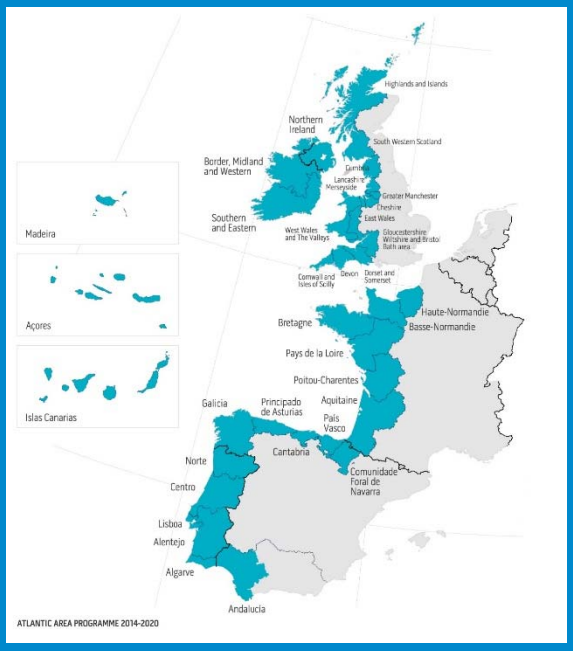
European Internationalisation Maritime Consortia

Work Package 4
Economic Sector and Territories Diagnosis



A Collaborative Document Developed by Consortex Partners

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[1] Dissemination level: PU = Public, CO = Confidential, CI = Classified

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Introduction

The European coastline is approximately 136,000 km and the oceans and seas are an integral part of the continent's traditional maritime orientation and also a source of new opportunities for the future. For generations the European seas have inspired exploration and the development of breakthrough innovations in order to harness its potential, and considered a frontier which needed to be overcome (European Commission, 2013).

The economic and social importance of the industry and services related to sea across Europe is extremely important, and the shipbuilding industry has a significant tractor effect on a set of complementary activities carried out, in most cases, by SMEs. Globally, the market of shipbuilding and its ancillary industries, is growing and offering market opportunities. However, competition is fierce, especially from China, South Korea and Japan. The shift of focus from the West to the East, is challenging Europe's maritime capabilities on a daily basis. Shipping and consequently the building of merchant vessels as well as maritime manufacturing have seen cyclical and often volatile market developments. The construction of cargo ships has largely shifted to China, Korea and Japan producing four-fifths of the world's vessels. European production has mainly focused on the production of specialised high-tech ship types. Consequently, European SMEs in the sector need to grow in size, innovate in marketing and supply a complete portfolio of technical solutions in all links of the value chain.

Faced with the challenge of international competition, it is intended that SMEs focused on supporting the shipbuilding sector can address high value specialised niche markets by forming groups of companies. The main aim of CONSORTEX is to set up a minimum of 5 export consortia formed by 6 or more European interregional SMEs specialised in the manufacture of certain built-in packages of naval production (bridge, engine room, accommodation and deck) for certain segments of shipbuilding (e.g. offshore vessels, marine power plants, cruise ships and scientific vessels). These consortia will be able to supply the international market with a different product from the Asian offering – one which is based on leading technology. Ultimately CONSORTEX will endeavour to support the improvement of participating firms' market positioning, international sales and help them to sign additional contracts.

While much of the collaboration will be developed through innovation in marketing, additional benefits will be extended to other areas of importance for the shipbuilding industry, e.g. innovation and technological development. From a Corporate Social Responsibility perspective, the result will see additional returns to society and territory. These returns will be based on tax income for Public Authorities, additional employment, higher levels of technical qualifications for staff and environmental protection benefits.

The next section in this report will provide an overview of the European Naval Sector. This will be followed by a Socio-Economic regional description, which describes the main territories involved in the CONSORTEX project. The next section outlines the economic impact of the maritime supplies industry. The naval sector in each region will then be considered before the report concludes with some opportunities for collaboration between SMEs focused on the shipbuilding sector across Europe.

Overview of European Naval Sector

The European shipbuilding industry can look back to centuries of excellence in the design and production of ships. Europe has taken particular pride in their ability to produce sea-going vessels as this expertise has allowed engagement in global trade and to defend their interests.

Shipbuilding is an essential part of Europe's industrial structure. It consists of shipyards engaging in commercial and naval shipbuilding, the marine equipment industry, the ship repair and conversion sector, as well as a wide range of knowledge providers such as universities, towing tanks, design offices and classification societies. Combined the sector develops advanced technologies that offer considerable spin-offs to other sectors; it provides essential means of transport for international trade; and it supplies modern navies with technologically advanced vessels, a key requirement for effective military operations. Shipbuilding is therefore an important part of Europe's strategic economic needs.

Shipyards provide products of high complexity, requiring a multitude of skills, an outstanding degree of scientific knowledge and smart production technologies. Ships are the largest moving man-made objects. Their long life cycle, combined with high level of operational autonomy in a hostile environment, makes them one of the most sophisticated capital goods.

Given that shipbuilding is naturally limited to coastal regions with access to deep water, a modern shipbuilding industry depends on an industrial network of companies, often described as a regional cluster. In an industrial cluster, a wide variety of companies and organisations come together, with the aim of exchanging strategic knowledge for the achievement of projects. Timing and quality of service are essential to make projects successful and profitable.

Shipbuilding is an example of an industry that displays the particular strengths and weaknesses of Europe's economic situation in a distinct sectoral environment, while at the same time addressing the key challenges, through a pro-active approach in a wide range of areas. The world shipbuilding industry has been experiencing structural and cyclical problems since the first oil crisis (which revealed the over-investment in the sector), but European yards have been able to 're-invent' themselves in the face of adversity (European Commission, 2013).

European shipbuilding has been undergoing changes since the mid 70's. Two out of three shipyards have disappeared and employment has fallen from around 460,000 shipyard workers in 1975 to about 100,000 in 2003 in newbuilding and repair (European Commission, 2003). If we broaden the scope, in 2013, the ships and maritime equipment industry employed more than 500,000 people and had an average annual turnover of around €72 billion (European Commission, 2013). This was broken into:

- The European shipbuilding industry and ship repair industry is made up of around 300 yards of which more than 80% can be considered to be 'small to medium' (building ships of 60-150mt). The remaining yards are 'large.' Around 90% of the order book is for export markets.
- The European marine equipment manufacturing and industry (propulsion, cargo handling, communication, automation, integrated systems, etc.) is made up of around 7,500 companies, the vast majority of which can be considered to be 'small to medium.' Around 70% of production is for export markets.

These figures demonstrates the ability of European shipbuilders to move to more sophisticated and knowledge-based products, away from the mass market where price is the dominant factor.

However, the global maritime technology industry is facing serious challenges. New orders for ships have virtually collapsed from a pre-crisis speculative boom of 85 million CGT[2] to 16 million CGT in 2009 and have remained low. The expected average order volume is 30-40 million CGT annually. At the same time the expanded global shipyard capacity reached new output records year on year peaking in 2012 at around 60 million CGT. The capacity expansion in shipbuilding has mainly taken place in China, Korea and other emerging markets. Europe has refrained from taking this approach. The long production cycle in shipbuilding means that the impact of low orders on the supply chain and on employment is only now being felt, which is particularly concerning for Europe (European Commission, 2013).

The capacity of the existing fleet is well above the demand due to speculative ordering and reduced growth in trade volumes. At the same time Asian shipyards are still delivering record volumes of cargo vessels resulting in shipping freight rates sharply declining as a consequence - in some market segments by more than 90%. Lower revenues coupled with high fuel prices and depreciation of assets has seen a sharp decline in the profitability of shipping and hence new ship orders.

The specialised segments of shipbuilding (cruise ships, offshore support vessels, etc.) are not directly affected by overcapacity in the cargo shipping fleet, however, the drought of financing has meant that new orders in these segments have also diminished. The European orderbook has shrunk to 30% of the pre-crisis level at the end of 2012. A major problem is that Asian mass producers of steel intensive vessels are increasingly trying to enter these relatively small niche markets in some cases supported by their governments (European Commission, 2013).

Parc and Normand (p.73, 2016) believe that “in order to formulate effective policies for the European shipbuilding industry, it is necessary to precisely identify and rigorously analyse its critical problems.”

Ludwig and Tholen (2006), suggest that European ship builders should specialise in the construction of high tech ships as well as other types of vessels in order to minimise the threat posed by international competitors. Ludwig and Tholen (2006), further emphasise the necessity to improve vertical and horizontal integrations in the European shipbuilding industry. The traditional model whereby one third of the value added of a ship is produced by the shipyard itself while suppliers produce the rest no longer applies. They recommend a closer vertical relationship among producers and suppliers. On top of this process of vertical integration, they highlight the benefits of horizontal cooperation with universities, research institutions, and consultancies; especially with regards to ‘sensitive’ fields such as research, development and innovation (RD&I). The authors equally highlight the importance of European shipbuilders developing pre- and post-sales services. So far, most have focused only on selling ships. To facilitate production, they propose that shipbuilders should expand into financing, improvement of harbour infrastructure, and engage in global repair services.

Others such as Hart and Schotte (2008) identify problems which relate to the ageing demographic of personnel involved in the European shipbuilding and ship repair industries in a study comparing EU Member States. They propose developing European legislation to facilitate the (temporary) employment of skilled EU and non-EU workers, thus preventing the average age

[2] The OECD Definition of Compensated Gross Ton (CGT) System https://www.oecd.org/CGT.pdf

of workers from continuing to rise. They suggest further mobility of labour could make up for the lack of workers in some Western European shipyards.

In order to enhance the competitiveness of the European shipbuilding industry, the European Commission (2013) presented *'LeaderSHIP 2020,'* a strategy report outlining how to foster the right conditions to make the industry both profitable and sustainable once more. In this regard, it identifies four pillars: (1) employment and skills, (2) improving market access and fair market conditions, (3) access to finance and (4) research, development and innovation. SEA Europe (2014) argues that these strategies provide a solid political basis for the industry, enabling the sector to further increase its innovative and competitive edge in specialisation. Innovation has been one of the cornerstones of the European shipbuilding industry.

In addressing the four pillars identified in *'LeaderSHIP 2020,'* Parc and Normand (p.76, 2016) focus on pillars (1) employment and skills and (4) research, development and innovation. They note that "First, the shipbuilding industry has evolved from being labour and capital-intensive to becoming capital and technology-intensive; the manufacturing process is more complex than ever. Therefore, the European Commission (2013) advocates continuous education and training to enhance worker skills and to facilitate their inter-sector mobility. Furthermore, it believes that the industry needs to attract more low and medium-skilled workers to meet the increased supply of comparatively cheaper labour caused by the accession of new member countries to the European Union. On this basis, the implementation of an EU-wide maritime engineering diploma has been suggested."

Regarding the fourth pillar Parc and Normand (p.77, 2016) suggest that "in matters pertaining to research, development and innovation, the Commission insists that European shipyards should pursue their current forays in "smart specialisation" by building high value-added ships such as cruise ships, "green" ships and offshore vessels with sophisticated technology capable of harvesting energy and deep-sea minerals. In addition, the European Commission (2013) recommends continuous investment in R&D for further innovation in non-technical products, services, as well as new processes that can enhance shipbuilding operations. In this regard, the commission's report proposes developing shipbuilding clusters among European shipyards to work on specific R&D projects, much like Korean shipyards did in the 1980s."

Capone (2014) explores innovation trajectories in the shipbuilding industry and identifies key innovators in Europe. He also maps existing and possible future geographical clusters for the industry. He argues in favour of increasing the size of the projects with respect to the size of the budget and the number of partners involved across various shipbuilding projects. Through this, he sheds light on how small and medium-sized companies can develop innovation networks with major European shipyards. Despite the negative situation of the industry today, long term global demographic and economic growth will act as a stimulant. The economic drivers of the globalisation process remain in existence and the longer term demand for maritime goods and services will see solid growth. It is expected that this will restore balance of supply and demand in the shipping and shipbuilding markets.

Despite long term favourable prospects the present economic situation needs to be taken into account. The fleet/shipbuilding overcapacity, economic recession and chronic lack of financing needs to be dealt with effectively in order to avoid structural damage to competitive companies

and the loss of critical mass which safeguards competitiveness once the downward trend reverses.

Commentators such as Ludwig and Tholen (2006), Capone (2014) and Parc and Normand (2016) identify, clusters / networks and collaboration as methods for improving competitiveness in the sector across Europe. As CONSORTEX is addressing the entirety of the shipbuilding industry, it is important to address the relationship between shipbuilding yards and the marine supplies industry, its structure and supply chains.

Socio-Economic Regional Descriptions

The CONSORTEX project brings together seven partners – clusters, universities and maritime associations: Foro Marítimo Vasco (Lead Partner) from the Spain País Vasco region; Fórum Oceano, Associação da Economia do Mar from the Portuguese Norte region; Associação das Indústrias Navais from the Portuguese Lisboa region; Cork Institute of Technology from the Irish Southern and Eastern region; National Maritime from the UK Atlantic Area region; Clúster del Sector Naval Gallego from the Spanish Galicia region and finally Bretagne Pôle from the French region of Bretagne.

This section provides a socio-economic overview of the regions engaged in the project a short description of their local regions.

País Vasco Region, Spain[3]

Capital: Vitoria-Gasteiz

Size: 7,235.2 km²

Population: 2,128,397

Regional GDP: 64,473

% of the National GDP: 6.15

Regional GERD (%): 2.13

% of Unemployment: 12.0

The Basque Country, officially the Basque Autonomous Community is an autonomous community in northern Spain. It includes the Basque provinces of Alava, Biscay and Gipuzkoa.

The Basque Country or Basque Autonomous Community was granted the status of nationality within Spain, attributed by the Spanish Constitution of 1978. The autonomous community is based on the Statute of Autonomy of the Basque Country, a foundational legal document providing the framework for the development of the Basque people on Spanish soil, although the territory of Navarre was left out and made into a separate autonomous community.

Currently there is no official capital in the autonomous community, but Vitoria-Gasteiz, located in the province of Álava, is where the Basque Parliament, the headquarters of the Basque Government, and the Basque Autonomous Community's President's residence (Ajuria Enea Palace) are located, making it the de facto capital. Whilst Vitoria-Gasteiz is the largest municipality in area, with 277 km2 (107 sq mi), Bilbao (or Bilbo in Basque) is the largest in population, with 353,187 people, located in the province of Biscay within a conurbation of 875,552 people.

The term Basque Country may also refer to the larger cultural region (Basque: Euskal Herria), the home of the Basque people, which includes the autonomous community.

The two most important ports are the Port of Bilbao and the Port of Pasaia. There are other minor fishing ports like Bermeo and Ondarroa.

The Port of Bilbao is by far the most important in the Basque Country and the north of Spain, being the fourth most important in Spain with over 38 million tons of traffic.

All cruising routes arrive in Bilbao and there is a ferry service linking Bilbao with Portsmouth (United Kingdom).

The project is led by Foro Maritimo Vasco, based in Bilbao representing the País Vasco Region.

[3] Data Sourced from RIS3 Platform 10-1-18 http://s3platform.jrc.ec.europa.eu/regions/ES21/tags/ES21

Galicia Region, Spain[4]

Capital: Santiago de Compostela

Size: 29,574.4 km²

Population: 2,728,906

Regional GDP: 56,441

% of the National GDP: 5.38

Regional GERD (%): 0.94

% of Unemployment: 17.4

Galicia is located in north-western Spain. Made up of the Provinces of A Coruña, Lugo, Ourense and Pontevedra, it has an area of 29,574 km² approximately 5.8% of the total area of the Spanish state, and 5.8% of the population.

With a coastline length of 1,498 kilometres, it is a region closely linked to the maritime sector, highlighting in its economic activity three large productive areas closely linked to this sector, the shipbuilding and repair industry, fishing and its processing industry, and the port activity, by its location in the so-called "Atlantic coast".

The shipbuilding and repair industry is located mainly around two geographic areas, the cities of Vigo and Ferrol. The Vigo area host a total of 10 shipyards whose activity focuses on the construction and repair of high value-added vessels. The other pole of activity is located in the estuary of Ferrol, with the Navantia Fene-Ferrol shipyard and, whose activity focuses on the construction of military vessels for navies from all over the world, as well as components for the offshore wind industry.

There are an important auxiliary industry - formed by 280 companies - whose activity covers the entire value chain of the Galician shipbuilding sector.

Other traditional activity in the region is fishing and its processing industry. With a record of 4,396 vessels dedicated to fishing, which represent 47.1% of the Spanish fishing fleet, Galicia is a European reference in the marketing of fresh, frozen and preserved products.

Due to its privileged location, situated on the main international shipping routes between Europe, America and Asia, it has important ports, such as Ferrol-San Cibrao, A Coruña and Vigo, being the first in Spain in landing fresh and frozen fish, beside to hosting one of the three free zones in Spain, in the area of Vigo.

Aclunaga, is the Spanish partner representing the Galicia Region.

[4] Data Sourced from RIS3 Platform 10-1-18 http://s3platform.jrc.ec.europa.eu/regions/ES11/tags/ES11

Norte Region, Portugal[5]

Capital: Porto

Size: 21,285.8 km^2

Population: 3,679,416

Regional GDP: 48,836

% of the National GDP: 28.26

Regional GERD (%): 1.42

% of Unemployment: 13.0

Northern Portugal is the most populous region in Portugal, ahead of Lisbon, and the third most extensive by area. The region has over three and a half million inhabitants and its area is 21,285 km². It is one of five regions of Mainland Portugal. Its main population centre is the urban area of Porto, with about one million inhabitants; it includes a larger political metropolitan region with 1.8 million, and an urban-metropolitan agglomeration with 2.99 million inhabitants, including Porto and a number of urban areas in North-western Portugal, ranging from Braga to Aveiro. The Commission of Regional Coordination of the North (CCDR-N) is the agency that coordinates environmental policies, land-use planning, cities and the overall development of this region, supporting local governments and associations.

