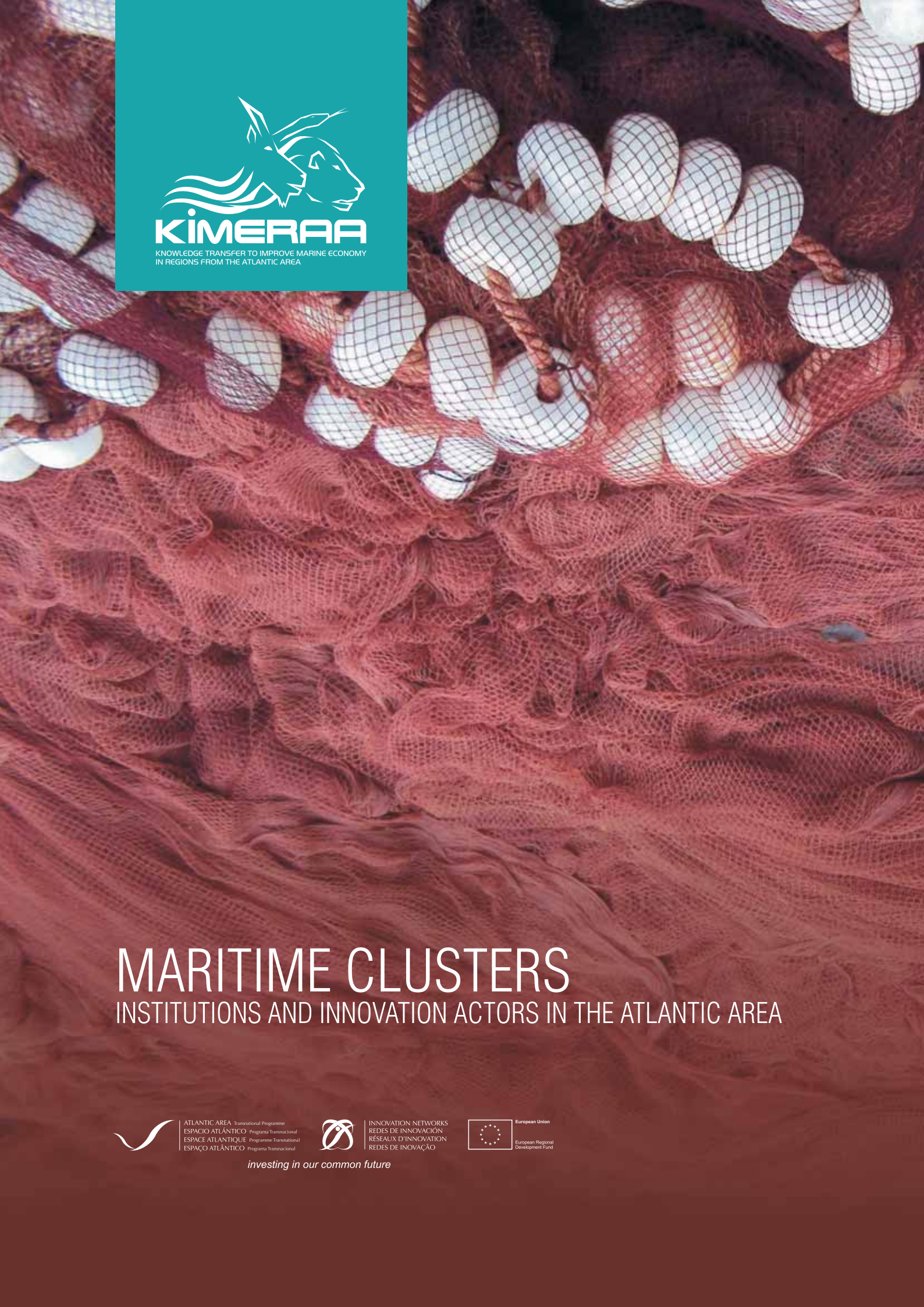

KIMERAA

KNOWLEDGE TRANSFER TO IMPROVE MARINE ECONOMY IN REGIONS FROM THE ATLANTIC AREA

MARITIME CLUSTERS

INSTITUTIONS AND INNOVATION ACTORS IN THE ATLANTIC AREA

ATLANTIC AREA Transnational Programme
ESPACIO ATLÁNTICO Programa Transnacional
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ESPAÇO ATLÂNTICO Programa Transnacional

INNOVATION NETWORKS
REDES DE INNOVACIÓN
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CONTENTS

1. INTRODUCTION

The maritime economy within the Atlantic Area is integral to the livelihoods, food, culture, and identity of the inhabitants of the region. The Atlantic Ocean supports a complex web of onshore and offshore ecosystems which thousands of people rely on for employment, income and food. However, while the Atlantic Area regions are reliant on the ocean for their needs, the offshore ecosystem is largely under researched. Both the socioeconomic significance of the Ocean to the Atlantic Area as well as the growth potential for research based in or around the Ocean need to be researched further to provide an understanding of the tremendous economic opportunities.

The Atlantic Area maritime economies also face considerable challenges on several levels, including: environment, economy, climate change, and many unforeseen aspects associated with these issues. At the regional, national and supranational levels, there is a responsibility to ensure these ecosystems are preserved and valued but also studied to get the most information possible from this resource. The economic value of goods and services provided by coastal and marine living and non-living resources, such as fish, seaweed, beaches, seaports, and shipping lanes, is significant given their contribution to socioeconomic development. Policymakers must seek to provide policy that supports both the protection and development of the ecosystems.

This report, as part of the broader KIMERAA project, provides insight on how the key innovation actors involved in the ecosystems work together within their regions with the long term goal of creating a sustainable network for the entirety of the maritime economy of the Atlantic Area. KIMERAA – Knowledge transfer to Improve Marine Economy in Regions from the Atlantic Area (www.kimeraa.eu) is a European project approved in 2009 by the Atlantic Area Programme, co-financed by the European Regional Development Fund (ERDF). With a partnership that represents four different European countries, this project is being implemented until 2012. The main objective of the KIMERAA project is to build strong linkages between firms and scientific communities, focusing on marine sciences and related activities and contributing to the progress of regional economies in the Atlantic Area.

Within the scope of the project and under the activity “Maritime Clusters: Institutions and Innovation Actors in the Atlantic Area”, the partnership established a methodology, conducted fieldwork and reported their findings according to the threefold main objective:

- Identify the key actors in the partnership region maritime clusters, focusing on Universities, R&D centres, Industry, SMEs, and Government;
- Find out how/if knowledge transfer is facilitated amongst these actors or amongst these actors and actors outside the clusters or outside the region;
- Check to see if the knowledge transfer has lead to collaboration and/or innovation.

This report will consolidate and review the findings from this qualitative study.

1.1. Regional Economics

The KIMERAA partners are located throughout the Atlantic area in: Spain, Ireland, United Kingdom and Portugal. The regions that the partners' are responsible for evaluating for this report are: Huelva (Spain), the Basque Country (Spain), Border, Midland and Western - BMW (Ireland), Wales (United Kingdom), Norte (Portugal) and the Algarve (Portugal). Each region has a unique profile in terms of cluster creation as well as economic indicators. See Table 1.

Table 1: Economic Overview by Partner Region

	Regional Economic Indicators (Current Figures)					
	Population	GDP	Unemployment	Main Sectors	Value of Maritime Economy	Maritime Economy Employment Figures
Huelva	513 403 (2009)	9,3m € (2009)	14 566 (2008) 49 940 (2010)	Agriculture, Industry, Construction, Services	5m € (2009)	11 427 (2007) 30 246 (2010)
Basque Country	2,2m (2008)	65,9m € (2007)	–	Industrial, Petrochemicals, Tourism, Construction	-	-
BMW	1,2m (2007)		12,8% (2010)	Agriculture, Industry, Services	-	-
Wales	3m (2009)	£44,5bn (2009)[1]	85 000 (2008)	Services, Manufacturing, Finance, Health/Education	£6,8b (2008)[1]	169 000 (2008) 92 600 (2010)
Norte	3,7m (2009)	47m € (2008)	8,7% (2008) 478 387	Industries, Motor Vehicle, Agriculture, Construction, Health, Education	-	-
Algarve	458 000 (2010)	16,2m € (2008)	15 076-7% (2008) 28 831-13% (2010)	Construction, Wholesale and retail trade, repair of motor vehicles and motorcycles, Accommodation, restaurants and similar, Financial and insurance	3,19m € (2010)	116 000 (2007) 114 000 (2010)

Source: Own elaboration based on secondary information

The figures found in the first four columns are for the whole of the region and reflect the overall population, GDP, unemployment and main sectors. The remaining columns are specific to the maritime economy (overall) and its impact in the region. There is variation in the population, GDP and valuation of the maritime economy which can be explained by considering the size of the regions, the population density and the output. While the Algarve and Wales are somewhat closely aligned in their maritime employment figures, Wales is several times larger than the Algarve has almost six times the population and is considered a separate nation within the United Kingdom. Beyond these variations, the similarities (2) in the main sectors and unemployment create an interesting view of the Atlantic Area maritime economy.

[1] Regional Gross Value Added (GVA) provides an annual estimate of the value of the economy across the different regions and sub-regions (NUTS II and III areas) of the UK. GVA was previously known as Gross Domestic Product (GDP) at basic prices, but at a regional level in the UK, figures are only produced at basic prices, so GVA is now the term given to the measure of the value of the economy at a regional level.

First, all of the main sectors in the regions are outside of the maritime economy. For the case of Huelva, this is impressive, given the value of the maritime economy to the region. However, there is an industrial presence in each region, with the exception of Wales. While industry may not be a main sector now, Wales used to be a major industrial hub in the UK. This is noticeable in the presence of manufacturing as a main sector. An industrial hub provides the platform for a shipping industry in having the need to ship the items. Second, all of the regions have been negatively affected by the recession which is demonstrated in the increase in unemployment from 2008-2010. This increase is across the entire economy of the region, including the maritime economy. The lack of job creation, coupled with the loss of jobs, could be detrimental to the recovery of the regions. Overall, each of these regions is faced with tumultuous times due to the economy; however, through using the existing infrastructure the future can be secured through evolving the clusters (and, in certain cases regions) and innovating through filling the gaps in knowledge.

This report will continue as follows. The next section will discuss the methodology that was utilised by the partnership to collect the primary data, in the form of semi-structured interviews, for this report. The methodology will also highlight what clusters will be analysed for their knowledge transfer/collaboration capacity in later sections. Following this section, there will be a review of the active maritime sectors in the partners' regions based on the definition set forth in the methodology. This will serve two purposes: to understand the role of the clusters in the region and to make a comparison between the regions. After this, there will be a discussion on the clusters that were identified by the partners to review; one for its growth potential and the other for its socioeconomic significance to the region. This section will focus on highlighting the knowledge transfer efforts within the cluster. The next section will be a review of policy relating to clusters, knowledge transfer, and innovation. Finally, the report will end with concluding remarks regarding the way forward for the maritime economy within the Atlantic Area.

2. METHODOLOGY

To achieve the aims set forth in the introduction, the partnership created a three-phase methodology that would largely focus on qualitative data gathering. The first phase of the methodology revolved around the agreed definition of the maritime sectors as well as the sub-sectors. These are presented in table 2.

Table 2: Initially Agreed definition of maritime sub-sectors

Sector	Sub-sector
Shipping	Waterside port facilities, insurance, transit
Shipbuilding	Supply chain for ship building, health & safety
Marine Equipment	Life-saving equipment, sonars, radars
Seaports	Security, maintenance
Maritime Services	Research, education, logistics, flag registration
Yachtbuilding	Marinas, services
Offshore Services	Wind energy, water energy, oil & gas extraction
Fishing	Sea-based fish-farming, sea-farming
Navy & Coastguard	Military-based protection services
Inland Waterways	Barge companies, maintenance
Dredging & Waterworks	Trade, training
Coastal Tourism	Hotels, restaurants, rides

Source: Adapted from *European Network of Maritime Clusters*, 2006

Based on this list, each partner was expected to choose two sectors that had clusters in their region (first phase). One cluster was expected to exemplify growth potential and the other cluster was expected to exemplify socioeconomic significance to the region. Table 3 displays the choices that each partner made in their regions.

Table 3: Regional Cluster Identification

Maritime Sectors	Huelva	Basque Country	BMW	Wales	Norte	Algarve
Shipping						
Shipbuilding		●				
Marine Equipment						
Seaports						
Maritime Services					●●	●
Yacht Building						
Offshore Services			●●	●●		
Fishing	●●					
Navy/Coastguard						
Inland Waterways						
Dredging&Waterworks						
Coastal Tourism	●	●●		●		●●
Other[2]			●		●	

Legend: ● Growth potential sector; ●● Socioeconomic significance sector to the region

Source: Own elaboration

This table also highlights the gaps in the definition that was originally chosen to define the maritime economy. Table 2 denotes a need for additional sector consideration in the form of marine biotechnology and food-fish processing. These two sectors were added to the definition in table 3.

Although there was some overlap in the regional clusters that were chosen which could be used for comparative purposes, such as coastal tourism, the results varied greatly. In response to this, the partnership agreed that each partner would provide information for their region on all of the sectors listed in the definition. Even if, for example, one partner region did not have an active fishing sector, then that inactivity was also reported. This was a mandatory contribution by each partner to ensure that the maritime economy, as a whole, was researched.

The second phase of the methodology was conducting a secondary source analysis to gain background information on the partners' regions to compose an economic, sociologic, and geographic profile for each partner region. While getting a general idea of these elements at the regional level, this was also the section of the report that discussed the aforementioned sectors and the two clusters that were chosen for their growth potential and socioeconomic significance. Due to this, additional emphasis was paid to the latter to demonstrate why these examples were chosen. Furthermore, policy was also researched and provided, at both the national and regional level, for topics such as: clusters, innovation, knowledge transfer, networking, collaboration and financing.

The third phase of the methodology was semi-structured interviews with the key actors in each partners' relevant clusters. Through the secondary source analysis the key actors in the clusters were identified and the semi-structured interviews built on

[2] Westbic 'other' for socio-economic example is seaweed based products (beauty & cosmetics); Porto 'other' for socio-economic example is fisheries including fish processing.

this analysis by allowing the partners to openly engage with the actors. The interviews were expected to be completed and recorded either in person or over-the-phone. The interview schedules were provided to the partners, each one containing slightly different questions based on what innovation actor was being interviewed: government, university, SME, or large industry.

Each partner was expected to conduct 15 interviews with the key actors in each cluster, making it 30 interviews in all. However, given the time appropriated for this task, it was later decided to reduce the quota to a minimum of 10 interviews with key actors in each cluster, totalling a minimum of 20 interviews overall. Therefore, if each partner provided the minimum amount of interviews, as a partnership we would have 120 interviews as primary data for this study.

In the end the partnership was able to collect 145 interviews of maritime clusters innovation actors.

3. ATLANTIC AREA MARITIME SECTOR ASSESSMENT

The sectors that will be discussed in this section were first outlined in the methodology section. Essentially, each partner was expected to pick two of the sectors (of 14) that were operating at the cluster-level in their region for interviews; however, as not every partner picked the same sector, this section will serve as a sector overview covering all of the sectors first identified in the maritime economy definition. The sectors that were chosen as the cluster example, and were subsequently interviewed, will not be discussed in this section as they will be reviewed and analysed in the next section. As an overview, Table 4 shows the sectors reviewed by each of the partners for their regions.

Table 4: Overview of Active Sectors in Partners' Regions

Active Sectors in Region[3]	Huelva	Basque Country	BMW	Wales	Norte	Algarve
Shipping	X	X		X	X	
Shipbuilding	X	X			X	X
Marine Equipment		X		X	X	X
Seaports	X	X			X	X
Maritime Services	X	X		X	X	X
Yacht Building	X			X		
Offshore Services	X	X	X	X	X	
Fishing	X	X		X	X	X
Navy/Coastguard		X		X		X
Inland Waterways		X		X		
Dredging&Waterworks		X				X
Pharma			X	X		
Coastal Tourism	X	X		X	X	X
Food	X	X	X	X	X	

Source: Own elaboration

[3] Up to and including cluster level

3.1 Shipping

Huelva-Wales-Norte-Basque Country

The shipping sector in Huelva is predominantly used for the movement of both non-renewable and renewable energy as well as sea-based food products. The liquid bulks traffic represents a 76,6% of the total traffic, that was in 2007 21,9 million Tons of mainly: crude oil, natural gas, bio diesel and fuel oil. The general volume of the traffic in Huelva's Port in the balance of the first half of year 2010, shows that this sector is overcoming the impact of the recession, with a 15,16% growth regarding the previous year, an increase of 1 283 414 Tons. Connected to the fishing sector, the shipping sector is used to export fresh and frozen seafood and to receive the seafood fished in the Moroccan coasts due to the favourable location of the fishing enterprises in Huelva's Port, from where the products are sent. Most of these enterprises trade with fresh and frozen fish and shellfish.

In Wales, the main facility dealing with shipping in the South West is the Milford Haven Port Authority (MHPA). While this is the main shipping facility, it also provides the infrastructure for many other industries. In terms of shipping, MHPA controls the port which specialises in importing non-renewable energy in the form of oil and Liquefied Natural Gas (LNG). For the latter, the pipeline then moves the gas across the UK. Potentially, 30% of the UK's gas requirements can now be processed through the Port. With 25% of the UK's petrol and diesel provisions already being handled on the Waterway, Milford Haven is soon to become the new energy capital of the UK.

For Northern Portugal, the Norte region, seaports are located at Leixões (Matosinhos) and Viana do Castelo. The first is one of the most important seaports in Portugal, and presents a workload (concerning handled cargo) 16 times bigger than the latter one, sea trading and handling, 15 million Ton of commodities per year through a traffic of around 3 000 vessels. Concerning ships traffic, this ratio is around 10/1 (calculated based on annual average values between 1998 and 2005). Leixões seaport is internationally oriented, and the main traffic with the EU is with countries like United Kingdom, Netherlands, Spain and France. Outside de EU, ships traffic is with Egypt, Algiers, Libya and Russia.

APDL (Douro and Leixões Ports Administration) are now promoting a set of very relevant projects for the region: a multifunctional logistics platform was built, south pear and sea cruises terminal are under construction, and the insertion of the port in the Sea Highways of the Atlantic is an objective. These projects reinforce the port position and attractiveness among the international cargo shipping circuits and the international cruises tourism circuits. The latter present high growth potential and APDL expects to dock more than 100 cruise ships within 2 or 3 years, therefore doubling the current figure of around 25 000 passengers received annually. It is possible to verify a significant increase in the ship cruises traffic as well as in the general cargo shipping. This justifies why investments have been made on a multiuse logistics platform and on a cruises terminal constructions. The seaports cargo related operations are assured by long term contracts issued to companies like the navigation agent Garland, the containers handling responsible TCL-Terminal de Contentores de Leixões, SA, the general and bulk cargo handler TCGL – Terminal de Carga Geral e de Graneis de Leixões and the bulk cargo reception and storage responsible company Silos de Leixões, SA.

Finally, the main shipping facility dealing with shipping in the Basque Country is the Port of Bilbao in Biscay. The Port of Bilbao is a real direct communication gateway between Spain and Europe: it is a flexible and dynamic port, capable of receiving any type of vessel and cargo, and with specialized services for all traffics. In addition, its modern electronic platform, e-puertobilbao, is the quickest and most agile way to expedite all cargo management both orderly and efficiently. The container volume was over half a million TEUs (twenty-foot equivalent units) in year 2007. The Port is the 4th busiest port in Spain after Algeciras, Barcelona and Valencia and is Spain's largest. From 1998 to the present, the port's physical capacity has increased dramatically, so this has influenced the increase of traffic in the last years. The port is served by the RENFE railroad, but a new rail connection is needed because the current line is shared by commuter traffic and goes through a densely populated metropolitan area. A high speed connection is being considered, but Spain's current high-speed network does not support goods trafficking.

For the great logistics operators, Bilbao offers facilities with extensive equipment to satisfy the demands of both ro-ro and lo-lo shipments. The Port has 32–metre depths at some points, which allow the greatest vessels to berth: what stands out among its facilities are the 17 km of wharves and the ample cargo storage space housing more than 250 000 m² of covered storage surface, 30 000 m² of bonded warehouses, and 25 300 m² of cold storage. The facilities are located on more than 313 hectares of land surface and almost 1 700 hectares of surfaces in all. There are specialized terminals for the following cargoes and

traffics: general, container, liquid and solid bulks, fruit and vegetable cargo, and motor vehicles. Therefore, the Port of Bilbao's ample maritime services offer facilitates access to the international markets. In order to satisfy user demands, among its facilities the Port offers a bonded warehouse, recognized by the London Metal Exchange which is located at the Reina Victoria Dock at Santurtzi with 11 multipurpose warehouses equipped with the most modern auxiliary machinery. Concerning passenger transport, the Port of Bilbao offers two ferry services to Portsmouth (UK) operated by two companies offering a total of five weekly sailings. Bearing this in mind, together with the growth in cruisers calling at Bilbao in recent years, the Port is aiming at becoming an open door for tourists coming to Spain by sea.

As a side note, this sector is relevant in Algarve, but is associated with inland waterways and coastal tourism.

3.2. Shipbuilding

Norte-Huelva-Basque Country-Algarve

Shipbuilding and repair are significant activities in the North region of Portugal. The Viana do Castelo shipyard (Estaleiros Navais de Viana do Castelo – ENVC) is the most relevant actor in this field. The restructuring and modernisation of this shipyard, due to its' strategic character, both at regional and national level, and due to its role in the reinforcement and structuring of upstream related activities, make it a priority intervention area to the Sea knowledge and Economy cluster. The ENVC, specialized in average size ocean ships (up to 30 000 tdw). Their facilities include a harbour, specific industrial units and a naval engineering projects centre. The most relevant ship work completed thus far have been ferries, touristic ships, chemical cargo ships, military ships and containers cargo ships. A strategic decision has been made in order to position themselves in the medium/high European shipbuilding market, focused on high added value ships (technologically advanced and luxury fittings), such as ferries, ro-pax, luxury mega yachts and small and medium weight military ships. With annual revenue around 100 million Euros, the ENVC involve a significant set of companies at national level, being the majority located in the Norte region. Close cooperation with foreign partners is also established. These shipyards are orientated towards exports, and the major clients are international ship owners from Germany, France, Greece, among others. On the other hand, traditional wooden boats shipyards - that could be considered cultural and historic heritage - are kept alive through the activity of several small handcrafters. This traditional and very specific knowledge can be found at coastal cities such as Vila Nova de Gaia and Vila do Conde. In 2008, and according to available INE statistics, in the naval construction and repair activity there were corresponding to a growth rate of 19,2% relatively to 2007. The recreational and sports boats construction sector is also a field of world acknowledge expertise. Located at the Northwest part of the Norte region, in a sub region called Minho, several companies present growth potential, such as Valian-Brunswick Marine (Spanish and American assets), a company that manufactures recreational and sports boats. The Nelo Company, mentioned under the recreational boating sector, has become a world leader in top performance canoes.

In Huelva there is a very large shipbuilding industry. After the economic shock this activity has decreased considerably which forced many of the enterprises to close down with 40% of the auxiliary industry, and the naval industry in general, not recovering from the crisis. But the auxiliary industry wants to maintain the naval activity in the Port, avoiding the end of the naval industry in Huelva. After the end of the construction of big vessels, these enterprises (different supply chain for shipbuilding enterprises) are trying to organize an investing group to maintain and repair the ships, not ruling out the construction of ships, working with the Huelva shipyard's clients and the big infraestructures we have in this maritime cluster. There are some important enterprises in the province such as: Astilleros Conrado Moreno, Astilleros Lamsur, Astilleros do Carmo, Astilleros Vizmar, and Astilleros Astimar.

The Basque Country has a vast shipbuilding sector steeped in tradition, this is one of the reasons it was chosen as the socioeconomic example to be interviewed for this project.

Finally, the shipbuilding sector in the Algarve has been losing importance over the last decades; however, it is still possible to find around ten shipyards in the Algarve, mostly situated in the municipalities of Lagos and Portimão. There are many more companies engaged in the construction of specific boats parts and others focused on the business of repairing and maintaining boats. It is also important to highlight that these last companies are mostly located close to marinas or ports. In this sector, it is frequent to find stores for the sale or resale of boats or boat equipment.

3.3. Marine Equipment

Wales-Norte-Basque Country-Algarve

As mentioned, the MHPA is the main facilitator within the marine economy in South West Wales providing infrastructure in terms of shipping and general port needs. This also includes dry docks and testing facilities for the marine energy-related firms. Commercially, the Milford Haven Ship Repairers (MHSR) is a specialist and very successful division of the MHPA. It employs a highly skilled labour force, with expertise in management processes and an ethos of providing the highest standards of after-care service, an ongoing programme of investment enables the company to offer a variety of facilities including:

- 19 metres beam Dry Dock - can accommodate vessels up to 140 metres in length and a 19 metre beam;
- Wet berths- wet berths are available within the Docks to accommodate vessels from 90 to 130 metres;
- Pump workshop - the company's machine workshop facility specialises in pump refurbishment and repair as well as machining services. MHSR also has workshops dedicated to pipe work, plate work and engine/machinery;
- Alongside repairs/on-site travelling teams - the company is able to commit a high calibre of skilled personnel to satisfy all contractual requirements, supplemented whenever necessary by exclusive specialist sub-contractors;
- Steel fabrication expertise - as specified by several classification societies, MHSR has the ability to build vessels and barges up to 50 metres. Expertise in steel fabrication also extends to projects of a non-marine nature within both the construction and petrochemical industries.

