Study on Deepening Understanding of Potential Blue Growth in the EU Member States on Europe's Atlantic Arc

Sea Basin Report

FWC MARE/2012/06 – SC C1/2013/02

Client: DG Maritime Affairs and Fisheries

Rotterdam/Brussels, 7th March 2014

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Preface

This study on the Blue Growth potential in the Atlantic Arc is one of four sea-basin studies commissioned by DG MARE. The aim of the study is to examine in closer detail the individual development patterns of the maritime industries within the European Union and their prospects for future development. Within the framework of this present study we have evaluated the state of play and growth potential of five countries: France, Ireland, Portugal, Spain and the United Kingdom, bordering the Atlantic Arc. Some of these countries border several sea-basins. For those countries where this is the case this report focuses on the activities that are relevant for the Atlantic se basin. In this sense it deviates from the country fiches which describe maritime economic activities primarily at a country level, although the country reports also include an allocation of activities to sea-basins.

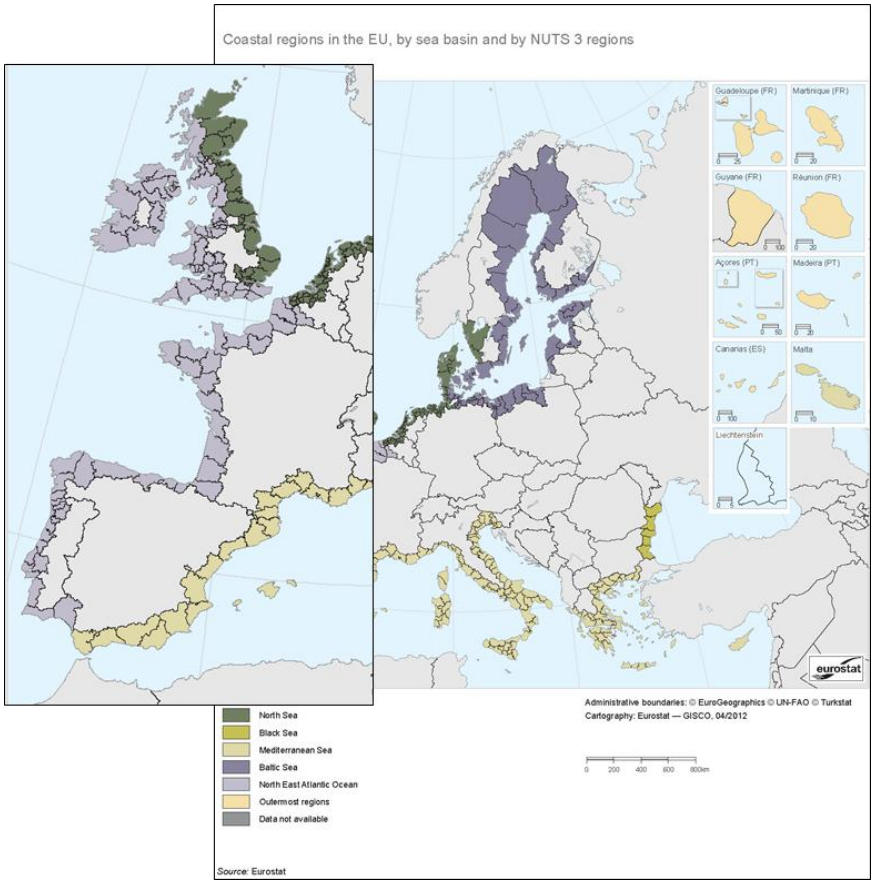
Executive summary

The European Commission has recognized the importance of the maritime sector for achieving Europe's long-term growth and employment targets in its communication *"Blue Growth – opportunities for marine and maritime sustainable growth.*[1]*"* Blue Growth is seen as the maritime pillar of the Horizon 2020 strategy and intends to reap the full potential of maritime economic activities.

Within the overall Blue Growth strategy, the European Commission encourages sea-basin specific strategies aligned with the financial framework 2014 – 2020 as well as the new funding programmes within the EU Common Strategic Framework funds (CSF funds), according to the partnership principle. The need for increased insight in the specific conditions of different sea basin in releasing Blue Growth is important in developing focused strategies. In this respect the Commission has stated Blue growth studies in various sea basins. The current report addresses the Atlantic Arc Sea Basin.

Five countries are bordering the Atlantic Arc: Portugal, Spain, France, Ireland and the United Kingdom. All of them have an extensive coastline and a large share of the population is living in coastal regions. Some of these countries are bordering more than one sea basin.

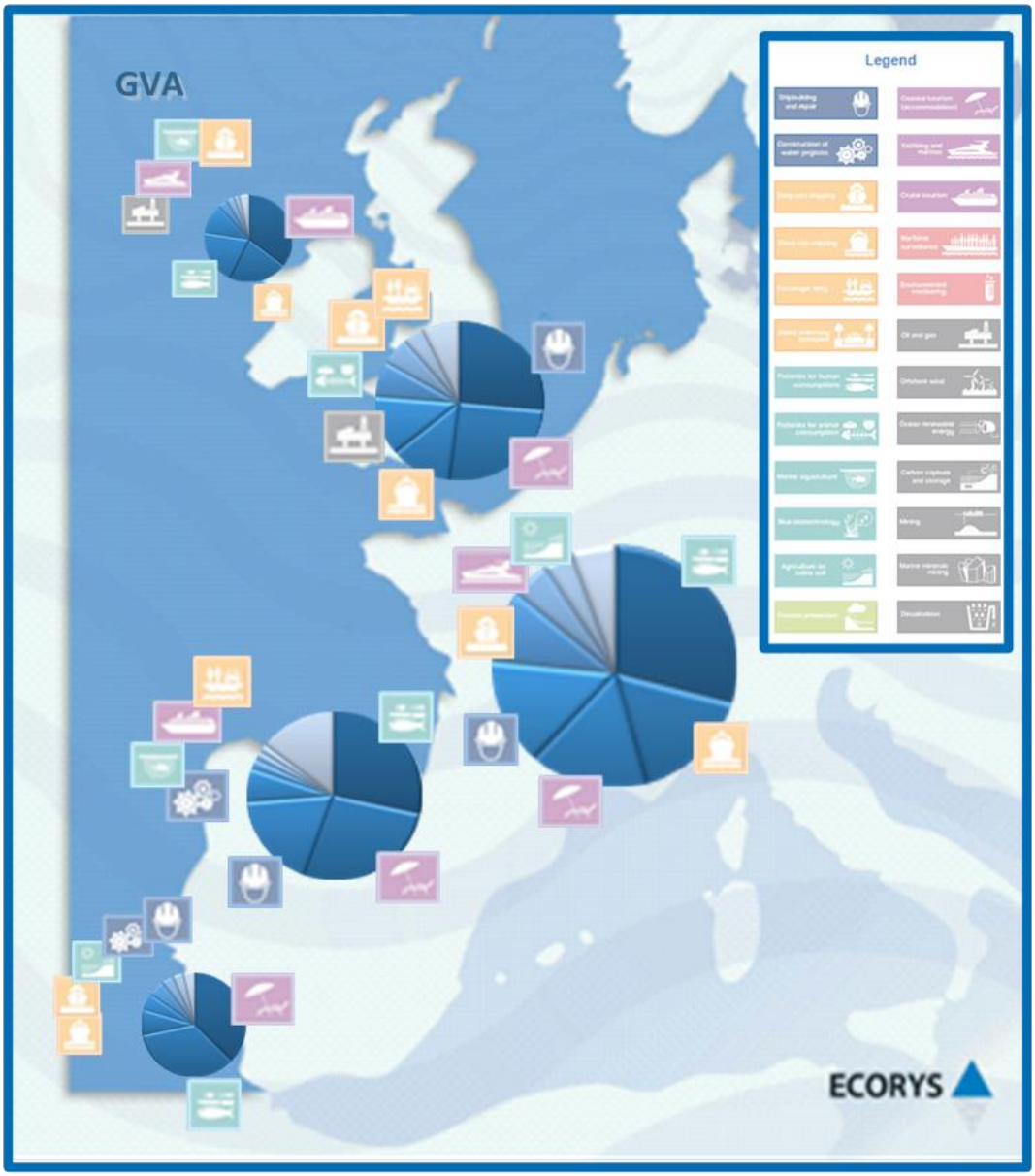
Figure 0.1 The Atlantic Sea Basin



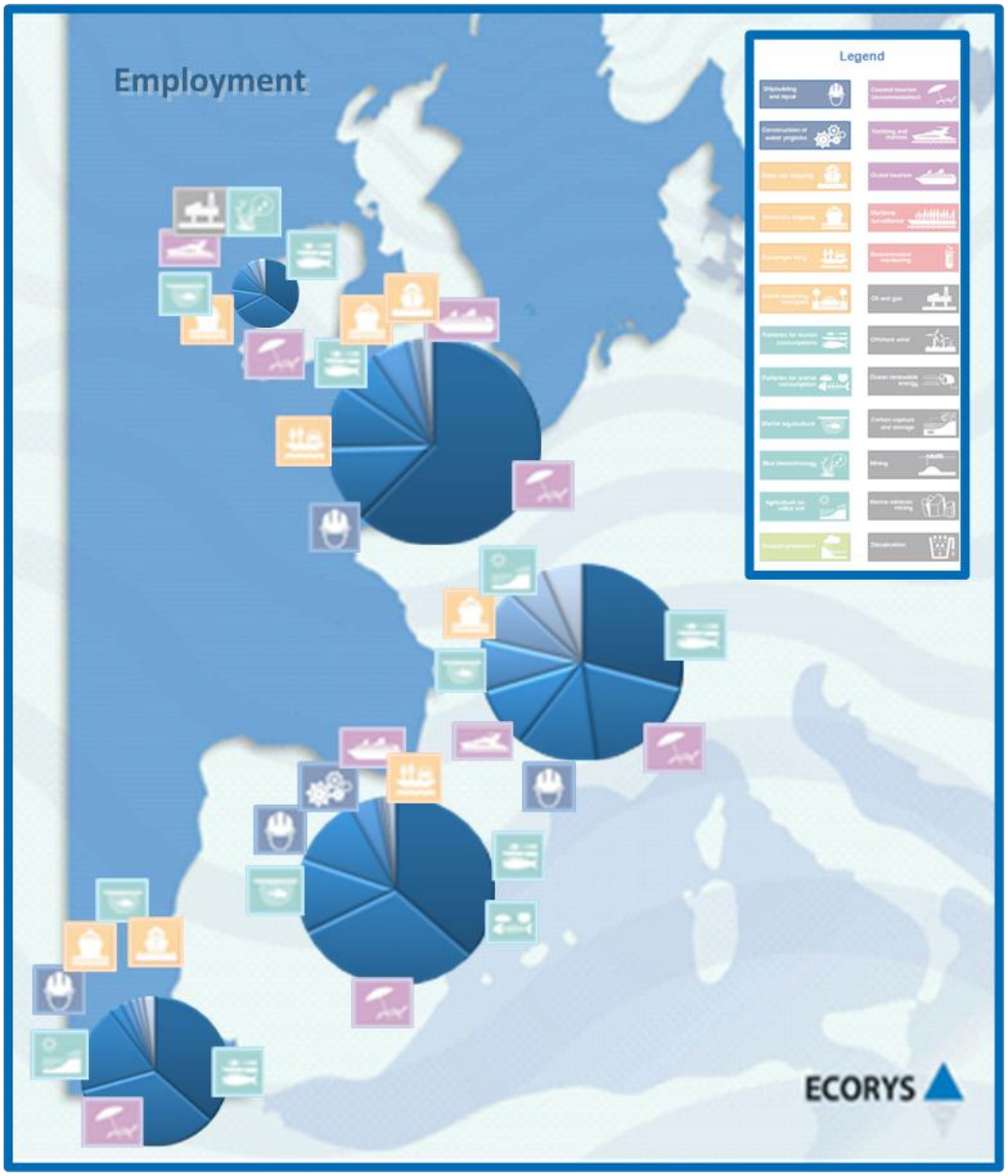
[1] COM (2012) 494 final

To estimate the size of the Blue Economy in the Atlantic Arc, a set of different maritime economic activities has been discerned, building on the six maritime function of the original Blue Growth study[2]. These maritime economic activities (MEAs) follow a value chain approach, combining several economic sector activities, rather than an individual sector approach.

The total size of the Atlantic Blue Economy, including only those activities that can be allocated to the Atlantic Arc (hence excluding maritime economic activities attributed to other sea basins in the country) is at least € 26.8 billion in gross value added (GVA) and accounts for more than 800.000 jobs, excluding maritime economic activities that could not be quantified. If all direct and indirect economic activities would be accounted for the figure would further increase.



[2] Ecorys (2012), Blue Growth. Scenarios and drivers for sustainable growth of oceans, seas and coasts



The activities comprise a mix of economic activities in various stages of development, including both mature activities and activities that are relatively recent but show a fast growth. Also new activities have been identified that are still in their (pre-) development stage but may hold a promise towards the longer term.

Typical mature activities, which represent a large share of the Blue economy in most countries, are coastal & nautical tourism, fishing, shipbuilding. But also activities related to maritime transport and shipping and marine aquaculture are important in the Atlantic Arc. Maritime economic activities have also been assessed on their innovation intensity. Several innovation indicators have been used, although it has been hard to access a fully developed indicator set at the level of maritime economic activities[3]. Based on the available data an indicative listing of the innovation level of a maritime economic activity has been assessed.

[3] Some MEAs could not be covered at all.

Maritime economic activity	Innovation intensity	Maturity of the MEA
Offshore oil & gas	●●●	●●●●●
Blue Biotech	●●●●●	●
Dee Sea Mining	●●●●	●
Ocean Renewable Energy	●●●●●	●
Fishing for human consumption	●●	●●●●
Desalination	●●●●	●●●
Shipbuilding	●●●●	●●●●
Marine Aquaculture	●●●●	●●●
Shipping	●	●●●●●
Environmental monitoring	●●●●●	●●
Tourism	●	●●●●●
Coastal protection	●	●●●●
Maritime surveillance	●	●●●●
Offshore wind	●●●	●●

The importance of the Blue Economy is recognized in the Atlantic Arc. At the EU level policy initiatives have been developed following the adoption of the Integrated Maritime Policy, which reinforced the view that growth and development of European maritime industries would benefit form coordinated and streamlined sea-basin level initiatives. A concrete example of this is the Atlantic Arc Action Plan, which aims to " revitalise the marine and maritime economy in the Atlantic Ocean Area"[4]. In order to ensure integration of EU-level objectives Partnership Agreements submitted by Member States on the use of the Structural, Cohesion or Regional Development Funds will need to highlight linkages between national level objectives and those of the Atlantic Action Plan. Also at the national level and at a regional level various maritime strategies and policies have been developed that promote the development of the Blue Economy.

To further propel the Blue Economy in the Atlantic Arc the specific mix of maritime economic activities in the region, further building on the specific strengths and comparative advantages of the Atlantic. Also the stage of development of individual maritime economic activities should be distinguished, as this would merit different type of support and facilitation. In the study a number of specific maritime economic activities has been further elaborated. Details can be found in the underlying report.

[4] EC (2013): European Commission unveils maritime strategy for the Atlantic, http://europa.eu/rapid/press-release_IP-13-420_en.htm

1 Purpose of this report

1.1 Introduction

1.1.1 Blue Growth

The 2012 "Blue Growth Study" on the scenarios and drivers for sustainable growth from the oceans, seas and coasts[5] provided a comprehensive overview of the blue economy in Europe.

Using a value chain approach, the study identified the components of the maritime economy and provided a detailed analysis of maritime economic activities and their contribution to economic growth and job creation within Europe 2020 agenda. Grouping maritime economic activities into the main stages of economic development (mature, growth- and pre-development stage), the study analysed for each maritime economic activity specific characteristics. The study acknowledged that a large part of the economic activities takes place not only in key sectors (e.g. oil and gas, shipping) but also in adjacent economic activities located on the up-, and downstream activities (e.g. reservation services, sea ground exploration and). In the Blue Growth study a case-study on the Irish maritime cluster,[6] was instrumental in identifying the local and regional level synergies and potential tensions between maritime stakeholders on the ground. Besides, it provided insights into some of industries that are specific to the sea-basin due to the physical characteristics.

The importance of the maritime sector for achieving Europe's long-term growth and employment targets has been invigorated by launching the communication *"Blue Growth – opportunities for marine and maritime sustainable growth." COM (2012) 494 final*, stating that the marine and maritime industries in Europe provide employment for 5.4 million people and contribute a total gross value added of € 488 billion. By 2020, these numbers are expected to increase to € 7 million and nearly € 600 billion respectively.[7] Overall, maritime economic activities are seen as a powerful driver to contribute to the EU's international competitiveness, resource efficiency and job creation. It ensures economic growth whilst safeguarding biodiversity and protecting the marine environment, which are vital elements of retaining healthy and resilient marine and coastal ecosystems. In terms of their employment impact and potential for research and development to deliver technology improvements and innovation, offshore wind, wave and tidal energy, marine aquaculture and coastal tourism as well as marine minerals and blue biotechnology[8] have been showcased as particularly relevant for further policy action.[9]

By means of the Communication, the European Commission has the blue economy placed firmly on the agenda of Members States, regions, enterprises and civil society to encourage dialogue and

[5] Ecorys, Deltares, Oceanique Developpement, 2012: Blue Growth – Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Final Report. 13th August 2013. P. 91 ff. Available here: https://webgate.ec.europa.eu/maritimeforum/system/files/Blue%20Growth%20Final%20Report%2013082012.pdf

[6] See Annex 5, Cluster Reports. Attached to: Ecorys, Deltares, Oceanique Developpement, 2012: Blue Growth – Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Final Report. 13th August 2013. P. 91 ff. Available here: https://webgate.ec.europa.eu/maritimeforum/content/2946

[7] European Commission, 2012 Press Release: Blue Growth: Commission presents prospects for sustainable growth from marine and maritime sectors. Available at http://www.eesc.europa.eu/?i=portal.en.ten-opinions.25393

[8] European Commission, 2012: Blue Growth – opportunities for marine and maritime sustainable growth. COM (2012) 494 final. P. 6-12.

[9] These sectors were repeated also in the later "Limassol Declaration" within the Cypriot EU Presidency publication: Declaration of the European Ministers responsible for the Integrated Maritime Policy and the European Commission, on a Marine and Maritime Agenda for growth and jobs – "The Limassol Declaration". See also here: http://ec.europa.eu/maritimeaffairs/policy/documents/limassol_en.pdf

joint action.[10] Within that context, the European Commission also encourages sea-basin specific strategies aligned with the financial framework 2014 – 2020 as well as the new funding programmes within the EU Common Strategic Framework funds (CSF funds), according to the partnership principle. This is seen as a means to joining forces, identifying common actions and issues in order to pool resources in a more efficient and outcome-oriented approach.

The need for more indicators and baseline conditions, e.g. the state of RDI, availability of skilled labour, training, education etc. for the future development of the Blue Growth sector were highlighted.[11] Moreover, the opinion points out that the economic crisis is making it more difficult to address short- and long-term challenges at European and global level especially when it comes to the future development of SMEs in the sector. Therefore, it is important to assess the current state of the maritime economic activities and provide a more refined assessment of its resiliency towards the on-going crisis, and moreover, its capacity to contribute to the Europe 2020 strategy.

1.1.2 The role of a sea-basin specific approach to rolling out Blue Growth

On a political level, the importance of sea–basins and their role in linking to third countries has recently been highlighted in the 2012 "Limassol declaration"[12] under the auspices of the Cyprus Presidency of the Council of the European Union. The declaration acknowledged the role of sea-basins as trade gateways from and into the Internal Market. Besides, it emphasises the importance of dialogue and exchange of best practices on maritime affairs at regional and international level. Highlighting certain maritime economic activities for which maritime policies can play a particular facilitating role, the Limassol – declaration calls for a European Marine and Maritime agenda to foster their development across all EU sea-basins.

Via its Communication on *"Developing a Maritime Strategy for the Atlantic Area Ocean"*,[13] it fostered the on-going debate on how to harness the resources provided in the Atlantic in line with the overarching policy framework at EU level. In view of the Europe 2020 strategy and the objective of increasing economic growth and employment, the policy document suggests areas of particular attention for maritime stakeholders in the Atlantic Arc.

An ecosystem approach - the Marine Strategy Framework Directive provides references to enhanced coherence amongst various maritime activities.[14] It acknowledges the efforts undertaken to close fishing areas for bottom trawling and the contribution to enhancing a long-term sustainability of deep sea fish stock and for the preservation of vulnerable marine ecosystems. Aquaculture can play an important role here in providing healthy and sustainable fish production. Maritime observation techniques will help predicting future changes in Europe's climate and understand the drivers of change in terrestrial and marine ecosystems.[15] Spatial planning and coastal zone management will play a vital tool to overcome the shortage of space on the Atlantic seaboard. This currently limits expansion in terms of maritime economic activities in the Atlantic Arc. Sharing of space and exploiting synergies with other maritime activities will remain a vital issue.

[10] European Commission, 2012: Blue Growth – opportunities for marine and maritime sustainable growth. COM (2012) 494 final. P. 3.
[11] European Economic and Social Committee, 2013: OPINION of the European Economic and Social Committee on the COM (2012) 494 final. TEN/499. Brussels, 20th March 2103.
[12] Declaration of the European Ministers responsible for the Integrated Maritime Policy and the European Commission, on a Marine and Maritime Agenda for growth and jobs "The Limassol Declaration" 7th October 2012. Available here: http://ec.europa.eu/maritimeaffairs/policy/documents/limassol_en.pdf
[13] European Union, 2011: Developing a Maritime Strategy for the Atlantic Ocean Area. COM (2011) 782 final.
[14] As stated in the Common Fisheries Policy (recital 8 and Article 2(4) and Marine Strategy Framework Directive (recitals 39 and 40). Adapted from European Union, 2012: Developing a Maritime Strategy for the Atlantic Ocean Area. COM (2011) 782 final. P. 2.
[15] European Union, 2011: Developing a Maritime Strategy for the Atlantic Ocean Area. COM (2011) 782 final.

The contribution of the Atlantic Member States in *reducing Europe's carbon footprint.* The potential of the Atlantic Arc in terms of offshore wind capacity will contribute to decreasing dependency on distant fossil fuels. Similarly, more efforts will need to be put in exploiting ocean renewable energy sources from the Atlantic. More restrictive emission targets may influence the routing of Atlantic shipping. The EU "motorways of the sea" programme contributes through existing routes between Bilbao and Zeebrugge to better connect waterborne transport with the overall transport network. Further EU actions support the increase in efficiency and volume of short-sea shipping.[16]

A more *sustainable exploitation of the Atlantic seafloor's resources* should be generated through marine research institutes active in understanding the biodiversity for Food, Nutrition, health and ecosystem services. Joint action amongst the Member States bordering the Atlantic is also undertaken within the FP7 research programmes.[17] Further action facilitating research collaboration is provided through the EU's marine knowledge 2020 initiative that provides harmonised marine data.

To *ensure long-term growth in employment*, communities in the Atlantic Arc will need to cope with the decline in traditional industries, e.g. fisheries and shipbuilding and a decline in mass tourism.[18] The policy document suggests a few actions at EU and EU Member State level:

- A closer interface between regional clusters of maritime industries and educational establishments are seen as a way out, since local and regional agglomerations of companies and education institutes ensure a skilled workforce and to promote greater labour mobility within sectors. At EU level, territorial cooperation projects in line with the Operational programmes currently developed for the new ERDF programming period (2104 – 2020) aim at supporting these.
- Tourism can contribute to regenerating some coastal areas provided that it succeeds to attract all-year round trade in order to provide a real impact on employment
- Fostering nautical activities can provide an important source of revenue and high-value employment. It will be crucial to overcome the deficits in berths, notably for large recreational vessels
- Explore opportunities to fuel the growth of the cruise industry

To fuel the debate leading to define the Atlantic Action Plan, the European Commission set-up the Atlantic Forum, which consisted of a series of five workshops organised in 2012 and 2013. It aimed at an open dialogue of maritime stakeholders on barriers to cooperation across various EU Member States in the Atlantic Arc, an exchange on potential areas for joint cooperation, as well as highlighting good practice cases of Blue Growth at regional and local level. It aimed at gathering momentum by building a community of interest of stakeholders in Member States, regional and civil society representatives, the marine research community and emerging, growth-stage and mature industries.[19]

[16] Implementation of the European Maritime Transport Space without Barriers and the "Blue Belt" pilot project aiming at reducing administrative burden for intra-EU cargo traffic.
[17] SEAS-era: Towards Integrated Marine Research Strategy and Programmes. FP7 coordination action. http://www.seas-era.eu
[18] European Union, 2011: Developing a Maritime Strategy for the Atlantic Ocean Area. COM (2011) 782 final. P. 7.
[19] See also: European Union, 2011: Developing a Maritime Strategy for the Atlantic Ocean Area. COM (2011) 782 final. P. 10. The Atlantic Forum took place in the following cities: Horta (PT), Brest (FR), Bilbao (ES), Cardiff (UK), Cork (IE). More information: http://ec.europa.eu/maritimeaffairs/policy/sea_basins/atlantic_ocean/atlanticforum/

1.2 Purpose of the study

The call for increased cooperation at sea basin level will ultimately also provide a need for a better understanding of the maritime economic activities, their weight and contribution to the overall EU policy goals but equally so to regional and macro-regional strategies, e.g. the Atlantic action plan. The study should be seen as part of this initiative. Hence, the overall objective of conducting this study, as identified by the Tender Specification, is to

> *"…provide a detailed breakdown of the current state of the marine and maritime sectors that make up the blue economy in each of the five EU Member States on Europe's Atlantic facade…"*

Ultimately, this aims to deepen and broaden our understanding of potential for Blue Growth in the EU Member States located in the Atlantic Arc.

The study builds on the results of the Blue Growth study which provided a picture of the blue economy at EU level as well as sketches for the development of eleven maritime economic activities in Member States adjacent to the Atlantic Arc.

To ensure reproducibility and consistency of the data used to describe the maritime economic activities, the study is aligned in terms of methodology and approach with similar studies for other sea basins, notably the North Sea and English Channel, the Baltic Sea, as well as the Mediterranean Sea.[20] [21] Besides, the study aims at providing a clear picture, both in qualitative and quantitative terms of what is included in the blue economy. The definitions used for the maritime economic activities should be fully aligned with other sea basin studies.

In line with the Atlantic Action Plan and previous policy blueprints at EU level, we understand the specific objectives of the study are as follows:

- Mapping of maritime economic activities in the Member States of the Atlantic Arc: Provide a more in-depth analysis of the maritime economic activities at country specific level, hence producing five country papers (UK, IE, ES, PT, FR) that follow a consistent approach to generating data for GVA and employment. In particular, the country papers, aim at:
  - describing the GVA and employment contribution for each of the maritime economic activities;
  - providing a regional breakdown of the maritime economic activities, to allow for sea basin splits of the maritime economy;
  - providing an overview of maritime clusters per country, showcasing two clusters more in-depth;
  - summarise the maritime strategies existing at regional and national levels in the Member States of the Atlantic Arc;
- Mapping maritime economic activities at sea basin level:
  - identifying and rank the 7 largest and 7 fastest growing maritime economic activities in each Member State;

[20] Please see also the Methodology Annex I which summarises the approach to the quantification of maritime economic activities.

[21] As agreed in the meeting of 23 April 2013 between DG MARE, COGEA, and ECORYS, COGEA will take care of "Maritime transport and shipbuilding", "Food, nutrition, and eco-system services", and "Maritime monitoring and surveillance", while ECORYS will take care of "Energy and raw materials", "Leisure, working and living", and "Coastal Protection". EU Member States with multiple sea-basins will be allocated to one particular study, e.g. ES, FR, UK to Atlantic Arc, DE and NO to North Sea and English Channel.

- identifying promising maritime economic activities, that score high on innovation criteria in each Member State;
- Identifying the 6 most relevant maritime economic activities at sea basin level;

- Analysing growth drivers and barriers of the most relevant maritime economic activities:
  - Providing sector reviews of the six most relevant maritime economic activities, by focussing on a sea basin perspective on workforce and hiring characteristics, administrative burdens, restrictive practices and sources of finance;
- Providing reproducible blue economy tables (spreadsheets) that can serve for any future use and can be updated, once further data is available;
- Provide the method for calculating clear and reproducible indicators on the performance of the maritime economic activities;
- Providing an analysis on potential measures that the EU could take to stimulate growth, both in terms of financial and legislative measures, including good practice cases that have potential to be transferred.

1.3 Purpose and structure of this Report

This report aims to summarise the main findings of the maritime economy, the specific maritime economic activities as well as regional agglomerations (clusters) and maritime policies. In particular, the report aims at aggregating the findings from the country analysis into a sea basin view. This sea-basin synthesis is described in part A of the report.

In addition the report provides a further in-depth analysis of six maritime economic activities that have been selected[22] as being highly relevant for the Atlantic Arc. This is taken forward under part B of the report.

Part A: Sea basin synthesis

With regards to the sea basin synthesis (part A), the report provides

- A synthesis of the country papers in terms of geographic delineation and socio-economic characteristics (chapter 2);
- An overview of the methodology for the analysis of the maritime economic activities and results of this analysis (chapter 3, sections 3.1 and 3.2 and Annex I)
- The indirect contribution of the maritime economy to GVA and employment in the EU (section 3.2 and Annex III);
- A qualitative description of the maritime economic activities in the Atlantic Arc (section 3.3);
- Geographic location of maritime economic activities and maritime clusters (3.4.);
- Ranking of the maritime economic activities in the Atlantic Arc in terms of both qualitative and quantitative criteria, including an innovation level (section 3.5.);
- Main maritime policies at sea basin level (3.5.).

Part B: In-depth sector analysis

Regarding the sector analysis (part B), the report features an analysis of the drivers and barriers of growth to fully unleash the potential for Blue Growth for the six selected maritime economic activities. These include:

- Shipbuilding;
- Ocean energy;

[22] As agreed with DG MARE and the representatives of the EU Member States during the meeting on 12th September 2013.

- Fisheries;
- Aquaculture;
- Short sea shipping;
- Yachting and marinas.

In particular, the sea basin sector reviews include:

- the identification to what extent the following factors are drivers or bottlenecks for growth of the sector; *workforce-, hiring characteristics, administrative burdens, restrictive practices, sources of finance and on-going research;*
- an assessment which measures at EU and national level have been developed to support the drivers and limit the bottlenecks identified;
- the identification of previous best practice examples of countries and sectors with regards to fostering or impeding on the development of the blue economy will be analysed.

Part A: Sea Basin synthesis report

This part of the report synthesizes and summarizes the finding from the country reports from a sea-basin perspective. In deviation to the country reports (included in the annexes) this report focuses on the activities that are relevant and located in coastal regions that border the Atlantic Arc, rather than sketching the overall picture for the country. Activities that are relevant to other sea-basins (Mediterranean, North Sea) are incorporated in those sea-basin reports.

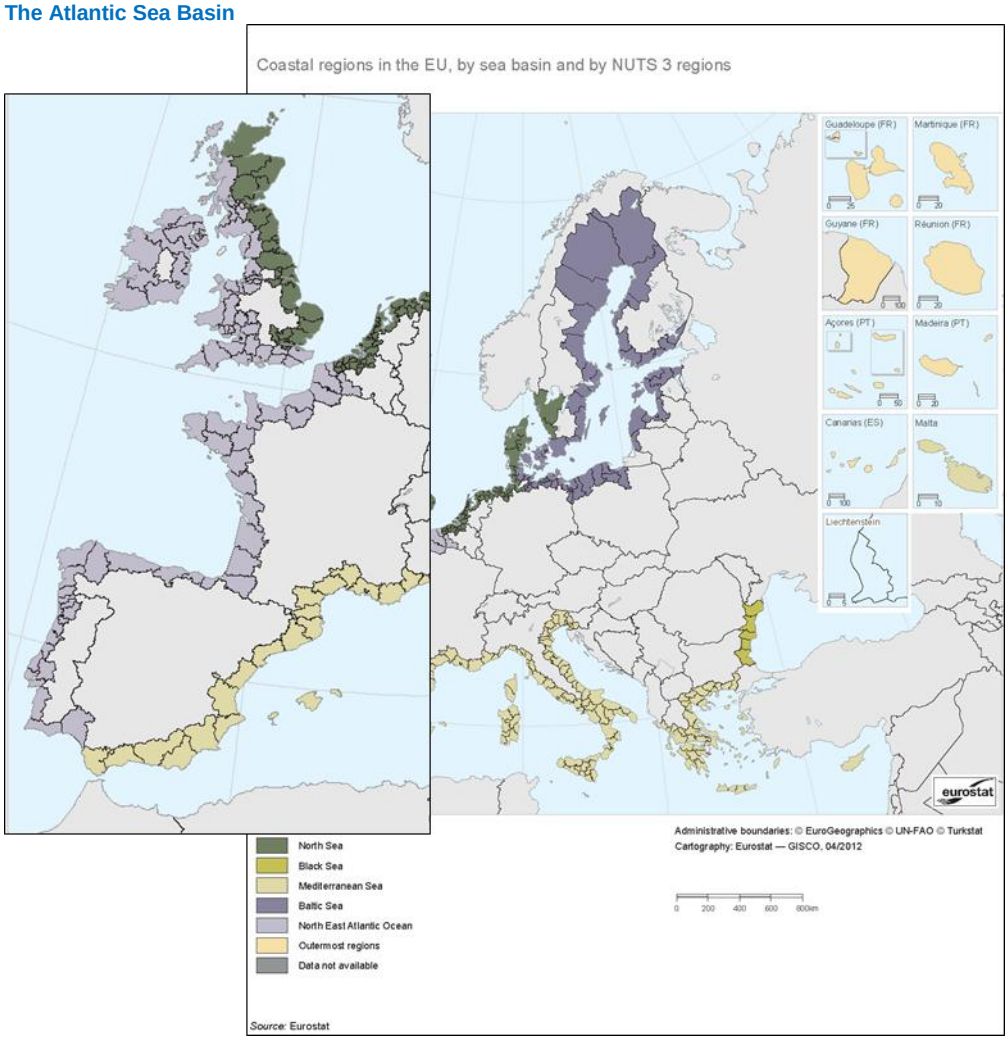
2 The Atlantic Arc – an introduction

This chapter sets the scene and aims to give the reader a contextual overview of countries bordering the Atlantic Arc. As such, it provides a geographical delineation of the countries and regions adjacent to the Atlantic Arc. In doing so, it briefs the reader on the main socio-economic characteristics of the maritime economies in that countries, without prejudice to maritime economic activities only.

2.1 Geographic delineation

Five countries are bordering the Atlantic Arc: Portugal, Spain, France, Ireland and the United Kingdom.

Figure 2.1 The Atlantic Sea Basin



The maritime economy is an important factor in all countries bordering the Atlantic Arc. All of them have extensive coastlines and a large share of the population is living in coastal regions. The below overview indicates the coastal regions that are bordering the Atlantic Arc.[23]

EU Member State	NUTS 1	NUTS 2
France	Bassin Parisien	Haute Normandie
		Basse Normandie
		Picardie
	Ouest	Pays de la Loire
		Bretagne
		Poitou-Charentes
	Sud-Ouest	Aquitaine
Ireland	Republic of Ireland	Border, Midland and Western
		Southern and Eastern Region
Spain	Noroeste	Galicia
		Asturias
		Cantabria
	Noreste	Basque Community
	Canarias	Canary Islands[24]
Portugal	Continental Portugal (except for Açores and Madeira) [25]	Norte
		Algarve
		Centro
		Lisboa
		Alentejo
	Acores and Madeira[26]	Região Autónoma dos Açores
		Região Autónoma da Madeira
UK	North West England	Cumbria
		Cheshire
	North West England South West England[27]	Lancashire
		Merseyside
		Gloucestershire, Wiltshire and Bristol/Bath
		Dorset and Somerset
	South West England[28] Scotland	Cornwall and Isles of Scilly
		Devon
		South Western Scotland
		Highlands and Islands
	Wales	West Wales and the Valleys
		East Wales
	Northern Ireland	Northern Ireland

Source: Ecorys

2.2 Atlantic Arc: EU Member States

In the following text a brief overview is given of each of the countries bordering the Atlantic Arc.

[23] By coastal region, we mean statistical regions defined at NUTS level with a coastline or with more than half of their population living less than 50 km from the sea.Please note: this definition is based on Eurostat Coastal Regions statistics. Available here: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Coastal_region_statistics For the purpose of this report, we have used NUTS 2 level as the level to define coastal regoins.

[24] The Canary Islands (NUTS 2) will be assessed separately from the other NUTS 2 regions in Spain, due to the specific nature of the maritime economic activities and indicators.

[25] Formally not a NUTS 1 classification. Figures refer back to the NUTS 1 figure for Portugal minus the figures for Acores and Madeira.

[26] This is formally not a NUTS 1 classification but is done to distinguish the island regions from the continent of Portugal. It needs to be build up from two NUTS 2 regions.

[27] For the NUTS 2 level regions Dorset and Somerset, Cornwall and Isles of Scilly as well as Devon, we will use a workable split according to the sea-basin (of 50/50 split in both sea-basins, unless a clear rationale can be provided for a different allocation, e.g. a large port on one of the sea-basins etc.).

[28] For the NUTS 2 level regions Dorset and Somerset, Cornwall and Isles of Scilly as well as Devon, we will use a workable split according to the sea-basin (of 50/50 split in both sea-basins, unless a clear rationale can be provided for a different allocation, e.g. a large port on one of the sea-basins etc.).

Portugal

The coastline of Portugal measures approximately 2587 km, including the continental territory (1242 km) and the archipelagos of Açores (943 km) and Madeira (402 km)[29]. In total, this represents 2.7% of the total EU coastline. Besides, the country has one of the largest Economic Exclusive Zone (EEZ) in Europe covering more than 1.7 million km^2 (equal to more than 18 times the country's territorial space). Its coastal population living at 10km from the sea amounts to 4.9 million which represent 49.2% of total population[30].

Portugal is undergoing a period of fiscal adjustments. In 2012, the GDP amounted to € 165 bn which represents a decrease of 3.2%, as compared to 2011[31]. In the first quarter of 2013 GDP further decreased with 3.9% in real terms (in comparison to the same quarter in the previous year). The unemployment rate stood at 17.7%[32]. The country has a population of 10.5 million inhabitants

An important sector in Portugal is fisheries, representing slightly less than 2% of the country's GDP in 2012[33]. In 2011, industrial production of fishery and aquaculture dropped by 2.2%[34]. This was seen as a result of the structural adjustment of the economy produced by technological improvements in the first sector, and the subsequent diversification of the economic activity towards the industry and service sectors. Within the fisheries sector aquaculture has shown an increase and is now contributing around 5% of the total fish production[35]. In 2011, 13,156 individuals worked in the fishing sector, representing 0.3% of the total employed population[36].

In the maritime economy tourism is another important sector showing an increase of GVA and employment contribution in coastal and nautical tourism, including yachting and marinas and cruise tourism, despite the economic crisis. Tourism is gaining an important weight in the economy and is currently representing 8.8% of the national GDP[37]. The country is widely known as a sun and beach destination within Europe counting with a wide accommodation and restoration infrastructure. Major touristic destinations are Algarve, Madeira and Lisbon.

In addition, positive prospects have been reported for renewable energies, including off-shore projects. Also cargo transport activity in the main ports has reported an increase during the economic crisis (2009 – 2011).

Spain

Spain has a total of 7 876 km[38] of seas and oceans[39] bordering the Iberian peninsula and the Canary and Balearic Islands[40]. This equals 12.1% of the European coastline[41]. The Economic

[29] Anuário Estatístico de Portugal 2012, Cap. I, Cuadro I.1.2
[30] Landscan. Coastal population living at 20km from sea is 6,000,000m which is 60.5% of the total population.
[31] Statistics Portugal (INE), 2011,Website Data, Table A.1.1. Gross domestic product at market prices (annual) and Table A.1.1.8 - Gross domestic product at market prices (volume change rate; annual). Please note that the figure on GDP is a prelimary data calculation realised by Statistics Potugal (INE).Further information provided in Flash sheet "Destaque" of 11th of March 2013 set the GDP for 2012 in € 165.4 bn.
[32] Statistics Portugal (INE)Portugal, 2013, Boletim mensal de Estadística. Setembro 2013.
[33] Statistics Portugal (INE), 2012, Fishery Statistics 2012 and Website Data.Tables 1.1.1. and Please note that value for Agriculture and fishing GDP is a preliminary data calculation realised by the Statistics Portugal (INE). Figures include fishing and agriculture economic activities.
[34] Fishing Statistics, 2012. Statistics Portugal (INE).
[35] Fishery Survey, 2012, Statistics Portugal (INE)
[36] Fishery Survey, 2012, Statistics Portugal (INE)
[37] Yearbook of tourism statistics, 2009, Turismo do Portugal.
[38] The World Resources Institute data, spanish coastline is 8000km ,using and 50km interval scale.
[39] Statistical National Office, Spain. Data : 2008. Alternative data from the 2012 Annual Report of the Ministry of Agriculture, Food and Environment states that the Spanish coastline is of 10,250 km2, measured according to the procedure described by the Spanish Coastal Law. This difference could be attributed to the fact that the Spanish Coastal law determines the coast borderline and delivers cartography drawing of mentioned line at scale 1:1000.
http://www.magrama.gob.es/es/ministerio/servicios/publicaciones/10-II-F-Costas_y_medio_marino_tcm7-286714.pdf - page 639
[40] However, this figures will have to be treated with caution due to the coastline paradox. It states that "….a coastline does not have a well-defined length. Measurements of the length of a coastline behave like a fractal, being different at different scale intervals (distance between points on the coastline at which measurements are taken). The smaller the scale interval (meaning

Exclusive Zone (EEZ) covers 552,000 km^2 for the continental mainland and 455,000 km^2 for the Canary Islands[42]. Its coastal population living at 10 km from sea amounts to 13 000 000 which represents 33.2% of total population[43]. Spain borders two sea-basins: the Mediterranean and the Atlantic.

Also Spain has been heavily affected by the economic crisis, that marked a period of serious economic decline, reversing the economic expansion that was observed in the preceding period. In the first semester of 2013, an economic downturn of - 0.5% GDP was recorded (total GDP value of € 255 bn)[44]. Fiscal adjustments policies and the bank system restructuring process have had important consequences on the national demand, counterbalanced by a sluggish increase in exports. At present, Spain's Structural Reform and Economic Policy Programme focusses on tackling the (youth) unemployment, and increase of productivity, flexibility and competitiveness.

Overall, the population amounted to 46.7 million[45] has steadily decreased since the beginning of the economic crisis mainly due to the tight pressures on the labour market forcing the exodus of emigrants and the return of immigrants. The unemployment rate amounted to 27.2%.[46].

In 2011, around 1% of GDP in Spain stems from fishery activities, representing a GVA of € 2 bn. Compared to 2010, this presents a 9% increase. Aquaculture formed some 30% of these fishery activities. In addition, other sea related activities are reporting positive trends, such as maritime transport and the coastal tourism. Maritime transport and port activities represent for Spain around 1.1% of GDP[47]. Also the tourism sector, notably on the Mediterranean coast is an important sources of income for the country. The total number of nights spent by both residents and non-residents in Spain during 2012 was 382 million, of which 79% were spent in coastal regions[48]. Maritime passenger transport has gained in significance for the Spanish economy, in part explained by the increasing relevance of cruises in this market area creating a total turnover of € 1 255 million in 2012[49]. The shipbuilding industry is one of the maritime activities in Spain with a long tradition. During the period 2008-2011, the annual turnover amounted to € 3 billion.[50] The sector is in heavy competition with Asian countries and the order portfolio has shown a decrease.

France

France has 8 411 km of coastline[51]. When the overseas territories are included its exclusive economic zone extends 11 m square kilometres, 400 000 square kilometres of which is continental shelf (3.6%)[52]. Thanks to its overseas departments and territories, France has the second largest Exclusive Economic Zone in the world[53]. The country is linked to three sea-basins: Nord Pas-de-Calais is allocated to the North Sea/English Channel, whereas the regions Bassin Parisien, Ouest and Sud-Ouest are located on the Atlantic Sea Basin coast. As for the region Mediterannée, it is

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the more detailed the measurement), the longer the coastline will be.[Note 1] This 'magnifying' effect is greater for convoluted coastlines than for relatively smooth ones." See also: http://en.wikipedia.org/wiki/List_of_countries_by_length_of_coastline

[41] European Union coastline is around 66.000 Km.

[42] Sea Around Us Project, The Pew Institute. www.searoundus.org

[43] Landscan. Coastal population living at 20km from sea is 16,100,000m which is 41.1% of the total population.

[44] Statistical National Office, Spain. Data: 1st quarter 2013.

[45] Counted on 1st January 2013.

[46] Statistical National Office, Spain.

[47] Puertos del Estado.

[48] Eurostat.

[49] Informe anual de contribución económica 2013. Puertos del Estado.

[50] ICEX.2001. España Sector de Construcción Naval.

[51] Coastline length and people living in coastal regions source: European Commission, DG Fisheries and Maritime Affairs, 'Studies aiming at improving national maritime and coastal statistics', Sogeti, Eurostat, 2008: Description of the coastal and sea areas in the European Union. Chapter 2. P. 98. In this study, the coastline length (km) is calculated from the Corine land cover database. Figures may vary from national statistics owing to the inclusion or exclusion of coastal features, such as estuaries, islands and spits. Sogeti study available here: https://webgate.ec.europa.eu/maritimeforum/content/498

[52] Le Cluster Maritime Français, 2009-2010, French Maritime Industries, p. 2. More information available here: http://www.cluster-maritime.fr/pdf/Brochure_CMF_EN_2009.pdf

[53] Le Cluster Maritime Français. http://www.cluster-maritime.fr/article.php?id=17&lang=Fr

allocated to the Mediterreanean sea basin. Within these larger regions (NUTS-1), smaller sub-regions (NUTS-2) can be discerned which correspond to the French administrative regions.[54] Finally, French administrative departments (*départements français*) correspond to NUTS 3 regions. Of its total population 11.8%, i.e. 7.5 m people, are living within 10 km from the sea.[55]

France scored as the world's 5th and Europe's 2nd largest national economy by GDP (2010). GDP per capita is €26 000. France's economy entered a recession in the late 2000s and since then annual GDP growth has fluctuated considerably: -0.1% in 2009, -3.1% in 2009 and 1.7% in 2010. The unemployment rate increased from 7.4% in 2008 and has remained above 9% per year since then.

Major economic activities are related to the proximity of the water, including fishing, shipbuilding, coastal tourism and port or shipping activities.

Ireland

Ireland is a truly maritime nation with jurisdiction over a seabed territory of almost 900,000 km^2 and a coastline of 7,500 km.[56] When taking the former into account, Ireland is one of the largest EU states with sovereign or exclusive rights over one of the largest sea to land ratios (10:1) in the EU, having 90,000 km^2 of land resource.[57] The coastal population living at 10km from sea amounts to 1.9 million which represents 52.8% of total population[58].

Ireland's economy recorded a second consecutive year of GDP growth of 0.9% in the first half of 2013. Despite the future economic outlook remaining uncertain and with some worrying signs for the Irish economy, the overall forecast remain positive with a growth rate of 1% in 2013 and increasing to 3% in 2015. Unemployment has continued to decline since the peak at the start of 2012 (15%) a trend that is to continue, while employment has started to also increase in the second half[59] of 2012 and is expected to continue to show signs of recovery in 2013 (growth of 0.2%). The continued net emigration that has started in mid 2009 is expected to continue, thus decreasing the pressures on the domestic labour market.

The main ports in Ireland are located in: Dublin, Howth (near Dublin), Drogheda, Rosslare, Waterford, Cork, Baltimore, Shannon Foynes and Galway.[60] This also reflects the main employment locations in the Irish ocean economy. The sector is dominated by marine tourism and

[54] The regions in the overseas territories are excluded from this study.

[55] LandScan™ Global Population Database, 2006. % share of coastal population based on 2006 data. To calculate the total number of coastal population, we assume that the share of inhabitants living within 10 km from the coast remained equal from 2006 to 2012 and apply the 2006 % share to the 2012 population data of 63,556,191 (France metropolitan, 2012 figures, based on Eurostat).

[56] OUR OCEAN WEALTH, 2011, Towards an Integrated Marine Plan for Ireland Seeking Your Views on New Ways; New Approaches; New Thinking. Introduction. P. 7. Available here: http://www.ouroceanwealth.ie/SiteCollectionDocuments/FINAL%20CONSULTATION%20DOCUMENT%20Our%20Ocean%20Wealth.pdf

[57] Marine Institute, Ireland, 2011: OUR OCEAN WEALTH: Towards an Integrated Marine Plan for Ireland Seeking Your Views on New Ways; New Approaches; New Thinking. P. 7. Available here: http://www.ouroceanwealth.ie/SiteCollectionDocuments/FINAL%20CONSULTATION%20DOCUMENT%20Our%20Ocean%20Wealth.pdf

[58] Landscan Coastal population living at 20km from sea is 2,420,000m which is 67.2% of the total population.

[59] Employment figures recover more slowly than unemployment figures.

[60] Please note: this listing of main ports in Ireland includes both shipping ports and fishery harbours. In: Marine Institute, Ireland, 2011: OUR OCEAN WEALTH: Towards an Integrated Marine Plan for Ireland Seeking Your Views on New Ways; New Approaches; New Thinking. P. 12. Available here: http://www.ouroceanwealth.ie/Briefing%20Documents/Our%20Ocean%20Wealth%20Briefing%20Documents%20for%20Consultation%20Part%20II%20Sectoral%20Briefs.pdf.

maritime transport[61]. Together they account for 54% of the sector's direct GVA. They are followed by: oil & gas, marine manufacturing and fishing as the five major sub sectors in the maritime economy[62].

United Kingdom

The coastline of the United Kingdom is around 17 820 km (mainland only) or 31 368 km (mainland and principal islands). The Eastern seaboard faces the North Sea and the Western and South Western seaboard the Atlantic Arc. On the Eastern seaboard, the principal conurbations are Edinburgh in Scotland, and in England: Newcastle and London. There are major ports from north to south at Forth, Tees and Hartlepool, Grimsby & Immingham, Felixtowe, London, Medway and Dover. On the Western seaboard, the principal conurbations are Glasgow in Scotland, Cardiff in wales and in England Liverpool, Bristol and Southampton.

With regard to the United Kingdom, the GDP in the United Kingdom amounted to € 1.9 trillion in 2012, which equated to an average income of € 30 500 per capita. Service industries accounted for 73 % of output in 2010.[63] Of which around 20 % was government-supplied health, education and social work, around 20 % financial and professional services and around 17 % was distribution, transport, hotels and restaurants. Recently, the declining output of North Sea oil and gas has depressed the growth rate in production and in the economy as a whole. The population of the UK amounted to 62.5 m at the end of 2011 in 23.4 m households.[64] Total employment was 29.4 m in 2012 and unemployment was 7.8 per cent in the last quarter of 2012.[65] Twenty per cent of the population is aged over 65.

Around 17 % of the UK population lives within 10 km of the coast and 43 % within 20 km. This reflects the historic growth of cities located on major coastal rivers and the importance of sea-borne trade to Britain's economy in recent history.[66]

The UK has major ports at Milford Haven and Liverpool. Most of the aquaculture occurs along the West Coast of Scotland and catching fish is mainly based in Peterhead and Fraserburgh on the East Coast of Scotland, with the North East of England and South West of England also active in fishing. The North Sea is important for the UK's economy through the production of oil and gas, in particular the city of Aberdeen in Scotland, and renewable energy is playing an increasing role, with substantial investment in offshore wind in the shallower southern part of the North Sea.