With regard to the country, the labour force employed in the Region in 2014 represented 34% of the employed in the country, with the regional manufacturing sector accounting for 53.4% of the national equivalent and trade of 34.1%.

In five years, between 2011 and 2016, national exports grew by 16.3%, while in the region under analysis the growth was 27.7%, higher than the behaviour of total exports. On average, in the same period, the goods exports in the North, represented 38% of the national exports.

Regarding Logistic infrastructures, the North Region, mainly the Oporto Metropolitan Area is very well served by accessibility, in all its modes: road, rail, sea, river and air.

The maritime industries, in the North Region have 19% of the companies in this sector, generates 25% of the turnover and employs 29% of the total national number of workers of the sector. In 2016 the North Region had 65 companies with 675 employees and a generated turnover of €72,115,330.00.

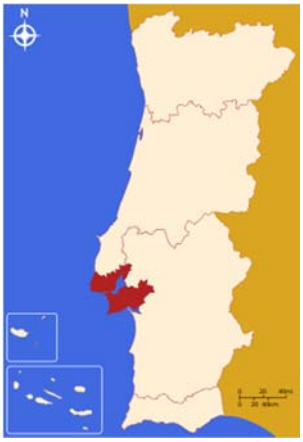
The largest shipyard in this Region and one of the largest Portuguese shipyards is located in Viana do Castelo. Once a public company, the Viana do Castelo Shipyards, gave way to the company West Sea, founded by the Martifer group in 2013, which is the current subconcessionary and in operation.

The shipyard is located in the north-west of the North Region, on the Atlantic coast, a strategically well-positioned area, due to the proximity or not very distant from several ports with international relevance, such as the port of Douro & Leixões, also, Aveiro, Setúbal, in Portugal or, more closely, Vigo, in Galicia - Spain. The shipyards link the Mediterranean to the North of Europe and this to South America, as well as to North America.

Fórum Oceano is the Portuguese partner representing the Norte Region.

[5] Data Sourced from RIS3 Platform 10-1-18 http://s3platform.jrc.ec.europa.eu/regions/PT11/tags/PT11

Lisboa Region, Portugal[6]



Capital: Lisboa

Size: 3,001.9 km^2

Population: 2,823,798

Regional GDP: 64,275

% of the National GDP: 37.19

Regional GERD (%): 2.45

% of Unemployment: 14.1

Lisbon Metropolitan Area is an administrative division that includes 18 municipalities (concelhos) in Portugal. Centered in the Portuguese capital city of Lisbon, is the largest population concentration in Portugal. The population in 2011 was 2,821,876, of which 547,733 (19.4%) lives in the city of Lisbon. 26.7% of the total population of Portugal lives in the Lisbon Metropolitan Area.

The Lisbon Metropolitan Area has 32.7% of the national employment being located in its territory, the contribution of AML for the Gross Domestic Product surpasses 36%. Today, Lisbon Metropolitan Area territory is almost the same as Lisbon Region territory, a union of metropolitan municipalities, and Lisbon Region a NUTS II region. The municipalities north of the Tagus River are from Lisbon District (Grande Lisboa), those south of the river are from Setubal District (Península de Setúbal). Regarding employment, Lisbon Metropolitan Area employs 37.1% of the national active population, in almost 37% of the companies disseminated throughout the country. A large proportion of the workforce is qualified due to the greater concentration of higher education schools, research centres, incubators and technological infrastructures, etc.

In terms of the Maritime industries, Lisbon metropolitan area have 36% of the companies in this sector, generates 48% of the turnover and employs 38% of the total national number of maritime workers. The Lisbon metropolitan area had in 2016, 123 companies with 1,174 employees and a generated turnover of €161,224,415.00.

The largest Portuguese shipyard is located in this very important Region, very close to Setúbal, on the Mitrena peninsula. It is the largest in Europe and one of the largest in the world, Lisnave, Estaleiros Navais, SA. Its main activities are the repair, maintenance and reconversion of ships, for which it is ideally located and equipped in terms of means and highly specialized personnel.

The Lisbon Metropolitan Area has, however, other important shipyards, as well as the very old Arsenal do Alfeite, in Almada, which is dedicated to the construction, repair and maintenance of the Navy fleet, and more recently to the submarines, Navalrocha, in Lisbon, Navaltagus in Seixal.

Associação das Indústrias Navais is the partner representing the Lisboa region.

[6] Data Sourced from RIS3 Platform 10-1-18 http://s3platform.jrc.ec.europa.eu/regions/PT17/tags/PT17

U.K. Atlantic Area[7]

Size: 144,661 km2

Population: 16,841,240

Regional GDP: £410.436 Bn.

% of Unemployment: 4.08

The United Kingdom Atlantic Area is made up of ten NUTS3 regions, Northern Ireland, Cornwall and Isles of Scilly, Devon, Somerset, Wales, Scotland, Cumbria, Lancashire and Cheshire, Merseyside and Gloucestershire.

The Atlantic Area accounts for 58% of the UK land mass in square kilometres, and is home to 27% of the UK's total population of approx. 63 million inhabitants and represents 22% of the UK's GDP. The area has an unemployment rate of 4.08% (compared to the national average of 8.0%).

Northern Ireland's coastline is 539 km in length, this represents approximately 0.8% of the whole of Europe's coastline (65,993 km). Northern Ireland's seas are a major environmental and economic asset. They provide an important social and cultural function and sustain coastal communities and industries. And these ports have contributed to 15.7% of Northern Ireland's total economic GDP.

Northern Ireland's premier port is the Port of Belfast, providing 70% of seaport trade. The main services provided at this port are lift-on lift-off, roll-on roll-off, liquid bulk, dry bulk, break bulk and cruise ship activities. The port was the UK's first dedicated facility for offshore wind.

The Cornwall and the Isles of Scilly coastline is 1,672 km, this represents 2.5% of Europe's total coastline (65,993 km). The region represents roughly 1.5% of the whole of the UK, approximately 0.9% of the population and is one of the UK's three leading marine renewables regions.

The Port of Falmouth together with Carrick Roads, forms the third deepest natural harbour in the world, and the deepest in Western Europe. The Port of Falmouth also provides services for ship repair and conversion. Some of the services include engineering, electrical, paint and fabrication workshops. The port is home to ship building companies, which build custom yachts up to 100m, as well as undertaking substantial restoration and re-modelling projects or routine class/flag refit works. The port provides international bunkering (refuelling), a yacht haven, cruise ship facilities and pilotage services. The port receives many vessels including; dry bulk, break bulk, liquid bulk, roll-on roll-off carriers, passenger ferries, yachts, tugs boats and the Royal Fleet Auxiliary fleet. It also has an offshore wave energy test site.

[7] Data Sourced from RIS3 Platform 10-1-18 http://s3platform.jrc.ec.europa.eu/regions/UK/tags/UK

The Devon coastline is 819 km, this represents 1.2% of Europe's total coastline (65,993 km). Devon represents roughly 2.8% of the whole of the UK and approximately 1.2% of the population. The Port of Plymouth is operated by the Ministry of Defence and operates under the statutory control of the Queen's Harbour Master. It is the largest naval base in Western Europe. The port provides many services for the UK's Royal Navy including nuclear submarines, large warships and receives a number of large number of foreign naval ships for operational sea training. The port is the Royal Navy's only nuclear repair facility. The port also receives passenger ferries, cruise ships, liquid bulk carriers, dry bulk carriers, roll-on roll-off and lay by vessels.

The Somerset coastline is 64 km, this represents 0.1% of Europe's total coastline (65,993 km). Somerset represents 1.4% of the whole of the UK and approximately 0.8% of the population. The Port of Bristol receives liquid bulk, dry bulk, break bulk, cruise ships and roll-on roll-off vessels. The port provides 25% of the total UK imports of aviation fuel. Since 1991, £475 million has been invested into the port to offer the full range of shipping, distribution and logistics services.

The Welsh marine area is composed of around 15,000 km² of sea. With 2,120 km of coastline, it represents 3.2% of Europe's total coastline (65,993 km). Wales represents 8.6% of the whole of the UK and approximately 4.8% of the population. The marine and coastal environment supports 92,600 jobs and contributes £2.5 billion to GDP. There are eight major ports which contribute to the seaport trade within Wales. These include the Port of Barry, Port of Cardiff, Port of Holyhead, Port of Newport, Port of Mostyn, Pembroke Port, Port Talbot, Port of Swansea and Port of Milford Haven.

Port of Milford Haven is the largest port serving Wales and the largest energy and liquid bulk port in the UK. The port handles 74% of all Welsh traffic and receives 30% of the UK's whole gas demand and is the largest handler of gas and oil. The ports activity accounts for around 6.8 percent of all activity through UK ports. It specializes in the transportation of break bulk, dry bulk and project cargoes providing a roll on roll off service. The port receives cruise ships, passenger ferries, dry bulk, liquid bulk, break bulk, yachts, project cargoes and roll-on roll-off vessels.

Scotland has 9,910 km of coastline which represents 15% of Europe's total coastline (65,993 km). Scotland represents roughly 33% of the whole of the UK and approximately 8.3% of the population. Scotland's marine area has an estimated 25% of Europe's offshore wind and tidal resource and 10% of the wave resource. The major ports in Scotland are Sullom Voe, Orkney, Cromarthy Firth, Peterhead, Aberdeen, Dundee, Port of Leith, Lock Ryan Port, Clyde, Glensanda and Cairnryan.

The Port of Sullom Voe is a major deep water harbour and accepts the largest vessels in the world for transportation of oil. Orkney has the longest deep water commercial berth in Scotland and receives cargo vessels, mainland ferries, North Sea oil supply vessels, cruise ships, marine renewable energy vessels and platforms.

Cumbria has 642 km of coastline which represents 1.0% of Europe's total coastline (65,993 km). Cumbria represents roughly 2.8% of the whole of the UK and approximately 0.8% of the population. The North West inshore marine area covers an area of approximately 1,280

kilometres of coastline stretching from the Solway Firth border with Scotland to the River Dee border with Wales, taking in a total of approximately 4,900 square kilometres of sea.

The Port of Barrow is the only deep water port between the Mersey and the Clyde and is home to one of the largest shipyards in the United Kingdom and home to the country's only submarine production facility. The Port of Barrow is well placed to serve shipping routes to Ireland, mainland Europe, the North Atlantic and beyond. The port also receives cruise liners, dry bulk carriers, liquid bulk carriers and forest products. It also services five offshore wind farms supplying monopiles and transition pieces.

Lancashire and Cheshire has 280 km of coastline which represents 0.4% of Europe's total coastline (65,993 km). Lancashire and Cheshire represents roughly 2.2% of the whole of the UK and approximately 1.9% of the population. The North West inshore marine area covers an area of approximately 1,280 kilometres of coastline stretching from the Solway Firth border with Scotland to the River Dee border with Wales, taking in a total of approximately 4,900 square kilometres of sea. Within Cheshire there is only one port, the Port of Cheshire. It is a 75-acre site that offers a true multi-modal development opportunity with road, rail and sea access. In Lancashire, Heysham Port is a major distribution hub serving the Isle of Man, Ireland and mainland UK. The port also services offshore wind, gas and nuclear energy industries. Heysham Port is located on the Irish Sea and offers deep water berthing which caters for some of the world's largest vessels. The port receives roll-on roll-off vessels at its ro-ro terminal.

The Merseyside region has approximately 100 km of coastline, this represents 0.2% of Europe's total coastline (65,993 km). Merseyside represents roughly 0.3% of the whole of the UK and approximately 2.1% of the population. The North West inshore marine area covers an area of approximately 1,280 kilometres of coastline stretching from the Solway Firth border with Scotland to the River Dee border with Wales, taking in a total of approximately 4,900 square kilometres of sea.

The Port of Liverpool is the major port of Merseyside and one of the largest ports in the UK. The Port of Liverpool lies just three kilometres inland from the Irish Sea on the River Mersey and is located on both sides of the River Mersey. A recent investment called Liverpool2 created a new £400m deep-water container terminal. This port is capable of accommodating the world's largest container vessels. The Port of Liverpool receives dry bulk, liquid bulk, roll-on roll-off vessels, project cargo and forest products. It also provides deep water berthing facilities. The port also has the UK's first fully automated steel terminal.

Finally Gloucestershire has around 300 km of coastline, this represents 0.5% of Europe's total coastline (65,993 km). Gloucestershire represents roughly 1.3% of the whole of the UK and approximately 0.9% of the population. The South West inshore marine area covers an area of approximately 2,000 kilometres of coastline stretching from the River Severn border with Wales to the River Dart in Devon, taking in a total of over 16,000 square kilometres of sea.

Gloucester Harbour Trustees is the statutory harbour authority for Gloucester Harbour. Its main duties and responsibilities are to provide a pilotage service, provide and maintain navigation aids and generally ensure the safety of navigation within the Gloucester Harbour. They receive break bulk, dry bulk and forest products.

National Maritime is the UK partner which represents the UK Atlantic Area.

Southern and Eastern Region, Ireland[8]

Capital: Dublin

Size: 36,297.0 km^2

Population: 3,474,630

National GDP: 163,938.7 (2012)

National GERD (%): 1.58 (2012)

% of Unemployment: 9.7

The Southern and Eastern Region of Ireland consists of the territory of the counties of Cork, Dublin, Kerry, Limerick, Clare, Tipperary, Carlow, Kilkenny, Wexford, Waterford Kildare, Meath and Wicklow. The Southern and Eastern Region spans 36,297 km^2, roughly 53% of the total area of the state and approximately 68% of the population.

The Port of Cork[9] is the key seaport in the south of Ireland and is one of only two Irish ports which service the requirements of all six shipping modes i.e. Lift-on Lift-off, Roll-on Roll-off, Liquid Bulk, Dry Bulk, Break Bulk and Cruise. The port has made impressive strides in recent decades. Since 2000, the Port of Cork has invested €72 million in improving Port infrastructure and facilities. Cork Harbour is a natural harbour and river estuary at the mouth of the River Lee in County Cork, Ireland. It lays claim to the title of 'second largest natural harbour in the world by navigational area' (after Port Jackson, Sydney). The harbour has been a working port, and a strategic defensive hub, for centuries, and it has been one of Ireland's major employment hubs since the early 1900s. Cork Harbour has major and strategic significance in energy generation, shipping, refining and pharmaceuticals.

Rosslare-Europort[10], being the closest point from the southern part of Ireland to the UK and the European Mainland, is a hub of all the major RORO Passenger and Freight services operating the southern Irish Sea and Continental routes. Rosslare Europort, is the second biggest port in the State in terms of unitised freight.

Dublin Port is Ireland's premier port, handling almost 50% of all trade in the Republic of Ireland. Located in the heart of Dublin City and at the hub of the national road and rail network, Dublin Port is a key strategic access point for Ireland and in particular the Dublin area.

Taking the seabed area into account, Ireland is one of the largest EU states. It has sovereign or exclusive rights over one of the largest sea to land ratios (over 10:1) of any EU state. Also, Ireland's coastline of 7,500 kilometres is longer than that of many European countries and represents approximately 11% of Europe's total coastline (65,993 km). Traditionally however, the potential in Ireland's ocean resources were largely overlooked, although in recent years there has been a growing focus on the opportunities that this natural resource offers. Currently, it derives only 1 percent of its GDP from the maritime sector[11].

The Cork Institute of Technology is the Irish partner representing the Southern and Eastern region.

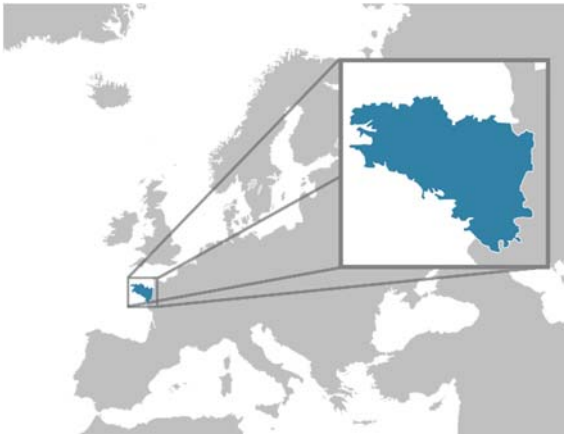
[8] Data Sourced from RIS3 Platform 10-1-18 http://s3platform.jrc.ec.europa.eu/regions/ie/tags/ie

[9] http://www.portofcork.ie/

[10] http://rosslareeuroport.irishrail.ie/home/

[11] "Our Ocean Wealth": Integrated Marine Plan for Ireland (2012) http://www.ouroceanwealth.ie/

Bretagne Region, France[12]



Capital: Rennes

Size: 27,207.9 km²

Population: 3,249,815

Regional GDP: 78,240

% of the National GDP: 4.04

Regional GERD (%): 1.87

% of Unemployment: 7.5

Bretagne is a cultural region in the northwest of France covering the western part of Armorica, as it was known during the period of Roman occupation. It became an independent kingdom and then a duchy before being united with the Kingdom of France in 1532 as a province governed as if it were a separate nation under the crown. It is bordered by the English Channel to the north, the Celtic Sea and the Atlantic Ocean to the west, and the Bay of Biscay to the south. Its land area is 34,023 km².