Milford Haven Ship Repairers has a varied client base which includes some of the most prolific names in the industry. Companies such as James Fisher Everard Limited, Clipper Marine Shipping, Svitzer Marine, The Ministry of Defence, Trinity House and QinetiQ use the facilities and expertise of the company on a regular basis.

For the Norte region, Oceanographic research requires specific underwater vehicles and ICT support technologies. Under the robotics field a high expertise level has been reached through successful ROV (Remotely Operated Vehicles) and AOV (Autonomous Operated Vehicles) development by research centres like LSTS (Systems and Underwater Technologies Laboratory) integrated in the Engineering Faculty of Porto. The research carried out led to a spin-off called OceanScan, a company incubated at the Science and Technology Park of the University of Porto providing oceanographic, environmental and security innovative solutions. OceanScan is developing solutions in collaboration with international partners like NATO, as well as the national Navy. The underwater communication systems are another field of research by this unit.

The Portuguese Group of Maritime Industry in Euskadi (ADIMDE) was founded in the year 1993, with the aim of promoting the maritime activity and culture in Euskadi. ADIMDE comprises more than 160 associates, which includes Merchant and Fisheries Ship-owners, Shipyards, subcontractor Assistant Industry and equipment manufacturers. ADIMDE companies have a high technological value, and are capable of facing any challenge which can appear in a market as demanding as today. The sector companies are investing in research and development and also in the application of new technologies in shipbuilding as well as in the goods that are incorporated in the vessel. Lots of them are an important point of reference at world level, as they design, develop and produce, satisfying the expectations and needs of clients from all over the world. The Basque maritime sector has a great importance in the whole Euskadi economy. The companies of the Basque maritime sector have charged in the year 2008, by means of activities directly related to the maritime sector, 1 500 million Euros and have achieved the employment of 9 100 employees.

Regarding this sector, much of equipment produced in the Algarve is associated with the shipbuilding sector. In this sense, they develop not only specific parts for vessels, but also other equipment considered key for navigation, such as life-saving equipment. However, the greatest activity in this sector is more related to the sale and resale of marine equipment, rather than with its production.

3.4. Seaports

Huelva-Norte-Basque Country-Algarve

Huelva's port, which is one of the Spanish ports with the most activity due to its location and trade with Africa, is divided in two: the interior port and the exterior ports. The former is located in the city and has low maritime traffic, mainly related to fishing, paper paste and copper. It actually collects millions of Euros monthly in the trade of fish, shellfish and molluscs, and has refrigerators and ice factories to preserve the products, beside the shipbuilding offices. The Seaport also has a tourist aspect. In the summer months, tourists can visit Punta Umbría beach on the tourist ship.

On the other hand the exterior port is more provincial and is located in the industry area. They had 6 moles like the Torre Arenilla oil mole, the Levante mole or the Juan Gonzalo engineer mole which are leaders in the movement of solid and liquid bulks. The general volume of the traffic in the Huelva's Port in the balance for the first half of the year 2010, show a 15,16% growth regarding the previous year, 8 465 712 Ton to 9 749 126 Ton, an increase of 1 283 414 Ton. The liquid bulks traffic (7 467 139 Ton) represents a 76,6% of the total traffic, 15,74% more (1 015 534) Ton than the previous year (2009).

The Port of Huelva enjoys a privileged position to face the new challenges of growth and to ensure the sustainable development of the port activity as well as its positive influence in the local and regional economic activity related to the port. It is assumed that the Port of Huelva has one of the most advantageous strategic positions in the Spanish Port System. After going through a serious crisis in the port market, the year 2010 ended up with an economic recovery of the ports, with a special positive performance in freight traffic in Huelva. This situation is the result of the efforts made by the users and clients, by the Enterprises, Administrations and Organizations they work with, by the Port staff and the Loading and Unloading State Company, and the Port Authority of Huelva. The port faces a new era at the Port Authority of Huelva, with a new Law of Ports which seeks a greater competitiveness and autonomy of the ports.

As mentioned before (Shipping section), the Norte region seaports are located at Leixões (Matosinhos) and Viana do Castelo. The most handled cargo types at Leixões seaport are the liquid bulks followed by shipping containers. As historic record, the significant increase on containers handling is revealed when comparing the 2 680 Tons in 2001 with 3 866 Tons in 2006. This represents, for this period only, an increase of 35%. The Viana do Castelo Seaport, although smaller, is nowadays expanding, mainly due to the development of the wind energy sector. The main player in this sector and in the region is Enercon manufacturer, exporting a large part of its production.

Bilbao, in the Basque Country, is one of the seven major seaports in Spain. The importance of this Port is measured with regard to its traffic figures and its physical dimensions. However, without any doubt at all, the impact of the Port of Bilbao goes beyond such means of measurement, because, due to its existence and development, the Port is capable of generating a high beneficial effect on the regional economy. Apart from the port industry by definition, the Port of Bilbao, is a driver for the development of other auxiliary sectors It has a perfectly automated perishables terminal, the Bilbao Atlantic Fruit Terminal, that incorporates a tracing system for its pallets and that offers the possibility to import products from China and South Africa directly, due to its excellent links with ports form these countries. Estimated traffic for this terminal is about 12 000 pallets a year. The multimodal connections linking the Port of Bilbao with the main Spanish and European road and railway networks favour smooth and fast direct freight movements with a hinterland in continuous economic growth, as well as with the dry ports of Azuqueca de Henares, Coslada and Villafría, Burgos.

In the Algarve two commercial ports (Portimão and Faro), four marinas (Lagos, Portimão, Albufeira and Vilamoura), seven leisure ports (Lagoa, Faro, Olhão, Tavira, Vila Real de Santo António and two in Lagos), fifteen harbours or fishing ports and eight fish markets (Baleeira-Sagres, Lagos, Portimão, Quarteira, Olhão, Santa Luzia, Tavira and Vila Real de Santo António) can be found. Over the last decade the Algarve commercial ports have been decreasing in importance in the national trade movements. Nevertheless, there are some regional cases that contradict this trend like the case of the commercial port of Portimão that is responsible for 74% of regional traffic. Portimão also has the only cruise port in the region which is a very important aspect for tourism. Regarding recreational boating, the Algarve offers 41% of the national mooring berths.

3.5. Maritime Services

Huelva-Wales-Norte-Basque Country-Algarve

In Huelva there are some Marine Research Centres that are a part of the University and others that are a part of the government or SMEs. Most of the research is connected to seafood breeding as well as seaweeds that are studied to produce bio diesel. In the University there are many groups who research in marine science:

- ALGATECH: Seaweed Biochemical and Biotechnology research group, created in 1994, researches algae and organizes other academic activities. Some of the research is on the bioproduction of biomolecules with antioxidant activity using microalgae, cyanobacterias' toxic fluorescences and the criteria of ecological quality of the water of supplying reservoirs for human consumption, the effect on the route of assimilation of nitrogen and sulphur inorganic in microalgae. (http://www.uhu.es/algatech/)

- IDL - Local Development Institute Research Group: a research group focusing on the local development and it works in tourism with a special research line that started in 1998, and makes some research and concrete activities in fishing. (http://www.uhu.es/idl/)

- MEMPES - Econometric and Mathematical Modelling of Fisheries: This economic research group works in the statistics of the fishing sector. They have had research on topics such as multiple objectives in the management of EU Fisheries (MOFISH), Technical Efficiency in EU Fisheries: Implications for monitoring and management through effort control (TEMEC), Development of a Statistics Informational System for Fisheries in Andalusia (SIEP), Socio-Economic Regulation of shellfishing in Huelva. Production and Commercialization, Andalucian Fishing Production Statistics (1985-1999), Data on economic performance of fisheries sector, Commercial Viability Study of a Distribution Center of Fishing Products, Bioeconomic Analysis of Andalucian Fisheries, Regional Socio Economics Studies on Employment and the Level of Dependency on Fishing, Management Policies for Small-scale Fisheries, Analysis of the effects of the Economic Activity of the Port of Huelva – Spain. (http://www.uhu.es/mempes_aea/)

- GEIDETUR – Generando Conocimiento Científico, Innovando para los Agentes Sociales, Desarrollando el Turismo: constituted in 2004, integrates and systematizes the dispersed research efforts that are occurring in the region in the field of tourist management. Firms have already arisen in the Department of Business Administration and Marketing at Huelva University, due to the implantation of the Tourism degree and the growth that the tourist sector is experiencing in the province of Huelva. The different research lines of this group are Environmental management, Development strategies: Internationalization, Knowledge Management, Innovation, Corporate Social Responsibility, Entrepreneurship and Social Economy, Human Resources Management, Family business and Industrial Tourism (mining tourism, wine tourism, company visits in general). (http://www.uhu.es/GEIDETUR/)

The University also has a research centre related to the marine activities:

- CIECEM - International Centre for Ecological and Environmental Research and Conventions: It is an International Centre for Ecological and Environmental Research and Conventions, placed in the Area of the Doñana Natural Park (in the Dune Park, Matalascañas). This Centre, created in 2001, works to research, spread and promote the education and the knowledge in relation to the Aquatic biology, the Biomass, and the Quality of the Air. CIECEM is a centre of the Andalusia Research Plan attaches to the University of Huelva and provide services to the scientific community involved in environmental research and development. (http://www.ciecem.uhu.es/)

There are also other research and education centres in the region where marine research is being conducted:

- Reception and Documentation Centre in the Huelva's Port: This Education Centre organizes guided tourist visits and it is the scenario to different meetings, workshops, courses, expositions, conferences, among others, always related to the Port Community. (http://www.puertohuelva.com/)

- Fishing and Agrarian Research and Education Centre in Huelva, Aguas del Pino: The main aim of this centre is to contribute to the modernization and improvement of the competitiveness of the sectors fishing and aquaculture in Andalusia. Moreover this centre works in relation to the Marine resources and oceanographic coastal processes (his aim is to know the oceanographic dynamics and of the marine populations, in order to improve the management of the natural populations) and in the determination of the quality of the waters, in order to realize the follow-up of the quality of the water used in the activities of the centre. This centre is connected to the University of Huelva through the researchers and the research groups.(http://www.juntadeandalucia.es/agriculturaypesca/ifapa/web?ec=huelva/)

- CIT-GARUM Technology Research Centre in the Fishing Sector: this is a private-public Enterprise Research Centre in Isla Cristina, Huelva. It's a Fishing Innovation and Technology Centre and works in fishing products. It has different areas related to the food, the Environment and the Marine Resources, the Research in Enterprising Strategies and the Technology Transfer. (http://www.citgarum.com/)

Also, in relation to education, there is in the University of Huelva the "Huelva's Port External Chair" (http://uhu.es/catedrapuertohuelva/), which is organized by the University and the Port Authority, and the CEPSA and University of Huelva research, named "Cepsa Chair" (http://www.uhu.catedracepsa.es/), in relation to the bio diesel production with micro seaweeds. In this Chair, the researchers look for the way to use the micro seaweeds to obtain useful oils to produce bio diesel.

For the Wales region, the actors listed below are University-based with their research focussed on South West Wales. The Universities involved in the marine economy are: Swansea University, Bangor University, Pembrokeshire College, Cardiff University, Swansea Metropolitan University, and Aberystwyth University. All of these Universities are involved in at least one, if not both, of the research groups (LCRI) Low Carbon Research Institute (Marine Energy Working Group) and Sustainable Expansion of the Applied Coastal and Marine Sectors (SEACAMS) which conduct research on marine energy and the marine environment. On the whole, these consortiums employ approximately 50 people.

The LCRI aims to support the whole energy sector, UK and globally, in developing low carbon generation, storage, distribution and end use technologies. Over £5.1 million has been received from the Higher Education Funding Council for Wales (HEFCW) under the Reconfiguration and Collaboration Fund to develop the LCRI for 5 years from April 2008. It is a consortium of six Welsh universities: Glyndwyr, Aberystwyth, Cardiff, Swansea, Bangor, and Glamorgan. It is lead by Cardiff University's School of Architecture. As the overall emphasis of the LCRI is renewable energy, each partner is involved in a different type of renewable energy. Swansea University is responsible for marine energy and has created the Marine Energy Task Group to address this sector. The task group is a member of the Marine Energy Pembrokeshire (MEP) and is therefore connected with all of those firms; however, it also acts a network for a separate group of key actors in: university (Pembroke College/Swansea Metropolitan), spatial planning (Crown's Estate) and governance. Please see the figure provided in the interview analysis template for further information. While the lead of LCRI is located in South East Wales, due to the partnership with Swansea University and their business outreach goals, they will also be included in this research.

SEACAMS is a new (2010), major £23.6m investment to grow Wales' growing marine sector by increasing collaborative research projects between business and universities. The Centre will be based at Bangor University's and has been given the go-ahead following EU backing of £12.6m from the European Regional Development Fund through Welsh Assembly Government (WAG). The project is led by Bangor University in collaboration with partners at Swansea and Aberystwyth Universities who are also funding the project with further backing from the Countryside Council for Wales. The project will turn cutting edge research ideas into new processes, services and technologies to encourage over 450 businesses to grow, create new high tech jobs and win more global contracts. As part of the project, a new Innovation Centre will be set up at the University's School of Ocean Sciences (SOS) at Menai Bridge, Anglesey. The Centre will provide laboratory and computing facilities for SMEs. SMEs will also have access to the 40 metre SOS research ship Prince Madog to focus studies on tackling the impact of climate change such as coastal erosion, flooding, water quality and offshore energy generation. While the lead of SEACAMS is located in North West Wales, due to the partnership with Swansea University and their business outreach goals, they will also be included in this research.

The Norte region as well as the Algarve, has a vast maritime services cluster, this is one of the reasons it was chosen to be interviewed for this project.

In the Basque Country, the Basque Maritime Forum (BMF) is a non-profit-making organisation, which includes companies, associations, banks, research centres and universities. It was officially recognised as a Priority Cluster by the Basque Government in 1999. The BMF's mission is to represent, defend, consolidate, promote and improve the competitiveness of the companies in the Basque maritime sector by means of the services it offers in line with its Core Strategic Areas (Internationalisation, Technology, Management Excellence, Finance and Taxes, Training and People and Communication, Information and Representation). As a whole, the maritime sector plays a very important role in the economy of the Basque Country, roughly representing 2,5% of its GNP. The turnover of these companies in 2008 was: 1 470 million Euros in those activities directly related to the sector and 2 535 million Euros overall. Regarding employment, the number of workers in the Basque maritime sector showed an increase in the year 2008, with 9 300 more employees working in activities directly related to the sector and 17 900 more overall.

The BMF has consolidated itself as the sector's main reference point within the region and one of the most highly regarded clusters in the sector on a national and international level. The BMF has helped set up the Spanish Maritime Cluster, as well as a significant number of regional clusters, and often works and cooperates with other European organisations on projects that have an international scope.

3.6. Yacht building

Huelva-Wales

For Huelva, marinas and yacht building are becoming very important for the tourism sector, because people are becoming interested in sailing and playing other marine sports. Despites the crisis, these marinas that started with small facilities have had to increase in size to provide space based on the consumer demand. In Huelva's province there are almost 7 ports dedicated to sports - Sanlúcar de Guadiana's Marina, Ayamonte's Marina, Isla Canela's Marina, Isla Cristina's Marina, El Rompido's Marina, Punta Umbría's Marina, the Huelva's Maritime Club and Mazagón's Marina. The Mazagón Marina is close to the Doñana Reserve. The Ayamonte Marina is located in the Guadiana estuary and the Isla Canela Marina is a new marina located in the Light Coast vertex, near the Algarve and the Guadiana River, exactly in the Isla Canela Tourist Centre. The Isla Cristina Marina, the Punta Umbría Marina or the Piedras River Nautical Club are others marinas in the region. These marinas have increased because of the nautical sports that are now very important. In relation to these activities, Huelva has the Royal Huelva's Maritime Club that hosts annual celebrations: the Colombina Nautical Week, the Oceanic Boat Race Huelva-La Gomera Isle, the Doñana Regatta, the Huelva's Bay Winter Regatta and others. Moreover there are some maritime clubs and nautical schools in the region like the International Sail School in El Rompido or in Islantilla, the Maritime Club in Punta Umbría that provide services to the population and to the tourists. There are also other Nautical Schools in coastal towns, enterprises located in Yacht building that organize trips in ships, Sport Fishing, Kitesurf, Windsurf, Catamaran and others.

Alternatively, yacht building is not a significant sector in Wales. However, under the definition, marinas and services are also included which there is a growing industry of in the region. Some of the existing marinas include the Conwy Marina in North West Wales. This is a 500 berth, five 'gold anchor' marine on the Conwy Estuary. Since opening in 1992, it has created high value jobs in specialist marine and engineering skills which provide jobs for 48 full-time equivalent (FTE) employees. Through contracting and tourism, another 22 jobs are provided to the local economy. It is estimated to provide value added £4.6m to the local economy per year. There is also the Deganwy Marina in Conwy which is a 165 berth marina that has received Blue Flag status (one of four in Wales). On the other side of the country, the Penarth marina located on the Penarth side of Cardiff Bay in the capitol, has 350 berths and employs approximately 10 staff. Closer to the South West of Wales, there is the Milford Marine which is located close to the active port. It provides space for 360 berths and is operated by the port. Finally, there is the on-going project of Martello Quays which is a regeneration project that aims to provide a new marina and housing development in Milford Haven.

3.7. Offshore Services

Huelva-Galway-Wales-Norte-Basque Country

The offshore services sector is important in Huelva, as was discussed in the aforementioned shipping section. The most important increase of the port traffic is in the natural gas port, which increased in 331 448 Ton, and the crude oil, which increase in 263 298 Ton, with other products like the produced by Cepsa Química, Fertiberia, ENCE or Tioxide. The total volume of the liquid bulks come from the: crude oil with a 35,97% (2.686.524 Ton), the natural gas, a 28,39 % (2 120 103 Ton), the bio diesel, with 5,31% (396 226 Ton) and the fuel oil, 4,61% (343 902 Ton). Cepsa has two production centres in Palos de la Frontera: "La Rábida" and Ertisa Refinery. This enterprise is one of the most important enterprises in the sector, which employ 2 550 people (2006), the 13,1% of the Huelva's industrial employment (a 1,5% of the provincial total). It concentrates his activity in the crude oil refiner, producing the extend range of the products needed by the society as the gasoline, the diesel, the butane. The Economic Shock has change the economy in Huelva, and the Industrial sector has decreased with a lot of industrial enterprises closing down and increasing unemployment.

Wales and BMW both have vast offshore service sectors, predominantly dealing with renewable energy, this is one of the reasons it was chosen as the growth potential example to be interviewed for this project.

Alternatively, in the Basque Country, the only marine energy which can be harnessed at this time is wave energy. In the field of wave energy, two global "firsts" are being implemented in the Basque Country:

- *Mutriku Wave Energy Plant:* Making use of the construction of a new breakwater at the entrance to the harbour at Mutriku, the plant has been included in the designs to harness wave power using "Oscillating Water Column" (OWC) technology. The plant, which has a capacity of 300 kW from 16 turbo-generator sets, is the first of its kind operating with multiple turbines in the world. It occupies 100 metres of the breakwater and is now close to completion and connection to the power grid.

- *Bimep // Biscay Marine Energy Platform:* The bimep - Biscay Marine Energy Platform - is an ocean infrastructure for off-shore research, demonstration and operation of wave-energy capturing systems.

A wave is the propagation of a disturbance, caused by the transmission of part of the wind's energy to the sea surface. The wind produces not just one wave, but a group of associated waves. The waves may vary in height, direction (waves can come from a range of directions at the same time) and frequency (the length of time between waves). Every hour throughout the day, the buoy measures all the waves passing its mooring point in a half-hour period. To describe this group of waves we use a series of representative parameters. These essentially involve their height (measured in metres between the top and bottom of the wave), period (time in seconds between two consecutive waves) and direction (the mean direction from which the waves come. Wind direction is measured from 0 to 360°, where 0° and 360° are North, 90° is East, 180° is South and 270° is West). These and other parameters all have a physical/mathematical basis which can sometimes be quite complex, related to the statistical and energy description of the mean and maximum values of the waves.

The main parameters used to describe the three most important characteristics of the waves - height, period and direction - are explained in simplified form with relatively simple terminology below, with their main classifications: whether the waves are due to a "wind sea" ((waves caused by local winds in the record period. Wind sea waves tend to be peaked in shape and normally have a relatively shorter period) or "swell" waves (produced a long distance away and propagated to the given position. These waves are more rounded in shape and have a longer period).

The Atlantic Ocean at the Norte region offers immense potential concerning renewable energies production (waves and off-shore wind) through the application of new technologies. Some relevant private initiatives have been taken, such as the Enernova and DST Energias example. Under Enersis initiative in a partnership that included also two main energy players (EDP and EFACEC), a pilot wave energy project called Pelamis was developed and installed 5 km off the Atlantic coastline of northern Portugal (substation at Aguçadoura). One of the objectives of OCEANO XXI Sea cluster promoting association is the promotion of some actors clustering in order to foster a multi-use offshore platform development dynamic.

3.8. Fishing

Huelva-Wales-Norte-Algarve-Basque Country

Huelva has a vast fishing sector that operates at the cluster level. This is one of the reasons it was chosen as one of the clusters operating in the region to be interviewed for this project. Please see the analysis of this research in the next section.

On a smaller level, there are several fish farms in Southwest Wales specialising in Freshwater Fish Farm, Marine Mollusc Farming, and Marine Fish Farming. They employ approximately 150 people and contributed to the estimated £200m that Welsh fisheries as a whole generated to the Welsh economy in 2007.

Alternatively, fisheries are considered as a sector in the Norte region that includes maritime and inland fishing, fish processing and aquaculture. As a sector it employs 7 900 people (*Policy Research Corporation*, 2008). This regional figure represents 24% of the national employment in the sector. The North region accounts for 19% of all the fish unloaded on the national fish market. According to the Statistics Portugal (INE, 2007) enterprises consolidated statistics from 2004 to 2006, there were around 40 companies (including aquaculture and fish processing industrial sectors), employing around 1 700 people. This represented around 30% of the human resources in these sectors.

Sea fishing activities represented a transitioned source value of 254,8 million Euros in 2009, and have been continuously declining since 2003. The Norte region example shows how the fishing activity has been neglected and only recently it has been intervened under the new development paradigm: sustainability. An example of this approach are the GACs (Coastal Action Groups), innovative support instruments of the fisheries operational program called PROMAR and oriented towards local fishing areas sustainable development. Efforts are being made in order to value fish, food and other coastal resources, therefore benefiting those communities.

The fishing sector has been facing severe restrictions for the past years. These restrictions include the need to limit the fish capture techniques and the fish stock sustainability. As an evidence reflecting that dynamic, fishermen jobs (excluding inland waterways) have been decreasing since 2003 at an annual average rate of 5,2%. According to INE regional balance, people employed in the fishing sector accounted for 3 628 in 2006, representing 23,9% at national level. In spite of this trend, an inversion was observed on 2007 and fishermen number growth is happening at an increasing rate between 3 and 6%. In 2009 there were 3 815 fishermen registered at Norte, increasing its national weight up to 24,8%. The Norte region registered, in 2007, 31 300 Tons of fresh, refrigerated and frozen fish download at the lota (a local fish harbour that daily register all the fish downloaded). This quantity is valued around 34,69 million Euros and represents around 19% of all the fish downloaded at the Portuguese fish harbours (DocaPesca data). Concerning the fishing fleet, the Norte region had 1 368 boats, with a global capacity of 21 737 GT and a global power of 82 318 Kw in 31/12/2009 (19,5% of national total). The most representative species captured in of the Norte region fishing areas is the sardine, representing around two thirds of the total quantity (2009 DocaPesca data).

Aquaculture is an activity sector that presents high growth potential in order to overcome the restrictions imposed to guarantee sustainable fishing. Taking into consideration the opening of a very large aquaculture facility installed recently in the Centro region (Mira location), as well as the proximity of a significant world player region in the fish markets – Galiza – an opportunity gap exists: aquaculture support services and products. It is possible to value knowledge in this field of expertise in order to offer high value specialized services and products.

According to the statistical data available, the Norte region presented in 2007 an aquaculture production of 923 Ton. Although this value represents around 2,2 million Euros, only 32 Ton (valued 269 000 Euros) were produced in marine and estuary environment. This production represented 12% of the national total, being almost half of the production in the Algarve region, in Ria Formosa. A brief SWOT analysis to this sector shows that the region benefits from excellent natural conditions for fish production (marine environment quality, estuary and hydrographical basins) and good soil and climate conditions to produce the majority of fish species and some companies exist that are capable of technology incorporation, certified quality production and global market adaptation.