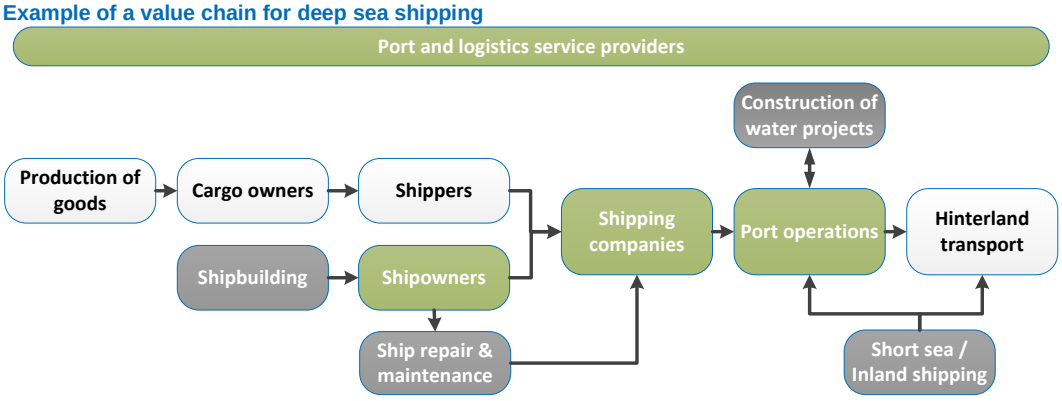
[61] SEMRU (2011). Ireland's Ocean Economy, SEMRU Report, NUI Galway.
[62] Ireland's Ocean Economy, SEMRU , December 2010
[63] UK Office for National Statistics National Accounts
[64] Eurostat
[65] Eurostat
[66] Landscan, UK Office for National Statistics, personal communication European Commission, Vivid Economics calculations

3 Maritime economic activities in the Atlantic Arc

3.1 Introduction and methodological approach

In order to estimate the size of the Blue Economy, in the original Blue Growth study[67], six maritime functions were defined, which were further subdivided into 27 sub-functions or maritime economic activities (MEAs). An important aspect in these functions or MEAs is that they have been approached from a value chain perspective (combining several economic sector activities) rather then an individual economic sector. As an example, the MEA of deep sea shipping does not just include the shipping sector itself, but also associated cargo handling and port services necessary to deliver the functional demand of bringing goods from A to B.

Figure 3.1 Example of a value chain for deep sea shipping

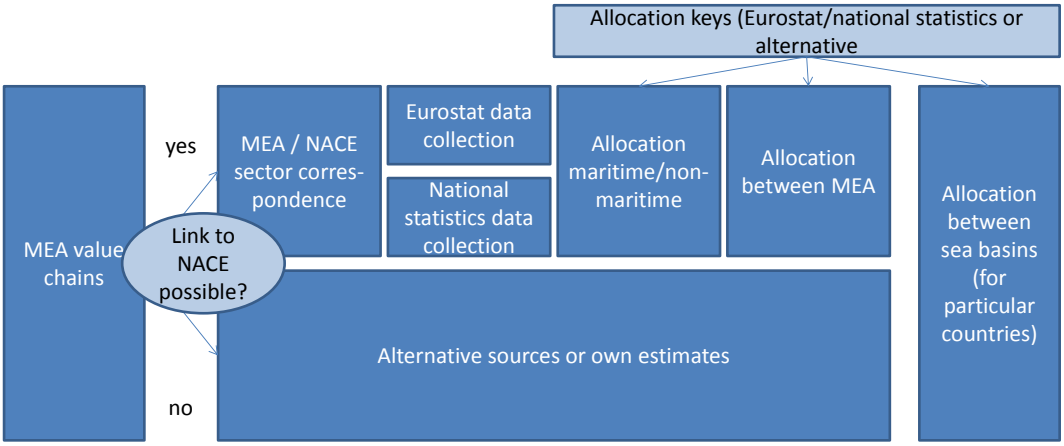


As much as possible, use was made of data from publicly available data sources, notably Eurostat, using standardised sector definitions (NACE codes) to ensure consistency across MEA and across countries, and to avoid double counting. However not all MEAs allow the use of formal statistics.

The general approach followed to estimate the size of the of the maritime economic activities is shown in the following scheme.

[67] Ecorys (2012), Blue Growth. Scenarios and drivers for sustainable growth of oceans, seas and coasts

Figure 3.2 Schematic overview of general methodology



3.1.1 Value chain approach – mapping MEAs to NACE codes

For each maritime economic activity, the value chain has been defined, and subsequently, for those where links to NACE sectors can be made, corresponding NACE sectors where identified. For parts of the value chain however, especially those parts 'downstream', often sectors are disconnected from specific maritime activities and include many other activities not relevant to the MEA anymore or are captured in other MEAs.

As an example, for the deepsea shipping value chain, sectors in green are covered directly in the MEA itself (encompassing various NACE codes), sectors in grey are not covered there but are included in other MEAs estimated, while sectors in white are not measured.

The following table summarises the NACE sectors that are included in the assessment of the size of each MEA. In addition NACE sectors are indicated that have been identified as relevant to the value chain but are not included in the estimate itself. An overview of these sectors, plus an elaborate description of the methodology used to assess and allocate sectors to MEA can be found in Annex I – "Methodology" of this report.

Table 3.1 Maritime economic activities: NACE sectors covered

MEA	NACE sectors covered	Comments
0. Other sectors		
0.a Shipbuilding and repair	30.11 Building of ships and floating structures 30.12 Building of pleasure and sporting boats 33.15 Repair and maintenance of ships and boats	This sector serves many of the below MEA and was therefore taken separately.
0.b Water projects	42.91 Construction of water projects	This sector serves many of the below MEA and was therefore taken separately.
1. Maritime transport		
1.a Deepsea shipping	50.20 Sea and coastal freight water transport 77.34 Renting and leasing of water transport 52.22 Service activities incidental to water transportation 52.24 Cargo handling 52.10 Warehousing and storage	Shipbuilding and repair covered separately under 0.a shipbuilding. Construction of ports covered separately under 0.b Water projects.
1.b Shortsea shipping	50.20 Sea and coastal freight water transport 77.34 Renting and leasing of water transport 52.22 Service activities incidental to water	Idem. Same sectors as for 1.a deepsea shipping; allocation keys applied to assign relevant

MEA	NACE sectors covered	Comments
	transportation 52.24 Cargo handling 52.10 Warehousing and storage	shares.
1.c Passenger ferries	50.10 Sea and coastal passenger water transport 77.34 Renting and leasing of water transport 52.22 Service activities incidental to water transportation 52.24 Cargo handling 52.10 Warehousing and storage	Idem; data split between 1.c passenger ferries and 4.c cruise tourism.
1.d Inland water transport	50.40 Inland water transport 77.34 Renting and leasing of water transport 52.22 Service activities incidental to water transportation 52.24 Cargo handling 52.10 Warehousing and storage	Idem
2. Food, nutrition and health		
2a. Fisheries for human consumption	A03.11 and A03.12 share of production based on value added by fish species C10.20 share of fish processing 46.38 Wholesale of other food, including fish, crustaceans and molluscs 47.23 Retail sale of fish, crustaceans and molluscs in specialised stores	
2.b Fisheries for animal consumption	A03.11 and A03.12 share of production based on value added by fish species C10.20 share of fish processing	
2.c Marine aquaculture	03.21 Marine aquaculture	
2.d Blue biotechnology	-	No statistical correspondence possible
2.e Agriculture on saline soils	Total agriculture * share of saline soils	
3. Energy and seabed materials		
3.a Oil & gas	06.10 Extraction of crude petroleum 06.20 Extraction of natural gas 09.10 Support activities for petroleum and natural gas extraction	Shipbuilding & repair covered under 0.a. Sea and coastal water transport covered under 1.a, 1.b.
3.b Offshore wind	-	No statistical correspondence possible
3.c Ocean renewables	-	No statistical correspondence possible
3.d CCS	-	No statistical correspondence possible
3.e Mining (aggregates)	08.12 Operation of gravel and sand pits; mining of clays and kaolin 09.90 Supporting activities for other mining and quarrying	Shipbuilding & repair covered under 0.a. Sea and coastal water transport covered under 1.a, 1.b.
3.f Minerals mining (deepsea)	-	No statistical correspondence possible
3.g Desalination	-	No statistical correspondence possible

MEA	NACE sectors covered	Comments
4. Leisure and tourism		
4.a Coastal tourism	55.10 Hotels and similar accommodation 55.20 Holiday and other short-stay accommodation 55.30 Camping grounds, recreational vehicle parks and trailer parks 55.90 Other accommodation	
4.b Yachting & marinas	-	No statistical correspondence possible
4.c Cruise tourism	50.10 Sea and coastal passenger water transport 77.34 Renting and leasing of water transport 52.22 Service activities incidental to water transportation 52.24 Cargo handling 52.10 Warehousing and storage	Idem; data split between 1.c passenger ferries and 4.c cruise tourism. Wider estimates taken from European Cruise Council.
5. Coastal protection		
5.a Coastal protection	-	No statistical correspondence possible
6. Maritime monitoring & surveillance		
6.a Maritime surveillance	-	No statistical correspondence possible
6.b Environmental monitoring	-	No statistical correspondence possible

For a number of MEA, correspondence to NACE 4-digit NACE sectors is not possible, as the sectors underlying the value chains from point 1 are too small/invisible in NACE 4-digit levels. The below table indicates for which MEAs a direct correlation with Eurostat/NACE data could not be developed. For these MEA, alternative approaches and sources have been applied (see Annex 1 “Methodology”, part C).

Table 3.2 MEA based on NACE 2 sector data(left) versus alternative sources (right)

MEA based on NACE correspondence	MEA estimated usingalternative sources
1.a Deep-sea shipping	2.d Blue biotechnology
1.b Short-sea shipping	3.b Offshore wind
1.c Passenger ferry services	3.c Ocean renewable energy sources
1.d Inland water transport	3.d Carbon Capture & Storage
2.a Fisheries for human consumption	3.f Minerals mining (deep sea)
2.b Fisheries for animal consumption	3.g Desalination
2.c Marine aquaculture	4.b Yachting and marinas
2.e Agriculture on saline soils	5.a Coastal protection
3.a Oil & gas	6.a Maritime surveillance
3.e Aggregates mining	6.b Environmental monitoring
4.a Coastal tourism	
4.c Cruise tourism	

3.1.2 Alternative approach to value chains: input-output analysis

The methodology followed as described above is based on summing data on related economic sectors considered relevant to the value chain of a specific maritime economic activity. In particular,

sectors that cannot be exclusively linked to a single maritime economic activity (see also the methodology annex 1) present limitations. An alternative approach would be to assess input-output tables. These however do not exist for all countries and/or do not have the required sectoral detail. In the context of this study, the I/O tables for the UK and Spain, which are available for fairly recent years (2010 for the UK, 2009 for Spain) and sufficient level of detail (110 industry sectors in the UK, 73 in Spain).

The tables can be used to assess the backward and forward economic linkages of a specific (maritime) sector, by defining the intermediate purchases made by the sector chosen from other sectors and its deliveries. These are then transferred into GVA contributions towards these other sectors. This way, the shares of these other sectors relevant to the selected marine sector can be calculated, giving an indication of the total size of the value chain related to this sector.

The method was applied for selected marine sectors and is presented in detail in Annex III. The below figure present an example of the input relations to fishing and aquaculture in the United Kingdom.

Table 3.3 **Fishing and aquaculture: main input product categories (intermediate consumption plus gross fixed capital formation)**

Code	Product	EUR million	Share of total
03	**Fish and other fishing products; aquaculture products; support services to fishing**	**122**	**14.2%**
19	Coke and refined petroleum products	153	17.7%
10.9	Prepared animal feeds	126	14.6%
35.1	Electricity, transmission and distribution	44	5.1%
30.1	Ships and boats	43	5.0%
22	Rubber and plastic products	38	4.5%
33.15	Repair and maintenance of ships and boats	30	3.5%
64	Financial services, except insurance and pension funding	29	3.4%
35.2-3	Gas; distribution of gaseous fuels through mains; steam and air conditioning supply	28	3.2%
43	Specialised construction works	27	3.1%
41	Buildings and building construction works	23	2.7%
	Other	*199*	*23.1%*
	Total	**864**	**100.0%**

Source: Ecorys calculation based on UK Supply & Use tables, 2010

3.2 The size of the maritime economic activities for the sea basin

Based on the above methodology the gross value added (GVA) and employment in each of the Member States bordering the Atlantic Arc have been estimated [68] [69]. These estimates cover the size of the maritime economic activity for the country as a whole. Not all of these activities might be equally relevant for the Atlantic Arc. For example oil & gas exploration in the UK is mainly relevant for the North Sea Basin and much less for the Atlantic, whereas a relatively new MEA such as

[68] Although in general a consistent methodology has been used, direct feedback and information from Member States has sometimes led to the adoption of different definitions. More information on this canbe found in the country fiches.

[69] Figures are reported in table 2.1 in the country papers. Please note that in the following table only those activities that can be attributed to the Atlantic Sea Basin have been used. As a result figures can deviate from the figures presented in the country fiches.

ocean renewable energy on the other hand is mainly relevant for the Atlantic and much less for the other sea basins.

To take account of this maritime economic activities have been allocated by regions and sea-basins. The figures presented in the tables in this report refer to the activities that can be allocated to the Atlantic Arc. As such they deviate from the overall figures presented in the country papers (see Annexes IV to VIII) which show figures for the country as a whole.

3.2.1 Direct GVA and employment

The tables presented on the following pages give an overview of GVA and employment figures for all Maritime Economic Activities for the five countries bordering the Atlantic Arc.

Table 3.4 **GVA per maritime economic activity and per country (NB only the part of MEA that is allocated to the Atlantic Arc)**

	FR	IE	PT	ES	UK	Total
0. Shipbuilding						
a. Shipbuilding & repair	1.241	7	83	1.067	1.677	*4.075*
b. Construction of water projects	n/a	4	84	410	108	*606*
1. Maritime transport						
a. Deep-sea shipping	789	23	122	176	421	*1.531*
b. Short – sea shipping	1.419	283	190	184	959	*3.034*
c. Passenger ferry services	186	23	36	95	379	*719*
d. Inland waterway transport	16	n/a	0	0	8	*24*
2. Food, nutrition and health						
a. Fisheries for human	2.238	259	834	2.760	213	*6.304*
b. Fisheries for animal	n/a	n/a	5	9	17	*31*
c. Marine aquaculture	258	37	6	116	95	*512*
d. Blue biotechnology	n/a	9	n/a	n/a	n/a	*9*
e. Agriculture on saline soil	322	n/a	120	n/a	n/a	*442*
3. Energy and seabed materials						
a. Oil and gas	n/a	137	0	4	785	*926*
b. Offshore wind	n/a	4	n/a	n/a	n/a	*4*
c. Ocean renewable energy	Minimal	1	n/a	n/a	n/a	*1*
d. Carbon capture and storage	n/a	n/a	n/a	n/a	n/a	*0*
e. Mining	29	n/a	n/a	0	10	*39*
f. Marine minerals mining	n/a	n/a	n/a	n/a	n/a	*0*
g. Desalination	n/a	n/a	n/a	97	0	*97*

	FR	IE	PT	ES	UK	Total
4. Leisure and tourism						
a. Coastal tourism	1.416	453[70]	905	2.061	2.118	*6.953*
b. Yachting and marinas	417	45	n/a	694	14	*1.170*
c. Cruise tourism	11	n/a	39	100	148	*298*
5. Coastal protection						
a. Coastal protection	n/a	n/a	6	4	n/a	*14*
6. Maritime monitoring and surveillance						
a. Maritime surveillance	n/a	n/a	n/a	n/a	n/a	*n/a*
b.Environmental monitoring	n/a	n/a	n/a	12	n/a	*12*
Total	8.342	1.289	2.428	7.789	6.952	26.800

Source: country fiches

Table 3.5 **Employment per maritime activity and per country (NB only the part of M EA that is allocated to the Atlantic Arc)**

	FR	IE	PT	ES	UK	Total
0. Shipbuilding						
a. Shipbuilding & repair	22.422	155	3.472	18.501	25.476	70.026
b. Construction of water projects	n/a	17	1.520	8.598	643	10.778
1. Maritime transport						
a. Deep-sea shipping	7.906	154	1.758	2.507	3.884	16.209
b. Short – sea shipping	14.226	1.886	2.739	2.620	14.207	35.678
c. Passenger ferry services	2.647	154	698	1.507	29.408	34.414
d. Inland waterway transport	245	n/a	n/a	0	1.069	1.314
2. Food, nutrition and health						
a. Fisheries for human	45.586	6.391	47.050	95.880	14.317	209.224
b. Fisheries for animal	n/a	n/a	281	337	430	1.048
c. Marine aquaculture	15.336	1.705	2.085	20.340	988	40.454
d. Blue biotechnology	n/a	185	n/a	n/a	n/a	185
e. Agriculture on saline soil	11.405	n/a	24.604	0	n/a	36.009
3. Energy and seabed materials						
a. Oil and gas	n/a	790	0	n/a	710	1.500
b. Offshore wind	n/a	101	n/a	n/a	n/a	101

[70] Please note that the Irish figures do not include accomodation and are hence not fully comparable with the data for other countries (which focus on tourist accomodation in coastal areas)

	FR	IE	PT	ES	UK	Total
c. Ocean renewable energy	Minimal	50	n/a	n/a	n/a	50
d. Carbon capture and storage	n/a	n/a	n/a	n/a	n/a	0
e. Mining	323	n/a	n/a	0	436	759
f. Marine minerals mining	n/a	n/a	n/a	n/a	n/a	0
g. Desalination	n/a	n/a	n/a	1.068	0	1.068
4. Leisure and tourism						
a. Coastal tourism	32.129	5.836	44.155	64.499	170.806[71]	317.425
b. Yachting and marinas	16.922	800	n/a	13.042	700	31.464
c. Cruise tourism	150	n/a	758	1.589	1.503	4.000
5. Coastal protection						
a. Coastal protection	n/a	44	63	40	n/a	*147*
6. Maritime monitoring and surveillance						
a. Maritime surveillance	n/a	n/a	n/a	n/a	n/a	0
b. Environmental monitoring	n/a	n/a	n/a	n/a	n/a	0
Total	169.297	18.268	129.283	230.528	264.577	811.853

Source: country fiches

The tables show that the total size of the Atlantic marine economy is at least € 26.8 billion, and accounts for more than 800 000 jobs, excluding maritime economic activities that could not be quantified[72]. It should be noted that for some large (mature) maritime economic activities only parts of the value chains are included. This indicates that, if all indirect related activities would be accounted for, the figure would likely further increase. For example an input/output analysis conducted for several marine sectors in the UK and Spain shows multipliers of 1.3 (for water transport in Spain) up to 7.5 (for oil & gas in the UK)[73].

A number of conclusions can be drawn based on the assessment of the maritime economic activities in the Atlantic Arc:

- Within the Atlantic, France provides the largest contribution to GVA, while the highest employment is found in the UK. Figures for Spain are of similar magnitude while the smaller economies of Portugal and Ireland are reflected in their maritime activities figures;
- In four of the five countries, fisheries and coastal tourism are the two largest sectors in terms of employment. In terms of GVA the picture is similar, although in the UK shipbuilding ranks second and in most other countries this sector is also among the largest four. Furthermore shortsea shipping is also an important sector across the Atlantic Arc;
- Comparing largest sectors spread across the sea basin, the share of coastal tourism in the maritime economy in terms of GVA is around 30 percent in Ireland, Spain and the UK, but close to 40 percent in Portugal against 17 percent in France. In terms of employment the largest relative importance is found in the UK with 65% (39% for the sea basin as a whole). For the fisheries sector, the share is around 30 percent in France, Portugal and

[71] This figure refers to estimates of seaside jobs supporting visitors to coastal areas, mainly in the retail, leisure, catering and hospitality sectors. As such it uses a wider definition than the definition used for other countries. Also Ireland uses a different definition (see footnote previous table).

[72] To a large extent this refers to economic activities in their (pre)development stages which are not expected to have a major impact on the opverall figures.

[73] See annex III for further results of the Input-Output analysis conducted

Spain, 20 percent in Ireland and only 3 percent in the UK. Similar figures apply for employment in this sector. Shortsea shipping has the highest relative importance in France and Ireland (17 and 22 percent respectively), while shipbuilding is much more important in the UK (24 percent) than anywhere else (Ireland 1%, Portugal 3%, and of moderate importance in France (15%) and Spain (14%).

The following section presents a brief descriptive overview of the maritime economic activities that have been analysed.

3.3 Description of the maritime economic activities at sea basin level

Shipbuilding and water projects

Shipbuilding and repair

Shipbuilding a one of the major maritime economic activities in the sea basin in particular in France, UK and Spain. Although the sector has been in decline in Europe due to upcoming competition of in particular Asian countries still a strong position in attained in these countries. This is partially due to the presence of naval (defense related) shipbuilding and the construction of high quality ships and structures in which Europe still retains a strong position globally. Not only the construction and repair of vessels is of relevance for the maritime economy being of direct relevance in the execution of many of the other maritime activities, but also the construction of offshore installation and structures in general which are delivered to sectors such as oil & gas and ocean energy.

In the construction of leisure boats and mega-yachts, in particular France holds a strong position but also again the UK and Spain have sizeable industries.

Construction of water projects

The construction of water projects is a diverse sector that encompasses activities related to port reconstruction and expansion to coastal works and related works. As such it is an activity that is very much driven by other maritime economic activities. It has been assessed separately because this sector is very hard to allocate to a specific maritime economic activity.

Maritime transport

Shipping (deep sea and short sea)

Obviously shipping is a major activity for all Atlantic countries, with a number of major ports located in the Atlantic Arc. Two of the countries (the United Kingdom and Ireland) are island which makes shipping a major means to transport goods internationally Whereas deep-sea shipping is mainly driven by international trade flows and hence economic global economic growth, short-sea shipping is mainly intra-European and competes with other modes of transport. In this sense short sea shipping is also important from a European policy perspective in promoting more sustainable forms of transport and is impacted directly in the Motorways of the Sea policy of the Commission. At the same time short-sea and deep-sea shipping are obviously closely connected as short sea shipping also performs a feeder distributor function for deep sea shipping. In terms of tonnage short sea shipping is outperforming deep-sea shipping in the Atlantic transporting a higher tonnage in goods.

Passenger ferry

In the Atlantic Arc passenger ferries are in particular important in cross-Channel transportation and in passenger transport to and between islands belonging to for examples Spain (Canary Islands)

and Portugal (Azores, Madeira). In most of the countries ferry transport has been under pressure, in particular as a result of the competition of low cost airlines although some level of stabilisation seems to be reached on certain routes.

Inland waterway transport

The position if inland waterway transport is strongly influenced by the presence of inland waterways connecting the Atlantic to the hinterland. In general inland waterway transport is not seen as a large sector and the main activity in this sector (albeit limited) is observed in France and the UK.

Food, nutrition and health

Fisheries (human and animal consumption)

Traditionally fisheries (including fish processing and wholesale/retail) has been one of the main maritime economic activities in the Atlantic Arc. In particular Portugal, Spain and France large fishing fleets exist and a large number of people is employed in the sector. Over 34000 fishing vessels are in use in the Atlantic countries. Stock sustainability is pivotal for the growth of the EU fisheries sector and one of the main objectives of the EU policy, as expressed in the Common Fisheries Policy, and the Member States is to promote environmentally sustainable fisheries. Most of the income generated in the sector comes from large scale fishing vessels (43% of the fleet, generating 66% of income).

Marine aquaculture

Aquaculture has gained importance over time next to fisheries in the Atlantic. Major production countries are France and Spain followed at some distance by Portugal and Ireland. The type of products that are produced in aquaculture differ across the countries also due to the physical and climatic conditions of their waters with the northern countries in the Atlantic (Ireland and the UK) having a focus on (Atlantic) salmon production, whereas shellfish farming is primarily found in France, Spain and Portugal.

Blue biotechnology

Blue biotechnology is very much an emerging maritime economic activity that is very much in its development stage. As a result the size is still small. As with biotechnology in general the sector is seen to hold a true promise towards the future, as was also recognizes in the Blue growth Communication of the European Commission. Various countries in the Atlantic both companies and governments have targeted blue biotechnology as an emerging secotr.

Agriculture on saline soils

Agriculture on saline soils reflects growing specific (salt resistant) crops in coastal areas with saline soil conditions. Saline and sodic soils are found at various places along the Atlantic coast in France, Portugal and southern Spain.

Energy and seabed materials

Offshore oil and gas

Although some discoveries of oil & gas reserves have been made, oil & gas exploitation is not very prominent in the Atlantic compared to other sea-basins (notable the North Sea). Apart from a number of active sites (among others in UK waters) most activities in the Atlantic appear to focus on exploration.

Offshore wind

Although a clear potential for offshore wind energy generation exists (in terms of wind), until present no large scale offshore wind capacity is installed in the Atlantic. The strongest activities in the filed can be found in Ireland and the UK. A major bottleneck in the development of offshore wind capacity in the sea basin is the water depth in the Atlantic, which is disadvantageous in comparison to more shallow water such as found in the Baltic and North Sea sea basins. The development of floating installation on the longer term might decrease this bottleneck in the future.

Ocean renewable energy

Ocean energy combines a set of different technologies, of which wind en tidal energy are the most promising at this moment. At present most ocean energy installation are still in their pilot and testing phase, with the notable exception of the La Rance tidal range plant in France which was already built in the 1960s. However all countries have identified ocean energy as an interesting energy source in the future and activities have stepped up significantly in the last years. The UK is by far the most ambitious in developing ocean energy and a strong growth is expected in the UK in the coming decade.

Carbon capture and storage

Seen as part of the overall policy of combatting greenhouse gashouse emission and climate change, carbon capture and storage is seen as potentially able to play a role in reducing GHG concentrations in the atmosphere. However to this extent CCS is still in research stages and concrete pilots have not yet started.

Aggregates mining

Sand, grind and gravel are mainly mined in shallow waters in the Atlantic (e.g. in front of the coast of Wales). Due to the physical characteristics of the sea basin (water depth) this activity is relatively limited.

Marine minerals (deep sea) mining

Marine minerals mining focuses on the mining of minerals in the deep seas. According to the Blue Growth Communication of the Commission According to the Communication, up to 10% of global production of minerals such as cobalt, copper and zinc could come from the ocean floors by 2030. Main deposits (in the form of polymetallic nodules, polymetallic sulphides, cobalt rich crusts or rare earth deposits) are found outside the territorial borders of the EU. As a result most activities can be expected from EU companies in the Atlantic that operate outside EU waters. The International Seabed Authority has entered into exploration contract with organisation from France and the UK, but also Portugese and Spanish research organisation have shown exploration activity in seabed minerals.

Desalinisation

Desalinisation is of particular relevance to the southern parts of Europe and as such less relevant to the Atlantic Arc. With the exception to the Canary Islands and some small scale desalinisation plants most desalinisation plants are found in the Mediterranean.

Leisure and tourism

Coastal tourism (accommodation)

Next to fisheries and shipbuilding coastal tourism is a major maritime economic activity in the Atlantic sea basin. Although the exact delineation of coastal tourism is fraught with difficulties employment and gross value added generated in accommodation related activities in coastal

regions has a major impact on the maritime economy. This is valid for all countries in the Atlantic Arc, although in countries bordering both the Mediterranean and the Atlantic obviously a strong focus of coastal tourism on the Mediterranean exists.

Yachting & marinas

Closely related to coastal tourism marinas and yachting are a specific form of tourism. With its long coastline a large number of marinas exist in the Atlantic Arc feeding a whole value chain of supplier, vessel maintenance, yards, boat hire etcetera. Recreational boating is a growing activity although also susceptible to the economic climate which has had a negative impact on the activity in the last few years.

Cruise tourism

Cruise tourism is one of the fastest growing maritime economic activities in Europe. In comparison to other destinations the Atlantic Arc is a less strong destination area than the Baltic and the Mediterranean, but also in the Atlantic Arc the cruise tourism has shown increased activity. Several countries and ports try to ride the wave of increased cruise tourism by promoting the area as a cruise destination.

Coastal protection

Being primarily a public funded Activity coastal protection has gained increased attention from governments in the Atlantic Arc due to coastal erosion and coastal change. On the longer term climate change is expected to further these aspects triggering an enhanced attention for coastal protection. Figures on coastal protection are hard to obtain, but the available information seems to indicate that the size of this activity is relatively small.

Maritime monitoring and surveillance

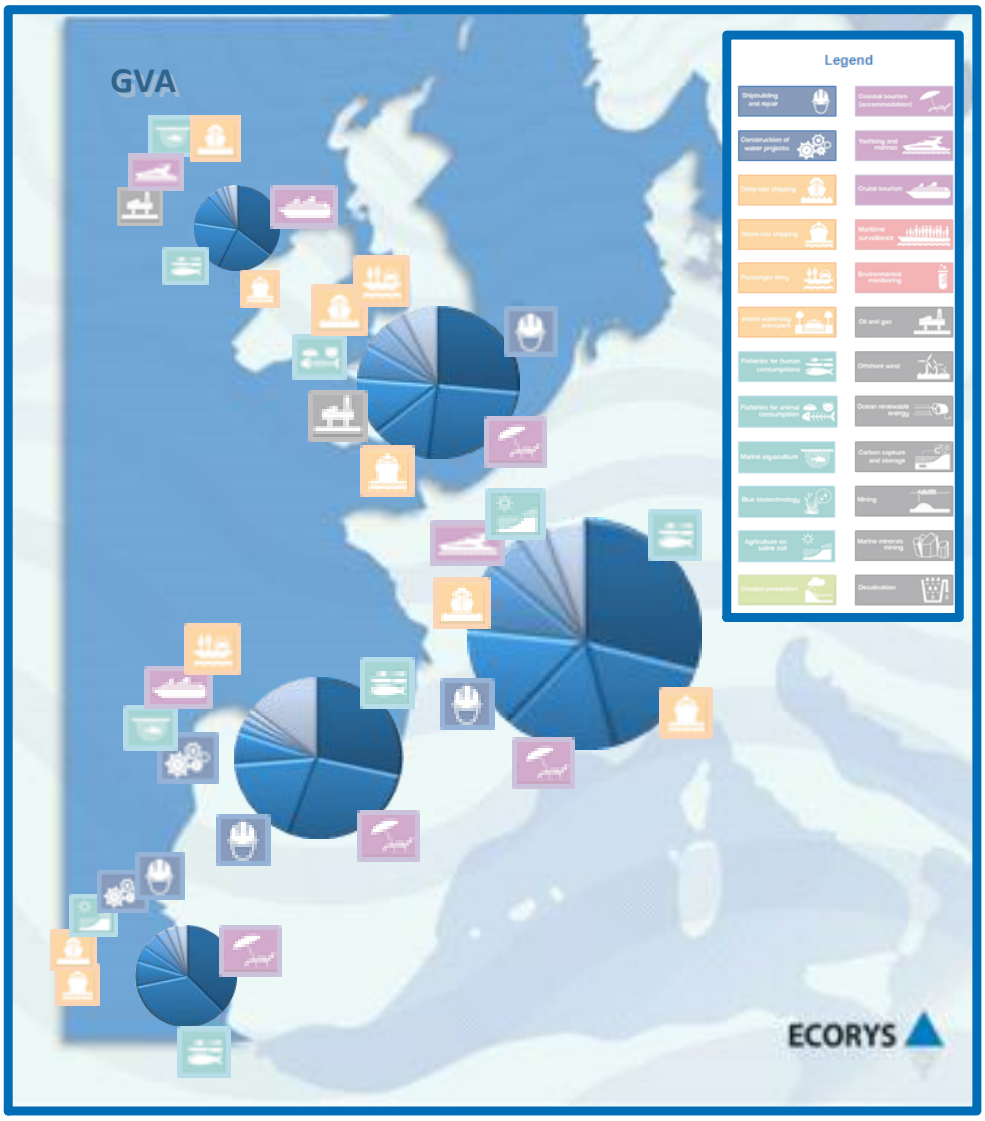
Also maritime surveillance and monitoring is a predominantly public funded (and executed) activity. Within this activity a distinction has been made between surveillance activities (tracing of (illegal) goods and people) and environmental monitoring. Driven by an increased need for environmental monitoring and an increased dependence on new technologies several research organisation and companies have stepped up their activities in the past decade.

3.4 The regional picture of the maritime economic activities

3.4.1 Geographical distribution of activities

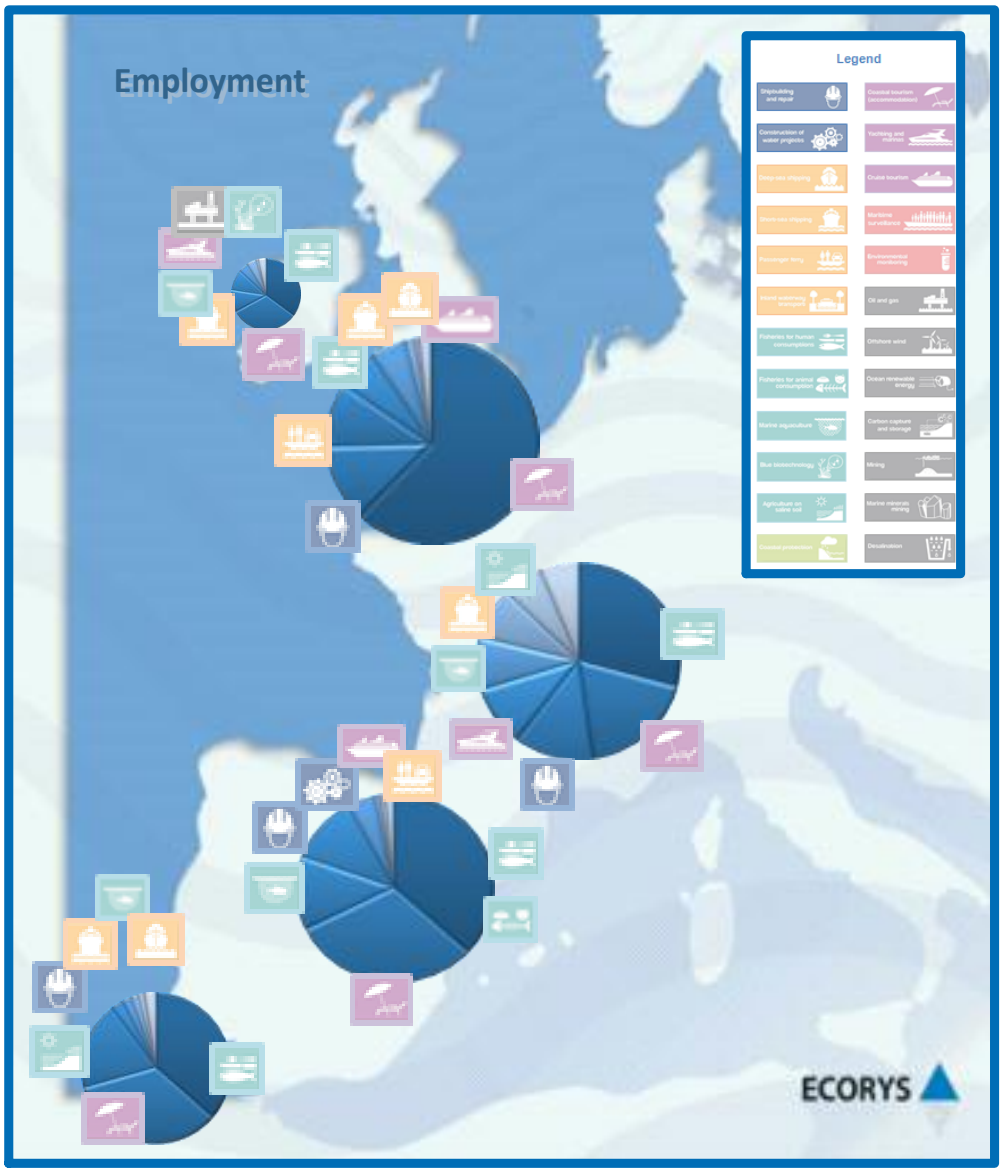
The maps below summarize the findings on the size maritime economy in terms of GVA (Figure 3.3) and employment (Figure 3.4) graphically for each of the five countries in the Atlantic Arc. It is noted that the again figures given include only the Atlantic activities of these countries.

Figure 3.3 GVA for the largest maritime economic activities in Atlantic countries



Source: Ecorys

Figure 3.4 Employment in the largest maritime economic activities in Atlantic countries



Source: Ecorys

Within these countries specific hotspots or maritime clusters can be discerned. These will be further elaborated in the next section.

3.4.2 Maritime clusters as a means to fuel Blue Growth at local and regional level

Since October 2007, the European Union has been pursuing the Integrated Maritime Policy (IMP)[74] as an innovative approach which, among several fundamental objectives, aims at fostering the development of efficient cooperation structures among economic actors and stakeholders. Building on the EU Integrated Maritime Approach, the Blue Growth strategy[75] is designed to provide policy-makers at EU and sea-basin level with a comprehensive, robust and consistent analysis of possible

74 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, An Integrated Maritime Policy for the European Union, COM(2007) 575 final, 10.10.2007.
75 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, COM(2012) 494 final, 13.9.2012.

future policy options to support smart, sustainable and inclusive growth from the oceans, seas and coasts.

The potential of Blue Growth is influenced by the performance of established and emerging maritime clusters active in a variety of maritime sectors throughout Europe.[76] Clusters are therefore deemed important for Blue Growth especially since the development of maritime economic sectors – notably those in a pre-development or growth stage – is dependent on establishing the appropriate inter-linkages amongst local players and reinforcing growth potential. Still, it has become clear that to prosper and flourish, maritime clusters require stronger local and regional involvement[77], as well as greater support and recognition at the EU level[78].

Maritime clusters already emerged as a relevant topic in the Blue Growth study. The study acknowledged the potential relevance of Maritime Clusters as mechanisms through which Blue Growth can be reinforced, by taking advantage of and provide support to maritime synergies. However, the study recognised that taking advantage of existing opportunities requires that the specifics of each location, area or coastal region, are reflected upon and adequately addressed.

Maritime clusters – a definition

Clusters are one of the most notable concepts within economic geography. However they are not always easily to grasp or to measure as they are not clearly delineated industries or sectors. Clusters can be defined at the level of:

- An end product industry or industries;
- Downstream or channel industries;
- Specialised suppliers;
- Service providers;
- Related industries: those with important shared activities, shared skills, shared technologies, common channels, or common customers;
- Supporting institutions: financial, training and standard setting organisations, research institutions, and trade associations.

In this study, we take recourse to a prominent academic definition, which defines clusters as “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (external economies)[79].” Maritime clusters are hence characterised by a high concentration of connected companies and research institutes in a given maritime industry, which show high complementarities and commonalities at regional level.

Key maritime clusters at sea basin level

In this study clusters that have been identified in the country papers. The listed clusters are building on a previous maritime cluster exercise, compiled in the initial Blue growth study in 2012, complemented with clusters and regional agglomerations of maritime industries identified through the EU Cluster Observatory.[80] In addition direct feedback per country, either through the country editors or by the feedback and comments from the member States directly over the course of this

76

77 Ecorys, Deltares, Oceanique Development, 2012: Blue Growth: Scenarios and drivers for sustainable growth from the oceans, seas and coasts, Final report. P. 127: Available here: https://webgate.ec.europa.eu/maritimeforum/content/2946

78http://www.espon.eu/export/sites/default/Documents/Projects/AppliedResearch/ESaTDOR/FR_160413/ESaTDOR_Executive_Summary.pdf

79 Prof. Michael E. Porter, 20120213, MOC2012 (HBS course) Session 5 - final

80 The EU Cluster Observatory (http://www.clusterobservatory.eu) denotes maritime clusters as separate clusters. .

study have been incorporated. The following map visualises their location. A list of clusters is given in the table beneath the map.

Figure 3.5 **Map of maritime clusters in the Atlantic Arc**

Source: Ecorys. Cluster codes, see Table 3.6 below.

Table 3.6 **List of maritime clusters in the Atlantic Arc**

Country	No in map	Region	Cluster	Main maritime activities
UK	A	Scottish West Coast	Highlands and Islands, SW Scotland	Offshore wind, marine aquaculture, fisheries, ocean renewable energy, blue biotech
	B	South West England	Dorset and Somerset	Fisheries/Aquaculture, Biotechnology, Renewable Energy, Minerals and Aggregates, Coastal protection, yachting/marinas, Ship/(leisure) boat building
Ireland	C	Galway		Ocean renewables; offshore wind wind areas; blue biotechnology, aquaculture; deep sea technologies (synergies)

Country	No in map	Region	Cluster	Main maritime activities
	D	Cork		Marine Energy, Shipping, Logistics and Transport; Maritime Safety and Security, Marine Recreation
France	E	Bretagne	Brest	Defence, blue biotechnology, shipbuilding, fisheries, ocean renewable energy
	F	Pays de la Loire		Shipbuilding, defence, naval architecture
	G	Aquitaine	Bordeaux	Yacht building and repair
	H	Poitou-Charentes		
	I	Basse-Normandie		
Portugal	J	Centro	Aveiro	
	K	Norte	Porto	deep and short-sea shipping; coastal, nautical and cruise tourism; marine minerals mining;
	L		Leixões	
	M		Viana do Castelo	
	N	Lisboa	Lisbon	(industrial) fisheries, marine biotechnology, metallic and non-metallic minerals, freight transport, marine aquaculture, cruise tourism
	O	Sines		
	P	Algarve		Tourism
	Q	Açores		Tourism, ferry transport
	R	Madeira		Tourism
Spain	S	Galicia	Cluster Maritimo de Malaga	Coastal tourism, Maritime transport (deep and short-sea shipping), Fisheries, Aquaculture, Offshore renewable energy, Shipbuilding
	T	Basque Country		Shipbuilding, Marine energy, Coastline tourism, Maritime transport (port of Bilbao).
	U	Canarias	Cluster Maritime de Canarias	Shipbuilding and ship repairs; port services; fishing and aquaculture; and auxiliary industries.
	V	Cantabria		
	W	Asturias		

Source: Atlantic Arc countrypapers

3.5 The 7 largest, fastest growing and most promising maritime economic activities at sea basin level

To allow a balanced overview of the strength of the Blue Economy in the Atlantic Arc it is important not only present economic activities that are mature and large in size. In addition fast growing activities need to be identified that may increase their contribution on the short and medium term and support the growth of the blue economy. Finally it is important to identify maritime economic activities that enable Europe to build a future competitive position and contribute to the wider policy goals of a smart, sustainable and inclusive growth as embedded in the Europe 2020 Strategy.

Based on this approach a selection has been made of the 7 largest and the 7 fastest growing maritime activities. In addition 7 promising activities have been identified based on several criteria.

3.5.1 The 7 largest maritime economic activities at sea basin level

In Table 3.7 below, the seven largest maritime activities of each country in the Atlantic Arc are given. Colored are those that are found in the top-7 in at least four countries, indicating they are of major importance across large parts of the sea basin. The table indicates that the ranking of these is very similar between the countries.

Table 3.7 List of seven largest activities today in each Atlantic country

Ireland	France	Spain	Portugal	UK
Fisheries for human consumption	Coastal tourism (accommodation)	Coastal tourism (accommodation)	Fisheries for human consumption	Offshore oil and gas
Coastal tourism (accommodation)	Fisheries for human consumption	Fisheries for human consumption	Coastal tourism (accommodation)	Coastal tourism (accommodation)
Short-sea shipping	Short-sea shipping	Shipbuilding and ship repair	Agriculture on saline soils	Passenger ferry services
Marine aquaculture	Yachting and marinas	Construction of water projects	Short-sea shipping	Short-sea shipping
Offshore oil and gas	Shipbuilding and ship repair	Short-sea shipping	Shipbuilding and ship repair	Shipbuilding and ship repair
Yachting and marinas	Deep-sea shipping	Deep-sea shipping	Deep-sea shipping	Fisheries for human consumption
Cruise tourism	Passenger ferry services	Passenger ferry services	Construction of water projects	Deep-sea shipping

Source: country fiches[81]

3.5.2 The 7 fastest growing maritime economic activities at sea basin level[82]

Measuring the seven fastest growing sectors requires reliable data on their recent performance over a number of years. For a number of sectors, such data was lacking and a variety of alternative indicators has been gathered to compensate partially for that. Still only an indicative ranking results from this as a number of sectors which are understood to have grown rapidly over recent years are lacking data. Therefore the lists in Table 3.8 should be used only as an indication. In this table, no sector is present in the top-7 in all of the 5 countries, and only three of them in four out of five (cruise tourism and fisheries for human consumption and fisheries for animal consumption). Also their position in the top-7 varies a lot between the countries. The same holds for a number of other sectors that are mentioned in three countries. All in all this indicates that while the current absolute levels observed appear fairly similar, the trends over time are more diverse across the Atlantic Arc.

[81] It is noted that the ranking in the country fiches is based on figures for the countries as a whole, not taking account of the allocation between sea basins.
[82] Disclaimer: please note that the methodology for calculating the 7 fastest growing maritime economic activities may differ from each EU Member State. This is due to incomplete and discontinued data, which does not allow for calculating the CAGR as outlined in the methodology Annex. Therefore, we used 'Alternative indicators'. Please see the Methodology Annex for more information.

Table 3.8 List of seven fastest growing activities in each Atlantic country

Ireland	France	Spain	Portugal	UK
Fisheries for human consumption	Cruise tourism	Offshore Oil & Gas	Construction of water projects	Fisheries for animal consumption
Passenger ferry services	Shipbuilding and repair	Cruise tourism	Short-sea shipping	Shipbuilding and repair
Short sea shipping	Fisheries for human consumption	Fisheries for human consumption	Deep-sea shipping	Cruise tourism
Offshore Oil & Gas	Fisheries for animal feeding	Fisheries for animal feeding	Passenger ferry services	Short-sea shipping
Deep sea shipping	Passenger ferry services	Short sea shipping	Coastal tourism	Fisheries for human consumption
Shipbuilding and repair	Coastal tourism (accommodation)	Passenger ferry services	Shipbuilding and repair	Deep-sea shipping
Construction of water projects	Inland waterway transport	Coastal tourism	Fisheries for human consumption	Coastal tourism (accommodation)

Source: country fiches[83]

3.5.3 *Promising maritime economic activities at sea basin level*

The selection of maritime economic activities which hold a clear promise towards the future, even if they might be small today, is done on a number of criteria. The most important element aspect is the innovation level of the sector. The innovation level of maritime economic activities is analysed on the basis of a number of innovation criteria. The scoring on innovation is complemented with a set of other criteria, which are qualitatively scored, to arrive at a more comprehensive insight of the potential of a maritime economic activity. This includes criteria such as the ability of Europe to establish itself as a competitive player on the market, the extent to which the activity will facilitate other economic activities or create spill-over effects and the sustainability of the activity.

Innovation indicators[84]

The innovation indicators are inspired by the recent communication on innovation indicators which aim to capture the innovation level of a country[85]. The following two indicator sets are included[86]:

Table 3.9 Innovation indicators applied for the maritime economic activities in the Atlantic Arc

Indicator	Explanation	Source
Technological innovation		
• Scientific publications	Number of scientific publications in a MAE in a Member State in relation to the GVA of that maritime economic activity[87].	Thomson Reuters (2011)[88]
• Patents	Number of patents in a MAE in a Member State in relation to the GVA of that maritime economic activity.	Thomsons Reuters

[83] It is noted that the ranking in the country fiches is based on figures for the countries as a whole, not taking account of the allocation between sea basins.
[84] A more complete description of the innovation indicators can be found in Annex II
85 European Union, 2013: Measuring innovation output in Europe: towards a new indicator. COM(2013)624 final
86 Dependent on data availability
87 For small economic activities a default value of € 1 million has been used. The analysis was performed for 10 MEAs.
88 Analysis carried out in 2011 by Ecorys in the context of the general Blue Growth study. The analysis is based on Thomson Reuters data.

		(2011)
R&D expenditure		
• R&D expenditure/GVA	R&D expenditure as a percentage of value added[89] (2007 and most recent available year).	OECD, ANBERD database
• RTD expenditure/turnover	R&D expenditure as a percentage of company turnover. Data are available for UK only..	Amadeus company database

Technological innovation

The table below gives an overview number of publications per MEA for each of the Member States in the Atlantic Arc. The top half of the table (in green) is considered as the most active in terms of publications. The bottom half of the table (blue) is considered less active and therefore less innovative compared to the other sectors. The middle row for Oil & Gas (colored salmon) is a special case with a high number of publications but also a large size of the sector leading to lower relative scores.

Table 3.10 Ratio of number of publications to GVA (€m) [90]

Maritime Economic Activities		Ireland		Portugal		Spain		France		UK		total
		number	ratio	number	ratio	number	ratio	number	ratio	number	ratio	number
2.4	Blue biotechnology			101	101.0	188	188.0	326	326.0	479	479.0	1094
3.3	Ocean renewable energy	28	56.0	76	76.0	101	101.0	148	148.0	351	351.0	704
3.6	Marine minerals mining			30	30.0	159	159.0	125	125.0	204	204.0	518
6.3	Environmental monitoring	26	26.0	78	78.0	255	10.5	720	720.0	853	853.0	1932
3.1	Offshore oil and gas			35	35.0	124	7.8	226	226.0	469	0.0	854
2.3	Marine aquaculture	42	1.1	117	18.6	220	1.7	198	0.8	308	2.3	858
3.2	Offshore wind			22	22.0	62	62.0	76	76.0	173	173.0	836
3.7	Desalination			3	3.0	19	19.0	23	23.0	29	29.0	74
5.1	Coastal protection			4	0.6	43	0.9	31	2.6	43	43.0	121
6.1/ 6.2	Maritime surveillance	2	2.0	11	11.0	11	11.0	23	23.0	15	15.0	62
	Total	98		477		1182		1896		2924		6577

Source: Ecorys,2013

In terms of patents a similar table can be presented. Analysing the innovation ratios in relation to the size of the MEA a diverse pattern emerges with differences among countries. For example invention activity in Ocean Renewables is particularly high in the UK having a share of over 50% of all patents in this field in the Atlantic sea-basin, reflecting the strong concentration of this activity in the UK.

On the other hand the level of patents in desalination is high in Spain and France, which together account for the vast majority of all inventions in the 5 countries in this area. In particular we can see that in Spain this sector is the largest in terms of the invention activity, which is not surprising given

89 This indicator can be calculated for a few sectors only and are in most cases expressed at a higher sector level (e.g. oil & gas as part of the larger sector mining & quarrying). Only for shipbuilding a relatively straightforward match can be reached.

90 limitations: it has not been possible to analyse all MEAs due to lack of data; when data on the GVA per economic activity in the selected country was unavailable and assessed to be relatively small, we have assumed it to be equal to €1 million.

the serious societal and environmental challenges of lack of water in some parts of Spain. The fact that this MEA was not one of the more productive in terms of frontline research illustrates, that the sector is starting to move to the second stage in the innovation cycle in turning research into inventions.

What becomes particularly evident is that the most inventions come from the offshore oil and gas sector with 627 in 2011 alone. The UK leads this sector with 68% of all the inventions (426). Yet its ratio very close to zero since the GVA of the industry is enormous. This invention focus is due to UK's long experience with oil & gas in the North Sea (Aberdeen in the north of Scotland being dubbed as "the oil capital of EU"). Nevertheless, France is also rather active in the sector with 188 inventions, yet its ratio is very large suggesting that most of the inventions are destined for exportation rather than to be used in its mainland industry.

Table 3.11 Ratio of number of inventions to GVA (€ million)

Maritime economic activity		Ireland		Portugal		Spain		France		UK		total
		number	ratio	number	ratio	number	ratio	number	ratio	number	ratio	
2.4	Blue biotechnology					33	33.0	99	99.0	59	59.0	191
3.3	Ocean renewable energy			5	5.0	82	82.0	62	62.0	259	259.0	408
3.7	Desalination			3	3.0	106	106.0	105	105.0	85	85.0	299
6.3	Environmental monitoring	2	2.0			21	0.9	103	103.0	104	104.0	230
3.1	Offshore oil and gas	1	0.0			12	0.8	188	188.0	426	0.0	627
2.3	Marine aquaculture	5	0.1	5	0.8	54	0.4	60	0.2	105	0.8	229
3.2	Offshore wind	8	1.8	3	3.0	21	21.0	42	42.0	66	66.0	140
3.6	Marine minerals mining	1	1.0			32	32.0	83	83.0	64	64.0	180
5.1	Coastal protection	3	0.7	3	0.5	14	0.3	23	1.9	34	34.0	77
6.1/ 6.2	Maritime surveillance	2	2.0			31	31.0	58	58.0	51	51.0	142
	total	22		19		406		823		1253		2523

Source: Ecorys,2013

R&D expenditure(R&D intensity)

R&D expenditure has been assessed based on two different databases:

- The OECD Amadeus database. Key indicator: R&D expenditure as a % of value added;
- Amadeus company database (only figures available for the UK). Key indicator R&D expenditure as a % of turnover.

OECD-ANBERD data can be established only for 4 sectors. The sector classifications available do not always create a perfect match with the (sub)sector/maritime economic activity that is included in the Blue Growth study as they often are at a higher level of aggregation (e.g. fisheries is combined with the much larger agriculture sector, and oil & gas is part of mining). As such figures should only be treated indicatively.