The historical province of Bretagne is now split among five French departments: Finistère in the west, Côtes-d'Armor in the north, Ille-et-Vilaine in the north east, Loire-Atlantique in the south east and Morbihan in the south on the Bay of Biscay. Since reorganisation in 1956, the modern administrative region of Bretagne comprises only four of the five Breton departments, or 80% of historical Bretagne. The remaining area of old Brittany, the Loire-Atlantique department around Nantes, now forms part of the Pays de la Loire region.

Bretagne is the traditional homeland of the Breton people and is recognised by the Celtic League as one of the six Celtic nations, retaining a distinct cultural identity that reflects its history. With a seaboard of 2,700 km of coastline, Bretagne has a strong maritime identity. It is therefore not surprising that shipbuilding occupies a prominent place in the economic fabric of the region.

More than a sector of activity, the naval sector is a major component of the Bretagne economy. Solidly structured on a network of players composed of large contractors and smaller subcontractors (equipment manufacturers, service companies) this sector has a unique potential to develop skills with high added value and thus promote the opening of new technological and economic horizons.

The region has also acquired the world class equipment, so companies in Bretagne find an environment conducive to the development of their activities (11 dry docks, handling equipment for heavy loads, 2 slipways for ships up to 420 tons, covered workshop and slipways, deep-water industrial docks connected to multimodal platforms).

Bretagne Pôle Naval is the French partner representing the Bretagne region.

[12] Data Sourced on RIS3 Platform 10-1-18 http://s3platform.jrc.ec.europa.eu/regions/FR52/tags/FR52

Economic Impact Analysis of the Marine Supplies Industry

European Commission (2014) outlines that the marine supplies industries serve different end product related markets as providers of equipment, systems and many different kinds of subcontracts and services. The major markets and customers can be identified as follows:

- Newbuilding of merchant ships and offshore ships (shipyards, boatyards and shipping companies)
- Ship repair and conversion of merchant ships (shipyards, boatyards and shipping companies)
- Retrofitting - a special conversion market for ships following new regulations (shipyards, boatyards and shipping companies)
- Offshore platforms, jack-ups etc. for oil and gas (offshore- and shipyards, oil and gas companies/operators)
- Offshore facilities, plants for offshore wind applications (offshore- and shipyards, offshore wind operators and wind farm developers)
- Naval shipbuilding, maintenance and repair (shipyards and governments)
- Boatbuilding (boatyards, shipyards)

Although the markets listed above can be defined precisely, the customer base is overlapping to a certain extend. Some markets also appear along the life cycle of products, e.g. when equipment has to be replaced. Other, like retrofitting may only apply for certain time periods (when new regulation requires special conversion) and are probably difficult to distinguish from the normal repair and conversion markets – which are driven by regular operational needs. Regarding the building of major yachts or smaller specialised vessels, the distinction of boatbuilding and shipbuilding become fuzzy, especially when shipyards/boatyards are operating in both markets. For suppliers, it is also often a necessity to look at the builder of the final product (ship, offshore unit) and at the same time at the operators of these products, since decisions with regard to major outfitting systems and components are taken also by the owners.

The marine supplies industry is a comparably fragmented industry. On the one hand, companies can be identified as major players in their technological fields of systems and components. These are more specifically marine equipment and systems manufacturers which serve different marine markets and acting internationally, nationally or cross border / regionally. Depending on their level of export, they may depend more on the development of the international markets or the markets in a narrower vicinity (country or region). These are marine equipment and systems manufacturers in the narrow sense of the word and can be identified normally also by the fact that they are manufacturers having type approvals with one or more classification societies. Furthermore, a very large number of manufacturers and service providers are more active close to their physical location, either serve local / national or cross border regional marine industries. During the 1990s many of these companies were created due to extensive outsourcing activities from shipyards and used to be trades in shipyards before. This has decreased the level of value added by the shipyards and by the same time has increased their relative purchasing volume. Such manufacturers and service providers very much depend on the national or regional economic development of maritime markets (European Commission, 2014).

The shipbuilding and offshore system and equipment supplies industry can be categorised into the following types of companies:

- Global (maritime) market leaders for one or more technological sub-sectors which basically serve the maritime and offshore market.
- Global technological specialist companies with significant maritime revenue shares, but also significant supplies to other industrial sectors.
- Maritime specialist companies that serve essentially only the maritime and offshore market in Europe as well as worldwide. These companies operate either only one or several maritime sub-markets.
- Industrial generalists with lower maritime revenue shares but still significant global maritime market shares.

Structure and Supply Chains

The following descriptions distinguish marine suppliers from subcontractors (European Commission, p.18, 2017):

A. Marine suppliers are characterised by the fact that they develop functions or systems according to their own patents and techniques and they operate by respecting the specifications and terms of references defined by the customer for complete products or subassemblies. Marine suppliers can be distinguished in 'system suppliers,' 'component suppliers' (to be seen as a subgroup of system suppliers) and 'material suppliers.'

B. Marine subcontracting exists whenever the customer participates in the conception of the product, even partially providing specifications to the manufacturer ranging from detailed technical plans to looser specifications. Marine subcontractors are subdivided in those offering services for 'manufacturing and assembly' and those offering services in the areas of 'engineering, design and consulting.' Engineering, design and consulting service contracts basically exist for all shipyards employing classification societies, model basins, architects and all kinds of engineering services. Service contracts in manufacturing and assembly are depending on the overall building philosophy of shipyards and to what extent they have applied outsourcing strategies for trades, which originally were internal trades of the shipyards. Further labour services are included in the purchase of material, systems and components which cannot be identified separately. Therefore a grey zone exists between category A and B of the suppliers.

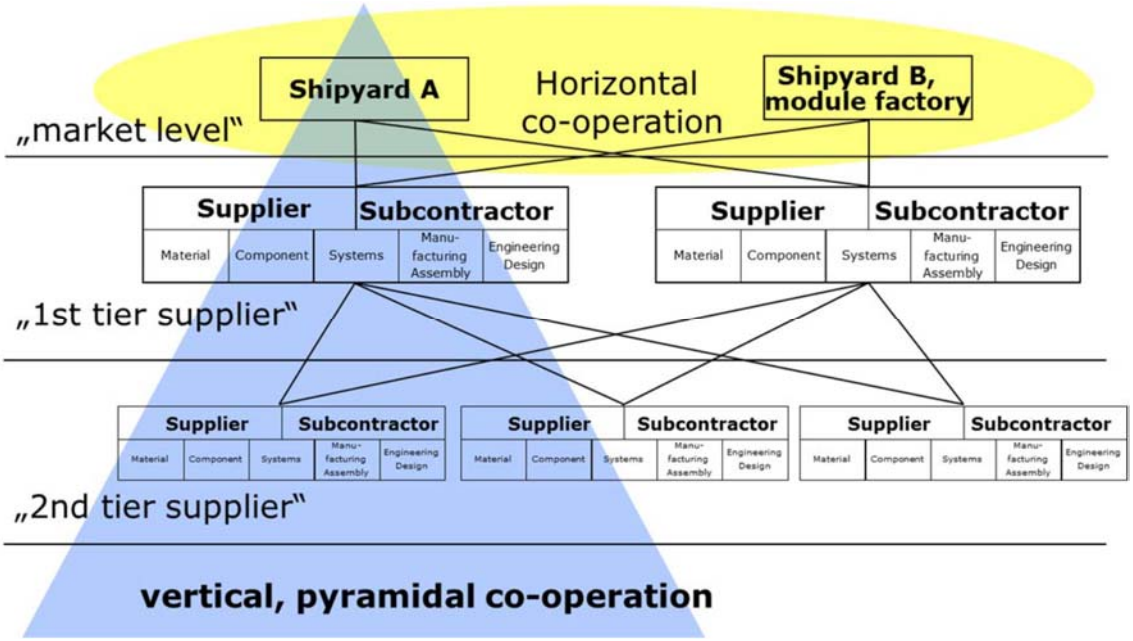


Figure 1: Horizontal and vertical co-operation between shipyards and suppliers (Source: European Commission, p.18, 2014)

Two forms of co-operation (horizontal and vertical) in the form of supplies and subcontracting co-exist in the shipbuilding/marine industry sector. Vertical co-operation exists because of the high complexity and fragmentation of the products and sub-products. Horizontal cooperation between shipyards (or comparable manufacturers of turn-key modules) exists for capacity or delivery reasons (Figure 1).

Horizontal co-operation between shipyards

Horizontal co-operation in the sector is carried out by shipyards more than in other industries. Shipbuilding is characterised by important flows of subcontracts amongst main contractors. Hence, a main contractor, after having obtained an important contract, will entrust to other main contractors' part of the work on the contract which his own production capacity cannot meet. "Input-output statistics for the shipbuilding industry indicate that 5-10% of the reported turnover has been bought-in from the same industry sector, i.e. artificially increasing the statistical size of the industry sector. The activity of the sector is in fact characterised by long development phases and long manufacturing cycles (for example 12 – 24 months for merchant vessels, 24 – 36 months for passenger vessels). This means an alteration of periods where the factories operate at full capacity with others where they appear to have, on the contrary, spare capacities" European Commission, p.18, 2014). The exchange of subcontracts among shipyards also facilitates the management of manufacturing personnel in terms of levelling temporary over or under capacity.

Vertical co-operation

The vertical characteristic enables easy demarcation of the boundary between shipyards and major system suppliers (e.g. engine manufacturers) which make up the population of main contractors at the 2nd level and the other parties on the following levels. However, among the other parties, the distinction is not always easy to establish. Especially, the distinction between equipment suppliers (components and systems) and subcontractors is sometimes difficult. If a technical (existence of a research and development activity) or commercial (capacity to fix breakdowns and repair) responsibility with regard to products or components can be identified in a company it may be better to classify a supplier in the category of component manufacturers rather than in the category of subcontractors.

Equipment manufacturers are therefore characterised by the fact that they develop functions or systems according to their own patents and techniques, and they operate by respecting the specifications and terms of references defined by the manufacturers for complete functions or subassemblies: separators, propellers, radar, navigational equipment etc. These companies in most cases also work for customers from different industrial sectors.

The equipment manufacturers are affected by almost the same economic cycle as shipyards or their maritime customers themselves. When a reduction in orders occurs, they are equally affected, requiring the setting-up of plans to adapt, a decrease in investment and a reduction in subcontracting. However, there is difference for suppliers acting on the global market and a wide range of marine markets which are much more dependent on the global economic development of maritime markets than others who are only acting only nationally or regionally. Those suppliers may benefit or suffer respectively in case their national or regional markets are developing differently than the global market. This is definitely the case for European suppliers.

When discussing the differences between the supply chain structures of the shipbuilding/marine industry with that of other industries, it must be said that the pyramidal significance of the structure shows major differences. A first major difference lies in the number of final producers. Whereas, there are still more than 50 European shipyards with 500+ employees and more than 150 in total, the situation in automotive (~15 manufacturers) and aerospace industry (<5 manufacturers) is significantly different.

European Commission (p.19, 2014) note that “in the area of 1st tier suppliers and subcontractors the situation is comparable. Whereas in automotive and aerospace industry the manufacturers more and more concentrate on ‘platform suppliers’ with less than 500 suppliers on that level (Japan 200) the shipyards still work with a high number of suppliers and subcontractors directly. This leads to 1000 – 2500 names in the purchasing database depending on company size and ship types. Of course, products and industry specific requirement are different and supply chains for serial products are more deterministic than for shipbuilding.”

Appearing as a very heterogeneous industry, there is no formal structure available which classifies marine supply into dedicated categories. All parties which try to find a suitable categorisation find different solutions which serve more or less their own interests. Therefore, all information about marine equipment and materials provided for example by national associations, classification societies trade fairs etc. is structured differently and therefore difficult to compare. Names of products and services are chosen differently, higher aggregated

groupings are assembled differently and also the assignment of individual companies may be seen differently by the interested parties.

Therefore, a harmonised structure which follows a functional or system oriented view of the customers (shipyards, owners) would be extremely useful. The European Commission (Annex 1 p.1-39, 2014) suggest a definition which comprises a total of 19 system groups including 69 subgroups for equipment, 10 subgroups for materials and 16 subgroups for subcontracting. However, the structure is too complex for market analysis purposes. Therefore the European Commission (2014) decided to simplify the structure and only distinguish 3 classes (services/subcontracts, materials, systems/equipment) and 10 system groups of marine supplies for the evaluation of market volumes, focused on the ship newbuilding market.

1. **External services and subcontracts** - only engineering, design and consulting services are covered, because subcontracts for manufacturing or assembly in most cases are integrated in post-calculation data of material supplies or system/equipment supplies.
2. **Materials – Steel** (half raw materials, subassemblies)
3. **Materials – Pipes and ducts** (half raw materials, subassemblies)
4. **Materials – Paint, coating** (paints, painting services)
5. **Systems / Equipment – Ship operation** (steering gear, anchor, deck machinery, life saving equipment, MARPOL equipment, general outfitting components)
6. **Systems / Equipment - Cargo handling equipment and special cargo plants** (cranes, sucker, conveyors, cargo lift, hatch covers, Ro-Ro doors and ramps, trailer lifts, cargo hold outfitting and fittings, HVAC for cargo holds, LNG/LPG plants, fishing vessel equipment, special equipment for dredgers, offshore ships equipment - production, processing, drilling, exploration, etc.)
7. **Systems / Equipment – Accommodation** (pre-prepared cabins, doors, windows, walls, ceilings, coverings, floor coverings, carpets, staircases, railings, lifts, sanitary rooms, swimming pool equipment, accessories, equipment for pantry, bar, restaurant, food storage, laundry, furniture and decoration etc.)
8. **Systems / Equipment - Propulsion, power generation** (diesel engines, boiler, steam turbines, gas turbines, gears and couplings, propeller, shaft and bearings, accessories, auxiliary engines (diesel), auxiliary boilers, etc.)
9. **Systems / /Equipment - Auxiliary systems, apparatus & accessories for engine operation, ship operation, cargo handling, accommodation** (seawater cooling, fresh water cooling, fuel systems, lub oil systems, exhaust system, engine starting system, steam systems, heating systems, ballast water, firefighting, deck washing, pressurized air, tank heating, cargo hold heating and cooling, cargo pumps, inert gas plants, tank cleaning, tank heating, drinking water, sanitation hot/cold-water/sewage, HVAC, waste disposal, swimming pool technology, general engine room outfitting, roll-damping, anti-heeling systems, active stabilisers, etc.)
10. **Systems / Equipment - Electrical plants and electronic systems** (main plants, generators, batteries, cable trays, cables, fittings, e-engines, lighting (all rooms and decks), electrical heating, alarm and control systems (ship automation, remote engine control, monitoring, heating, cargo control, communication systems, nautical equipment (compass, radar, log, sat receiver, ECDIS, weather plotter), navigational lighting, entertainment systems (audio, video, cinema, theatre, meeting rooms, hotel management, clocks)

Statistical Analysis of the Marine Supplies Industry

The European Commission (2014) made an estimate of the total size of the marine supplies industry. The top-down (statistical) approach described above was utilised using existing studies and analysis from some national sources. The main statistical data sources used were:

- Eurostat SBS – Structural Business Statistics
- OECD STAN Database 2008
- Input / Output Tables from OECD, Eurostat and National Statistical Bodies

The results of the national statistical analysis were aggregated to an overall European (EU-28) Portfolio (Figure 2) averaging data for the period 2006-2010. According to this the overall size of the marine supplies industry EU-28 is €52.5 billion (€61.8 billion including Norway and Turkey) per annum. The major shares are taken by the production value for mechanical engineering including engines (18.1%), closely followed by electrical engineering/electronics (13.9%) and steel products (11.3%). The total export value is €24.2 billion of which €17.6 billion are exported to extra EU-28 countries which represents 33.6% of the total production value.

The total production value for EU-28 plus Norway and Turkey (1st tier supplies) adds up to €61.8 billion (Figure 3). Germany with about €12.8 billion is the biggest producer representing 21% of the EU-28 plus Norway and Turkey industry. Italy and Norway are following closely with €8.7 billion and €8.0 billion representing 14.5% and 13.3% of the total. These three are followed by UK, Netherlands, France and Spain, who represent the midfield of marine supplies industry in Europe. Since the total production volumes are initially based on the combined purchasing volumes of shipbuilding, boatbuilding and repair in both sectors, it needs to be said that Italy is home of the biggest boatbuilding industry in Europe with a share of about 28% of their production value, whereas Netherlands and France are in the range of 24%-27% and Germany has a share of 18.7% in that sector.

The total marine supplies production for export (€27.43 billion) represents about 44.4% of the total EU-28 incl. (Figure 4). Norway and Turkey production. Basically the same ranking appears for export values as a share of the production value. Germany again is the leader of the EU- 28 countries with a high export share. UK, Norway, Italy, Netherlands, Denmark and France as followers show already significantly lower absolute values for export. These export values include also the export data into the EU-28 plus Norway and Turkey countries, i.e. the intra-European trade. Based on average statistical figures it has been calculated that this intra-European trade is in the range of more than €8 billion, about 1/3 of the total export volume of €27.43 billion for EU-28 plus Norway and Turkey, on the other hand means that about €19 billion goes into international export (ex EU-28, Norway and Turkey) representing in average about 33% of European marine supplies production.