In the Algarve, fishing is one of the region's major economic resources, also providing employment for a large percentage of workers in the region (some estimates point to around 2% of the working population). In addition to this importance, it should be emphasized that the Algarve is one of the regions that contributes more for national catches in the country. Main species captured in the Algarve are mackerel, sardines and octopus, being the captured fish primarily originated from the polyvalent fishing (56,6% of total). The region was in 2007, the second largest Portuguese' fleet and currently contains two of the eight major national ports regarding the amount of fish caught, Olhão and Portimão, and the ports of Olhão and Vila Real de Santo Antonio are the most regional important at economic level. In the last decades we suffered a decline in this sector, regarding not only a decrease in the number of vessels (-62%), as well in the number of registered fishermen (-45%), which ultimately resulted in a reduction of catches (-32%). The Canning Industry, a sector that was traditionally very strong, specially the canned sardines, is re-gaining relevance in the region, being in 2002 accounted for 6% of national production of canned fish. The municipality of Olhão has the largest number of companies in the canning industry. It should be noted also that also Portimão has some tradition is this activity. In 2008 this municipality opened a museum that was created in the building of the old *"Feu Hermanos"* cannery.

Aquaculture and sea-based fish-farming was gaining importance at the regional level over the last decades, even being the region that has been highlighted at national level (responsible for close to half of national production during the last decade). Regional aquaculture is exclusively marine, often resulting from the use of salines. The Ria Formosa area contains the largest number of firms in this sub-sector and produce the greater number of mollusks and fish. Saliniculture is also a very important activity in the Algarve, which rise in 2007 92% of the national production of salt. In addition to the traditional salt, the fleur-de-salt is ranked as one of the bests in the world. With the economic turbulence these sectors heavily felted the crisis and several important companies went bankruptcy.

Fishermen Guilds in the Basque Country (Cofradias) have around one thousand years of tradition. The 14 guilds play a central role in the control of the fishing rights especially in the context of coastal fisheries. They are associations of fishermen and ship owners organized around every harbour in the region and in 2008 they employed 3 226 fishermen.

3.9. Food

Huelva-Border, Midland and Western-Wales-Norte-Basque Country

For Huelva, the canned, salting and smoked fish sector has lead to the creation of factories on our coasts close to the salt makers that provide the necessary preservatives. Actually, there are 27 enterprises located between Huelva and Cádiz. In Huelva, where 37% of the total handmade industries reside, they are specifically in Isla Cristina and Ayamonte. The marsh areas in the region with highly salinized lands, and the Odiel River, a kilometre from Huelva, supply the electrolytic process in the salt mines with salt. In Andalusia there are 186 salt mines operating to produce 420 000 Ton/year, with 30% of the Salt obtained in Spain and mainly in Huelva, Cádiz and Almería, in order of importance. The handmade fishing industries work with canned tuna, bullet tuna, mackerel, sardines, and cephalopods. Despite the economic hardships, Huelva still has very old canning factories that continue to produce and sell their products. The canned fish sector has increased over time with benefits in €, although the quantity of tons decreased between 2006 and 2007, increasing again after this period.

For Ireland, the clean, unpolluted waters around Ireland's 7 500km coastline are rich in aquatic life and form an exceptional environment for seafood. The rough Atlantic waters which shape the Irish coastline are confronted with the warm waters of the Gulf Stream and the cold fresh waters which flow off the Irish bog lands. Over 12 000km² of turf bog is present in Ireland which makes it one of the last remaining ecosystems of this type in Europe.

The Irish seafood sector currently has an annual estimated sales value of 700 million Euros and employs 11 000 people mostly in peripheral coastal communities. While the Irish seafood sector faces major immediate challenges, the potential exists to capitalise on strong demand to increase revenue to 1 billion Euros and employment to 14 000 full-time equivalent jobs by 2020 in sea fisheries and aquaculture, with a 78% increase in aquaculture volume production.

The catching sector consists of pelagic, demersal and shellfish fisheries. The principal growth potential lies in increasing unit value through improved quality, better marketing and additional processing, additional non Irish landings to Ireland and limited development of new species. The aquaculture sector comprises finfish and shellfish farming enterprises. Ireland has an excellent environment for the production of high quality farmed fish and shellfish and it is principally on the basis of quality that the sector can compete successfully[4]. The seafood processing sector in Galway, Mayo and Clare has a turnover of 65 million Euros, a Gross Value Added (GVA) of 3,5 million Euros and employs over 345 people. Similarly, the sea fisheries sector in Galway, Mayo and Clare employs 274 people. Furthermore, the aquaculture sector in Galway, Mayo and Clare has a turnover of 45,7 million Euros a GVA of 27,5 million Euros and currently employs 205 people[5].

In Wales, there are several, small firms that specialise in catching and selling fish. All of the fish-lobster, crab, seabass, eel, scallops, etc.- are locally caught and sold to order by the general public and the local restaurants. There are between 8-10 SMEs in South West Wales with this product which employ approximately 55 people.

Alternatively, this sector has a long tradition in the Norte region. More recently, it has concentrated on the modernisation process oriented towards quality and product certification, thus strengthening its international competitiveness over the years. This sector is mainly an exporting one, focusing on canned tuna (national sales focus) and sardine niches (mostly exportation oriented). The main company in this region is called Ramirez that is also market leader, exporting most of the production. As reference, the North region hosts the National Association of Conserve Industries of Fish (ANICP), clustering companies in the sector.

Available statistical data concerning fish processing and according to INE data (2005) show that the Norte region had 40 companies and 1 714 people working, representing 27% of the companies number and 28% of the people employed at national level in this sector. The turnover for this industry was of 138,53 million Euros, representing 26% of the national total. Framed at national level, only the Centro region presented stronger indicators than the Norte region.

Together with the sherry industry, the fishing process and trade sector is one of the oldest in the Basque country and also one of the most innovative in recent times. Affected by new consumer trends and a greater health concern, companies in this sector have had to seek new forms of marketing and packaging. Thus, there have been salmon-based products and others as original as the "tuna burgers" or "Gula del Norte", and the use of plastic instead of metal traditional preserves.

3.10. Navy & Coastguard

Wales-Basque Country-Algarve

In Wales, there are three Search and Rescue (SAR) stations located throughout the country. In Holyhead, forming part of the North West area and Milford Haven and Swansea in the South West Wales area. The Swansea station hosts the Maritime and Coastguard Agency 24-hour Information line. Because of the additional roles it performs, it has an enhanced SAR complement of 27 people (a standard station has 22 people on the watch complement). In addition the premises house the Regional Operations Manager SAR, the Area Operations Manager SAR, the Rescue Co-ordination Centre Manager, the Regional Business Manager, and the Regional Business Unit.

The Sea Rescue Service at the Basque Country is the result of the cooperation between diferent regional and state institutions. In the Basque Autonomous Comunity, all emergencies are coordinated by SOS Deiak (SOS Calls, in basque), the emergency managing center of the Ministry of Inner Affaires of the Basque Government. SOS Deiak is responsible for all the emergencies at land, inland waters (rivers, lakes, etc), beaches, cliffs and coast. Emergencies at sea are coordinated by the Sociedad Estatal de Salvamento Marítimo (Sasemar), which depends of the Spanish Central Government's Ministry of Public Works, covering high sea and shore. This two bodies are in charge of coordinating the intervention of the different rescue teams taking part on an emergency situation, such as lifeboats, coast guard and aircrafts. On top of this, SOS Deiak does also manage the regional emergency ambulance and firefighter services and police.

[4] Food Harvest 2020 – A Vision for Irish Agri – Food and Fisheries, DAFF, 2010
[5] Statistics on the marine and energy sub sectors in Galway, Mayo and Clare provided by SEMRU

The main group of sea rescue resources in the Basque Country consists on the lifeboats owned and operated by the Red Cross at the stations of Arriluze (Bilbao), Bermeo, Ondarroa, Getaria, Donostia, Pasaia and Hondarribia. Each one of these stations has its own B class (coast and shore rescue) and C class (inland water rescue) lifeboats. Three stations, Getxo, Ondarroa and San Sebastian (Donostia), also have class lifeboats for high sea and shore rescues. Two of these bigger ships have been donated by the Transportation Ministry of the Autonomous Government and apart from the donation of a number of lifeboats, the Basque Government also contributes with help in the form of some funding and rescue equipment. Together with the excellent response given by the volunteer crews, this makes possible for this Spanish region to count with one of the most advanced and efficient sea rescue services of Spain.

The coast guard ships, either from the regional or the state police, do also perform a very important task in a number of rescue operations, offering support to the lifeboats. Both the Spanish Civil Guard (dependent on the Spanish Government) and the Ertzaintza (regional police dependant on the Basque Government) have their own patrol ships capable to intervene in high sea operations. The helicopters of the Basque police, Ertzaintza, are based in the province of Bizkaia. They perform a rapid and effectively on those operations where they are required, including searches, rescues at difficult access areas and support to lifeboats. Sometimes, Sasemar can also bring its own bigger helicopter, with a larger range and capabilities, but less handy at minor scale rescues. This helicopter is based in Gijón (Asturias) and covers the whole North Spanish coast, which implies longer times to respond.

There is also a security-based presence in the Algarve. Maritime Security in the region is in charge of the South Marine Department and the Port Captaincy, the first of which includes the South Regional Maritime Police Command and the ISN (Institute of Shipwreck Rescue). The Algarve has six Port Captaincy (Faro, Lagos, Olhão, Portimão, Tavira and Vila Real de Santo António), four Maritime Delegations (Albufeira, Fuzeta, Quarteira and Sagres) and six ISN stations (Ferragudo, Sagres, Tavira, Fuzeta and Vila Real de Santo António). The assignments of the maritime authority includes the management of the lighthouses (Vila Real de Santo António, Cabo de Santa Maria, Alfanzina, Ponta do Altar, Ponta da Piedade, Cabo São Vicente and Ponta de Sagres); the security and control of shipping; the preservation and protection of the marine environment, natural resources and underwater heritage; the prevention and combat of sea's pollution; the supervision of the economic exploitation of living and non-living resources activities; the safety of life at sea, rescue and assistance to the sea bathers; the civil protection and public health focusing on sea and coastline; the prevention and prosecution of crime and illegal immigration; and security of the coastal zone. The monitoring of the movement of people across the borders (maritime, land or air) in the region is a crucial aspect to Europe because the Algarve is considered often a doorway to Europe from North Africa and South America. SEF (Portuguese Foreigners and Borders Services) aims to control the movement of persons across borders, as well as the stay and activities of foreigners in national territories.

3.11. Inland Waterways

Wales-Basque Country

Milford Haven, the home of the major port in Wales, is the only inland waterway in the South West of Wales. Outside of the port facility, the Milford Haven Waterway is the largest estuary in Wales. Its sheltered, tidal waters are surrounded by a diverse 200 mile coastline providing habitats for an abundance of wildlife. There are many tributaries waiting to be explored, but those not familiar with the area should always be aware of the tidal state when venturing off the main waterway. The Haven is a wetland of international importance and is home to one of the most diverse estuarine communities in the UK. In spring and summer the embankments and rivers provide breeding habitats and crèche sites for a multitude of birds. Wildfowl and wader counts have observed significant numbers of shelduck, teal, widgeon, curlew and redshank, with numbers reaching over 25 000 in winter.

The main port of the Basque Country is Bilbao, as explained in previous chapters, but there is also a significant inland waterway, the Port of Pasaia in the region of Gipuzkoa. It is situated in the estuary of the river Oiartzun, one of the most important waterways of the region. Due to the strong presence of the steel industry in Gipuzkoa, the iron and steel sector has a fundamental role in the trade of goods of the Pasaia Port. A great amount of scrap, necessary as raw material for this kind of industry, is imported by Pasaia, in order to supply the companies of the sector. These goods represent around 36% of the trade

of the Port. In the inland waterway of Pasaia there is also an important presence of: iron and steel products, Cars, coal, other bulk cargo, cereals, wood, paper, paper pulp, etc.

For the Algarve region, the transport by inland waterways is more observed in the municipalities of Faro, Olhão, Tavira and Vila Real de Santo António, largely associated with movements in the Ria Formosa and Guadiana river. Although the transport of goods is significant, the most important in the region is the transportation of passengers, specially made for the islands of these municipalities. The sector is also related with coastal tourism.

3.12. Dredging & Waterworks

Basque Country-Algarve

In the Basque Country, the main sources of this flow are the dredging operations at the ports of Bilbao and Pasajes. Dredged material is usually considered as a hidden flow, as it normally remains outside the economy.

Equally, this sector is relatively small in the Algarve. This type of activity is normally done by Construction companies enrolled in national consortiums. Regional construction companies were one of the sub-groups more affected in the economic crisis. With the costal re-organization in Ria Formosa by POLIS initiative several relevant projects are being implemented.

3.13. Coastal Tourism

Huelva-Wales-Norte-Basque Country-Algarve

The experience in the Norte region will be discussed in this section as Huelva, Wales, Basque Country and Algarve all opted to interview actors within the coastal tourism sector within their individual region for this project. This will be discussed further below in the next section.

Portugal and the Norte region present a well distributed set of infrastructures, although many of the marinas require new support facilities in order increase their attractiveness at the international level. The North region has 4 ocean marinas and a significant number of nautical sports clubs. According to statistics available, with 10 504 registered boat units, it represents 16,6% at national level.

Several investment projects exist in order to foster the North region's activity in this sector. Regional players like "Sport Club do Porto" promote infrastructures in construction and improvement, "Intercéltica" association promote the Atlantic nautical games and the municipalities association CIM-Minho promote the Sea Centre creation project. Recreational boating can benefit from the existence of fibre and steel yachts construction and repair industry, located at Viana do Castelo, as well as some small shipyards dedicated to wooden boats. As a strong success case, the NELO Company located in the Norte region is the largest canoe manufacturer in the world, designing and creating boats for racing.

NEA project, promoted by the Interceltica association and involving other regional actors, did an in depth characterization of this sector in the Norte region and concluded that direct investments in this sector could have high regional development impact. NEA 2 is the continuation of that study, and is still in progress.

In the table below it is possible to see some data on this sector.

Table 5: Recreational Boating Activity Indicators

Indicator	Universe	Turnover (K€)	Employed people	Investment (M€)
Infrastructures	66	860	29	40[6]
Maritime operator and maritime animation companies	96	-	461	3,34
Clubs	78	205	158	5,48
Economic Agents	142	-	194	3 877

Source: Own elaboration based on secondary information (NEA project)

This sector includes the sports and leisure activities and connected services. These activities take place at the Atlantic coastal area, inland waterways and hydrographical bay. Some sports observed include surf, bodyboard, kite surf, sailing, rowing, canoeing and rafting. One of the most significant investments on the marine economy on the North region is the 49,9 million Euros investment in the sea cruises terminal at Leixões Seaport, at Matosinhos city. This investment is expected to bring a big boost on Matosinhos and Porto international tourism.

3.14. Marine Biotechnology

Border, Midland and Western-Wales

The experience in Wales will be discussed in this section as BMW chose to interview innovation actors in their regional marine biotechnology sector for this project.

Due to the large supply, seaweed has been incorporated into Welsh cuisine for decades. At the current time, there are some small firms in West *Wales* that work with seaweed, but not exclusively. In addition, with the widespread support for algae as a bio fuel, Welsh Universities have provided funding for research into its applications. One such example is the Centre for Sustainable Aquaculture Research at Swansea University. They are current researching different methods of extracting oil from the type of algae which grows on ponds (microalgae) and seaweed (macro algae) commonly found on the Welsh coast. This 'algoil' could be an interesting discovery, particularly as major non-renewable industry firms such as Shell and Exxon Mobile also completing research on it; however, there is no collaboration at this time.

[6] Includes Leixões Cruise Terminal

4. MARITIME ECONOMY KNOWLEDGE TRANSFER & COLLABORATION IN ATLANTIC AREA

While all of the active maritime sectors located in the partners' regions have been explained above, this section will focus on two of the sectors that operate at the cluster-level or have the capacity to operate at the cluster-level, in each region. These were identified by each partner as being either socioeconomically significant to the region or having growth potential. The choices made by each partner are identified in table 3 in the methodology section. In addition to highlighting the clusters' role in the region, there will also be a discussion on the knowledge transfer capacity in each cluster, focusing on the key actors, as well as any collaborative efforts. This will include the output of the semi-structured interviews conducted by each partner.

The cluster configuration in each of the partners' regions is different and a point of comparison. For instance, in Western Ireland, there is policy in place to develop a cluster but the development of clusters has been limited. This is vastly different from the Portuguese partners that have top-down approaches, at the national and regional levels, to cluster creation that focuses on the maritime economy. Further contrast can be seen when adding Wales' market-driven clusters to the mix which are not based on policy but demand for the goods they produce. Finally, the Basque Country provides another top-down approach example but at the regional level in an autonomous fashion that is substantially different than the approach taken in Huelva in Southern Spain. The cluster policy and policy in relation to the subjects discussed in this report will be outlined further in the policy section below.

Although coastal areas have traditionally been viewed as being part of the wider environment, there has been an increasing degree of recognition that the coast is not only a complex natural ecosystem, but is also a key provider of a variety of socio-economic functions. These functions vary from the provision of employment, housing and transport opportunities to the enhancement of quality of life through recreational and leisure opportunities. However, no matter what the definition, the significance lies in the ability of these clusters to impact the livelihood of the residents of the region. If the coastal area is considered a rural area, without the fishing or coastal tourism sectors, the residents would have to commute for employment and leisure opportunities. As it is estimated that over 50% of the EU population resides within 50km of the coast, coastal areas are becoming increasingly central to the promotion of sustainable communities within Europe.

In contrast to the established clusters that are vital to the region, there will also be growth potential examples provided. For an example to be socioeconomically significant to the region, there must be some history to the cluster to convince people that it is an established means of employment or social relations. However, the growth potential examples, while they can have a history

and be evolving, are more likely to be more recently organised and have the potential to be economically significant in time. While the former is more likely to be established with a community that surrounds it, the latter is more likely to be more recently formed and have the potential to grow.

In keeping with the categorisation of each cluster as either socioeconomically significant to the region or having growth potential, this section will be structured differently than the previous sections. To do this methodologically, each partner's contribution will be separated based on whether it is for the socioeconomic example or the growth potential example.

4.1. Socioeconomic Examples

4.1.1. Basque Country (Spain)-Shipbuilding

As a whole, the maritime cluster plays a very important role in the economy of the Basque Country, roughly representing 2,5% of its GNP. The turnover of these companies in 2008 was: 1 470 million Euros in those activities directly related to the sector and 2 535 million Euros overall. Regarding employment, the number of workers in the Basque maritime clusters showed an increase in the year 2008, with 9 300 more employees working in activities directly related to the sector and 17 900 more overall. The shipbuilding cluster in the Basque Country has traditionally been a dynamic and competitive sector and one of the mainstays of the economy. It has great importance from both an economic and a social perspective, and also involves other areas including transport, security, research and the environment. In general terms, the Basque Country is affected by local, Spanish and European legislation to promote the development of the sector and to address competitiveness issues. The Annexes section provides an overview of the innovation actors interviewed in this cluster.

Unfortunately, the current situation is becoming worse and new challenges are arising when it comes to the future of shipbuilding. For the case of the Basque Country cluster, this extends beyond the problems created by the recession in terms of lack of job growth and lack of funding and is directly related to competitiveness. The global crisis that started in 2008 has accentuated the economic recession that the shipbuilding sector was suffering due to the introduction in the offer of countries like South Korea and China with an increasing strength and a rapid demand of his ships. Notable for their low prices, they have destabilized the market in their benefit. Generally speaking, taking an in-depth approach to the industry as a whole, one can notice that when it comes to knowledge management or innovation, there is an important gap to be covered and it is a real challenge to address this kind of issues in such traditional sector.

Nevertheless, great efforts are being made by one of the most dynamics clusters of the Basque Country: ADIMDE and the Basque Maritime Forum (BMF). As mentioned before, it was officially recognised as a Priority Cluster by the Basque Government in 1999 and its mission is to represent, defend, consolidate, promote and improve the competitiveness of the companies in the Basque maritime sector by means of the services it offers in line with its Core Strategic Areas (Internationalisation, Technology, Management Excellence, Finance and Taxes, Training and People and Communication, Information and Representation). Most of the interviewees agreed that ADIMDE – BMF is the key innovation actor and knowledge transfer facilitator. BMF organises workshops and work groups to foster cooperation and knowledge sharing among marine industry actors and they provide them with tools to tackle issues that wouldn't be possible to deal with in an individual basis. ADIMDE tries to foster innovation in the marine sector in the Basque Country, for that purpose, they have described different challenges:

- Product Innovation: Shipyards of the Basque Country will have to construct increasingly specialized ships that include advanced equipment. This strategy will need a narrow collaboration between shipyards and companies of capital goods. And these innovations in product will need that the companies of the sector have facilities and infrastructures, owned or shared, capable of giving response to the technological challenges.

- Process Innovation: Shipyards, manufacturers of capital goods and auxiliary industry will have to develop and coordinate a project management increasingly effectively capable of fitting and shortening the delivery times to the maximum. It will need besides the application of technological specific tools of project management.

- Organisational Innovation. The new global competitive context has is featured by an intensive use of technologies of the information and communication and it enhances the idea of competitiveness in cognitive factors (knowledge, creativity, talent, etc.) and not only productive. This new scenario worldwide will require, therefore, a new model of organization of the work in the companies putting the emphasis in aspects like the capacities of the people, the flexibility or the communication.

- Commercial and Marketing Innovation: Shipyards will have to look for opportunities and new market targets to be successful and sustainable in the future, and thus, develop commercial innovative formulas to penetrate to the increasingly complex and competitive markets.

- Finally, the culture of innovation will have to be promoted in the whole productive base of the sector. For that purpose, developing and consolidating a strong innovation culture in companies of the marine sector must be, therefore, one of the axes of the Agenda of Innovation of the Naval Sector 2.0. This interactive and social web tools will be developed in order to help and consolidate the improvement and the efficiency in the transfer of knowledge, as well as of the results of the innovative effort of the companies.

Consequently, the General Direction of the Spanish Industry Department passed the Project CONAVAL in 2008 to develop all necessary actions to define the possibilities of cooperation between shipyards. The participation in this project is interesting for the competitive improvement of the sector and it will be able to be an effective instrument for the commitment of the shipyards and the collaboration among them. The project is divided into different work packages:

- Management: It is considered to be a priority that the sector reaches a level of environmental quality management, prevention of labour risks and implementing research, development and innovation issues according to the established in ISO procedure 9 001, ISO 14 001, OHSAS 18 001 and ISO 166 000, by means of certifications. In addition, the shipyards will implant management and planning tools to make their systems more innovative and workers will receive specific training in this issue.

- Engineering: When developing a new project, the shipyards will assure a certain level of own resources so that they can control the design and the technological developments. They will need to ensure properly during the negotiation of the new contract, the conditions to assure costs, period and quality.

- Supplies: A common purchase platform will be implemented in cooperation. The aim of this platform is to diminish the costs of materials.

- Production: Innovative processes, promoting actions of vertical and horizontal collaboration will be implemented. These processes will include a model of relation with the auxiliary industry to enable narrow coordination and collaboration for the constant improvement of the productivity.

Beyond the knowledge transfer capabilities within the cluster, there is also knowledge transfer occurring between the innovation actors in the cluster and external organisations. The overall aim is still competitiveness; however, given the introduction of University and R&D Centres, lessons learned at the global level can be introduced to problems being faced at the local level. In addition, there is increased representation of the Basque shipbuilding cluster at international events-workshops, trade fairs- including but not limited to: Norshipping, Sinaval – Euroshipping, Offshore Europe, Europort Marine, and the Naval International Meetings (Encuentros Navales Internacionales - ENI) – figure 1.

The aim of many of these events is to promote knowledge transfer and collaboration between members of the cluster and international agents. In addition, collaboration groups about different topics take place between members of the cluster and other external firms:

- “Offshore” group: the aim of this work-group is to work collaboratively and promote the offshore sector in the Basque Country.

- “Military Naval Construction” group: The military naval construction market has been identified as very interesting and with great opportunities for the sector’s companies.

- “Gipuzkoa enterprises” group: Collaborative group developing research projects to expand knowledge of the local shipyards.

Beyond specific engagements, there are measures implemented based on a specific theme of importance to the maritime economy, such as: technology, management, funding and personnel training.

1. Technology. The measures implemented in this central point will enable companies in the shipbuilding sector to:

- Work in innovative projects in collaboration with Research Centers or Universities.
- Integrate ICTs in their productive processes.
- Be aware of the steps taken by the R&D policies in Europe.
- Participate in European platforms for collaboration and technology watch.

