between Member States in the area of maritime safety?**
- **How can we use maritime safety as a driver for blue growth and regional development? Provide good examples of Atlantic cutting-edge technology in the area.**

Finally, additional questions might be raised based on the discussions held at the Brest workshop which allowed gaps to be identified:

- **How will the climate changes impact the development of the transport sector?**
- **With which sectors are there spatial conflicts?**
- **How does this sector benefit from the ecosystems that the marine waters provide?**