Table 3.12 R&D expenditure as percentage of value added

	France		UK		Portugal	Spain	
	2007	2011	2007	2008	2008	2007	2009
Agriculture/fisheries/forestry	1,1%	1,3%	1,0%	0,8%	0,2%	0,4%	0,3%
Mining & quarrying	7,3%	10,3%	0,3%	n/a	n/a	5,3%	1,0%
Building of ships and boats	8,7%	16,4%	10,4%	n/a	2,7%	4,0%	n/a
Transportation & storage	0,0%	0,1%	0,0%	n/a	0,4%	0,2%	0,2%
Accommodation & food services	0,0%	0,0%	n/a	n/a	0,0%	0,0%	0,0%
Source: OECD ANBERD database							

Figures in the above table show a diverse picture. What becomes clear is that fisheries, shipping and coastal tourism (part of accommodation & food services) form part of a larger sector that has a relatively low R&D intensity. Mining & quarrying, which comprises both deep sea mining (although due to its size that will not show in the figures) and oil & gas, next to all other forms of mining, differs strongly per country. In France and Spain R&D intensity is relatively high, whereas in the UK R&D intensity as a ratio of GVA is very low. This confirms the AMADEUS analysis (see below), and is expected to be related to the relative large size of the sector (offshore oil and gas) in terms of value added. Finally shipbuilding is research intensive in most countries although at a significant higher level in the UK and France most likely due to the characteristics of shipbuilding in these countries (high value added commercial and naval ship versus more traditional shipbuilding activities in Portugal).

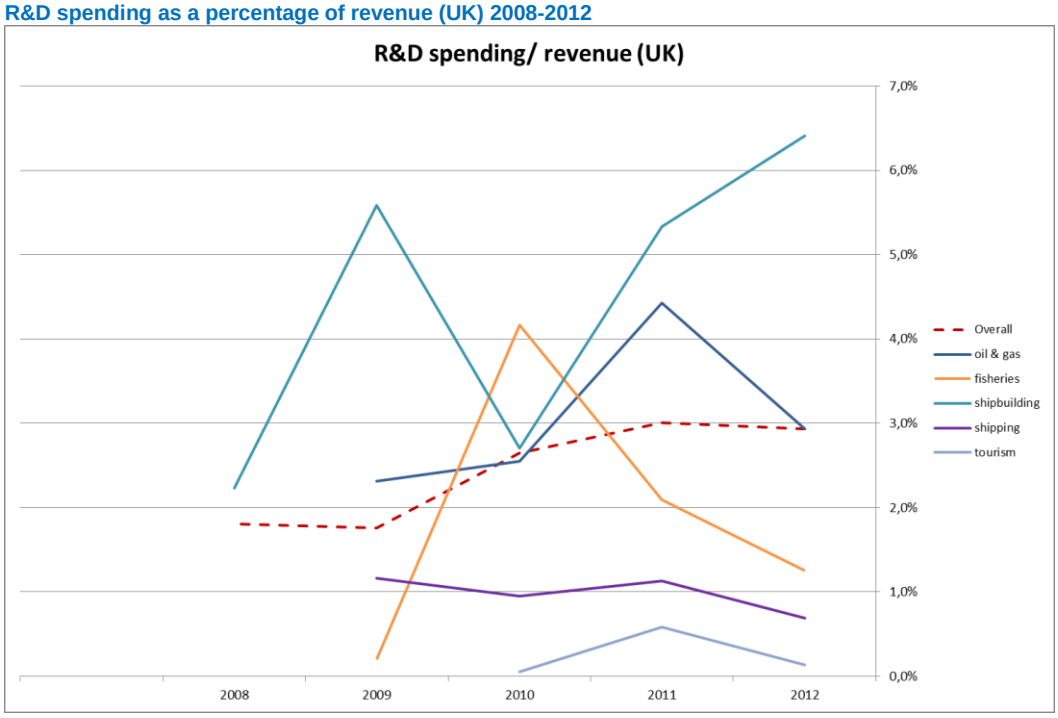
As indicated, Amadeus data can only be reported for the UK. R&D expenditure/turnover figures can be presented for the following maritime economic activities:

- Shipbuilding;
- Shipping (both deep sea and short sea);
- Fishing;
- Oil & Gas (offshore and onshore);
- Tourism (coastal and inland tourism).

The below figure shows the R&D spending as a percentage of revenue. Shipbuilding and oil and gas show an above average R&D spending. Since 2011 shipbuilding saw a return towards a more sustainable 5% (and beyond) ratio of R&D spending. This illustrates that although the industry is relatively mature it puts a strong emphasis on innovation. Also the oil & gas industry is a mature industry. The industry has maintained a stable ratio of around 3% R&D spending.

Shipping, tourism and fisheries are relatively low R&D intensive industries, although fisheries showed a strong upsurge in the R&D intensity ration in 2010. However, this has been largely due to a large fall in revenue, since nominal R&D expenditure decreased significantly in comparison to the previous year.

Figure 3.6 **R&D spending as a percentage of revenue (UK) 2008-2012**



Conclusion on innovation per MEA in the Atlantic Arc

Based on the above indicators an overall picture arises on the innovation level of a maritime economic activity. There also appears to be an inverse relationship between maturity of the MEA and the level of innovation, which is in line with the product life cycle as well as the innovation cycle.

Table 3.13 **Innovation scores (and maturity level) of selected maritime economic activities in the Atlantic Arc**

Maritime economic activity	Innovation intensity	Maturity of the MEA
Offshore oil & gas	●●●	●●●●●
Blue Biotech	●●●●●	●
Dee Sea Mining	●●●●	●
Ocean Renewable Energy	●●●●●	●
Fishing for human consumption	●●	●●●●
Desalination	●●●●	●●●
Shipbuilding	●●●●	●●●●
Marine Aquaculture	●●●●	●●●
Shipping	●	●●●●●
Environmental monitoring	●●●●●	●●
Tourism	●	●●●●●
Coastal protection	●	●●●●
Maritime surveillance	●	●●●●
Offshore wind	●●●	●●

Promising maritime economic activities

The innovation scores per MAE have been complemented with a number of additional criteria which have been scored in a qualitative manner. These include:

- Potential for competitiveness of EU industry, in comparison to the global industry in the respective segments;
- Future employment creation;
- Relevance for EU-based policy initiatives in that specific economic activity;
- Spill-over effects and synergies with other economic activities;
- Sustainability and environmental aspects.

Based on the overall scoring of these indicators, combined with the innovation scores 7 promising economic activities have been selected per Member States. The overview below lists the promising activities per Member State.

Table 3.14 Listing promising maritime economic activities at EU Member State level

UK	Ireland	France	Spain	Portugal
Blue biotechnology	Ocean Renewable Energy	Ocean Renewable Energy	Ocean renewable energy	Blue Biotechnology
Offshore wind	Blue Biotechnology	Blue Biotechnology	Blue Biotechnology	Ocean renewable energy
Ocean renewable energy	Environmental monitoring	Marine minerals mining	Desalination	Environmental monitoring
Environmental monitoring	Offshore wind	Shipbuilding	Marine minerals mining	Offshore wind
Shipbuilding	Yachting & marinas	Offshore oil & gas	Offshore wind	Marine minerals mining
Offshore oil & gas	Cruise tourism	Environmental monitoring	Environmental monitoring	Offshore oil & gas
Cruise tourism	Coastal protection	Maritime surveillance	Maritime surveillance	Shipbuilding

Note: Cells in colour represent maritime economic activities which are prominent in all countries

3.6 Maritime policy in the Atlantic Arc

As part of this study existing policies, both at a EU and at a country/regional level have been identified. These are described below. At the EU level we limit ourselves to activities that are specifically undertaken towards the Atlantic Arc sea basin.

3.6.1 EU level policies

There are a number of EU-wide policy intiatives governing the region of the Atlantic Arc. Regional (sea-basin level) strategies have been more dominant following the adoption of the Integrated Maritime Policy for the European Union[91] which had reinforced the view that growth and development of EU level maritime industries would benefit from coordinated and streamlined sea-basin level initiatives.

[91] EC (2007): Integrated Maritime Policy fot the European Union, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0575:FIN:EN:PDF

One of the most recent sea-basin level policy initiatives relevant for the Atlantic Arc is the Atlantic Action Plan which has been introduced with the intention to " revitalise the marine and maritime economy in the Atlantic Ocean Area"[92]. In order to ensure integration of EU-level objectives Partnership Agreements submitted by Member States on the use of the Structural, Cohesion or Regional Development Funds will need to highlight linkages between national level objectives and those of the Atlantic Action Plan.

The underlying objective of the Atlantic Action Plan is to identify investment and research priorities in the sea-basin that could be considered for EU financial support in the new programming period of 2014-2020. Based on the above, the four priorities of the action plan are:

- Promote entrepreneurship and innovation;
- Protect, secure and enhance the marine and coastal environment;
- Improve accessibility and connectivity;
- Create a socially inclusive and sustainable model of regional development;

Another overarching strategy relevant for the Atlantic Arc is the OSPAR Commission`s[93] North-East Atlantic Environment Strategy which is aimed at identifying and assessing the main threats and challenges to the ecosystem in the Region. The Strategy has identified six main thematic objectives where monitoring and evaluation work is being carried out to measure the impacts of policies on the marine environment. These six thematic objectives are:

- Biodiversity and ecosystem;
- Eutrophication;
- Hazardous substances;
- Offshore industry;
- Radioactive substances;
- Integrated management of human activities;
- Achieve good environmental status under the EU Marine Strategy Framework Directive by 2020.

Integrating EU-wide objectives into regional and local projects whilst maintaining a cohesive maritime environment is an important and challenging element of regional and industrial development. The European Commission, through its Seventh Framework Programme for Research and Technological Development (FP7) has supported initiatives such as the SEAS-ERA project[94] which aims to improve coordination, promote harmonisation between national and regional research programmes and at the same time foster synergies at regional and Pan-European level.
The project brings together 21 partners from 18 countries with the intention of strengthening maritime research across the European Union. The project has published its Atlantic Research Plan in December 2013[95] where among the main findings were the need for increased ocean observation and monitoring (including seabed mapping) as well as infrastructure (e.g. observatory) to map and gather relevant data.

[92] EC (2013): European Commission unveils maritime strategy for the Atlantic, http://europa.eu/rapid/press-release_IP-13-420_en.htm

[93] OSPAR is the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the North-East Atlantic, http://www.ospar.org

[94] Towards Integrated Marine Research Strategy and Programmes (SEAS-ERA) http://www.seas-era.eu

[95] SEAS-ERA (2013): Towards a Strategic Research Agenda / Marine Research Plan for the European Atlantic Sea Basin, http://www.seas-era.eu/np4/%7B$clientServletPath%7D/?newsId=19&fileName=SEAS_ERA_D_6.1.4_Atlantic_Report_FINAL_2.pdf

It is important to note that there are a number of wider regulative elements applicable for all maritime regions, thus providing a strategic framework for development. These include the Marine Strategy Framework Directive (MSFD) adopted in 2008 and the Maritime Spatial Planning Strategy which currently undergoing inter-service consultation.[96] Maritime spatial planning will be particularly important in connection with projects building on synergies of key maritime activities (e.g. shipping) while MSFD is essential for maintaining good environmental status – including biodiversity – which can impact on industries such as aquaculture or tourism.

3.6.2 Main national policies

The following table provides an overview of the key national level maritime policies in the countries of the Atlantic Arc selected for this study.

[96] European Commission (2013) Directive of the European Parliament and of the Council establishing a framework for maritime spatial planning and integrated coastal management http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0133:FIN:EN:PDF

Table 3.15 Main National Maritime Policies of the EU Member States in the Atlantic Arc

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
SPAIN					
National Strategic Plan for the European Fisheries Fund 2007-2013 + OP for the Spanish Fisheries sector *(Plan Estratégico Nacional del Fondo Europeo de La Pesca 2007-2013 + Programa Operativo para el sector pesquero español).*	The strategy pursues the adaptation of the fishing fleet, in order to ensure the future exploitation of living aquatic resources that provides sustainable environmental and social conditions, while ensuring a long-term economic sustainability.	• Management and adaptation of the fishing fleet; • Sustainable development of aquaculture activities; • Sustainable development, and processing and marketing of fishery products; • Sustainability of fishing areas; • Improving competitiveness in fisheries; • Preservation of human resources in the fisheries sector; • Protection and improvement of the aquatic environment related to the fisheries sector; • Inspection and control of fishing activities, through data collection and information systems and procedures on the common fisheries policy and sanctions regime; • Market supply and maintenance of fishing by Spanish vessels outside Community waters.	• Fishing effort adjustment actions: cessations (shipbreaking) and conversion to other uses (recreational); • Promote investment to improve safety and working conditions of workers and energy efficiency; • Support to traditional coastal fishing; • Promote of R & D by improving energy efficiency, improving seaworthiness of vessels and use of more selective techniques.	• Reduction of the fishing effort in order to restore fisheries; • Reinforcement of employment in the fishery sector; • Reduction of operating costs to increase the benefit of fishermen and fisheries sustainability improvement.	The total amount forecasted is €946M, as its breackdowb is described in the Operational Programme. Financial sources are: FEDER, FSE, Innovation plans, Spanish Central Administration (Fisheries Directorate General), and Autonomous Regions, etc.
National Action Plans on Marine Aquaculture *(Planes Nacionales de Cultivos Marinos).*	The purpose of these plans is to promote and develop marine aquaculture in an harmonised way in the whole country. They are oriented towards	Efforts focus on research, development and innovation, as well as any complementarity activity related to marine aquaculture whose achievement is considered important for the harmonious development of the sector.	• Develop a solid aquaculture sector in the Spanish marine sector; • Increase maritime revenue and new income sources through the development of the sector; • Create employment opportunities; • Promote sustainable fishing; • Protect marine enviroment and biodiversity.		Each plan elaborates a breackdown on the cost and activities to be realised. No data on the total amount invested on marine aquaculture is provided by the Ministry of Agriculture, Food

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
	the achievement of specific and concrete objectives to eliminate ambiguities and generalities and to be of interest to a significant portion of the country. The plans are elaborated by the Governement and the Autonomous regions, but co-ordinately executed by the Autonomous Regions under a specific plan for each marine species. The evaluation of those plans is commissioned to the Junta Nacional Asesora de Cultivos Marinos. From 2011-2012 a total of 38 plans have been elaborated and executed.				and Environment.
River Basin Management Plans *(Planes Hidrológicos de Cuenca*[97]*).*	The plans are elaborated to ensure the good condition and adequate protection of public water and wastewater, meeting water demands in balance with regional	• Drainage and water treatment initiatives; • Ensure water provision; • Modernisation of Irrigation methodologies and practices; • Flood management; • Restoration of water bodies in humid areas;	• Develop measures concerning Water Stations Treatment, deposits and pumping tools through the improvement of supply networks; works in dams and weirs; improved catchments and pipeline; • Realise drainage and water treatment works through improvements in wastewater treatment plants, manifolds and sanitation networks; • Support the modernization of irrigation activities and		Each plan elaborates a breakdown on costs and activities to be realised. Financial support is safeguarded through recuperation costs instruments, such as water surcharge and water supply

[97] A total of 18 plans approved. http://www.magrama.gob.es/es/agua/temas/planificacion-hidrologica/planificacion-hidrologica/planes-cuenca/default.aspx.

Policy	Objectives	Priorities	Consequences for maritime activities Impacts on sustainable growth	Investment and funding
	and sectoral development. The different actions aim to safeguard the availability of the resource, while protecting its quality, saving water dependent related jobs and streamlining their uses in harmony with the environment and other natural resources protection, through holitis and long-term initiatives. Water planning should contribute to mitígate the effects of floods and droughts, guided by the sustainability criteria in the use of water.	• Energy and water regulation; • Planning and administrative control of water.	practices through the investment in lower water consumption systems, improvements in canals and ditches and implementation of regulatory measures and concessions; • Develop flood management actions through the design of an Early Warning System including prevention plans; improvement works in dams, channels and defense flecks restoration. • Support actions for the Restoration of rivers, waterfront redevelopment, restoration Wetlands, etc • Develop administrative Measures to complement Water management and prevention mechanisms. • Develop Networks for water control (AHIS-SAICA) and cost recovery rate update, rules and regulations of uses, development of good practice codes, awareness campaigns and environmental education.	tariffs.
Guidelines for Integrated Coastal Area Management *(Plan estratégico Directrices Gestión Integrada de Costas[98]).*	These guidlines serve to identify and promote measures to halt and reverse the erosion of environmental resources, deterioration of socio-economic and cultural resources in coastal areas, and to improve	• Preservation and restoration of the values and functions of the natural and scenic coastal strip ; • Natural recovery in degraded coastal areas or excessively urbanized zones . • Protection of the beach as a natural area with high environmental values ; • Recovery of natural spaces of the	• Attend the incessant growth of the coast demand exceeding in many cases the capacity load of the beaches and fall of the environmental quality of these urban coastal areas . The recovery of the coastal edge quality of these cities and urban areas is closely linked to the pressure relief on edificatoria on seashore ; • Transform urban waterfronts to protect and preserve the coast, and to "recover naturally" the degraded coastal and urbanized areas ensuring the environmental quality and the general interest of the coast;	The Coasts Directorate General has a specific financial item for urban coast areas' protection and regeneration. The amount is included in the General State Budget.

[98] http://www.magrama.gob.es/es/costas/temas/proteccion-del-medio-marino/la-union-europea-y-la-proteccion-del-medio-marino-y-costero/gizc.aspx

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
	their overall situation. They intend to provide guidance on what should be the content, approach and objectives of coastal works projects, among which are those that pursue the integrity protection of the coast as well as its free public access and use.	waterfront ; • Protection and defence of the integrity of public land and maritime areas and access for general use ; • Ensuring the public use of the seashore and the rest of the public domain seascapes ; • Improvement of open access, transit and public use of the coast in those stretches where there is some privatization of the coastline.	• Support routes works and nature trails on non-urban coastal areas that allow exploring the coastline walk and enjoy the scenery and natural value of Spanish Coast ; • Develop actions for free access, transit and public use of the shoreline by integrating trails and itineraries in harmony with the environment, reducing their impact as much as possible, both physically and visually.		
Strategic Infrastructure and tranport plan 2005-2020. *(Plan estrategico de Infraestructuras y Transporte 2005-2020[99]).*	The plan ensures the effective integration of Spanish transport system to European transport policies, by the increase in the relative weight of the different transports involved in intermodal transport (air, road, rail and maritime) both in long distance movements of passengers and goods.	Particular attention will be given to maritime (and air links connections), in order to better integrate these networks in non-mainland areas of Spain.	Increase by 2020 national operators presence in the maritime transport market, to attain an economic share proportionate to the country's weight in the EU/International level; and support intermodal operator (with participation in rail, sea and road) activities to the average levels of the European Union.		A total of investment effort of € 250,000 M; through direct investment (State and Central Government Administration), Indirect investment (Autonomous Community, Municipality, Public Corporation or Holding Company), EU funds, Public Private Partnership agreements and deferred mechanisms (i.e. Automobile charge, special levies, etc). The amount for Sea transport and ports is 23,460million and, in the frame of intermodal transport , a total of 1,220millionis foreseen for "Land access to ports projects".
National Action	The plan seeks the	• Adaptation of R&D and innovation	• Biodiversity: protect inland aquatic ecosystems, realise		n/a

[99] http://www.fomento.gob.es/MFOM/LANG_CASTELLANO/_ESPECIALES/PEIT/

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
Plan for Adaptation to Climate Change. *(Plan Nacional de Adaptación al Cambio climático[100]).*	integration along all sectors and/or systems of climate change adaptation measures in order to implement and develop state-level commitments that the country has gained in the international context of the United Nations Framework Convention on Climate Change (UNFCCC) and the European Union. The plan is conceived as a continuous and cumulative process of knowledge generation and capacity building, as well as a tool for decision makers related to climate change adaptation policies.	scheme to the needs identified in the field of climate change; • Development of a permanent process of information activities and communication of projects evolution ; • Promotion of participation of relevant actors through their involvement in the different sectors / systems ; • Elaboration of specific reports taking in hand the results of the evaluations and projects ; • Preparation of periodic reports for the monitoring and evaluation of the joint projects and the National Adaptation Plan.	evaluation studies of protected natural areas, create a biological indicator system, etc. • Fisheries and marine ecosystems: climate change supposes a reduction of Spanish waters productivity given its characteristics of warm temperate seas, that may infer a change in the distribution of many species. Also, unsubsidized mariculture with food may be affected by the reduced marine productivity. Increases in the presence of toxic phytoplankton species or cultivated species parasites, are favoured by the temperature increase of coastal waters. The plans support the evaluation of marine protected area networks to mitigate these impacts. • Coastal areas: a rise in the level of the sea may have an impact on deltas and coastal wetland areas for agricultural use or built in the vicinity of estuaries or coastal floodplains. At this regard the plan includes the evaluation of potential actions to enhance stabilization of beaches and dunes, construction works to protect transport capacity of the incident wave and artificial sediments. • Transportation: a rise in sea level, changes in the regime rainfall, winds, waves, etc., could have numerous impacts on ports and maritime transport; • Tourism: Areas most vulnerable to climate change are located in the coastal area (with a high degree of artificiality), which supposes a threat to the Spanish main tourism product, tourism of sun and beach. On the other hand, the sea level rise threats the current location of certain tourist settlements and their infrastructure.		
National Action Plan for renewable energy 2011-2020. *(Plan de acción*	The plan promotes the use of energy from renewable sources, with the objective that	• Liberalization and the promotion of transparency in energy market as well as the development of international interconnections in	• Develop a specific regulatory framework for the development of the Sea Energy projects ; • Develop scientific research and innovation lines, to promote technological development of renewable		The financial support is assured through the determination of specific compensation values for each

[100] http://www.magrama.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/pna_v3_tcm7-12445_tcm7-197092.pdf

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
nacional de energías renovables 2011-2020[101]*).*	renewable sources account for at least 20% of final energy consumption in 2020, with a contribution of 10 % of renewable energy in the transport sector t in that year.	the electricity and gas sector; • Development of energy infrastructure to improve security and diversification of energy supply sources through the modernization of networks, the development of LNG regasification plants, underground natural gas storages and strategic reserves of petroleum products; • Promotion of the use and consumption of renewable energy and energy efficiency and savings, by increasing the investing effort in technology, advances in the management of the system, the use of storage techniques such as pumping, or the development of renewable energy facilities with a storage capacity.	energy prototypes at sea; • Develop specific marine technologies, designed for the deployment of deepwater projects.		renewable-energy aiming to contribute to the investment efforts realised in this field. These compensation values for the remuneration of the renewable energy production are established by royal decree, RD 485/2009.
Spanish Strategy for the conservation and sustainable use of the biological biodiversity, *(Estrategia española de conservación y uso sostenible de la biodiversidad biológica*[102]*).*	Increase the knowledge and conservation of biodiversity as a whole, protecting the variety of life forms, species and communities, and the maintenance of ecological processes.	• Promotion of active cooperation between all parties involved, both from the different public and private institutions and the various social and economic groups, to achieve a company-wide commitment to the ration and sustainable conservation of biological diversity ; • Incorporation of the principles of restoration, conservation and sustainable use of biodiversity in planning processes	• Identify the areas likely to be part of the list of Specially Protected Areas for its importance in the Mediterranean (ZEPIM) according to the Fourth Protocol of the Barcelona Convention, as well as marine areas appropriate to the process of implementation of Annex V of the Convention on the Prevention of Marine Pollution (OSPAR), as and create a technical-administrative database for these areas ; • Develop restoration plans for natural habitats, terrestrial, marine and freshwater gradients, necessary for the prior development of the necessary guidelines for their development and implementation ; • Elaborate a Planning for the use of land and the		n/a

[101] http://www.minetur.gob.es/energia/desarrollo/EnergiaRenovable/Paginas/paner.aspx
[102] http://www.magrama.gob.es/es/biodiversidad/servicios/banco-datos-naturaleza/informacion-disponible/descargas_es.aspx

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
		and sectoral and intersectoral policies ; • Establishment of planning management mechanisms for the conservation of natural resources in the medium and long term ; • Promotion of research, knowledge generation activities and training on biological diversity ; • Incrementation of education, outreach and information efforts to raise awareness on citizenship and achieve social involvement in the conservation and sustainable use of biological diversity ; • Articulation of policy instruments and financial resources, through the adaptation of existing instruments or through the possible establishment of new ones ; • Involvement of bilateral and multilateral programs and active participation in all initiatives arising between countries towards the better conservation of natural heritage, in line with the gaining momentum of international cooperation in this area.	maritime space, that ensures the conservation of biological diversity ; • Develop specific protective measures on the landscape as a way of preserving habitats and species that do not fall on the Special Areas of Conservation in the marine environment ; • Establish animal reserves or marine sanctuaries, and as well as a Center for Marine Biodiversity.		
FRANCE					
Grenelle de la Mer (National strategy	1- Research into and respect for the	• Research and innovation • Protection and development of	• More resources for improved coastal	It is not yet possible to	Desk research has not revealed the overall budget of

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
for the Seas and the Oceans)[103]	marine environment; 2- Development of a sustainable maritime economy; 3- Promotion of the maritime dimension of France's overseas territory 4- Affirmation of France's place in Europe and the world at large	coastal and marine areas • Protection of marine biodiversity • Transports, ports and naval industry • Marine resources other than fisheries • Tourism, yachting, sport and leisure • Pollution • Training, professions • Public awareness, communication, education • Governing	management; • Setting up of a network of marine protected areas for 10% of oceans by 2012 and 20% by 2020; • Reduced greenhouse gas emissions from maritime transport by 20% by 2020; • Development of a national ports strategy, reconsider shipbuilding industry; • 3% of all energy consumed to be generated from maritime energy by 2020; • Coastal tourism activities to be placed in a sustainable development perspective; • Strengthen the legal framework on pollution, reduce	assess the impact of the 'Grenelle de la Mer' policy on sustainable growth. The policy has not yet been the object of an overall evaluation. The last publicly available progress report[104] (March 2012) refers to several on-going projects, launching of funding mechanisms, creation of supporting agencies, development of ad hoc strategies. However, their impact on sustainable growth is not yet visible.	the policy. However, investment levels for certain specific policies and initiatives are hereafter reported: • Industrial programme 'Navire du futur': 100 m€ ; • Investment fund for maritime ports (2009-2013): 2.4 m€ Marine renewable energie : 100 m€[105]

[103] All information concerning the 'Grenelle de la Mer' has been retrieved from the official website of the policy initiative as well as from the progress reports published by the French Governement. If otherwise, alternative sources have been reported. For more information, see : http://www.developpement-durable.gouv.fr/IMG/pdf/09024_HS-Grenelle-Mer_Engagements_GB_23-12-10_web.pdf and http://www.developpement-durable.gouv.fr/IMG/pdf/Grenelle_de_la_mer_2eme_rapport.pdf

[104] For more information, see the second and last progress report : http://www.developpement-durable.gouv.fr/IMG/pdf/Rapport_d_etape_-_Grenelle_de_la_mer.pdf

[105] http://www.geo.fr/environnement/les-mots-verts/energies-renouvelables-40381

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
			effluents released into oceans, fight against floating waste, se up specific funding; • Adapt and structure training programmes, strengthen establishments providing training in seafaring occupations and encourage synergies.		
IRELAND					
Our Ocean Wealth[106]	Harnessing Our Ocean Wealth is an Integrated Marine Plan (IMP), setting out a roadmap for the Government's vision, high-level goals and integrated actions on achieving economic growth in maritime economic activities. On an operational level, it defines three goals: Goal 1 focuses on a thriving maritime economy, whereby	The following measurable Ocean Wealth 2020 Targets have been defined: • Double the value of our ocean wealth to 2.4% of GDP by 2030. • Increase the turnover from the ocean economy to exceed €6.4bn by 2020.	Among the direct consequences for maritime activities are: • Good governance and maritime safety, security and surveillance are vital cornerstones and will receive further attention • Cross-sectoral integrated marine policy, planning and decision-making at • The delivery of	Healthy marine ecosystems, including a clean, green environment is defined as one of the key enabling goals to harness the benefits of Blue Growth. 12 out of the 39 policy actions related to Our Ocean Wealth are dedicated to achieving the goal	

[106] Harnessing Our Ocean Wealth, 2012: An Integrated Marine Plan for Ireland. July 2012.

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
	Ireland harnesses the market opportunities to achieve economic recovery and socially inclusive, sustainable growth. Goal 2 sets out to achieve healthy ecosystems that provide monetary and non-monetary goods and services (e.g. food, climate, health and well-being). Goal 3 aims to increase the people's engagement with the sea with the aim of strengthening the maritime identity and increase our awareness of the value (market and nonmarket), opportunities and social benefits of engaging with the sea.		more efficient and effective public services; the removal • Healthy marine ecosystems, including a clean, green environment, • Green marine products and services (e.g. in our food and tourism sectors) • implementation and compliance with environmental legislation. Equally, we need • drawing on strengths in Research, Technology, Development and Innovation (RTDI) in marine science and technology • An enabling infrastructure (e.g. ports, piers, electricity grid, research infrastructure) • Close North/South cooperation and collaboration with our Atlantic neighbours and		

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
			international partners		
The SmartOcean Research and Innovation Strategy 107	The strategy, launched in 2010, is a part of the Marine Institute's National Marine Technology Programme , dedicated to facilitate a range of research and development activities in the area of sensor development, data management and information systems for application driven technology development in marine ICT. The strategy seeks to harness Ireland's natural marine resources and specialist expertise in Marine Science and ICT to establish Ireland as a leader in the development of high value products and services for the global marine sector.	The strategy seeks to establish an Irish position for marine ICT development and enable future opportunities such as those that will emerge from Horizon 2020 to be strategically targeted in a global and EU context.	This includes the delivery of next generation technology products and services for marine sectors such as aquaculture, environmental monitoring, shipping and security and marine renewable energy. Currently, a public consultation is launched to which Blue Growth stakeholders in Ireland are invited to contribute	There are currently over 50 indigenous and multinational companies based in Ireland engaged in the development and provision of High Tech Marine products and services to the Global Marine Sector. These include the provision of remote sensing systems, data management and visualisation tools, modelling, simulation, forecasting and engineering design supporting operational management.	•
Sea Change – A Marine Knowledge, Research &	The primary objective was aimed at driving the development of the	• Strengthening the competitiveness and environmental sustainability of	Building upon the 2007 and 2008 investment	The SeaChange strategy has been implemented via three research measures	• Since the launch of Sea Change, an estimated €119m has been

[107] See also: http://www.smartocean.org/Home.aspx and Harnessing Ireland's Potential as a European and Global Centre for Ocean Technologies. Inspire – Initiate – Innovate. Marine Institute.

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
Innovation Strategy for Ireland 2007-2013[108]	marine sector as a dynamic element of Ireland's knowledge economy.	the marine sector by alignment between public sector & third-level research capacity and industry needs; • Building new multidisciplinary research capacity and capability in fundamental technologies that can be applied to marine-related activities • Delivering a comprehensive planned policy research programme	commitments, new investment of ~€2.15m was committed by Marine Institute managed research funds in 2009, supporting research and training on board the national research vessels. This brings the total committed under the NDP Marine Research Sub-Programme to € 49.7m. During 2009, the Sea Change Team were actively engaged in supporting 3 major emerging national R&D programmes in Marine Biotechnology, Advanced Marine Technology and Renewable Ocean Energy.	(industry, discovery and policy support), and two supporting programmes (innovation and infrastructure)	committed (nationally and internationally) in marine-related research: • 41% of which comes from Marine Institute managed NDP funds; • 39% from other national funding bodies; and • 20% from international funding. • research investment focuses on funding projects that address policy issues or potential development opportunities and build research capacity in specific areas – e.g. marine functional foods, marine biotechnology, fisheries management, ocean energy and marine technology.
Food Harvest 2020[109]	National Strategy to align the entire food sector in Ireland (including also seafood) with the	The reports set out three measurable targets to be achieved by 2020: A 33% increase in the value of the primary agriculture	Seafood, aquaculture and fishing are included in the Food Harvest 2020 blueprint.		

[108] http://www.marine.ie/home/research/SeaChange/ and http://www.marine.ie/home/research/SeaChange/Update+on+Progress/

[109] http://www.agriculture.gov.ie/agri-foodindustry/foodharvest2020/ and also: Department of Agriculture, Food and the Marine: Food Harvest 2020. Milestones for Success 2013.

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
	objectives of the Europe 2020 agenda and contribution to smart, green and sustainable growth.	An export target of €12 bn A 40% increase in value-added from 2008 baseline year	In terms of concrete output of the Food Harvest 2020 in terms of maritime economic activities, two offshore aquaculture sites have been selected in Galway Bay, as well as two sites of offshore aquaculture determined; an assessment of the EU market for organic salmon was carried out with positive results for the market segment		
National Marine Biotechnology Programme[110]	The Marine Institute established Marine Biotechnology Ireland as a national programme in 2007 to deliver on the objectives of Sea Change: A Marine Knowledge, Research & Innovation Strategy for Ireland 2007-2013. The objectives are to create and sustain Irish opportunities for research, development and innovation in marine biotechnology		The actions of MBI are focused on stimulating the utilisation of marine organisms and materials for the sustainable production of food, drugs, biomaterials, nutraceuticals and industrial processes.	MBI will establish a strong collaboration with the growing biopharma sector in Ireland; Building links between marine biotechnology research and the medical device and diagnostic sectors; Stimulating the use of marine origin materials by Ireland's agri-food sector; Encouraging the use of biological processes to help maintain healthy environments and Promoting the sustainable exploitation of Ireland's marine resources.	Since 2007, an excess of €20 m to develop national research capacity in marine biotechnology and marine biosciences have been invested. Additional national and international funding sources further support scientific investigation in molecular and nanosciences.

[110] http://www.marine.ie/home/research/SeaChange/NationalMarineBiotechnology/

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
	and to focus on strategically important research areas. Another objective lies in the fact of acquiring through the commercialisation of marine biotechnology research outputs.				
2013 National Ports Policy[111]	Facilitate a competitive and effective market for maritime transport in Ireland Ultimately, to call for a more differentiated support structure of ports according to their significance To pool public support at national level to the ports of national significance	The Policy Statement states that most of the harbours would best achieve their potential through transfer to local authority ownership. In harbours where significant commercial traffic exists, consideration will be given to bringing such harbours under the control of a port company.	Commercial port activities will be geared more towards generating economies of scale and increase capacity Individual port companies will have to be open to private-sector driven investments More regional / local policy support (for ports of regional significance)	Policy framework to allow the commercial port sector to develop in a sustainable manner	In the policy blueprint of the 2005 Ports Policy Statement, it stated that ports should receive no further Exchequer funding for infrastructure. Projects that can demonstrate strong cash flow and attract private-sector investors are welcomed (commercial basis with commercial return)
Steering a New Course – Strategy for a restructured, Sustainable and Profitable Seafood Industry for the period 2007–2013"112	Specific recommendations (12) to implement the industry vision of a profitable seafood industry		Key Recommendations included the Processing Sector, fleet restructuring and development, fisheries management, aquaculture development, marine environment and conservation		It recommended a budget of €55 m for marketing over the seven-year period, which on an average annual basis amounts to €7.8 m. In all a total of €334 m is being requested over the seven year duration of the programme. This State supported

[111] Department of Transport, Tourism and Sport, 2013: National Ports Policy. Available here: http://www.transport.ie/upload/general/13776-NATIONAL_PORTS_POLICY_2013-1.PDF

[112] http://www.agriculture.gov.ie/media/migration/fisheries/marineagenciesandprogrammes/seafooddevelopmentinireland/SteeringaNewCourse141111.pdf

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
					investment will in turn be used to leverage a further €263 m by way of private sector funding.113
Galway Statement on Atlantic Ocean Cooperation particularly in relation to climate change.	Signed by representatives of the European Union, the United States and Canada, the signees agreed to join forces on Atlantic Ocean Research. The goal is to better understand the Atlantic Ocean and promote the sustainable management of its resources. The Agreement aims to connect the ocean observation efforts of the three partners.	• Increasing the knowledge on Atlantic Ocean • Aligning ocean observation efforts to improve sustainable ecosystems • Coordinate data sharing, interoperability and coordination of observing infrastructures	• Promote citizen's understanding of the value of the Atlantic by promoting oceans literacy. • Indicate how results of ocean science and observation address pressing issues facing our citizens • Coordinate the planning of relevant activities, including researcher's mobility		
PORTUGAL					
National Ocean Strategy 2013-2020 *(Estratégia Nacional para o Mar 2013-2020)*	1. Recover a national maritime identity 2. Foster the economic, geostrategic and geopolitical potential 3. Create conditions to attract	Natural resources: Ocean, Atmosphere and Integrated System Governance: Administration, Strategic thinking Education, science and technology, Communication and culture and protection and safeguarding Non-living natural resources: marine mineral resources and marine energy resources	Given its integrated approach and its cross cutting nature, the strategy will have an impact to all maritime activities. Although the strategy has not been implemented yet, the following (illustrative) impacts can be		The total investment has not been designed yet. The plurianual budgets will be determined under the different action plans together with the other stakeholder. In general, it can be said the funding will come from national (from the government and from other relevant

[113] Steering a New Course – Strategy for a restructured, Sustainable and Profitable Seafood Industry for the period 2007–2013. P. 142.

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
	domestic and international investment in all sectors of the maritime economy to promote growth, employment, social cohesion and territorial integrity, and reaching, by 2020, a 50% of direct contribution of the maritime sector to the national GDP 4. Strengthen scientific and technological activities to increase the "knowledge of the sea" and to promote an efficient and sustainable use of resources 5. Enhance the role of Portugal within the European IPM, in particular for the Atlantic Area	Living natural resources: fishing and seafood industry, aquaculture and blue biotechnology Other activities: ports, transports and logistics leisure, sports and tourism, shipbuilding and repairing and water projects	foreseen: - the development of the onshore and offshore aquiculture will reduce the negative fishing trade deficit - the enhancement of the R&D activities and genetic resources will have develop the blue technology sector - the underwater and its non-living resources exploration will develop a wide range of activities and sectors, from shipping and port infrastructure, environmental monitoring and technology development - the enhancement of the maritime renewable energies will contribute to the decarbonisation of the economy as well as the improvement of the domestic industry - shipbuilding and shipyard sector restructuring will enhance the competitiveness and production of the sector - improving marinas infraestructuras and sector		maritime-related organisms) and European sources as well as other cooperation financial instruments available. It is also expected to attract private invest, mainly FDI and venture capital funds.

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
			internationalization will boost the coastal and maritime tourism		
Strategic plan for transport. Sustainable mobility, 2011-2015 *(Plano Estratégico dos Transportes. Mobilidade Sustentável 2011-2015)*	1. Meet external commitments assumed by Portugal and make the sector financially balanced and affordable for taxpayers 2. Enhance the competitiveness and development of the national economy; 3. Ensure efficient mobility and accessibility for people and goods, promoting social cohesion.	Passengers Public transports Road infrastructure Maritime transports and ports Logistics Air transport Governance and regulation	In the field of maritime transport, the Plan foresees a number of important investments in Portuguese ports related to building and enlarging container terminals, construction of Port Logistics Platforms, improvement of the Zones of Logistic Activities and cruises terminals. Those projects will improve the Portuguese ports system and will positively affect the competitiveness in the maritime transport sector as well as the cruise tourism.		Given the scarcity and limited public resources, the Plan encourages the participation of the private sector. As far as the investment in the maritime transports is concerned, the Plan presents investment projects (underway or under study) with a value of € 2 456.85 m to be funded via private, public investment and EU funds.
Coastal valorisation and protection Plan for Portugal (PAPVL) 2012-15 *(Plano de Ação de Proteção e Valorização do Litoral 2012-2015)*	Define the political and strategic vision to improve and valorise the coastal area in Portugal	Coastal defence and risk areas Studies, management and monitoring Plans and regeneration projects	The main objective of the plan is to protect and improve the Portuguese coastal through an important number of initiatives such as: - Interventions to ensure the safety of persons and property; - Maintenance / rehabilitation works of defence / coastal	-	The plan include 3030 action with a total cost of € 41 thousand m: - Coastal defence and risk areas: 98 actions, € 211 thousand m - Studies, management and monitoring: 23 actions, € 16 thousand m Plans and regeneration projects: 182 actions, € 189 thousand m

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
			protection; - Monitoring of the evolution of coastal systems - Inventory, mapping and evaluation of resources and sedimentary reserves (sand) on the continental shelf - Plans addressed to risk areas, particularly where there is erosion / retreat of the shoreline - Rehabilitation of degraded urban areas in Domain Hydride - Rehabilitation of degraded natural areas Thus, given the general and strategic approach of the plan, it will improve the physical conditions of the coastal areas having positive consequences to all maritime activities in particular: - The improvement in the security (goods and persons) will have		

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
			an impact on the maritime transport, tourism and ports - The rehabilitation of degraded areas will mainly improve the quality of the tourism - Actions to reduce erosion risks will also - The improvement of the marine environment will improve maritime economic activities such as fishery, fresh water, marine mining, agriculture on saline soils or aquaculture - In general, ensuring and improving access to natural resources marine will also boost technological development (blue biotechnology, energy...)		
National Strategic Plan for Tourism 2013-2015 *(Plano Estratégico Nacional do Turismo - PENT*	Quantitative targets for 2013 – 2015: - Number of night spent: growing by an annual average of 3.1%	The Plan puts the focus on the development of 10 touristic products. The ones related with the blue economy are: - Add value to the “sun and sea” model, improving resource	The following maritime related-activities are foreseen: - Enhance environmental quality and		The budget has not been designated

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
2013-2015)	the main engine for growth and continuing the diversification of demand - Revenues: growing 6.3% over the same period by increasing the average consumption of the tourist in Portugal, only possible with the skills and innovative offer of experiences.	conditions, equipment, services and surrounding landscape - Develop coastal tourism, mainly recreational boating and surfing	accessibility of beaches - Stimulate the add value to "sun and sea" tourism with complementary activities; - Development and revitalization of the Algarve as an excellence sun and sea destination - Accessible tourism - Promote surf beaches - Improvement of the marinas (infrastructures, management) - Stimulate the development of nautical activities - Organize and promote international nautical events and competitions With all those activities, it is expected that the Plan will have positive consequences for coastal tourism.		

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
UNITED KINGDOM					
National Policy Statement on ports planning[114]	To give guidance on port development	Port infrastructure development	More timely, appropriate and efficient port investment	An improved investment environment which takes account of environmental impacts	The impact on investment is not known
Electricity market reform and offshore wind energy[115,116]	To stimulate investment in offshore wind and contribute to decarbonisation objectives for power and energy supply	Value for money in financial support for offshore wind	Continuing large-scale investment in offshore wind power	Contributes to decarbonisation of the economy, which is one of the themes of sustainable growth	Intended to give investors confidence to invest in more than a further 10 GW of wind power capacity by 2020
Licensing of wind and marine energy[117]	To facilitate and coordinate deployment of renewable power plant and protect the environment	Creation of a stable licensing regime and commissioning of environmental monitoring studies	Enables the development of offshore wind and marine renewables	As above	As above
CCS pilot programme and research and development programme[118]	To deploy one commercial-scale CCS plant and develop the supply chain	Funding of capital and operating costs of plant and testing of commercial and other ancillary arrangements	Potential future use for closed gas or oil fields and aquifers	As above	Funding through a levy on electricity bills and grants from central government
Oil and gas exploration and production licensing[119]	To maximise economic production from UK Continental Shelf	Efficient exploitation of hydrocarbon reserves and attracting investment	Encourages hydrocarbon exploration and production	Sustains the oil and gas production sector in the UK and contributes tax revenues	Enables large-scale upstream oil and gas investment and downstream investment in oil refining and petrochemicals
Marine Planning	To streamline and	To allocate marine space across	More efficient,	Supplies some of the	Impact on investment is not

[114] *Department for Transport (2012), National Policy Statement for Ports, January*
[115] *DECC (2013), Energy Trends, September*
[116] *DECC (2013), Electricity Market Reform: Consultation on proposals for implementation, October*
[117] *The Crown Estate (2013), The Crown Estate role in offshore renewable energy development: Briefing*
[118] *DECC (2012), CCS Roadmap, Innovation and R&D, April*
[119] *House of Commons Energy and Climate Change Committee (2009), UK offshore oil and gas, June*

Policy	Objectives	Priorities	Consequences for maritime activities	Impacts on sustainable growth	Investment and funding
	coordinate planning control for marine activities	activities such as transport, energy and fisheries, and to regulate environmental impacts	centralised decision-making, allowing investment to proceed more quickly	institutional arrangements for delivering sustainable growth	known. No impact on funding
Marine Conservation Zones[120]	To protect species-rich marine areas	To protect from damage areas of special character or species richness	Areas set up in which marine activities are newly controlled, reduced or excluded	Improved environmental outcomes and some restrictions on economic activities	Impact on investment is not known
Community fisheries quota management	To allow more fisher involvement in catch and stock management	Local management and accountability for fisheries	Changes to institutional arrangements with the intention of reducing the incentive to over-exploit fisheries	Increased and more productive fish stocks	Discourages over-investment in vessels and requires little funding
Fisheries catch quota pilot[121]	To reduce discards from commercial fisheries	Testing reform of quota management to reduce discarding	Might lead to changes in fishering monitoring methods and quota rules	May reduce fish mortality from harvesting while maintaining landings	Direct government funding of pilot
Defence procurement	To secure future supply of military vessels	New advanced surface ships and submarines built in the UK	Continued investment and employment in naval ship yards in the UK	Large locally important employers and supply chains are sustained	Large scale investment directly funded by government

[120] *DEFRA (2013), Marine Conservation Zones: Site designation and summary of site-specific consultation responses, November*
[121] *Marine Management Organisation (2013), Catch Quota Trial 2012: Final Report, July*

Part B: In-depth analysis of six relevant maritime economic activities

As part of the study an in-depth analysis has been made of six maritime economic activities that are highly relevant for the Atlantic Arc. These comprise a mixture of mature, fast growing and promising economic activities. Prime selection criterion has been whether the Atlantic is seen to have a comparative advantage in these activities vis-á-vis other sea basin[122]. In other words, how can the Atlantic Arc take advantage of its unique character and structure of its blue economy.

The selection does not entail that activities that are not elaborated are not relevant or important for the Atlantic Arc in general or specific countries in particular.

The following maritime economic activities are elaborated in the next chapters:

- Shipbuilding
- Ocean renewable energy
- Fisheries
- Aquaculture
- Short-sea shipping
- Yachting and marinas

Each chapter follows the same structure:

- General overview of the MAE in the Atlantic Arc
- Drivers and barriers to growth
- Labour market characteristics
- Administrative burden
- Finance and research
- Good practices
- Measures to stimulate Blue growth

[122] Although obviously highly relevant for the Atlantic Arc in terms of size, coastal tourism has not been included in the final selection due to the fact that DG MARE just concluded a separate study on Coast Tourism. In exchange yachting and marinas (as being closely related to coastal tourism) has been selected to obtain further insights in this specific maritime economic activity.

4 Shipbuilding

4.1 General overview of shipbuilding and ship repair in the Atlantic Arc

Performance of the sector

The following table shows the economic importance of the shipbuilding and repair in the Atlantic Arc.

Table 4.1 **Overview of economic importance of the shipbuilding and ship repair sector in Atlantic Arc (2010)**

	GVA (€, m)	Employment	Enterprises
France	1 238	22 397	85
Ireland	7	155	40
Portugal	78	3 472	349
Spain	1 099	19 056	804
UK	1 641	24 929	n.a.
Atlantic total	**4 064**	**70 009**	**1 278**

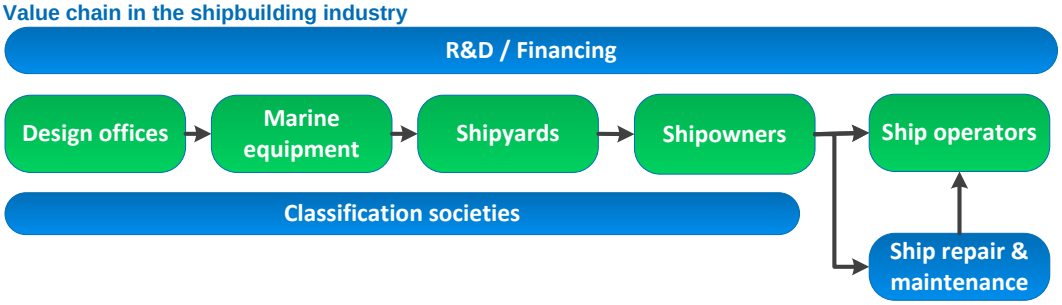
Source: Country fiches

The above figures are based on NACE sectors 30.11 (building of ships and boats), 30.12 (building of pleasure boats) and 33.15 (ship repair), but do not take account of marine equipment manufacturing, so that the overall importance in the region is likely higher than the figures given.

Value chain

The figure below shows the main actors in the value chain of the shipbuilding industry.

Figure 4.1 **Value chain in the shipbuilding industry**



Source: Ecorys (2012)

While marine equipment and design offices are placed 'upstream' from shipyards in the value chain, direct interaction with ship-owners, the decision-makers in terms of purchase takes place which implies designers and equipment manufacturers try to deal with owners directly instead of being dependent on a yard selecting their services instead of those from others.

Sub sectors in economic activity

Shipbuilding is an economic activity that contributes across most of the maritime economic sectors providing them with the vessels necessary to perform their activities. Three main components are identified:

- Shipyards involved in new building activities
- Repair and maintenance
- Marine equipment

4.1.1 New build vessels

Whereas historically, shipyards located in Europe have been active in building all kinds of ships, today the majority of commercially used ships (tankers, bulkers, container vessels) is built elsewhere, mainly in Asia (China, Korea, Japan). Yards in the Atlantic region as well as other parts of Europe have however been able to maintain a leading position in the higher value vessels, like cruise- and passenger vessels, navy vessels and offshore ships. On the other hand with declining demand in lower value segments, competitors from the Middle-East and Asia are also trying to enter these markets. For instance Mitsubishi Heavy Industry has started to build cruise vessels as well.

The following table provides the order book per country by the end of 2012. It should be noted that the figures presented for Spain, UK and France also include the orders of yards located in other sea basins that border these countries. No data for Ireland are available.

Table 4.2 Order book by Country (by the end of 2012)

	France	Spain	Portugal	UK	Total Atlantic	Total World
No.	7	57	4	14	82	5 550
1,000 GT	401	245	46	17	709	160 368
1,000 CGT	389	404	40	45	878	88 674

Source: CESA, Shipbuilding Market Monitoring, N°30

Detailed data on the types of ships built at yards in Atlantic countries cannot be derived from central data sources like CESA. However at country level various shipbuilding associations give a picture of the types of vessels being built.

The UK shipbuilding industry is mainly focusing on the construction of navy vessels. Most military vessels are built in the Clyde area, near Glasgow. Three major yards are located in Scotland: Govan (used by BAE systems) and Scotsoun, both in Glasgow and Rosyth, located in Fife and used by the Air Carrier Alliance[123]. Main military vessel types built are submarines, destroyers, aircraft carriers and support vessels. The construction of merchant vessels almost ceased within the UK and some yards used to construct offshore oil rigs, but also this production has lost its significance, possibly related to the decline of the oil and gas exploitation activities in the North Sea (see the sector report on oil & gas as part of the North Sea basin study). However, deep sea engineering and fabrication skills are still strong and are supporting the expanding offshore wind power sector, particularly along the east coast of England.

Also France has a large naval shipbuilding industry, which is the third largest naval industry in the world and the first in Europe. Main region is St. Nazaire where a.o. the naval yards DCNS and CNM are located. In the same region the cruise builder STX France is located as well. This yard is currently under pressure as competition on the world cruise market is increasing (and the cruise fleet is relatively young). The yard recently lost an order for two new Viking line cruisers to the Italian cruise builder Fincantieri. As a result the company reduced it shipbuilding capacity from 2.5 to 1.5 cruise vessels per year and looks for opportunities in non-marine sectors including wind energy and other marine renewable technologies[124]. Goal of the yard is to receive 1/3 of its turnover from other activities than their traditional cruise construction within the coming years.

The shipbuilding sector in Portugal is declining. Main shipbuilding activities are the construction of navy vessels and repair and maintenance. In 2011 the turnover fell with 68% respectively 22% compared to the period 2001-2011[125]. The sector tries to focus on the construction of more

[123] Members of the alliance are Babcock Marine, BAE Systems, the Ministry of Defence and Thales.
[124] Ludwig, T., (2013), AgS-Monitoring, Shipbuilding in Europe
[125] Ecorys (2013), Country report Portugal

sophisticated vessels and platforms. Good example is the Windfloat platform, the first floating offshore wind device that will be constructed at the largest Portuguese yard, Lisnave in Setubal.