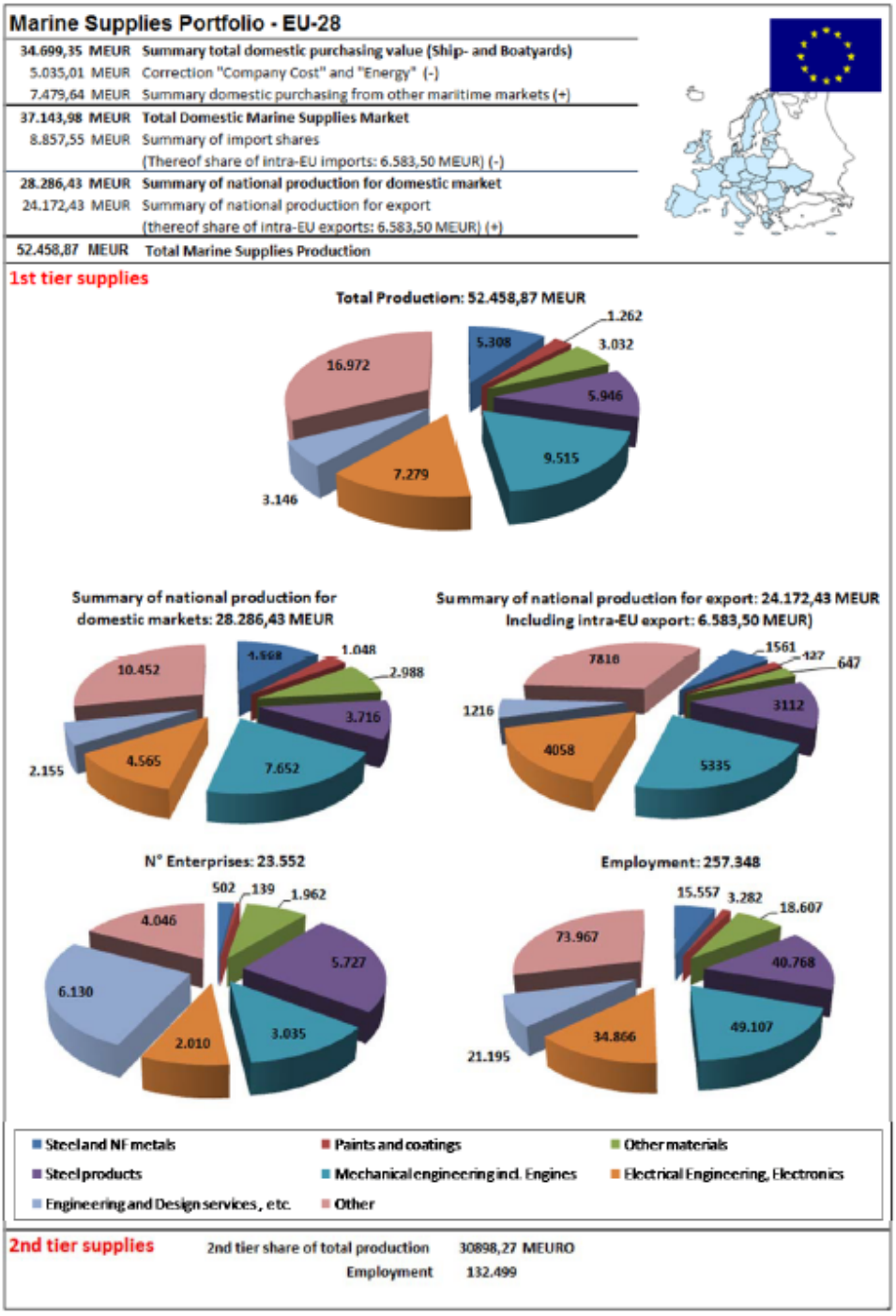


Figure 2: Aggregated EU-28 states portfolios (Source: European Commission, p.32, 2014)

European employment has been calculated on two levels. First of all the employment of 1st tier suppliers, which are directly dealing with the final producers, i.e. shipyards, boatyards etc. and secondly 2nd tier suppliers, which are acting as sub-suppliers. Employment for 1st tier suppliers only is summing up to 296,082 persons (full time equivalents). Another 155,689 employees for the 2nd tier suppliers can be added which leads to a total employment of the marine supplies industry in EU-28 plus Norway and Turkey of 451,771 persons (full time equivalents) as average figure for the period 2006-2010 (Figure 5). For EU-28 alone, we calculate a total employment for that period of 257,348 persons (full time equivalents 1st tier) and 389,847 persons (1st and 2nd tier). These figures include employment from different sizes of companies which also have different coverage of marine products and services in their portfolio.

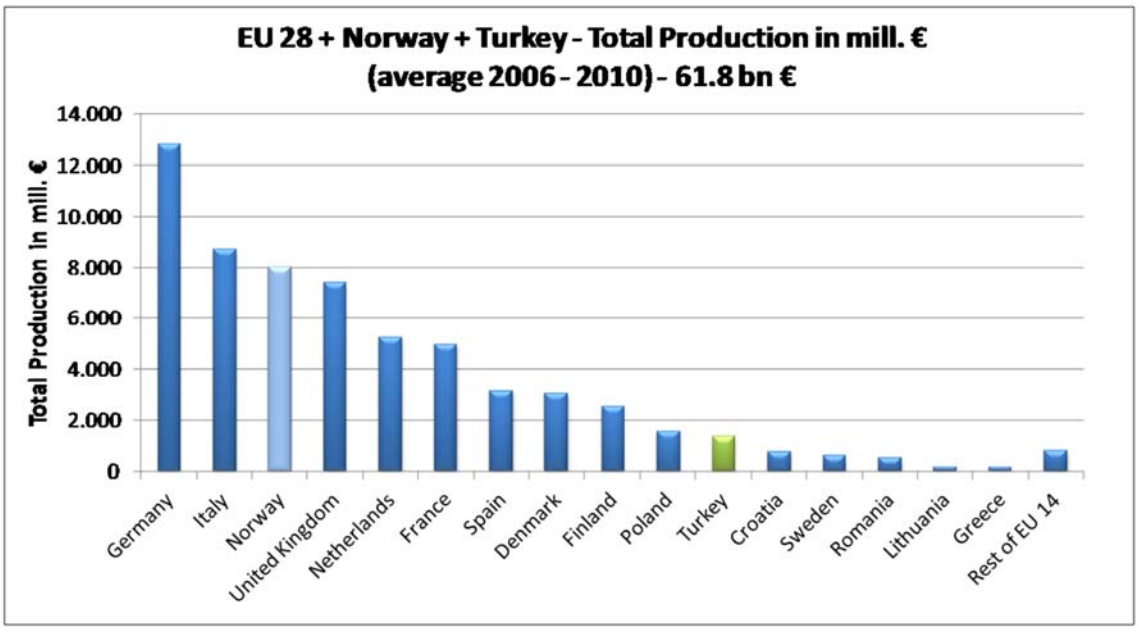


Figure 3: EU-28 - Production value in million EUR (average 2006-2010) (Source: European Commission, p.33, 2014)

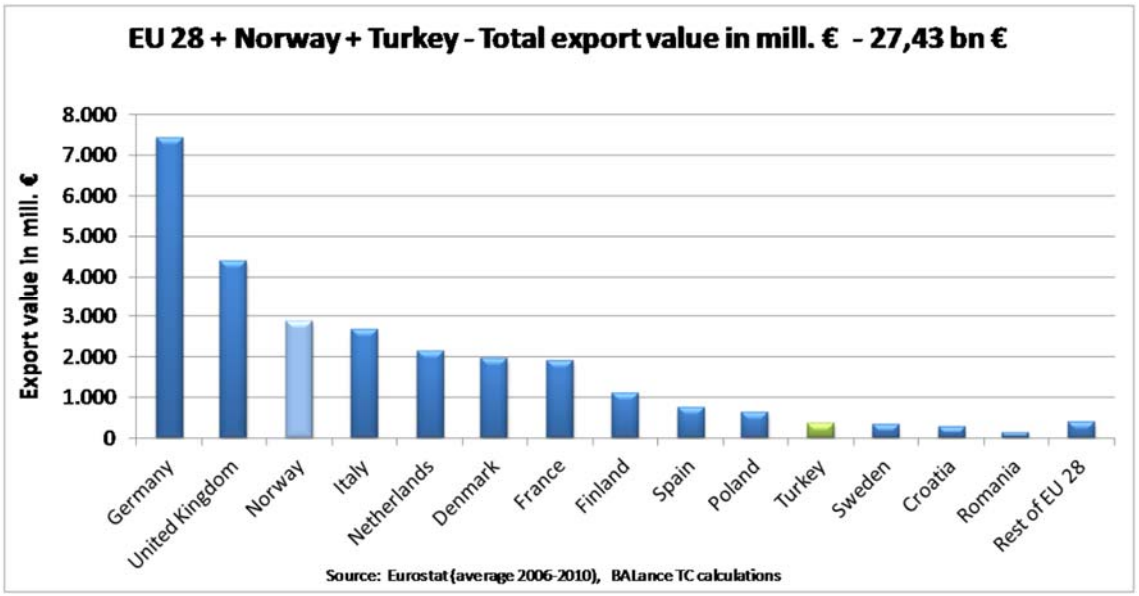


Figure 4: EU-28 - Export value in million EUR (average 2006-2010) (Source: European Commission, p.34, 2014)

The number of companies for the marine supplies industry has been calculated on the basis of the production values and by employing statistical figures on average employment per company, country and trade. This leads to a total number of 29,078 enterprises as 1st tier suppliers involved in the marine industry supply chain in EU-28 plus Norway and Turkey. The analysis on a country basis came to the unexpected result that Italy is far leading the European ranking on number of companies. With little less than 7,000 companies, Italy has double the number than the following countries Norway, United Kingdom and Germany with about 3,000 companies each (Figure 6). The high figure for Italy can be explained by the high share of boatbuilding in the Italian production portfolio. Many very small firms are involved in this industry sector. In addition it is a general feature of the Italian industry structure that the

average number of employees per enterprise is very low compared to other EU-28 countries, which also contributes to the calculation of these very high figures.

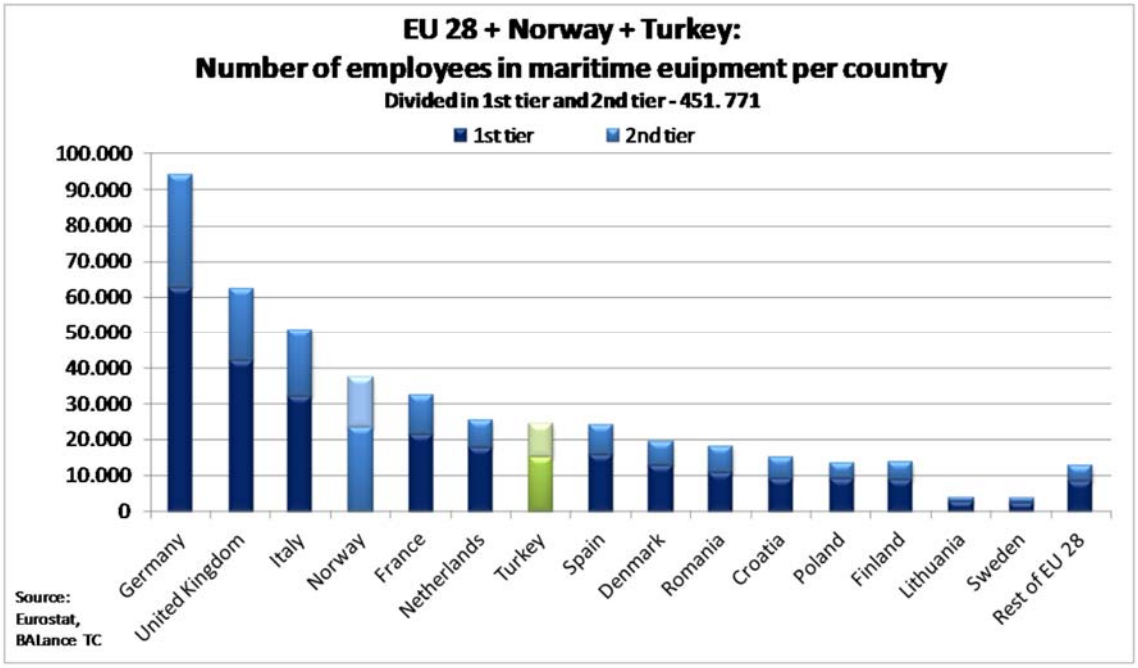


Figure 5: EU-28 - Number of employees in marine supplies per country (1st and 2nd tier) (Source: European Commission, p.34, 2014)

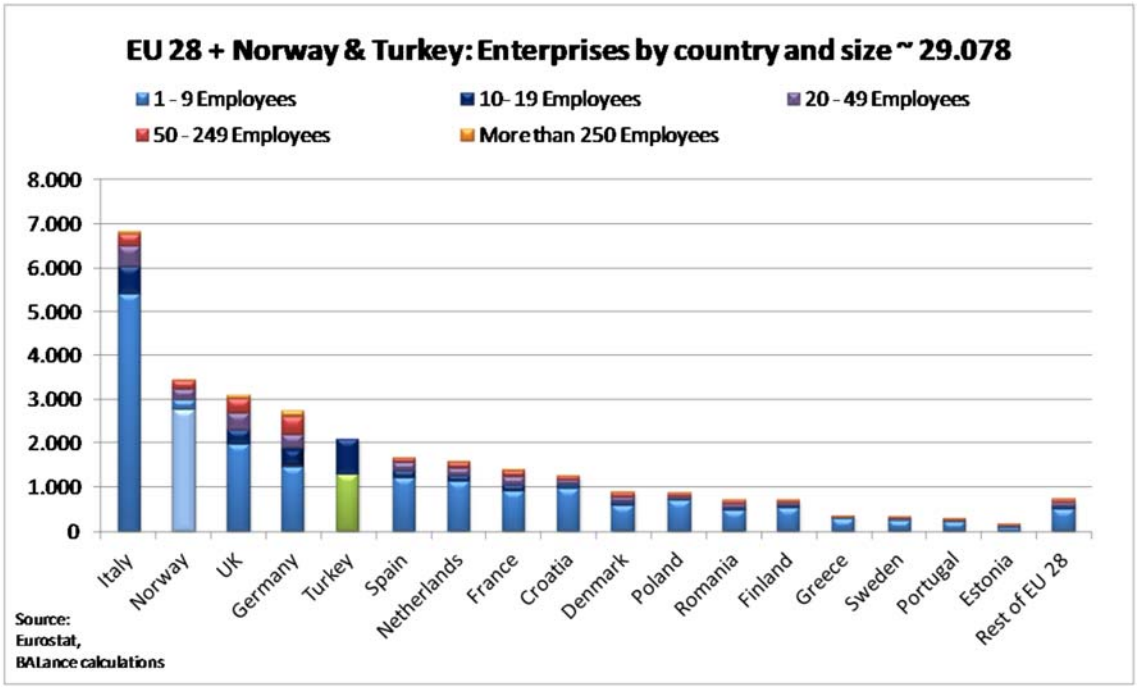


Figure 6: EU-28 number of enterprises per country and size, tier 1 (Source: European Commission, p.34, 2014)

A calculation of the number of companies for the 2nd tier suppliers in the supply chain has been performed, but is in the opinion of the authors not meaningful. This is due to the fact that 1st tier suppliers very often also act as 2nd tier suppliers and vice versa. Therefore these figures have not been taken into account. The figure of 29,078 enterprises is therefore regarded as the overall

total number of marine supplies companies which includes companies of very different sizes. In particular those with 1-9 employees contribute to the high total as presented. It has been therefore proposed to deduct the number companies with 1-9 employees in order to get an idea on the number of companies in the marine supplies industry in the narrower sense (Figure 7). As a result of this analysis, we get a total of about 8.380 companies in EU-28 including Norway and Turkey, which seems to be a reasonable estimate of companies being truly involved in marine supply chains.

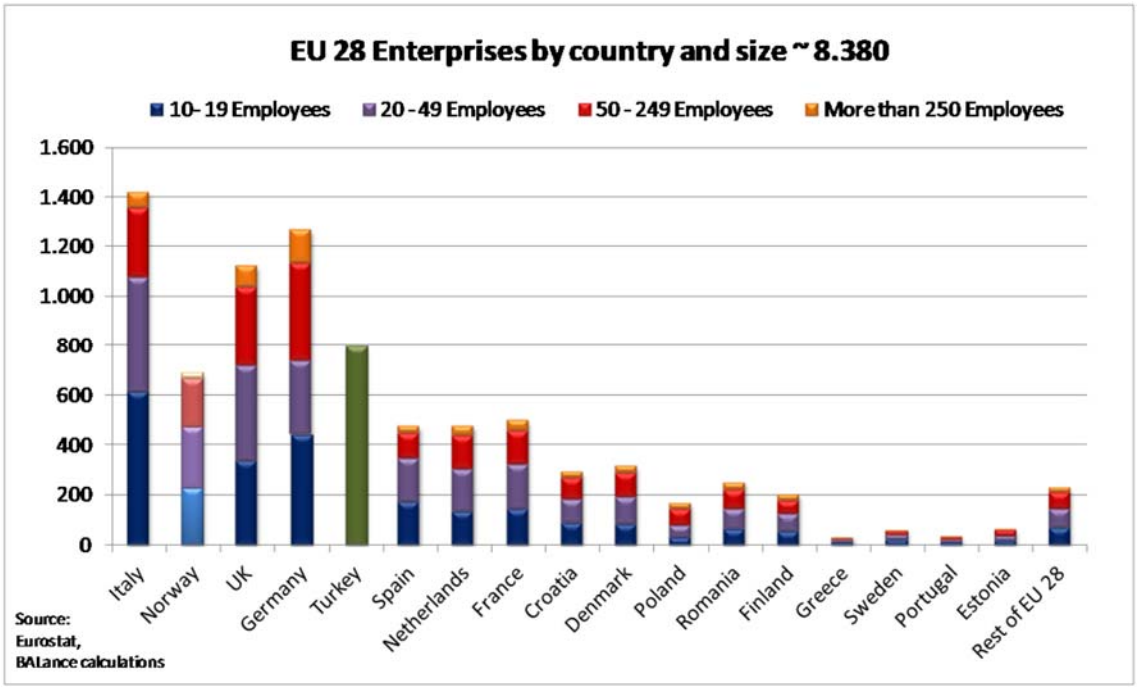


Figure 7: EU-28 Number of enterprises per country and size, tier 1 without companies with 1-9 employees (Source: European Commission, p.34, 2014)

European Commission (2017) concludes that the European (EU 28) maritime technology industry, namely shipbuilders together with 1st and 2nd tier suppliers in Europe, is the leading global region in terms of aggregated production value of shipbuilding and ship-systems production, even though its physical level of shipbuilding production - in terms of gross tons (GT) and deadweight tons (dwt) is low. With a calculated value of €112.5 billion, the EU 28 countries represent 23.3% of the global production value for maritime technology of €482.5 billion (annual average for 2010-2014). The position is even stronger, if Norway and Turkey are added to the EU 28 group. As individual nations, Germany follow Korea, China, USA and Japan in 5th position followed by Norway in 6th. United Kingdom, Italy and France follow in 8th, 9th and 10th position respectively. However, the position of Europe collectively can be viewed as a virtual one, despite the aforementioned figures, as there is no clear targeted European shipbuilding policy in place to offer an integrated and unified approach towards international competition.