These are some examples of the actions carried out in the technology topic where knowledge transfer has occurred between innovation actors and with external collaborations:

- Dynamics and the promotion of technological projects in cooperation with other entities: Universities, Research Centres, Government.
- European and National Technological Platform on the marine sector.
- Analysis and promotion of the technological offer of the naval sector. The aim is to foster cooperation with the technological centres.
- Shipyard and Engineering teamwork: Aims to develop an intelligent fishing ship prototype.
- BCP – Basque Contact Point Waterborne. The objective of the BCP is to promote the participation of shipbuilding firms of the Basque Country in the European R&D strategy.
- Competitive Intelligence System: The aim of this initiative is to foster the competitiveness of the sector. The system provides a search-tool to capture all the relevant information related to market and technology, and delivers it to the enterprises.

2. Excellence in management. The goals pursues in this activity are:

- Increase the number of environmental certification.
- Increase the quality parameters.
- Optimise security in working conditions.

3. Funding and taxes

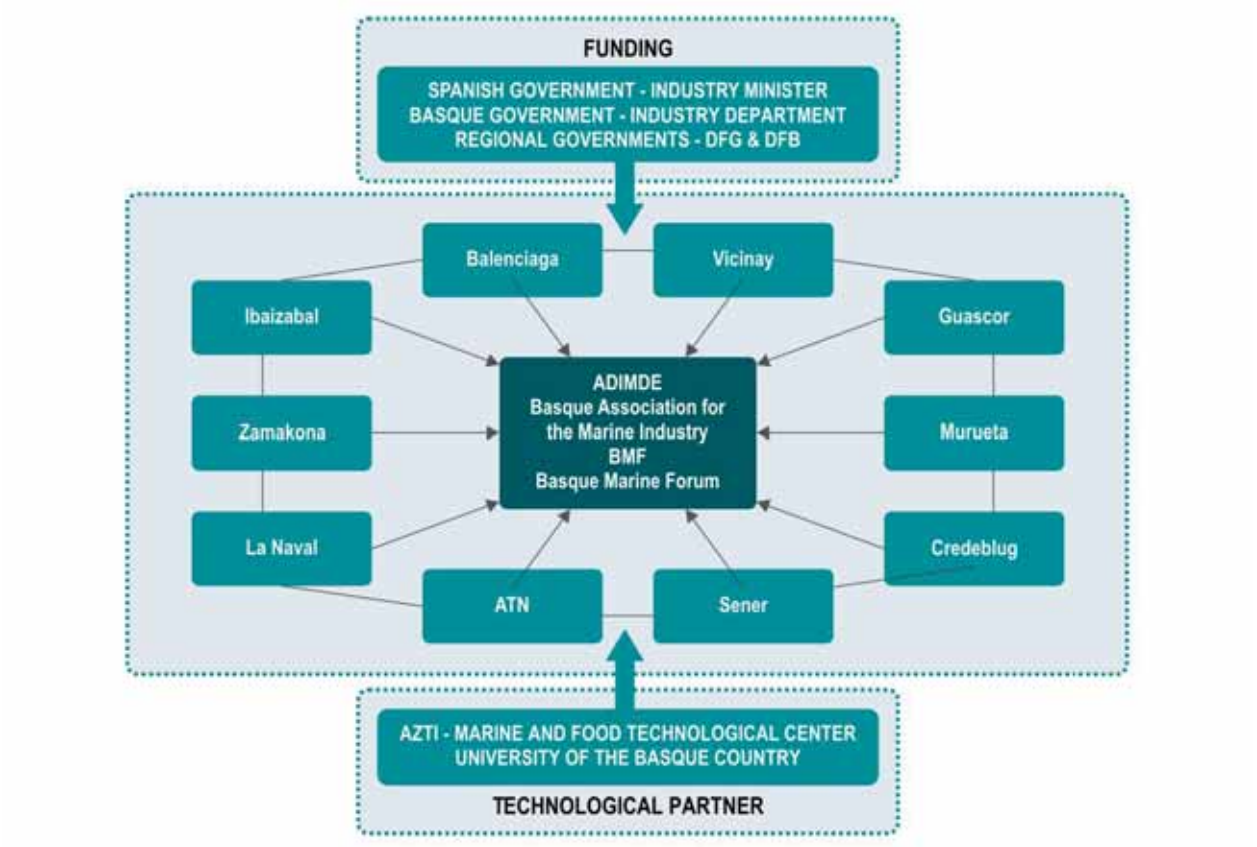
- Adopt measures to valorise new contracts in the Basque shipyards.
- Attract naval firms and shipyards to the Basque Country.

4. Training and persons. Identification and development of projects in this topic will enable to the associated enterprises to:

- Detect the needs and formative profile of the enterprises and design a formative plan to address these needs.
- Train high qualified professionals in the shipbuilding branch.

The practice of taking knowledge transfer to the next step and collaborating is not occurring in the shipbuilding cluster. The Cluster's leader, that is to say, ADIMDE – Basque Marine Forum (BMF), is conducting and promoting the channels for collaboration into the shipbuilding cluster; however, at this stage, there are no solid examples. This may be explored in the future to increase competitiveness and to recover from aforementioned shocks. In addition, the collaboration between the cluster and external organisations is at a minimum, mainly collaboration with the Basque government for funding purposes. This can largely be seen as a recovery mechanism due to the economic crisis.

Figure 1: Innovation Actors in the Shipbuilding Cluster in the Basque Country



Source: Own elaboration

4.1.2. Huelva (Spain)-Coastal Tourism

The most important places to the fishing cluster in the region are also places that are very important to the tourism cluster. They are in locations such as: Matalascañas, Mazagón, Islantilla, La Antilla, and so on. This coastline (more than 120 km of uninterrupted coast) is one of the most attractive tourist destinations in southern Spain, probably because of the weather and the landscape with white sand beaches and green pine forests. The natural beauty of the beaches is one of the reasons to visit them, because they are between nature parks and places like the Doñana National Park, the Odiel and Isla Cristina Marshes, the El Portil Lagoon. The beaches are also combined with the historic and artistic heritage, related to the Nobel award winner Juan Ramón Jiménez, the American Discovery, the English bequest, the Carnival, and The El Rocío pilgrimage. Furthermore, combined with the gastronomy above all fresh fish, Shellfish or the Iberian Ham (cured ham) the beach area is significant to both the residents and the tourists. The tourist infrastructure offer more than 42 000 accommodation posts, with an important leisure or sport supply: golf, sport ports. Yatch buildings and nautical stations. According to the 'Encuesta de Coyuntura Turística de Andalucía – ECTA' made by the IEA (Instituto de Estadística de Andalucía), during 2007, a total of 108 513 travellers stayed overnight in Hotel establishments with a total of 355 718 overnight stays in the city of Huelva.

Tourism is generally in Spain, and in Andalusia, the most important socioeconomic activity because of the incomes and the culture. Huelva was in 2008 the third most visited Andalusian capital in number of overnight stays and Andalusia is the fourth destination in Spain after Cataluña and the Isles. This marine cluster gave to the society since the tourism boom, a new way to live, creating a lot of employment in the Service Sector (mainly in Tourism) a 41,02% of the total. 11 292 people work in the accommodation services (3,74% of the total) and 15 750 people work in the restaurant services (5,20%). Related to the travel agency, there are 529 people who work on that (0,18%).

From the interviews, insight has been gained on knowledge transfer within the cluster, particularly Universities, the Port Authority, and local government. Due to the socioeconomic significance of the cluster to the region, the top-down approach is used making SMEs the benefactors but not largely in a position to have knowledge transfer with those making the policies.

Due to the importance of knowledge transfer at the University-level, the Transfer of Research Results Office (OTRI) was created. The OTRI works to promote knowledge transfer in the University through announcing research and other calls, transferring knowledge through the news in the Research Web, sending e-mails to the researchers, with special actions in the different Research Centres in the University, and making relations with the University in general and with SMEs though the EBT and spin-off bureau. The University of Huelva, through the Research Vice-chancellor, has different projects to create frontier networks, like the KIMERAA project. More specific to coastal tourism, the Local Development Institute Research Group (LDIR) transfers the analysis and the diagnosis of Sun & Beach Tourism Studies, the development of tourist infrastructures and the results of other small studies in fishing and other tourism-related sectors. They work with other innovation actors in the cluster such as: the University, the Regional Ministry (Junta de Andalucía), the Local Authorities and the Private Enterprises. In relation to the Research and Knowledge Transfer the GEIDETUR university research group has different research lines in tourism to improve the economy and the social environment and its aims are to feed the new knowledge in tourist enterprises management and produce results to develop the region, transferring the knowledge. They also organise some seminars, courses and conferences. The University's activities, in general, considering the OTRI and the Research Groups actions could be considered the best practices in research and knowledge transfer at the educational level, although at the government level, the Isla Cristina's Town Council is another best practice in this marine cluster.

At the government-level, the focus is on increasing knowledge transfer that is why all of the actors interviewed in the Government, mentioned the importance of knowledge transfer to science and society. The exception is Huelva's Port Authority who does not engage in knowledge transfer frequently. It is a self-funded organisation which transfers knowledge horizontally. Some of the knowledge is transferred to promote the Port like tourist places, because there are many activities to develop the tourist cruises, and other cultural and tourist activities like this are organized in Huelva's Port Locomotive Garage. In addition, located in one of the most important coastal tourism towns in Huelva, The Ayamonte's Official Chamber of Commerce, Industry and Shipping has different initiatives than the government to promote the knowledge transfer between innovation actors in our region in tourism. The varying initiatives are due to the Chamber belonging to the Andalusia Knowledge Agents System, a Knowledge Transfer Entity. It participates in other Chambers and with the Superior Council of Chambers in a state project called Innovation and Knowledge Transfer Program "Knowledge Fair", with the collaboration of the Science and Innovation Ministry and the European Social Funding. The main knowledge transferred is the general innovation in tourism and the marketing of the tourist products. The way to transfer the knowledge is though pre-agreements and the Chamber try to put in touch the enterprises and other innovation actors like the OTRI's, the Technology Centres, the Research Centres. The Funding come from subventions from the Public National and European Institutions and Organizations.

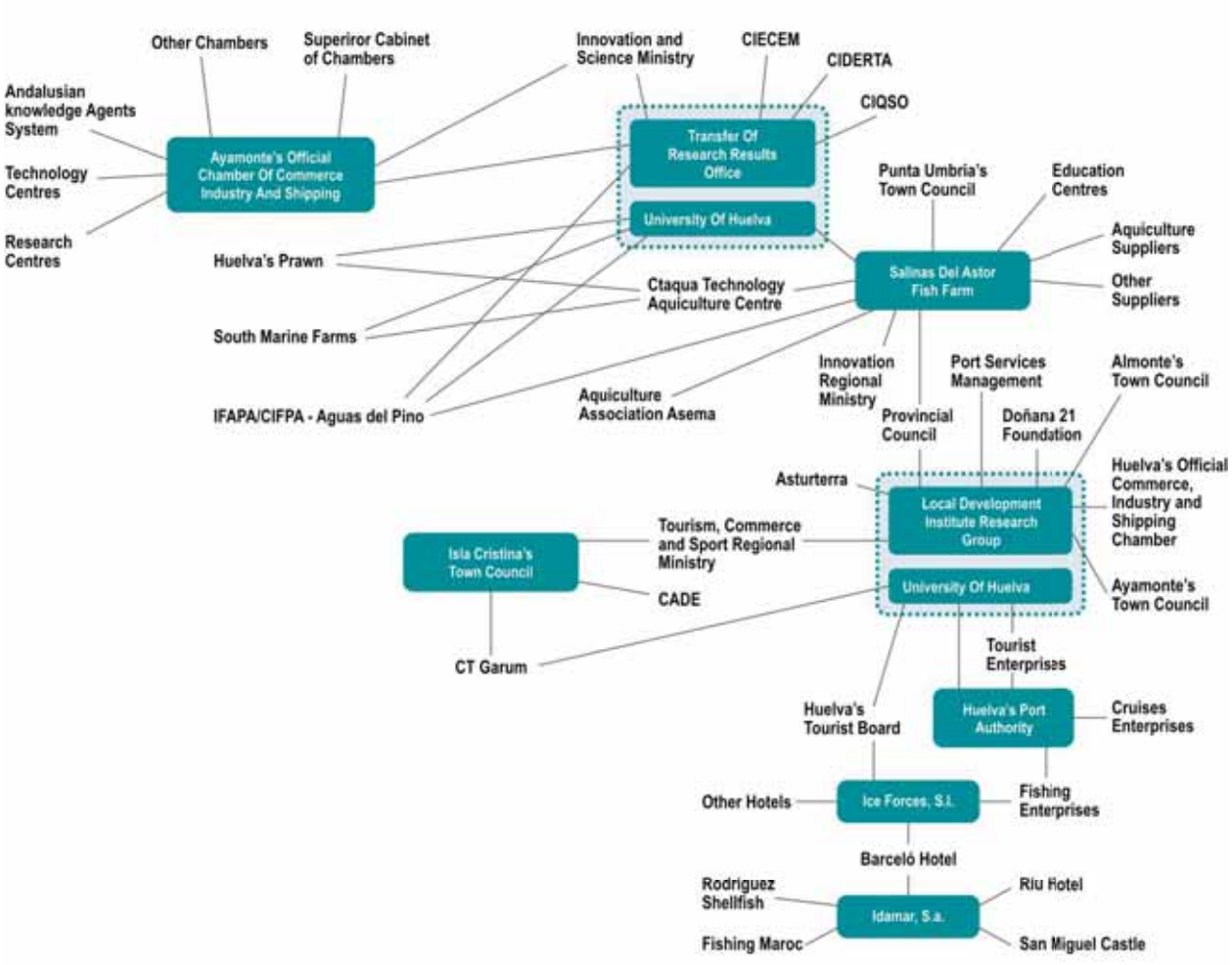
Beyond knowledge transfer, collaboration also occurs both within the coastal tourism cluster in Huelva as well as between the coastal tourism cluster and external actors. For the former case, the local government, the Isla Cristina Town Council, collaborates as an employer in the creation of the CIT-GARUM Technology Centre. This private-public Enterprise Research Centre works specially in fishing researches. This Town Council organizes fairs like FAMAR (the Andalusian Fair of the Sea) collaborating with the Regional Authority (Junta de Andalucía) or other tourist fairs and activities, like Isla Cristina Shellfish Fair. For example in this fair the shock impact has caused the fall of the prices selling very cheap fishing products. The Isla Cristina's Town Council organizes several conferences and other educational actions to transfer the knowledge. It collaborates in the Huelva's Town Council participation in the International Tourism Fair FITUR, which takes place in Madrid each year, where information is sent about each town in Huelva. Knowledge is transferred easily with this organization between innovation actors in marine clusters through the cession of spaces and infrastructures to organize events and provide funding. They produce knowledge transfers through fairs, conferences, educational actions, and support in the creation of R&D+i Centre. They produce coastal tourism activities, like the Carmen's Fair or the Carnival, some punctual publications transferring information about the town, some enterprises, the activities they make, and statistics.

Outside of government-lead collaboration within the cluster, there is The Salinas del Astur Fish Farm which collaborates in the maritime cluster with funding from the European Fish Funding participating in innovation projects in collaboration with the ASEMA Sectorial Association. This Fish Farm has modified this strategy including innovation activities, probably because of the shock impact, and apart from the fishing, they are organising tourist visits and planning the creation of a restaurant in the

facilities, so the tourists could select the fish they want and after that eat them. They are organising as well school visits to transfer the knowledge to the young educational generations.

In addition, the Aquaconsultant aquiculture and services S.L. works collaborating with different actors in the marine cluster as the University of Huelva, Pescaplus, and Aquiculture Producers. Finally, CIT GARUM collaborates with different enterprises like: Unión Salazonera Isleña S.A (Usisa), Innovation and Development Agency in Andalusia (Agencia de Innovación y Desarrollo de Andalucía - IDEA), Isla Cristina Town Council, Public Enterprise to the fishing and agricultural development (Empresa Pública Desarrollo Agrario y Pesquero - DAP) and University of Huelva. There are much inter-cluster collaborations between Fishing and Coastal Tourism Cluster, because Tourism and gastronomy are very connected, and Huelva's gastronomy is based in fishing, and cause, due to the economic crisis, some fishing enterprises are diversifying their activity and working in both sector. For the latter case of external collaboration, this does not occur frequently in the coastal tourism cluster in Huelva. Only the Transfer of Research Results Office (OTRI) and the Salinas del Astur Fish Farm collaborate with actors outside of the marine clusters. The OTRI has the most collaboration activity with actors from outside the coastal tourism cluster (figure 2). The main aim of this transfer of knowledge is to improve the Marine Economy in the different regions in the Atlantic Area, developing excellent economic points with the creation of bridges between the scientific knowledge and the enterprises in relation to the sea. The OTRI is involved in the collaboration through the KIMERAA project with Spanish, Portuguese, Irish and English Universities and other actors.

Figure 2: Innovation Actors in the Fishing Cluster in Huelva



Source: Own elaboration

4.1.3. Border, Midland and Western (Ireland)-Marine Biotechnology & Cosmetics

From the interviews we found that the vast majority of actors contacted for this report are not engaging in knowledge transfer or collaboration of any kind. The information provided below can be viewed as best practice cases for the region in terms of marine biotechnology and cosmetics applications.

UISCE Project - Virtual Aquaculture (GIS modelling application for bay and site specific aquaculture production scenarios) - Anticipating the consequences of Aquaculture

Bord Iascaigh Mhara commissioned a national pilot study from 2006-2008, to develop a desktop computer system to allow end users run aquaculture and water quality scenarios of interest to them. The objectives of the project were to: 1) develop a suite of computer models to facilitate the prediction of different aquacultures and water quality scenarios which could influence the nature and/or scale of shellfish aquaculture activity in a bay area; 2) provide decision support system, based on the suite of computer models, to the aquaculture industry with respect to the best locations and optimal size of shellfish aquaculture sites; 3) provide an information base and liaison facility for industry. The decision support system enables shellfish producers optimize aquaculture operations in a virtual environment by examining different husbandry scenarios without incurring the financial risk such experimentation would incur in real-life. Shellfish producers can use this application to assist in developing site specific husbandry strategies based on the output from the system. The graphical user interface for the decision support system has been developed within a customised GIS environment which facilitates location specific predictions from the suite of computer models and allows for the modelling and reporting on issues surrounding the shellfish aquaculture industry from a 'macro' or bay scale level through to a 'micro' or individual animal level. Project Benefits: The primary deliverable from the project is not a 'once off' report. The resultant desktop application can be used repeatedly by growers and functionality added and refined as required. This system gives growers access to the best science that's out there and the knowledge, in software form, of international experts. The system makes it easier to understand embayment from a food and flow perspective thus allowing growers to move away from 'trial and error' aquaculture. The data generated by this project forms an information base for industry and other state agencies. This data can be built upon and put to a variety of uses. Lessons learned and industry advice which was gleaned during the course of this project has been included in this report.

More specific to cosmetics is the Ri Na Mara firm. It is a commercial producer of seaweed cosmetic products which were established after extensive research in France, Italy and Spain. Research and Development of the products has been done with the expertise and assistance of the Irish Seaweed Centre based in the Martin Ryan Institute at NUI Galway. Other assistance has been provided by Bord Iascaigh Mhara. The company has in effect purchased knowledge and expertise with the assistance of R&D grants and their own resources. In addition, for funding and up skilling, Udaras Na Gaeltachta, provides services and fosters knowledge transfer through networking events. A variety of companies in the marine sector have received support from Udaras. Finally, beyond these specific cases, knowledge transfer occurs in the following manner:

- Attendance at Trade Shows where latest trends and technologies are presented;
- Industry specific magazines and journals inform other actors with a particular interest in the Marine sector;
- Organised lectures and seminars for invited audiences whom the sector seeks to influence e.g. policy makers;
- Commercial transfer of knowledge where external organisations purchase knowledge required;
- Publication of information and data by state agencies e.g. National Parks and Wildlife Services, Fisheries Boards etc;
- Publication of Scientific Papers by Universities on specific areas of research;
- Normal day to day exchange between actors.

4.1.4. Wales (UK)-Coastal Tourism

The actors involved in the coastal tourism cluster in South West Wales are largely SME owners and government that are involved in formal networks in the region (figure 3). There is knowledge transfer occurring but it is not for the purpose of innovation; rather, it is with the aim of conservation and increasing tourist numbers. For the former, the majority of tourists come to West Wales due to the scenic coastline and the natural environment. Understanding their customers' demands, and the significance of the tourism industry to the regional economy, the actors in the cluster are interested in cooperating, with their competitors in some cases, to conserve their environment in order to have a sustainable business based on their natural

surroundings. This is the case for the majority of SMEs and other actors which will be discussed in a large part below. For the latter issue of tourist numbers, while this is important for the livelihood of the SMEs and the region, the knowledge transfer around this topic is predominantly at the government level through strategies, projects, and research. Both Visit Wales (WAG) and Pembrokeshire Coastal Forum (PCF) engage in knowledge transfer for the same purpose- attracting tourists; however, the organisations go about achieving this purpose through different methods which will be the focus of this section. Interestingly, it should be noted that unlike several of the other clusters highlighted in this report, the focus here is not on recovering from a shock as coastal tourism in West Wales is thriving more now that it has in the past few years, largely due to more tourists who are interested in spending less by staying in the UK as opposed to travelling abroad.

The main knowledge transfer (with the conservation aim) is with the PCF. It has over 1 000 members and focuses on conservation efforts to enable and promote sustainable tourism. To accomplish this, PCF started the Outdoor Charter and the Marine Code. As these specialised groups work together for a common goal they will be considered in the collaboration section below. In terms of knowledge transfer, PCF will be further explored here. The role of Visit Wales will also be discussed in terms of knowledge transfer to increase tourist numbers.

The PCF aims to conserve the Pembrokeshire coast line and Pembrokeshire region. It attempts to meet these aims through holding regular meetings with members, engaging stakeholders at all level, and spreading the message about the forum and the conservation efforts. It is currently funded by the following organisations: Milford Haven Port Authority (MHPA), Pembrokeshire Coast National Park Authority, Pembrokeshire County Council, Countryside Council for Wales, Environment Agency Wales, Murco - Milford Haven Refinery, South Hook LNG and RWE power. The dynamic of the founders is interesting given that there is a representation of firms involved in the production of both renewable and non-renewable energy. These points to the efforts of the MHPA, where the non-renewable firms are located, to ensure that conservation is key.

On the other hand, Visit Wales engages in a form of knowledge transfer where the involved parties are loosely connected as arm's length subsidiaries of the Welsh Assembly Government: Visit Wales and Visit Wales' regional representative, the South West Wales Tourism Partnership (SWWTP). Visit Wales is based in Cardiff's city centre. It provides research, reports, and policy recommendations on tourism throughout Wales and authored the Coastal Tourism Strategy in 2008. While the strategy applied to the entirety of the West Wales coastline, the majority of the findings and recommendations equally apply to the South West of Wales. The more up-to-date statistics that are presented in the secondary source section of this report are from the SWWTP research which is more recent.

To implement the strategies in The Coastal Tourism Strategy, the Coastal Tourism Strategy Steering Group was created. Many of the members of this group are also members of the PCF; however, given the policy implementation remit of the steering group, more of the departments within WAG are represented. These departments are formed around the topics of: transportation, strategic regeneration, economic development, social justice, and others. The group meets biannually to discuss potential collaborations to implement the strategy until 2013 and to discuss any issues that have arisen since the strategy was enacted. This steering group is essential and, while interested in conservation, its main goal is to develop the tourism business in Wales.

One issue presented in Visit Wales/WAG's coastal tourism strategy that is of particular interest to the tourism firms in the South West Wales region is seasonality. As described by the SMEs (TYF Interview) and local policymakers based in South West Wales, during the summer months, or the peak season they are at capacity in giving tours, accommodation, etc. However, in the off season, the area is empty. Over the past few years the tourist season has been extending to the point where it is now considered from May until late September but the aim is to have further extension into the winter months. This will add stability to the current economy in the region. SMEs are extending their hours/services, offering winter excursions and special rates. This is also an issue being reviewed by Pembrokeshire County Council and WAG (Visit Wales). According to Visit Wales, one way they are trying to tackle the issue of seasonality is to have week-long activities (possibly festivals) during the offseason to attract tourists to the region for other reasons.

Another issue first addressed in the coastal tourism strategy that should be updated is the potential lack of tourists visiting the South West Wales region for more than a weekend due to the low cost of European air travel for stays of over 3 day. In this case, the recession has actually helped the tourism industry in South West Wales as the tourist numbers have increased over the last two years. This is reinforced by the TYF representatives who explained that the last two years have been record

breaking in terms of filling capacity during the peak season. Going back to the aforementioned issue of seasonality, the next obstacle to overcome is drawing visitors in the off season.