The shipbuilding sector in Ireland is already in decline for years. Some repair services are offered, mainly on the Verolme site in Dublin. Some smaller yards offer repair and maintenance services for yachts and pleasure boats. In 2010 155 fully employed persons were working in the maintenance and repair yards. There are no employees constructing new build vessels anymore.

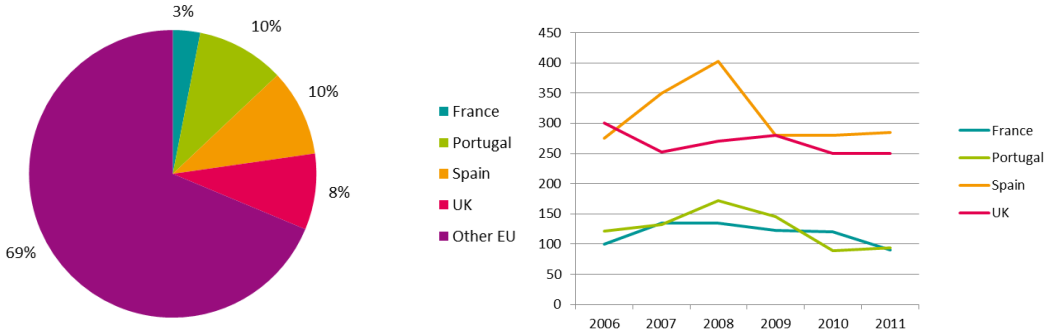
The current Spanish production is specialised in the construction of ferries, dredges, tugs, offshore vessels, earthquake and natural disasters response, ocean and marine research and some general cargo ships. Especially the private yards focus on these ship types. The publically owned yard Navantia builds navy vessels and focuses on high tech marine vessels, e.g. the final construction of the first diesel electric submarine of the world 9S-81 Isaac Peral) and the first gas propulsion vessel (aircraft carrier Príncipe de Asturias). Although the yards are already focusing in high technological vessels, the yards are still struggling. During 2011 and the first quarter of 2012, Spain's 22 privately owned yards managed to close 25 new building contracts, all for small vessels. According to Lloyd's List[126] many yards are seemingly close to collapse and some are involved in insolvency proceedings. This trend is worrisome as the Spanish shipbuilding industry has long been a backbone of employment in the country.

4.1.2 Repair, maintenance and conversion yards

The second subsector contains the repair and maintenance of ships. Repair and maintenance is a short term activity that typically lasts between 10 and 12 days. The repair can be scheduled or non-scheduled. Scheduled repairs are known in advance, and ship owners can be influenced in the planning of their maintenance. The unscheduled repairs are not planned and yards can not rely on them. Before the crisis of 2008 the repair and maintenance yards had a relatively strong position; however since the crisis competition has increased.

In terms of operational process, conversion yards are a bit similar to new build yards. Vessels stay at the yard for a considerable amount of time and the activities done are rather complicated. These yards were doing fine before the economic crisis. Since the crisis the orders declined as conversion is an expensive activity. Since the second half of 2010 yards receive some order again and the market is gradually growing again. The competition with yards elsewhere in the world is limited.

Figure 4.2 Competitive position of repair, maintenance and conversion yards in EU (2011)



Source: CESA annual report 2011-2012, modified by authors

The figures above show the market share of repair and maintenance yards in the Atlantic Arc in comparison to the rest of Europe. Ireland does not have any yards significantly performing these

[126] Ludwig, T., (2013), AgS-Monitoring, Shipbuilding in Europe

activities and is therefore left out of the figures. The right hand side shows the development of turnover of repair and maintenance in the different countries.

4.1.3 Marine equipment

A third and very important segment present in the Atlantic Arc is that of marine equipment manufacturers. This is a very heterogeneous group containing both very small as well as very large companies, and the structure differs per sub segment. The engine manufacturers are large companies that operate worldwide and do not produce marine specific products only. They have offices all over the world, but their headquarters are located in the Atlantic region. Examples are Rolls Royce and Caterpillar. The engine manufacturers sell there products both to European and Asian yards. The number of marine engine producers is limited and the mentioned European players are considered leaders in class.

Producers of emission reduction devices are often SMEs with only a few products. These companies deliver for clients based regionally mainly, with limited ability to access non-EU markets. Apart from fuel efficiency improvement, the demand for emission control relates to regulatory restriction without offering direct operating advantages to the users. Thus depending on the state of legislation they will have a business or not.

Marine equipment manufacturers also focus on solutions to reduce fuel consumption. One of the options is to improve the propulsion system of the vessels. Examples include Stone Marine in the UK who is developing new propulsions systems, and Converteam in France is focusing on the same topic. An example of a marine supplier involved in other types of equipment is MacGregor, a British subsidiary of Cargotec, who is developing and maintaining handling systems for bulk and offshore vessels, as well as hatch covers and cranes.

Finally, ballast water treatment systems are receiving increased attention following the increased ratification of the Ballast Water Management Convention, and in the past few years several manufacturers have applied for type-approval of their systems. An example of a ballast water treatment manufacturer is Hamworthy, UK.

As for new build yards, marine equipment suppliers are also affected by the economic crisis, especially because less new vessels are built and this is their main market. However as European manufacturers serve a multitude of segments worldwide; they appear more robust to market fluctuations within ship segments. The marine equipment manufacturers are also changing their business model. Instead of only selling new equipment to the ship owner, they also start to offer long life support (e.g. repair and maintenance) of the equipment. The relationship between marine equipment manufacturer and client is strengthened and once the equipment needs to be replaced the ship owner will probably chose the same manufacturer again.

4.2 Growth drivers and barriers to growth for shipbuilding

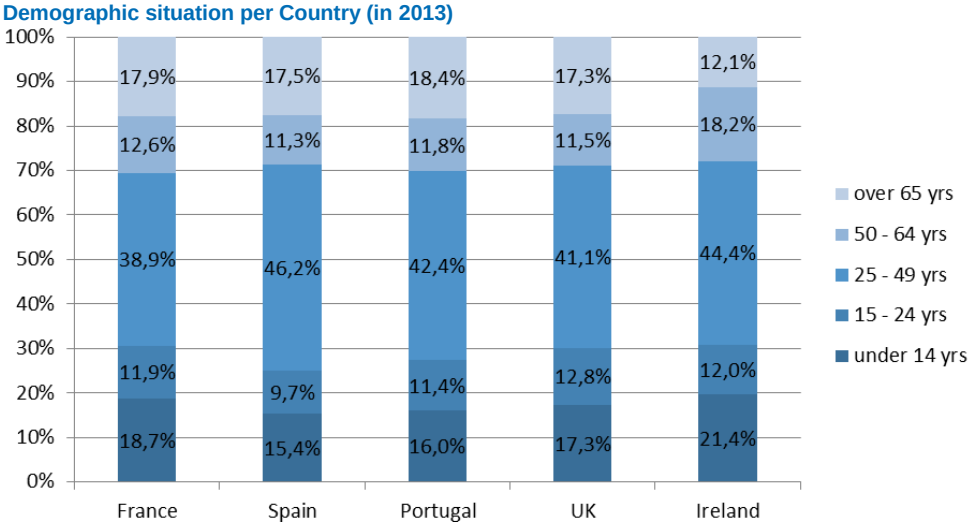
4.2.1 Labour market characteristics

Workforce characteristics

The shipbuilding and marine equipment sectors are high-tech industries and therefore require skilled workers. Common problem throughout Europe is the changing demographic situation which leads to a large group that is no longer active in the labour market. Figure 4.3 shows the current age distribution in the five countries as established in 2013. As the figure shows, in most countries, except Ireland, between 17-18% of the population is over 65 years. According to predictions made by Eurostat almost 23% of all inhabitants will be over 65 years in 2025 compared to 17% in 2000.

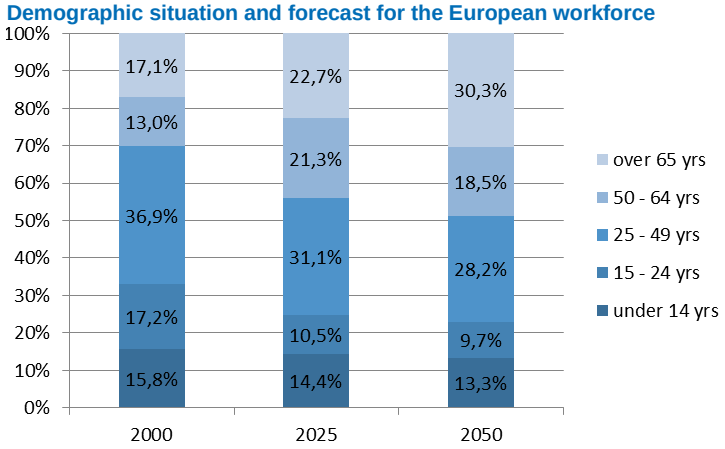
Their share will have increased to more than 30% in 2050[127]. Figure 4.4 shows the age distribution and forecast made in Europe as a whole.

Figure 4.3 Demographic situation per Country (in 2013)



Source: Based on CIA Factbooks, edited by authors

Figure 4.4 Demographic situation and forecast for the European workforce



Source: Eurostat, edited by authors

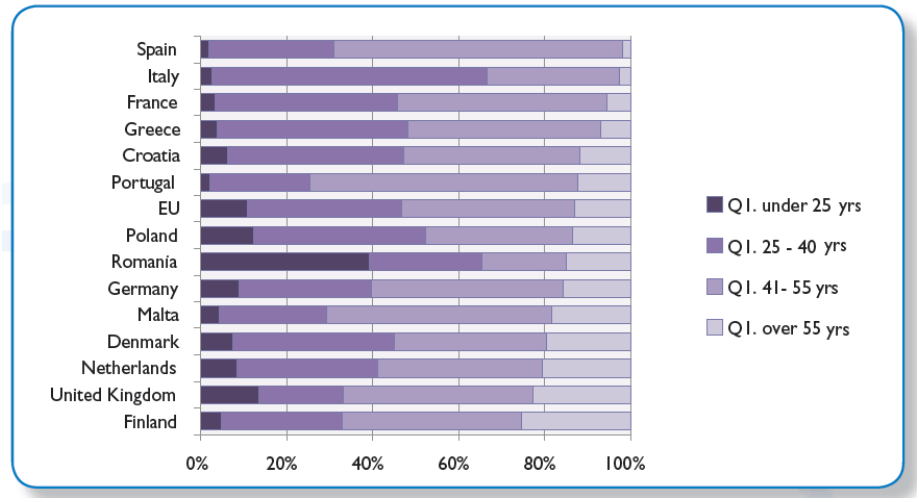
Based on the current age distribution in the five countries it can be concluded their distribution is more favourable than the EU average. In 2000 the share of people between 25 – 49 years was 36.9%. In all five countries in 2013 the share of this age group is higher than the EU average implying that their employable population is relatively larger than in other EU countries. As a consequence we could conclude that the ageing problem is less felt in those countries than elsewhere in Europe.

However this 'advantage' is not seen in the shipbuilding sector. Following figure shows an overview of the age distribution in shipbuilding countries in the EU. It should be noted that only the shipbuilding activities are included in the figures, the marine equipment is not included. The figure shows the predicted composition of the labour force in 2012. Applied to the figures provided in Chapter 1 and combined with the data of Figure 4.3 it can be concluded that the around 65% of the employees in France, Spain, Portugal and the UK is 40 years or older, which is more than 42 000 employees. Especially in the UK the average age of a worker is high; around 22% of the workers is

[127] It is expected that the Eurostat predictions be fulfilled as the population growth in the five countries is low; France: 0.47%, UK: 0.55%, Portugal: 0.15% and Spain: 0.73%. Only Ireland has a growth rate of more than one percent: 1.16%,

older than 55 years. In France this group represents with 12% of all workers in the shipbuilding sector.

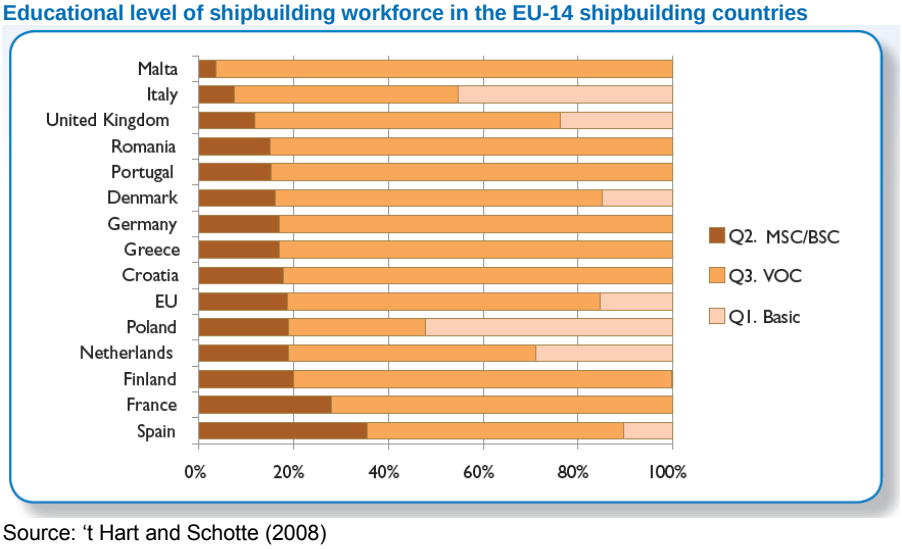
Figure 4.5 Expected age distribution of shipbuilding technical workforce in 2012 in the EU-14 shipbuilding countries



Source: 't Hart and Schotte (2008)

The level of required education differs between the five countries. In France and Portugal none of the workers only has a basic degree, most of them (72% and 84%) of the workers have a vocational degree and the remaining workers (28% and 16% respectively) have completed a tertiary education (MSc or BSc degree). Spain is the country with the highest share of workers with a tertiary education; 35% or more than 6,750 workers hold an MSc or BSc title[128]. In the Atlantic Arc as a whole almost 25% of workers have finished a tertiary education and in addition around 65% have finished their vocational education. This equals 60,000 of the workers in the countries analysed.

Figure 4.6 Educational level of shipbuilding workforce in the EU-14 shipbuilding countries



Source: 't Hart and Schotte (2008)

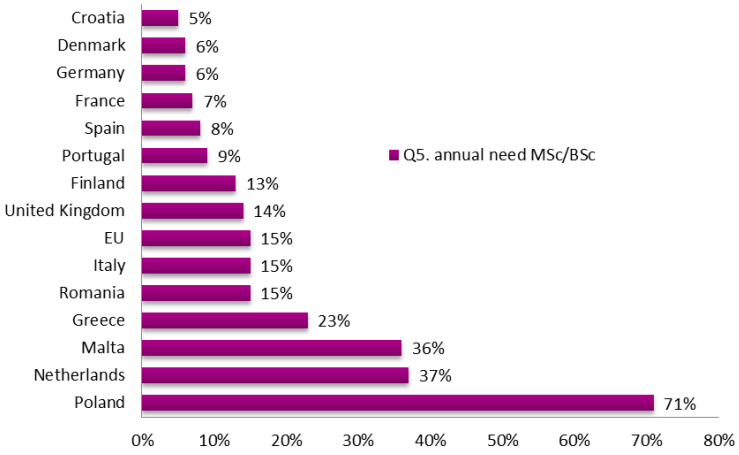
The level of education is one factor, but the specialisation is another. From general sources it is known that in many countries technical education attracts fewer students than alfa or gamma

[128] However it should be noted that two subgroups exists in in Spain. The yards employ higher educated, but ageing workers. Employment at the yards is relatively stable. The supply industry employs many young, but relatively inexperienced workers. Employment is far less stable than employment at the yards

sciences. As a result industries in need of highly specialised technically educated staff may face shortages even if the overall education level is high.

The following figure shows the annual need for technical shipbuilding personnel at MSc/BSc level. The need is based to compensate for the need for additional employees, the retirement of older employees and employees leaving the shipbuilding industry. It should be noted that these needs were defined under different economic perspectives (the shipbuilding sector was prospering), however as both the shipbuilding and marine equipment sector are more and more focusing on high technical vessels and equipment, the need for high trained personnel will have remained the same or even increased.

Figure 4.7 Annual need for technical shipbuilding personnel at MSc/BSc level



Source: 't Hart and Schotte (2008), edited by authors

On a yearly basis France has the lowest demand for high skilled technical personnel, around 7%. The country is followed by Spain with a need 8% and Portugal with a need of 9% for high skilled technical employees. The United Kingdom has the largest need for technical personnel of the four countries, 14%. Although the countries are in need of high skilled technical employees the countries are still below European average. On EU level there is a need of 15%. Frontrunners are the Netherlands (37%) and Poland (71%).

French government, region and social partners agree on 'Compétences 2020'

The French government, together with shipbuilding region Pays de la Loire and social partners agreed in 2013 on a competence program, Compétences 2020. Aim of the program is to develop an ambition to durably employ a variety of employees ranging from actually employed workers to unemployed as well as from junior to senior workers. All employees should receive the training they need to execute their job and to be able to stay in the shipbuilding industry. The program is introducing competence management in the sector with a special focus on SMEs[129]. This is important as more than 60% of all companies active in the French shipbuilding industry can be qualified as a SME.

Although the educational levels look good, the current economic crisis threatens the knowledge and skills level. Due to a reduction in ship orders yards are forced to restructure and lay off many employees. Latest restructuring can be found in the UK, where BAE Systems, one of the largest companies in naval shipbuilding will cut 1 775 jobs in the UK, which equals 40% of all jobs provided by BAE[130]. Also in other countries around the Atlantic yards are struggling. The yards in Portugal are rather old fashioned and have difficulties in obtaining orders. The Spanish yards are under pressure as well, especially since the European ruling of their state aid framework which was found

[129] http://www.paysdelaloire.fr/politiques-regionales/emploi/actu-detaillee/n/la-gpec-competences-2020/
[130] 'BAE systems cuts 1,775 jobs at English and Scottish shipyards', BBC News, 6 November 2013

not in line with the European State aid rules. The restructuring and difficulties will probably lead to a lose of skills and knowledge and putting the sector in a difficult position.

Hiring characteristics

According to IKEI (2009) a total of 18 different function types can be distinguished in the shipbuilding and marine equipment industries. Most important functions are:

- Marine engineers and naval architects: the marine engineers are involved in designing, building, operating and maintaining the equipment and machinery used in vessels, while the naval engineers are involved in the designing, building and maintaining of the vessels;
- Industrial engineers: they design, develop, test and evaluate integrated systems for managing processes including quality control and inventory control;
- Mechanical engineers: these engineers perform duties in planning and designing tools, engines, machines and other mechanically functioning equipment;
- Drafters: the drafters prepare detailed drawings that give exact measures and specifications of all ship parts used.

Besides those technical developing functions many blue collar functions are used in the shipbuilding sector, e.g. carpenters, plumbers, pipefitters, electricians and painters.

In an employment survey carried out in 2006 among shipyards in Europe 35% of the employers in the sector indicated that they had difficulties in recruiting blue collar workers and 55% indicated having difficulties in recruiting white collar workers. The study also distinguished the difficulties of yards in separate member states. The following table provides an overview of the difficulties in recruiting blue and white collar workers in the different Atlantic countries.

Table 4.3 Percentage of employers reporting recruitment difficulties in the shipbuilding and repair industry, by category of staff searched (2006)

	Spain	France	Portugal	UK
Blue collar	18,8	33,3	50	75
White collar	25	66,7	50	25

Source: IKEI (2009)

Two years later, in 2008, a second survey was carried out which showed that in Europe 63,8% of the shipbuilding companies had difficulties in recruiting blue collar workers, an increase of almost 30%-point. In particular 61,7% of the companies indicated to have difficulties in hiring engineers, 59,6% in hiring naval architects and 27.2% in hiring IT specialists. Due to the economic crisis of 2008 in the shipbuilding industry it is expected that these percentages have decreased.

Main reasons given for the difficulties in hiring the right workers were; the low number of qualified graduates (55,3%) holding an MSc or BSc degree, the low number of school leavers (51,1%) with a vocational education qualified for shipbuilding and the decrease in attractiveness of the sector (46.8%). Also 23.4% indicated the ageing society as one of the reasons for the difficulty in hiring people.

Labour costs

Currently, the competition in the shipbuilding industry is fierce and to make a difference companies focus on a high innovative level of competences. European companies are not or to a far lesser extent competing on labour costs. However wages are put under pressure due to the fierce competition. Example is the French cruise yard STX France which has the intention to break up the labour agreement between the company and the employees represented by labour unions, this in order to be able to renegotiate employment contracts, salaries and related benefits. The unions are

opposing as they require equal status and labour conditions for all employees[131]. If this intention is put through it will further influence the image of shipbuilding and might influence the willingness to work in shipbuilding negatively.

4.2.2 Administrative burdens for the industry

Environmental regulations in place, both globally and in European waters (MARPOL, Ballast Water Convention, EEDI, introduction of ECA zones) may be a burden to the shipping sector, but can rather be seen as advantages to the shipbuilding and marine equipment sector. The same applies to renewable energy policies where a boost of offshore wind has resulted in demand for specialised construction and service ships, of which the sector has benefited and is likely to benefit more in the future.[132]

Requirements directly affecting the administrative (and operational) processes of the shipbuilding and manufacturing sector itself are in other areas, such as:

- HSE (Health, Safety & Environment). Where EU and national rules put strict requirements to working conditions, safety at work sites and the handling of waste and energy, competitor regions elsewhere may be less strict, causing an imbalanced level playing field;
- Labour cost requirements and the role of labour unions;
- Raw materials prices: an example is the price of steel for which different rates for Europe versus East Asia are reported, affecting the export potential of European yards;
- Classification.

Many of these factors apply to the industry Europe-wide, but in the Atlantic region where the current outlook of the sector, especially on the side of the yards, is not bright, they may be felt as burdens. On the other hand there is a common belief that by keeping high working standards, the competitive advantages can be maintained in the long run.

4.2.3 Other factor relevant to the growth of shipbuilding

Raw materials

The price of raw materials is important to yards. During the prosperous times major price difference occurred between Europe and Asia. It was estimated that the price for hot rolled steel plates where around 40% cheaper in Asia than in Europe. Since the crisis it seems that the price gaps have become smaller, however steel prices are still 10-20% higher in Europe than in Asia[133]. It is difficult to solve the inequality in prices of raw materials as Asian governments focus on strong domestic policies for raw materials (domestic companies have to sell most of their stock to domestic clients) and sometimes even reduce prices. Alternative option for Europe might be to focus on sub-sea mining to obtain new raw materials. Positive sight-effect might be that it will directly benefit the European shipbuilding industry as highly specialized vessels are needed to perform the activities and European yards focus on such types of vessels.

Japanese yards request steel producers to lower their prices

In 2011 the Japanese shipyards jointly requested Japanese steel manufacturers to lower their prices. Due to an increase of the yen, already high prices for raw materials and a struggling economy, the Japanese yards feared to loose their competitive position in the shipbuilding industry. Steel accounts for 40% of the

[131] http://www.lemarin.fr/articles/detail/items/stx-france-la-direction-confirme-son-intention-de-denoncer-des-accords-dentreprise.html
[132] Ecorys (2012), Green Growth opportunities in the EU shipbuilding sector
[133] Possible innovation partnership on raw materials (2011) CESA

ship costs and high prices influence the selling price of the vessels. Japanese yards threatened to purchase the steel at Chinese or South-Korean producers instead.[134]

Flags states and classification

Based on UNCLOS articles 90 and 91, Flag States are given the right to sail ships on the high seas and fix conditions for registering ships under their flag. As a counterpart, these flag states have a duty to check and control administrative, technical and social matters on their vessels. Article 94 UNCLOS provides an overview of all the obligations of a flag state to ensure save ships under their flag, e.g. related to pollution and labour conditions of crew members. Flag States are allowed to increase the requirements for their flag, as UNCLOS only supplies the minimum requirements.

Although, internationally, flag states are all obliged to apply the same set of minimum rules, in practise the level of rules and therefore the administrative burden differs. Some countries, maintain open registers, welcoming all vessels. These countries offer a so-called flag of convenience and are less strict in applying the inspection rules. Several measures are taken to limit the problem, one of them being the increased controls in European ports based on the Paris MOU. Flag States are divided in three groups, the white, grey and black group. Countries in the first group maintain high standards, while countries in the last included the flags of convenience.

The legislation might not directly lead to a difference in administrative burdens for shipping companies, but execution of the rules does. The choice of flag also influences the shipbuilding industries, as requirements for vessels might be lower as the country of registration might accept these vessels.

During the building process classification societies are involved. Besides the surveys they carry out for the ship owner, the also offer to carry out statutory surveys for the flag state government concerned in order to implement and enforce the compliance with the UNCLOS standards and additional national standards in place. Whereas in the past many flag states used to have such survey capacity in-house, nowadays more and more flag states delegate these surveys to classification societies. As classification societies operate in a competitive market, this bears the risk of a decreased service level, as prices may be under pressure[135]. To maintain high standards, as per the Paris MoU, every year list evaluating the performance in relation to the inspections carried out of different classification societies world wide is published[136].

4.2.4 Restrictive practices

Restrictive practises compromise practises that in effect hinder the development of the shipbuilding and marine equipment industries. Main examples found are:

- Labour mobility, especially between countries around the Atlantic Arc and North Sea & English Channel;
- Image of the shipbuilding industry;
- Intra-regional cooperation.

Labour mobility

A general problem that is also affecting the shipbuilding industry is the unequal division of skilled labour between European countries. Especially the division between the countries located around the North Sea & English Channel and countries around the Atlantic Arc is unequal. Countries around the North Sea have a high demand for skilled workers, while countries around the Atlantic

[134] 'Japan shipyards said to ask lower steel prices, warn of cuts', Bloomberg, 21 October 2011.
[135] 'A critical analysis of flag state duties as laid down under article 94 of UNCLOS (2010) Hosanee, N.M.
[136] Port State Control, Taking port state control to the next level (2012), Paris MoU, p. 50

have often, especially in the current economic crisis period, a surplus of workers. Also within the Atlantic Arc the division is not optimal; French yards do need additional employees, while in Spain many employees will become redundant as a result of the European ruling. However, it is not expected that the Spanish employees will move to the French yards very easily.

Ideally, people would move within Europe to areas where jobs are available, however reality shows that this is not happen very often. Actual mobility of employees is still limited within Europe, although regulation is trying to facilitate and support labour mobility. Language can be a major barrier. One of the exemptions seems the STX France yard. After winning the large cruise order from their Finnish sister yards, many smaller Finnish supply companies moved their business towards France, including their personnel. However examples like this are rare.

Image of shipbuilding

The image of the shipbuilding sector is not attractive enough to attract young employees. As indicated above the workforce in the shipbuilding industry is ageing and yards are struggling to attract enough new (young) employees. Overall there is a shortage of employees with a technical background and it seems that other sectors, requiring technical personnel, are more attractive than the shipbuilding industry. For instance in France, the yards around St. Nazaire are competing with the automotive and aviation industry that seem to be more attractive for young technical personnel than the shipbuilding industry. Improving the image of the shipbuilding sector is one of the actions identified by Leadership 2020[137]; however no concrete actions have been formulated yet. More concrete actions, which also apply to shipbuilding, can be found in the Atlantic Action Plan[138]:

- Putting in place educational and training measures, including cross border programmes and mutual recognition of national education and training programs;
- Raising awareness of sea-related careers, generating enthusiasm for maritime culture and careers among young people and addressing other barriers that discourage you people to choose for a maritime career.

Intra-regional cooperation

To improve the position of the sector the cooperation between suppliers, marine equipment manufacturers and yards should be improved. At local level it seems that companies are able to find each other and cooperated. For example, both in the UK (e.g. Clyde area) and France (e.g. St Nazaire) strong clusters exist that focus on new market opportunities, for instance maritime renewable energy. However it seems that the cooperation between different clusters and companies in different countries is still limited although it would improve the competitive advantage of the European shipbuilding sector as a whole. The European shipbuilding market is still regionally oriented and not much cross-border cooperation is sought. As the example blow shows, there are a few exemptions.

Establishment of the Channel Marine Academy

In 2013 a cross-border initiative between the French and British shipbuilding and marine industry started to promote the marine industry as an attractive industry to work in. The academy highlights the educational opportunities and professional marine careers and aims to bring together companies with specific needs in terms of competences and young people or people integrating in the job market that lack information on careers available in the marine and shipbuilding industry. One of the initiatives set up was the creation of a short film highlighting the attractiveness of the sector and the high level of education of employees[139].

[137] European Commission (2013) Leadership 2020 – The Sea new opportunities for the future
[138] COM (2013) 279, final
[139] http://www.channelmarineacademy.eu/yeswiki/wakka.php?wiki=PresentationCma

4.2.5 Finance and research

Sources of finance

Access to finance is a general problem in shipping and shipbuilding. Especially due to the economic crisis banks are reluctant to finance the construction of new vessels or new shipping companies. The low profitability of existing companies, in combination with the reluctance of banks to provide them with liquidity is responsible for the shrinking of their reserves leading to the need to search for alternative sources of finance[140].

In an attempt to respond to the low availability of bank financing, shipping companies have turned to explore alternative sources schemes to finance their operations. Using company bonds, either in simple structures or more elaborate tailor-made to the needs of each company is becoming a popular method to raise liquidity from private sources. Despite the fact that this financing scheme is more expensive than bank loans used to be, at the current global financial setting it has proven to be a valuable alternative to acquire the funds necessary for operations[141].

State Aid Framework for shipbuilding

Under certain conditions the shipbuilding sector may receive governmental support in the form of state aid. The European Commission has created three exemptions for the shipbuilding industry that are considered not disturb the internal market and competition between companies and countries. The newest Framework ends per 31 December 2013. In 2014 the rules will be transferred to more general regulations[142], but will be still applicable to the sector. The three areas for state aid identified are: regional aid[143], innovation aid[144] and export credits[145].

Spain introduced a tax lease scheme in 2002, which in 2013 was ruled to be against European state aid rules[146]. The scheme allowed companies to finance vessels via an investment vehicle (the so-called tax lease). Instead of buying the vessel directly from the yard, the companies could lease the vessel before obtaining ownership and were granted a tax reduction. As a consequence, prices for Spanish built ships were about 20 – 30% lower than vessel built in other European yards. Following the EC's disapproval, all subsidies paid between April 2007 and June 2011 will have to be repaid by the investors. Although the exact amount is unknown yet, it is expected that around € 1 bn needs to be paid back. Shipyards in Spain expect that the decision will influence their market opportunities and puts 87 000 jobs at risk (both at the yards and in related industries)[147].

Possibilities for EIB loans

The EIB is also financing projects in the shipbuilding industry. Both yards and marine equipment suppliers can benefit of the programs issued by the bank. Focus of the projects is on environmental performance, energy efficiency and, growth and employment. The projects issued comply with international regulation, e.g. IMO Ballast Water Convention and IMO Convention on safe and Environmentally Sound Recycling of Ships. Besides funding of the real construction of the vessels the Bank also supports R&D projects in the field of shipbuilding. Focus of the research program is on the improvement of the environmental performance of the sector.

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[140] http://www.nortonrosefulbright.com/knowledge/publications/33057/innovation-in-ship-finance-tapping-the-capital-markets
[141] http://www.nortonrosefulbright.com/knowledge/publications/33057/innovation-in-ship-finance-tapping-the-capital-markets
[142] The provisions on innovation aid will be included in the future Framework for State aid for research and development. The provisions on regional aid will be included in the revised Regional Aid Guidelines.
[143] State aid is allowed if the investment is used for upgrading or modernizing existing yards and is not used to restructure the yard financially.
[144] Aid for innovation in existing shipbuilding, ship repair or ship conversion yards is justified, provided that it relates to the industrial application of innovative products and processes.
[145] Ship owners may be granted state-supported credit facilities for new buildings or vessel conversions.
[146] 'State aid: Commission calls for recovery of tax benefits granted by Spain to certain Economic Interest Groupings (EIG) and their investors', Press release European Commission, 17 July 2013
[147] 'Brussels rules Spanish shipbuilding subsidies illegal', Financial Times, 17 July 2013

Blue PPP constructions

Leadership 2020 launches the idea of introducing Blue PPP structures. The structures could be used for financing greening and retrofitting projects. Private and public entities form a joint venture and work together to finance shipping hardware (vessels, equipment etc.) The model is based on the Japanese scheme in which a large part (70 – 90%) of the construction is pre-financed by the state entity involved. When the vessel is finalized the shipping company pays a user fee to repay the state entity and once the loan is repaid the shipping company is 100% owner of the vessel.

In Europe the Blue PPP must comply with state aid rules. Two possible options are available:

- Non commercial projects which require public support, e.g. state-run and commercially non-feasible local ferry lines;
- Potentially profitable projects which the private sector does not or only insufficiently support and carry a significant objective of common EU interest, e.g. environmental related measures.

Support measures by Atlantic states taken since summer 2008

- France: The French shipbuilder STX France is in trouble since the summer of 2008. In February 2010 the French government announced to support the yard and in case the company needs to obtain loans the government will back these loans. This strategy helped to secure the yard a billion euro contract by the end of 2012 to build a cruise vessel for Royal Caribbean Cruises. The contract was won from their sister company STX Finland[148]. Besides the guarantee of the French government the yard can also benefit from the national transport program which includes € 1 bn[149];
- Portugal: the government was planning to re-privatize the shipyard Estaleiros Navais de Viana do Castelo[150]. The yard, now owned by the Portuguese government, is struggling and to attract additional funding the government waned to sell the yard. Important selling condition was the maintenance of the 630 employees currently employed by the yard. In April 2013 the Portuguese government announced to cease the privatization process due to an on-going investigation of the European Commission which seeks to verify whether the yard received state aid worth € 180 m between 2006 and 2011[151][152];
- Spain: provides € 65 m for yards and shipping lines. Around € 45.8 m is dedicated for the restructuring of shipyards and qualification measures. The measure is taken independently from the State aid measures[153];
- UK: So far, according to industry sources (AgS-Monitoring), the British government has not introduced support measures for the shipbuilding industry.

Some countries, e.g. France, introduced national guarantee schemes, which ensure loans to shipyards in order to construct new vessels in the pre- delivery phase. In this phase the yard already incurs large investment costs, but does not receive payments of the client and therefore the financial risks are high for the yard. CESA proposes to adopt an European wide fund for the pre- and post delivery periods to guarantee financial stabilities of yards all over Europe.

Some regional initiatives to improve the access to finance have been developed as well. Pays de la Loire has introduced the P2RI (Prêt regional de redéploiement industriel). This initiative implements a financial products which has been designed and launched by a group of banks. Banks part of the

[148] 'President of STX France: Better funding situation solved the ship order', Helsinki Times, 28 December 2013
[149] Ludwig, T., (2013), AgS-Monitoring, Shipbuilding in Europe
[150] Ludwig, T., (2013), AgS-Monitoring, Shipbuilding in Europe
[151] 'Governo encerra processo de privatização dos Estaleiros Navais de Viana do Castelo', Cofina media, 18 April 2013
[152] 'Portugal suspends definately ENVC shipyard privatization', SeeNews Shipping, 18 April 2013
[153] Ludwig, T., (2013), AgS-Monitoring, Shipbuilding in Europe

imitative offer comparable conditions and loans between € 200 000 and € 2 m are offered with a delayed repayment of three years[154].

Competitive disadvantages vis-à-vis Asian yards in terms of government financial support

In Asia a number of policies and practises are in place that favour the Asian shipbuilding industry over European and other builders. These practises are not in line with European state aid rules and therefore these practises can not be used in Europe, placing the Asian yards in a better competitive position.

- Asian yards are allegedly able to offer vessels under construction prices because of their company structure and their close ties to government. The Japanese yards are part of large conglomerates and the Korean ones of so-called chaebols. Within those company structures it is easy to shift profits and losses between different parts of the company and therefore yards can back up their losses by profits from other units. Besides many conglomerates or chaebols are closely linked to the public sector and can obtain implicit governmental funding;
- In August 2013 the Chinese government issued a three year program to stimulate the Chinese shipbuilding industry. Financial institutions are urged to support the industry by providing better access to finance and some key companies will be allowed to issue cooperate bonds[155]. It is expected that a third of the more than 1 600 yards need to be shut down to reduce the overcapacity and that mainly the private owned yards will go bankrupt as the publically owned yards are already indirectly supported by the government and will benefit most of the proposed stimulation program[156]. The arrangement is applicable to ship owners ordering Chinese-made vessels, engines and main parts.

On-going research activities

Industry initiatives and policies

Companies in the shipbuilding sector are starting to focus on new areas outside their core business. Example is the French naval yard DCNS, which focuses on marine renewable energies, beside the construction of traditional navy vessels. Their focus is on four new products:

- Generating tidal energy by using underwater turbines;
- Developing ocean thermal energy conversion (OTEC) technologies;
- Offshore wind; and
- Wave energy technology.

Also the French cruise yard STX France is searching for new market activities. These activities should generate about one third of the company's revenue in the coming years. Focus is on marine renewable energies as well[157].

National policies

In the different countries some research programs have started to stimulate the shipbuilding and marine equipment sector. Some of the larger programs are:

- UK Marine Industries strategic framework: This framework is led by the UK Department for business Innovation & Skills and was introduced in 2010. The framework provides a comprehensive overview of the British shipbuilding industry, sets the goals for the coming years and formulates concrete actions and responsible leaders to achieve to goals set. The framework aims to include all parties involved in the shipbuilding industry;
- Piloting UK marine and maritime innovation[158]: Governmental funded program with a budget of £ 8 m with the focus on vessel efficiency. UK based companies are invited to submit innovative proposals aiming to improve vessel efficiency of current and future vessels in all possible ways;

[154] http://www.paysdelaloire.fr/services-en-ligne/aides-regionales/aides-regionales-themes/action-economique/actu-detaillee/n/pret-regional-de-redeploiement-industriel-p2ri/
[155] 'China's State Council urges support for shipbuilders', Bloomberg, 5 August 2013
[156] 'China poised to gain control as shipyard shakeout looms', Bloomberg, 12 August 2013
[157] http://www.stxeurope.com/sites/France/about/Pages/Marine-Renewable-Energy.aspx

- Corican[159]: Research organisation established in 2011 to facilitate research and development for the French shipbuilding industry. The organisation is an imitative of the Ministries of Transport and Industry. In the organisation not only the public actors are involved, but also NGO's, yards, marine equipment suppliers and unions.

European funded research programs

In Europe a wide variety of shipbuilding related research projects exists. Main focus of these programs is on improvement of the environmental performance of vessels and increase fuel efficiency. Main beneficiaries are marine equipment suppliers; yards are often not participating in those programs. Below a snap shot of recent large projects is provided:

- Interreg Aux Navalia[160]: This project aims to strengthen the competitive position of the shipbuilding industry and especially the marine equipment suppliers. The project focuses on the introduction of the financing instruments, stronger collaboration of industry between different countries and focus on niche markets;
- FP7 BESST[161] (Breakthrough in European Ship and Shipbuilding Technologies) started in 2009 and will end in 2013. The objective of the project is to find a breakthrough in competitiveness; environmental friendliness and safety of ships build in Europe. The focus is on passenger ferries, mega-yachts and ferries, but results of this project will also be applicable to other vessels types. *Budget: € 29 m;*
- FP7 STREAMLINE[162]; main focus of the project is on state-of-the-art propulsion systems and new propulsion system in combination with CFD calculations. Aim is to reduce the fuel consumption and emissions of vessels. The project is the response of the marine community to this demand that will be addressed through key objectives. *Budget: € 10.9 m;*
- FP7 Flagship[163]: This EU project covers on-board systems and procedures, ship management systems on shore, impact of new technology on organisation, effective and efficient communication interfaces and impact of standards and regulations. For example, on-board monitoring and decision support was tested in prototypes. *Budget: € 10 m.*

Dedicated working group established to promote the European maintenance, repair and conversion yards.

To strengthen the position of European maintenance, repair and conversion yards the umbrella organisation for shipbuilding related companies, SEA Europe, has established the dedicated working group SMRC (Ship Maintenance Repair Conversion). Companies involved in the working group have formulated ambitions aimed at improving the image and position of European repair yards. Main aims are: profile of the industry, improve awareness of activities performed by repair yards and improve lobby in Brussels. New European regulation can improve the new orders and improve the competitive position of these yards.[164]

Overview of research institutes in the Atlantic Arc

The following table provides an overview of major research institutes in the five different countries. It should be noted that besides these institutes many more universities and smaller institutes are active in the shipbuilding and marine equipment domain.

Table 4.4 Overview of major research institutes in the five different countries

Country	Research institute	Website
Ireland	Cork Institute of Technology; National Maritime	http://www.nmci.ie/

[158] https://www.innovateuk.org/-/vessel-efficiency-piloting-uk-marine-and-maritime-innovation
[159] http://www.corican.fr/le-corican/le-corican.html
[160] http://auxnavalia.org/en/categorias/auxnavalia/contexto-del-proyecto
[161] http://www.besst.it/
[162] http://www.streamline-project.eu/
[163] http://www.flagship.be/
[164] 'Reparatie en ombouw: andere tak van sport'. Magazine Scheepsbouw Nederland, September 2013

Country	Research institute	Website
	College of Ireland	
France	Ecole Navale	http://www.ecole-navale.fr
	Ecole Nationale Supérieure de Techniques Avancées (ENSTA)	http://www.ensta-paristech.fr
Portugal	Escola Superior Náutica Infante Dom Henrique	http://informacao.enautica.pt/
Spain	Platforma Technológica Marítima Española	http://www.ptmaritima.org
	Spanish research council Consejo Superior de Investigaciones Cientificas CSIC	http://www.csic.es
UK	University of Southampton; Southampton marine and maritime Institute (SMMI)	http://www.southampton.ac.uk/smmi/
	Natural Environment Research Council (NERC)	http://www.nerc.ac.uk
	Institute for Marine Engineering, Science & Technology	http://www.imarest.org

4.3 Good practices for support of the sector at sea-basin level

Table 4.5 Good practice examples

Name of good practise	Description	Weblink, contact person	Assessment of transferability potential to other EU Member States
Centre of development of industrial technology (CDIT)	Aim of the organisation is to assists Spanish companies to improve their technological profile by granting them financial assistance and facilitating access to finance, e.g. through banks. Focus is on the execution of national and international research programs.	http://www.cdti.es/	Good
Piloting UK marine and maritime innovation	Governmental funded program with a budget of £ 8 m with the focus on vessel efficiency (2013). UK based companies are invited to submit innovative proposals aiming to improve vessel efficiency of current and future vessels in all possible ways. Consortia should consist of SMEs. Second aim is to build collaboration across the maritime and marine industry, and develop UK-based supply chains and SMEs to underpin a national *Strategy for Growth*	https://www.innovateuk.org/-/vessel-efficiency-piloting-uk-marine-and-maritime-innovation	Medium
Corican	Research organisation established in 2011 to facilitate research and development for the French shipbuilding industry. The organisation is an imitative of the Ministries of Transport and Industry. In the organisation not only the public actors are involved, but also NGO's, yards, marine equipment suppliers and unions.	http://www.corican.fr/le-corican/le-corican.html	Good
Governmental back up for cruise yard	In February 2010 the French government announced to support the yard and in case the yard needs to obtain loans the government will back these loans. This strategy helped to secure the yard a billion euro contract by the end of 2012 to build a cruiser for Royal Caribbean Cruises. Besides the guarantee of the French government the yard can also benefit of the national transport program which includes € 1 bn.	-	Low
Interreg Aux Navalia	This project aims to strengthen the competitive position of the shipbuilding industry and especially the marine equipment suppliers. Yards and marine equipment suppliers from Portugal Spain and the UK are involved in the project. The project focuses on the introduction of the financing instruments, stronger collaboration of industry between different countries and focus on niche markets.	http://auxnavalia.org/en/categorias/auxnavalia/contexto-del-proyecto	Medium
UK Marine Industries strategic	This framework is led by the UK Department for business Innovation & Skills and was introduced in 2010. The framework provides a comprehensive	http://www.bis.gov.uk/assets/biscore/business-sectors/docs/10-647-marine-industries-strategic-	Good

Name of good practise	Description	Weblink, contact person	Assessment of transferability potential to other EU Member States
framework	overview of the British shipbuilding industry sets the goals for the coming years and formulates concrete actions and responsible leaders to achieve to goals set. The framework aims to include all parties involved in the shipbuilding industry.	framework	
DCNS focus on marine renewable energy	The French naval yard is expanding its business to new markets. Besides the construction of navy vessel, their traditional market area, the yard is developing products for the marine renewable energy market. Currently the company has developed products for four submarkets: tidal energy, offshore wind, wave energy technologies and OTEC technologies. By diversifying the activities the company is adjusting to the changing market conditions.	http://en.dcnsgroup.com/energy/marine-renewable-energy/	Good
Establishment of the Channel Marine Academy	Cross-border initiative between the French and British shipbuilding and marine industry started to promote the marine industry as an attractive industry to work in. The academy highlights the educational opportunities and professional marine careers and aims to bring together companies with specific needs in terms of competences and young people or people integrating in the job market that lack information on careers available in the marine and shipbuilding industry.	http://www.channelmarineacademy.eu/yeswiki/wakka.php?wiki=PresentationCma	Medium

4.4 Measures that stimulate Blue growth in the Atlantic Arc

Main findings

To a large extent, the position of challenges faced by the shipbuilding industry in the Atlantic Arc are similar to that of the sector elsewhere in Europe: bleak economic times with low demand and pressure from non-EU competitors to enter high-value niche segments. Still, some specificities with regard to the Atlantic position are identified.

The current position of the different shipbuilding sectors is diverse. The sector is very small in Ireland and is hardly of any significance. In Portugal the sector is rather old fashioned and characterised as not very innovative. Although the shipbuilding sector in Spain is believed to have a good potential, it is currently under high pressure, especially since the EU ruled that the Spanish tax-lease system is not compliant with EU state aid rules. Yards and marine equipment suppliers fear that thousands of jobs will be lost, both directly and indirectly related to the shipbuilding industry. The shipbuilding sectors in France and the UK are considered to have a good competitive position, with both strong marine equipment suppliers (e.g. Rolls Royce, Converteam and Cargotec) and specialized yards; STX France for cruise vessels and several major navy yards in the UK (e.g. BAE, Thales) and France (e.g. DCNS, Thales as well). However also yards in these countries are struggling in the current weak economic climate and in need of financial support. To cope with the decrease in demand for cruise and navy vessels, especially the French yards, are diversifying their activities by focusing on marine renewable energy.

Labour characteristics are favourable in all five countries. A large share of the population falls within the employable ages and compared to the European average the populations in the five countries are younger than the average European population and is well educated. However, the demographic distribution now employed by the shipbuilding sector is different. In the shipbuilding sector many older workers are active, who will retire in the coming decade. Besides an ageing shipbuilding population, many yards are struggling and jobs are on the line. These two factors combined will lead to a loss of skills and knowledge in the shipbuilding sector. At the side of newly available workers (school leavers), shortage of specialist degrees is observed. This is a problem as the shipbuilding sector is a knowledge intense industry and to remain a competitive industry the sector should be as innovative as possible.

Although the image of the shipbuilding industry is improving, the sector has not the same attractive image as for instance the air or automotive industry. Many young people still think the sector is 3D (dirty, difficult and dangerous). The image combined with the current job uncertainty, especially in Spain, will not encourage many young people to choose a career in shipbuilding or marine equipment manufacturing.

Access to finance is important in the shipbuilding industry. Many financing options are available, e.g. through current banking practices, EIB loans and through the current EU Framework for State Aid in Shipbuilding. Still the sector is struggling to obtain enough financing, especially yards that need large up front investments, while banks are reluctant to provide pre-financing. The French government has decided to support their main cruise yard, STX France, by backing any loans the yard needs to construct new cruise vessels.

In the Atlantic Arc many research projects are initiated. Main focus is on environmental performance and energy efficiency, but some projects, e.g. the Interreg project Aux Navalia, are also looking into new ways of financing. In these programs both yards and marine equipment

suppliers are active and companies located in other sea basins are involved as well. This leads to many knowledge spill overs which will increase the competitive of both the shipbuilding sectors in countries surrounding the Atlantic as the European shipbuilding sector as a whole.

Policy needs

A first field of action relates to the employment demand and supply in the shipbuilding sector. All countries do have a favourable demographic situation in general, but in the shipbuilding sector the age of employees is higher than average. These people will retire within a decade and as the image of the sector is not very positive and jobs are cut down, not many youngsters will choose a career in shipbuilding, and a gradual loss of skills and knowledge may result. Both national and European agencies could create public awareness of the sector and its possibilities to turn this trend.

Access to finance is important for yards and marine equipment suppliers as their investments are capital intensive and uncertain. Currently many banks are reluctant to finance new vessels or equipment; however this is often based on a knowledge gap. Also yards and suppliers are not always aware of the funding possibilities. To this end the Spanish government has set up a dedicated agency (Centre of development of industrial technology) that brings together financing institutions and industry partners. Some part of research activities is financed by the agency itself, but for other investments the agency has a facilitating role. An additional action could be to introduce a platform where different parties can meet, either at country or regional level, so that financing and cooperation become easier.

Public agencies could also stimulate joint research programs in which different industrial players, government bodies and research industries are brought together. Example is the Aircraft Carrier Alliance in the UK, where several partners are working together to develop the Queen Elizabeth class carriers, which will be the biggest and most powerful surface warships ever built for the Royal Navy. The consortium is led by BAE Systems, who leads the ship product design and building process. Other partners involved are Babcock (managing design and build elements, as well as final assembly), Thales UK (responsible for power and prolusion, together with Converteam and Rolls-Royce). Last partner is the Ministry of Defence who is also the client of the consortium.

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Annex II – List of stakeholders consulted

Interviewee	Organisation	City / Country	T = telephone F = face to face	Date of interview
Mrs. Vera Kissler	Pays de la Loire	France	Face to face + Questionnaire	3 December 2013
Mr. Douwe Cunningham	Sea Europe	Belgium	Face to face	3 December 2013

5 Ocean renewable energy

5.1 General overview of Ocean Renewable Energy in the Atlantic Arc

Ocean Renewable Energy is encompassing a set of different technologies (as opposed to e.g. offshore wind energy). Due to their immaturity they are discussed as one group[165] . Ocean Renewable Energy includes:

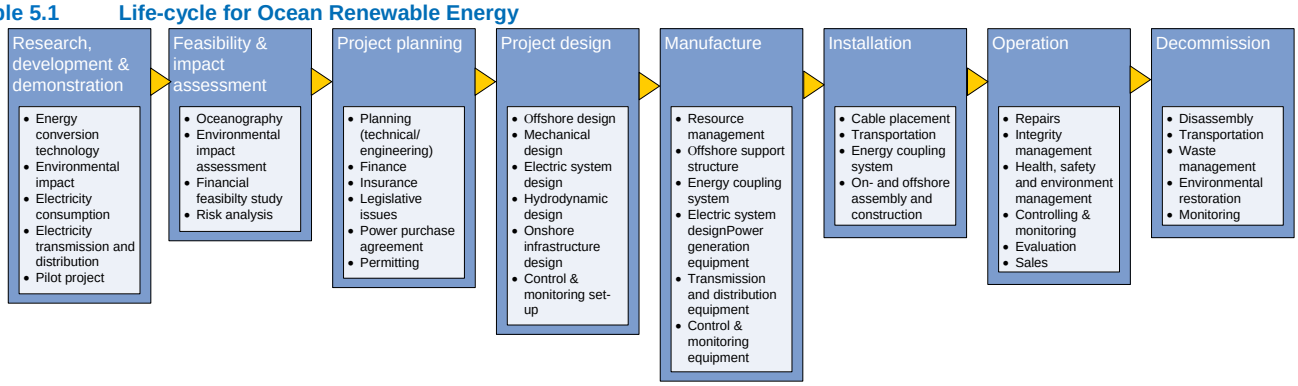
- Wave energy
- Tidal energy
- Ocean thermal energy conversion (OTEC)
- Osmotic energy.

Within each of the four types various sub-technologies (e.g. tidal stream vs. tidal range) can be distinguished.

At present, wave and tidal energy are the most promising technologies for further implementation on a larger scale in the coming decades. Ocean thermal energy conversion (OTEC)[166] and osmotic[167] are still in the infant stages of their development and are expected to mature at a later stage[168].

The following life-cycle presents the various stages of ocean renewable energy:

Table 5.1 Life-cycle for Ocean Renewable Energy



Source: Ecorys (2011): Maritime Sub-Function Profile Report 3.3 "Ocean Renewable Energy Sources"

The following table presents the ocean renewable energy power plants in place in the Atlantic Arc by type. A detailed overview of individual installation in Annexed to this chapter.