The Economic Value of the Shipbuilding and Marine Supplies Sector by Region

European Commission (p.10, 2017) reports that during 2015-2016, the ordering of "commodity ships and offshore vessels has seen a dramatic reduction, which has affected the big shipbuilding nations in Asia, in particular, and put large parts of their industry at stake. Europe, in contrast to the global competition, in the last three years has moved into a more comfortable position when looking at the value of their shipbuilding order book because of its concentration on special high-tech and high value ships."

Although the European equipment industry benefits from this situation in Europe, they also suffer from a decreasing demand from the Far East and other parts of the world, as a result of the lack of orders from these regions where a less technologically advanced product is required.

It is anticipated that the European shipbuilding market for special high-tech and high value ships, predominantly cruise ships, will come under more and more pressure over time. In the absence of an imminent improvement of the market situation for the major commodity ship-types, the market sectors for special high-tech and high value ships will face more competition. China is preparing to enter this market sector as a political objective and is keen to build-up critical capacities to serve a wider range of marine supply needs. This is not only a threat to their Asian competitors, but even more so to the European shipyards and marine suppliers. With this mid-term prognosis, the maritime technology industry in Europe cannot feel safe or be complacent and needs to take action now. The next 10 years are likely to determine whether the European shipbuilding and marine supply chain industry can survive and grow or will decline and fail.

In this context it is important to look at the levels of capacity across the European regions involved in CONSORTEX from a current provision regarding economic indicators for shipyards and marine suppliers located in these regions.

País Vasco Region, Spain

The País Vasco shipbuilding and supply industry has 144 companies, and its economic weight in 2016 was €2,840,000,000.00 which represents 13,735 jobs.

Partner: FORO MARITIMO VASCO
Region: PAIS VASCO

	No of Firms	Number of Employees	Turnover (€)	% Turnover Related to Naval Sector	% of Regional GDP	R&D Investment (€)	Exports (€)
Newbuilding of merchant ships and offshore ships	5	495	€304,000,000.00	100%			€212,800,000.00
Ship repair and conversion of merchant ships							
Retrofitting - a special conversion market for ships following new regulations							
Offshore platforms, jack-ups etc. for oil and gas							
Offshore facilities, plants for offshore wind applications							
Naval shipbuilding, maintenance and repair							
Boatbuilding							
External services and subcontracts							
Materials – Steel	22	1568	€44,000,000.00	30%			€13,200,000.00
Materials – Pipes and ducts	7	529	€150,000,000.00	30%			€67,500,000.00
Materials – Paint, coating	2	127	€8,000,000.00	40%			€0.00
Systems / Equipment – Ship operation	4	168	€45,000,000.00	90%			€9,000,000.00
Systems / Equipment - Cargo handling equipment and special cargo plants	5	559	€105,000,000.00	60%			€47,000,000.00
Systems / Equipment – Accommodation	1	14	€3,000,000.00	100%			€0.00
Systems / Equipment - Propulsion, power generation	7	228	€82,000,000.00	60%			€50,000,000.00
Systems / /Equipment - Auxiliary systems, apparatus & accessories for engine operation, ship operation, cargo handling, accommodation	78	8460	€1,623,000,000.00				€649,000,000.00
Systems / Equipment - Electrical plants and electronic systems	13	1587	€476,000,000.00	30%			€214,000,000.00
Totals	144	13735	€2,840,000,000.00			€0.00	€1,262,500,000.00

Data Source: FORO MARITIMO VASCO Analysis 2016

Galicia Region, Spain

The Galician shipbuilding industry has 281 companies, and its economic weight in 2017 was €152,003,800.00 which represents 11,341 jobs.

Partner: Aclunaga

Region: Galacia, Spain

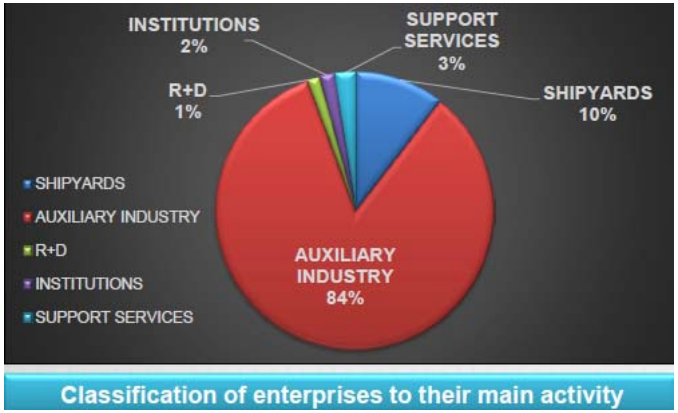
	No of Firms	Number of Employees	Turnover (€)	% Turnover Related to Naval Sector	% of Regional GDP	R&D Investment (€)	Exports (€)
Newbuilding of merchant ships and offshore ships	24	433	€4,940,100.00	21.23%	18.00%	€84,000.00	€741,015.00
Ship repair and conversion of merchant ships	48	1481	€11,518,300.00	58.22%	0.20%	€1,958.00	€3,455,490.00
Retrofitting - a special conversion market for ships following new regulations	24	433	€4,940,100.00	21.23%	18.00%	€84,000.00	€741,015.00
Offshore platforms, jack-ups etc. for oil and gas							
Offshore facilities, plants for offshore wind applications							
Naval shipbuilding, maintenance and repair	15	1788	€31,680,450.00	99.68%	1.13%	€5,385.50	€28,512,405.00
Boatbuilding	15	1788	€31,680,450.00	99.68%	1.13%	€5,385.50	€28,512,405.00
External services and subcontracts	9	393	€3,411,700.00	11.58%	0.02%	€580.00	€272,880.00
Materials – Steel							
Materials – Pipes and ducts	5	155	€1,833,000.00	69.00%	0.03%	€312.00	€0.00
Materials – Paint, coating	15	537	€3,212,700.00	71.41%	0.06%	€546.00	€321,270.00
Systems / Equipment – Ship operation	39	479	€13,938,500.00	22.45%	0.25%	€2,370.00	€1,393,850.00
Systems / Equipment - Cargo handling equipment and special cargo plants	22	480	€7,016,400.00	78.24%	0.12%	€1,193.00	€3,508,200.00
Systems / Equipment – Accommodation	21	1166	€12,193,200.00	57.41%	0.22%	€2,073.00	€1,828,980.00
Systems / Equipment - Propulsion, power generation	10	377	€6,230,500.00	67.32%	0.11%	€1,059.00	€4,049,825.00
Systems / /Equipment - Auxiliary systems, apparatus & accessories for engine operation, ship operation, cargo handling, accommodation	18	1039	€13,929,200.00	25.75%	0.08%	€2,369.00	€3,408,630.00
Systems / Equipment - Electrical plants and electronic systems	16	792	€5,479,200.00	67.25%	0.10%	€931.00	€821,880.00
Totals	**281**	**11,341**	**€152,003,800.00**	**55.03%**	**2.82%**	**€192,162.00**	**€77,567,845.00**

Data Sources: Aclunaga Data Collection 2017

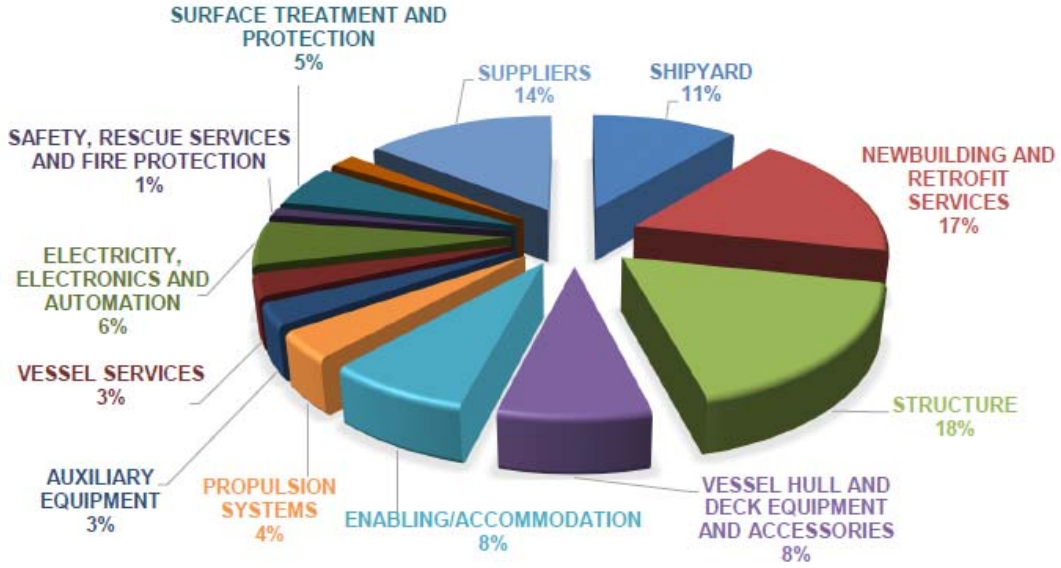
Distribution of companies in Galicia:

North area: 36.81%

South area: 63.19%



Classification of Auxiliary Industry to their main activity:



Norte Region, Portugal

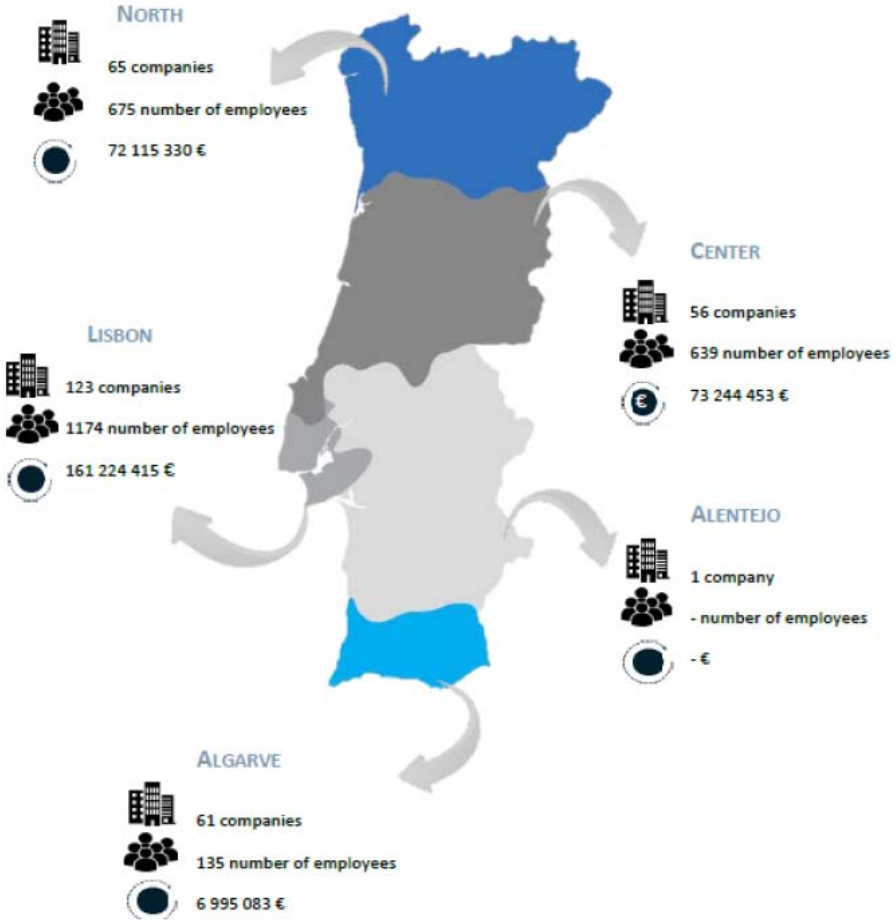
The maritime industries in North Region have 19% of the companies in this sector, generates 25% of the turnover and employs 29% of the total national number of workers of the sector. In numbers, the North Region had in 2016, 65 companies with 857 employees and a generated turnover of €81,540,103.00.

Partner: Forum Oceano
Region: North Region

	No of Firms	Number of Employees	Turnover (€)	% Turnover Related to Naval Sector	% of Regional GDP	R&D Investment (€)	Exports (€)
Newbuilding of merchant ships and offshore ships	16	213	€11,944,138.00				
Ship repair and conversion of merchant ships	33	182	€9,424,773.00				
Retrofitting - a special conversion market for ships following new regulations							
Offshore platforms, jack-ups etc. for oil and gas							
Offshore facilities, plants for offshore wind applications							
Naval shipbuilding, maintenance and repair							
Boatbuilding	16	462	€60,171,192.00				
External services and subcontracts							
Materials – Steel							
Materials – Pipes and ducts							
Materials – Paint, coating							
Systems / Equipment – Ship operation							
Systems / Equipment - Cargo handling equipment and special cargo plants							
Systems / Equipment – Accommodation							
Systems / Equipment - Propulsion, power generation							
Systems / /Equipment - Auxiliary systems, apparatus & accessories for engine operation, ship operation, cargo handling, accommodation							
Systems / Equipment - Electrical plants and electronic systems							
Totals	**65**	**857**	**€81,540,103.00**			**€0.00**	**€0.00**

Data Sources: 2016 Instituto Nacional de Estatística (INE)

Geographic location of the Maritime Industry:


NORTH
65 companies
675 number of employees
72 115 330 €
CENTER
56 companies
639 number of employees
73 244 453 €
LISBON
123 companies
1174 number of employees
161 224 415 €
ALENTEJO
1 company
- number of employees
- €
ALGARVE
61 companies
135 number of employees
6 995 083 €

Lisboa Region, Portugal

The maritime industries in the Lisbon metropolitan area have 36% of the companies in this sector, generates 48% of the turnover and employs 38% of the total national number of workers of the sector. In numbers, the Lisbon metropolitan area had in 2016, 124 companies with 1,719 employees and a generated turnover of €164,782,136.00.

Partner: AIN
Region: Lisbon Metropolitan Area

	No of Firms	Number of Employees	Turnover (€)	% Turnover Related to Naval Sector	% of Regional GDP	R&D Investment (€)	Exports (€)
Newbuilding of merchant ships and offshore ships	23	214	€16,275,810.00				
Ship repair and conversion of merchant ships	85	909	€144,948,605.00				
Retrofitting - a special conversion market for ships following new regulations							
Offshore platforms, jack-ups etc. for oil and gas							
Offshore facilities, plants for offshore wind applications							
Naval shipbuilding, maintenance and repair	1	545	€17,089.00				
Boatbuilding	15	51	€3,540,632.00				
External services and subcontracts							
Materials – Steel							
Materials – Pipes and ducts							
Materials – Paint, coating							
Systems / Equipment – Ship operation							
Systems / Equipment - Cargo handling equipment and special cargo plants							
Systems / Equipment – Accommodation							
Systems / Equipment - Propulsion, power generation							
Systems / /Equipment - Auxiliary systems, apparatus & accessories for engine operation, ship operation, cargo handling, accommodation							
Systems / Equipment - Electrical plants and electronic systems							
Totals	**124**	**1719**	**€164,782,136.00**			**€0.00**	**€0.00**

Data Sources: 2016 Instituto Nacional de Estatística (INE)

U.K. Atlantic Area

The UK Atlantic Area shipbuilding industry and services sector has 345 companies, and its economic weight in was €83,050,240,045.07 which represents 52,322 jobs.