While the PCF is the main facilitator of knowledge transfer between firms in the coastal tourism cluster, there are other examples of knowledge transfer occurring between the firms in the cluster and external firms, particularly relating to cruise tourism and enhancing the links with Ireland. Cruise tourism is a type of tourism that currently brings revenue into South West Wales. While this type of tourism is in its nascent stage in West Wales, several cruise ships have come into the Milford Haven port and it is estimated that each passenger spends £85 and each member of crew spends £55. In terms of costs to employ staff at the port to handle the cruise liner, this task is completed by existing port workers and does not incur an extra fee. Noticing a gap in the market, as many of the tour operators come from England to sell the excursions, it is expected that a new company, based in South West Wales, will spin out soon. Knowledge transfer has occurred between the Milford Haven Port Authority, in charge of cruise tourism, and the University of Glamorgan Wales Transport Centre, on behalf of the Welsh Assembly Government in 2006. The study evaluated developing ports in Wales. Finally, the project 'Pembrokeshire - The Haven: Maximising Maritime Assets and links to Ireland' is being run by the PCF to generate and facilitate ideas and proposals for new delivery activity; identify opportunities to improve or add value to delivery against this agenda, in particular through improved collaboration across the whole of the spatial plan area. Given the early stage of the discussions, this is considered a knowledge transfer opportunity. In the future this could be considered collaboration.

While the last section addressed knowledge transfer outside of the cluster, this section will resume discussion of the PCF in their ability to have a 'collaboration arm' that also focuses on conservation. In addition, the University/government research-based collaboration will also be discussed.

Both of the groups discussed in this section are run through the PCF but instead of an information meeting regarding the general issue of conservation, these groups take their commitment a step further my signing up to actively teach, report, and innovate around the region with the aim of conservation. In this section, the collaboration between actors in the cluster will be discussed.

The POCG is a collection of over 100 outdoor activity businesses, environmental education centres, conservation groups and organisations (including Universities). The majority of members are from local SMEs and local government. The group is working to ensure that adventure activities such as coasteering, kayaking and cliff climbing; do not impact on the environments and wildlife of Pembrokeshire. Activity providers and conservationists meet routinely, and work together to develop adventure activities in a way which is sustainable for the environment. Agreed codes of conduct for activities have been developed, and regular environmental training events are organised for members to raise awareness of the flora, fauna, and natural heritage of Pembrokeshire. The staff at the TYF company explained the importance of being a member of the POCG as they can then relay this information to tourists in a 'play and lean' fashion (TYF Interview, 2010). Members have also agreed to work towards combating climate change by working towards environmental accreditation schemes, recycling, reducing waste and reducing carbon emissions. The members include: the Milford Haven Port Authority, the Countryside Council for Wales, the National Park Authority, Trinity College Carmarthen, Pembrokeshire County Council, Pembrokeshire College, Prince's Trust, and approximately 75 SMEs.

The Marine Code Group, with over 50 members, was developed by local operators and other organisations working closely with the Pembrokeshire Coast National park Authority and the National Trust. These organisations are all concerned about the long-term management of the area and the development of high standards of practice. They recognise that sustainable use must be a key theme in marine recreational activities and education. Most of the Pembrokeshire Coastline is privately owned, and the Marine Code encourages groups to show respect and consideration for the land owners, environment, wildlife and other users. This Marine Code Group represents a commitment by all members to good practice. Everyone who signs up to the Marine Code agrees to conform to appropriate safety legislation. The project aims to develop Marine recreational activities within Pembrokeshire in a sustainable manner. This will be achieved by:

- Training – skippers, crews, user groups and clubs.
- Maintaining & developing Marine Code partnerships - steering committee, ID new centres/providers, monitoring activities and developing database of providers and regular users.
- Publicity and marketing of Marine Code - update and develop literature, web site, presentation and display materials, magazine articles etc.
- Practical projects – development and implementation of Codes of Conduct and of zoning for areas of high sensitivity.

Training events allow skippers and trip leaders to be more environmentally aware of the Pembrokeshire coastline and due to the practical projects, maintain and enhance a quality coastal environment for both visitors and local residents. Again, this works in the same way as the POCG to increase awareness for conservation in the region, which can be passed onto tourists in a 'play and learn' fashion.

As the TYF firm, as well as many other firms, uses the marine area extensively throughout the year, the marine code is important for two main reasons: 1) due to the voluntarily nature of membership, the members are active conservationists which will benefit the overall group more so than a government conservation initiative imposed on the region and 2) as the members of the marine code group are those that are using the area for business, and realising the tourists' desire to see the natural surroundings, they know the area and can make amendments to land use accordingly. The latter point was exemplified by TYF when they said that the marine code group will decide to suspend usage of an area when birds are nesting for the long term benefit.

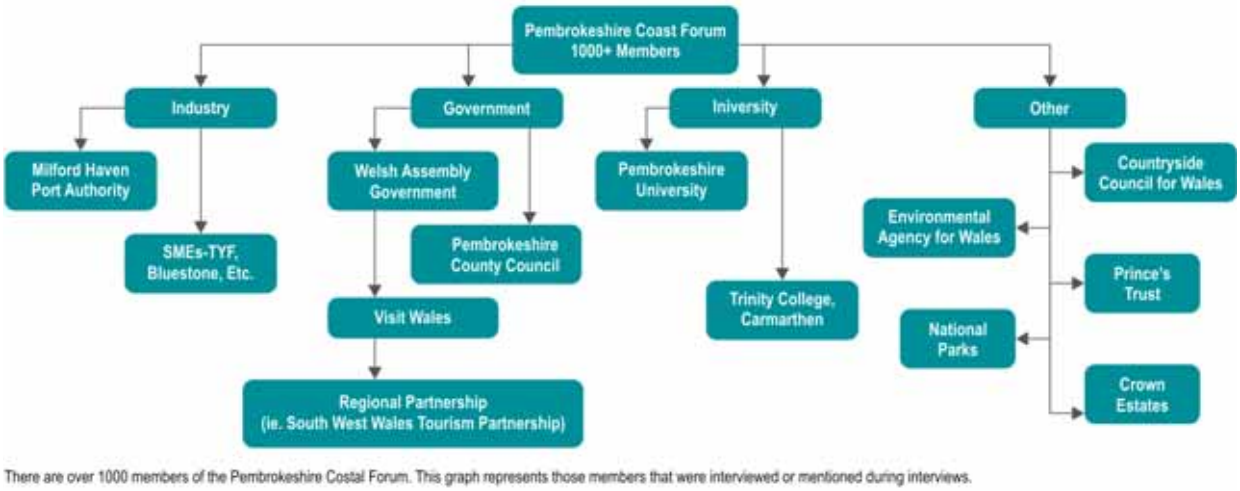
The University/government collaboration occurs between Visit Wales and Universities in the Cardiff area. This collaboration is based on research conducted on a project basis by the Universities for Visit Wales. One recent (2010) research project was completed by the Cardiff University Business School '*Developing the tourism satellite account and impact planning model*. Research and analysis for Visit Wales, Welsh Assembly Government, with C.Jones and A.Roberts'. Another example of the collaboration is between Trinity College Carmarthen's Centre for Outdoor Education Research and Visit Wales.

Collaboration also occurs between cluster members and firms that are external to the coastal tourism cluster. There are three main collaborations that have occurred between firms involved with the coastal tourism cluster and actors outside of the coastal tourism cluster in South West Wales: 1) cruise tourism, 2) the St. David's eco-city initiative and 3) Visit Wales/Sheffield University research project. This will be the focus of this section.

Celtic Wave is an ongoing INTERREG project that aims to raise the profile of the ports in the Irish Sea. The partnership is between ports in: Milford Haven, Dublin, Cork, Waterford, Swansea, and Holyhead. The attraction of the Irish Sea for the cruise operators is the density of ports (6) and the short distance (400 nautical miles). The latter is more important as cruise operators are increasingly concerned with the distance travelled due to the desire to reduce the ecological footprint of the industry and the taxes that are paid on petrol after travelling a certain distance. This is a long-term partnership.

The director of the TYF Adventure firm, which encompasses both an adventure centre focusing on excursions and a sustainable apparel shop, is leading the initiative to make St. David's, located in the northern part of South West Wales, an eco-city. Leading by example, the director has transitioned his firm into a carbon neutral organisation; designed and built an eco-house in the region for his family; and has started two other firms (EcoSapiens & Biomimicry Consultants) devoted to the environment. In terms of the eco-city initiative, the Landscape Art Gallery, Pembrokeshire Coast National Park, PBEsco, and BlueStone all contribute to the aim of the initiative.

Figure 3: Innovation Actors in Coastal Tourism Cluster in Wales



Source: Own elaboration

4.1.5. Norte (Portugal)-Fisheries Including Fish Processing

The knowledge generated around the sea marine sectors and sub-sectors is diverse (figure 4). OCEANOXXI, the Sea Knowledge and Economy association responsible for promoting the Sea Knowledge and Economy cluster, funded by the national Competitiveness Factors Program Compete, plays a vital role on the Knowledge Transfer (KT) process since it acts transversally reaching a large number of organisations, whether inside or outside the marine cluster, thus facilitating the communication and collaboration between the different stakeholders.

According to the interviews conducted, the facilitation of knowledge transfer takes place in different ways, but mostly by promoting new projects with the participation of the cluster associates, establishing cooperation protocols with other entities, providing follow-up to approved projects, providing technical advice about projects framing to adequate public financing programs and helping in the search for suitable solutions providers in response to associates specific technological needs and acting as an interface organism between project promoters and public funding programs managing authorities. Contributions to this knowledge transfer include both the own association communication activities as well as the organization of networking events among associates. An example of such practice is the request from WOW - Walk on Wind, a start-up headed at UPTEC Sea Pole that intended to find a technological partner that could help this company developing a new ship. OCEANO XXI facilitated this contact by matching the request with one of marine cluster's associate, namely INEGI, the Institute of Mechanical Engineering and Industrial Management.

Cluster reinforcement is taking place through major anchor projects – priority investment projects (8 in the cluster, 4 in the Norte region, 4 in the Centro region) and complementary projects (proposed by partners). OCEANOXXI is establishing contacts with other regional maritime representative entities (Lisbon) in order to create stronger partnerships and to strengthen the cluster to be able to propose national interest projects. Such example is the current proposal draft concerning the project conception phase of multi-use off-shore platforms. More than a knowledge transfer example, this could be considered a "co-creation process", demanding a massive commitment among a significant number of partners. Projects followed by this association are funded by national public financing programs such as Compete, regional operational program ON2 (Norte region), regional operational program Mais Centro (Centro region) or through European funds (for example FP7 and INTERREG).

In terms of researching knowledge transfer in the fishing cluster, it was not possible to conduct an interview with the company responsible for managing fish download at harbours DocaPesca; however, it was possible to identify a significant initiative that could bring great value to the fishing activity. It is fish quality and origins certification that can guarantee regional fishing products origin and authenticity. This can contribute to raise value on all the economic activity downstream through the value chain. Ultimately, this can benefit the consumer, helping on a better and informed buying option. In addition, knowledge transfer takes place through national and international collaboration projects. The main areas of focus are fish processing industry technologies, wastewater treatment and fish residues valorisation. Some collaboration is promoted by the canned fish manufactures in partnership with research centres and companies. Funding is obtained through co-promotion project application to regional or national public programs.

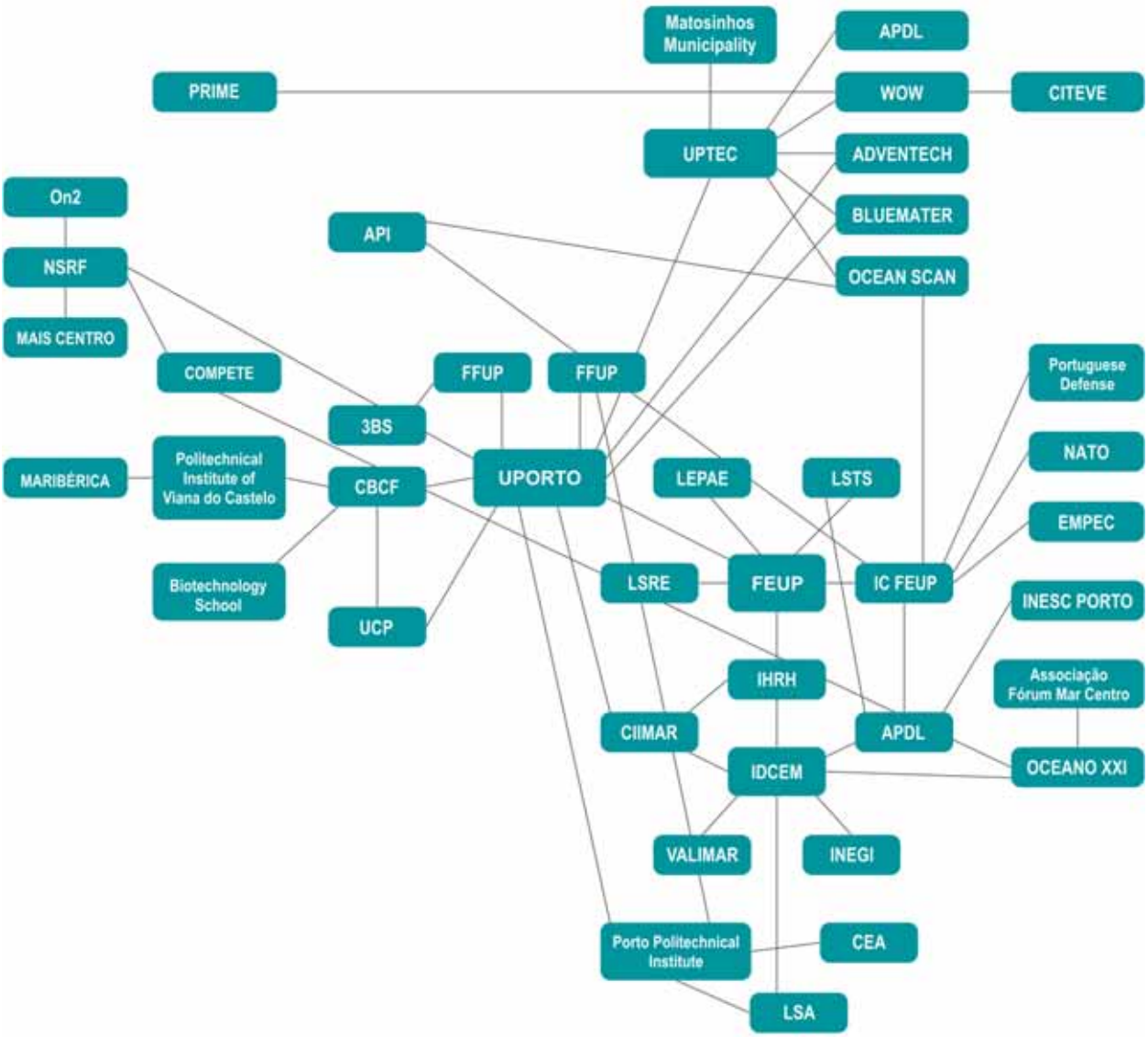
More specifically among the interviewed intermediary fishing associations, the knowledge transferred includes information and support to fishing funds applications and bureaucratic mediation between fishing professionals and involved authorities. The knowledge transfer takes place mainly as information services. An exception to APMSHM, a fishermen's association promoting maritime safety, that joined University of Porto and CITEVE technological centre in order to develop safety equipment for fishing professionals.

ANICP – National association of canned fish manufacturers has partnerships with University of Porto (FEUP) and the Biotechnology School of Universidade Católica Portuguesa. Knowledge is essentially transferred through collaborative projects and IPR eventually generated is negotiated between academic partners and companies. The main knowledge areas focused during these projects are fish processing by products valorisation, new products development and others. Marketing mechanisms such as seminars, internet and mailings are used to disseminate information widely. ANICP includes a technical laboratory called QUALIMAR that works on marine food quality, safety, analysis and innovation. This laboratory is hosted within the IPIMAR (Fishing and Sea Public Research institute), now absorbed by the public research institute INRB. Concerning international collaborations, ANICP collaborates, among others, with Anfaco in Vigo and Santiago Compostela University. Funding is obtained through European projects like FP7, INTERREG, etc. Similar to the knowledge transfer practiced between

entities inside the cluster, knowledge transfer is facilitated through the promotion of projects or establishment of cooperation protocols involving cluster associates and external organisations.

At the inter-cluster level, there is an example of project-based between research labs in the health cluster and the marine area that show opportunities concerning marine species research in order to develop bio engineering solutions. This area shows collaborations among the University of Minho and University of Porto. Considering that one focus sector of the Sea knowledge and economy cluster is fishing, aquaculture and fish processing, seems natural that inter-cluster projects with the Food Industry cluster may be developed. The same principle applies to the energy competitiveness pole and the sea knowledge and economy cluster under the multi-use offshore platform project idea. The transversal role of OCEANOXXI can facilitate all this synergies among innovation actors and new partners. While not definite, this innovation in a third –way, could be a response to increased competitiveness in the individual clusters prompting collaboration.

Figure 4: Innovation Actors in Norte's Maritime Economy



Source: Own elaboration

4.1.6. Algarve (Portugal)-Coastal Tourism

Coastal tourism is the crucial economic activity in the Algarve. This opinion was underlined by all of those interviewed. But the future of coastal tourism requires an integrated management approach because, as stated by a researcher in the area of coastal tourism, *"(...) our coastal activities produce a series of impacts in other activities"* what demands from several entities a significant effort for coordination. Coastline concentrates both population and economic activities where tourism is one example. He continues *"(...) but we need to overcome the limited vision of coastal tourism of one kilometre to the interior. Today people want to go to beach and have dinner in the mountain. That is an advantage of Algarve. It can provide these different products. We need a strategic vision that encompasses within Sea activities more than fisheries, that includes several sectors and other communities."* This researcher also underlined that the constellation of actors creates deficiencies in articulation, management problems, lack of focus in excellence and often a politisation and partidisation of public entities. The ITP [*Instituto de Turismo de Portugal*] has also a very centralized work process in Lisbon that forgets often the specificities of tourism activities.

In addition to the aforementioned issues that are inherent to coastal tourism, there have been a series of shocks to the cluster in recent years due to the recession and its effects on oversees tourist numbers. There was a reduction of national and international tourists. As one of the interviewed economists underlined [EF] *"it is a very small and open economy, the external shocks impact strongly, for the better and for the worse."* Economic turbulence postpones expenses, investments, collaborations. Projects being launched are surrounded by uncertainty, especially those that depend from tourism companies. But JG, the rector of UAlg, gives some incentive "*The economic crisis can be an opportunity. We have the majority of resources. What we lack is coordination of the several sub-activities (...)."*

This is the first example thus far in the report where knowledge transfer has been specifically affected by the economic crisis and has been specifically targeted as an area of improvement to recover from the shock. The economic crisis had a specific impact in knowledge transfer activities. Internally the knowledge transfer office tried to upgrade internal competencies (though advanced studies and training) in KT and was very attentive to financing opportunities in EU. This attention granted to CRIA the participation in more than a dozen EU projects in the KT topic for best-practices exchange creating the financial conditions for the growth of the office and to broaden activities. In parallel the knowledge transfer process is being professionalized, from a more informal support to more structured set of activities. After the revision of the Higher Education Institutions in Portugal in 2007, which gave relevance to third mission activities, 2010 was the year that CRIA was established as a University formal structure, the Entrepreneurship and Technology Transfer Division, giving more stability to human resources and to the organization strategic planning. Externally the crisis has augmented heavily the number of unemployed people that seek support to initiate a business.

In coastal tourism, the promotion of innovation is done mainly in existing firms through collaborative R&D projects focusing mainly the reduction of environmental impacts and energetic rationalization in tourist activities. The regional knowledge transfer office [CRIA] is having an intensive activity in the last years supporting knowledge-based spin-offs related with tourism. In parallel, this office was very active in the creation and development of policies and strategies to induce the development of this cluster in the Algarve.

Industrial property rights have a particular relevance in coastal tourism. It is particularly significant the management of the trademarks. In the coastal tourism activities, trademarks are very important instrument to differentiate products. Local companies like travel agencies or hotels are regular users of GAPI services (unit for promotion of industrial property rights). There are a limited connection between the university and its research centres and the tourism companies. The relation is often demanded by firm-side that looks for support in FEUAlg or ESGHT. The Golf Platform, integrating advanced services in the university to Golf industry, is a good example of what can be done. In general, SV an IPR manager, stresses the very limited knowledge and information about IPR, situation is more worrying among Portuguese people. PB, manager in the intermediate organization EEN, refers that the learning in the sector is mainly based in the recruitment of qualified personnel. Companies' don't have structured connections with knowledge producers. ATA (*Associação de Turismo do Algarve*) tries to make some articulated promotion but in a casuistic way. Sub-products like nautical activities or gastronomy are central but remain unexploited. Economic activities in the protected areas, for example Ria Formosa, need to have more information available about constraints of the activities. PB underlines that coastal tourism needs to be more cooperative, with a less prohibitive and more supportive legal environment, the supply needs to be more innovative, qualified and oriented to new demands, adding value to Sun and Beach.

Regarding the entrepreneurship in the coastal tourism, the researcher JM supported that *"(…) there are several generations of tourism entrepreneurs in the Algarve. We had the ones that were only focused in the summer activities and now we are beginning to have all-year entrepreneurs what requires a more sustainable business model (…) Tourism supply is not improving and lots of marketing in a bad product does not worth it. Algarve is losing ground."* Nevertheless some advanced firms emerged in the last years, integrating "traditional" coastal tourism activities with research and science communication. Regarding the capture of knowledge RB, co-founder of NATURA, one of these companies, commented that "*We work in very specialized areas; for example birdwatching is a world […] we have companies that are only working in birdwatching. To work at the highest level we need to have a person specialized in birdwatching. And here we have a problem, which is the lack of means to access resources, skilled labour and specialized knowledge. Because obviously this is an investment and we have to keep people, we have to capture people and to secure them and to get some attractive environment for them to stay and dedicate themselves to improving this area. Unfortunately we are not yet at that stage."* RB refers to some of the obstacles he felt when trying to collaborate with other actors in the structuring the business. *"[at] this time [is] almost impossible to think of a collaboration with IPTM, the municipalities, CCDR, or the Maritime Museum that belongs to the Navy."* The implementation of the idea coincides with the emergence of bureaucratic obstacles that almost prevent the creation of the company. The help of CRIA and ANJE was crucial to overcome these obstacles. *"Administrative authorizations for the activity were another chapter that gave a lot to do, licensing is basically a matter of culture and education, so the question of authorization is not only related with the fact that there are five different entities involve."* An example *"[in] the captaincy [...] a lady almost slapped me because I said I wanted to sign up as a sailor and because that never had happened before she has started screaming. So there are a number of issues, ignorance and lack of knowledge, lack of trained people, that even the Simplex [administrative simplification program] was implemented, people remained the same and therefore it is difficult to interpret, is difficult to facilitate, it is difficult collaborate with ideas very different from the usual."* The timings were not respected *"(…) counting with the entire maximum legal time to decide and still it gave me more than that, even if I was consulting all entities, and they were all using the last minute to answer, I took more time than was legally possible. This, in my opinion, is no more than a lack of respect and a lack of awareness of what is entrepreneurship, which is to achieve the projects that are somewhat different and who come to bring added value to the region. To these people we must increasingly point the finger and say that they are not playing entirety their role."* The difficulties of funding have been great and only with the financial help of family was possible to finance the investment. Regarding sources of information the first one was a centre of scientific knowledge of marine sciences at the university [CCMAR], which served as basis for recruitment of qualified human resources but also to structure some of the services based in science through cooperation. The second source, once it was necessary to capture the traditional knowledge of the Ria Formosa, were a range of actors that intervened in the Ria and ensured the local acceptance of the entrepreneur activities. This company was from the beginning proactive in seeking to adapt their activities to the fishermen, residents, and the nurseries own lagoon. The systematic cooperation with these actors intended to stabilize the market allowing access to knowledge.

Difficulties are also underlined by other entrepreneur [DM from Ecoceanus]. The major problems faced were related with the legislative framework that creates too demanding and frustrating bureaucratic processes. The difficulty is that often no one knows who is responsible for deciding. *"It is almost impossible be legal in this business*" [maritime tourism]. The relations with these public authorities, like IPTM, that grant the activity licenses are very complex. Other limitation is the definition of the company and the registration process (CAE) that restricts the access to future public incentives if this situation is not fully taken in attention from the very beginning. This particular spin-off had a micro-credit financing approved (20.000 Euros) but was not activated. The family was the main business angel, giving money for cash-flow and renting the boat (a catamaran of DM's father). The proposals to NSRF are difficult in the vision of the entrepreneur because of used notion of internationalization (based in going to fairs). A micro-company lacks specific financing instruments able to support smaller investments (in NSRF the amounts for start-ups are never smaller than 50.000 Euros). In terms of sector contrasts, DM underlines that in coastal tourism the knowledge production and collective learning is dependent in relations between companies, when in marine sciences it relates mainly to scientific capabilities generated in the university. In coastal tourism activities, engaging benchmarking processes with other firms is particularly useful to detect and transfer best-practices. New ICT tools and open innovation practices are very beneficial for tourism SMEs.