[165] Cf. discussion on “renewables” in general at its early stages of development.
[166] The idea of OTEC is to use the temperature difference between cooler deep and warmer shallow or surface ocean waters to run a heat engine and thereby generate electricity.
[167] Osmotic power is supposed to generate electricity out of the difference in the salt concentration between seawater and river water where they meet.
[168] Ecorys (2013): Study in support of Impact Assessment work for Ocean Energy, p.9-12

Table 5.2 Installed ocean renewable energy power plants capacity in 2013

Country	Wave energy	Tidal stream	Tidal range
United Kingdom[169]	3.4 MW	5.2 MW	
France	2.2MW		240MW[170]
Portugal	3.45 MW		
Spain	0.95 MW		
Ireland	0.02 MW		
Total	**5.6 MW**	**8.85 MW**	**240 MW**

Source: IEA OES (2011), pg. 122, and EU-OEA (2012) modified by Ecorys

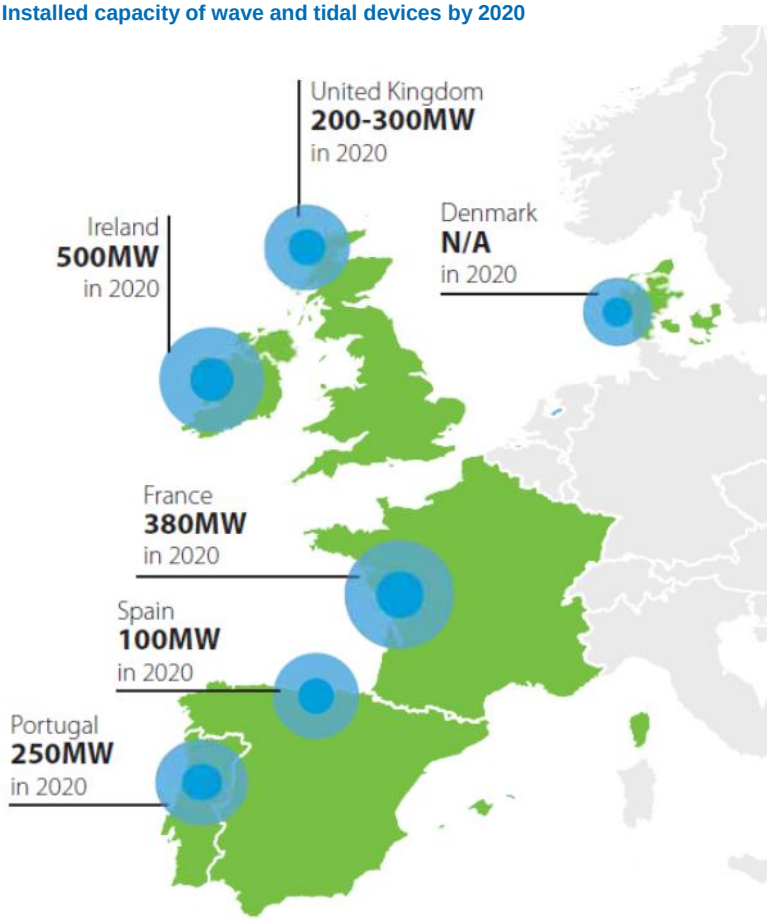
Developing technologies are characterised by high labour intensity with a focus on R&D activities. Employment related to operation and maintenance of the equipment is becoming more important once commercial deployment is introduced. This observation is in particular relevant for ocean renewable energy as installed capacity is currently mainly in specific testing sites and the total installed capacity is still rather limited. Over the course of its development this is expected to shift towards more manufacturing and installation and later maintenance jobs. In this light, the current employment in ocean energy per MW is higher due to the intensive R&D activities then can be expected once the installation are commercially implemented[171].

In 2010 about 1000 people were estimated to be employed in the ocean renewable energy sector and about € 250 million of GVA was created in the EU whereas the great majority was depending on the developments in the Atlantic Arc.[172] This is in line with an estimate of the trade body RenewableUK which counted 800 persons permanently employed in the sector in the UK.[173]

The following figure shows the expected installed capacity of wave and tidal devices by 2020. If the Member States reach these expectations, it will have a direct impact on the creation of employment and GVA. Despite the expected strong development of installed capacity, a full commercial expansion of the industry is mainly expected to take place after 2020, once the industry is able to deliver utility scale international energy projects backed by an advanced manufacturing capability.[174]

[169] Only full scale devices (source: Natural Environment Research Council, 2013, Wave & Tidal Consenting Position Paper Series, Ornithological Impacts)
[170] The Rance tidal range power plant is the biggest and oldes ocean energy power plant in place. As it was opened already in 1966 it cannot be compared to new ocean renewable energy technologies. It is therefore often not counted in when estimating future growth on the basis of recent developments.
[171] This also means that the recently installed and currently planned power plants in the UK are expected to create more jobs than the 240 MW installed in La Rance in France in the 1960s even though the total amount of MW sis lower..
[172] Ecorys (2012): Blue Growth, Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts, p.35
[173] European Ocean Energy (2013): Industry vision paper 2013
[174] South West Marine Energy Park (2012) http://www.wavehub.co.uk/wp-content/uploads/2012/01/Marine-Energy-Park-prospectus.pdf , p.5

Figure 5.1 Installed capacity of wave and tidal devices by 2020



Source: Source: EU OEA (2013) Industry Vision Paper

5.2 Growth drivers and barriers to growth for Ocean Renewable Energy

5.2.1 Labour market characteristics

Workforce characteristics

Due to the still rather low numbers of employment in the sector it is difficult to provide representative data for ocean renewable energy. Therefore data gathered is more anecdotal, but can serve as indication.[175]

It is expected that workforce characteristics for ocean renewable energy will be similar to offshore wind and other offshore activities. Ocean renewable energy requires a combination of skills from hydropower and offshore skills also needed for offshore wind, but also offshore oil & gas. For different parts of the value chain, different skills are needed. Furthermore, as the sector is still under development, there are many research and consulting skills are required involved.[176]

[175] Based on an interview
[176] Based on an interview

Manufacturing of power plants and their spare parts

Manufacturing of turbines and other parts of ocean energy spare parts is mainly done by companies which have experience in related technologies. These bigger companies can easier shift workforce from one sector to the other.[177] Voith[178] for example uses its knowledge from automotive industry, aerospace industry and apply it towards ocean renewable energy. The same counts for Andritz[179] which uses its experience and knowledge on hydropower plants and transfers this towards the ocean. Skills are therefore transferable; also the locations where employees are needed do not drastically change (even though a production closer to the installation is favourable). Even though it seems to be advantageous to produce close to implementation sites, big companies follow diverse business strategies (some closer, others not).[180]

R&D, Installation and maintenance

Installation and maintenance is taking place on the sea, partially in rough sea where there are stronger waves. This requires offshore experience and employees who are able to handle the difficulties on the sea. They need to be highly skilled and at least during the installation/maintenance period located close to the actual power plant. Companies with experience in offshore drilling, offshore oil & gas can transfer their knowledge. There is demand for engineers with specific skills in these new technologies, but also from related fields (such as marine survey, subsea technology or offshore wind). Often engineers are coming from other sectors (less offshore wind, but more oil & gas; there is also a case of a fishing company switching to installation). Mechanical engineers come from naval and defence sector, structural engineers from the oil industry.[181]

As there are more activities in parallel taking place in the future offshore, there can be a lack of supply of persons able to carry out such work. Furthermore it is difficult to attract electrical engineers.[182]

Characteristics of persons working in this area[183]:

- Majority male;
- Aged between 25 and 45;
- Highly skilled – highly academic;
- Engineers;
- Highly mobile;
- Persons who want to work in new pioneering fields.

Hiring characteristics

As in other related sectors, shortages in engineering skills might occur. Again ocean energy may have to compete with similar sector. In offshore wind in the UK from 2013 onwards bottlenecks are expected as energy sectors are expected to grow at the same time.[184] This also affects ocean renewable energy. In the short-run employment will need to come from other sectors (e.g. offshore wind, offshore oil & gas). Thereby companies will need to be more attractive which can be a financial barrier for growth of the sector.[185] While big companies can shift employment within their

[177] Based on an interview
[178] http://voith.com/en/index.html
[179] http://www.andritz.com/
[180] Based on an interview
[181] Based on an interview
[182] Based on an interview
[183] Based on the experience of one interviewee
[184] UKCES (2011): Maximising employment and skills in the offshore wind supply chain, p. 12
[185] UKCES (2011): Maximising employment and skills in the offshore wind supply chain, p. 12

company, SMEs are struggling to attract skilled people from related sectors. The competition among offshore sectors is getting more and fiercer.[186]

Know-how of staff involved in the development phase is expected to be demanded also in maintenance stages. Therefore companies/individuals involved in early developments are expected to be demanded based on their experiences also in the future.[187]

Staff is recruited mainly within Europe. There are companies which are trying to recruit outside the EU (e.g. China & India). The problem of foreigners is that they often do not have the sufficient regional knowledge to fulfil the required tasks.[188]

5.2.2 Administrative burden for industry

The complexity of procedures especially for new technologies (due to a lack of experience) is often a strong barrier for further growth. The 2012 IEA-OES report indicates that many countries have complex administrative procedures or not even clarity on which administration is actually responsible for ocean renewable energy.[189]

Ocean energy is facing more difficulties and administrative burden in requiring the necessary licenses and permits then for example offshore wind. This is not only due to a more limited experience with ocean renewables but also to a number of unknowns regarding the environmental impacts of these new technologies. Overall administrative project costs for offshore wind are 14 % higher than for onshore wind. In ocean renewable energy we can expect this amount to be even higher, as it is still less recognized than offshore wind.[190] Some governments (e.g. Scotland) are working already on a reduction of procedures through the introduction of so-called “one-stop-shops” and with easier permissions on dedicated test sites (e.g. EMEC in Scotland, AMETS in Ireland).[191]

The one-stop-shop in Scotland facilitates administrative procedures. Nevertheless, there are still a lot of requirements to fulfil. Especially the habitat directive causes challenges for the sector (as it was agreed on before the ocean renewables sector attracted interest). Companies which want to install ocean renewable energy power plant need to gather extensive data before installation and also after. It is easier though to get licenses within test sites (EMEC), because applicants are provided with help (which is not the case e.g. in Spain & Portugal, where the first mover has high costs and therefore a first mover disadvantage).[192]

5.2.3 Restrictive practices

How open is the competition (e.g. test-sites…)?

Competition is rather limited due to a lack of capital. Especially since governments are currently more reluctant to provide high subsidies in comparison to the pre-crisis period, it is difficult for SMEs to enter. The amount of money required to start-up a plant is significant and therefore needs strong support. This limits competition. Test-sites are open to everyone and e.g. in the UK power plants are also possible outside the test-sites depending on the landlords.[193]

[186] Based on an interview
[187] South West Marine Energy Park (2012) http://www.wavehub.co.uk/wp-content/uploads/2012/01/Marine-Energy-Park-prospectus.pdf , p.43
[188] Based on an interview
[189] O’Hagan (2012): A review of international consenting regimes for marine renewables: are we moving towards better practice?
[190] Ecorys (2013): Study in support of Impact Assessment work for Ocean Energy, p.17
[191] Ecorys (2013): Study in support of Impact Assessment work for Ocean Energy, p.17
[192] Based on an interview
[193] Based on an interview

5.2.4 Finance and research

Sources of finance

Significant public funding but also industry funding has been targeted at the development of ocean energy technology. According to EU-OEA industry investments in the last 7 years totalled over € 600 m.[194] Current public funding is under pressure as a result of the economic situation and support has decreased in comparison to mid 2000 levels.[195] Moreover, governments are not allowed (due to a state aid requirements) to subsidise more than a set percentage of the costs of ocean renewable energy power plants[196]. For test facilities a less rigid support principle applies. For a number of companies this has led to a decreased interest for ocean energy in the last years. The industry is looking for strategic funds to cover the costs, which become more and more the exclusive source of funding.[197]

With varying degrees of effectiveness across the Sea basin, a mix of capital and revenue funding schemes have been implemented to support and incentivise investment in ocean renewable energy technologies. Several of the countries have implemented a Feed-in Tariff (FiT) scheme (UK, Spain, France). However, the level of support and utilisation of these schemes has varied.[198] The following table provides an overview on the Atlantic Arc countries:

Table 5.3 Sources of finance by country

Country	Finance
France	- Feed-in Tariff of €150/MWh available to ocean renewable energy sector - The Government is developing a new revenue support scheme as part of the national debate on energy taxation.[199]
Ireland	- 2005 Ocean Energy Strategy included € 26 m in dedicated funding including a € 10 m Prototype Development Fund and support for two test sites: Galway Bay and County Mayo. - Plans for FiT exist, but have not been implemented. - Since 2005, many universities receive large funding from public and private actors. E.g. € 25 m grant to fund Marine Renewable Energy Ireland led by University College Cork (involving other universities and industry partners).[200]
Portugal	- Government considering a new FiT from 2014 on.[201]
Spain	- Basque Government is exploring new funding mechanisms for wave energy sector.[202]
United Kingdom	- Increasing interest in the commercial potential of ocean renewable energy by industry. - Due to the challenging economic climate, the government is reluctant of further funding to the same extent than in recent years. - In 2013 the sector receives approximately € 44 m (£ 38 m) capital support through the MEAD (€ 23 m / £ 20 m) and MRCF (€ 21 m/£ 18 m) funding programmes. In January 2013 the Crown Estate announced it was considering investing up to € 23 m (£ 20 m) to support two array projects.[203]

Source: SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom

Costs

[194] http://www.oceanenergy-europe.eu/index.php/ocean-energy/ocean-energy-in-europe
[195] SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom, p. 6
[196] In the interveiw a maximum percentage of 25% is indicated.
[197] Based on an interview
[198] SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom, p. 6
[199] SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom, p. 10
[200] SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom, p. 11
[201] SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom, p. 12
[202] SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom, p. 13
[203] SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom, p. 14

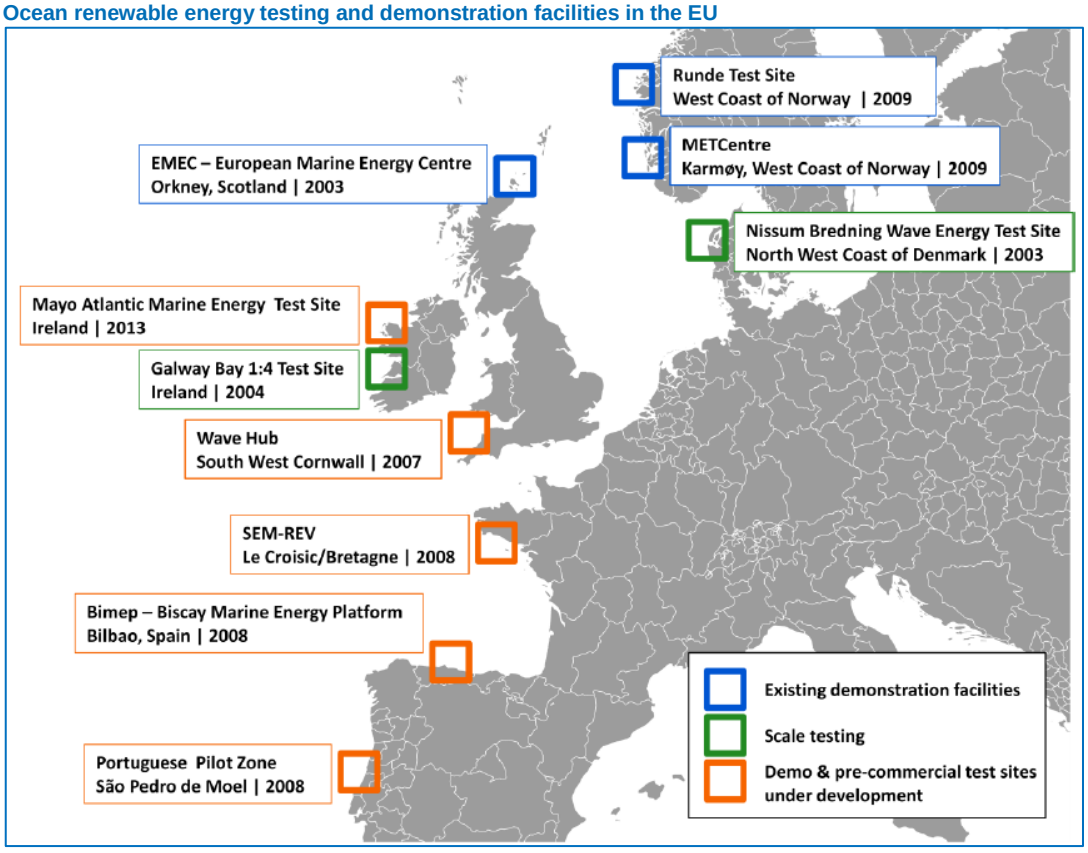
Current high costs of ocean renewable energy are one of the most important barriers for the development of wave and tidal technology. Recent estimates place the current costs of the order of 400 – 470 €/MWh for wave and 240 – 350 €/MWh for tidal[204], much higher than wind costs (offshore 160 – 210 €/ MWh and onshore 60 – 105 €/MWh[205]). At present, the uncertainties about final costs and risks of ocean renewables devices are still large, due to the very early stages of development. Nevertheless, the more power plants installed the higher the expected learning effect.[206] However, these learning effects need to be high enough to provide a credible path towards about 120 €/MWh in 2025 to sustain a momentum for the technology.[207]

Estimations on the basis of various development scenarios in the Ecorys (2013) study have shown that under a very ocean renewable energy friendly development, tidal energy might get close to this price level still before 2030. Wave energy on the other hand is expected to achieve lower costs at a later stage.[208]

On-going research activities

On the ground there are several testing sites in place in the EU. The following figure shows existing demonstration facilities, scale testing and demo & pre-commercial test sites under development:

Figure 5.2 Ocean renewable energy testing and demonstration facilities in the EU



EU OEA (2012) Position Paper Towards European industrial leadership in OE in 2020 p.13

Current testing facilities can build on experiences with passed and on-going FP7 projects. Examples of such projects are:

[204] LCIG Technology Innovation Needs Assessment (TINA) Marine Energy Summary Report, August 2012
[205] Renewable Energy technology cost series, IRENA, issue 5/5, Wind power, June 2012
[206] Ecorys (2013): Study in support of Impact Assessment work for Ocean Energy, p.28
[207] Low Carbon Innovation Coordination Group (2012): Technology Innovation Needs Assessment (TINA) – Marine Energy Summary Report, p. 6
[208] Ecorys (2013): Study in support of Impact Assessment work for Ocean Energy, p.33

- The Equimar project is completed and involved about 60 scientists, developers, engineers and conservationists from 11 European countries who were working together to find ways to measure and compare tidal and wave energy devices, proposed locations and management systems competing for funds at that time, so governments could invest in the best ones and get ocean renewable energy on tap fast[209];
- The Vectors project is focussing on how environmental and man made factors are impacting marine ecosystems now and how they will do so in the future environmental impacts[210]
- The Mermaid project is developing ideal multi-purpose platforms for each type of sea (and therefore sea basin). Ocean renewable energy is included in the Atlantic Sea basin multi-purpose platforms[211];
- The SOWFIA project aims to achieve the sharing and consolidation of pan-European experience of consenting processes and environmental and socio-economic impact assessment best practices for offshore wave energy conversion developments[212].

In addition to the actual testing, there is a growing interest from academia and research institutions in ocean renewable energy. This is shown in the growing number of scientific publications on the topic.

Table 5.4 Development of scientific publications (2001-2010)

Publications	Number	Number	Number	Increase in %	Increase in %	% of total	% of total
Year	***2001***	***2006***	***2010***	***2001-2010***	***2006-2010***	***2001***	***2011***
Ocean Renewable Energy	143	257	392	274%	153%	11%	8%

Source: Ecorys (2012) Blue Growth report

Another indicator in addition to scientific publications is the number of patents which represent the link between scientific research and private industry.

Table 5.5 Development of patents worldwide (2001 – 2010)

Patents	Number	Number	Number	Increase in %	Increase in %	% of total	% of total
Year	***2001***	***2006***	***2010***	***2001 -2010***	***2006 -2010***	***2001***	***2011***
Ocean Energy	110	166	730	664%	440%	6%	15%

Source: Ecorys (2012) Blue Growth report

Out of all patents registered between 2001 and 2010, 259 patents were registered in the UK, 82 in Spain, 62 in France and 109 at the European patent office. Furthermore, several European companies are leading patent holders in the field (e.g. Voith Paper Patent GmbH 17 patents, Bosch GmbH 15, Rolls-Royce PLC 10, Single Buoy Moorings 8, Siemens 7).[213]

5.3 Good practices for support of the sector at sea-basin level

Table 5.6 Detailed description of good practices

[209] http://www.equimar.org/
[210] http://www.marine-vectors.eu/
[211] http://www.mermaidproject.eu/
[212] http://sowfia.eu/
[213] Ecorys (2012) Blue Growth report

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
European Marine Energy Centre (EMEC)	The European Marine Energy Centre (EMEC) Ltd was established in 2003 and is the first and only centre of its kind in the world to provide developers of both wave and tidal energy converters with purpose-built, accredited open-sea testing facilities.	http://www.emec.org.uk/	Can be transferred to other areas in the EU with ocean renewable energy potential.
Paimpol-Brehat site, Brittany, France	8 MW tidal turbine demonstration farm off with the first 2 MW installed turbine in 2011. According to EdF, when completed it will be the world's largest tidal array and the world's first grid-connected tidal energy farm.[214]	http://energie.edf.com/hydraulique/energies-marines/carte-des-implantations-marines/parc-hydrolien-de-paimpol-brehat/presentation-51512.html	Serves as pilot project which, if successful, can be transferred to other countries with tidal energy potential.
Falmouth Marine School	Provides a comprehensive selection of marine based courses and apprenticeships including entry level to degrees in Marine Engineering and Marine Sciences many of which are not available anywhere else in the UK. The school also manages the Marine Innovation Service, established to provide knowledge transfer and consultancy to companies working in the marine sector.[215]	www.cornwall.ac.uk/falmouth/Home	A transferable concept to regions with start-up of ocean renewable technology installations.
One-stop-shop Scotland/consenting regime in Scotland	The idea behind the one-stop-shop is to reduce administrative burden to companies which are interested in investing in ocean renewable energy. Even though requirements are still perceived high, in Scotland they are facing public officials who know what needs to be done and are all located at one office.		The concept is transferable, but needs a commitment of the government towards ocean renewable energy.
University of Edinburgh/IDCORE	The IDCORE programme at the University of Edinburgh is a programme which intends to train world-class industrially focussed research engineers who will, with the help of sponsoring companies, accelerate the deployment of offshore wind, wave and tidal-current technologies in order to meet the UK's ambitious offshore renewable energy targets.[216] The programme has strong links to industry.	http://www.idcore.ac.uk/	To provide a interlinked programme of industry and university a certain level of existing industry is necessary as well as clear prospects for the sector in a certain region. Currently the programme is probably difficult to be transferred to other EU Member States.
BIFAB apprenticeship programme	Recognising the future demands for a highly skilled work force, BiFab introduced an apprenticeship training scheme in 2007 with the aim to have a rolling programme of 50 apprentices in the scheme at any one time.[217]	http://www.bifab.co.uk/view/news.aspx?newsid=28	Yes

5.4 Measures that stimulate Blue Growth in the Atlantic Arc

Ocean renewable energy consists of various technologies with different ambitions for the up-coming years. All technologies are still in a development stage, but wave and tidal are aiming to

[214] http://en.wikipedia.org/wiki/Paimpol%E2%80%93Br%C3%A9hat_tidal_farm#cite_note-green-2
[215] South West Marine Energy Park (2012) http://www.wavehub.co.uk/wp-content/uploads/2012/01/Marine-Energy-Park-prospectus.pdf , p.27
[216] http://www.idcore.ac.uk/
[217] http://www.bifab.co.uk/view/news.aspx?newsid=28

become competitive in the next decades. Currently about 10 MW capacity is installed (mainly in the UK), however the potential until 2020 is assessed to be 2 GW.

In recent years, manufacturers from related technologies (e.g. VOITH) got interested in the field and started to invest in R&D for ocean renewable energy. The sector is offshore competing for workforce from offshore oil and gas and offshore wind. The increasing demand for marine engineers in the upcoming years will lead to fierce competition for skilled workers. Especially engineers who are attracted by becoming pioneers will join more and more the ocean renewables sector.

A challenge for the sector is the rather high administrative burden which it faces in most countries. A step in the right direction in this respect is the one-stop-shop in Scotland which facilitates application procedures. However, even there, requirements are very high which raises costs for companies. In certain cases we can speak of a “first-mover disadvantage”.

Another problem for the sector is that Member States are reducing public funding since the economic Crisis. Therefore, industry is looking for strategic funds. A form of support found are feed-in tariffs which are either already in place or currently under discussion. Nevertheless, the sector will need to drastically reduce costs to become competitive within the next 15 years. The high intensity of research and the work in different test centres will help to achieve this goal.

Public policy can either stimulate growth in the sector through enhanced political coordination, voluntary initiatives and awareness raising or even more targeted structural actions to provide continuous support and ocean renewable energy mainstreaming.

In order to accelerate innovation and bring down the costs of ocean renewable devices, concerted R&D efforts are essential. These can be either supported by direct subsidies or by more soft political actions. Given the fact that different Member States have achieved a different level of development, information exchange, roundtables including all relevant stakeholders and further awareness rising can help to tackle the challenges of the sector. A wider political buy-in and commitment can, in turn, effectively mitigate risk and facilitate the industry’s access to finance.

Exchange of best practice examples can support R&D. Learning from and investing in technology development projects (as in the FP7 programmes) will further help the development of the sector.

Furthermore, as the sector will have growing needs for marine engineering skills and will thereby need to compete with other growing offshore technologies (offshore wind, offshore oil & gas) stronger support for skills developments (apprenticeship programmes, university programmes) will be needed. This can be either financial support, but in many cases also support in raising awareness of the programmes and promoting their existence. Existing programmes e.g. the BIFAB apprenticeship programme or the IDCORE programme of the University of Edinburgh can profit from publicity as well as exchange programmes.

Additionally, regulatory issues need to be solved. Administrative procedures are still very complex and in many cases even unknown. Grid planning and Maritime Spatial Planning keep the sector in uncertainty. These complex administrative procedures and uncertainties about the future deter potential investors from investment.

According to article 13 of the RES Directive Member States should ensure that national authorisation and licensing rules applied to RES installations are “proportionate and necessary”, which is in reality only poorly implemented.

All these measures can have a European and a national perspective. The following figure provides an overview of national key policy drivers across the EU’s Atlantic Arc region:

Figure 5.3 Key policy drivers across the EU's Atlantic Arc region - March 2013

Member State	Political will to develop Ocean Energy (OE)	Govt. strategy on OE	Market pull	Technology push*	Planning regime	Leasing process	Infrastructure focus	Of interest
Denmark 	Regarded as longer term prospect that could supplement wind and biomass.	No dedicated OE strategy (*Partnership for Wave Energy* developed strategy for R, D & D in 2012).	FiT of €80/MWh (Uniform across all renewables)	€3.4m for wave projects 2014-15.	(Offshore wind one-stop-shop).	Too early.	Strong offshore expertise. Smart Grid for renewables under development.	Research focus on wind/wave device & 100% renewable by 2050.
France 	Regarded as priority sector for low carbon future.	Govt report released in March 2013 on future prospects of ocean energy in France.	FiT of €150/MWh	ADEME launched calls for demonstration projects and pilot farms in 2009 and May 2013. Further calls expected up to 2016.	Managed by state préfectures on case by case basis.	Multi-agency.	Future grid upgrades req'd. Strong port facilities.	Established France Energies Marines in 2012 - €133m/10yrs.
Ireland 	OE regarded as single greatest energy resource and identified in 2012 as one of 14 priority research areas for Ireland.	Range of OE strategic plans.	FiT proposed but not availed as yet.	€10m Prototype Dev. Fund; €3.5m RE RD&D Pgrm; €4m Galway Bay ¼ scale testing facility (operational); €14m Beaufort Laboratory (UCC); AMETS full scale (under development)	Review of foreshore consenting regime (since 2010). Public consultation in 2013. Possible future one-stop-shop.	Under review.	EirGrid progressing €4bn Grid25 and DS3 grid upgrade programs.	500MW East-West Interconnector to facilitate energy exports between Ireland and UK completed in 2012.
Portugal 	Strong momentum of early-2000s stalled due to national austerity measures. OE regarded as important future RE source.	No dedicated OE strategy. OE embedded in national energy strategy.	Scheme halted. (Former support: FiT of €260/MWh to €190/MWh).	Project finance for renewable energy available through QREN and Portugal Ventures.	National Maritime Spatial Plan (POEM) under development (since 2010).	Multi-agency. (Wave Energy Pilot Zone under development).	Strong grid infrastructure along coast but minimal offshore expertise.	POEM expected to facilitate efficient consenting process within Pilot Zone.
Spain 	Strong regional commitment. National position on OE under review.	No dedicated OE strategy. OE embedded in national & Basque energy strategies.	2012 moratorium suspending FiT for future projects. (Prior to suspension, FiT was €68.9/MWh for all renewables)	€15m for OceanLider under CENIT Pgrm (National); ETORGAI (Basque) - €8m for UHINDAR Pgrm.	Multi-agency.	Multi-agency.	Strong mainland grid. Future connectivity in Canary Islands req'd.	Biscay Marine Energy Platform (BIMEP) - open sea test facility, due to be operational in 2013.
U.K. 	Strong, sustained commitment, especially Scotland, has allowed industry to reach cusp of commercialisation.	Range of OE strategic plans.	Revenue support: €290/MWh (5ROCs) €58-60/MWh per ROC.	Range of capital support programs: WATERS, MEAD, ETI, TSB, MRCF (c. €100m (£85.5m) over 7 years)	One-stop-shops for consenting. Scotland (Marine Scotland) and England (Marine Mgt Org).	Single Authority: Crown Estate	Grid upgrades critical to industry development. Transmission charging in Scotland under review.	Electricity Market Reform will change revenue support.

Please note: All figures are approximations due to currency conversions.
* Of known sources, list may not be exhaustive.

Source: SI OCEAN (2013): Ocean Energy In Europe's Atlantic Arc – An overview of policy and market conditions in Denmark, France, Ireland, Portugal, Spain and the United Kingdom

Annex I – References

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- www.cornwall.ac.uk/falmouth/Home

Annex II – List of stakeholders consulted

Interviewee	Organisation	City / Country	T = Telephone F = Face-to-face	Date of the interview
Sian George	OEA	United Kingdom	T	13/11/2013
Rémy Gruet	OEA	Brussels	T	13/11/2013
David Krohn	RenewableUK	United Kingdom	T	13/11/2013

Annex III – Detailed overview of ocean energy installations per Member State[218]

Country& name plant/device	Technology	Capacity (year installation)	Location
United Kingdom			
• Limpet	Wave	0.5 MW (2000; closed in 2013)	Isle of Islay (Scotland)
• Open Hydro	Tidal	0.25 (2008)	EMEC (Scotland)
• Marine Current Turbines	Tidal	1.2 MW (2009)	Strangford Lough (N Ireland)
• Oyster 1	Wave	0,315 MW (2009)	EMEC (Scotland)
• Pelamis	Wave	0,75 MW (2010)	EMEC (Scotland)
• TGL	Tidal	0,5 MW (2010)	EMEC (Scotland)
• Oyster 800	Wave	2.4 MW (2011 first phase)	EMEC (Scotland)
• Ak-1000 Mk1	Tidal	1 MW (2011)	EMEC (Scotland)
• HS-1000	Tidal	1 MW (2011)	EMEC (Scotland)
• Neptune Proteus	Tidal	0.5 MW (2011)	Humber Estuary (England)
• Pelamis P2	Wave	0.75 MW (2011)	EMEC (Scotland)
• SR250	Tidal	0.25 MW (2011)	EMEC (Scotland)
• AWS-II single cell	Wave	1.25 MW (2012)	EMEC (Scotland)
• PS1200	Tidal	1.2 MW (2012)	Kyle Rhea (Scotland)
• TGL (ReDAPT)	Tidal	1 MW (2012)	EMEC (Scotland)
• Voith Wavegen 100 kV	Wave	4 MW (2012)	Riadar (Scotland)
• DeltaStream	Tidal	1.2 MW (2012)	Ramsey Sound (Wales)
• Voith Siemens Hydro Tidal	Tidal	1 MW (2012)	EMEC (Scotland)
• Penguin (Wello)	Wave	0.5 MW (2012)	EMEC (Scotland)
• Bolt “Lifesaver”	Wave	0.25 MW (2012)	Cornwall
• Oceanus	Wave	1 MW (2012)	EMEC (Scotland)
• DeepGen 1 MW	Tidal	1 MW (2013)	EMEC (Scotland)
• Deep Green	Tidal	0.5 MW (2013)	Strangford Lough (N Ireland)
• Hy Tide 1000-13	Tidal	1 MW (2013)	EMEC (Scotland)
France			
• La Rance	Tidal barrage	240 MW (1966)	La Rance
• Paimpol-Brehat Tidal Farm	Tidal range	2.2 MW (2012)	Paimpol
Portugal			
• WaveRoller	Wave	0.3 MW (1999)	Peniche
• Pelamis	Wave	2.25 MW (2008, closed 2008)	Aguçadoura Wave Farm
• OWC Pico Power plant	Wave	0.4 MW (2011)	Pico, Azores
• Wavebob	Wave	0.25 MW (2012)	Pilot Zone
• BlueWAVE	Wave	2.5 MW (2012)	Pilot Zone
Spain			
• Mutriku Wave Power Plant	Wave	0.3 MW (2011)	Mutriku, Basque country
• Project WELCOME219	Wave	0.1 MW (2011)	Las Palmas
• (J + B) 2B	Wave	0.3 MW (2011)	Galicia
• Seapower Abencis220	Wave	n/a (2011)	Catalunia
• PowerBuoy 221	Wave	0.04 MW (2008) +0.15 MW (2013)	Santoña, Cantabira
• UNDIGEN	Wave	0,1 MW (2013)	Las Palmas

[218] Many installations are prototypes only, some of which are not connected to the grid
[219] 1:5 scale prototype
[220] 1:4 scale prototype
[221] Demonstrator

Ireland • OE Buoy	Wave	0.02 MW (2007-2011)	Galway Bay Test Site

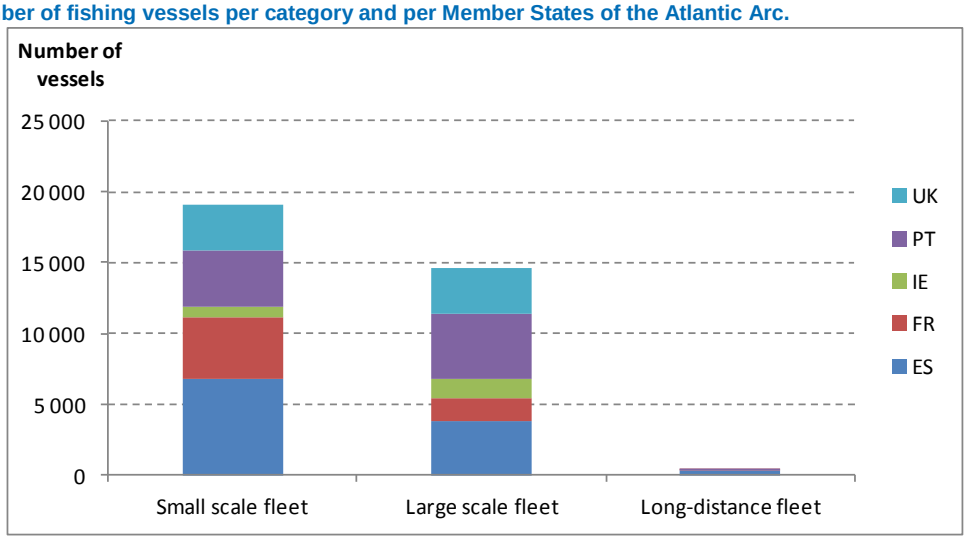
Source: Ecorys, based on IEA OES (2011), pg. 122, EU-OEA (2012), APPA Marina (2013), Tecnalia (2012), RenewableUK (2013)

6 Fisheries

6.1 General overview of fisheries in the Atlantic Arc

The fisheries sector of the five Member States of the Atlantic Arc comprised in 2011 a total of 34 082 registered fishing vessels, including 19 120 small scale fishing vessels (53%), 14 623 large scale vessels (43%) and 339 long-distance waters vessels (1%) (STECF, 2013)[222]. Small scale fishing vessels include small vessels of less than 12 metres using passive gears and fishing mostly in the territorial waters of the Member States, long-distance waters vessels include larger vessels of more than 24 m and fishing in other regions than the North-East Atlantic, and large scale vessels include vessels not falling under any of these two categories, *i.e.* mainly fishing vessels greater than 12 m in length operating in the waters of the North East Atlantic beyond territorial seas of Member States and vessels of less than 12 m using active gears such are trawls or dredges.

Figure 6.1 Number of fishing vessels per category and per Member States of the Atlantic Arc.



Source : from STECF (2013)

In terms of fishing capacity expressed in engine power (KW) and in tonnage of the vessels (GT), the small scale fleet of Member States of the Atlantic Arc concentrate 27% in KW and 6% in GT, the large scale fleet 63% and 72% respectively, and the long distance fleet 10% and 23% respectively. Long distance fishing activities concern essentially Spain and France, and Portugal to a lesser extent.

Total landings (in live weight) of the fishing fleets registered in the 5 Member States is close to 2 500 000 tonnes on average over the 2008-2011 period (FAO, 2013) [223]. This represents just below 50% of total EU landings. It can be noted that the proportion of landings originating from waters of the North East Atlantic represent only 69% of total landings. Close to 26% of landings are originating from other areas, in particular the North West Atlantic and Eastern Central Atlantic, the Indian Ocean and the Pacific Ocean. These catches are mostly attributable to the activities of the

[222] STECF (2013) The 2013 Annual Economic Report on the EU Fishing Fleet (STECF 13-15). JRC Scientific and Policy Reports JRC 84745, 302 p.
[223] FAO (2013) FISHSTAT. In: *Global Capture Production*. FAO, Rome, Italy.

long distance fleet, and in particular to the Spanish fishing fleet. Fishing activities of Spanish and French vessels in the Mediterranean account for 5% of total catches of the Member States of the Atlantic Arc.

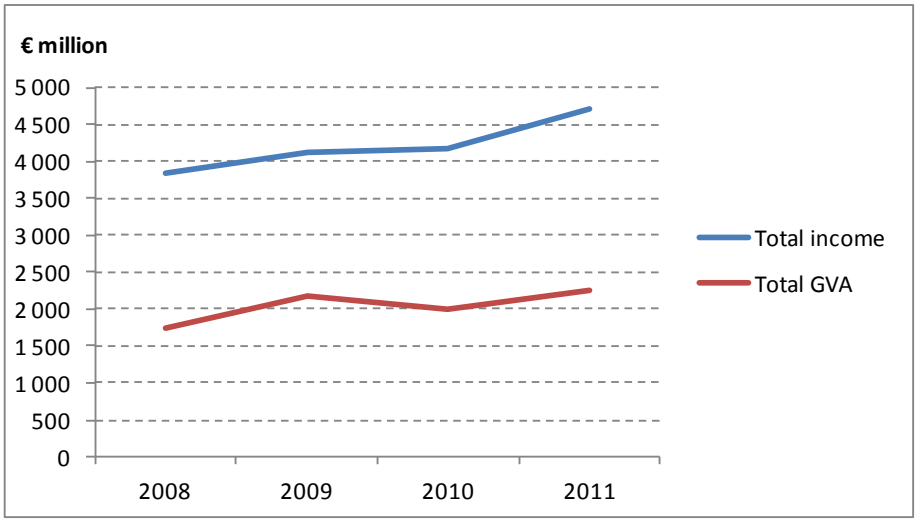
Table 6.1 **Data on landings of the five Member States of the Atlantic Arc (in tonnes live weight).**

Fishing area	2008	2009	2010	2011	Average	%
Atlantic, Northeast	1 725 771	1 674 152	1 786 861	1 707 193	1 723 494	69%
Other Atlantic Ocean areas	337 184	392 077	450 988	411 067	397 829	16%
Indian Ocean	218 649	189 119	195 452	192 125	198 836	8%
Pacific Ocean	55 198	59 713	43 677	74 830	58 355	2%
Mediterranean and Black Sea	127 310	122 371	117 422	116 139	120 810	5%
TOTAL	**2 464 112**	**2 437 432**	**2 594 400**	**2 501 354**	**2 499 324**	**100%**

Source: FAO (2013)

The income of the fishing fleet of the 5 EU Member States from the sale of catches is estimated by STECF (2013)[224] to be slightly in excess of €4.2 bn per year on average over the 2008-2011 period. The Gross Value Added generated by the fleet is slightly in excess of €2 bn on average over the same period. On average, GVA generated by the fleet represents 48% of income from landings. The following graph shows that both total income and GVA are following an increasing trend over the 2008-2011 period.

Figure 6.2 **Evolution of income and gross value added from sales of catches generated by the fleet of the 5 Member States of the Atlantic Arc.**

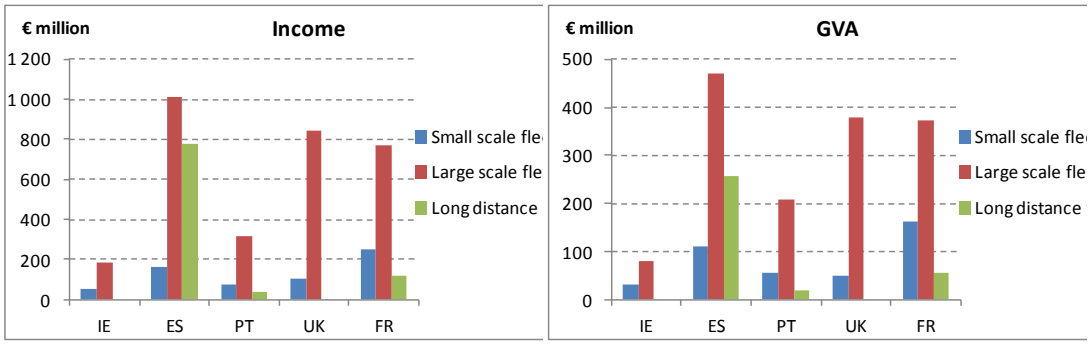


Source : STECF (2013)

According to STECF (2013) data, the fleet segment that contributes the most to income and GVA is the large scale fleet segment (66% of income, 67% of GVA across the 5 Member States of the Atlantic Arc). The long distance fleet segment is the second contributor (20% of income, 15% of GVA), just ahead of the small scale segment (14% of income, 18% of GVA). As shown in the following graph, the economic prevalence of the large scale fleet segment is to be found in each of the 5 Member States of the Atlantic Arc. In Spain, the long distance fleet segment is at the origin of 30% of the National GVA generated by fishing activities.

[224] STECF (2013) The 2013 Annual Economic Report on the EU Fishing Fleet (STECF 13-15). JRC Scientific and Policy Reports JRC 84745, 302 p.

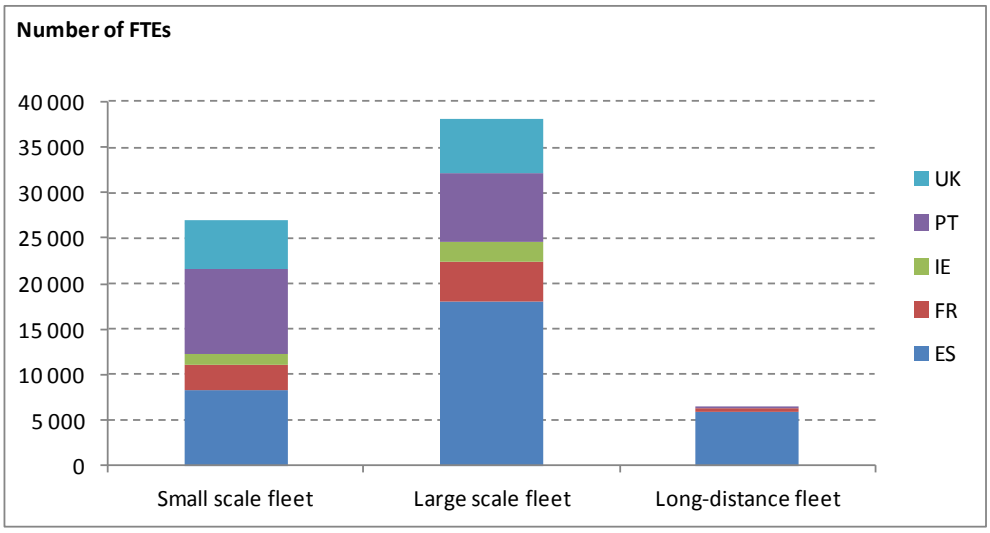
Figure 6.3 **Income (left) and GVA (right) generated by the different fleet segments in the 5 Member States of the Atlantic Arc.**



Source : STECF (2013)

Employment in the fisheries sector of the 5 Member States of the Atlantic Arc represents approximately 65 000 FTE on average over the 2008-2011 period (STECF, 2013). The number of FTEs is following a decreasing trend, from 66 745 FTE in 2008 to 60 069 FTE in 2011 (-10%). In 2011, 53% of employment is on large scale fishing vessels, 38% on small scale fishing vessels, and 9% on long distance fishing vessels.

Figure 6.4 **Distribution of employment (in FTE) according to the different fleet segments in the 5 Member States of the Atlantic Arc.**



Source: STECF (2013)

Value chain:

The fisheries sector is integrated in a value chain that includes suppliers of goods and services to the fleet (upstream sector) and a downstream sector supported by transport, processing and marketing of fisheries products landed by the fleet.

Table 6.2 **Upstream and downstream activities of fisheries**

NACE code	NACE label	Description
Main upstream economic activities		
30.11	Building of ships and floating structures	Construction of fishing vessels
33.15	Repair and maintenance of ships and boats	Repair & maintenance of fishing vessels
65.15	Non-life insurance	Insurances for vessels and crew
46.71	Wholesale of solid, liquid and gaseous fuels and	Supply of petrol

NACE code	NACE label	Description
	related products	
13.10	Preparation and spinning of textile fibres	Manufacture of fishing gears
Main downstream economic activities		
10.20	Processing and preserving of fish, crustaceans and molluscs	Processing of catches
46.38	Wholesale of other food, including fish, crustaceans and molluscs	First buyers and traders of fisheries products
47.23	Retail sale of fish, crustaceans and molluscs in specialised stores	Specialised retailers of fisheries products
47.11	Retail sale in non-specialised stores with food, beverages or tobacco predominating	Supermarkets distributing fisheries products
49.41	Freight transport by road	Transport of fisheries products from point of landing / processing to final destination
50.20	Sea and coastal freight water transport	Transport of fisheries products from point of landing / processing to final destination (for long-distance fleet)

It should be noted that the upstream and downstream activities are not necessarily linked to the activities of the fishing fleet registered in the 5 Member States of the Atlantic Arc. For example, shipyards based in one of the NUTS of the Atlantic Arc build fishing vessels that will operate in other regions, including in third countries, while fishing enterprises of Atlantic Arc may have their vessels built in other EU regions or in third countries.

The same applies to the downstream sector. In general, there is little connection between local landings and the fish processing industry (NACE 10.20). Fish processing companies need regular and large amounts of raw material at cheap prices that are mostly sourced outside their regions. For example, supply of salmon for processing is essentially sourced from the aquaculture sector. Whitefish processed is purchased from fisheries producing large quantities of raw material like the Alaska Pollock fishery (USA) or the Russia cod fishery in the Barents Sea. Factories processing tuna in Galicia (Spain) utilise part of the production of the national vessels, but rely extensively on tuna catches of third-country vessels pre-processed into precooked loins in the same or in another third country. Nevertheless, the fish processing industry generates substantial economic benefits in the 5 Member States of the Atlantic Arc, greater than those measured for the fisheries sector with for 2009 with a turnover estimated at €15.8 bn, a GVA of €3.4 m, and employment in excess of 53 000 FTE (STECF, 2012)[225].

The following table presents the value of the production of the fish processing sector in the 5 Member States of the Atlantic Arc disaggregated by PRODCOM subheading[226]. The table details the value of the production for the main categories of products manufactured totalling 72% of the total production estimated through PRODCOM surveys. As indicated by the assumptions on the method of production and origin of supply, most raw material processed by the fish processing sector of the 5 Member States is not linked to the activities of the EU fishing fleet, with large quantities imported from third countries and/or produced by the aquaculture sector. According to STECF (2012), purchase of raw material is estimated to represent between two-third and 90% of total operational costs borne by the fish processing industry.

[225] STECF (2012) Economic Performance of the EU Fish Processing Industry Sector (STECF-OWP-12-01). JRC Scientific and Technical reports JRC 69584.
[226] By comparing the estimated value of the production estimated by STECF (2012) close to €15 bn and the estimated value of production estimated by PRODCOM at around €10 bn, it can be estimated that PRODOM covers around 75% of the EU production.

Table 6.3 **Value of the production of the fish processing sector in the 5 Member States and assumptions on the production method and origin of supply of raw material processed.**

NACE code	Heading (shortened)	Value (€ m)	% Total	Assumptions on the production method and origin of supply
10202540	Prepared or preserved tuna	1 746	17%	Capture fisheries products. Estimated 20% produced by EU fleet, 80% imported(1)
10201100	Fresh or chilled fish fillets	1 295	13%	Capture fisheries products. Estimated 50% produced by EU fleet, 50% imported (2)
10203400	Prepared or preserved crustaceans	1 042	10%	Aquaculture products (shrimps) (3)
10202425	Smoked salmon	983	10%	Aquacutlure products (salmons) (4)
10201330	Frozen whole salt water fish	948	9%	Capture fisheries products Estimated 50% produced by EU fleet, 50% imported (5)
10202570	Fish fillets in batter or breadcrumbs	821	8%	Capture fisheries products. Estimated 90% imported from third countries (6)
10203100	Frozen crustaceans	548	5%	Aquaculture products (shrimps) (7)
Other 1020 products		2 921	28%	
All 1020		10 304	100%	

(1): Part of the tuna processed in the Member States is caught by the EU long distance fleet

(2): Concerns primarily whitefish fillets (cod, haddock, whiting). Large supply is known to be purchased by processors from Norway and Russia in particular

(3): Aquaculture

(4): Aquaculture

(5): Same assumption as for (2)

(6): The fish processing industry process primarily frozen blocks of whitefish fillets. Most common sources of supply include US Alaska Pollock or Pacific cod, or cod from the Barents Sea produced by Norway and Russia

(7): Aquaculture

Data on production source: PRODCOM http://epp.eurostat.ec.europa.eu/portal/page/portal/prodcom/data/tables_excel

Due to stagnating internal production and increase of the demand for fisheries products, the EU market is heavily dependent on imports of fisheries products from third countries. The next table shows the external trade data of the 5 Member States of the Atlantic Arc for fisheries products. Fisheries products include products from capture fisheries and aquaculture utilised directly on the markets or by the processing industry for manufacturing value-added seafood products. The combined nomenclature does not make the difference between the two sources of supply (fisheries or aquaculture) and between the utilisation of products (direct consumption or input for the processing industry).

Table 6.4 **Values of imports and exports of fisheries and aquaculture products* into the EU from extra-EU countries.**

Values in € m	2007	2008	2009	2010	2011
Imports					
Atlantic Arc Member States	7 158	6 970	6 219	6 912	7 563
EU	16 154	16 165	15 232	17 152	18 502
Exports					
Atlantic Arc Member States	1 109	1 253	1 162	1 424	1 720

Values in € m	2007	2008	2009	2010	2011
EU	2 593	2 818	2 509	3 024	3 355
Balance Export-Imports					
Atlantic Arc Member States	-6 048	-5 717	-5 057	-5 488	-5 843
EU	-13 560	-13 347	-12 724	-14 127	-15 147

* Defined as chapter 03 and tariff headings 1604 and 1605 of the Combined Nomenclature

Source: COMEXT database

6.2 Growth drivers and barriers to growth for the fisheries sector

6.2.1 Stock sustainability

Stock sustainability is pivotal for the growth of the EU fisheries sector. One of the main objectives of the European Union is to promote environmentally sustainable fisheries in the long term, in particular by adapting the exploitation rates so as to ensure that the exploitation of marine biological resources restores and maintain population populations of harvested stocks above levels that can produce the maximum sustainable yield (MSY). This conservation objective applies for fisheries under the competency of the EU, *i.e.* fisheries exploited by any vessel in the waters under the sovereignty of the EU and fisheries exploited by vessels flying the flag of a Member State wherever they operate.