Partner: National Maritime

Region: UK - Atlantic Area

	No of Firms	Number of Employees	Turnover (€)	% Turnover Related to Naval Sector	% of Regional GDP	R&D Investment (€)	Exports (€)
Newbuilding of merchant ships and offshore ships	14	1218	€267,050,553.57	23.20%	0.65%	€4,005,758.30	€16,023,033.21
Ship repair and conversion of merchant ships	61	1454	€299,199,610.99	63.20%	0.72%	€149,599.80	€89,759,883.29
Retrofitting - a special conversion market for ships following new regulations	11	1071	€261,833,559.88	12.00%	0.63%	€5,236,671.19	€81,168,403.56
Offshore platforms, jack-ups etc. for oil and gas	5	5867	€15,895,946,560.00	65.60%	3.87%	€556,358,129.60	€2,225,432,518.40
Offshore facilities, plants for offshore wind applications	5	5867	€15,895,946,560.00	22.30%	3.87%	€556,358,129.60	€2,225,432,518.40
Naval shipbuilding, maintenance and repair	34	18840	€45,775,021,450.00	25.00%	11.15%	€5,035,252,359.50	€3,204,251,501.50
Boatbuilding	18	3072	€318,192,704.71	100.00%	0.77%	€22,273,489.32	€194,097,549.87
External services and subcontracts							
Materials – Steel	4	9300	€4,148,218,000.00	12.50%	1.01%	€261,376.00	€66,371,488.00
Materials – Pipes and ducts	8	282	€11,386,167.63	6.00%	0.02%	€341.59	€455,446.70
Materials – Paint, coating	10	420	€27,698,150.05	49.00%	0.06%	€739,392.87	€985,857.16
Systems / Equipment – Ship operation	56	840	€47,650,102.86	96.00%	0.11%	€953,002.05	€10,959,523.65
Systems / Equipment - Cargo handling equipment and special cargo plants	47	517	€30,245,487.00	98.30%	0.07%	€937,610.09	€2,722,093.83
Systems / Equipment – Accommodation	9	234	€8,852,206.52	94.60%	0.02%	€137,845.57	€157,537.80
Systems / Equipment - Propulsion, power generation	19	1,197	€26,263,673.40	64.30%	0.06%	€1,733,402.44	€7,353,828.55
Systems / /Equipment - Auxiliary systems, apparatus & accessories for engine operation, ship operation, cargo handling, accommodation	13	624	€9,235,029.06	26.00%	0.02%	€369,401.16	€2,124,056.68
Systems / Equipment - Electrical plants and electronic systems	31	1,519	€27,500,229.40	71.44%	0.06%	€1,182,509.86	€8,800,073.40
Totals	**345**	**52322**	**€83,050,240,045.07**			**€6,185,949,018.94**	**€8,136,095,314.00**

Data Sources: EEF UK Steel, BCF, CEBR, ONS, MOD,Oxford Economics, Oil & Gas UK, DiT, National Maritime Analysis 2016

Southern and Eastern Region, Ireland

There are difficulties regarding the availability of marine socio-economic data in Ireland. The Established Marine Industries in 2016 had a turnover of €5.3 billion and provided employment of 28,231 FTEs representing 93% of the total turnover and 94% of total employment in Ireland's ocean economy. This sector includes shipping and maritime transport, tourism and leisure in marine and coastal areas, international cruise, sea fisheries, marine aquaculture, seafood processing, oil and gas exploration and production, marine manufacturing, construction and engineering and marine retail services. Emerging Marine Industries in 2016 had a turnover of €383 million and provided employment to 1,945 FTEs representing 7% of the turnover and 6% of employment in Ireland's ocean economy. Emerging industries refer to those that are still at a relatively early stage of development or growth, and are primarily R&D intensive and/or use the latest cutting edge technology in their pursuit of economic growth. Ireland's ocean economy includes a number of emerging industries with considerable growth potential. It includes advanced marine technology products and services, marine commerce, marine biotechnology and bio-products and marine renewable energy.

The importance of marine socio-economic data collection and analysis has been recognised by the Irish Government in Harnessing Our Ocean Wealth – an Integrated Marine Plan (IMP) for Ireland. Published in 2012, the IMP presents "the Government's vision, high-level goals and integrated actions across policy, governance and business to enable Ireland's marine potential to be realized.

The majority of Marine Manufacturing, Construction and Engineering companies are small and medium sized enterprises, these firms include: Boat and Related Equipment Manufacturing; Boat Manufacturing; Boat and Ship Repair; Water Construction; Marine Industrial Engineering and Other Marine Manufacturing. Companies involved in marine manufacturing are found throughout Ireland, both along the coast and inland. However, there are clusters of particular marine product manufacturing to be found in certain areas, particularly in Co. Donegal (marine industrial engineering), and counties Galway and Cork (boat building).

Marine Retail Services are located throughout Ireland, both along the coast and inland. The majority of the technology-related marine service companies are located within the larger cities, primarily Galway, Cork and Dublin.

Irish shipbuilding industry and services sector has 390 companies, and its economic weight in 2014 was €342,430,420.00 which represents 2,150 jobs.

Partner: Cork Institute of Technology
Region: Republic of Ireland

	No of Firms	Number of Employees	Turnover (€)	% Turnover Related to Naval Sector	% of Regional GDP	R&D Investment (€)	Exports (€)
Newbuilding of merchant ships and offshore ships	6	34	€4,904,000.00	100.00%	0.90%	€78,464.00	€784,640.00
Ship repair and conversion of merchant ships	69	402	€53,166,000.00	100.00%	0.90%	€850,656.00	€8,506,560.00
Retrofitting - a special conversion market for ships following new regulations	6	34	€4,904,000.00	100.00%	0.90%	€78,464.00	€784,640.00
Offshore platforms, jack-ups etc. for oil and gas		227	€29,501,125.00	100.00%	0.90%	€472,018.00	€590,022.50
Offshore facilities, plants for offshore wind applications		227	€29,501,125.00	100.00%	0.90%	€472,018.00	€590,022.50
Naval shipbuilding, maintenance and repair	69	402	€53,166,000.00	100.00%	0.90%	€850,656.00	€8,506,560.00
Boatbuilding	6	34	€4,904,000.00	100.00%	0.90%	€78,464.00	€784,640.00
External services and subcontracts							
Materials – Steel							
Materials – Pipes and ducts							
Materials – Paint, coating							
Systems / Equipment – Ship operation	39	132	€27,064,028.33	100.00%	0.90%	€433,024.45	€541,280.57
Systems / Equipment - Cargo handling equipment and special cargo plants	39	132	€27,064,028.33	100.00%	0.90%	€433,024.45	€541,280.57
Systems / Equipment – Accommodation	39	132	€27,064,028.33	100.00%	0.90%	€433,024.45	€541,280.57
Systems / Equipment - Propulsion, power generation	39	132	€27,064,028.33	100.00%	0.90%	€433,024.45	€541,280.57
Systems / /Equipment - Auxiliary systems, apparatus & accessories for engine operation, ship operation, cargo handling, accommodation	39	132	€27,064,028.33	100.00%	0.90%	€433,024.45	€541,280.57
Systems / Equipment - Electrical plants and electronic systems	39	132	€27,064,028.33	100.00%	0.90%	€433,024.45	€541,280.57
Totals	**390**	**2150**	**€342,430,420.00**			**€5,478,886.72**	**€23,794,768.40**

Data Sources: SEMRU Company Survey, CSO – Census of Industrial Production (CIP), CSO – Annual Services Inquiry (ASI) CSO – Retail Services Inquiry. Figures for 2014, Percentages for Regional GDP, R&D and Exports are taken from IMDO

Bretagne Region, France

The French naval industry economic value in 2017 was €9,450,000,000 which represent 42,300 jobs this one is mainly positioned on the construction and the MOC (maintenance in operational condition) of highly technological high added value vessels, naval electro-technical systems, cruise ships, travel ships, transport of liquefied gas (LGN) defence vessels.

The naval sector structuration is composed of **major activity segments** namely:

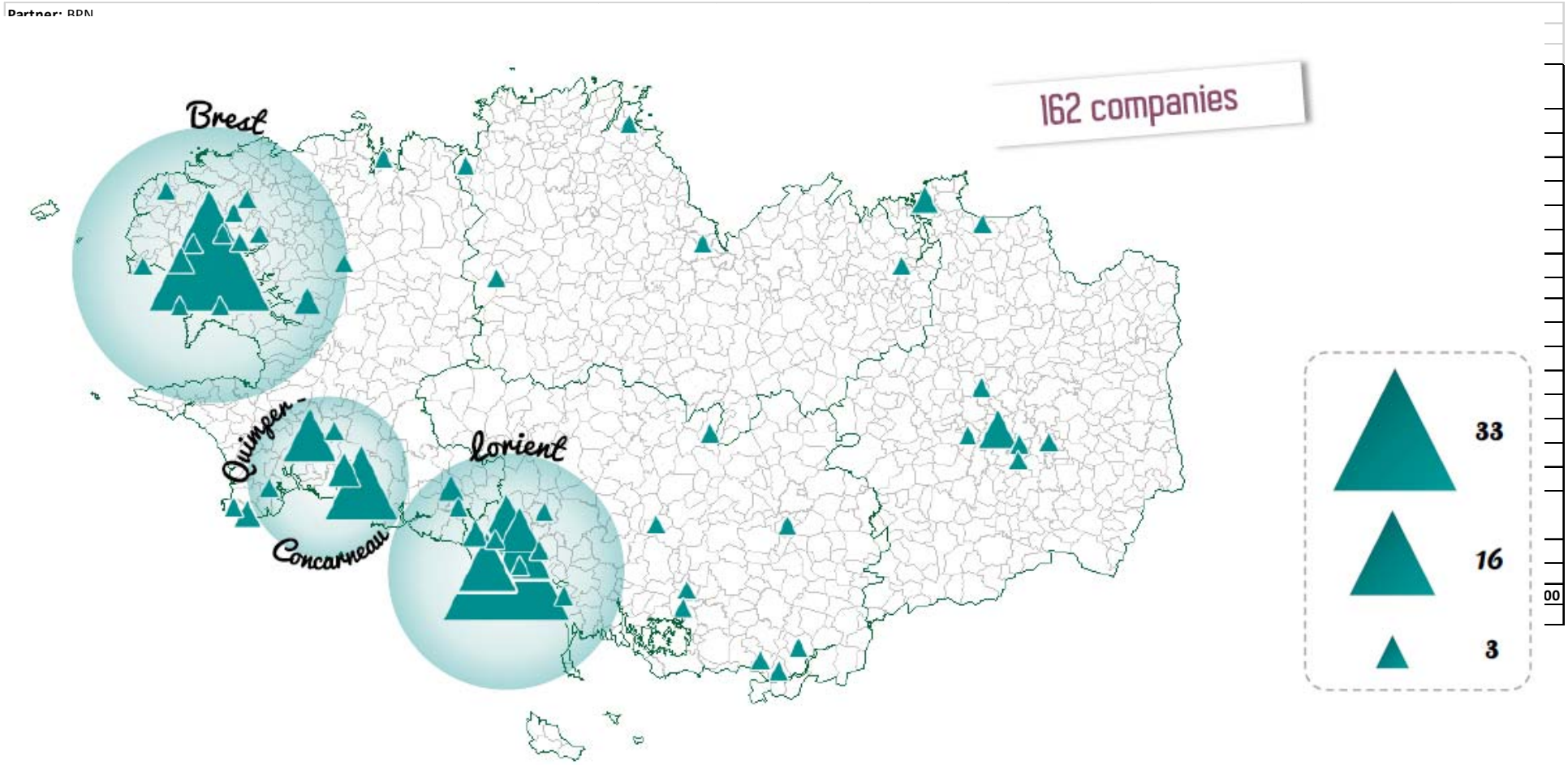
Construction and repair of civilian vessels, (CRNC : industrial vessels, yachting, large pleasure craft), construction and maintenance in operational conditions of military vessels, (MCO), the equipment manufacturers and subcontractors of construction and repair of civilian vessels, the equipment manufacturers and subcontractors of construction and repair of military vessels.

For less than three years, the shipbuilding market in France has improved and after several years of decline, indeed between 2012 and 2015 the sector has faced a decrease in the load plan and new orders. This aggravation began in 2012 with a level of order and down prices. In order to pass this difficult course, it was necessary (imperative) to make cost reductions of about 20% on the production price.

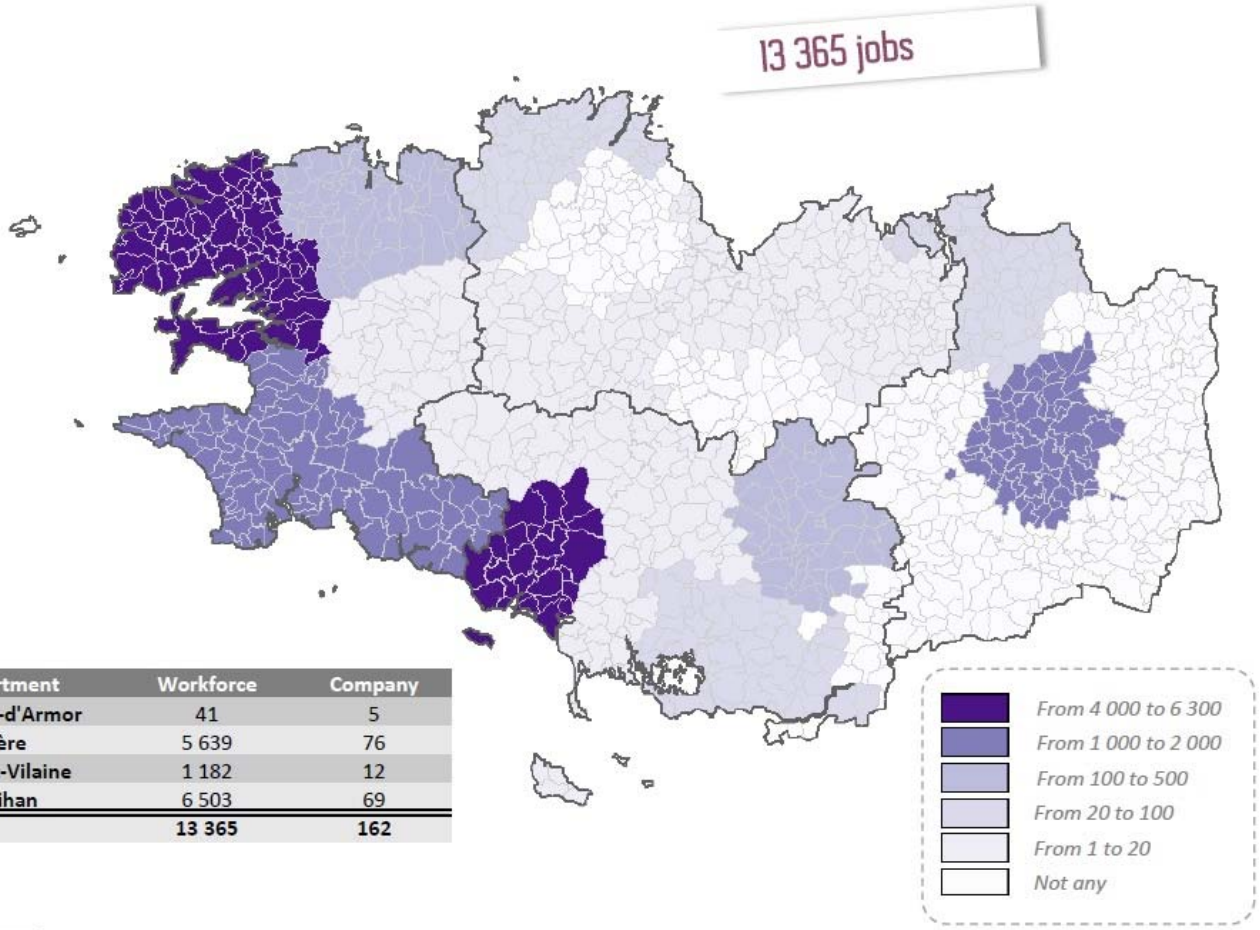
The sector is characterised by a **cyclical activity**, on the industrial and commercial level. The volume of employment and solicitation of the different professions in the naval worksites vary greatly over the orders and the different stages of the project, with good times and periods of less activity.

To mitigate this, the majority of worksites are striving to diversify their activity and develop the employability of staff.