Other relevant spin-off operating in this area is Sunquays that develops its activities with respect with the ideas of ecological protection. MG, one of the co-founder states that *"(…) the Natural Park of Ria Formosa is an area of environmental excellence and to underline this aspect is its election as one of the seven Natural Wonders of Portugal [recent national contest]. It is a lagoon system of great sensibility with an internationally recognized ecological relevance, being protected by several policy instruments due to the unique natural characteristics, its localization (…)."* Only preserving the environmental values and sharing

the respect for Nature is possible to conserve this type of areas. For MG eco-tourism is crucial to develop the region without the negative impacts. The environmental education is crucial and it is one of the pillars of Sunquays with the enrolment of schools in this visits. The policy instruments, in particular the financial support of ALGARVE 21, were indispensable to structure and launch the project. Without this program, the concept of Sunquays was not possible to be implemented in the idea of the entrepreneurs.

Beyond the spin-offs, the Sea Cluster itself was formalized at the national level with an initiative from Norte and Centro regions with the support of COMPETE Efficiency collective actions [Knowledge Economy and Sea Cluster]. The Algarve, pushed by the CCDR, is debating the possibility to integrate this cluster. For now it is important to grant the institutional support of regional actors. CCDR has the support of PNRF, Polis Ria Formosa, CMP, CMO, IPTM, IPIMAR and UAlg. In a posterior phase is crucial to include private agents and necessary to create an entity, in the format of a non-profit private association, which is supposed to be the operational unit of the cluster. This association can be the engine for sharing information and cooperating. The participation in this national cluster grants to the promoters of initiatives to NSRF incentives an increase of the co-financing rates.

Another crucial actor in the transfer of knowledge is the Hydrographical Institute that *"it develops often hydrographical studies and that's a plus for safety at sea and to the diffusion of that information by all stakeholders who use it."* In addition, several regional stakeholders are collaborating with the Continental Shelf Expansion team.

In the vision of the industry, the proximity with the other related companies is very important. An example is MarLagos that referred the linkages with the other national marinas, with the national association, and the existence of direct collaborations with the American's and British's marinas associations as very significant to learning and benchmarking. This proximity allows a constant knowledge transfer regarding the marina's management and nautical markets performance. Companies refer that the knowledge transfer is also visible with several other cooperation, for example, with the maritime tourism businesses, like diving or sailing schools. Communication is focused on the development of working strategies and the promotion of tourist packages. This collaboration isn't normally financed and only strategic. Companies also try to collaborate with other institutions, because this connection is seen as really important and should be increased. In the particular case of Marinas, a different problem was identified. In Portugal, there isn't a construction industry of boat parts, which makes the boat's maintenance slow and costly. The external expertise and knowledge is of particular relevance and this sector was indicated of having interest for the region to structure the coastal tourism. AS, a SIPLAB researcher, stressed the importance of this group of activities for the global chain-value and its high added-value. There are possibilities to integrate some accumulated knowledge of the university in this kind of maritime technologies. The revenues of coastal tourism, in particular nautical activities, have an impressive imported component that could be reduced with a segment of service suppliers established in the region.

For the group of spin-offs in coastal tourism, other relevant topic that emerges is science communication. RB, entrepreneur in NATURA, underlines the importance of actively participating in science communication activities: *"These activities are part of our strategy of being near science [...] as a potential source of exploitation of our skills, the organization of activities mainly related to schools, because I believe that the area schools, later or sooner will evolve into something much larger than the current, possibly even with a partnership, because I believe we can move through this stage."* The enrolment of other authorities, like the Ministry of Education, proved to be relevant. Other entrepreneur [DM] underlines the role of international collaborations, for example with research groups, but thinks that there are no relevant differences of these groups with the Portuguese ones. The major distinction is probably the financial capacity to organize field work with several researchers.

Collaboration is occurring both within the cluster and between cluster actors and external actors. The University of Algarve is a crucial entity in regional tourism. The university has an intensive intervention in this sub-sector. Tourism studies are an area of research that is growing. In fact, an ERASMUS MUNDUS doctoral programme is being re-focused in coastal tourism. Regional tourism needs a new paradigm or its product is going to be obsolete very soon. In this way the informed opinions and activities of research units can give some insights for a more sustainable activity.

The relations of University and enterprises are weak in the opinion of several interviewees. There are problems to understand the potential contribution of research, sometimes connected with lack of vision from the private sector. The fact that the decision-centres are not regionally located is also a constraint. It is crucial to need to emphasize the win-win potential of cooperation. Several research centres are being developed. The creation of CITeL is an example, giving coherence to the capacities that were dispersed in the University. The creation of Hospitality and Management Institute (HMI Portugal), in collaboration with ISCTE-IUL and ESTHE, was a recent effort with no evident results. It was aimed to provide advanced training and applied

research to companies. Today it is common in this area the decision-makers, in particular CCDR and the municipalities, contract specific projects to UAlg research groups. The Sea Agenda or the Study of Nautical Tourism (CIITT) are good examples.

UAlg prepares often projects and evaluations to companies, like ANA [airports] or ERTA regarding specific topics of tourism. Another example is the Golf Platform, a non-formal structure that collects the competencies of several research groups to offer an integrated set of advanced services to golf companies and tourism operators. In the last two years the University was approached by many important companies that are willing to advance with a tourism PIN project (*Projecto de Potencial Interesse Nacional*) and require the participation of a regional research unit to grant this statute. Normally this projects don't have any research component nor innovative character – are only real estate that want to continue exploiting from the potentialities of the region.

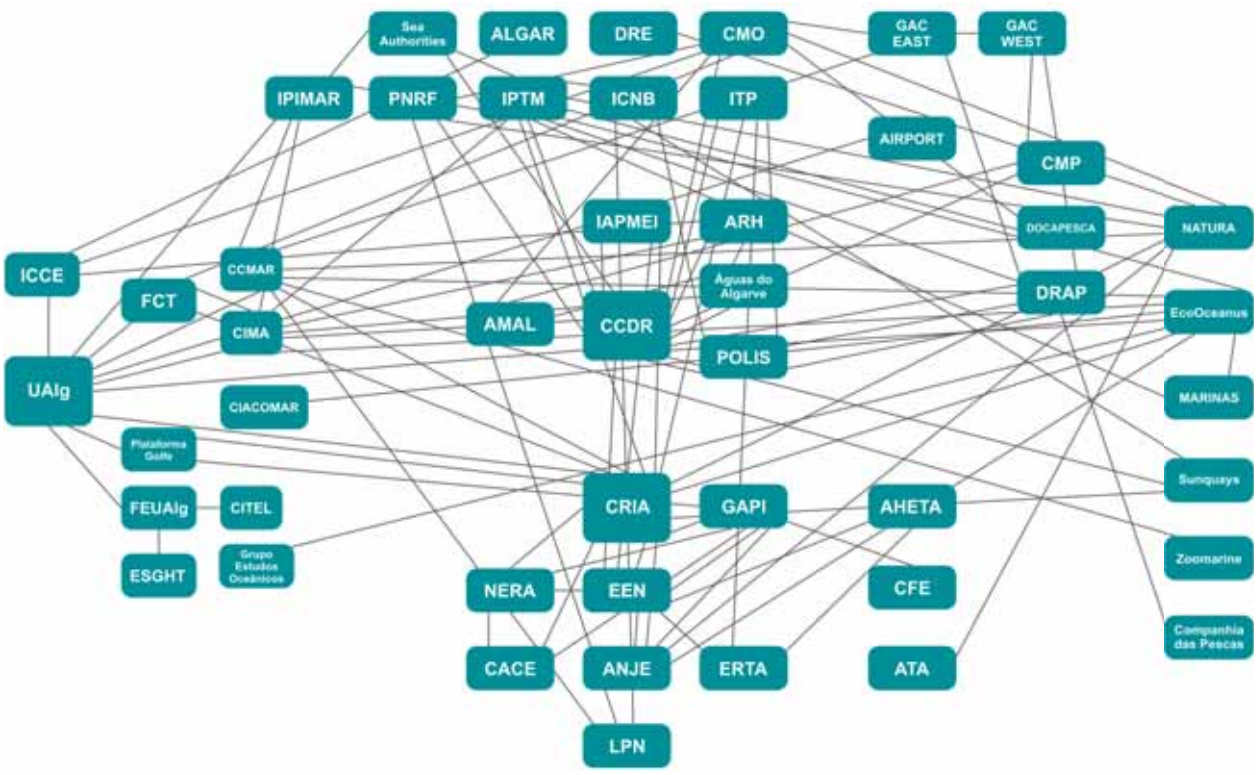
In the opinion of ER, director of FEUAlg, the interaction of university with coastal tourism activities is limited, and it is mainly related with education and training that changed deeply competencies of Algarve institutions and qualification of human resources. Consultancy often concentrated in polytechnic (ESGHT). *"The major contribution that the faculty can give to the sector is producing high quality research to produce knowledge and inform decision-makers. In consolidated areas, like marine sciences, the transfer of R&D results can be more adequate. For now, tourism research needs to improve their quality to achieve global excellence. CRIA, the KTO, has an interesting role in activities related with companies, but more effective in the scientific areas that are more relevant for local companies. Companies do not ask university solutions for their production problems."* There are translation problems but research needs to learn to give protagonist to industry. Portuguese universities often kill the market for research services.

Outside of the cluster, the University is one of the crucial regional actors. It cooperates with several actors that are engaged in the territorial development. It is particularly relevant the recent effort in contracting the Professor Jafar Jafari, highly respected scientist in the field of tourism studies and founding editor of Annals of Tourism Research to instigate the international consolidation of this area of Education and Research in the University. The contributions of Professor Jafari were central with his experience to strengthen the relations of the university with several other universities like the Universidad de Baleares (Spain). In this Spanish region the FEUAlg is trying to understand and benchmark the good-practice that is the case of CIDTUR (www.cidtur.org), a private R&D centre that focus questions demanded by industry at Baleares, a coastal tourism region like the Algarve.

The UAlg is also collaborating closely with UNWTO – United Nations World Tourism Organization. Tourism Portugal [ITP] and the University, together, are hosting the first global conference of the Knowledge network on 1-3 June 2011, designed to disseminate programmes and projects of members, and to serve as a liaison to bilateral and multilateral cooperation organizations and other international big-league players.

Figure 5 represents the innovation actors in the coastal tourism cluster in the Algarve region.

Figure 5: Innovation Actors in the Coastal Tourism Cluster in the Algarve



Source: Own elaboration

4.2. Growth Potential Examples

4.2.1. Basque Country (Spain)-Coastal Tourism

To begin, it should be noted that the Basque Country is examining the coastal tourism in the region at the sector level. The reason it is included in this section of the report is because the sector has the potential to grow in the region, it has increasing economic implications, and, mainly, the tourism actors links with other marine sectors and marine clusters in the Basque Country (figure 6).

Despite the lack of a tourism cluster, there is a Basque Maritime Forum (BMF) committed to the social and economic development of the Basque Country. The BMF was established as a non-profit-making organisation, which includes companies, associations, banks, research centres and universities, in 1993 and was officially recognised as a Priority Cluster by the Basque Government in 1999. The BMF's mission is to represent, defend, consolidate, promote and improve the competitiveness of the companies in the Basque maritime sector by means of the services it offers in line with its Core Strategic Areas (Internationalisation, Technology, Management Excellence, Finance and Taxes, Training and People and Communication, Information and Representation).

Alongside the BMF, the Basque Government wants to boost the development of sustainable and innovative recreation and tourism in the marine environment and the Basque coast. In this sense, departments linked to the coastal departments of the Basque and Regional Governments are coordinating their efforts to guarantee the viability of tourist destinations and to contribute on the subject of infrastructures to the sustainability of the same. It is a question of a convergence of synergies in tourist infrastructure projects and improving the marine way, as well as defining and promoting tourist recreation activities such

as tourist fishing and eco diving in Basque marine reservations and nautical stations on the Basque coast. Tourism based on the sustainability of the coast wants to be promoted, as well as its promotion in international markets.

All the institutions involved are going to work on different levels with regards to the sustainability of the marine sector and coastal tourism. Five actions are expected to be carried out. First, the promotion of large beach regeneration projects, the authorisation of blue flags and Quality Q flags to Basque beaches; the creation of tourist value infrastructures linked to the environment as coastal paths. Second, the incorporation, from 2010, of the information about the quality of the waters to the information about coastal tourist destinations. Third, the inclusion of recreationally sustainable activities such as the observation of aquatic mammals that fulfil the protection requisites established in the current regulation. Fourth, the promotion of an innovative experimental product in the environment of "fishing tourism", to complement and diversify extractive fishing. Finally, the creation of information centres in the marine reservations, promoting the local activities to young people and adults. This last action has already been started.

This wide set of activities aims to make tourist development compatible with the sustainability of the sea and of the coastal development, based on scientific reports originating from public agencies. The actions that were just mentioned involve different strategies regarding knowledge transfer. Depending on the type of action, Basque Tourism institutions / enterprises want to foster, strategies change. As it has been reflected in the interviews, depending on the institution / enterprise, knowledge transfer capacity also changes.

Some of these knowledge transfer strategies among the regional actors belonging to the marine cluster are:

- Dissemination of research results,
- Dynamics of the enterprises added to the BMF in order to make them able the collaboration among them and in this way give answers to their challenges,
- Cooperation with other clusters and association,
- Cooperation with other European clusters,
- Participation in regional and national forums,
- Improve and transfer a modern picture of the maritime sector and the BMF in a regional and national level,
- Boots activities regarding the maritime culture in the Basque Country,
- Reports and analysis of the maritime sector's development in the regional, national and international level.

While there are clearly strategies in place to facilitate knowledge transfer in the growing Basque coastal tourism sector, it is important to highlight that most of the interviewees agreed on the fact that most knowledge transfer and innovation processes are taking place with other external organisations, such as universities, research centres, and not that much within innovation actors of the maritime tourism field.

Tourism is a complex phenomenon that includes an industrial activity along with the production and offer of services provided by semi-public organisations. Airline companies, hoteliers, caterers, leisure industry and entertainment and free-time industries are interdependent when it comes to offering a service-product. This interdependence of the different sub-sectors in the production and also in the achievement of common targets means that tourism must be understood as a functional system, i.e. a set of interrelated items for the achievement of common targets.

According to this situation, the Basque Country is gaining its own name as a quality tourist destination mainly within an urban environment. There is general agreement on the fact that the Basque tourism sector is a strategic sector with a great potential. Nevertheless, due to the fact that new information and communication technologies have just recently been incorporated to tourism management and delivery activities, in general, there is scarce specific information to promote a more competitive tourism sector with the ability to face the new economy and knowledge-based society. In the near future, the situation of tourism in the Basque Country and in Europe will have to undergo a deep transformation. The boost of new products and advanced services and innovations will very likely occur in the field of technological applications.

Innovation and knowledge transfer are seen as two essential factors for the development and maintenance of a more competitive tourism sector, improving its global sustainability. The results of the interviews show that the sector is deeply interested in applying innovation to the aforementioned areas as a way to improve the Basque tourism sector-s competitiveness. Most of the agents have declared that Innovation and knowledge transfer can significantly contribute to the development and support of a more competitive sector, improving its sustainability from environmental, economic and social points of view. The

analysis of the information has allowed to identify that the most urgent needs in terms of innovation to improve the Basque Country's Tourism sector's overall competitiveness is to improve the competitiveness of the destination itself and of each of the sub-sectors. The needs we have identified are the following:

1. Opportunities

- Image of the Basque Country as an innovative country in other sectors to consolidate it as an innovative and technological tourist destination.
- Comprehensive availability of products due to the wide range of resources attractions and experiences in a reduced area.
- Increase of the commercialisation including new products with already consolidated products such as cultural and sports events (film festival, jazz festival, surf, races, rowing, …), gastronomy and wine, etc.
- Visitor's satisfaction as a competitive strength not only focused on the improvement of the industry's professionalism but also to contribute to the pride of the Autonomous Basque Community.
- Interdependence of the tourism industry link to the sea with other sectors forces the leaders of other industrial and service sectors, the government and the community to get involved in its future.

2. Challenges

- Lack of knowledge of the real value of the tourism in economic, social and environmental terms (not to mention marine tourism) by the interviews.
- Lack of cohesion between tourism organisations: the need of a strong voice of the sector that has a negative influence in the positions for the negotiation of the relevant policies.
- The need for modernisation and competitiveness improvement policies in the tourism sector.
- The intellectual capital and scientific production in the field of tourism (in the tourism marine framework above all).
- Lack of a trademark that makes it necessary a bigger commercialisation effort.

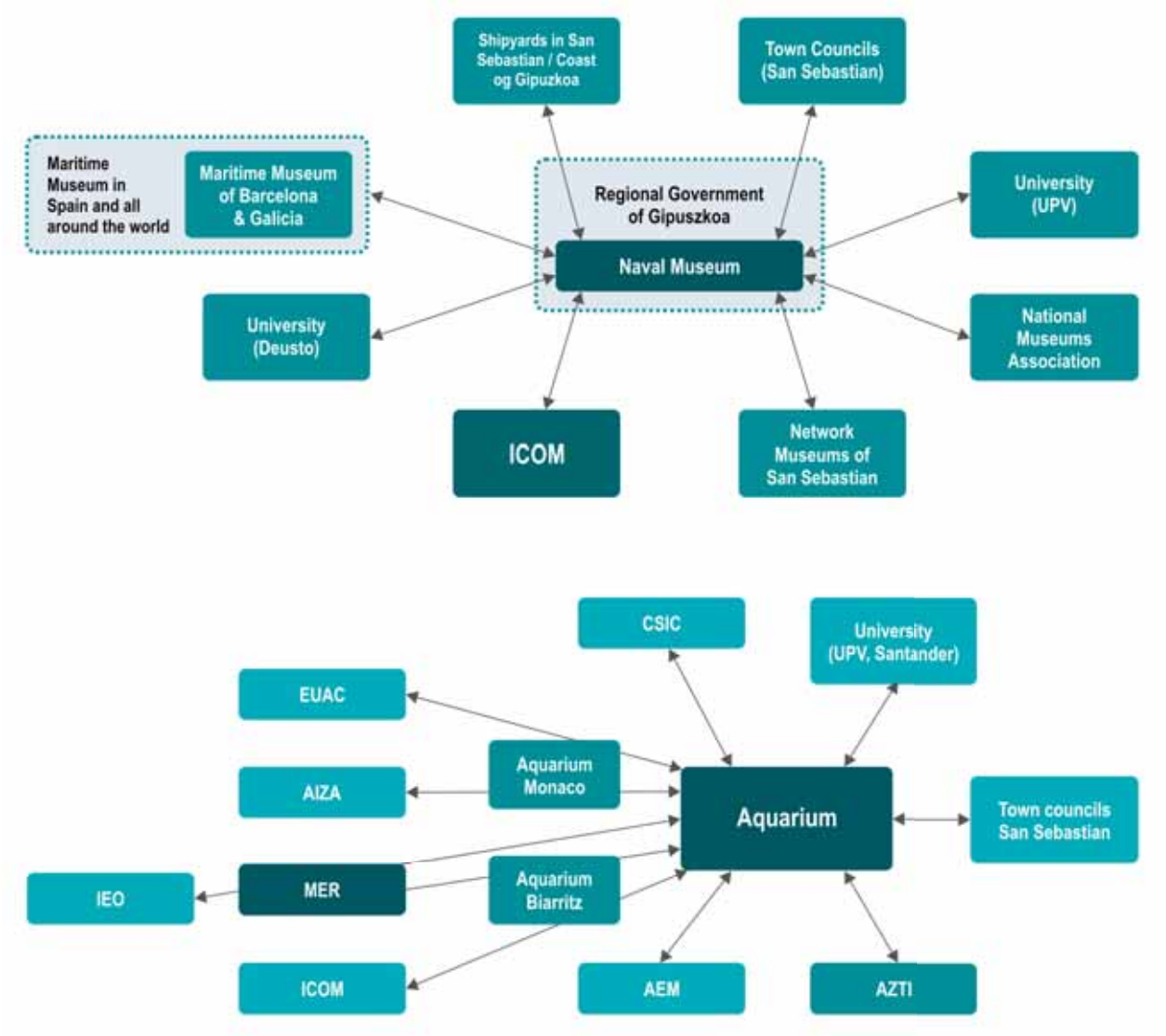
Cooperation between different tourism institutions for the definition, development and implementation of strategies of the new technologies in the tourism industry is an advantage. There ought to be meeting points for relevant agents, implement a control centre to reinforce surveillance and study consumer and tourism professional habits and carry out enquiries about habits, prospective, present and future, without forgetting a regular follow-up of the market access with its functionality and number of users.

Although there is currently no coastal tourism cluster in the Basque Country, the tourism sector has been identified as a potential sector in the maritime economy that has plenty of collaborators with different stakeholders. The main development strand is sustainable coastal development, with the aim to contribute to the knowledge and study of marine environments necessary to reach sustainable developments. However, the collaboration with external actors is paramount, particularly the regional government. Grants or projects are set up by Public Administration normally oriented to improve and renew the work conditions and somehow to compensate for lowering incomes due to the global crisis.

There are also collaborations with technological centres and universities (AZTI, UPV) in developing prospective projects. Collaborations among other innovations actors outside the Basque Country are usually linked to the sustainable development of the marine field and coastal tourism as listed below:

- The knowledge promotion of the huge projects regarding beaches regeneration.
- Information about coastal tourism destination and the water quality. However, it will boost scientific research in this field.
- In the documentation of the tourism destinations they will include those recreational sustainable activities (adventure activities).
- It will boost the innovation of new products and services for the tourism sector, especially regarding water treatment, residues, air and environment control, and the preservation of the fleet and marine fauna.

Figure 6: Innovation Actors in the Coastal Tourism Sector in the Basque Country



Source: Own elaboration

4.2.2. Huelva (Spain)-Fishing

Through the analysis of the coastal tourism cluster and the information provided below, it appears that the role of the actors involved are multi-faceted in that many of the actors listed discussed in terms of coastal tourism knowledge transfer and collaboration are also discussed here (figure 7).

The University, as educational organization, makes knowledge transfer through the OTRI. This Office manage different research projects in the frame of programmes like the Atlantic Area Transnational Programme, the POCTEC, POCTEFEX, SUDOE… different INTERREG programs and Framework Programs. In these sense, the OTRI manage the project PRESPO (Sustainable Development of the handcraft fisheries in the Atlantic Area) which aim is to improve the policies in management of fishing common resources in the Atlantic Area, exploited by the handcraft fleet, through the development of alternative tools in the integrated management of the coastal fisheries. There are many other research groups in marine clusters, like the ALGATECH, Seaweeds Biochemical and biotechnology research group, or the MEMPES, Econometric and Mathematical Modelling of Fisheries research group, apart from all kind of researches, which could transfer the results of the different researches through OTRI using the web tools, the press department, the UHU Research's bulletin, etc. The OTRI works in other knowledge transfer

activities, like the participation in fairs and events. The IDL - Local Development Institute Research Group has some researches and concrete activities in fishing, inter-relating it with other clusters, and they try to transfer the knowledge though the participation in different fairs, conferences and events.

The Government in general is the main promoter of research activities, who funds most of the knowledge transfer and research activities and projects. Huelva's Port Authority, for example, does not provide funding but does organize some activities which aid in unloading fresh fish. The Ayamonte's Official Chamber of Commerce, industry and shipping, is located in one of the most important fishing towns in Huelva, it operates within different government initiatives to promote knowledge transfer between innovation actors in the region in fishing. The reason for this is because the Chamber belongs to the Andalusia Knowledge Agents System, as a Knowledge Transfer Entity. Also, it participates in other Chambers and with the Superior Council of Chambers in a state project called the Innovation and Knowledge Transfer Program or "Knowledge Fair", with the collaboration of the Science and Innovation Ministry and European Social Funding. The "Knowledge Fair" enables the installation of researchers from the Tourism and Fishing Sector of the OTRI of the University of Huelva. The knowledge is transferred though pre-agreements and the Chamber attempts to put the enterprises and other innovation actors like the OTRI's, the Technology Centres, the Research Centre in touch through networking. The funding for this initiative comes from subventions from the Public National and European Institutions and Organizations.

At the local level, the Isla Cristina Town Council collaborates as an employer in the creation of the CIT-GARUM Technology Centre. This private-public Enterprise Research Centre it's a Fishing Innovation and Technology Centre and works in fishing production and researches. It has different areas related to the food, the Environment and the Marine Resources, the Research in Enterprising Strategies and the Technology transfer.