In waters under the sovereignty of the EU, which correspond globally to the North East Atlantic area from where the fishing fleets of the 5 Member States of the Atlantic Arc catch approximately 70% of their landings, stock sustainability is addressed through a series of measures adopted by the EU by virtue of its exclusive competency in the domain that include principally maximum levels of catches and fishing effort (TAC & quotas regulations, effort regulations), technical measures to promote selective fishing techniques and structural adjustments of EU fleets to maintain a balance between fishing capacity and the biological potential of stocks. The measures adopted so far have paid off, with 39% of stocks estimated as overfished in 2013 compared to 94% in 2007 according to the latest figure published by the European Commission (EC, 2013)[227]. However, the figures concern only stocks for which scientific advice is available. For more than 50 other stocks and a number of small stocks of inshore species (*e.g.* crabs, molluscs), the state of stocks is unknown due to poor data.

Table 6.5 Number of stocks overfished and fished at MSY level. Source : EC (2013)

	2007	2008	2009	2010	2011	2012	2013
Stock overfished	30	29	30	28	22	18	16
Stock is fished at MSY	2	4	5	11	13	20	25
% stocks overfished	94%	88%	86%	72%	63%	47%	39%

The reformed Common Fisheries Policy is expected to bring substantial economic benefits to fleets operating in EU waters. This reform includes in particular a commitment to bring all stocks at MSY level by 2020 latest, an obligation to land all catches, and a decentralisation of the decision making process through regionalisation of the CFP. According to the impact assessment prepared by the

[227] EC (2013) Communication for the Commission to the Council concerning a consultation on Fishing Opportunities for 2014. COM(2013) 319 final.

European Commission (EC, 2011a)[228], the reformed CFP that will be applicable as from next 1st January 2014 will support a growth in GVA between 35% and 57% at the 2017 horizon, and between 63% and 97% at the 2022 horizon, depending on the options tested. Assuming that these percentage increases will benefit to the fishing fleets of the Atlantic Arc operating in EU waters, *i.e.* mostly the small scale fleet and the large scale fleet, the absolute growth in GVA in real term could lie anywhere between €700 m and €1 bn in 2017, and €1.2 bn and €1.8 bn in 2020[229]. However, the predictions in the impact assessment (EC, 2011a) also indicate that employment in the sector should further decrease, mainly as a consequence of the necessary adaptation of the fishing fleet to available resources, by around 16% in 2017 and between 21%-23% in 2020. In absolute value, the sector could lose a further 10 300 FTEs in 2017, and 15 000 FTEs in 2020 compared to the 65 000 FTEs currently supported by the activities of the small scale fleet and of the large scale fleet in the 5 Member States of the Atlantic Arc.

In waters not under the sovereignty of the EU, *i.e.* international waters or waters under jurisdiction of third countries, the EU regulates the activity of the fleets under the bilateral context of fishing agreement or under the multilateral context of regional fisheries management organisations. As outlined in the presentation of the sector, the activities of the long-distance fleets can bring a major contribution to the national economies, especially in Spain, but also in France and Portugal although to a smaller extent. Since the EU is not the only entity managing these fisheries, the evolution cannot be predicted as conservation measures in these waters are the result of negotiation between interested parties according to broad principles set out by the UN Convention for the Law of the Sea and related international instruments. The action of the EU, which has also exclusive competency on management of international fisheries, encompasses conclusions of fishing agreements with third countries and proactive role in the multilateral context of RFMOs to promote sustainable fishing practices, including additional voluntary actions to support research programmes and develop control plans to combat IUU fishing.

Member States can also adopt conservation measures that are no less stringent than EU measures to protect stocks of interest. In territorial waters, where Member States have empowerments to adopt measures according the CFP, there are numerous examples of inshore fisheries regulated by national instruments going beyond EU legislation. A classical example is the management of scallops stocks within territorial waters of France which include National measures to *inter alia* limit the number of vessels and the allowable landings, impose rules on gears that can be utilised and implement additional monitoring and control rules. Other examples include the management of inshore fisheries in the rias of Galicia by regional governments including measures on the maximum catch per day, allowable time at sea and technical measures on gears. In Ireland, National authorities also impose additional rules like the prohibition to catch seabass with nets or seasonal closures of fishing grounds exploited by the inshore fleet for protection of juveniles. Outside territorial waters, Member States may also define and implement measures to conserve stocks. Examples include the joint Spain-Portugal management of the Iberian stock of sardine, the unilateral decision by France to introduce selectivity devices in the trawl fleet targeting Nephrops in the Bay of Biscay, or the Conservation Credit Scheme implemented in the United Kingdom to encourage utilisation of selective fishing gears to avoid catches on endangered whitefish stocks.

[228] EC (2011a) Impact assessment accompanying Commission proposal for a Regulation of the European Parliament and of the Council on the Common Fisheries Policy [repealing Regulation (EC) N° 2371/2002]. Commission Staff Working Paper SEC(2011) 891, 84 p.
[229] Taking as a baseline the €1.9 bn GVA generated by these two segments of the fishing fleet of the 5 EU Member States in 2010 (Figure 6.3, right)

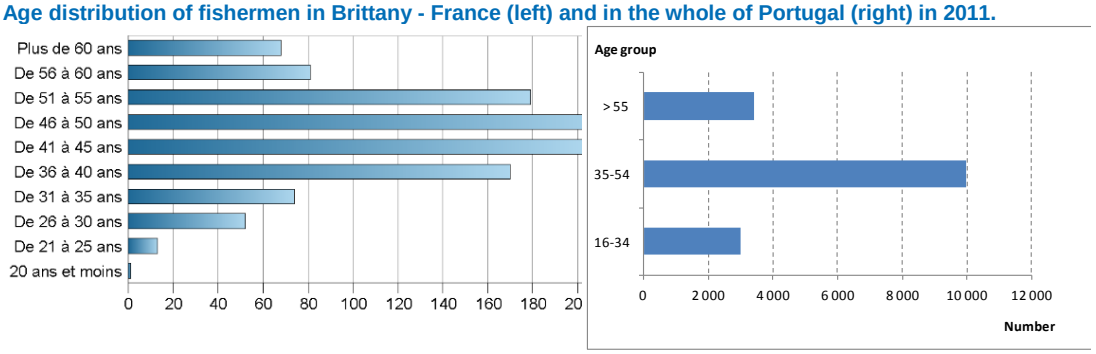
6.2.2 Labour market characteristics

Workforce characteristics

A typical fisherman carrier starts at the age of 16 years old and concerns persons not wishing to complete full secondary education levels (in most Member States non-compulsory secondary education levels concern persons aged 16 and more). The initial training of persons between the ages of 16 and 18 is provided through participation in an apprenticeship or approved training programme, which are operated under established rules and monitored by the competent authorities of Member States in dedicated maritime schools. With accumulation of time spent on fishing vessels and completion of additional training modules, persons starting as crew occupy officer positions (deck officer, engineer officer, master). For persons having completed secondary education levels or not, a carrier in the fishing industry can start at any age by following basic compulsory vocational courses focusing primarily on security issues. Globally, most persons engaged in the fishing industry have specialised training, with possibilities to work in other sectors of the maritime economy when qualifications obtained meet certain international standards defined by the International Maritime Organisation and implemented in EU Law through Directive 2008/106/EC (as amended)[230].

One of the main feature of the population employed in the fishing sector of the EU, including the 5 Member States of the Atlantic Arc, it that it is an ageing workforce. For example, the following figure (left) indicates that 71% of fishermen working on fishing vessels registered in Brittany (France) are 41 years old and more, including 31% more that 50 years old. In Portugal, 61% of the population engaged in professional fishing is between 35 and 54 years old, and 21% aged of more than 55 years old.

Figure 6.5 **Age distribution of fishermen in Brittany - France (left) and in the whole of Portugal (right) in 2011.**



Source: IFREMER (2012) for Brittany and INE (2012) for Portugal

In southern European countries, social protection systems are usually specific to the fishing industry: in France, fishermen are contributing to the ENIM (Etablissement National des Invalides de la Marine) which gather most maritime workers (sailors, fishermen and some aquaculture workers); in Portugal, fishermen may be covered by the Mútua dos Pescadores and in Spain, they are part of a specific social security for seafarers. In UK and Ireland, fishermen paid under the share system are considered to be self employed and have therefore to decide to contribute to the welfare system if they want to be covered (social security and jobseeker).

[230] Directive 2008/106/EC of the European Parliament and of the Council of 19 November 2008 on the minimum level of training of seafarers (recast)

Average wages of fishermen are estimated trough economic data collected under the DCF. Figures published for 2011 by STECF (2013) indicate that generally, average wages in the fishing sector are lower than average national wages across all economic sectors as reported by Eurostat (data ref earn_gr_nace2). One exception is France with higher salaries in the fishing sector compared to the National economy. The lower average wage in the small-scale fleet may reflect the high incident of owner-operated vessels and possibly, average wages are underestimated and profits overestimated (i.e. including what would be the crew/owner wages).

Table 6.6 **Average gross annual wages in the different segments of the fishing fleet of Member States and comparison with average gross annual wages in the business economy.**

(in €)	Small scale	Large scale	Long distance	All fleets	Average National Wages
ES	15 213	21 004	26 302	20 454	27 047*
FR	41 955	60 248	81 477	54 994	36 155*
IE	2 732	29 650		20 957	46 208*
PT	3 642	15 458	17 170	8 986	16 586
UK	6 606	32 456		31 608	43 196
All EU	**10 730**	**27 243**	**27 598**	**21 577**	**n.a.**

* 2010 data

Source : STECF (2013) for wages in the fishing sector and Eurostat (data table ref earn_gr_nace2) for average national wages

Hiring characteristics

The labour market is relatively fluid in the fishing sector, as employment contracts may be broken quite easily from both sides. Attracting workforce to the fishing sector is however more and more difficult. For some reasons linked to the quality of life and the harshness of the job, young people are less and less attracted to fishing as a career choice. As reported by most Member States in STECF (2013), the EU fleet is facing crew shortages which can have detrimental effects on the operations of the businesses as security rules impose minimum number of crews and minimum associated levels of qualification to be authorised to go at sea. These is especially true for the large scale fleet and for the long distance fleet both involving several days at sea in a row very often under difficult working conditions. The small scale fleet has comparatively less recruitment problems.

The development of other sectors of the maritime economy also underpins recruitment problems. Economic sectors such as offshore renewable energies or exploitation of natural mineral resources from the sea provide alternative employment opportunities for fishermen having officer qualifications meeting the IMO requirements transposed into EU Law through Directive 2008/106/EC[231] (as amended). Fishermen actively seize up these opportunities which offer more comfortable working conditions and higher wages compared to fishing.

In some Member States, the recruitment problem is partially resolved by hiring of third country nationals. In the United Kingdom, shipowners recruit Filipinos and nationals from Eastern EU (Latvia, Poland) to man the large scale vessels. In Spain, large scale vessels and long-distance vessels are partially manned by nationals from South American countries (*e.g.* Peru) or from Africa (*e.g.* Senegal, Morocco). In France, the number of foreign crew tends also to increase with nationals from Portugal or Poland working on large scale vessels. There are no data on the

[231] Directive 2008/106/EC of the European Parliament and of the Council of 19 November 2008 on the minimum level of training of seafarers (recast)

quantitative importance of foreign crew onboard the vessels, whether from another EU Member State or else.

The shortage of young people in the fishing sector compounded by the relative attractiveness of other sectors of the maritime economy is also threatening the continuity of operations of fishing vessels. Retiring fishermen are having problems to sell their assets to younger entrepreneurs discouraged by the low attractiveness of the job and the amount of capital needed to invest in fishing vessels of a certain fishing capacity. This threatens the economies of coastal regions dependent on fishing with decreasing employment opportunities in relation with shrinking fleets.

The poor attractiveness of the fishing sector has already been raised as a key issue by the Commission in its proposal on the reform of the Common Fisheries Policy (EC, 2011c)[232]. In the opinion of the Commission, together with developing social dialogue at all levels, bringing the catching sector back to profitability is an effective way of making fishing vessels safer and better working places, as well as making fishing an attractive, secure way of making a living. The CFP needs to contribute to the modernization of the working conditions on board of vessels and to ensure that modern health and safety standards are met. The Commission and the Council have encouraged the Member States to ratify the ILO Work in Fishing Convention of 2007 (C-188)[233]. As of end of 2013, no EU Member States had ratified this Convention. However the EU has already transposed into EU Law some requirements contributing to better working conditions onboard fishing vessels notably through:

- Council Directive 93/103/EC concerning the minimum safety and health requirements for work on board fishing vessels;
- Council Directive on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace (third individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC);
- Council Directive setting up a harmonised safety regime for fishing vessels of 24 metres in length and over;
- Directive 2003/88/EC of the European Parliament and of the Council concerning certain aspects of the organisation of working time;
- Directive 2008/106/EC of the European Parliament and of the Council on the minimum level of training of seafarers (recast).

A substantial part of public funds directed at supporting the fishing sector is targeting measures improving the qualification of the workforce, for initial and refresher training. All countries have developed specific training schemes for fishermen available at a relative low cost, covering the essential aspects of fishing activities: safety at sea, navigation skills, and improvement of the quality of the catch... In Ireland, the BIM is offering several 3 to 4 month long training courses for fees limited to €100 to €200. French lycées maritimes offer specific free training sessions for skippers, mechanics and deckhand either as initial training or refresher courses, with possibilities for persons attending the courses to receive financial aids to compensate for the loss of income during the training programme[234].

[232] EC (2011b) Proposal for a Regulation of the European Parliament and of the Council on the Common Fisheries Policy. 85 p.
[233] Available at http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C188
[234] See http://www.spppcm.fr/

6.2.3 Administrative burden and restrictive practices

The fishing industry does not appear to suffer from excessive administrative burden. Fishermen are obliged to comply with a number of reporting obligations (*e.g.* logbooks, sales notes) but this is not seen as abusive obligations. These reporting obligations may be extended to first buyers, in a move to better control landings, such as the implementation by the UK of the Registration of Buyers and Sellers (RBS) Scheme since 2005: this system is used by the fishing administration to cross-check information to detect possible infringements to the obligation of reporting landings. Submission of detailed data on landings is also pivotal for the traceability chain.

Restrictive practices

All fishing activities are subject to the possession of specific fishing licence in the EU and for some countries to the possession of specific rights on fishing quotas: FQAs in UK, "antériorités" in France, individual allocations for some stocks in Spain (Iriondo et al 2013[235]). In some Member States (UK notably), these fishing rights may be acquired by new-entrants, independently or combined with a fishing vessel. For other countries, the attribution of fishing rights to new entrants in the fishing sector may be more cumbersome: in France, the fishing licence (PME, for Permis de Mise en Exploitation) as well as the quotas ("antériorités") may be acquired directly when a new entrant in the sector buys a second hand vessel following a precise procedure. In certain circumstances however, young skippers have to introduce a specific request to be granted a PME and some "antériorités" by ad hoc commissions.

The procedures are burdensome, but they ensure that vessels have fishing opportunities available.

6.2.4 Finance and research

Sources of finance

Access to credit remains complicated for most fishing fleet in Europe in the current global economic crisis, as highlighted in STECF (2013). Funding new vessels is also becoming more and more difficult as the banking sector is reluctant to engage in the fishing sector considered as a high risk sector (overcapitalised, short-term visibility, low financial capacities of entrepreneurs). Some few very profitable fleet segments are nonetheless capable of retaining the financial institutions' attentions, such as the UK large pelagic vessels fleet which attracts investors to regularly renew its vessels, as highlighted in the latest Seafish publication[236].

Public aids for investment in fishing vessels are strictly scrutinised at the EU level, as one of the EU objective is to avoid any further increase in fishing capacity at the European level. There is currently no public scheme aiming at financing the construction of new fishing vessels. An EFF provision[237] allows member states to provide partial funding to young but experienced skippers (under 40 years old, with more than 5 years of experience as fishermen) for up to 15% (or €50 000) of the value of their first vessel bought in the second hand market with specific characteristics (under 24 m long, between 5 and 30 years old). Public money may also be targeted at schemes improving fishing operations such as engine renewal, catch selectivity or better on-board working conditions.

There is a trend towards the development of "fisheries improvement projects" (FIPs) under the umbrella of several NGOs, aiming at improving the sustainability of specific fisheries by a collaborative approach grouping fishermen and seafood buyers. The Prince Charities International

[235] Iriondo, A., Aranda, M. y Santurtún, M., 2013. El reparto de las cuotas individuales de pesca por buque de la flota de altura española en aguas del Nordeste Atlántico. Revista de Investigación Marina, AZTITecnalia, 20(2): 23-28
[236] John Anderson, Hazel Curtis (2010) Economic survey of the UK Fishing Fleet. Seafish, 114 pages.
[237] Council regulation (EC) No 1198/2006 of 27 July 2006 on the European Fisheries Fund - Article 27 "Socio-economic compensation for the management of the community fishing fleet" – paragraphs 2 and 3

Sustainability Unit is currently advocating for financial institutions to take part in such projects, providing transition finance to help groups of fishermen implementing these FIPs[238].

On-going research activities

A large share of the research developed for the fishing industry is aiming at assessing the different fish stocks targeted by the fishing vessels. All stocks are not however fully covered by these researches which are primarily oriented at evaluating stocks that are part of the EU TAC and quota system for provision of advices supporting the decision-making on fishing opportunities. These stocks are evaluated by research institutes from all over Europe in a regular process piloted by the ICES (International Council for the Exploration of the Sea). Each of the five Member States of the Atlantic Arc has designated institutes undertaking the data collection and the stock assessment necessary to provide relevant evaluations. Not all quota species benefit however from a comprehensive evaluation, as the data gathered may not be sufficient to implement a robust assessment such as the stocks of anglerfish (*Lophiidae*) or Nephrops (*Nephrops Norvegicus*). However, the situation is improving with more stocks being assessed as a result of the comprehensive data collection programmes supported by the EU (see below). According to the Commission, 50% of exploited stocks have a known status in 2013 (compared to less than 40% before). Additional data collection and research are needed to obtain indications of the status of the 50% other stocks. Some non-quota stocks benefit also from comprehensive research allowing evaluation to be performed on a regular basis, like some scallops stocks (*Pecten maximus*) along the French coast (Baie de Saint Brieuc, Baie de Seine) or the various crab stocks surrounding the UK.

Besides stock assessment, research and development has been concentrating on the improvement of fishing gears, aiming at reducing their drag to lower energy cost, but also at increasing their selectivity to reduce discards. Research projects have also been conducted to improve the design of fishing vessel to lower their dependency to energy, which represent a growing cost for the industry with the continuous increase in energy prices over the last 10 years. According to the latest AER report, energy costs represent on average the equivalent of 20% of the landed value generated by the European fleet, with some trawler segments spending more than 35% of their total income in fuel. Several initiatives have recently been launched on the development of innovative vessel designs for inshore vessels including new types of propulsion to lower the dependency on, such as hydrogen fuel cell, diesel-electric powertrain or the implementation of automatic sails.

Data collection and research in the fisheries sector are largely supported by the EU. The main instruments include:

- The Data Collection Framework [239] which establishes a common framework across the EU for collection of data in support of the Common Fisheries Policy. Data collected under this scheme include biological data for stock assessment, economic and employment data to monitor the socio-economic situation of the fisheries, aquaculture and fish processing sectors. Total cost of DCF is in the region of € 65 m per year and borne 50% by the EU;
- The research framework programmes developed by the EU which include funding for research programmes in support of the Common Fisheries Policy and related sectors including aquaculture, fish processing, sanitary issues;

[238] International Sustainable Unit (2012). Towards Global Sustainable Fisheries: The Opportunity for Transition. 49 pages.
[239] Commission Regulation (EC) No. 665/2008 of the 14 July 2008

- The EFF[240] which can support collective actions involving industry-science partnerships focusing *inter alia* on improvements of fishing gears or research on certain fish stocks.

Major research institutes along the Atlantic Arc

- BIM (Bord Iascaigh Mhara) (Ireland);
- CEFAS (United Kingdom);
- Marine Scotland Science (United Kingdom);
- IFREMER (France);
- IEO (Spain);
- AZTI (Spain);
- IPIMAR (Portuguese Institute of Sea and Fisheries Research) (Portugal).

6.3 Good practices for support of the sector at sea-basin level

Table 6.7 Detailed description of good practices

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
Stock assessment of local stocks (not part of the ICES process)	In several instances, cooperation between scientists and fishermen has lead to the development of local stock assessment, such as several scallops fisheries in France or shellfish stocks around the UK (crab, lobster and scallops). Specific management measures (effort limitation, closed areas...) are initiated based on these assessments in most cases.	French scallop fishery: http://cdpmem22.fr/index.php/la-coquille-saint-jacques/gisements-de-saint-brieuc English crab assessment: http://www.cefas.defra.gov.uk/our-science/fisheries-information/commercial-species/shellfish.aspx	Assessment of local stock is a task that may be developing all over the European costs but which need extensive funding to be effective.
Improving gear selectivity	After research projects improving gear selectivity, Member States have occasionally integrated the potential use of these selectivity devices in their legislation. In some instances, rewarding schemes were associated to foster uptake by skippers, such as access to restricted zones or allocation of extra days and/or quotas.	Conservation Credit Scheme (UK): http://www.scotland.gov.uk/Topics/marine/Sea-Fisheries/17681 Obligation to use a specific square-mesh panel for French Nephrops trawlers: http://www.comite-peches.fr/site/index.php?page=g28&commissions=5&suite=suite	Transfer of the concept is not considered as problematic
Offering initial and refresher training courses for a minimal fee	Fostering the development of a skilled workforce, with up-to-date training is essential for improving on-board safety and catch quality. Avoiding fishermen or fishing businesses to finance these training courses is the best option to maximise uptake, especially for segments with low profit margins. Some Member States also compensate fishermen for lost revenues as they were not able to go at sea during training sessions (France with the FAF pêche for example).	See the BIM example: http://www.bim.ie/training/skippersandcrew/ FAF pêche: http://www.spppcm.fr/	Transfer may not be a technical issue, but depend on political will to target funding toward training.
Minimum guaranteed salary for fishermen	Convention concluded between the French Authorities and the social partners on a minimum guaranteed salary for fishermen paid on a share basis. Extension to the fishing sector of some social *acquis* for workers.	http://www.developpement-durable.gouv.fr/IMG/pdf/Avenant4_15-02-2011.pdf	Depend on the nature of the social model in the Member States
Design of new vessel following eco-design principles	Currently several pilot projects are under development to prove the concept of new powertrain designs based on low diesel consumption systems or alternative fuels.	For example: the “Nehalennia” project - http://www.oceanward-mg.com/ Or the project “Buques Autómatas	Design of new powertrain lowering energy dependence will

[240] Council Regulation (EC) No 1198/2006 of 27 July 2006

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
	They may not all be successful, but some designs may prove the concept.	Inteligentes Polivalentes para la explotación de la Pesca en el future" http://www.baip2020.org/	benefit to the entire fishing industry.
Creating local clusters	To maintain landings in the port of Loctudy (F), vessel owners have created a joint venture with fish buyers and other stakeholders of the port to generate a cluster reaching the critical size to attract investors for vessel replacement and on-shore developments (fish freezing facility). With currently 4 fishing vessels, the cluster also secures regular landings allowing local processors to plan their production.	Hen tar Bugale: http://www.hentarbugale.fr/	Fostering the development of similar local clusters would allow fishing communities to access more easily to finance.

6.4 Measures that stimulate Blue Growth in the Atlantic Arc

The findings indicate that the sustainability of exploited stocks is the major driver for growth of the fishery sector. Fishing vessels exploiting depressed stocks show generally poor economic performances attributable to their catch levels, with profitability further undermined by the increasing costs of inputs (fuel). Poor profitability has knock on effects on wage levels in the sector, and contributes to the poor attractiveness of the sector for job seekers. Poor profitability also contributes to flag a high risk level on the sector from banks perspective, potentially restricting access to finance for entrepreneurs.

By virtue of its exclusive competency on conservation and management of fisheries resources given by the TFUE, the EU has a pivotal role to play. The ongoing reform of the Common Fisheries Policy has an ambitious objective of restoring and maintaining exploited stocks above levels that can produce the maximum sustainable yield (MSY). According to the impact assessment accompanying the proposed reform of the CFP, the economic indicators of the fisheries sector should increase dramatically, with higher levels of gross value added generated and large increases of the wages paid to workers in the sector. However, given the need to adjust fishing capacities with the potential of stocks, the EU fishing fleet should further decrease in number and capacity, with concomitant substantial decrease in the number of jobs in the sector (fewer vessels means less crew).

About 30% of the landings of the fishing fleets of the 5 Member States of the Atlantic Arc are caught outside the waters under EU jurisdiction. Under this context, the EU manages the stocks under the frame of bilateral and multilateral agreements, where management measures are the results of compromises between the different parties involved. The action of the EU is however important and seeks to promote the objectives of the CFP internationally, ensuring that fishing activities are based on same principles and standards as those applicable under EU legislation and promoting a level playing field for EU operators and third country operators.

The EU does not manage all the fish stocks in the waters under its sovereignty. In particular, local inshore stocks of crustaceans (e.g. crabs, European lobsters) and molluscs (e.g. scallops, other bivalves) are not subject to EU regulations on fishing opportunities. These inshore stocks can be important for some local fishermen communities, like scallops stocks in Brittany, crab stocks in the United Kingdom or barnacle and bivalves stocks in Galicia. Generally speaking, there is insufficient knowledge on these inshore stocks to support management decisions. In some cases, the

fishermen community establishes partnerships with research institutes for the evaluation of the status of the stocks (ex. scallops in Brittany and crabs in the United Kingdom), but the costs are high. There are co-funding opportunities through EFF (collective actions), but these should be increased.

As outlined above, attractiveness of the fishing sector is one of the problems faced by employers. Whilst the expected increase in wages as a result of the CFP reform will probably improve the situation, some work remained to be done to improve working conditions and social treatment of seamen in the fishing sector. Working conditions onboard the vessels is under the competency of Member States. However, the EU ensures that standards agreed internationally under the auspices of the International Labour Organisation are translated into Member States legislation through Directives, as well as some EU social *acquis* (i.e. the working time directive). Some important international conventions are still pending ratification before entering into force. An example is the Work in Fishing Convention of 2007 which has not been ratified by any Member State so far. Member States can go further and apply to their fishermen, very often considered separately on the basis of the specificity of the activity, some of the National social *acquis.* An example is the application of a minimum wage in the fishing sector in France.

Since fisheries products are a global commodity, the situation of the supply and of the demand on the world markets has an influence on fish prices and the revenues of fishing enterprises. For example, the recent economic downturn in Europe has had consequences on the internal demand in particular in Spain, and fish prices have dropped during the 2008-2010 period. Other external factors like the abundance of cod stocks in the Barents Sea or of Alaska Pollock in the North Pacific are contributing to depress the prices paid to EU fishermen for their equivalent products. The EU has limited margins of intervention to prevent negative influences of such externalities. The EU can however promote a level playing field and protect the competitiveness of the EU fleet as permitted in particular by the World Trade Organisation. EU action includes promotion of certain marketing standards through the Common Market Organisation[241], equivalent hygiene conditions through food law[242], banning commercialisation of fishery products which have been caught in contravention with applicable management and conservation measures[243], anti-dumping measures[244] or protect through custom tariffs the competitiveness of fisheries products manufactured in the EU compared to similar fisheries products manufactured in third countries[245].

In conclusion, it appears that there is little additional actions the EU could envisage to support growth in the fisheries sector. The main recommendations include:

- The continuation of the conservation policy to restore and maintain fish stocks at sustainable levels, as the policy is expected to have significant positive environmental and economic impact, as well as some related social impacts (wages increase);
- Maintain and increase as far as possible EU funding possibilities for data collection in support of the Common Fisheries Policy, support to science-industry partnerships and to research under a broad objective of increasing the number of stocks for which management advice is available and of promoting more selective fishing practices;
- Encourage ratification by Member States of the international conventions aiming at improving working conditions onboard fishing vessels, and introduce prescriptions in EU law through Directives if necessary;

[241] Council Regulation (EC) No 104/2000 of 17 December 1999
[242] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002
[243] Council Regulation (EC) No 1005/2008 of 29 September 2008
[244] **Council Regulation (EC) No 1225/2009 of 30 November 2009**
[245] Council Regulation (EEC) No 2658/87 of 23 July 1987

- Promote as necessary a level playing field for EU fisheries operators and third countries fisheries operators.

Annex I – References

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7 Aquaculture

7.1 General overview of aquaculture in the Atlantic Arc

Globally aquaculture is the world's fastest growing food production industry. As such it is an important sector to assess in relation to the potential contribution that it can make to economic growth. This report therefore presents the current status of marine aquaculture in the Atlantic Arc region.

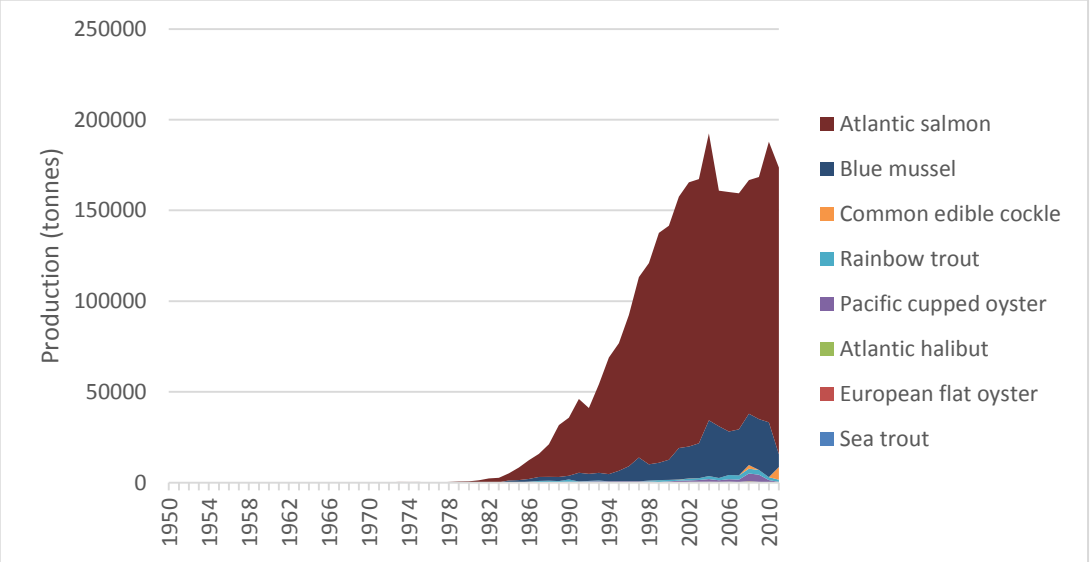
The Atlantic Arc regions have been the focus of aquaculture activities for a considerable period. Culture of shellfish, such as oysters for example, began in Roman times. More recently, since the late 1970s, culture of finfish such as Atlantic salmon, particularly in Scotland has increased dramatically. Atlantic salmon is now one of the three species that dominate production in the Atlantic Arc region: Atlantic salmon, blue mussel and Pacific oyster[246]. Shellfish farming is most intensive along the coast of France, Portugal and Spain (Bay of Biscay and Iberian Coast)[247]. Scotland is the largest producer of farmed Atlantic salmon in the EU.

Under this first chapter we will provide an overview of the sector with some key information on the status and performance of the sector across the Atlantic Arc countries, distinguishing between the countries.

United Kingdom

Within the UK aquaculture production a percentage of the UK total (by weight) is: Scotland 81%; England 6%; Wales 6%; Northern Ireland 6%.

Figure 7.1 **Annual Aquaculture Production of top eight species farmed by the UK**



Source: FAO Global Aquaculture Production Database

[246] Bloomfield H.J., Allcock Z., Bos O., Paramor O.A.L., Allen K.A., Aanesen M., Armstrong C., Hegland T., Le Quesne W., Piet G.J., Raakær J., Rogers S., van Hal R., van Hoof L.J.W., van Overzee H.M.J. and C.L.J. Frid (2011). MEFEPO North Sea Atlas, 2nd Edition - August 2011. University of Liverpool.
[247] OSPAR (2009) Assessment of Impacts of Mariculture. OSPAR Biodiversity Series Report

UK production is dominated by Atlantic salmon (see Figure 7.1) mainly in Scotland where, in 2012, there were 1 059 people employed in salmon production at 257 active sites working for 22 companies[248]. Production was dominated by eight companies that accounted for over 98% of Scotland's salmon production. The majority of production takes place in sea cages with a small amount (64 tonnes in 2012) produced in seawater tanks, reflecting the high costs of operating seawater tank systems. Within Scotland the industry is seen to be one of growing importance that is providing valuable jobs and income for the economy. Since the early dynamic years when there were large increases in production and there was also considerable consolidation in the industry, the situation now is that there are limited opportunities to establish new farms and the number of companies has decreased from 84 in 2002 to 22 in 2012[249]. Production is also tending to move towards larger sites and production has shown only small increases over the past five years. The majority of suitable sites have been used and the environmental and legislative frameworks that have been put in place are likely to mean that there will be little potential for further development of aquaculture production in the UK without some additional innovation. The emphasis within the industry is on increasing productivity[250] and focusing on producing price-premium product.

In addition to Atlantic salmon, Scotland also produces a variety of shellfish including mussels, oysters (Pacific and native) and scallop (scallop and queen scallop). There are a total of 153 businesses active in producing shellfish in Scotland at 493 sites[251] and the majority of shellfish production is mussel and Pacific oyster. The shellfish sub-sector employs 171 full time and 187 part time workers and the total value of shellfish production was estimated to be GBP 8.7 m in 2012[252]. The industry is currently dominated by small producers, although there is a continued trend toward large businesses dominating the annual production of all species. As with Salmon, the sites are located in Shetland, Western Isles, West coast highlands and Strathclyde.

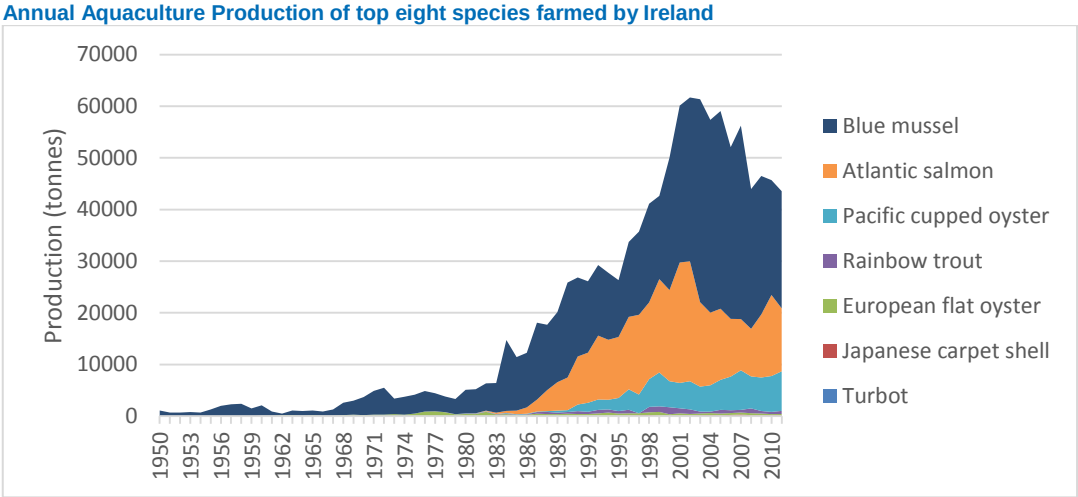
The aquaculture industry in England and Wales is much smaller than in Scotland and consists predominantly of small scale operators producing shellfish in estuarine sites. Species produced include: oysters (Pacific and native), mussels, clams (Manila and hardshell) and cockles with the majority of production being mussels. The annual value of production was estimated to be in the region of GBP 20 m. In Wales the value of production was GBP 12 m from 12 sites operated by 11 companies employing 43 full time and 13 part time employees. The aquaculture industry in Northern Ireland is mainly focused on shellfish, producing mussels, oysters (Pacific and native) and clams (Manila and hardshell) at about 50 sites. Atlantic salmon has been produced at two sites. In 2007, 8 400 tonnes of shellfish was produced valued at GBP 5.8 m[253].

Ireland

[248] Marine Scotland (2013) Scottish Fish Farm Production Survey 2012 Report. Marine Scotland Science. NB. This figure excludes an additional 328 people involved in smolt production.
[249] Marine Scotland (2013) Scottish Fish Farm Production Survey 2012 Report. Marine Scotland Science
[250] Currently mean annual productivity stands at 153 tonnes per person.
[251] This figure includes farms that are either producing or at some stage in the production cycle (including fallow).
[252] All figures from Marine Scotland (2013) Scottish Shellfish Farm Production Survey 2012 Report. Marine Scotland Science
[253] Figures for England, Wales and Northern Ireland from FRM and Epsilon (2009) A strategic review of the potential for aquaculture to contribute to the future security of food and non-food products and services in the UK and specifically England. Report for DEFRA

Aquaculture in Ireland has grown in importance since the 1970s (see Figure 7.2).

Figure 7.2 **Annual Aquaculture Production of top eight species farmed by Ireland**



Source: FAO Global Aquaculture Production Database

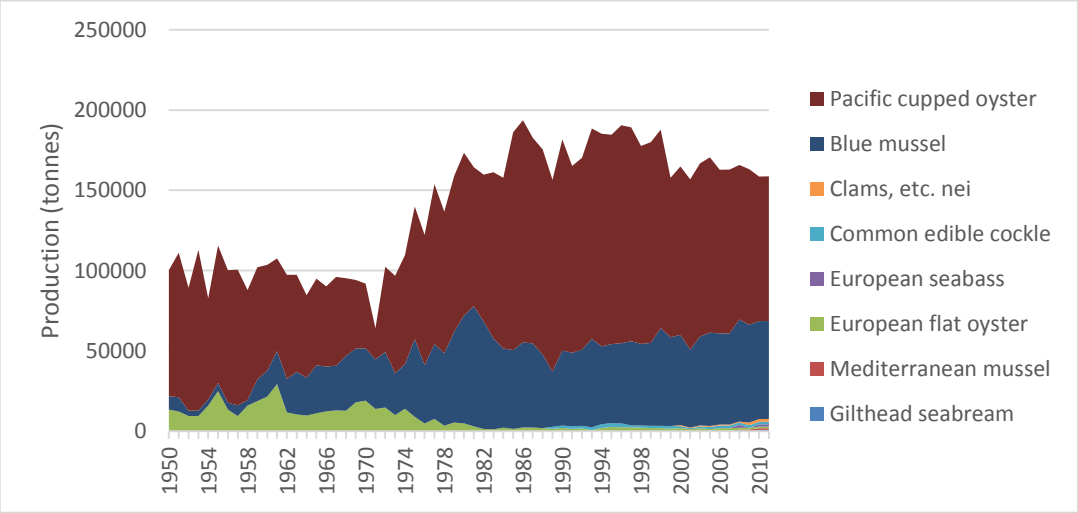
As with the UK, the main species cultured are mussels (cultured in beds and on ropes), oysters (Pacific and native), clams and scallops. Total employment in the oyster industry in 2012 was 933 people and 444 in the mussel industry and the majority of production was exported to France. Salmon and rainbow trout are the two principal finfish species farmed at sea, with salmon the most significant accounting for over 85% of annual production by volume. Other species that make some contribution to overall aquaculture production include abalone (shellfish) and cod (Finfish). Since its early beginnings, aquaculture has been a sector that has been increasing in terms of volume and value of production, employment and species farmed. However the sector is also quite geographically focused with 83% of all employment in Irish aquaculture located along the western seaboard[254]. For salmon production has stabilised and the main production areas are Donegal and Cork.

France

Approximately 70% of aquaculture production in France is shellfish (around 153 000 tonnes[255] with a value of around € 491 m in 2012). This includes blue mussels, oysters (Pacific and native) and cockles (see Figure 7.3).

[254] Bord Iascagh Mhara (2012) Annual Aquaculture Survey
[255] Agrimer (2013) The fisheries and aquaculture sector in France. Edition April 2013

Figure 7.3 Annual Aquaculture Production of top eight species farmed by France



Source: FAO Global Aquaculture Production Database

Oysters represent around 65% of total production. Production of shellfish in France is considerably higher than in the UK, indeed France is among the top five global shellfish producers. However it is difficult to disaggregate the national statistics and identify the proportion of production resulting from the study area. For France as a whole there are an estimated 2 967 firms engaged in shellfish farming employing 16 816 people. The firms depend on natural spat as well as seed supplied from around 10 hatcheries. Since 2008, the French oyster industry has been experiencing high mortalities of spat oysters. The precise cause of the mortalities remains unknown but is thought to be viral and related to bacterial infection. The spat mortalities have reduced production (and employment) but also increased the role of the hatcheries in spat provision and led to public support for the sector. Most hatchery produced spat are triploids and exhibit higher growth (although they also cost more to purchase) providing shorter production cycles and more rapid rotation of stock.

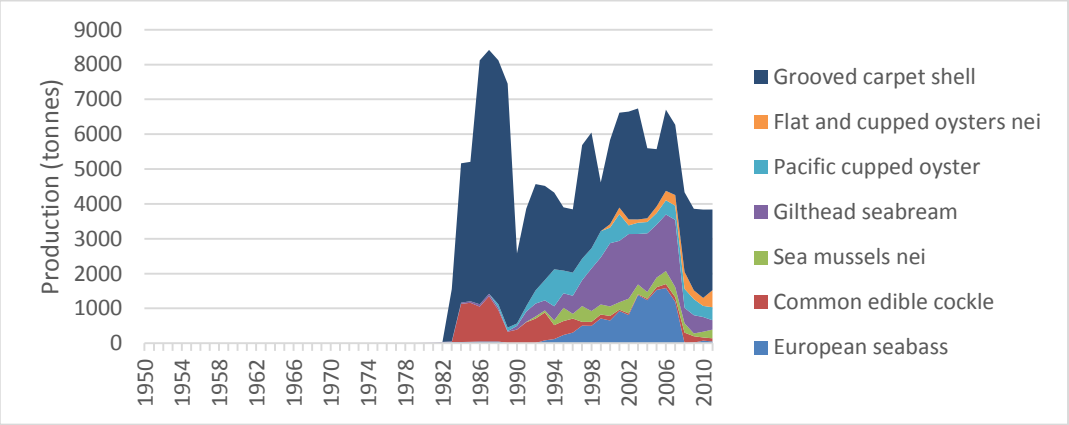
The oyster industry is heterogeneous (i.e. in terms of size, turnover, production strategy – including the use of triploid spat etc.). The oyster farms of Charente Maritime and Vendée practice an additional step in the production cycle whereby they hold the stock in marshland ponds known as *claires*. This step adds significant value to the final product.

Portugal

Aquaculture in Portugal is largely centred on extensive culture in sheltered coastal and estuarine locations. In 2010 there were 1 467 active aquaculture facilities employing 2 319 people, mainly in small-scale operations producing bivalve molluscs[256] (mainly clam) but with limited finfish production (mainly seabass and seabream[257]) but with some turbot and sole[258](see Figure 7.4).

[256] Scientific, Technical and Economic Committee for Fisheries (2013) – The Economic Performance of the EU Aquaculture Sector - 2012
[257] According to STECF (2013) 66 production units producing 1,118 tonnes in traditional earth ponds.
[258] According to STECF (2013) 9 production units producing 1,401 tonnes.

Figure 7.4 Annual Aquaculture Production of top eight species farmed by Portugal



Source: FAO Global Aquaculture Production Database)

The Portuguese aquaculture sector directly employs 2 319 people and generated € 42 m in 2010[259].

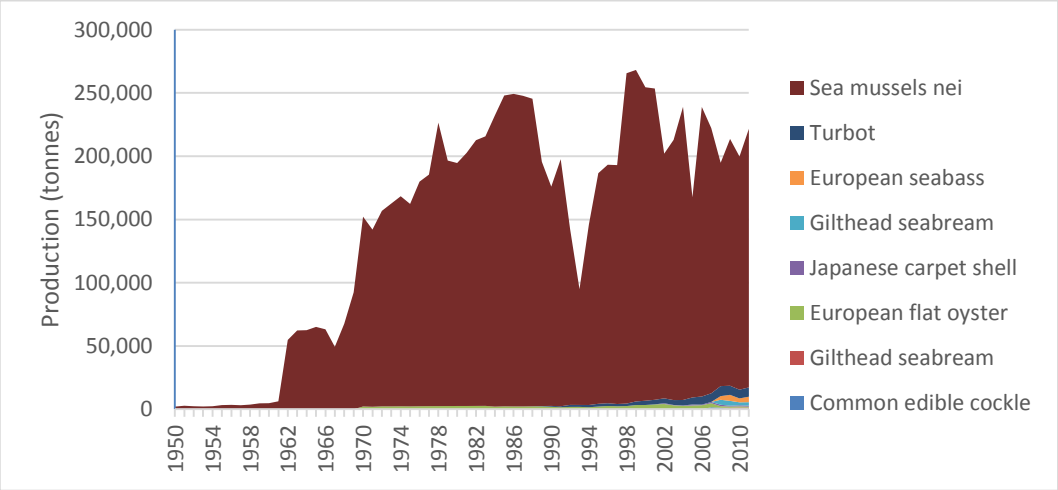
Aquaculture is being promoted within Portugal as an alternative for fishers facing reduced fishing quotas and it is seen as a sector that should receive additional policy-level attention and public investment. The economic performance of the sector report (see STECF 2013) suggests that aquaculture in Portugal is less profitable than in other areas of the Atlantic Arc and that additional investment could increase the stability and competitiveness of the sector in Portugal.

Spain

Spain is the largest aquaculture producer in the EU, accounting for 20% of total production by volume. Spain's aquaculture sector is economically significant generating approximately € 470 m in 2010[260] from 5 120 aquaculture production facilities. Within Spain Galicia is a particularly significant centre of both fishing and aquaculture activity and aquaculture production is heavily dominated by mussels (*Mytilus galloprovincialis)*[261] as Figure 7.5 shows.

[259] Scientific, Technical and Economic Committee for Fisheries (2013) – The Economic Performance of the EU Aquaculture Sector - 2012
[260] Scientific, Technical and Economic Committee for Fisheries (2013) The Economic Performance of the EU Aquaculture Sector – 2012, Spain
[261] FAO (2013) Global Aquaculture Production Database

Figure 7.5 Annual aquaculture production of top eight species farmed by Spain



Source: FAO Global Aquaculture Production Database)

Mussels in the Galicia region are grown in estuaries on ropes that hang from rafts: a total of 3 605 rafts are present in Galicia[260]. The main finfish species produced in the Atlantic region are Gilthead seabream and European seabass, with some turbot. Seabream and seabass production has declined in recent years as a result of the economic crisis and the associated reduction in consumers' purchasing power**Error! Bookmark not defined.**. There is also some stock nhancement of cockles involving release into the wild where they can grow and later be captured for consumption. In addition, polyculture (the growing of several species together to increase overall production) of finfish and shellfish within enclosed areas are under investigation.

Imported aquaculture products

In addition to aquaculture production from within the EU, imported aquaculture products reached 1.27 m tonnes, virtually 50% of the EU total demand, with a value of € 2.85m of which 81%, worth € 2.31 m in 2008, is from Norway salmon with the major markets in the Atlantic countries of UK, France and Spain, although Spain also gets some salmon from Chile (Bostock 2009). Beyond salmon, the most fish important imports are Pangasius and Tilapia fillets although the markets for these tend to be non-Atlantic countries. Also of significance is the import of mussels largely from Chile.

Much of this material, particularly salmon, passes through processing plants in the EU where the average added value is for salmon aquaculture products is 37% and on other species, 25-28%[262]. Basically, such data is not collected systematically under the EU data collection systems and therefore, currently, understanding is reliant on occasional in-depth sector reviews.

The sector is largely in the hands of SMEs, often family owned businesses particularly in trout and oysters. The few large consolidated, vertically integrated companies dominate the salmon industry however.

[262] Bostock J. (2009). European Aquaculture Competitiveness: Limitations and Possible Strategies. European Parliament, Brussels. 128pp

7.2 Growth drivers and barriers to growth for aquaculture

In this section we provide an assessment of the potential for future development of the sector across the Atlantic Arc countries.

United Kingdom

A key constraint to further development of the industry across the UK is the physical availability of suitable production sites. Not only are there limited numbers of sites but there is often competition for these with other users of marine space[263].

Aquaculture in Scotland involves a range of organisations including Marine Scotland[264], the Scottish Environmental Protection Agency[265] and the Crown Estate[266] (which leases marine aquaculture sites as part of its responsibility to manage seabed around the UK out to 12nm). The aquaculture sector is generally well-organised. There are a number of agencies and research facilities providing support to the sector, including Stirling University which maintains a world class institute of aquaculture and the Scottish Aquaculture Research Forum that helps support the industry through targeted research[267].

Aquaculture in England is the responsibility of the Marine Management Organisation[268] that undertakes marine planning, licensing and marine environmental conservation. The MMO is advised by Natural England[269], The Joint Nature Conservation Committee[270] and the Centre for Environmental, Fisheries and Aquaculture Science[271]. As with Scotland, the Crown Estate has a role in leasing potential marine aquaculture sites.

In order for the sector to develop further it is likely to require some form of innovation in terms of offshore (e.g. exposed and offshore cage production of fish or semi-submerged long line shellfish production systems) or onshore (pump ashore or recirculating systems exist)facilities, new species or new approaches (e.g. ranching). For many of the species cultured the following problems remain: Competition both with imports from aquaculture in other parts of the world (salmon and mussels) and with wild stocks (cod, scallops). High labour and regulatory costs that mean that the economics remain challenging and can affect the potential to invest in aquaculture.

Ireland

The Department of Agriculture, Food and the Marine[272] has primary responsibility for aquaculture, including marine research, aquaculture licensing, monitoring, and enforcement of aquaculture activities. The Marine Institute[273] is also directly involved with the aquaculture sector, both finfish and shellfish, providing advice and research and Bord Iascagh Mhara[274] serves to promote the development and diversification of the Irish Seafood industry. Given the nature of the coastline and competition for the use of inshore waters, opportunities for expansion of aquaculture in this area will again require innovation to overcome site limitations, high costs of energy, labour and equipment coupled with competition from low-cost imports of both wild and cultured fish. As of 2012 there were

[263] e.g. FRM and Epsilon (2009) A strategic review of the potential for aquaculture to contribute to the future security of food and non-food products and services in the UK and specifically England. Report for DEFRA
[264] http://www.scotland.gov.uk/About/People/Directorates/marinescotland
[265] http://www.sepa.org.uk/
[266] http://www.thecrownestate.co.uk/coastal/aquaculture/
[267] http://www.sarf.org.uk/
[268] http://www.marinemanagement.org.uk/
[269] http://www.naturalengland.org.uk/
[270] http://jncc.defra.gov.uk/
[271] http://www.cefas.defra.gov.uk/
[272] http://www.agriculture.gov.ie/
[273] https://www.marine.ie/home/
[274] http://www.bim.ie/

over 50 people employed full and part time in the culture of novel species including abalone, urchin and cod.

France

Shellfish aquaculture is overseen by the Committee for bivalve aquaculture that is organised in seven regional committees. Five of these are exclusively covering areas in the Atlantic Arc: Bretagne Nord, Bretagne Sud, Pays de la Loire, Poite d Charentes and Aquitaine. The committees include a range of interests and have responsibility for water quality, training and promoting production. The development of the shellfish industry is constrained by the lack of available sites and competition for these sites with other users of marine space. For finfish culture the only opportunity in this area would be from innovation such as the farming of new high value species that might justify the high costs of labour and equipment coupled with competition from low-cost imports.

Portugal

Portugal is considering the development of a sector specific development plan for aquaculture. Issues that have been identified as potential constraints are the extensive and small-scale nature of much of the sector and the need to be able to address competition from intensive aquaculture of other countries[275]. Product quality and the need to add a price premium to Portuguese aquaculture products has been identified as an issue to address in the national policy**Error! Bookmark not efined.**. Financing from the European Fisheries Fund (EFF) is anticipated to fund a number of future developments.

Spain

While aquaculture in Spain has been able to apply research to improve the efficiency of production in recent years (e.g. through improvements in culture and feeding techniques and disease prevention and management measures) [276], the sector still faces a number challenges. As with other areas in the Atlantic Arc, limited availability of new sites for aquaculture and competition for space with other maritime activities remains a key constraint. Similarly competition with other countries within the EU and further afield affects performance. Spanish firms also complain that there are administrative and tax burdens that affect their ability to compete.