There are 162 establishments working for the shipbuilding industry. These are located along the Breton coast. There are 3 major centres: Brest, Lorient et Quimper-Concarneau. They concentrate more than half of the establishments. The Distribution of companies in Brittany is as follows:

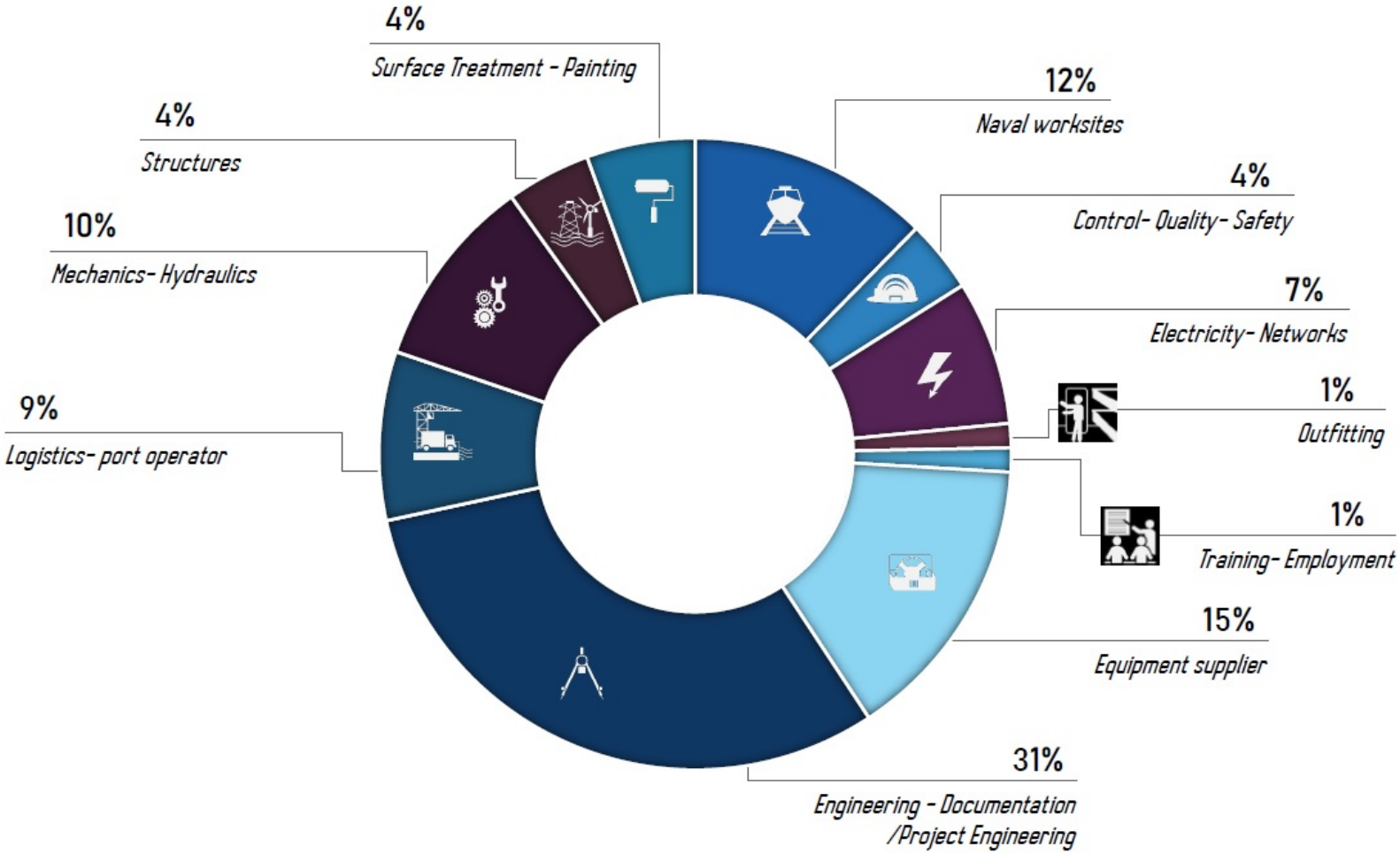


The distribution of the workforce by country varies significantly according to the industrial fabric. Two parameters are mainly taken into account: the number of establishments present per country and the presence of major contractors. Thus, in Brest and Lorient, more than 30% of the salaried work force in the industry are employed by a company in the naval branch. This implies that any change in employment in the naval sector has important consequences for these countries.



Department	Workforce	Company
Côtes-d'Armor	41	5
Finistère	5 639	76
Ille-et-Vilaine	1 182	12
Morbihan	6 503	69
Total	**13 365**	**162**

Economic Impact Analysis of the Marine Supplies Industry in Brittany - Companies classification by activity:



The overall **quantitative analysis** of the **sector's activities** highlight that:

Of the 162 establishments in the region, more than 46% are specialized in the **design** and **supply of equipment and materials**. This is **90% of medium size establishment** (*workforce less than 50*). Only one establishment in the category has a workforce of more than 200. This type of activity often depends on major contractors.

The part of **R&D**, research department and engineering activities is at a **high average level** compared to that usually observed. This puts **Brittany at the forefront of research and innovation**. Its research potential is a tremendous asset for economic development and demonstrates a creative and innovative capacity essential to the competitiveness of the region.

Main leaders* :
**Workforce higher than 150*

COMPANY	WORKFORCE	TUROVER 2017	NAF CODE	ACTIVITY	CITY	DPT
SPIE OUEST-CENTRE	2995	380M€	4321A	Engineering and services for shipbuilding and ship repair	PLOEMEUR	56
NAVAL GROUP SITE DE BREST	2700		3315Z	Naval defence industry – engineering – energies	BREST	29
NAVAL GROUP SITE DE LORIENT	1800	3,04Md€	3011Z	Design and construction of surface ships and their systems	LORIENT	56
EDF *BRITTANY REGIONAL DELEGATION*	800	1,5MD€	3513Z	Producer of renewable energies	RENNES	35
PIRIOU	450	152 M€	6430Z	Shipbuilding, repair ad engineering	CONCARNEAU	29
ETT – *ENERGY THERMAL TRANSFERT*	261	45M€	2825Z	Design and manufacture of air conditioning equipment	PLOUDALMÉZEAU	29
NAVTIS BREST	245	21M€	3315Z	Multi-speciality mastery: naval, industry, RME, Oil&Gas	BREST	29
PRESTIA	175	43 M€	7010Z	Antico / esthetical surface treatment: galvanizing, metallization, painting	LA CHAPELLE-CARO	56
DAMEN SHIPREPAIR BREST	170		3315Z	Ship repair and maintenance	BREST	29
GUELT	150	17M€	2562B	Equipment manufacturer in naval industry and RME	QUIMPERLÉ	29

Regional Stakeholder Interview Summaries:

To understand the capabilities in each partner region, the CONSORTEX partnership conducted 5 interviews with regional experts to add some much needed context to the Economic Impact Analysis of the Marine Supplies Industry in each region. The interviewees included managers / presidents of maritime cluster or association of maritime industry firms; representatives of Public Authorities (City Council, Regional Authorities); deans or directors of University Engineering and Nautical School); R&D centers manager or representatives; Trade Fair Managing Directors; Port Authorities or trade union representatives.

Each interview will refer to the shipbuilding and ship-repair, auxiliary industry, navigation, fishing, ports capacity and strategy at a regional level. The questions will include:

1. Definition of the situation. Its weight in the Regional economy.
2. Strengths of the sector
3. Weaknesses and major problems
4. Level of competitiveness of the industry
5. Importance of technological innovation, R&D etc.
6. Qualification and level of training of staff working in companies
7. Equality of opportunities in the sector and underrepresented groups (female, people with disabilities, minorities etc.)
8. Prospects for the future in the short / medium term (5 years)
9. Prospects for the long-term future (more than 10 years).

A summary of each of the interviews conducted at a regional level are provided in this section, with transcripts of the interviews provided in Appendix 1.

País Vasco Region, Spain

To give some perspectives of the shipbuilding and ship repair sector in the País Vasco region the main inputs and conclusions from the combined 5 interviews of ADIMDE, BEC, Universidad Del País Vasco, Tecnalia and Uniport are as follows:

1. Definition of the situation in the naval sector in the region.

Shipbuilding was the engine of industrialization in Basque Country, but currently, has lost its position. Worldwide, there is an excessive offer and there is a lot of unfair competition. This industry is atomized and works by ups and downs. An increase in shipbuilding is foreseen in next years, working on fishing vessels and offshore wind power plants equipment. Small shipyards have found leading market niches. Bilbao Port has an important multiplying effect on the entire maritime sector. The profession of ship master, much appreciated time ago, has lost attraction for young people and few of them study navigation.

2. Strengths of the sector. Keys to its success.

- The industrial experience and know-how
- Market differentiation and specialization in several market niches (There are success niches in tuna boats, offshore and wind energy).
- Large accumulation of ancillary industries in a very small territory
- Technology applied by companies and high value in the supply chain
- Very qualified human resources and good training facilities
- Port infrastructures and diversification

3. Weaknesses, difficulties and most relevant problems.

- The market. There is a single global market, in which some countries have a very cheap workforce and give illegal state aid. Some European countries are competitors physically too close to the Basque Country.
- Large shipyards have little product differentiation.
- Shipyards are small, with a limitation on the size and type of ship they can build.
- Geographical location of Bilbao Port, outside the major transport routes.
- The lack of some expensive training facilities in the University School of Navigation

4. Competitiveness level of naval industry companies.

Very high. We have the capacity to face the building of any type of boat, regardless of its technological complexity. Basque industry has obtained synergies through technology centers, clusters, business associations and the support of public and private institutions. Shipping companies, on the other hand, have a high level of competitiveness worldwide.

5. **Importance of R+D+i in the sector and level reached by its companies and surrounding institutions (technology centers, training institutions ...).**

R+D+i is of fundamental importance for companies in the sector. The Basque Country is implementing the Industry 4.0 Master Plan to develop new technologies in the shipyards in a horizon of ten to twelve years. The current R+D+i level in Basque ancillary industry is high. A problem is that the sector outsources tasks and activities, and it is not possible to do R+D+i from shipyards due to its lack of specialization. Research is made, normally, by suppliers and throughout the supply chain.

6. **Qualification and training level of the personnel in the companies. Positive and negative points to highlight.**

Very high. Shipbuilding is moving towards specialized products in which a skilled workforce with high added value works. So, a Training Plan to attract young talent is needed. This would be linked to the Industry 4.0 Master Plan. A problem is that in periods of crisis the labor force migrates to other industrial sectors and, later, it is difficult to recover them. A part of the shipbuilding work with low added value still remains, so it can be covered with low qualified personnel. The ancillary industry, on the other hand, has been able to attract high qualified human resources. In shipping companies is possible to speak of overqualification as some of them prefer to hire other less qualified but more economical human resources.

7. **Equal opportunities for underrepresented groups (women, people with disabilities, foreigners ...), both in access to the sector and in their working and professional conditions.**

In production and less added value tasks the gender composition of the workforce is highly masculine, though there is more female presence in management and marketing tasks. And the same happens with disabled people or foreigners. Nowadays, this situation has no meaning, as many tasks are highly mechanized. Technology will be able to greatly improve this equality of opportunities, since a large part of the work will be fully automated. In the ancillary industry, the participation of women is greater. In shipping companies women find more difficult to continue on board than men due to the lack of conditions that favor work and family conciliation.

8. **Prospects for the future of the sector in the short/medium term (up to 5 years).**

The trend has to be the search for highly specialized market niches, as it happens in the case of the offshore sector. A sustained growth in shipbuilding is expected, with increases of around 3% per year. However, this sector is subject to external factors that may affect its development. We will continue facing unfair competition from East Asia, so the support of European and national institutions will be decisive. Moderate growth of port freight traffic is expected, too.

9. Prospects for the long-term future (more than 10 years).

Technology and automation can produce disruptive changes in shipbuilding industry. The autonomous ship is a very attractive idea, but with a lot of problems, due the chaotic environment of the sea. But is highly probable that many navigation processes were automated and the crews were reduced considerably. There is no doubt that the Basque industry would be able to face the technological challenges of this eventuality. It is necessary to look for new niche markets, such as marine renewable energies, that can generate a remarkable business for the ancillary industry. The support of Public Institutions will be very important, especially through the maintenance of Technology Centers.

Galicia Region, Spain

To give some perspectives of the shipbuilding and ship repair sector in the Galicia region of Spain the main inputs and conclusions from the combined 5 interviews are as follows:

1. Definition of the situation in the naval sector in the region.

- It involves an important percentage of Galicia's GDP and has a high international character, with 90% of the ships built for export.
- The 45% of the Spanish shipyards are Galician, and the auxiliary industry occupies more than 200 companies. The reindustrialization efforts of the last decades were very important to adjust the sector to market needs.
- It has become an industry of synthesis.
- Sector formed mainly by SMEs, with reduced staff and high level of subcontracting.

2. Strengths of the sector. Keys to its success.

- Customer-oriented specialization, the diversity of products and markets is not attractive for low-cost products.
- Increase in the global fleet and demand for vessel modernisation.
- Need to meet regulations, environmental regulations etc. Greater work associated with the repair and reuse of ships. Is well organized al local, national and international level.
- Increasingly international in its nature.

3. Weaknesses, difficulties and most relevant problems.

- Fierce international competition
- Limited investment capacity of the sector
- Limited capacity for innovation, most of the companies are SMEs. High relative labor costs
- More information and knowledge of the different European and International legal system is required.

4. Competitiveness level of naval industry companies.

- It is not possible to compete with Asian industry at the present time. The Asian effect will take time to reach our sector as it will first affect the heaviest and most specialized vessels in Northern Europe, after affecting them, it will reach southern Europe. To this day, our competition is on the continent.
- Galicia provides customer-oriented specialization, non-serial products that are not attractive to low-cost producers.
- Increasingly competitive in markets that demand a high level of quality- be it in the market of fish products, or in shipbuilding.

5. Importance of R+D+i in the sector and level reached by its companies and surrounding institutions (technology centers, training institutions ...).

- Efficiency in manufacturing is considered as a key point and of a great impact in the naval sector. The introduction of integrated systems throughout the production systems is essential for greater efficiency.
- There is a need for differentiation, also a need to increase the productive and management capacity to be more competitive. Need for product development and own technology.
- It is a sector with some resistance to change, with manual processes, but companies are aware that it´s increasingly important and are investing in it.
- To achieve greater capacity and efficiency, greater standardisation of processes and greater information processing will be needed.
- The solution must be found in the adoption of new management models based on new technologies.
- The robotic solutions, for three-dimensional measurements, shaped sheets etc.
- Decision support systems, information systems through an interface that allows analysis and makes quick and safe decisions.
- Introduction of mobile technologies that facilitate planning operations, supervision of construction tasks. Sensory and communication technologies. Smart materials technology modelling, simulation and virtualization of processes, wearables, augmented reality. Analysis of functional data for fault detection. Big Data, Cloud Computing etc.

6. Qualification and training level of the personnel in the companies. Positive and negative points to highlight.

- There is very little relationship between the training needs of companies and regulated training; this translates into a lack of specialists. The average age of the sector is advanced and there are no adequately trained young people.
- Lack of trained internal resources.
- The staff is well trained also in legal matters language.

7. **Equal opportunities for underrepresented groups (women, people with disabilities, foreigners ...), both in access to the sector and in their working and professional conditions.**

In the shipbuilding sector work a greater number of men than women, but there is nothing that makes us think that it is due to an incorrect business policy.

8. **Prospects for the future of the sector in the short/medium term (up to 5 years).**

- The time of the current workload, could range between two years and ten that allow for example the future frigates for the Spanish state.
- Galicia is a national leader, covering around 1/3 of the national construction load.
- Strong competition at European and International level. Companies are taking measures to improve their competitiveness by reinforcing their staff with people with specific knowledge.

9. **Prospects for the long-term future (more than 10 years).**

- There is a diversification towards various market niches, which will mitigate the possible effects of a new crisis.
- The companies that lead the sector, both shipyards and auxiliary industry have been focused on international markets that allow them to think of a wide range of options.
- The diversification and the capacity of adaptation to the client, are the bases on which the sector understands that it will maintain the competitiveness in the future.

Norte & Lisboa Region, Portugal

To give some perspectives of the shipbuilding and ship repair sector in the Lisboa Region the main inputs and conclusions from the combined 11 interviews of ASM Industries; ALMA Design; ENIDH Escola Náutica Infante D. Henrique; O.E. – Colégio de Engenharia Naval; West Sea – Estaleiros Navais, Lda; LISNAVE – Estaleiros Navais, S.A., TECOR - Tecnologias de Anticorrosão, S.A, HEMPEL Portugal S.A., I.S.Q. – Instituto de Soldadura e Qualidade; TECNOVERITAS - Serviços de Engenharia e Sistemas Tecnológicos, Lda and VERA NAVIS – Desenho e Engenharia Naval are as follows:

1. **Definition of the situation in the naval sector in the region.**

Most of the interviewed companies are relevant or very relevant in the Portuguese economy. Some because the high level of their turnovers and its positive contribution for the growth of Portuguese GDP; others because of the high quality and innovation of the products and services provided or also due to the role they play in the training of technicians and higher education specialists.

2. **Strengths of the sector. Keys to its success.**

High knowledge and specialization, long experience, well equipped in innovative areas and in naval architecture, shipbuilding software, and marine engineering. Various certifications. Credibility in the international market and good networks. Various awards obtained in design products. Two of the interviewees are the very prestigious and sole public higher education school in Portugal to train officers of the merchant navy or naval engineers.

3. **Weaknesses, difficulties and most relevant problems.**

Small size of the domestic market, namely in shipbuilding industry, particularly the construction of new ships Strong commercial competition from the external market. Poor visibility, insufficient communication Lack of sectoral policies to support the Portuguese maritime industry. Insufficient domestic labour market - difficulties in recruiting staff, despite the training provided by the companies for many years. Higher education programs, especially for the education of naval engineers, must be more business-oriented.

4. **Competitiveness level of naval industry companies.**

Some of the interviewed companies are leader in maritime sector, namely in ship repair, practically the unique in this business to vessels over 30 thousand dwt. Others are very competitive even in external market in their specific activities, such as: naval architecture, shipbuilding software, and marine engineering; innovative design of different kinds of transport means. Experience of participation in multi-skilled projects, national and European.

5. **Importance of R+D+i in the sector and level reached by its companies and surrounding institutions (technology centers, training institutions ...).**

Very important, for all the companies interviewed. Strong focus on R & D. Some have specific departments related with these two areas and develop active cooperation with official R&D institutions.

6. **Qualification and training level of the personnel in the companies. Positive and negative points to highlight.**

High qualified and trained technicians, according the high standards of qualification and training they establish: quality, technical, environmental, safety and management. Some of the companies have their own training departments to prepare high qualified and multi skilled technicians and specialists.

7. **Equal opportunities for underrepresented groups (women, people with disabilities, foreigners ...), both in access to the sector and in their working and professional conditions.**

There is no discrimination in gender. Both genders are equally admitted. General policy is do not tolerate racial, sexual or any other kind of harassment.

8. Prospects for the future of the sector in the short/medium term (up to 5 years).

Short term prospects are positive. Each company has its own very short-term prospects. The common denominator is ensuring greater penetration or consolidation in the markets in which they operate.

9. Prospects for the long-term future (more than 10 years).

The entry into force of international regulations for the environment, security, safety and health by 2020, creates the expectation of recovery and enhancement of the activity for 2019 and 2020, especially with the opportunities generated after 2020, due to the mandatory rules of de-carbonisation. Increment the activity in marine renewable energies and the expansion of the continental shelf. Biggest bet on the foreign market, especially in the Portuguese-speaking countries. Enlarging the network cooperation within maritime sector.