Moreover this Town Council organizes fairs like FAMAR (the Andalusian Fair of the Sea) collaborating with the Regional Authority (Junta de Andalucía) or other fairs and educational activities and conferences. The FAMAR fair, which it was created to promote the most important activity in Isla Cristina and to promote and trade with the fishing products, is very important in the sector because it gets together the most important enterprises and representatives of the fishing sector in an international level, to create collaborations and if it's possible enterprises networks. The Isla Cristina's Town Council organizes other less important fairs, but very important as well, like the Isla Cristina Shellfish Fair celebrated to promote the importance of the gastronomy and the fishing products in Isla Cristina (like crawfish, prawns, clams, octopus…), related with the fishes and shellfishes, and the value of the products. In this fair the shock impact has caused the fall of the prices selling very cheap fishing products. The Isla Cristina's Town Council organizes as well educational actions and conferences to transfer the knowledge to the society in relation to the fishing that it's the most important economic sector in the town. It participates in other fairs, which it doesn't organize, in relation to the salt and the canned fishing to promote and transfer the knowledge of the lot of canning enterprises there are in the region. Knowledge is transferred easily with this organization between innovation actors in marine clusters through the cession of spaces and infrastructures to organize events and provide funding. They produce knowledge transfers through fairs, conferences, educational actions, and support in the creation of R&D+i Centre. These are supported with public funding. The innovation actors are the Innovation Regional Ministry (Junta de Andalucía or CADE – Support to the Business Development Centre), the Fishing technician and the tourism technician which are internal agents in the Town Council and CIT-GARUM as an external agent.

In relation to the enterprises, most of the interviewed enterprises are private, but there are some public ones as well, like the Salinas del Astur Fish Farm that engages in knowledge transfer through sector-based conferences, transferring knowledge about the new culture technologies: new species, new machines and equipment, new nutritional product that are transferred by the Aquiculture Association Asema. This Fish Farm works producing aquiculture fishes, and nowadays it has modify his strategy including innovation activities, probably because of the shock impact, and makes some tourist and school visits, to transfer the knowledge to the young educational generations. They work together with the research groups of the university to improve the culture, reproduction and trade of the different products (Sole, Gilthead Bream and Sea Bass). So in that case, the innovation actors involved are the Universities, the Regional Ministry of Innovation and some other suppliers. Other collaborations also occur with Local Authorities and IFAPA "Aguas del Pino", a research centre where the researchers study fishes, algae, clam, cephalopods, molluscs and others.

Regarding the private enterprises, Shellfish Huelva transfers knowledge to the innovation actors through Enterprises Associations or meetings. For example, they organize conferences where they transfer the experience and exchange the results of their research. It is funded with research projects and the innovation actors involved are Asema Association, Ctaqua, CIFPA

(*Centro de Investigación y Formación Pesquera y Acuícola* – Research and Educational Fishing and Aquiculture Center) and the University. In addition, Aquaconsultant Aquiculture and Services supports the innovation actors to make knowledge transfer through Pescaplus, the Promotion and Energizing of the R&D+i Projects Office in the fishing and aquiculture sector, promoted by the Sea Ministry. They produce the knowledge transfer with R&D projects, relating mainly to fishing projects and are funded by the CDTI (*Centro para el Desarrollo Tecnológico Industrial* – Industrial Technology Development Centre), the regional funding body. The main innovation actor is the Administration. Finally, the Culmasur promotes knowledge transfer between innovation actors through enterprise associations and meetings. The knowledge transfer is produced in conferences, where the experiences are exchanged and research results are discussed. It's funded through research projects and the innovation actors involved are Asema Association, Ctaqua, CIFPA and the University.

Along with the private enterprise, the CIT-GARUM, a public-private enterprise, successfully transfers knowledge through technology centres. These have a special area working in technology transfer for the private sector through the scientific academic institutions and the public administration. They work in a net with other national and international organizations; make education in human resources and other activities that allow them to permanently be in touch with the research and innovation areas to make the transfer of knowledge for the different research projects.

As it happens in the previous case with the knowledge transfer, the University and the Government are those who work collaborating with marine actors, and only one private firm collaborates with them: Aquaconsultant aquiculture and services S.L. This firm collaborates with different actors in the marine cluster as the University of Huelva, Pescaplus, and Aquiculture Producers.

In terms of government and University collaboration, which are the best practices, these are the main linkages:

- The Local Development Institute Research Group (LDIR) that is part of the University, collaborates with the Regional Ministries (Junta de Andalucía), the Local Authority (Diputación Provincial) and Private and Public Enterprises with the main aim of working in specific research projects. They are funded with agreements and LOU (Ley Orgánica de Universidades – Universities Act) contracts. This organization is involved in the collaboration because they were contacted by companies and public administrations that knew about the work of the research group or about its members.

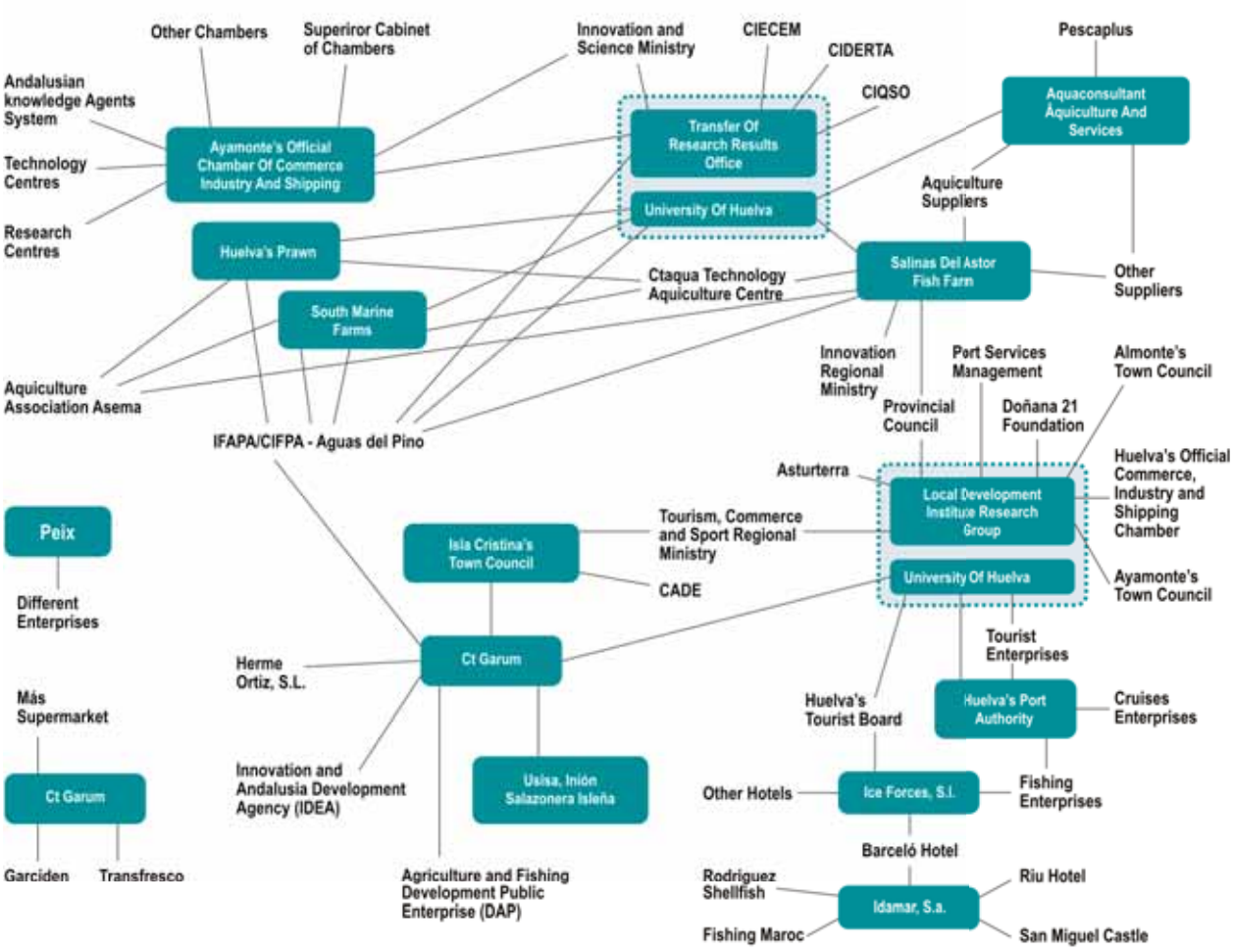
- The Transfer of Research Results Office (OTRI) has collaborated with actors from the marine clusters through the different research groups based at the University and some Research Centres like Ifapa/Cifpa Aguas del Pino, located in El Rompido, Cartaya, Huelva, that mainly are connected to the University through the researchers and the research groups. The University has special Research Centres where there are some marine research as CIECEM, International Centre for Ecological and Environmental Research and Conventions.

- Huelva's Port Authority makes some undefined collaborations to increase the service rendered in the needs of the socio-economic environment. The Port Authority collaborated to the innovation actors with a modernization of the facilities project (Muelle de Levante Norte – North East Mole), that motivated the participation of the fresh and frozen fish commercial actors toward ideas for a new project.

- CIT GARUM collaborates with different enterprises like: Unión Salazonera Isleña S.A (Usisa), Innovation and Development Agency in Andalusia (Agencia de Innovación y Desarrollo de Andalucía - IDEA), Isla Cristina Town Council, Public Enterprise to the fishing and agriculture development (Empresa Pública Desarrollo Agrario y Pesquero - DAP) and University of Huelva.

Beyond the collaboration within the cluster, only two organisations, the Transfer of Research Results Office (OTRI) and the Salinas del Astur Fish Farm, collaborate with actors outside the marine clusters. The OTRI has more collaboration with actors from non-marine clusters, like the Universities and other Research Centres, with the main aim of transferring knowledge to improve the marine economy in the different regions in the Atlantic Area. This collaboration is funded by the European Funding. Furthermore, the Salinas del Astur Fish Farm collaborates outside the maritime cluster with ASEMA Sectorial Association with European Funding. It participates in innovation projects and the transferring of information with these actors: Asema, Ctaqua (Aquiculture Technology Centre), and the Innovation Regional Ministry.

Figure 7: Innovation Actors in the Coastal Tourism Cluster in Huelva



Source: Own elaboration

4.2.3. Border, Midland and Western (Ireland)-Offshore Services

In the same way as the marine biotechnology/cosmetics interviews were completed at the sector level, the offshore services interviews were also completed at the sector level. The wind and wave regimes off the west coast of Ireland are among the most favourable in the world for energy production from these sources, although, there are challenges in building an export orientated, offshore renewable energy industry in Ireland. This sector has potentially phenomenal global growth prospects for world class renewable energy technologies. Opportunities also exist for Galway to offer support services in the carbon recovery sector.

According to research from Deloitte and the Irish Wind Energy Association (IWEA)[7] in 2009, the construction and development of offshore and onshore wind energy projects across the island of Ireland will involve c. 14,75 billion Euros of investment; c 5,1 billion Euros of which will be retained in the local Irish economy to 2020. Of the 5,1 billion Euros it is estimated that c. 4,3 billion Euros will be invested in Ireland. The report also suggests that other opportunities exist including grid development, upgrade works, pump storage, energy exports and electric transport among others. Construction provides the majority of the jobs opportunities available from the wind energy sector. Offshore wind development requires significant construction inputs in order to develop the large scale wind farm projects planned. It is estimated that there will be excess of 7 250 jobs that can be supported by the construction element of wind energy projects. The Deloitte/ IWEA analysis indicates that Ireland has an installed capacity of 1026,37 MW. The report estimates the following installed capacity for Galway, Clare and Mayo:

[7] Jobs and Investment in Irish Wind Energy, Report by Deloitte/ IWEA, 2009

Table 7: Installed Wind Capacity, 2009

County	Installed Capacity
Galway	72,52 MW
Clare	32,10 MW
Mayo	30,65 MW

Source: Deloitte/ IWEA, 2009

The total contract or projected capacity for Ireland is estimated at 5218.52. The report predicts the total contracted or project capacity for Galway, Clare and Mayo:

Table 8: Total Contracted or Projected Wind Capacity

County	Projected Capacity
Galway	379,4 MW
Clare	153,3 MW
Mayo	797,9 MW

Source: Deloitte/ IWEA, 2009

The Deloitte/ IWEA analysis shows that the wind sector in Ireland can support 1,50 jobs per MW to be installed in the island, resulting in just over 10 760 jobs being available across the sector up to 2020. This number includes construction operation and maintenance of all wind farms and assumes a steady growth in the industry over the period to 2020. Employment involved in planning, financing, constructing and maintaining MW and wind farms provides 1,37 jobs per MW to be installed. Support services such as administration, payroll and marketing/ communications will provide 0,13 jobs per MW to be installed. For Galway, Clare and Mayo the estimated MW to be installed and corresponding employment are as follows:

Table 9: Estimated MW to be installed and corresponding employment, 2020

County	MW	Jobs
Galway	399,81	629
Clare	161,57	253
Mayo	840,89	1 318

Source: Deloitte/ IWEA, 2009

The wave regimes off the west coast of Ireland are among the most favourable in the world. A survey[8] of Irish ocean energy companies in 2008 and 2009 showed that expenditure by these companies was approximately 5 million Euros and 3.8 million Euros respectively. This represents direct expenditure within the Irish economy of approximately 8.8 million Euros over two years. However, this expenditure stimulates economic activity throughout the sector, either through direct purchasing or employment or through knock – on effects that arise from the first round of spending. Sub – sectors which have benefited from this direct expenditure include engineering consultants, materials manufacturers and research and development companies. Using output materials, SEMRU (Socio-Economic Marine Research Unit) calculated that the ocean energy sector in 2008 and 2009 contributed 6,5 million Euros and 4,3 million Euros to the Irish economy respectively. This represents additional indirect

[8] Survey carried out by the Socio – Economic Marine Research Unit (SEMRU), NUI Galway. Preliminary results were presented at the Economics of Ocean and Marine Renewable Energy Conference, UCC, April 2010.

expenditure of 1,5 million Euros and 500 000 Euros in 2008 and 2009. Similarly, there are currently around 85 individuals (full – time equivalents) employed within the Marine Renewable sector. Direct and indirect employment for the ocean energy sector was 155 FTE in 2008 and 2009.

The development of an indigenous supply chain for the Ocean Energy sector depends on a number of key issues. Government has a key role to play in a number of areas:

- remove barriers to deployment and facilitate ease of access to and transparency in licensing,
- Provide sufficient incentives and returns to the developers which will have knock – on effects to downstream companies,
- Provide incentives and understanding of the sector to potential downstream companies,
- Provide training and education to highly skilled marine graduates.

The offshore oil and gas industry for Ireland has been in existence for over 30 years, though in that time it has consisted only of the Kinsale Gas Field and some associate reservoirs. Over the 30 years Kinsale Gas has been a consistent source of employment of the Cork area and is expected to continue for at least 10 more years and even beyond that if the current plans for gas storage are realised. Since the Kinsale Gas find there has been a certain amount of exploratory drilling offshore Ireland and a number of oil and gas fields have been discovered off both the South and West Coasts. The Corrib Field off Mayo is due to go into production in the near future and will create over 130 permanent jobs in North Mayo (in addition to over 800 jobs during the development/construction phase). The predictions are that there will be significant future developments off the West coast, particularly when looking out towards the next 30 years to 2040. Oil and gas developments off the West coast are particularly challenging due to the deep waters and harsh North Atlantic environmental conditions.

Further developments are expected in the greater Corrib area, Rockall and Porcupine Bank areas, e.g. the Dunquin Prospect in the South Porcupine Basin is considered to hold between 1,7 and 3,7 billion barrels of oil (the partners on this are Irish company Providence and international majors ExxonMobil and ENI).

These developments will generate high value employment during both developmental and the operational phases (a typical lifetime for a deepwater field is 20+ years and so has the potential for long term sustainable employment). For example the oil and gas sector in the UK North Sea has 2 000 companies employing around 100 000 people in Scotland and has been the main driver behind the growth and development of Aberdeen. The expertise built up in Scottish indigenous companies is now been exported worldwide.

It is therefore important to position the West coast to maximise the benefit of future oil and gas developments. Areas such as Killybegs in Donegal and Foynes in the Shannon Estuary, and airports along the West coast, can be important operational bases for these developments, and may also be used for certain construction activities. During the development phases of these projects Galway should be promoted as an ideal centre for engineering and project management services, e.g. there is already one offshore oil and gas engineering company in Galway that employs over 80 people in its Galway office. Opportunities should also be pursued to locate large industrial developments (which are dependent on gas supplies) in the western region, such as the gas fired power station in Tynagh.

This is a small diverse sub sector with high growth potential. The core of this sector is in new innovative technologies in the areas of sensing, communications, data management, software, control systems, mechanical engineering, materials and informatics which have marine applications. Marine and Energy technology products and services have applications in new emerging niche areas (marine renewable energy, environmental monitoring, and water management) as well as established markets (e.g. oil and gas, aquaculture, maritime transport, tourism, coastal erosion etc). There are a large number of specialist research institutes, innovative SMEs and MNCs operating within the Marine Technology sector in Ireland. Much of the demand for marine technology products is global and the sector has significant export potential. With the right support and leadership, and capitalising on high-level capabilities that have been developed in areas such as sensors, microelectronics and ICT, this sub-sector could develop into a world leading industry. The recently launched SmartOcean Innovation Cluster Strategy states that "*by 2020, Ireland will be a recognised leader in the development, testing, commercialisation and delivery to market of the next generation of innovative technologies addressing evolving global markets in marine renewable energy, environmental monitoring and water technologies*".

The Marine Technology sector in Galway, Mayo and Clare has a turnover of almost 13 million Euros and currently employs 155 people with a gross value added (GVA) of 10 million Euros. The successful implementation of the SmartOcean Innovation Cluster initiative offers significant commercial opportunities for the Galway region given its close proximity to the test sites (SmartBay Galway; ¼ Scale Test Site, Spiddal; SmartCatchment, Newport Co. Mayo; Full Scale Grid Connected Test Site, Belmullet) and the supporting infrastructure located in Galway (i.e. Marine Institute, specialist research institutes in NUI Galway, and GMIT). Therefore, to 2040 and beyond, there is significant scope for Galway to benefit from the increased business activity in new emerging markets and indirectly from the downstream services relating to these activities.

Ireland's Ocean Territory extends to 220 million acres and encompasses a wealth of natural marine and energy resources. The future development opportunity from those resources offers significant and unrealised economic benefit for Ireland. It makes Ireland strategically central to the future development of Europe. Investing in the development of natural resources requires an integrated and informed strategic planning process that engages both the Western communities and the Irish Government. In the last 10 years the Irish Government has funded a number of initiatives. Such investments serve to develop this future base of resource and create the economic and infrastructural environment to attract the significant new investment in Marine and Energy. This investment will be substantial and in renewable energy alone is likely to exceed 20 billion Euros.

In terms of knowledge transfer and collaboration, these are the main actors that are working on offshore services within the region:

The Martin Ryan Institute (MRI), now merged into the Environmental Change Institute (ECI) is involved in ongoing and planned research conducted under 4 themes i.e. Climate Change, Energy, Biodiversity, Environment and Health. The ECI is actively involved in knowledge transfer through the Graduate Environment Programme and the Marie Curie Transfer of knowledge exchange. The Institute works actively with the NUI Galway Technology Transfer Office, State Agencies and private industry. A considerable amount of research time is purchased by private sector companies through Ireland's Innovation Voucher Scheme[9]. This is awarded to companies with a good business/product/service idea who need R&D assistance to bring it to commercialisation.

In addition to the work completed by the ECI, the Coastal and Marine Resources Centre, University College Cork (CMRC) is a specific example of the work of CMRC and the ensuing knowledge transfer in the Marine Mammal Monitoring in Broadhaven Bay. This project was commissioned by RSK Consultancy Scotland initially to conduct a cetacean (whale and dolphin) monitoring programme in North West Ireland in advance of the development of the Corrib Gas Field. As a result of the preliminary findings it was determined that the study's remit be expanded to include all marine mammal species recorded in the study area. The present monitoring phase which commenced in 2008 is prior to and in concurrence with the construction of the Corrib Gas underwater pipeline. It provides an assessment of marine mammal occurrence in Broadhaven Bay a Special Area of Conservation (SAC) and the objectives of the project are as follows:

- To collaborate with the National Parks and Wildlife Service (NPWS) of the Department of Environment, Heritage and Local Government and with RSK to monitor any potential impacts on animals due to construction activities in Broadhaven Bay,
- To collate the findings of the most recent survey period with those of previous year's studies to develop an overall understanding of Broadhaven Bay's significance for marine mammals and to allow for comparative analysis of marine mammal presence and distribution in the area between years,
- To further contribute to the international knowledge-base of marine mammals on the Irish West coast.

While a study of this nature has been privately commissioned the knowledge gained is for widespread dissemination and potentially of immense value to actors in other sectors including the marine energy. The findings of such studies are made available through the National Parks and Wildlife website and also on the CMRC web page.

Finally, the Letterkenny Institute of Technology (LYIT) has a tradition of co-operating closely with employers including those in the marine sector in the North West region. This co-operation takes several forms, including the provision of high quality

[9] The objective of the Innovation Voucher initiative is to build links between Ireland's public knowledge providers and small businesses and create a cultural shift in the small business community's approach to innovation.

graduates with practical knowledge and business awareness, the delivery of bespoke research and development programmes and collaboration on shared research projects such as those supported by Enterprise Ireland and other funding agencies.

In addition it works collaboratively with other agencies including the Higher Education Authority, the Marine Institute, a Bord Iascaigh Mhara, NIRSA, HSE/HRB, Central Government, Local Authorities and the Centre for Cross Border Studies as well as North - South Academic Partnerships building on its existing successful relationships with University of Ulster.

To support such collaboration the Institute currently has an informal policy of adjusting teaching hours in order to enable lecturers to dedicate time to research and to the supervision of postgraduates. Where lecturers are engaged in large research projects requiring significant amounts of time, teaching obligations may be further reduced.

Beyond the higher education initiatives to promote knowledge transfer and collaboration, independent firms are also noticing the benefits and engaging in market-driven collaboration. One example is Aquafact International Services Ltd which is an environmental consultancy company. Aquafact has undertaken numerous projects on behalf of private and public sector clients. Many of these while commissioned for specific purpose e.g. environmental impact assessments come in to the public domain through the planning process and a substantial database of information becomes available to all sectors e.g. EIS for an Integrated Approach to Salmon Production at the Bradan Mara Teo. fish farm sites in Bertraghboy Bay, Co. Galway.

Aquafact are also conducting intertidal and subtidal survey work at several key locations around the Irish Coast. This work is being overseen by the Marine Institute. In addition to this, Aquafact has a good working relationship with a number of universities and colleges, fisheries boards, government departments, state bodies and non-governmental organizations all of which helps them in accessing information for clients.

Two other notable examples are Moore Marine Ltd and Marcon Computations International. The former act has a specialist provider. Knowledge transfer occurs on a commercial basis between the company and its clients. In addition the company engages in trade show activity which displays its services. Its personnel also give lectures, contribute to industry papers and magazine articles. The latter are mainly providing general information to targeted audiences on marine archaeological, geophysical and oceanographic issues. The latter is a specialist consultancy and software solutions provider and as such transfers knowledge on a commercial or grant supported basis mainly to government bodies. Depending on the assignment this may ultimately involve a much wider dissemination by the Government body concerned.

In addition to these specific examples, knowledge transfer is also facilitated through trade shows, conferences, etc.

4.2.4. Wales (UK)-Offshore Services

Knowledge Transfer within the marine energy cluster in South West Wales is facilitated largely through formal knowledge networks in the region (figure 8). The main network that is intra-regional is Marine Energy Pembrokeshire (MEP). Given the significance of the network in facilitating knowledge transfer in the region, the discussion with members of MEP will be the focus of this section. In a subsidiary manner, additional information will also be provided on knowledge transfer activities, external to MEP, between actors in the cluster.

Marine Energy Pembrokeshire (MEP)

The members of the MEP are the main actors in the marine energy cluster in South West Wales, namely: WAG, Milford Haven Port Authority, E.On, Marine Energy, Lunar Energy, Tidal Energy Ltd., Pembrokeshire Coast National Park, Pembrokeshire Coastal Forum, Rural Council of Pembrokeshire, Far Offshore Renewables, International Power and the Marine Energy Task Group (METG). There are two networks mentioned within the MEP list: the Pembrokeshire Coastal Forum and the Marine Energy Task Group. Through the Pembrokeshire Coastal Forum, with over 1 000 members, there is representation of local businesses predominantly working with coastal tourism. Their emphasis is more on conservation and less on marine energy; however, due to its success, it is what the MEP was based on. On the other hand, the METG, from the Low Carbon Research Institute, is completely focused on marine energy, run by Swansea University, and brings other key actors into the network, such as: Halcrows, Crown Estates, Swanturbines, Wave Dragon, Pembrokeshire College, E.On Renewables, Severn Tidal Power Group, Bangor University, Cardiff University, Environmental Agency for Wales, the Countryside Council for Wales, Aberystwyth

University, and Swansea Metropolitan University. It should be noted that while all of these actors are concentrating on marine energy in South West Wales, they are not all located in South West Wales. Due to this, METG will be discussed in the this section due to its involvement in MEP but also in the next section due to its knowledge transfer outside of South West Wales. The MEP provides the platform for knowledge transfer focusing on development, impact and conservation.