Development of aquaculture production in Spain also requires diversification within the sector. Recently, there have been attempts to commercialise Atlantic cod and Atlantic halibut but these have not yet met with much commercial success except for limited quantities of cod.

7.3 Labour market characteristics

Workforce characteristics

The general profile of workers in the aquaculture production sector is that they are likely to be male (Table 7.1). The figures presented in Table 7.1 also show the difference in the level of employment and provide and additional indication the size of the sector in the different countries.

[275] Scientific, Technical and Economic Committee for Fisheries (2013) – The Economic Performance of the EU Aquaculture Sector - 2012
[276] Scientific, Technical and Economic Committee for Fisheries (STECF) – The Economic Performance of the EU Aquaculture Sector - 2012

Table 7.1 **Numbers of workers, male and female, employed in aquaculture production in Atlantic Arc countries.**

Country[277]	Male workers	Female workers	Female workers (%)
United Kingdom	4 000	0	18%[278]
Ireland	1 573	146	9%
France	12 784	7 030	55%
Portugal	1 889	430	23%
Spain	19 852	8 056	41%

For the smaller production units aquaculture is a sector that tends to have a familiar structure (e.g. Spain and Portugal) within which many of the workers are self- employed workers[279]. The more familial structure of these enterprises compared to the larger and more commercialised units seen in Ireland and Scotland may account for the lower proportion of women workers in the latter.

While farm managers are likely to be both skilled and educated, farm workers tend to be younger and with less skills. There is some evidence that in coastal areas workers may prefer aquaculture over capture fisheries as wages in the latter tend to be based on shares of the catch and are therefore more volatile and the preference is for greater security. It is worth noting that for aquaculture activities that are reliant on natural seed (e.g. blue mussels) some volatility remains in that production levels can be variable and employment less secure as a result. Ireland recently experienced a drop in blue mussel production as a result of seed supply and lower market demand that led to reduced employment. Workers are generally recruited locally to work on farms while more skilled roles (technicians and managers) will be sourced nationally or even internationally using trade networks and media, especially for higher paid job roles. Technical/specialist roles may require specific qualifications and/or experience, but some employers may invest in training a suitable individual. Across the Atlantic Arc countries the mean income level tended to be fairly similar with the exception of Portugal. This perhaps reflects the structure of the enterprises in Portugal and the more extensive nature of the individual production units.

Table 7.2 **Mean wage (€) for workers in the aquaculture production industries**

Country[280]	Mean wage (€)
United Kingdom	18 300
Ireland	26 600
France	22 700
Portugal	7 200
Spain	20 600

Hiring characteristics

The sector has been one that has been developing rapidly over the last thirty years and which has seen significant changes in both technologies and the structure of the sector. Because of the consolidation and integration that has been occurring in the sector along with the relatively high labour costs in Europe, the trend has been towards investments in production efficiencies that reduce the number of workers required per unit weight of aquaculture production. This is most evident in the salmon culture industry where clear trends are observed towards higher productivity from larger more capital intensive farms. By contrast, shellfish culture, in particular blue mussel, tends to be relatively labour intensive, particularly so where the individual operations are quite small (e.g. UK and Portugal).

[277] Note that these figures are indicative only as they are for the country as a whole as it was not possible to disaggregate by region or by inland/marine.
[278] See STECF (2013) – this figure is based on employment within the Scottish shellfish industry
[279] e.g. Scientific, Technical and Economic Committee for Fisheries (STECF) – The Economic Performance of the EU Aquaculture Sector - 2012
[280] This figure represents a national average for all production (shellfish and finfish) in inland and marine areas. It is intended to be indicative only.

Entry requirements for this industry vary depending on the job role. Some jobs require no formal qualifications. However, relevant qualifications and experience can be an advantage.

In addition to those employed in fish production, workers are required in other areas that support production – research, feed development, production technologies, product development and marketing tend to have a higher level of knowledge and qualification. Europe is a global leader in aquaculture development and feed technologies and skilled workers are required for these aspects. Many of the institutions listed in Table 7.3 below play a leading role in supplying these skilled workers. Environmental regulation in the EU emphasises environmental health and the development of mitigation measures for aquaculture and for monitoring and enforcing regulations and assessing their impact are other areas where trained specialists are required. Graduates are regularly employed as scientific observers and researchers in universities, government agencies, consultancies and NGOs.

The main aquaculture production areas of the Atlantic Arc counties all have training centres that can provide general vocational training for aquaculture workers or practical training for aquaculture technicians (bivalve farming, hatchery techniques, salmon farming, etc.). In addition there are a number of advanced research and training centres that are able to provide Masters/Bachelor programmes and highly skilled workers who can enter the industry.

Table 7.3 Examples of Training centres in the Atlantic Arc countries that support aquaculture development and management

Country	Institution	Course	Level
UK (Scotland)	University of St Andrews	Sustainable aquaculture	Undergraduate and postgraduate
UK (Scotland)	Stirling University – Institute of Aquaculture	Aquaculture	Undergraduate and postgraduate
UK (England)	Sparsholt College	Aquaculture and fishery management	Diploma and undergraduate
UK (England)	Plymouth University	Sustainable aquaculture	Postgraduate
UK (Wales)	Swansea University	Sustainable aquaculture and fisheries	Postgraduate
Ireland	University College Cork – Aquaculture and Fisheries Development Centre	Marine Biology	Undergraduate and postgraduate
France	University of Caen	Marine Biology	Undergraduate and postgraduate
France	University of La Rochelle	Integrated Management of Littoral Ecosystems	Postgraduate
France	University of Western Brittany	Marine and Coastal Science	Postgraduate
Portugal	Universidade do Algarve	Aquaculture and fisheries	Postgraduate
Spain	University of Valencia	Aquaculture	Postgraduate
Spain	University of Vigo	Aquaculture	Undergraduate and postgraduate
Spain	University of Cadiz	Aquaculture and Fisheries: Marine Resources and Sustainability	Postgraduate

The Atlantic Arc countries all have good education systems and high-quality research institutions and these are producing well trained and skilled individuals.

7.4 Administrative burden for industry

The administrative burden on aquaculture is considered by industry representatives to have increased. The regulation of the industry is primarily a result of the raising awareness of the impacts that aquaculture has on the immediate and wider environment. This includes: the placement of fish farms within sensitive marine areas, the spread of invasive species and dependency of aquaculture on catches of wild fish that are used as a component of fish feed.

Local impacts of aquaculture include effects on water quality (e.g. eutrophication from feeds and effluents and the release into the marine environment of antifouling chemicals and antibiotics). Animals escaping from farms may compete with wild stocks and there may also be a transfer of parasites and diseases and genetic interaction between escaped domesticated and wild stocks is a concern. Domesticated animals can enter the environment from aquaculture facilities in a number of ways, resulting in a range of potential impacts. Diseases, such as infectious salmon anaemia (ISA) or *Bonamia ostrea* affecting oysters can be transferred to wild stocks and the escaped animals may also compete for food. The year 2012 saw a considerable increase in the importation of mussel seed, for ongrowing, into Scotland to supplement the vagaries in natural settlement. Perhaps though of greatest concern is that escapees from aquaculture may interbreed with wild populations resulting in losses of genetic variability, including loss of naturally selected adaptations, or genetic drift.

Global impacts from aquaculture include the introduction of alien species or domesticated varieties that may lead to increased local impacts. This includes both the transfer of animals (e.g. Atlantic salmon) to sites in New Zealand and Chile as well as the transfer of eggs and fish from those locations. These transfers are potentially facilitated by the global nature of the business and the consolidation that has occurred in the salmon farming industry. Similar risks are noted for shellfish farming with the introduction of exotic species (oysters and abalone). In contrast to many of the fish species reared in Asia, European finfish aquaculture tends to focus on high value carnivorous fish (e.g. Atlantic salmon, turbot and bass). Because of this there is a potential additional risk posed by the escape of these animals into the wild.

The rearing of carnivorous species also creates a high demand for fish meals and fish oils that are produced using wild-caught fish. Generally the conversion factor is such that more fish in input into the system than eventually comes out. This creates a number of sustainability issues that have been the target of NGOs in particular. In the first place, many of the stocks of fish used in the manufacture of fish feed are fully exploited and any expansion of aquaculture could place additional pressure on these stocks. Furthermore, there is the question of whether these species should not be consumed directly by humans (as has been suggested for the Peruvian anchovetta).

As a result of the above, the Atlantic Arc countries have a range of administrative restrictions on the location and operations of aquaculture units and require close monitoring to ensure that environmental impacts are minimised. Sheltered inshore marine sites for aquaculture (principally cage culture of fish) are subject to a range of planning and development controls coupled with strict environmental regulation and monitoring. Most of the appropriate sites for aquaculture are found along the west coast of Scotland and Ireland and the coasts of France, Portugal and Spain. Shelter from waves is a critical factor and the limited number of suitable sites plus the environmental impact is probably the greatest barrier to aquaculture expansion. The formal requirements for operations are supplemented by less formal ‘codes of conduct’ and certification schemes that seek to set standards for aquaculture producers.

Restrictive practices

The administrative burden on the industry together with the limited number of sites available has had the effect of making it increasingly expensive to establish a new production unit in many places. This is one of the factors that has been driving the consolidation of the salmon industry for example. There are currently considerable restrictions in the EU on the use of antibiotics in open culture systems because of the danger of build up of resistance factors as well as on the movement of animals within the EU and from outside sources. Good husbandry, hatchery development and research has reduced the need for this but reduced use of antibiotics can increase the risks of loss due to incidence of disease.

For shellfish farmers the situation is almost the opposite as their primary concern is the effect of water quality on their animals rather than the other way around. For many shellfish farmers it is the lack of action by national authorities to improve water quality that affects the potential of the industry. This is both in terms of reducing the numbers of sites that are potentially available for production units as well as a lack of protection from the actions of polluters.

Both finfish and shellfish aquaculture is affected by uneven application of regulation across countries that can affect competitiveness. This includes the local standards that are used for water quality as well as depuration times for the purification of bivalves. As well as the application of restrictions, there is criticism of the uneven development of national policies for aquaculture that could promote the development of the sector and address inter-sectoral issues. While Spain and Portugal have been prioritising strategies that can identify key constraints and frame the development in terms of the wider CFP and public funding opportunities, there has been less progress in the case of England.

Not all restrictive practices are derived from the EU or national authorities and the aquaculture is moving to demonstrate long-term ecological and social sustainability. Eco-labelling options for farmed produce (GAA, ASC etc.) are increasing and standards are being developed at a range of scales for farmed products. In this respect the sector can be seen to be responding to consumer and NGO pressure and this is an important driver or consideration in the industry. For example, the majority of Irish salmon production is certified organic[281]. However the weight given to environmental considerations does vary across the EU. In addition to the third-party certification schemes there are a number of self regulation initiatives, for example in Ireland, that are intended to improve both the environmental and commercial performance of the sector.

7.5 Finance and research

Sources of finance

One of the main sources of public finance for aquaculture activities is through the European Fisheries Fund (EFF) programme. This can provide investment in the aquaculture, fishing and fish processing industries to support development and diversification. Member States have separate allocations under this programme and have local application procedures, matched funding conditionalities and administrative structures. This funding is not exclusive to aquaculture and each round tends to be over-subscribed. However, some aquaculture projects in the Atlantic Arc countries have received support through Axis 4 of the EFF.

[281] Bord Iascagh Mhara (2012) Annual Aquaculture Survey

In addition to funding for local development and diversification projects there are also funds available at the EU level for research on key constraints and to explore identified opportunities. The most recent of these was the Seventh Research Framework (FP7) that financed a range of collaborative projects that included Atlantic Arc finfish and shellfish interests. Recent examples of project funded through FP7 that included participation of institutions in the Atlantic Arc include:

- BIVALIFE: Controlling infectious diseases in oysters and mussels in Europe;
- COEXIST: Interaction in coastal waters: A roadmap to sustainable integration of aquaculture and fisheries;
- REPROSEED: REsearch to improve PROduction of SEED of established and emerging bivalve species in European hatcheries;
- SALMOTRIP: Feasibility study of triploid salmon production;
- SETTLE: Bivalve conditioning and settlement - keys to competitive hatchery production;
- OYSERECOVER: Establishing the scientific bases and technical procedures and standards to recover the European flat oyster production through strategies to tackle the main constraint, bonamiosis.

In addition to the regional programme there are national level programmes to finance development and research. One example of these is the Scottish Aquaculture Research Forum[282]. This is a multi-stakeholder platform that identifies constraints and commissions research that can address them. Finally there are a wide range of smaller projects that are funded through public and private financing that are addressing more specific issues.

On-going research activities

The research activities that are identified above can generally be considered to be addressing three key areas related to the aquaculture sector: direct issues affecting or constraining production; data issues related to environmental quality and impacts and delivery issues related to the institutional structures supporting the development of aquaculture in the Atlantic Arc.

Disease: One of the key direct issues has been research to combat the effects of disease. Disease has had major effects on both the salmon (Scotland) and oyster (France) industries. More recently Ireland has been affected by both amoebic gill disease affecting salmon and *Karenia mikimotoi* affecting oysters that are expected to reduce production in both cases. A significant challenge for the salmon industry is sea lice infestations. Sea lice are natural parasite of salmonids but in aquaculture systems they can become abundant, causing injury, reduced growth rates and fish death. It is estimated that salmon lice cost the Atlantic salmon farming industry globally more than € 300m a year. These lice may also spread other microbial and bacterial disease that can further affect the fish. The chemicals that are used to treat sea lice can cause additional pollution problems. Research continues on measures to address lice, including the use of small wrasse as cleaner fish.

Hatcheries: Over the last decade, the development of the oyster hatcheries has has a significant effect on bivalve farming in France. Oyster farmers have become less dependent on natural spat and are able to source faster growing triploid oysters. Hatcheries have also enabled genetic selection programmes to identify more disease-resistant strains.

[282] http://www.sarf.org.uk/

New species: A recent review of the future of European aquaculture'[283] suggests that while experiments with new species will continue, it is likely that the current species dominating production, will continue to do so based on the experiences to date with new species such as cod and halibut. It is more likely that progress will be made with integrating species in polyculture or Integrated multitrophic aquaculture (IMTA) approaches to increase productivity or mitigate disease or environmental impacts.

New production technologies: Key amongst these are the development of onshore Recirculated Aquaculture Systems (RAS) that can provide a controlled culture environment and minimise environmental impacts. An additional benefit of these systems is that they can be sited in a wide range of locations, this overcoming one of the key constraints – lack of suitable locations – to production increases. While remaining a promising technology, it has proven difficult to develop commercially viable RAS aquaculture in the context of high energy, land and labour costs. Offshore aquaculture using more robust cages or submerged ropes for shellfish culture in order to extend the areas available have been identified as promising approaches. Again, the costs are currently preventing further development of this technology at this stage[284] The aquaculture industry has made efforts to reduce the amount of fish in fish feed by increasing the use of processing by-products and using vegetable oils (nearly 25% of fish meal comes from by-products). However use of vegetable oils raises sustainability questions as it again raises the issue of whether these should not be eaten directly. Alternatives for the use of fish meal and fish oils in feeds are important focus for investigation. There have been, and are ongoing, a number of research programmes at European level addressing the issues of protein and energy (oil) supply in feeds for farmed fish with a view to increasing sustainability, resilience and responsible farming. The current high level project operating is this respect is ARRAINA (Advanced Research Initiatives for Nutrition and Aquaculture).

7.6 Good practices for support of the sector at sea-basin level

Because of the expansion of the industry, many of the impacts and problems that now need to be addressed have emerged over time and, as problems have been identified strategies to address them have been developed. One of the strengths of the sector in this respect is the strong research capability and networks that exist within the EU and the Atlantic Arc countries. Furthermore, the opportunities to collaborate provided by initiatives such as FP7 can further enhance learning. As the preceding sections illustrate, efforts have been made by a number of stakeholders from farmers to government to reduce the impacts of aquaculture. Across the industries there are a number of Producer Organisation initiatives to establish 'best practice' and multi-stakeholder platforms such as the SARF or WWF aquaculture dialogues have provided a significant means to bring together producers, NGOs, researchers, retailers and governments. A number of examples of best practice emerging from the Atlantic Arc countries are presented in Table 7.4 below.

Table 7.4 Description of good practices in the aquaculture sector identified in the Atlantic Arc

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
SARF	Multi-stakeholder research network identifying and addressing key constraints to aquaculture.	http://www.sarf.org.uk/	High

[283] EATIP (2012) The Future of European Aquaculture. http://www.aquamedia.info/PDFFLIP/EATIPVision/files/assets/downloads/publication.pdf

[284] Sturrock H, Newton R, Paffrath S, Bostock J, Muir J, Young J, Immink A and Dickson M (2008) Part 2: Characterisation of emerging aquaculture systems In: Prospective Analysis of the Aquaculture Sector in the EU, European Commission,

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
EFF Axis 4	Providing support to local aquaculture development plans and environmental issues that can benefit aquaculture	https://webgate.ec.europa.eu/fpfis/cms/farnet/	N/A
Seafish Aquaculture Common Issues group	Multistakeholder forum to consider issues related to aquaculture in England. This includes production, policy, marketing and trade issues.		Medium
Specialisation	High quality, low volume niche markets, such as organic or eco-certified products – e.g. Salmon in Ireland		Demand in the more lucrative organic salmon market is outstripping supply.

7.7 Measures that stimulate Blue Growth in the Atlantic Arc

The situation with regards the opportunities and constraints to the expansion of aquaculture production in the Atlantic Arc countries are generally well understood. In terms of the situation and the potential for growth the following is worth stressing:

a) Aquaculture production as a percentage of the global total is small but the EU represents the largest market for fish market in the world;
b) Compared with significant increases in aquaculture production elsewhere (e.g. Asia), the situation in Europe is one of stagnating production despite significant R&D expenditure. There are a number of factors technical and other that are contributing to this;
c) Issues associated with intensification, including disease, environmental impact and interactions with wild fisheries have been increasing leading to greater regulation and emphasis on mitigation measures;
d) Lack of sites suitable for marine aquaculture. This is a key challenge to be overcome and needs to be addressed in ways that both address competing and conflicting interests and provide cost-effective solutions. Current technologies such as RAS have limited application due to cost;
e) The consolidated and integrated nature of some industries. The nature of some industries, salmon in particular, is such that these are often global operations and decisions about production in a particular location are a result of much wider considerations. The salmon industry has seen a rise in large vertically integrated companies, leading to ownership of production activities including hatcheries, fish processing and exporting. At the same time, both farming and processing have become more capital intensive, with a greater emphasis on improving productivity. The integrated, and at the same time global nature, of the industry mean that it is difficult to consider the Atlantic Arc operations in isolation as decisions on investments are motivated by factors beyond the locale;
f) Competition is affecting production from imports of all types of seafood (capture and culture);
g) Aquaculture in the Atlantic Arc is subject to complex and uneven regulation for which compliance is expensive;
h) Unlike some Asian fish production, EU finfish culture is focused on the production of species that require commercially produced artificial feeds.

Despite these challenges there are a number of positive aspects that can be identified:

i) The EU has a strong and globally significant R&D capability that is contributing to the global development of aquaculture;

j) There is investment in developing multi-stakeholder platforms that bring together public and private actors to consider the challenges and identify opportunities for positive outcomes;

k) Aquaculture is receiving increasing attention under the process of the reform of the Common Fisheries Policy (CFP). This should ultimately lead to a higher profile in planning processes and more effective governance measures.

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8 Short-sea shipping

8.1 General overview of Short-sea shipping in the Atlantic Arc

Short sea shipping (SSS) in European context is, according to the definition of the European Commission[285] defined as '*the maritime transport of goods over relatively short distances, as opposed to the intercontinental cross-ocean deep sea shipping; being maritime transport of goods between ports in the EU-27 on one hand and ports situated geographical Europe, on the Mediterranean and Black Seas on the other hand.*'

Short-sea shipping performance

In 2011, total SSS in the EU-27 was above the 1.7 bn tonnes, which is around 60% of total EU27 seaborne transport[286]. SSS is distributed per sea basin as illustrated in Table 8.1.

Table 8.1 Short sea shipping per European sea basin, 2011

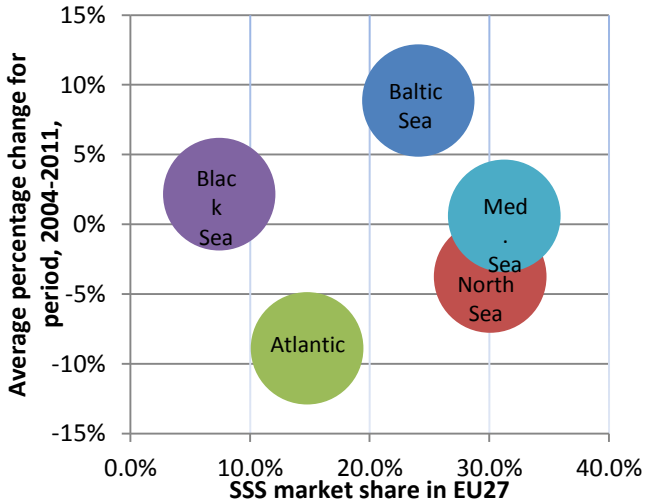
	Atlantic Ocean	Baltic Sea	Black Sea	Mediterranean Sea	North Sea	Others	Total
Mio Tonnes	258.1	420.3	129.7	545.7	525.3	100.0	1 746.2
%	**14.8%**	**24.1%**	**7.4%**	**31.3%**	**30.1%**	**5.7%**	**100%**

Source: Eurostat (mar_sg_am_cws)

The Atlantic Arc accounts for 258.1 m tons of freight which is respectively 14.8% of all short sea shipping transport of goods in the EU-27. The other basins with a large share of SSS activities are the North Sea, Mediterranean and Baltic sea basins.

The absolute tonnage being shipped by the Atlantic ports in this basin has been declining since 2006. This may have been a result from the economic crisis since 2008, but other basins' SSS tonnage did grow in the same time span. In Figure 8.1, a comparison of sea basins in terms of growth rate and market share is made.

Figure 8.1 Sea basin comparison of SSS growth and market share within EU27, 2011



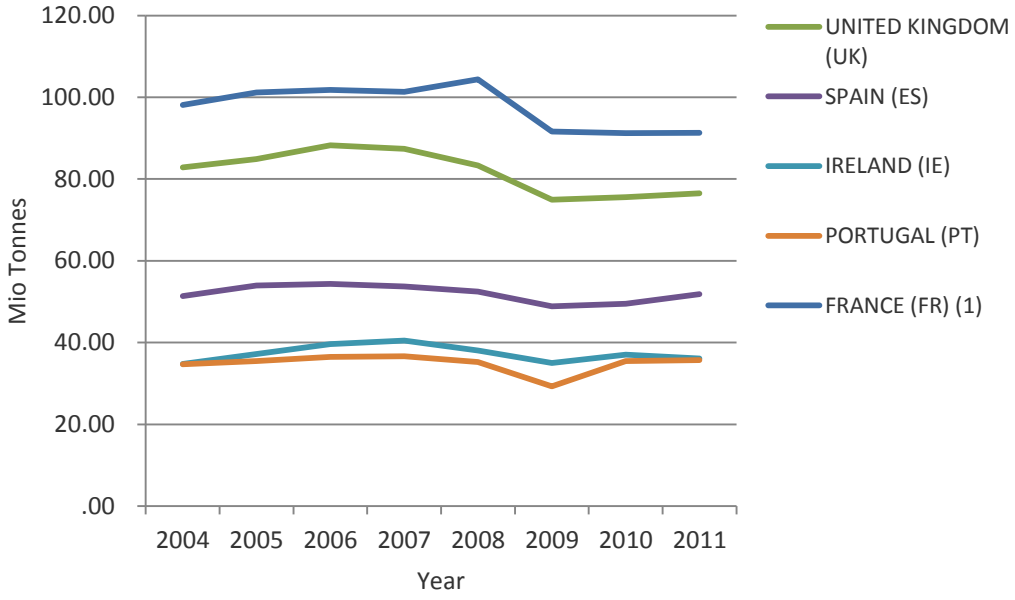
[285] COM (1999) 317, June 1997

[286] Eurostat(2013), Maritime transport statistics - short sea shipping of goods, April 2013 available at http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Maritime_transport_statistics_-_short_sea_shipping_of_goods

Source: Eurostat (mar_sg_am_cws)

In this respect, the SSS activities in the Atlantic can be seen as mature; with a market share of 15% but a percentage change of 9% over the period 2004-2011. In contrast, the Baltic sea basin as well as the Black sea basin show an increase in SSS activities. Looking more specifically into the Atlantic Arc countries performance in SSS, the France part of the Atlantic Arc has the most SSS activities, followed by the UK Atlantic coastline and Spain. The shipping performance has deteriorated since the crisis of 2008, but is recovering the last years.

Figure 8.2 SSS trend over time for Atlantic Arc coastlines, 2004-2011



Source: Eurostat (mar_sg_am_cwd), adjusted to sea basin specific tonnage by Ecorys.[287]

Within the basin, liquid bulk accounts for 36% of all SSS tonnage shipped. Dry bulk represents 22%, containers 13% and RoRo 21% of all SSS tonnage shipped. The remainder of 8% is left to other types of cargo.[288] The largest Atlantic Arc port is Le Havre with 36.4 m tons of short sea freight handled. Together with the port of Milford (UK) these are the only Atlantic ports in the top 20 of the European short sea shipping ports. [289]

The gross value added, employment and number of enterprises representing the short sea shipping maritime economic activity related to each Atlantic Arc coastal regions is presented in Table 8.2.

Table 8.2 Value added, Employment and number of enterprises, 2010

Atlantic coastal areas of	GVA (€ m)	Employment	Number of enterprises
United Kingdom	770.3	11 407.9	N/A
Ireland	282.9	1 886.0	226.0

[287] Allocated on Atlantic Arc sea basin based on regional allocations as in Ecorys (2013), Study on Deepening Understanding of Potential Blue Growth in the EU Member States on Europe's Atlantic Arc – Revised Country fiches: https://webgate.ec.europa.eu/maritimeforum/content/3408
[288] Source: Eurostat (mar_sg_am_ewx), 2011
[289] Note that the UK port of Southampton is attributed to the North Sea & English Channel basin and addressed under the respective sea basin study.

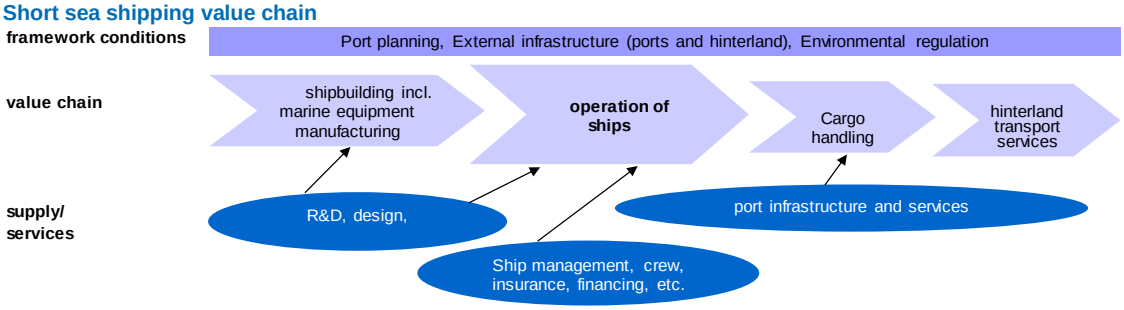
Atlantic coastal areas of	GVA (€ m)	Employment	Number of enterprises
France	853.7	8 560.2	296.2
Spain	181.7	2 593.4	319.8
Portugal	189.6	2 739.0	168.0
Total Atlantic	2 278.3	27 186.5	1 010.0

Source: Ecorys (2013), Study on Deepening Understanding of Potential Blue Growth in the EU Member States on Europe's Atlantic Arc – Country fiches, adjusted to the relevance of coastal areas adjacent to the Atlantic Arc

Value chain

The short-sea shipping value chain consists of the shipbuilding industry providing ships (including the marine equipment manufacturers), ship operators, handling services, port infrastructure provision and services, logistics and maritime infrastructure provisioning. The value chain is illustrated in Figure 8.3.

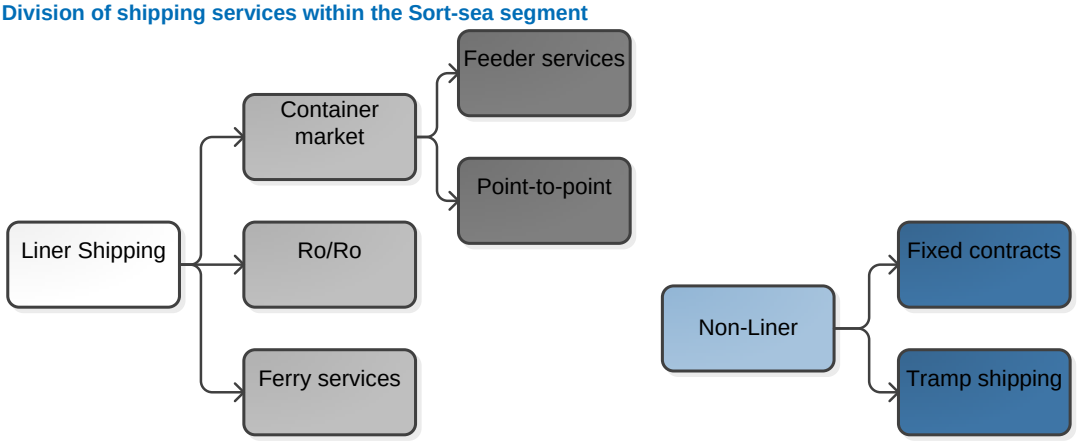
Figure 8.3 Short sea shipping value chain



Source: Ecorys (2012), Blue Growth: Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts

It should be noted that the short sea shipping market is a fragmented one with many niche markets and different sub-sectors. For each of those sectors; the above value chain in principle holds. We distinguish the following different markets:

Figure 8.4 Division of shipping services within the Sort-sea segment



Source: Ecorys

- Liner shipping, with fixed sailing schedules and fixed itineraries. This mostly concerns container (either point-to-point or feeder services), Ro-Ro and passenger ferry services;
- Non-Liner shipping with fixed contracts, mainly for dry bulk (ores, coal, cereals) or liquid bulk (crude oil, LNG, fuels, base chemicals), often under long term contracts (most commonly 5 to

10 years) for the transport of bulk commodities between two ports. In short sea shipping this is only done with small to medium-sized vessels, whereas large vessels are dominant in this segment in intercontinental shipping;

- Bulk tramp shipping: spot contracts for single voyages, usually medium-sized vessels (handysize and panamax), which can call at all or nearly all seaports.

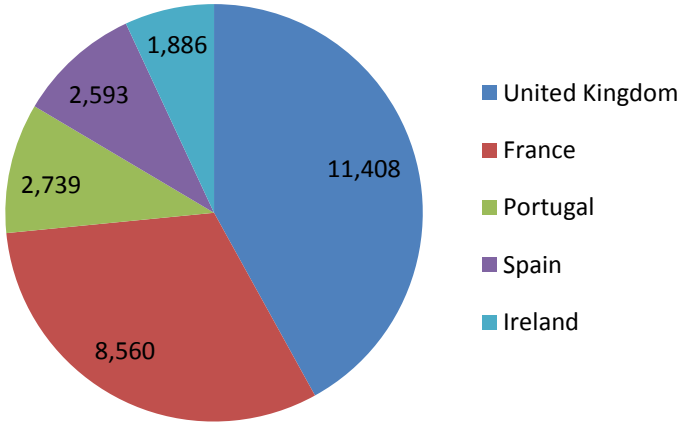
8.2 Growth drivers and barriers to growth for Short-sea shipping

8.2.1 Labour market and hiring characteristics

Workforce characteristics

An approximate 27 000 persons are employed within the short sea sector of the Atlantic Arc Sea basin. This estimate includes not only workers on board of short sea vessels but also – and that accounts for the majority of employment – people employed on-shore in ports, terminals and sectors otherwise servicing short-sea shipping.[290] The vast majority is employed in the UK and France, which are also the two major short-sea countries within the basin. The total number of persons employed within each Atlantic Arc country is shown in the figure below.

Figure 8.5 Number of employees active in the short-sea sector per Atlantic coastal area of each Atlantic Arc country, 2010



Source: Ecorys (2013), Study on Deepening Understanding of Potential Blue Growth in the EU Member States on Europe's Atlantic Arc – Country fiches, adjusted to the relevance of coastal areas adjacent to the Atlantic Arc

Following the maritime economic sector value chain of Short-sea shipping; we can distinguish two categories of labour within this sector: port labour (dock workers) and seafarers. As the characteristics of the workforce are so different for these two categories of labour; both are discussed separately within this paragraph.

Port labour

Ship, cargo and industrial services in ports generate direct employment effects. For Short-sea shipping, short-sea cargo is generally handled by the same dock workers compared to deep-sea shipping. It is therefore hard to gain separate statistics or information on the specific short-sea activities of dock-workers. The efficiency of cargo loading and unloading is an important factor for the competitiveness of ports, and therefore also for the wider economic effects of employment and value added.[291]

[290] See methodology annex for detailed breakdown of sectors assigned to short sea shipping.
[291] Notteboom (2010), Dock labour and port related employment in the European seaport system. ITMMA

The organization of port labour and its subsequent dock labour systems varies widely across the European seaports and has been studied in various European reports and studies.[292] Especially the case of causal employment[293] within ports is a difficult one and is tackled in different ways per country. An overview of port labour characteristics per Atlantic Arc country is provided in the following Table.

Table 8.3 Labour market and hiring characteristics per Atlantic Arc country

	United Kingdom	France	Ireland	Spain	Portugal
Labour market					
Management models	Mixed[294]	Landlord, some toolports	Mixed	Landlord model	Landlord model
Trade Union density	50% - 95%	95% - 100%	66%	100%	100%
Applicable law	General labour law	Maritime Ports Code and General labour Code	General labour law	Ports and Merchant Shipping Act	General labour law for permanent workers, *lex specialis* for pool workers
Labour publicly or privately arranged	Privately	Mostly private, public causal workers phases out in 2020	Privately	By Labour Pools constituted as private enterprises	Privately by operators and privately by labour pool companies
Temporary agency work allowed	Yes	Yes	Yes	Yes, but fixed agency per port	No
Issues	Local job insecurity and shortage of workers.	Presence of causal workers up to 2020, high strike propensity in French ports, restrictive practices hinder short sea shipping and inland navigation.	Over-employment of East-European workers is concern of the unions.	Exclusive right of pool workers, trade union involvement, restrictive practices harm efficiency of ports, lack of technological development.	Priorities and privileges for certain type of workers regardless of productivity, low flexibility in hiring process, high control of labour market by the unions.
Qualifications and trainings					
Trainings offered	Yes, Company based	Yes, by institutes and companies	Yes, company based	Yes, by the Pool Companies	Yes, at port and company level
Issues	Minority of temporary work agencies offer trainings	Trade union involvement	Absence of standardised training	Exclusive right to provide training for Pool Companies	None

Source: Based on Van Hooydonk(PORTIUS) (2013), Port labour in the EU – Volume II The Member State perspective, adjusted by Ecorys

Looking at the port labour markets in the Atlantic Arc, the table identifies a distinct difference between the UK and Ireland on the one hand and France, Spain and Portugal on the other. The UK

[292] See Notteboom (2010) , Dock labour and port related employment in the European seaport system. ITMMA and Van Hooydonk(PORTIUS) (2013), Port labour in the EU.
[293] Because of an irregular demand for cargo handling of vessels (causal demand for labour) which creates a lack of permanent attachment between the employer and employee.
[294] The port system in the UK consists of mainly private ports (Associated Britisch Ports, Hutchison Ports, Forth Ports), but also trusts (e.g. Dover and Milford) and municipal (e.g. Portsmouth)

and Ireland have more privately managed ports which is also reflected in the organisation of port labour. Here, it is the duty of the private terminal operators to hire the workers and they can also hire temporary workers through agencies. The applicable law is the general labour law. One cannot ignore the relation between the open labour market characteristics of these Member States and the relatively low share of trade union membership compared to the other Atlantic 'block'. For France, Spain and Portugal the situation is different. Specific law is drafted in these countries for port workers which stipulates many different rights and regulations for port workers. The work is done throughout labour pools and there is a high influence of the trade unions. Almost all port workers are member of the unions and its influence is shown in the propensity of strikes in these countries. An example are the latest strikes in Portugal[295], where the government wants to liberalise the labour market by introducing contracts for temporary work and occasional work in each of the Portuguese ports.

A specific issue for short sea shipping is reported by several stakeholders[296] in France, where high costs per docker, high manning scales leading to an obligation to hire unnecessary workers and a lack of flexibility are perceived factors leading to relative high handling costs to short sea shipping and inland navigation as these vessels have lesser cargo to be handled than deep-sea vessels. It is also mentioned by short-sea promoters that dock workers have the tendency to favour deep-sea ships as these, when calling at a French terminal can give them 6-8 hours of work. SSS ships calling at a terminal often do not have large volumes and can only use dockers' services for maximum 2 or 3 hours. Then the dockers do not easily find an extra task following the SSS activity. This statement could however not be checked on objective grounds within the scope of this study.

Concerning the skills and education of port workers, trainings are offered to educate the workers at company, union, port or labour pool level. Some specific country issues apply as described in the table above.

One can conclude that the labour market and hiring characteristics of port labour in the countries of Portugal, Spain and France are a barrier to growth of short sea shipping. Ports are not operating as efficiently as they could which hamper their competitive position. Moreover, short sea shipping has a inferior position by workers compared to deep-sea shipping. In the UK and Ireland, less restrictive practices apply and the labour market characteristics are a driver for competitive and efficient functioning of ports and short sea shipping.

Shipping labour (seafarers)

Within short-sea shipping, the majority of vessels which fly an EU-flag have national officers and seafarers on board. According to Ecorys (2009), 66% of the officers are nationals, 11% are from other EU countries and the remaining 23% are non-EU officers. Regarding other ratings, 76% are nationals, 4% other EU and 20% are non-EU ratings. These numbers reflect intra-European shipping for the whole EU; it is not clear how exactly the figures are when focussing on Short-sea activities in the Atlantic Arc.

However, the table below shows the percentage of national workers for the flag states of the Atlantic corresponding to all shipping activities, both short-sea and deep-sea.

[295] Strikes are planned from November 6th to November 27th 2013.
[296] Interviewed by the PORTIUS study: Van Hooydonk(PORTIUS) (2013), Port labour in the EU – Annex II, page 331

Table 8.4 Percentage of nationals on ships flying the national flag, 2009

	Percentage of nationals		
	Officers	Ratings	Total
United Kingdom	N/A	N/A	67%
France	88%	81%	82%
Ireland	N/A	N/A	N/A
Spain	98%	81%	87%
Portugal	21%	24%	27%

Source: Ecorys (2009) The labour market and employment conditions in Intra-Community regular maritime transport services carried out by ships under Member States' or Third Countries' flags

It is shown that the percentages of nationals are for every Atlantic country quite high, except for the vessels flying the Portuguese flag. This might be the case because of shipping connections between Portugal and North-Africa. Certain rules may apply for manning of vessels per type of flag register.

Concerning the average wage of seafarers, the table below provides an indication of average wages for the Atlantic Arc countries. In France, the wage conditions seem to be the best for both officers as able seamen, followed by the UK, Ireland and Spain.

Table 8.5 Average monthly wage costs for an officer and able seaman per country, 2009

	Officer (€)	Able seaman (€)
United Kingdom	3 710.00	1 650.00
France	4 510.00	2 450.00
Ireland	3 710.00	1 650.00
Spain	2 650.00	1 500.00
Portugal	N/A	N/A

Source: Ecorys (2009) The labour market and employment conditions in Intra-Community regular maritime transport services carried out by ships under Member States' or Third Countries' flags. Gross wagesexcludeemployer levies and social security charges

Regarding the education of seafarers, it is perceived that enough schools and education possibilities exist in the Atlantic Arc basin. However, for instance in Portugal, experts told that the nautical school is of good quality but students have difficulty to find jobs outside Portugal. The Portuguese fleet itself is too small to accommodate the supply of officers and ratings. An estimate of the demand and supply of seafarers per country is given in the following table. Note that these figures are of 2008, prior to the economic crisis that strongly affected short-sea shipping, as shown above.

Table 8.6 **Demand and supply on board of vessels flying national flag, 2008**

	Demand	Supply	Difference, excess supply
United Kingdom	N/A	N/A	N/A
France	21 041	29 243	8 202
Ireland	676	857	181
Spain	33 194	26 682	-6 512
Portugal	1 982	5 000	3 018

Source: Ecorys (2009) The labour market and employment conditions in Intra-Community regular maritime transport services carried out by ships under Member States' or Third Countries' flags

The tables above do not show a fierce barrier to growth of short-sea shipping, related to seafarer employment. Most intra-European vessels flying one of the Atlantic flags employ mostly nationals as officers and seafarers. However, there is still an issue concerning the excess supply of seafarers, created to a high extent through the supply of non-nationals and the more efficient operations on scale-increasing vessels. However, this is only part of the picture, as these tables only coincide with vessels sailing the national flag, not taking into account flags of convenience.

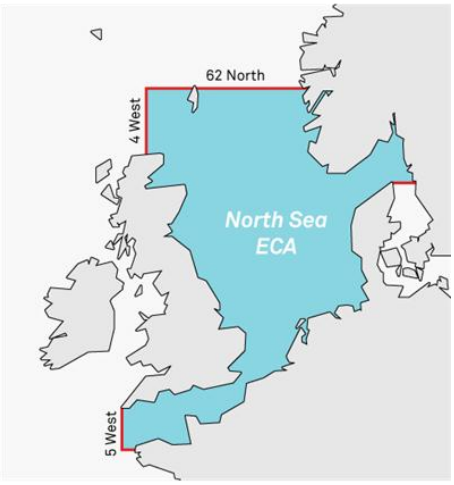
8.3 Administrative burdens for industry & restrictive practices

Administrative burdens

Just as all international shipping activities, short sea shipping in the Atlantic must adhere to the regulations of the IMO (International Maritime Organisation). The major conventions to which the industry must adhere are respectively SOLAS (Safety of Life at Sea Convention), ISPS code (International Ship and Port Facility Security Code) and MARPOL (International Convention for the Prevention of Pollution from Ships). However, these regulations cannot be seen as regionally specific administrative burdens, given their fundamental as well as international character. However, there might be one exception; the new sulphur emission rules for Emission Control Areas (ECA's).

From 1 January 2015, all ships in the ECA's (English Channel, North Sea and Baltic Sea) must use fuel with a sulphur content of less than 0.1%, while 1% is now applicable in ECA's and 3.5% in the rest of the world. Alternatively, the vessels must have cleaning system (scrubbers), which reduces the sulphur content of the exhaust gases accordingly.

Figure 8.6 **The North Sea ECA**



Source: Oceanox

The North Sea ECA will impact also short sea shipping in the Atlantic Arc as it includes the basin area below Nord-Pas de Calais and many short sea services to or from Atlantic Arc countries would also need to pass the North Sea.

It is the question whether the administrative and technical burden associated to complying to ECA rules is a competitive disadvantage to those shipping companies active in this area. It is legitimate to say that any additional investment or operational costs are hard to bear by the shipping companies in the current market context. Margins are already very low due to an overcapacity of vessels. However, it is likely that all competitors need to adhere to the rules as well, and otherwise the restriction to 0.1% will become globally effective sooner or later.

The largest perceived problem is the uncertainty ship owners have about any additional type of emission regulations in the coming future. Will their investments being made today be still valid the coming years or can they then expect even more stringent rules?

As part of the registry of vessels in Flag States, employment conditions may apply to those vessels registered to the national registry (1st register) or international registry (2nd register) of the Flag State. Especially for inland cabotage; there are rules in place limiting the employment on ships to nationals. An inventory of most important criteria for employment within the Atlantic Arc countries is provided in the following table.

Table 8.7 Summary of employment criteria for Atlantic Arc countries

	United Kingdom	France	Ireland	Spain	Portugal
Criteria applicable to employment conditions	- There is no requirement to use the UK flag or a general restriction to employ non-nationals. -Non-EEA personnel employed on ships operating wholly within UK territorial waters, on domestic scheduled passenger services (i.e. exclusively between UK ports) or on domestic scheduled cargo services are required to hold work permits. -A condition for a work permit is that the pay that the workers receive is no different from the level that a UK resident.	-French ship owners engaged in regular intra-EU maritime services (according to the French definition of routes including only EU ports) are required to use the 1st register. -Only EEA citizens may be employed in the 1st register	-EEA nationals on Irish ships: all EEA citizens can be employed by Irish employers and then have all rights as other Irish workers. -Non-EEA nationals: application for an employment permit is possible if the base salary is at least € 30 000	-There is no requirement to use the first register, but by Order of 22nd of July 1999, non-EU nationals on board ships engaged in within-country cabotage get paid the same as nationals -In the first register, non-EU seafarers may not be employed.	-The Madeira register (MAR) is the 2nd register for Portugal, ships in inland cabotage must use the 1st register (decreto Lei no 7/2006 of 4 Jan 2006) - In the 1st register only Portuguese seafarers may be employed. -In the 2nd register the Master must be a national as well as 50% of both the other officers and of the ratings.

Source: Ecorys (2009) The labour market and employment conditions in Intra-Community regular maritime transport services carried out by ships under Member States' or Third Countries' flags

It can be seen that for some Flag States registries, only EEA citizens may be employed (France), only EU citizens can be employed (Spain) or even only nationals may be employed (Portugal). The latter includes inland cabotage (mainly to Madeira).

From the interviews, it became clear that the market players are often not fully aware of the European policy goals and developments influencing their sector. Many stakeholders do not follow up the impact of policies on their day-to-day business, market or competitive position.

Administrative changes, due to changes in policies, are often slowly implemented. In practice, administrative procedures are differing locally due to habits of port services like customs and/or habits of the SSS operators.

Multimodal transport concepts often fail on the long term due to administrative formalities, hindering smooth transhipment and increasing costs of the total transport. Due to the non-existence of a unified transport document multi-modal transport concepts result in several slightly differing uni-modal transport documents and more importantly differing legal liabilities on each stretch.

Ships calling at French ports are obliged to state their CO_2 emissions as this information is then transposed to the end consumer of imported products. This obligation increases the administrative burden lying on the operators.

For several purposes, data and information from vessels is collected by ports and authorities before the vessels can make their calls. Either shipping agents or vessel masters should declare information on the port of call, cargo and hazardous goods they carry, waste notifications, security notifications and IMO FAL forms[297].

Some ports have electronic information systems in which information is entered by the shipping companies, stored, and used by the authorities or companies that need this information (one-stop-shop or single window systems). However, some smaller ports do not even have electronic systems and much information must still be declared by hand or fax. And if ports have electronic systems, those are often not interoperable between ports.

DG MOVE has initiated e-maritime to foster the use of advanced information technologies and promoting interoperability between systems. Likewise, the European Maritime Safety Agency (EMSA) has developed SafeSeaNet; a European vessel monitoring and information system for maritime data exchange. It links maritime authorities across Europe.

In the Atlantic, we can identify several Port Community Systems in place. We can see in France that multiple ports along the Atlantic coastline use the port community system of SOGET[298]. Le Havre, Rouen, Bordeaux, La Rochelle and Saint-Nazaire use all the same single-window system of SOGET.

[297] These reporting formalities relate to the ship, its stores, its crew's effects, its crew list, its cargo and for cruise ship its passenger list and they are sent electronically.
[298] http://www.soget.fr/soget-en/index.php/solutions/customs-authorities/guichet-unique-portuaire-2

In the UK Atlantic shore; Bristol and Liverpool use both the port community system of MCP[299], while others such as Southampton and Portsmouth use CNS[300] systems. In Spain, PORTEL is the leading provider of tailored community systems while the Port of Bilbao has developed its own community system; EpuertoBilbao.

All above mentioned systems and companies are members of the EPCSA (European Port Community Systems Association), which has the aim to develop e-maritime solutions throughout Europe. The port community system companies in Portugal (Indra; operating a single window in all three ports of Sines, Lisbon and Leixões) and Ireland (KLEIN systems in Dublin) are not member to the EPCSA.

The ports in the Atlantic sea-basin make good progress on the implementation of single window port community systems. In all Atlantic Member States, presence of such systems has been identified, which should reduce the administrative barriers for shipping companies to call a certain port. In France, Spain and Portugal; one main provider of port community systems exists; which increases the efficiency of operations between those ports.

Restrictive practices

The ports along the Atlantic Arc almost all have their port operations being licensed through concessions, or are fully privatised. As mentioned before, still some restrictive practices exist in Spain, Portugal and France concerning employment. Protective regulations and high involvement of trade unions makes the labour market rigid and costly. This also hamper the technological development within those ports, which is obstructed by the trade unions.

In France, it is mentioned that the 45 FT pallet wide container is neglected in legislation. This container is more and more becoming the standard in multi-modal transports, especially for the fresh food trade from Spain and Portugal towards the North of Europe. The 45 FT container can have a similar load volume as the 40 FT container, whilst at the same move having for instance refrigerating equipment on-board (diesel based reefer containers). The standard is however not appearing in official legislation.

It is perceived that the policies of DG Move, DG Energy, DG Environment and others are not conflicting but are not perfectly aligned towards each other either. Moreover, the SSS operators' information is often too high-level and only slowly and gradually reaches the operators. As an example[301]; the bunker fuels and emissions from shortsea shipping are being dealt with by DG MOVE for NOx and PM, but DG ENV for SOx and DG CLIMA for CO2 and oher GHG. Therefore it happened to be that SOx rules apply to all vessels while NOx only apply to new built ships. As such rules are also implemented in a different time schedule, it is hard for operators to anticipate and take deliberate actions.

The SSS market is highly fragmented and few big players are confronted with several SMEs and micro-enterprises spread across ports in EU coastal regions. Consequently, few big players (Unifeeder, Grimaldi, SAMSKIP) are well-structured to capture the value of and build on large economy of scale, whilst the majority of Small- and Micro-Enterprises have low if any capacity to succeed in a competitive market. Moreover, large and powerful shippers can easily exercise power pressure and control over such small- and micro-enterprises, with a consequent key role in shaping

[299] http://www.mcpplc.com/Partners/Ports.aspx
[300] https://www.cnsonline.net/web/guest/home
[301] Provided by interviewee Mr. Jean-Marie Millour

the market. This has evolved in a consolidation between players. For example Unifeeder has acquired United Feeder Services, Feederlink and InterMarineContainer lines in the last three years.

There is a current lack in the development of a European-wide maritime traffic monitoring system: it may help increasing efficiency in ports, through a better distribution of information. The idea is that ships are tracked during their journey through European waters, along with all the information available on cargo and its destination. This information can be shared with the relevant stakeholders in ports for planning purposes, thus making the logistic process more efficient. Nonetheless, it currently appears impossible for the sector, due to proliferation of small players, to promote joint initiatives aimed at gathering data and providing adequate business intelligence.

Although in the main European ports the maritime infrastructure is well developed, in most of secondary ports across EU maritime regions a lack of port capacity may form a constraint to further growth. Many ports, especially the main ports, face an increasing pressure on their hinterland transport sector. A lack of sufficient hinterland links may constrain the flows of cargo between ports and hinterland, which might provide a barrier in the development of a fully integrated EU short-sea network.

8.4 Finance and research

Sources of finance

Financing is becoming one of the main problems for the SSS sector. The sector stands on the one hand for a large investment challenge as ship engines are to be retrofitted to meet upcoming emission standards (through cleaner fuels or through after treatment systems) or ships should be scrapped as these are in the nearby future exceeding the maximum emission levels. On the other hand, it is often said that the banking sector is restricting access to funding for the shipping sector, posing high approval criteria. EIB and other European funding mechanisms like Marco Polo could work as a co-funding source but do not cover the full costs of investments involved. And the entrepreneurs themselves do not have enough reserves to cope with the remaining part of the investment (often m per ship).

In combination with low freight rates, high bunker prices, and declining asset values, this makes it seem inevitable that many less credit-worthy owners will struggle to raise new debt. Ship owners' ability to take delivery of their new buildings or to place new orders will become highly constrained if their access to the debt markets is limited further. As banks will want to limit their exposure to the market, the Top Tier companies[302] will probably benefit from their position compared to SMEs. On the other hand, cash-rich and well established owners and/or owners with access to Export Credit Agencies (ECAs) or private equity funds might be able to make deals that could prove to be attractive in the long run. This can result in the short or mid-term future to a decline in ships and operators and/or a considerable increase of costs and therefore decline in competitiveness[303].