U.K. Atlantic Area

To give some perspectives of the shipbuilding and ship repair sector in Ireland the main inputs and conclusions from the combined 6 interviews of Invest in Cornwall, Marine Hub Cornwall, Cornwall Marine Network, Marine Energy Wales, Mersey Maritime and Scottish Maritime Cluster are as follows:

1. Definition of the situation in the naval sector in the region.

- It represents a high percentage of the regions GDP and employment
- Modernising, efficient, productive and competitive sector growing on the Clyde and on the Forth, Scotland, in Belfast Northern Ireland and in Barrow Cumbria, and in the North-West and South-West of England
- Has recognised excellence and high market rankings by value in design and manufacture of luxury leisure vessels, commercial and naval refits, supply of marine equipment and design, and construction and project management of complex warships and submarines
- Existing market share coupled with strengths in design and integration of complex vessels and systems, management of complexity and risk, and a range of pioneering technologies place the sector in a strong position for growth
- North West, Scotland and the South West has the largest share of employment in UK shipbuilding and repairing sector
- Sector has a high level of SMEs.

2. Strengths of the sector. Keys to its success.

- Despite the dominance of the Far East (China, South Korea and Japan) in large-scale shipbuilding, the region retains an acknowledged position as a centre for design, engineering, marine equipment and research
- The regions shipyards, like their European counterparts, now tend to concentrate more on niche markets and vessels with high technological content
- Workforce and skills availability: flexible workforce; research centres and universities; strong marine/naval reputation and skills base

- High value 'soft' technical skills: design and integration of complex vessels and systems; management of complexity and risk; design, build and fit-out of high-end leisure vessels and yachts
- Existing market share and presence: marine equipment, fourth in Europe; repairs and refit, sixth in Europe; two of top five yards globally in superyacht manufacture
- Specialist technical strengths: composites; marine coatings; waste/ballast and emission control systems
- Offshore energy infrastructure and market: the UK is a global leader in offshore wind farms and tidal array development
- UK proactively positioning itself as the global thought leader and market leader in key emerging market areas.

3. Weaknesses, difficulties and most relevant problems.

- Supply chain: low number of major ship yards; limited major manufacturers of main equipment; fragmented industry and supply chain
- Workforce and skills availability: high wage economy; ageing skills base; the ability to attract overseas marine talent given the UK visa controls
- Shipbuilding for the UK's Royal Naval fleet has historically provided a fluctuating source of business for a number of shipyards in the region. The biggest yards remain heavily dependent upon naval shipbuilding
- Brexit and Maritime issues; trade, safety, the environment, tonnage tax and security.

4. Competitiveness level of naval industry companies.

- The majority of larger civilian ships are now produced in the Far East on a scale not achievable in the UK. Despite this, there has been a renaissance in UK regions shipbuilding companies, which has been driven in part by a steadier supply of UK Naval Defence work and an entrepreneurial attitude towards pursuing opportunities in the commercial market. Regional success has included Cammell Laird (Merseyside) in the international competition for the polar research ship, Ferguson Marine (Scotland) the construction of two dual-fuel Caledonian MacBrayne ferries and Babcock (Devon and Scotland) contracts with the Irish Navy for four offshore patrol vessels and with the US Coast Guard to provide engineering design work for the construction phases of their new Offshore Patrol Cutter.
- The regions sector retains an acknowledged position as a centre for design, engineering, marine equipment and research
- The UK is the global thought leader and market leader in key emerging sector market areas and the regions businesses are competitively positioned to exploit the opportunities provided by trends associated to technology development and vessel design.

5. Importance of R+D+i in the sector and level reached by its companies and surrounding institutions (technology centers, training institutions ...).

- The sector highlights that managing and developing relationships, possessing technological superiority and managing costs are the most important factors that affect it competitive advantage
- Whilst the regions sector businesses have a good record of innovation they predict that the principal innovations that will shape the market over the next 10 years will include; Environmental protection and emissions reduction, Autonomous systems, Renewables, Propulsion technology, electronics and data management.
- Importance of R + D + I focus is on developing strength and further competitive advantage in the following areas; 1. Whole-vessel integration to deliver more affordable and optimised running with reduced staff and minimised through-life costs, 2. Design, integration, manufacture and operation of autonomous vessels and systems, 3. Design, manufacture and refit of superyachts, high-end powerboats and high-end sailing yachts, 4. Extended use of composites and other novel materials, 5. Design and manufacture of specialist vessels for support of the offshore energy and naval sectors, 6. Through-life operation and equipment insertion (including refits and conversions) to improve vessel efficiency, 7. Decision support systems – including integrated voyage optimisation to deliver just-in-time arrival at port at lowest cost, secure situational awareness and next-generation command and control.

6. Qualification and training level of the personnel in the companies. Positive and negative points to highlight.

- The sector recognises that modern industrial practices require a modern workforce. Having the sovereign skills to design, build, repair, and supply certain equipment and systems is a key factor in the successful delivery of future shipbuilding capability
- The sector needs to invest to ensure that there are sufficient numbers of properly skilled workers
- The number of apprenticeships and graduates in the shipbuilding Industry and supply chain is being driven by regions companies concerned rather that support by UK government
- A suite of interlocking standards and qualifications – “Maritime Studies Qualifications” is being developed to enable employees to progress both within their specialism and between sectors
- To remain competitive and minimize their cost-base, industry determines what skills are needed to deliver programmes, and tune their workforce accordingly
- The average age of the sector is high and there is a lack of adequately trained young people.

7. Equal opportunities for underrepresented groups (women, people with disabilities, foreigners ...), both in access to the sector and in their working and professional conditions.

- The sector has historically been a male-dominated industry and that tradition runs long and deep. However, sector businesses are making a concerted effort to help the industry move on from that tradition and to achieve a representation within it that is more in keeping with twenty-first century expectations.

8. Prospects for the future of the sector in the short/medium term (up to 5 years).

- Current global trends and associated opportunities in the industry are being driven by economic, environmental, social, technological and political/regulatory factors. These global trends drive

associated trends in technology development and vessel design of which the regions industry and its research base are competitively exploiting
- To be successful, both the shipyards and the supply chain need to develop their global competitiveness for military and civil work
- A commitment by the UK Government to grow its Royal Navy Fleet by 2030 is presenting the opportunity to rejuvenate UK shipbuilding. The regions shipyards and the wider supply chain are playing an important part in delivering new ships, and their systems, and in supporting and maintaining the Fleet
- This initiative is helping to secure non- military work, bringing employment and prosperity benefits across the region, and is providing a springboard for exports.

9. Prospects for the long-term future (more than 10 years).

- The UK Governments commitment to growing its Royal Navy Fleet by 2030 is presenting the opportunity to rejuvenate the long term future of UK shipbuilding. Its implementation will result in a transformation of the way that the Ministry of Defence procures naval ships, and will also re-energise the regions shipbuilding industry long term
- A shipbuilding enterprise for the regions that, encouraged by a clearer grip by Defence, and with greater certainty about the Royal Navy's procurement plans, is bringing the confidence to invest for the long term in its people and its assets to raise productivity and innovation and improve its competitiveness in the domestic and overseas markets
- In this way, the sector can become more resilient to the peaks and troughs of Royal Navy business, bringing more sustained growth and prosperity to the regions in which those businesses are based
- This will have significant benefits throughout the region in terms of increased jobs, skills, exports and wider prosperity
- To support future priority opportunities and alignment with trends in vessel design and operation, R&D funding is being focused on the development of UK expertise and intellectual property in areas of design and manufacturing techniques; electronics, sensors, communications and control and data management; energy efficiency and environmental protection; structures and materials; autonomous systems.

Southern and Eastern Region, Ireland

To give some perspectives of the shipbuilding and ship repair sector in Ireland the main inputs and conclusions from the combined 5 interviews of Barry Electronics, Enterprise Ireland, Mainport Group, Marine Development Team and Port of Cork, are as follows:

1. Definition of the situation in the naval sector in the region.

Small but important sector – consisting mainly of SMEs operating in small remote coastal locations.

2. Strengths of the sector. Keys to its success.

Innovative sector, adapting and evolving to meet market needs. Hard working, positive, 'can do attitude' small businesses. Strong cooperative mentality.

3. **Weaknesses, difficulties and most relevant problems.**

No formal support structures, small size of businesses, lacking resources to dedicated to long term strategic operations. Ad hoc operational structure. Lack of infrastructure to service large ships.

4. **Competitiveness level of naval industry companies.**

Competitive in aspects of maritime sector higher up the value chain, hi tech fit outs etc. Unable to compete in terms of ship building as labour costs are too high. Businesses have adapted in order to find their competitive niches.

5. **Importance of R+D+i in the sector and level reached by its companies and surrounding institutions (technology centers, training institutions ...).**

Ireland has some excellent national infrastructure in this regard. Innovation is very important since businesses are continually adapting to remain competitive – it is their innovation which enables them to remain competitive. Nevertheless it is small scale. Formal collaborative support could help improve ability to innovate & collaborate on R&D.

6. **Qualification and training level of the personnel in the companies. Positive and negative points to highlight.**

The NMCI provides an excellent stream of highly competent professionals for the industry. Levels of training vary but veering towards post graduate, highly qualified staff.

7. **Equal opportunities for underrepresented groups (women, people with disabilities, foreigners ...), both in access to the sector and in their working and professional conditions.**

Dominated by able bodied males.

8. **Prospects for the future of the sector in the short/medium term (up to 5 years).**

Excellent prospects for those operating in niche, innovative areas. Not so much for those in general practice.

9. **Prospects for the long-term future (more than 10 years).**

Innovation must be supported to secure long term prospects. Plenty of opportunity in off shore sector, the ability of SMEs to continue to grow, adapt, collaborate & innovate will determine long term success.

Bretagne Region, France

To give some perspectives of the shipbuilding and ship repair sector in the Bretagne region the main inputs and conclusions from the combined 5 interviews of Sofresid Engineering, BPN, CMQ, INDMER and IPL are as follows:

1. Definition of the situation in the naval sector in the region.

The economic weight of the maritime sector in Brittany is significant, representing more than 26,000 jobs in more than 215 establishments. It is mainly composed of companies with a workforce corresponding to the definition of SME Europe, i.e. less than 250 employees.

2. Strengths of the sector. Keys to its success.

A know-how recognised for the quality of the productions realized on the building sites, as well as to be able to display an extensive diversity on all the types of ships and in particular with the contribution of the innovations related to the military ships and transposable to the Non-military ships. In addition to the skills held by many companies, they do not hesitate to innovate not only in their production methods (robot use, new materials, etc.) but also in employee training. Port assets are strategic with a large majority of construction and repair shipyards located on the coastline and thus have large industrial assets (wharves, deep-water port, elevators up to 400T, paint cabin area).

3. Weaknesses, difficulties and most relevant problems.

Brittany has more than 215 establishments with an activity in the naval sector, with a high density of small and medium-sized (SME) enterprises, these because of their critical sizes have difficulties to penetrate the markets and in particular the export which requires investments in Human Resources for the commercial but also to obtain the bank guarantees to position themselves competitively.

Brittany shipbuilding, although recognized for the quality of its achievements, struggles to establish itself as a pole of excellence worldwide.

4. Competitiveness level of naval industry companies.

Competitive position on high value-added products, especially gateway equipment and other vessel control and command posts, enables companies to offer sustainable vessels and equipment and to integrate Maintenance in operational condition (MOC).

Several large companies are able to position themselves on the entire begging chain of design, construction, testing, maintenance, After Sale Services by adding the MOC throughout the life of the ship. The shipyards are also able to offer the training of personnel who will take delivery of the boat and this for both civilian and military ships.

5. Importance of R+D+i in the sector and level reached by its companies and surrounding institutions (technology centers, training institutions ...).

- Brittany benefits from numerous research laboratories as well as large schools that have the capacity to test new materials or shell structures, (hull basin.)
- The cluster role such as BPN also favours the development of R&D in companies by bringing together SMEs to form clusters between complementary companies.
- Brittany's naval sector is now opening up to marketing-related activities, particularly digital, for example in less than three years, companies providing enhanced virtual reality services, Big Data

processing, BIM, 3D printing ... have joined BPN bringing new technologies to the heart of business.

6. Qualification and training level of the personnel in the companies. Positive and negative points to highlight.

- Many courses exist in the territory of Brittany from bac -3 to bac +5 (from workers to engineer) and both at the initial level and through the contribution of continuing education organizations, innovative academic training is provided. As an example, the MINM professional license (trades in the naval and maritime industries) Bac +3 level, but also engineering level training (offshore naval platform, maritime project, etc.)
- On the other hand, this very important offer of training is not very legible, which is why for some years the world of academic education has approached industrialists in order to better identify needs and to make training more accessible.

7. Equal opportunities for underrepresented groups (women, people with disabilities, foreigners ...), both in access to the sector and in their working and professional conditions.

- Feminization is not very important, the ship building and repair activity is predominantly male (+ 60%). The trades of the naval sector, suffer from the negative image of the trades of the industry which are marked by a serious hardship with difficult working conditions.
- Nevertheless, a steady increase in the% of women is recorded in schools and training structures, especially at the bac +3 to bac +5 levels.

8. Prospects for the future of the sector in the short/medium term (up to 5 years).

A stable outlook at 3 to 5 years, but the actors in the naval field believe that innovation could allow a development of activity in the medium term, also the renewal of the fishing fleet and the development of supply vessels are driving factors.

9. Prospects for the long-term future (more than 10 years).

The "industrial" innovation applied to propulsion (LNG, hydrogen, electric diesel ...) as well as on materials (composites, resins, specific collages ....) But also in transmission equipment control command, fire safety, cyber security etc. (wireless network, ultrasound ...) are axes that require long development time but which will ultimately ensure a first-rate positioning in the value chain.

Opportunities for Collaboration

It is clear from research on the Maritime sector that collaboration and networking are key if Europe is to compete in the global marketplace of shipbuilding and its ancillary industries. Especially in the context of the fierce competition from China, South Korea and Japan.

Maritime clusters of substance which can bring together as Ludwig and Tholen (2006) suggest a closer vertical relationship among producers and suppliers at a national and transnational level through collaboration and cooperation. Furthermore, horizontal cooperation with universities and research institutions regarding research, development and innovation are also a necessity in the global marketplace.

Furthermore, Parc and Normand (p.77, 2016) align with the thoughts of the European Commission when they insist that "European shipyards should pursue their current forays in 'smart specialisation' by building high value-added ships such as cruise ships, 'green' ships and offshore vessels with sophisticated technology capable of harvesting energy and deep-sea minerals." Focusing on more sophisticated niche markets can focus firms and open the door for collaboration.

It is essential European SMEs in the sector grow in size, innovate in marketing and supply a complete portfolio of technical solutions in all links of the value chain.

Faced with the challenge of international competition, it is intended that SMEs focused on supporting the shipbuilding sector can address high value specialised niche markets by forming groups of companies. This provides a solid ground and context on which the CONSORTEX project can set up export consortia formed by 6 or more European interregional SMEs specialised in the manufacture of certain built-in packages of naval production (bridge, engine room, accommodation and deck) for certain segments of shipbuilding (e.g. offshore vessels, marine power plants, cruise ships and scientific vessels). These consortia should be able to supply the international market with a more specialised high-tech product from the Asian offering – one which is based on technological advances and innovation. Ultimately CONSORTEX will endeavour to support the improvement of participating firms' market positioning, international sales and help them to sign additional contracts.

Conclusions

Shipbuilding is an essential part of Europe's industrial structure. It consists of shipyards engaging in commercial and naval shipbuilding, the marine equipment industry, the ship repair and conversion sector, as well as a wide range of knowledge providers such as universities, towing tanks, design

offices and classification societies. Combined the sector develops advanced technologies that offer considerable spin-offs to other sectors; it provides essential means of transport for international trade; and it supplies modern navies with technologically advanced vessels, a key requirement for effective military operations.

Whilst globally, the market of shipbuilding and its ancillary industries, is growing and offering market opportunities it is clear that competition is fierce, especially from China, South Korea and Japan. The shift of focus from the West to the East, is challenging Europe's maritime capabilities. Shipping and consequently the building of merchant vessels as well as maritime manufacturing have seen cyclical. The construction of cargo ships has largely shifted to China, Korea and Japan producing four-fifths of the world's vessels.

Shipbuilding is however, still an important part of Europe's strategic economic needs. European production has more recently focused on the production of specialised high-tech ship types. Consequently, European SMEs in the sector need to grow in size, innovate in marketing and supply a complete portfolio of technical solutions in all links of the value chain.

Europe can be proud of its outstanding ability to design, manufacture and build the full range of high-tech vessels and maritime structures which meet the most stringent safety and technical requirements, allowing the continent to engage in global trade, exploit resources and when the necessity has arisen, defend its strategic interests.

Given that shipbuilding is naturally limited to coastal regions with access to deep water, a modern shipbuilding industry depends on an industrial network of companies, often described as a regional cluster. The CONSORTEX project is in an essential position to kick start a supra-regional cluster across Europe's Atlantic Area. The project will set up a minimum of 5 supra-regional export consortia formed by 6 or more European interregional SMEs specialised in the manufacture of certain built-in packages of naval production (bridge, engine room, accommodation and deck) for certain segments of shipbuilding (e.g. offshore vessels, marine power plants, cruise ships and scientific vessels). These consortia will be able to supply the international market with a different product from the Asian offering – one which is based on leading technology. CONSORTEX will endeavour to support the improvement of participating firms' market positioning, international sales and help them to sign additional contracts.

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