Multi-modal transport subsidy schemes like Marco Polo or Motorways of the Seas(as part of TEN-T) are not enough for bearing future investments in ship engines, however can be of high importance for the actual competitive position in relation to uni-modal road transport. Best practices can be found in Norway, Italy, Spain and Belgium. The Italian system of Eco bonus subsidies, started in 2005, subsidises the shipper and as such directly influences the SSS competitive

[302] Companies with considerable amount of market power and capital basis.
[303] Based on Danish Ship Finance A/S Shipping market review 2013

position. The system was however used as a blueprint by other countries and regions like the Basque region.

Figure 8.7 TEN-T core ports in the Atlantic Arc

Source: Google Maps, adjusted by Ecorys based on COM/2011/0650 final/2 - 2011/0294 (COD) */ Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Union guidelines for the development of the trans-European transport network – Annex II

Within Marco Polo; Motorways of the sea is the framework in place to promote short-sea shipping. The Motorway of the Sea Western Europe axis crosses the Atlantic from Portugal towards Ireland and the North Sea. In 2012; one project as been awarded with Marco Polo funding related to the Atlantic Arc. This project called 'OPTICARO 1' has been granted € 2.8 m in order to develop Short-sea shipping of high density cargo through Ro-Ro linking the ports of Santander (bi-weekly) and Pasajes (biweekly)with ports of Zeebrugge (biweekly),Southampton (weekly) andVlissingen (weekly).

However, on the other hand it has been heard that the Marco Polo scheme is perceived to be relatively slow in supporting innovative projects. An example of a project of a gas powered ship in France is now already waiting 2 years for an official launch. The ship is waiting in the port of Saint-Nazaire.

Additionally, under the new TEN-T funding schemes, many Atlantic Arc ports will become part of the Core Network (See figure), the foreseen backbone of the European transport network. This implies that they can opt for infrastructure funding through the Connecting Europe Facility with a total budget of €31.7 bn (for all modes).

The tonnage tax systems in place in several European countries are not truly examples of financial aid, though they create a substantial incentive in Europe for undertaking shipping activities. Tonnage tax is based on the registered tonnage of a ship, multiplied by a fixed amount of deemed profit per ton, instead of the actual accounting profits from the exploitation of a vessel. Most tonnage tax regimes apply to the 'maritime transport of goods', some also to dredging, towing or offshore activities. Mostly used criterion is that a company must have the strategic and commercial management of those vessels located in the specific country to apply tonnage tax.

Within the Atlantic Arc countries only Portugal does not apply a tonnage tax regime. Just recently, the European Commission (DG COMP) declared that it had decided not to change the current

regulation concerning tonnage tax within the maritime state aid guidelines, after four years of review. It had positive effects on employment and on the competitiveness of the industry in Europe. Moreover, in some countries the tonnage tax regime also stipulates the companies to train their personnel.

The current financial situation puts a burden to many short sea shipping companies to further invest and renew their fleet, especially SME's. European funding schemes as Marco Polo can help these companies, but won't save them from going bankrupt. It is perceived that the favourable tax schemes and possibly export credit agencies are important promoters for growth in the European shipping industry, from a framework condition perspective. Because the demand for intra-European shipping is still expected to increase it is totally up to the market itself to take up the opportunities at hand.

In multiple European countries promotion centres for Short sea shipping are active. They are in place to promote the mode of short sea shipping for intra-European transport. From 2000 onwards the national promotion centres were bundled into an informal network of such centres in Europe; European Shortsea Network (ESN). In 2008, the network consisted of 20 national bureaus.

However, the list of the ones still being active and financed is getting really short. Now only 18 exist of which only 12 are still active. An idea proposed by Shortsea promotion centre France (BP2S) is to combine the actual tasks of the bureau with the highly valued and so needed educational demand from the SSS market (now only supplied by two Marco Polo funded institutes).

On-going research activities

Under the 7th Framework Programme (FP7), all research related EU initiatives are bundled together under one framework. Financial tools are in place to support research and development activities, as well concerning transport. The following FP7 research projects have been carried out or are still running.

Table 8.8 FP7-research projects related to Short-sea shipping

Name	Project duration	Description	Project value	EU funding
PROPS (Promotional Platform for short-sea shipping and intermodality)	2008-2011	Through close collaboration with the short sea promotion centres, a methodology was developed to enhance practical promotion activities in the fields of legislative, technical and operational actions.	2 460 115	2 309 054
SOCOOL (Sustainable Organisation between Clusters Of Optimised Logistics @ Europe)	2012-2014	The consortium consists of five clusters that represent essential areas of logistics (deep-sea hubs, airports, land-hubs and short-sea hubs). In the project the needs of the stakeholders will be analysed, a strategy for international cooperation will be elaborated, and adequate plans for joint action will be initiated and implemented. In addition, training activities will be carried out.	2 829 397	2 528 017
SUPERGREEN (Supporting EU's Freight Transport Logistics Action Plan on Green Corridors Issues)	2010-2013	The purpose of SuperGreen is to promote the development of European freight logistics in an environmentally friendly manner. SuperGreen will evaluate a series of green corridors covering some representative regions and main transport routes throughout Europe. Bottlenecks are identified and supporting green technologies will be proposed to solve the bottlenecks	3 453 746	2 634 698

Source: European Commission, CORDIS

It is up to the market itself to take the R&D initiatives desired to innovate the sector, but it is also partly an opportunity in the hands of the EC to keep the positive momentum of short sea shipping. One could prevent a decline in awareness and support for the sector. The declining number of short sea shipping promotion centres in Europe is not yet seen within the promotion centres in the Atlantic Arc, but is not a positive sign. One of the instruments the EC has to keep the momentum of short-sea shipping are the research funds such as FP7 and the upcoming Horizon2020. With FP7 projects reaching termination, Horizon 2020 provides room for new short-sea related research topics. The table below highlights the main 'Waterborne' topics for proposal under Horizon 2020.

Table 8.9 Horizon 2020 topics for waterborne related research proposals

Horizon 2020 Waterborne Topics
Towards the energy efficient and very-low emission vessel
Safer and more efficient waterborne operations through new technologies and smarter traffic management
System modelling and life-cycle cost and performance optimisation for waterborne assets
Advancing innovation in the Inland Waterways Transport (IWT) sector

Source: European Commission

The topics provided above are not specifically aimed at short-sea shipping; however they show very much a smart and green approach towards the development in ship designs and operations which will also be applicable and relevant for short sea operations in the EU.

8.5 Good practices for support of the Short-sea sector at sea-basin level

Several barriers and bottlenecks have been identified in the previous chapters which might hamper the further growth of Short Sea Shipping within the Atlantic Arc. The main identified barriers are in short:

- Organization and restrictive practices within port labour in France, Spain and Portugal;
- Excess supply of shipping employment in combination with ships flying flags of convenience;
- SME's struggling to get the financial capacity to renew their fleet and coping with increased competitive pressure from consolidated larger market players;
- Lacking awareness of European policy goals within the industry;
- Administrative formalities within multimodal transport chains;
- Insufficient maritime infrastructure within more secondary ports;
- Sources of finance.

However, we see initiatives in the market, both on a business level and on a policy level that are being proposed in order to overcome these challenges. A summary of those best practices is provided in Table 8.10.

Table 8.10 Detailed description of good practices

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
Blue Belt Proposal	A single transport area for shipping is proposed through easing customs formalities for intra-EU shipping, as well as easing customs formalities for ships calling at third country ports.	http://ec.europa.eu/transport/modes/maritime/news/bluebelt_en.htm	Positive, if accepted it will be implemented at EU wide scale.
Eco-bonus in Italy	Eco-bonus is a national incentive; introduced in 2002 (L.365/2002) to support the road haulage firms to shift more and more goods amounts	http://www.odyssee-indicators.org/workshops/paris/session2_italy	Positive, transparent subsidy scheme can be transferred to other MS

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
	from the road to sea freight. To this purpose the 2008 Financial Law allocated 77 m € a year for three year period 2007-2009.	.pdf	as well.
Short-sea shipping courses in the school 2E3S.eu	The 'Escola Europea de Short Sea Shipping' (2E3S) is a training centre in place to provide courses for professionals in order to "change and bring about change and progress in society through the promotion of maritime transport as the basis for the development of sustainable logistics in Europe."	http://2e3s.eu/ Also addressed by the Short Sea Promotion Centre of France	Positive, through EC funding such courses can be held in multiple countries in order to get the professional people aware of the sea-mode.
Regional cooperation between ports; for example Le Havre, Rouen and Caen in France	When regional ports cooperate by using inter-port services, sharing facilities, or by specialising as a means to optimise land use. This may imply synergies strengthening the region as a whole, with positive employment and competitiveness impacts. An other example outside the Atlantic Arc is the Rotterdam-Dordrecht-Moerdijk cluster.	OECD, 2011, The Competitiveness of Global Port-Cities: The Case of the Seine Axis (Le Havre, Rouen, Paris, Caen) – France	Neutral, this very much depends on the relationship between the ports and whether they are open to cooperate. Both have to have confidence in such cooperation.

8.6 Measures that stimulate Blue Growth of Short-sea shipping in the Atlantic Arc

Short-sea shipping development..

The maritime economic activity of short sea shipping consists of a value chain including shipbuilding and marine equipment, ship operations, cargo handling in ports and ultimately also further hinterland services. In this sector study we have taken account of this value chain, but focussed on the 'maritime' links in the chain; ship operations and handling in ports. From a horizontal perspective sub-sectors as ferry, Ro/Ro, container and bulk shipping can be identified. In the Atlantic, liquid bulk, dry bulk and Ro/Ro are the largest sub-sectors based on tonnage transported.

The maritime economic activity is from a purely transport perspective a stable one. The number of goods being transported along the Atlantic coastlines is increasing again after a sharp decline in 2008 and 2009; during the financial crisis. Though, it is not emerging like the sector is within other basins as the Baltic or Black Sea. Within the Atlantic, an approximate 27 000 people are employed in the sector within a thousand companies, providing more than €2 bn GVA.

The workforce and hiring characteristics of short sea shipping are divided in two categories; port labour and shipping labour. One can conclude that the labour market and hiring characteristics of port labour in the countries of Portugal, Spain and France are a barrier to growth for short sea shipping. Ports are not operating as efficiently as they could which hamper their competitive position. A large influence of trade unions, restrictive practices to 'protect' the dock workers but hinder efficiency and a limited flexible labour market are some of the barriers identified. Moreover, short sea shipping has a inferior position by workers compared to deep-sea shipping. However, in the UK and Ireland, less restrictive practices apply and the labour market characteristics can be seen as a driver for competitive and efficient functioning of ports and short sea shipping.

Though most vessels flying one of the Atlantic nation flags employ mostly nationals as officers and seafarers, seafarer employment of Atlantic nationals on intra-European operated vessels is declining. More vessels are flying flags of convenience; which allows them as well to employ

seafarers outside the EU. Also, vessel operations become more efficient together with the trend of scale-increasing vessels.

Like all multimodal transport solution; short sea shipping is heavily depending on the efficiency of operations within ports and terminals to compete with direct road transport. It is therefore of no surprise that stakeholders identify the administrative burdens in place within Atlantic ports as important barrier for growth. Additionally, there is a concern on the future EC policy on especially emission regulations. Ship-owners find it hard to anticipate what types of investments are required for their ships at the moment, in order to be on the safe side concerning vessel pollutants in the future.

The above concern is also related to the limitations currently in place in financial capacities of the shipping companies and banks. Especially SME's are having troubles to survive and re-equip their vessels. Banks are careful with their exposure to the market, which provides the larger and more-capital intensive shipping companies in an advantageous position compared to SME's.

..and potential EC measures to stimulate growth

The 'market' in itself is not of any concern for Short-sea shipping within the Atlantic. The number goods to be transported on the intra-EU maritime leg is catching up since 2008 and world seaborne trade is expected to increase further. It are especially those framework conditions and facilitating services that are of concern; financial services, port infrastructure in secondary ports, administrative burdens and customs procedures, organisation of port employment in several countries, etcetera. With the EC as main potential facilitator to influence such framework conditions, there might indeed be a legitimate responsibility of the EC to act. Not to intervene in the market, but to set and improve the framework conditions for blue growth.

The 'Blue Belt' initiative is foreseen as major step to accommodate intra-EU shipping and remove the administrative barriers that are currently in place in ports. Started throughout a pilot project, it is up to the EC to continue along this path and explore the further possibilities of reducing administrative burdens in EU ports. Pilot projects are seen as best practice method to do so.

Further financial facilitation through TEN-T and a follow-up of Marco Polo are encouraged. The inclusion of many Atlantic seaports within the Core Network of TEN-T is a good sign for short sea shipping. On the other hand, it is questioned whether a too much scattered network will in the end work. There must be a certain concentration of goods in order to exploit a beneficial service, especially in the liner service industry. Improved port infrastructure only is not enough[304].

It is perceived that the Marco Polo program granting scheme can be improved in speed of awarding the subsidies and increased transparency. It cannot be the case that only large operators with sufficient capacity[305] to explore the possibilities to apply for these funds can in the end retrieve subsidies.

The inferior position of SME's in shipping (in inland waterway, deep-sea and short-sea) has been stressed out and mentioned a lot. It can be a task of the EC (DG COMP) to govern trends as consolidation through mergers and acquisition within the market. A good balance should be found between fair competition and the 'laissez-faire' principle.

[304] For example, in the past two times a weekly Ro/Ro service from Leixoes (PT) is tried to be exploited but was not a success. Now, Cobelfret is again trying setting up this service, but experts are not very positive because of the lacking haulauge.
[305] Having employees or external consultants working on such applications.

Regional clustering of ports may help to bundle certain flows of goods in order to be of such density to exploit a intra-European liner service. The EC may identify the potential clusters and facilitate this trend where possible.

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Annex II – List of stakeholders consulted

Interviewee	Organisation	City / Country	T = Telephone F = Face-to-face	Date of the interview
Ana Casaca	Shipping and Ports Researcher, Federal University of Maranhão/IAME/ESPRIM	Portugal	Telephone	13-11-2013
Jean-Marie Millour	Managing Director of Shortsea Promotion Centre France	France	Telephone	13-11-2013

9 Yachting and marinas

9.1 General overview of yachting and marinas in the Atlantic Arc

Sector performance

The sector yachting and marinas is strongly interlinked with coastal tourism. It can be defined as coastal tourism including the use of yachts and other pleasure boats, excluding cruise. It is therefore difficult to separate the yachting and marinas sector from coastal tourism. Table 9.1 below gives an impression of the performance of the sector in terms of Gross Value Added (GVA), employment and number of enterprises. It should be noted that the data in the table is indicative only, as figures come from various sources and represent different years. Based on a recent impact assessment study of impact assessment and coastal tourism[306], an estimate for the total GVA and employment for the sector is given. The total GVA seems rather high compared to the number of jobs. Figure 6.3 (next page) gives the GVA and number of jobs for each country.

Table 9.1 Indicative figures on GVA, employment and number of enterprises yachting and marinas sector in the Atlantic Arc

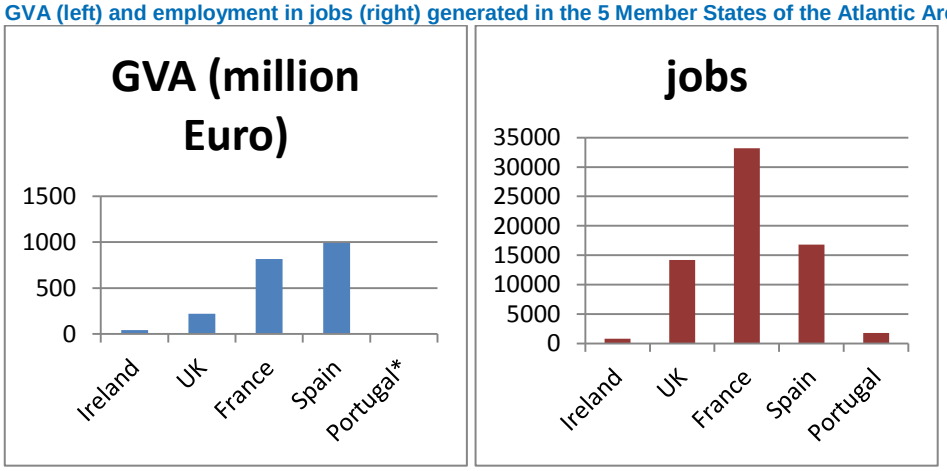
Country	Regions	GVA € m	Employment jobs	No. of enterprises	Source
France	Haute Normandie, Basse Normandie, Picardie, Pays de La Loire, Bretagne, Poitou-Charentes, Aquitaine	818	33 180	13 920	ICOMIA statistics (2011)
Ireland	Entire coastline	45	800	100	ICOMIA statistics (2011)
Spain*	Galicia, Asturias, Cantabria, Basque Country, Canary Islands	990	16,800.	700	GVA and employment: based on Innovamar (2011)[307], number of enterprises based on ICOMIA statistics (2011)
Portugal	Entire coastline (including Acores and Maderia)	n.a.	1 761	n.a.	Employment: Câmara Municipal Seixal, Um Retrato da Fileira da Náutica de Recreio em Portugal (undated)[308]
UK	North West England, South West England, South Western Scotland, Scottish Highlands & Islands, Wales, Northern Ireland	220	14 200	n.a.	The Crown Estate (2008)
Total Atlantic		6 700	64 476	n.a.	Estimate by Ecorys based on Eurostat, 2011

* Based on total for Spain, share Atlantic based on share of marinas along the Atlantic coastline

Source: Countries based on country papers[309], total based on Ecorys (2013) Study in support of Impact Assessment work for Maritime and Coastal Tourism - Draft Final Report.

[306] Ecorys (2013), Study in support of Impact Assessment work for Maritime and Coastal Tourism - Draft Final Report
[307] Innovamar (2011), Cuantificación económica del Sector Marítimo y su desagregación sectorial, Fundación Innovamar. Feb. 2011
[308] Câmara Municipal Sexial (undated), Um Retrato da Fileira da Náutica de Recreio em Portugal, at www.cm-seixal.pt
[309] Ecorys (2013), Study on deepening understanding of potential blue growth in the EU member states on Europe's Atlantic Arc – Draft country papers France, Ireland, Portugal, Spain and United Kingdom – revised versions

Figure 9.1 **GVA (left) and employment in jobs (right) generated in the 5 Member States of the Atlantic Arc**



* No GVA data available for Portugal

Source: draft country papers, employment Portugal from Câmara Municipal Seixal, Um Retrato da Fileira da Náutica de Recreio em Portugal (from www.cm-seixal.pt)

Value chain and subsectors

For value chain of yachting and marinas includes:

- Marina exploitation and operation;
- Yacht building, repair and trade;
- Port services and logistics, e.g. energy supply, waste water etc. in marinas;
- Maritime works – constructing marinas, maintaining access channels;
- Service sectors like hotels & restaurants, landside logistics & transport.

Description by country

Overall, the number of marinas along the Atlantic coastline is estimated at 350, offering a total of some 108 000 berths. Ireland and Portugal are relatively small; in the UK, France and Spain there are roughly 100 Atlantic marinas each. Yet, the Atlantic coast is much less endowed with marinas then the Mediterranean coast. In France 55% of the marina berths is on the Mediterranean coast[310] and waiting times to obtain a fixed spot are much longer along this coastline then on the Atlantic[311]. In Spain the gravity point is even more located in the Med with more then 80% of Spanish marina berths found there. This also translates in different prices: on Ibiza, the average m2 price per year of a berth is € 4 640, whereas in Galicia this is just € 463[312].

In the sections below a brief description of the yachting and marina sector on the Atlantic coastline per country is given. These descriptions are based on the country papers for the countries[313], and have been expanded where possible with additional information and figures.

Yachting and marinas in Ireland

Ireland is making efforts to further develop its yachting and marina sector, as the potential is generally underutilised and fairly concentrated around the main agglomerations (Dublin, Cork). The Practical Boat Owner Marina Guide lists 18 marinas with a total of 2 826 berths in Ireland[314]. The

[310] Ecorys (2013), Study on deepening understanding of potential blue growth in the EU member states on Europe's Atlantic Arc – Draft country paper France – revised version
[311] Fédération Française des Ports de Plaisance (2011), *Enquête Chiffres de la Plaisance 2011 – premier bilan et perspectives*
[312] Fondear S.L., at http://www.fondear.com/Todo_Empresa/Puertos_Links/Puertos-Deportivos.htm
[313] Ecorys (2013), Study on deepening understanding of potential blue growth in the EU member states on Europe's Atlantic Arc – Draft country papers France, Ireland, Portugal, Spain and United Kingdom – revised versions
[314] Practical Boat Owner Marina Guide, at www.pbo.co.uk/marina-guide

member's list of the Irish Marina Operators Association lists 20 members with a total of 3 687 berths[315].

Fáilte Ireland (the Irish National Tourism Development Authority) have carried out research into best practices regarding the development and financing of marina and berthing facilities in Ireland and abroad, with a view to shaping national policy in this area. Fáilte Ireland have recently reported that report has been finalised and that it was undertaking consultation in Summer of 2013[316].

Yachting and marinas in the United Kingdom

Coastal marinas had revenues of € 118 m in 2011/12 and employed 1 400 people, excluding those employed in the building of boats (see next paragraph)[317]. There are 236 coastal marinas in the UK, accounting for 49 000 berths[318]. The turnover is € 135 m, direct employment almost 1 700 people. The gross value added is around € 82 m. For every job in core coastal marinas according to the industry federation a further 12 jobs are generated in the value chain (which includes yacht building and general touristic services such as hotels and restaurants) and the indirect gross value added is estimated at a multiple of seven[319]. Additional jobs generated by the industry include suppliers, vessel maintenance, boatyards, boat hire, catering and hospitality as well as visitors and employee expenditures in the wider economy via the multiplier effect. An estimated 18 000 berths in 96 marinas are on the Atlantic coastline[320]. Using this division as an approximation, employment in marinas along the Atlantic coastline should be between 625 and 680 jobs.

Total revenue of the UK leisure, superyacht and small commercial marine industry was € 3.4 bn in 2011/12, employing 31 000 full time equivalents in around 4 200 businesses. Gross value added was €1 082 m[321]. The sector is strongest in the south east (part of the North Sea and English Channel basin) and south west (part of the Atlantics Arc) of England. Of these total figures, € 1.3 bn of revenue was from the manufacture of boats, 61% of which were sales outside the UK. The UK has a strong presence in the design and manufacture of superyachts with a turnover of around € 505 m per year and over 3 600 employees[322]. The superyacht building sector is showing innovation, competitive success and growth in output. There is some overlap in data between the superyacht building sector and the construction of naval and small commercial ships, as there are shipyards which are active in both sectors.

Yachting and marinas in France

The yachting and marina sector is well developed in France. The share of the Atlantic coastline is estimated to be 44% of all marina berths in France[323] with 51 652 berthing spaces in 90 marinas[324]. According to the same source, the number of jobs on the Atlantic coastline should be estimated at 600 permanent jobs and 250 seasonal jobs. This figure of permanent jobs is more or less in line with the average number of 7.6 jobs per port as given by the Fédération Française des Ports de

[315] Irish Marina Operators Association members list, at http://www.irishmarinefederation.com/imoa/index.html
[316] See http://www.ouroceanwealth.ie/SiteCollectionDocuments/MCG 2013 Q 2 Status Report of Implementing HOOW Early and Ongoing Actions _June_13.pdf
[317] British Marine Federation (2012), *UK Leisure, Superyacht and Small Commercial Marine Industry: Key Performance Indicators 2011/12.*
[318] This is different from the country paper which mentions inland marinas and not coastal marinas
[319] British Marine Federation (2007), *Economic Benefits of Coastal Marinas in the UK and Channel Islands – Executive Summary*
[320] Based on Practical Boat Owner Marina Guide, at www.pbo.co.uk/marina-guide
[321] British Marine Federation (2012), *UK Leisure, Superyacht and Small Commercial Marine Industry: Key Performance Indicators 2011/12.*
[322] UK Marine Industries Alliance (not dated), *A strategy for growth for the UK Marine Industries*
[323] Ecorys (2013), Study on deepening understanding of potential blue growth in the EU member states on Europe's Atlantic Arc – Draft country paper France – revised version
[324] Ministère de l'Ecologie, du Développement durable et de l'Energie (2010), *L'Observatoire des ports de plaisance*. See: http://www.developpement-durable.gouv.fr/IMG/pdf/donnees_OPP_dec_2010_resultat_enquete.pdf

Plaisance[325], which would suggest the number of jobs in the Atlantic marinas to be 684. However, according to the International Council of Marine Industry Associations (ICOMIA)[326] the number of jobs in marinas on the Atlantic coastline in France should be estimated at 1 320. If we assume 44% of other jobs to be on the Atlantic coastline too, the numbers would be: yacht trade and maintenance 6 070 jobs, equipment supply 1 400 jobs and yachting related services 2 200 jobs.

The position of France in the construction of leisure boats (such as sailboats, inflatable boats and motor boats) is strong. It is an internationally oriented industry; around two-thirds of production is sold on foreign markets, mainly in Germany, the UK, Spain, Italy and the US[327].

Yachting and marinas in Spain

In 2011, a total of 126 950 berthing places were under concession in Spain, spread over 355 marinas located along the 7 900 km of Spanish coastline[328]. Out of these, an estimated 23 600 berths in 106 marinas are along the Atlantic coastline (excluding Andalusia, including the Canary Islands). Until 2015, an estimated additional 8 200 places are foreseen to be created along the Atlantic coastline[329]. Dividing the total GVA and number of jobs for Spain on the basis of the number of marinas per basin, the GVA and employment for the Atlantic an be estimated at € 990 m and 16 800 jobs.

The Spanish yachting sector is hit hard by the economic crisis. In the years 2004-2007 the annual number of new leisure craft registrations was in between 12 000 and 13 000 (including aquascooters). By 2010 this had dropped to around 6 000 to 6 500 new registrations per year. Recently there are first signs of recovery: the number of registrations in October 2013 was up 16% compared to October 2012[330]. Around 30% of the registrations in the years 2009 and 2010 are Spanish built craft, whereas 70% are imported[331].

Yachting and marinas Portugal

In 2012, the maritime economic activity of yachting and marinas was featuring 38 infrastructures offering access to sea, with around 11 000 berths in total[332]. A different source mentions 10 127 berths in 35 marinas for the year 2009[333]. In terms of regional distribution, 65% of the berths is located in the regions of Algarve and Lisbon, accounting for more than 7 200 berthing places (35.1% and 30.1%, respectively)[334]. In the archipelagos of Açores and Madeira there are more than 2 400 berthing places. The Alentejo Region has the lowest share with 230. Until 2007, the recreational boating was a growing activity in Portugal. Due to the economic crisis, the sector stagnated in recent years.

Portugal has no major industry in shipbuilding and repairing of recreational boats with the exception of a few manufacturers of smaller recreational floating equipment (such as canoes and surfboards) and minor repair and maintenance services provided at marinas.

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[325] Fédération Française des Ports de Plaisance (2011), *Enquête Chiffres de la Plaisance 2011 – premier bilan et perspectives*
[326] ICOMIA (2011), *Recreational boating statistics*
[327] Cluster Maritime Français, see http://www.cluster-maritime.fr/article.php?lang=Uk&id=21
[328] Fondear S.L., see http://www.fondear.com/Todo_Empresa/Puertos_Links/Puertos-Deportivos.htm
[329] Based on Fondear S.L., see http://www.fondear.com/Todo_Empresa/Puertos_Links/Nuevas_Marinas.htm. Additionally, the marinas on the Andalusian coastline are estimated to be 2/3s in the Mediterranean and 1/3 on the Atlantic coastline.
[330] Asociación Nacional de Empresas Náuticas (2013), *Las matriculaciones de embarcaciones de recreo frenan su caída en octubre con un incremento del 16%,* news item on website www.anen.es on 6 November 2013
[331] Fira de Barcelona - Departament d'Investigació i Estratègia de Mercat (2010), *El sector Náutico en España. El sector Náutico Deportivo y de Recrea 2010.* Report in cooperation with Asociación Nacional de Empresas Náuticas.
[332] Listagem de infraestruturas de acesso ao mar e operadores – year 2012
[333] Instituto Portuário e dos Trasportes Marítimos (2010), Panorâmico da Náutica de Recreio em Portugal, presentation at IV Seminário Internacional de Náutica de Recreio e Desenvolvimento Local, Seixal, 1 October 2010
[334] Listagem de infraestruturas de acesso ao mar e operadores – year 2012

Comparison across countries

A comparison of marina penetration is given in Table 9.2, expressed in kilometres of coastline per marina. This table shows that France and Spain have the highest number of marinas compared to their coastlines, whereas Ireland, the UK and Portugal have less marinas. Figure 9.2 gives an overview of the number of marinas and number of berths per country.

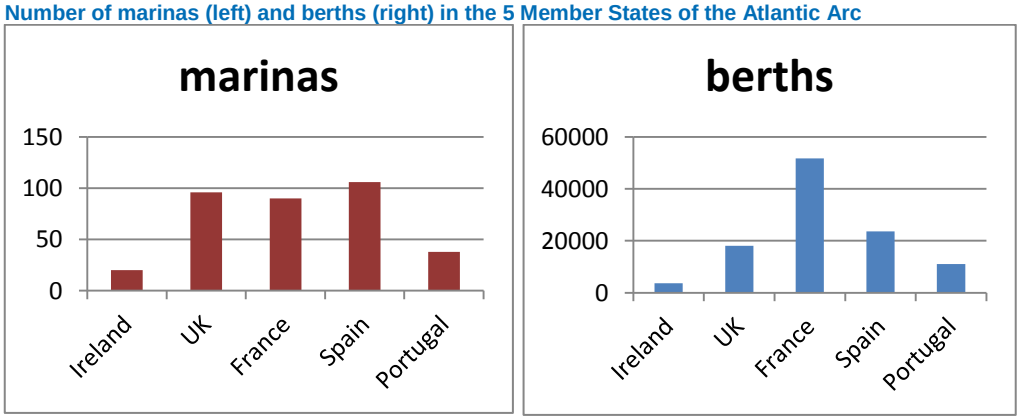
Table 9.2 **Indicative figure of marina penetration, expressed in kilometres of coastline per marina**

Country	Atlantic coastline (km)	No of marinas	No of kms of coastline per marina
France	1 520	90	17
Ireland	1 450	20	73
Spain	2 780	106	26
Portugal (incl. Acores and Madeira)	2 830	38	74
United Kingdom (excl. islands)	6 220	96	65
Total	**14 800**	**350**	**42**

* Based on total for Spain, share Atlantic based on share of marinas along the Atlantic coastline

Source: Countries based on country fiches, total based on Ecorys (2013) Study in support of Impact Assessment work for Maritime and Coastal Tourism - Draft Final Report.

Figure 9.2 **Number of marinas (left) and berths (right) in the 5 Member States of the Atlantic Arc**



9.2 Growth drivers and barriers to growth for yachting and marinas

9.3 Labour market characteristics

Workforce characteristics

The yachting and marina sector consists for a large part of Small and Medium Enterprises (SMEs). The workforce consists of permanent employees and seasonal employees; based on data available for France[335] with a roughly estimated division of 2/3 permanent to 1/3 seasonal employment.

Based on figures available for France and the UK, on average a marina generates 7 to 8 permanent direct jobs[336] and 84 to 108 jobs[337][338] in supplying sectors in the value chain such as yacht trade, construction and maintenance, equipment supply and services (which include the hospitality sector). Applying these benchmark figures to the total estimated number of marinas

[335] Ministère de l'Ecologie, du Développement durable et de l'Energie (2010), *L'Observatoire des ports de plaisance*. See: http://www.developpement-durable.gouv.fr/IMG/pdf/donnees_OPP_dec_2010_resultat_enquete.pdf
[336] Fédération Française des Ports de Plaisance (2011), *Enquête Chiffres de la Plaisance 2011 – premier bilan et perspectives*
[337] British Marine Federation (2007), *Economic benefits of coastal marinas in the UK and Channel Islands – executive summary*
[338] Fédération Française des Ports de Plaisance (2011), *Enquête Chiffres de la Plaisance 2011 – premier bilan et perspectives*

along the Atlantic Arc (see Table 9.2), the number of direct jobs along the Atlantic Arc can be estimated at 2 625 and the number of indirect jobs at around 31 500.

The employment is generally highly skilled and high value added, due to for instance the specific skills required in yacht construction and maintenance. The British Marine Federation estimated in 2007 that the average GVA per full time job in the marina sector is € 49 440[339], which is well above the British average. In large marinas, profiting from economies of scale, this GVA is estimated to go up to € 96 000. It is particularly the jobs in yacht construction and repair which high value added, whereas those in retail and hospitality sectors tend to be more lower skilled jobs.

The requirements to (professional) boaters are different from member state to member state, despite attempts of harmonisation through UN ECE (Economic Commission for Europe). This issue is further elaborated *restrictive practices.*

Hiring characteristics

As indicated, the marina and yachting sector hosts some highly skilled employment in the sectors of yacht building and repair, marina construction and maintenance and as well in the category of professional boaters. Other jobs in the sector, such as those in retail and hospitality services, are less skilled.

Part of the employment is seasonal, with hiring for one season only. Similarly to many Summer jobs in the tourist industry, the seasonal employment in the yachting sector is mainly performed by younger people, for instance as a temporary job between education and working life. Most of the seasonal employment concerns lower skilled jobs.

A specific type of work related to the yachting sector, mainly to the superyacht sector, is the hiring of crew. Contrary to the seasonal employment in marinas, crew jobs usually require specific qualifications in the field of navigation of motor yachts or sailing yachts. The market is very diverse: employment can be longer term, seasonal or even for one journey. Some yacht owners hire crew to navigate and operate their yachts during their holidays; others higher a crew to sail their yacht from one location to another, such as from the Mediterranean to the Caribbean or vice versa. This type of employment is found through agencies or internet forums. These employees would benefit from harmonised requirements to professional boaters.

9.4 Administrative burden for industry

Restrictive practices

The requirements to leisure craft and boaters can be different between member states, despite attempts to harmonise. The effect is a restriction of movement of leisure craft and (professional) boaters between member states. This is not unique to the Atlantic Arc but rather applies to the whole EU.

[339] British Marine Federation (2007), *Economic benefits of coastal marinas in the UK and Channel Islands – full report*

International Certificate of Competence

There is some form of harmonisation of licensing for skippers of pleasure craft, but only up to some extent. The International Certificate for Operators of Pleasure Craft (also referred to as ICC, International Certificate of Competence) is defined by the United Nations Economic Commission for Europe Inland Water Committee (UN ECE IWC) in Resolution 40[340]. The ICC certifies that the holder meets the levels of competence as specified in Resolution 40. The ICC is generally accepted in countries that have ratified resolution 40, but also in some countries who have not ratified.

In the Atlantic basin, only the UK and Ireland have ratified solution 40. France has ratified the preceding resolution 14 and also accepts the ICC. Spain and Portugal have not ratified resolution 40 but in practice tend to accept the ICC.

ICCs are issued through approved organisations. In the UK, these are International Yacht Training Worldwide, The Royal Yachting Association and the British Sub-Aqua Club. ICCs in the UK are only issued to UK nationals or residents. In Ireland, the Irish Sailing Association and International Yacht Training Worldwide are the approved organisations. The latter can issue ICCs to any nationality on behalf of the Irish Government[341].

Despite the fact that the ICC provides some form of harmonisation, there are various problems within the EU. There are countries in which boating qualifications are not mandatory. This creates a problem when a boater from a country where no license is required is asked to present his/her license in order to rent a boat in a country where licenses are required. In the Atlantic basin, the UK and Ireland do not require licenses for seagoing vessels. Others, such as France, do not require licenses for sailing boats but do require them for motor boats. Spain requires a license for all types of vessels[342].

A solution would be to encourage full participation of member states in the ICC scheme. Rather than harmonising standards across Europe, this would mean mutual recognition of recreational boating qualifications. An additional benefit would be that boaters from countries (that have ratified resolution 40) outside the EU would benefit too.

Requirements to professionals

The requirements to skippers on small commercial vessels (vessels below 24m) across EU-member states are heterogeneous and classifications obtained in one member state are often not recognised in other member states[343]. This makes it difficult for skippers to work abroad or to work on vessels registered under a foreign flag. The GETAFIX project (Gaining Educational Training Analysis for Identifying Cross Border Systems) lists a few examples in its April 2012 newsletter[344]:

- The German Sporthochseeschifferschein, which is a license for professional sailors of small vessels at high sea[345], is not recognised as a professional qualification in Italy;
- In Portugal, a 'Patroa da Costa' license is needed. This cannot be obtained on the basis of a British Royal Yachting Association (RYA) license;
- French nationals with a MCA (Maritime and Coastguard Agency) /RYA accreditation can regularise with the French system. Foreigners cannot obtain such regularisation with the French system and need to take tests non French maritime law and language.

[340] UNECE Inland Transport Committee Working party on Inland Water Transport (2011), *International Certificate for Operators of Pleasure Craft – Resolution 40 revision 1*
[341] Based on the International Certificate of Competence page on wikipedia
[342] European Boating Industry (2013), *Contribution to the EU tourism policy sustainable coastal and maritime tourism*
[343] European Boating Industry (2013), *Contribution to the EU tourism policy sustainable coastal and maritime tourism*
[344] GETAFIX project (2012), *Lack of recognition is widespread –GETAFIX Newsletter April 2012*
[345] See: http://de.wikipedia.org/wiki/Sporthochseeschifferschein

Initial survey results of the GETAFIX-project suggest that the lack of recognition is due to protection of national interests and a lack of knowledge about foreign qualification standards. This restricts mobility of labour and employment opportunities between member states.

Overview of licensing requirements in Atlantic basin countries

Table 9.3 Overview

Country	Licensing requirement	ICC Resolution 40 accepted
France	No license for sailing and motor boats with P < 4.5 kW 1 license for inland waterways for vessels up to L = 20m, P > 4kW and sail area > 12m2 Compulsory motor license if P > 4.5 kW (6 HP), incl. PWC 3 types of licenses for sea-going motor vessels: - Carte Mer for day navigation, max 5 miles from shelter, P btw 4.5-37 kW (50 HP) - Permis Mer Côtier for day (and night navigation if P > 37 kW), max 5 miles from shelter - Permis Mer Hauturier for day / night navigation, all distances, all P types 3 certificates for inland waterways: - S for "sport boats" - C for max L = 15 m (equivalent to ICC) - PP for L > 15 m	No. Resolution 40 under consideration Resolutions 13, 14 applied only for inland waterways (both issued and accepted). Therefore, only craft of max L = 15 m, carrying fewer than 15 persons, and designed to travel normally at max speed 20 km/h (referred to as "narrowboats") can travel freely on French waterways (except Rhine and Moselle rivers) with ICC. On offshore waters, the documents referred to in maritime conventions or bilateral agreements will continue to be required.
Ireland	No	Yes– Resolution 40 applied. ICC issued to Irish nationals and to foreigners
Portugal	6 types of driving licenses: - Carta de Principiante (Beginner's Card) for daylight navigation up to 1 NM from coast, on boats L = 5m and P = 4.5 kW - Carta de Marinheiro (Sailor's Card) for ages of 14 to 16, daylight navigation up to 3 NM from coast and 6 NM from a shelter, on boats L = 5m and P = 22.5 kW - Carta de Marinheiro (Sailor's Card) for ages of 18 +, in daylight navigation up to 3 NM from coast and 6 NM from a shelter, on boats L = 7m and P = 45 kW - Patrao Local (Local Skipper) for navigation up to 5 NM from coast and 10 NM from a shelter - Patrao de Costa (Coastal Skipper) for navigation up to 25 NM from the coast - Patrao de Alto Mar (Deep Sea Skipper) without navigation limits	No
Spain	4 types of compulsory licenses: - Capitán de Yate: no limits to navigation and boat's length - Patrón de Yate: navigation up to 60 NM and max L = 20m - P.E.R.: navigation up to 12 NM and max L = 12 m - Navegación Básica: navigation up to 5 NM and max L = 8m for sailing boat / L = 7.5m for motor boat Since 2002, any of the 4 licenses can be used for PWC or the dedicated PWC license No license required for sailing boats L < 5m and motorboats L < 4m and P < 11.03 kW for daylight navigation and within limits set by the local authority Foreigners sailing under Spanish flag can use the equivalent license of their home country	No
United Kingdom	No Though recommended, Certificates of Competence are not required for boats with L < 24 m	Yes – Resolutions 13, 40 applied. ICC issued only to UK nationals or residents

P = power; L = length

Source: Ecorys (2013) Study in support of Impact Assessment work for Maritime and Coastal Tourism - Draft Final Report

Technical and safety requirements

Similarly to differences in requirements to boater competence, there are differences in requirements to technical and safety standards. There are different regulations when it comes to periodic technical inspections, and different regulations as to what should be inspected. Safety requirements depend upon the flag under which a ship is registered. Some member states choose to apply safety regulations whereas others prefer good practice recommendations. This translates in different requirements to the presence of life vests, medical kits, communication means etc on board. This can be compared to the situation for road vehicles, for which an equal situation exists in EU member states (for instance with respect to the number of emergency triangles required, reflective vests not obligatory, only for drivers or for each passenger, first aid kit obligatory or not, spare set of lamps obligatory or not). The differences could result in competitive (dis)advantages of one country over the other.

Standards applicable to vessels used for recreational boating are set out in the Recreational Craft Directive (94/25/EC)[346] which creates a kind of 'type approval' system (analogous to motor vehicles) for construction standards which mean that once craft are accepted onto the market in one country, stricter standards may not be required elsewhere. The Recreational Craft Directive is currently under review. There do not appear to be any particular problems with regard to the implementation of the directive save that some Mediterranean ports are apparently requiring visiting yachts to have holding tanks[347].

Navigation regulations

The regulations regarding navigation differ between EU members states too. The definition of coastal and high sea navigation for instance can be different from country to country (as can be the requirements to skipper licensing for these areas). The effect is that a boater is allowed to venture out only 30 miles if he has a German Sportseeschifferschein, but up to 150 miles if he possesses the UK Yachtmaster offshore license. Yet both licenses are referred to as extended offshore licenses.

Protection measures in Marine Protected Areas can be quite different: speed limits, minimised access of motorised craft, anchoring regulations, specific measures on disembarking of persons, prohibition of waste water releases, prohibition of certain activities like fishing, etc.

Regulations regarding marinas

As regards marinas, there are at present no minimum regulatory standards for these although technical standards are currently being developed under the ISO. ISO standards frequently inform EU legislation (particularly as regards product standards). But the need for EU legislation on this topic does not automatically follow not least because of the quite different minimum requirements of marina users in different parts of Europe. In short a case for regulation is not made out even at a theoretical level.

9.5 Finance and research

Sources of finance

Marinas are often developed as part of a real estate development project. These can be projects for recreational purposes with holiday parks or second homes, or projects aimed at providing

[346] Directive 94/25/EC of the European Parliament and of the Council of 16 June 1994 on the approximation of the laws, regulations and administrative provisions of the Member States relating to recreational craft (OJ L 164, 30.6.1994, p. 15).
[347] The revision of Directive 94/25/EC is expected to make the inclusion of space for such tanks this mandatory in new craft.

permanent residence. For example, see Penlee Marina in Cornwall, where an old quarry site is redeveloped into a marina with real estate[348]. Often the real estate partly funds the costs of the marina infrastructure (such as a breakwater and basin). The operation of the marina is often given in concession to a private operator or to a yachting club.

The European Fund for Regional Development (EFRD) is referred to as source of co-financing for several marina and yachting projects, as these fit within the objectives of the EFRD. See for instance:

- Solent and the Central South Coast, a project to develop the UK's Central South Coast into Britain's Premier Yachting Location[349];
- Fenland Yacht Harbour[350];
- Pwllheli sailing academy and events centre[351].

Related to financing and development of marinas, a remark can be made on the potential role of marinas in regeneration of areas. The British Marine Federation mentions the following regeneration effects of marinas[352]:

- Marinas create an attractive environment for living and leisure, attracting not only boaters but also other visitors. Thus marinas can be used to boost tourism in a town or region;
- Marinas generate jobs, both directly and in the supply chain. These jobs generally consist of high skilled and high value added employment;
- Brownfield marina developments in rundown areas can help to image, appearance and attractiveness of an area. An example is the Torbay regeneration project, where marine leisure forms part of the Torbay regeneration project[353]. In this respect, the Brixham Marina in Brixham, Devon[354] can be mentioned too.

Effect of the economic crisis

The economic crisis has hit the nautical sports sector in Europe hard and caused the loss of an estimated 46 000 jobs across Europe[355]. Of these jobs a roughly estimated 12 000 would be lost in the Atlantic, given the total number of jobs in Europe compared to the Atlantic.

The service sector, including marinas and touristic services, has remained fairly steady, but the industrial sector (including yacht construction and equipment manufacturing) has seen a strong reduction, of 40 to 60% depending on the sector[356].

9.6 Good practices for support of the sector at sea-basin level

Galway Volvo Ocean Race Stopover

The Galway area has seen recent economic growth thanks to positioning itself as location for international marine sports events. Whereas the city is a well-known touristic centre for Irish citizens, it is not that well-known internationally. The 2009 Volvo Ocean Race stopover in Galway, which lasted two weeks, provides an interesting example of economic return and location branding generated through integrated sports events: an accompanying programme of entertainment aimed at attracting a broad range of visitors and not just the sailing community. In 2009, the average

[348] http://www.mdlmarinas.co.uk/consultancy/projects/penlee-marina
[349] See http://www.harbours.co.uk/metro.html
[350] http://www.fenland.gov.uk/article/4843/Yacht-Harbour
[351] Welsh European Funding Office (undated), £8m for Pwllheli sailing academy and events centre
[352] British Marine Federation (2007), *Economic benefits of coastal marinas in the UK and Channel Islands – full report*
[353] Torbay Development Agency (undated), *Towards Torbay's new economy: Economic regeneration strategy*
[354] See http://www.mdlmarinas.co.uk/mdl-brixham-marina
[355] European Economic and Social Committee (2013), *Opinion of the European Economic and Social Committee on Nautical Industries: restructuring accelerated by the crisis*.
[356] European Economic and Social Committee (2013), *Opinion of the European Economic and Social Committee on Nautical Industries: restructuring accelerated by the crisis*.

spending per each international visitor resulted in € 940 and final attendance amounted to 650 000 visitors with return of € 55.8 m to the Galway economy[357].

The Volvo Ocean Race again came to Galway in 2012, when the city hosted the finale of the race. This event attracted an over 900 000 visitors who according to Galway Chamber of Commerce estimates generated an economic impact to the city and region of about € 100 m[358]. At the time, the city considered submitting a bid for the 2014/2015 Volvo Ocean Race, but apparently has not done so as it is not listed in the 2014/2015 route[359]. However, there are two other cities along the Atlantic Arc that are part of the 2014/2015 race: Lisbon and Lorient. The latter has started its promotion campaign already[360].

This type of city promotion connected to a large sports event is quite common and is certainly not restricted to the yachting sector. Such events provide a very good opportunity for cities to present themselves to a larger audience and can easily be repeated in other member states of the EU.

Marinas and regeneration

Marinas can play a positive role in regeneration projects. This can be economic regeneration as well as general regeneration of run-down and disadvantaged areas. Generally speaking marinas attract boaters as well as other visitors who spend money in the area. Marinas can make areas more attractive by improving the image and appearance of an area, making it a more desirable place to live and to stay.

In terms of job generation, marinas tend to generate high skilled and high value added jobs, both directly as well in the supply chain. The economic effect can be wider than the yachting related jobs, as marinas can give a boost to general tourism too. An example can be found in the Torbay Economic Regeneration Strategy, where marine leisure is one of the target areas. Part of the stimulation of marine leisure is the creation of marinas in Torbay and Brixham. Specific promotion of marine leisure through the attraction of maritime events, such as tallship races, is also considered[361].

This type of regeneration projects with marinas can be specifically beneficial to run-down former port areas in cities that are in need of redevelopment. Regeneration with marinas can also be used to create alternative sources of employment in more remote coastal towns, for instance to offer perspective to young people, stopping the outflow of people from rural areas to cities.

Cooperation between marinas

The Association des Ports de Plaisance de l'Atlantique[362] (APPA) is an example of cooperation between several Atlantic marinas in France and the Spanish Basque country. The association has 33 members amongst which some of the largest ports along the coastline. Its objectives are to share best practices and advice on the daily management and operations of a marina and to be able to organise joint representation and actions versus professional, institutional and political institutions. A joint database on internet was realised (only accessible to members) and guidelines for good environmental management were published. Joint events, such as regattas, are considered too.

[357] Fáilte Ireland (2009), *Economic Impact & Media Report Volvo Ocean Race 2008 – 2009*.
[358] *Volvo Ocean Race Finale like " 3 Christmases coming at once",* article dated 9 July 2012 on www.letsdoitgalway.com
[359] See www.volvooceanrace.com
[360] See www.volvooceanracelorient.com/
[361] Torbay Development Agency (undated), *Towards Torbay's new economy: Economic regeneration strategy*
[362] See: http://www.appatlantique.com/index.asp

Table 9.4 **Detailed description of good practices**

Name of good practice	Description	Weblink, contact person	Assessment of transferability potential to other EU Member State
Galway Volvo Ocean Race Stopover	Promoting local yachting and tourism in general through a major sports event	http://www.letsdoitgalway.com/	This practice can easily be transferred to other EU member states.
Marinas as part of regeneration projects	Using marinas as (parts of) regeneration projects: creating an attractive environment and generating employment. Examples are found in Torquay and Brixham, UK.	http://www.mdlmarinas.co.uk/mdl-brixham-marina	This practice can easily be transferred to other EU member states
Association des Ports de Plaisance de l'Atlantique	Cooperation between marinas along the French Atlantic coast and the Spanish Basque country coast.	http://www.appatlantique.com/index.asp	This practice can be transferred, but it needs some coordination and efforts to get a critical mass of participating marinas along a coastline

9.7 Measures that stimulate Blue Growth in the Atlantic Arc

Main findings

The yachting and marina sector along the Atlantic Arc consists of around 350 marinas with an estimated 108 000 berths. The sector provides an estimated 2 625 direct permanent jobs and 35 000 indirect jobs in supplying sectors. The marina sector in the UK, France and Spain is well developed, though in the latter two countries the gravity point is in the Mediterranean. The three countries each have a yacht construction sector, but the UK is best known for its yacht construction. In Portugal and Ireland, the sector is less sizeable and yacht building is virtually absent in these countries whereas it plays an important role in the UK and France in particular.

The requirements to boaters (both recreational and professionals), yachts and the regulations for navigation in Marine Protected Areas are quite different between the member states. In the case of professional yachtsmen the lack of harmonisation impedes a free flow of labour between member states. In the case of recreational boaters the effect is more limited, though yachting and the related tourism could probably develop more internationally across member states if further harmonisation took place.

Potential measures

Further harmonisation of requirements to boaters and yachts could help the sector to develop more internationally. For professional yachtsmen it should become possible to work in any member state on the bases of their license obtained in any other member state. For recreational boaters it would for instance become easier to rent a yacht in another member state.

This requires an EU wide acceptance of licenses, as an initial step preferably by encouraging full participation of member states in the ICC scheme. Rather than a standardisation across European countries, this would mean mutual recognition of recreational boating qualifications. An additional benefit is that boaters from countries (that have ratified resolution 40) outside the EU would be able to profit too.

Taking this a step further would mean:

- Harmonisation of the definitions of various levels of licensing in the member states (i.e. same definitions for inland, coastal, sea and high sea navigation);
- Harmonisation of the requirements for these levels, for recreational boaters as well as for professional yachtsmen, thus creating a European skills passport for the industry;
- Harmonisation of the technical and safety requirements to leisure craft;
- Harmonisation of navigation restrictions in Marine Protected Areas.

These measures should facilitate further development of nautical tourism in Europe as it will make rules and requirements more transparent. This will make it easier both for EU citizens as for tourists from outside the EU to rent yachts and sail from one EU country to another. It will also facilitate free movement of labour as licensed yachtsmen can trust that their certificates will have the same validity across the EU. These requirements are in line with the recommendations of the European Economic and Social Committee in their opinion on the Nautical Sector: restructuring accelerated by the crisis[363].

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Annexes

Annexes will be attached as a separate and stand-alone document to this sea basin report.

List of Annexes:

Annex I: Methodological Annex for assessing the maritime economic activities
Annex II: Innovation indicators for sea basin report
Annex III: Input/Output analysis for Spain and the UK
Annex IV: Country paper France
Annex V: Country paper Ireland
Annex VI: Country paper Spain
Annex VII: Country paper Portugal
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