> *Marine Energy Pembrokeshire is an 'on the beach' delivery group of the local council, Pembrokeshire coastal forum, the national parks and the local academic institutions... have involvement from Milford Haven Port Authority as well. (Marine Energy Task Group - Swansea University)*

> *It (Marine Energy Pembrokeshire Group) was (started) through the Wales Spatial Plan. The Coastal Forum was asked to take on a scoping exercise to identify any opportunities for the marine environment for the Pembrokeshire coast and marine energy quickly emerged as offering a potential opportunity. From that an actual plan was produced, a seminar was held as a part of that, and from the seminar a working group was established, the concept of MEP was born of that working group, mainly of the developers hoping to put something in the water, Universities – Pembrokeshire and Swansea- and WAG to develop the marine energy sector in Pembrokeshire. (MEP Facilitator)*

Please see the spider graph in the annex section which shows the relationship between the aforementioned actors in the MEP network. As the key actors have been identified, the next phase is reviewing the effectiveness of networks like the MEP, as well as more informal channels, in transferring knowledge in the region. It should be mentioned at this point that due to the early stage of development that the marine energy cluster is in, the research on the impact as well as the product developers are all one group. This can potentially sway the results of having high levels of knowledge transfer when in reality the 'apples are merely talking to the oranges'. The future plans of the network would be that the MEP is more for development and the METG is more for impact research; however, for the current time, the MEP will be discussed taking into account the METG as one of its members.

Through these research findings, the significance of MEP to facilitate knowledge transfer amongst the actors has been identified. At this stage, this has lead to collaboration, in some instances, which will be discussed in further sections. This section will focus on the engagement of the actors at the MEP meetings and which types of actors (government, SME, etc.) are the most likely to transfer knowledge.

> *Even though they are potentially conflicting or competing organisations, some of the barriers we are looking at are mutual problems so there are definitely discussions on how the individual companies can work together to overcome these barriers so for example grid connections, things like that, general discussions and sharing of information- making people aware of research and a general sort of partnership even though in the future they are competing. A classic example was at the seminar we ran, there was Wave Dragon were looking at doing research and it turns out one of the other companies already did it so said use ours so they are coming together to work this out. (MEP Facilitator)*

> *So who do we have down in Pembrokeshire? We have developers who are trying to put kit in the water down there and they realise that although some of them are going to be competitors they are better off sharing their best practice. We had Jane Davidson the minister come down to co-chair one of the meetings and she left saying that it was quite refreshing to see competitive, early stage companies around the table, which is even worse because at that stage they can be quite guarded, just being quite friendly. They are a quite tight knit community so they are solving problems, sharing potential solutions. (Marine Energy Task Group- Swansea University)*

> *... (The MEP is) very good for networking as other developers are in the room at the same time as well as consultants and individuals oriented toward the supply chain as well so it is good to get everyone in one room, swap stories, and see how they can advance especially with the procedures of developing the area... it has aided us to know who is in the industry. (Tidal Energy Ltd.)*

Thus far, the focus has been on firms within the MEP network, and the extended network brought into the MEP through the METG. At this time, given the emerging status of the cluster as well as the comprehensive inclusion of the firms, government and universities in the MEP, there is no known knowledge transfer occurring within the region that is not based on actors in the network. As the cluster becomes more active, there may be interest in this type of knowledge transfer in the wider Welsh context. According to the Wave Dragon representative, this is of particular interest to firms that need turbines constructed as they are not available in Pembrokeshire, but in most cases are available in other parts of Wales from Wales-based companies.

Some Universities are expanding their knowledge transfer efforts by engaging with actors outside of the cluster but still in the Wales region.

Low Carbon Research Institute (LCRI)

The LCRI aims to support the whole energy sector, UK and globally, in developing low carbon generation, storage, distribution and end use technologies. Over £5,1 million has been received from the Higher Education Funding Council for Wales (HEFCW) under the Reconfiguration and Collaboration Fund to develop the LCRI for 5 years from April 2008. It is a consortium of six Welsh universities: Glyndwyr, Aberystwyth, Cardiff, Swansea, Bangor, and Glamorgan. It is lead by Cardiff University's School of Architecture. As the overall emphasis of the LCRI is renewable energy, each partner is involved in a different type of renewable energy: marine, hydrogen, low carbon housing, solar, biomass, and large scale power generation. Swansea University is responsible for marine energy and is the lead in the Marine Energy Task Group (METG) which addresses this sector. The task group is a member of the MEP and is therefore connected with all of those firms; however, it also acts a network for a separate group of key actors in: university (Pembroke College/Swansea Metropolitan), spatial planning (Crown's Estate) and governance. While the lead, Swansea University, of LCRI is located in South East Wales they have been included in this research.

Marine Energy Task Group (METG)

The Marine Energy Task Group predates the LCRI but is one of the partners focusing on marine energy and the active 'arm' of LCRI involved in the MEP. The actors involved in METG are: Halcrows, Crown Estates, Swanturbines, Wave Dragon, Pembrokeshire College, E.On Renewables, Severn Tidal Power Group, Bangor University, Cardiff University, Environmental Agency for Wales, the Countryside Council for Wales, Aberystwyth University, and Swansea Metropolitan University. Over 75% of those involved in METG are located in South West Wales and the work they do, impact research, is focussed on the region. Based on this, it has been included in the research as a viable knowledge transfer facilitator.

SEACAMS

SEACAMS is a new (2010), major £23.6m investment to grow Wales' growing marine sector by increasing collaborative research projects between business and universities. The Centre will be based at Bangor University's and has been given the go-ahead following EU backing of £12.6m from the European Regional Development Fund through WAG. The project is led by Bangor University in collaboration with partners at Swansea and Aberystwyth Universities who are also funding the project with further backing from the Countryside Council for Wales. The project will turn cutting edge research ideas into new processes, services and technologies to encourage over 450 businesses to grow, create new high tech jobs and win more global contracts. As part of the project, a new Innovation Centre will be set up at the University's School of Ocean Sciences (SOS) at Menai Bridge, Anglesey. The Centre will provide laboratory and computing facilities for small and medium sized enterprises (SMEs). SMEs will also have access to the 40 metre SOS research ship Prince Madog to focus studies on tackling the impact of climate change such as coastal erosion, flooding, water quality and offshore energy generation. While the lead of SEACAMS is located in North West Wales, due to the partnership with Swansea University and their business outreach goals, they have also been included in this research.

The vast majority of collaboration, at this stage, is between SMEs and larger firms. This fits into the larger picture painted by those in both industry and government when commenting that the future of the marine energy sector in Wales will not be based on government funding but rather lead through industry funding and development (METG Facilitator, E.On Engineering). This is largely due to the expense of the projects as well as the current recession. The industry, at this time, have yet to show advanced interest which is not based on a lack of talent or potential in the region; rather, it is based on the Strategic Environmental Assessment (SEA) to see what water can be developed as well as the ROC (renewable obligation certificate) policy. The importance of the SEA is straightforward in that it explains what area can be developed which is of particular importance to the Pembrokeshire area in South West Wales as it is a Special Area of Conservation (SAC).

> *In Scotland we have seen it (marine development) happen... It's because, it's a political reason, and now that oil and gas are going up they have the need. They have political drive to do it, they have resource, and they've already have an SEA, so their waters have already been assessed. This was completed by the Crown Estates, the landlady, has said let's start putting leases out in Scottish waters. You can't have an industrial environment until some leases have been granted and the Strategic Environmental Assessment done and then the developers are knocking on the door... The SEA for Wales will be finished sometime in early 2011. (Marine Energy Task Group- Swansea University)*

I think it's really important that the SEA is completed. It's extremely important. That sanctions project development in the area. As long as that green lights people to go ahead and undertake development activity within the area... in regards to Scotland as an example, the SEA has been completed and people are undertaking development activity within the region because they have an opportunity to deliver there. That is ideally the model we would like to see and if the SEA is completed for Wales and areas such as South Wales are identified as development sites then you will see a scale up of activity in that area. So I think that is what I would need to see to feel confident to look at project development in the area. (E.On)

Outside of the land set aside for development, the other issue pertains to the ROC system, which offers renewable energy generators an extra payment on top of the income they receive from electricity sales and the sale of climate change levy exemption certificates. The devolved Scottish government has increased the ROC return for firms working in the country in an effort to attract them away from England and Wales. Despite Wales devolved government in other scenarios, WAG defers to England for this policy; thereby, limiting the attractiveness of the region.

At the moment, if you're a developer that produces electricity you get paid £0,70/kWh for it, on top of that payment you get a ROC which gives you more money and the way that's raised is all big businesses have to show that part of their electricity comes from renewable sources so they buy these ROCs so those are traded on the open market at about £0,45/kWh, a considerable amount of money. If you're a wave developer or a tidal stream developer in the UK for every kWh you get 2 ROCs until you see that if you go to Scotland and you're a tidal stream developer you get 3 ROCs or 5 if you're wave developer. So if you've just taken money off an investor who is desperate to get some money off of you and you say I'm going to go to Wales and get 2 ROCs he says you're going to Scotland. We're lobbying government on that because it's not a level playing field. (Marine Energy Task Group- Swansea University)

The other factor is that in Scotland the support mechanism that is in place in offering 3-5 ROCs with the effect of concentrating activity in and around Scottish waters. Scotland's devolved administration has a role in setting that figure while the Welsh Assembly government does not have that same role and cannot set that support mechanism that is comparable to Scotland. (E.On)

While there is concern regarding the SEA and the ROC system, the marine energy actors within the region are confident that the services provided in the area will attract growth.

Equally, from the existing actors, there are collaborative efforts, that are mainly project-based, operating at this time. As is the case of knowledge transfer, collaboration is also largely facilitated through the MEP network. It should be noted that while the MEP gives those involved in collaboration an opportunity to meet, and meet with the other actors in the cluster, none of the collaboration is a result of the MEP. This is not an indication of the future usefulness of the network; rather, it is due to the relatively late start of the MEP (late 2009) and the market-driven demand for collaboration prior to that time. There are four active examples that range from funding to research-based projects:

- E.On/Lunar Energy;
- Far Offshore Renewables/Pembrokeshire Coast National Park Authority;
- Tidal Energy Limited/WAG/Pembrokeshire Coast National Park Authority;
- Wave Dragon.

E.ON/Lunar Energy

This is collaboration between the Multi-National Corporation (MNC) E.On and the SME Lunar Energy. E.On is a major energy provider at the global level. As with MNC's of this kind, they are turning their attention to renewable energy research given the finite non-renewable energy resources. On the other hand, Lunar Energy is an interesting firm, and probably will be one of many in the future, as it is based in England but has test facilities in Pembrokeshire due to the current in Ramsey Sound. The collaboration is product-based and both partners involved are active members of MEP.

The project is aiming to use the Rotech Tidal Turbine (RTT) that has been developed by Lunar and its technology partner Rotech Engineering Limited. The RTT design is patent protected and is designed to capture and convert tidal stream energy into renewable electricity. In 2005, RPS Group undertook an initial review of the consenting regime for tidal energy devices in UK

waters, on behalf of Lunar Energy. Following on from this review, RPS Group were commissioned to undertake an assessment of potential sites within UK waters suitable for the pre-commercial deployment of between 2-6 RTT's. An initial long-list of 22 sites was shortened to 6 following review of environmental and grid connection issues. Following further analysis, a short-list of two areas was identified. Site visits were undertaken to both areas to assess specific issues and a third report was commissioned to assess these two areas in detail. Following the issue of this third report in 2007, a decision was made to progress the project in Ramsey Sound, Pembrokeshire, West Wales.

Developing a tidal energy project in this area represents a major challenge as the site is designated as a European Special Area of Conservation (SAC) and the technology proposed is relatively unknown. In October 2007, RPS GROUP prepared and published an Environment Impact Assessment (EIA) Scoping Report for the project, as well as accompanying E.ON on a series of stakeholder consultation meetings. An EIA for the project will begin in 2008. RPS GROUP also managed a geophysical survey of the proposed study area on behalf of E.ON. This survey has gathered essential data to assist both the EIA and engineering processes.

E.ON is currently waiting for the results from the SEA to be published before taking the next steps with the project.

Far Offshore Renewables (FOR)

This firm is run by the inventor of the device and he is the sole employee. The actual product is a floating wind turbine device which is to be tested off the North Pembrokeshire coast. Unlike its counterparts, this project intends to convert electricity generated by the wind turbine into oxygen and hydrogen on the platform for shipping to port. In this instance, the collaboration is between FOR and the Pembrokeshire Coast National Park Authority which provided up to £125 000 match funding as a result of a successful application.

The survival of a storm in Fishguard harbour (West Wales) has provided confidence that the form of the floating wind turbine is adequately stable. The storm hit the structure with waves 50% in excess of the design wave load. The project of scaling up is underway with tenders having been issued to several companies local to south Wales. Following the sea trials the lessons learnt are being transferred to the larger scale device due for launch later in the year. The priority is to finalise the design and move into the construction phase.

Tidal Energy Limited (TEL)

The collaboration in this case is for funding, development and location. The initial research funding was from a sustainable development fund, administered by Pembrokeshire Coast National Park on behalf of the Welsh Assembly Government. Experts from Cranfield University undertook detailed design and optimisation of the blade design with funding from Carbon Connections UK. Finally, TEL's headquarters are in Cardiff which is approximately 2 hours' drive from the Pembrokeshire site. Due to this, the Pembrokeshire Technium, a business incubator set up by the Welsh Assembly Government to specifically explore renewable energy, provides the office space for the business.

> *Another thing to mention as well is the Pembrokeshire Technium of which we have signed up to them so when we are in the area as we don't have offices down there as yet we go into the Technium and use their facilities. The Pembrokeshire Technium has been established to facilitate collaboration through the energy business they know there are significant local facilities and skills in the area and it has been built in a way to accommodate those people.* (TEL)

This final collaboration, with the Technium can be considered invaluable to the other nascent firms that are also housed in the incubator due to the potential for future collaboration with TEL.

Wave Dragon

Similar to Lunar Energy, Wave Dragon is not a 'Welsh-grown' business; rather, it has a presence in Pembrokeshire due to the ideal testing ground. This is further exemplified by their representative's statement regarding their choice of location: 'If wave energy is going to happen in Wales, it's going to happen in Pembrokeshire, it's not going to happen anywhere else, there simply isn't the wave resource'. Nonetheless, they also have sites in Denmark and Portugal which will be further discussed below.

Wave Dragon is a private company working towards the commercialisation of a technology to extract electricity directly from ocean waves. Originally a Danish company, affiliated with Aalborg University, they are now moving the centre of the global operations to South Wales to take advantage of both the Wave Climate and the professional expertise in this area and especially the political commitment to renewable energies by the Welsh Assembly Government (this was written prior to Scotland's reassessment of their ROC system).

The demonstration site has been selected in order to meet several criteria. It must be exposed to the predominant wind and wave direction but relatively close to land, for economic and operational purposes. The site must be close to a major port, in our case Milford Haven, but yet away from commercial shipping interests and outside of military firing ranges. The landfall of the cable must be close to potential grid connection locations. Due to these practical limitations, the demonstration site is located within the Pembrokeshire Marine SAC (Special Area of Conservation), and a full Environmental Impact Assessment (EIA) has being conducted.

The Wave Dragon is large floating barge that produces energy directly from the power of the water; the only moving parts in the entire structure are the turbines. The Wave Dragon works by facing its outstretched collector arms towards the oncoming waves, these concentrate 300 metres of wave front towards 140 metres of ramp at the front of the structure. This focusing increases the wave height at the ramp, which in turn acts like a beach and causes the waves to break over its top and into the reservoir behind it. By this action the water is elevated and given potential energy, which is turned into electricity by simply running the water down through turbines in the bottom of the structure. The Wave Dragon actually produces energy in almost exactly the same way as a low-head hydro power station. This last fact is one of the major advantages of the Wave Dragon concept. There is no new technology utilised in this structure at all. The low-head turbines we are using are the same as the hydropower industry have been successfully using for over 80 years, the structure its self is based on designs that the maritime world has been using for even longer. This is of course another huge benefit of deploying in Pembrokeshire, in that there is a major resource of maritime construction experience that exists within Milford Haven and Pembroke Dock.

While the majority of their collaborative partners are outside of the South West Wales area, the representative interviewed did mention a partnership with Swansea University that goes back to the beginning of the device when it was still at project stage. Further investigation was completed but no additional information was found regarding this matter.

> *We are in separate discussions on a smaller project with Swansea University... Swansea is also a member of the Wave Dragon project, on par to take control of system design which is done by Swansea and the Technical University of Munich also contributes through turbine design. I'm not sure how actively they are working on it at the moment but they've been involved for a while as Wave Dragon was part of a European Research project in the 90's which Swansea were a partner in early on if not from the beginning.* (Wave Dragon)

MHPA was also mentioned due to providing the existing supply chain; however, representatives from the port did not mention any affiliation with Wave Dragon.

> *As an aside, it should also be mentioned that the MHPA, with a new CEO, is increasingly interested in utilising the number of Universities in the area to use their expertise regarding marine energy. While this is a plan for the future of the port, in the past, there have been a few knowledge transfers that have resulted in collaborations between the port and Universities through studentships and a Knowledge Transfer Partnership* (KTP).

The KTP is an agreement between a University and a firm which allows an associate to work in the firm while studying for a degree at the University involved. The agreement is facilitated by the Technology Strategy Board (TSB), a UK-wide innovation promotion organisation. The knowledge transfer occurs between the University and the firm through the associate with the associate's salary coming from the University. This is popular particularly within engineering departments and many of the associates are hired by the firm after the KTP term (typically 2-3 years). The collaborative side of the knowledge transfer occurs as most of the time an innovative product or process is devised through the KTP.

Many of the firms that collaborate within the marine energy cluster in South West Wales are the same firms that collaborate with actors outside of the regional marine cluster. This is the case with Tidal Energy Ltd. as well as Wave Dragon. However, a new addition to the SMEs is Marine Energy Ltd. which is also part of the MEP and has connections outside of the cluster (and the region) without collaborating inside of the cluster.

Marine Energy Ltd (MEL)

MEL is a privately owned marine energy development and generation company in the process of making applications for a project to deploy a 10MW pre-commercial wave energy power park on a site off the Pembrokeshire coast. Marine Energy Ltd is independently rising all required financing to support the project development costs as well as the cape and deployment expense of the wave energy park itself. The proposed location for this project is off the Castlemartin coast.

The expected electricity generation is 50 000 MWh per year from 2011 from the Pembrokeshire 10MW wave energy project. The power output will be exported via a 33kV/11kV sea cable to the on-shore power distribution grid owned and managed by Western Power Distribution Ltd, the regional power distributor in South Wales and South West England. Our power output will cover the power demand from 10 000 average households in Wales. The company will deploy "Seabased Wave Energy Converters", WECs, which are designed with a unique patented three phase, permanent NdFeB magnet, linear generator uniquely developed to be utilized in ocean bed arrays and directly driven by point absorbers on the ocean surface. The WECs form part of an integrated wave energy power generation system capable of delivering Grid Code compliant power to the on-shore grid. The system will be assembled by Seabased Industries AB in Lysekil based on the proprietary technology developed by Seabased AB in Uppsala, Sweden.

The wave power generates minimal emissions and has minimal visual impact on the seascape. The technology has been developed over 7 years of research at the Division for Electricity Research at the University of Uppsala in Sweden.

Tidal Energy Limited (TEL)

Information on TEL as an SME is listed above. As an update, the DeltaStream device is a 1.2MW unit which generates electricity from three separate horizontal axis turbines, each with a 15m rotor, mounted on a common frame. The use of three turbines on a single, 36m wide, triangular gravity base foundation produces a low centre of gravity enabling the device to satisfy its structural stability requirements including the avoidance of overturning and sliding.

Experts from Cranfield University undertook detailed design and optimisation of the blade design with funding from Carbon Connections UK. The benefits of the DeltaStream design include:

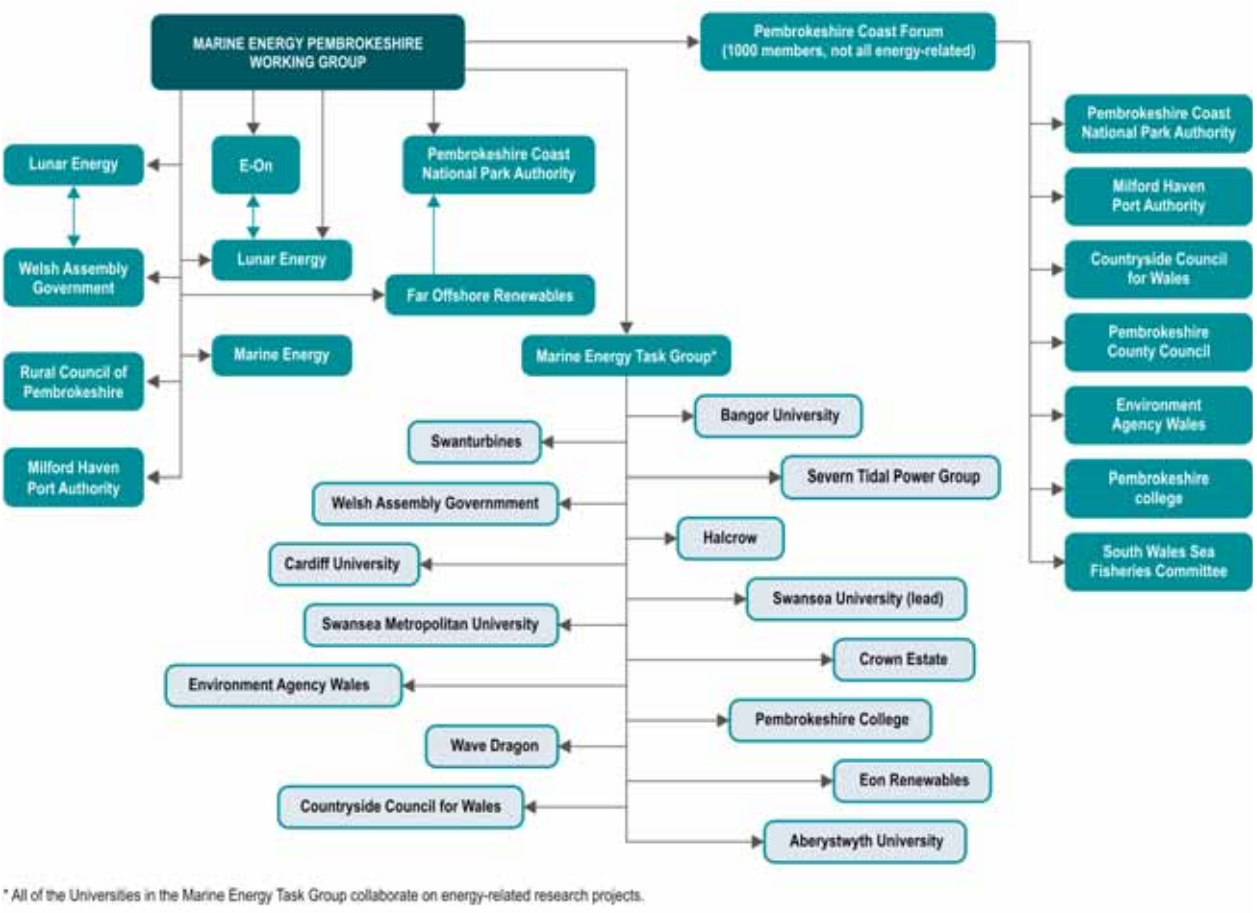
> *We're looking to move forward for the second stage of our project to work with Cranfield University which is based in East Anglia so they've worked with us in the past on the design of the device so looking forward we're looking at a joint application to the Welsh European Funding Office (WEFO)... they were chosen because of their expertise it goes back to some time ago when the company received a loan from Carbon Connections UK and as part of successfully going through that process there needed to be a connection with East Anglia and given Cranfield University's position within the area it was decided that would be a good route to go with significant help in designing the device. (TEL)*

Wave Dragon

The information regarding the firm and the device are mentioned above. The collaboration that occurred outside of the cluster is based on the research that was completed to create the current product as well as various applications and stress testing.

> *Our research is mostly completed, particularly on power production, with Aalborg University....it varies on what we already have how do we deal with deeper water, shallower water, are there different waves we can deploy a ray to get more power out of it...more application-based...we also work with the Technical University of Munch. (Wave Dragon)*

Figure 8: Innovation Actors in Offshore Services Cluster in Wales



Source: Own elaboration

4.2.5. Norte (Portugal)-Maritime Services

Among the interviews, an example was found of a company that developed its own technology for water treatment and protected the resulting IPR at Portuguese level. Investment in this knowledge- based approach, complemented by internationalization efforts, has proved to be highly successful: 2010 turnover was 5 times bigger than in 2009. Partnership projects involving University of Porto (UP), Porto Polytechnic Institute (IPP) are also on going for this particular example. This same example is developing research partnerships on the micro seaweeds area.

Within the marine cluster, although operating mainly in the health sector, a Minho University 3Bs (Biomaterials, Biodegradables and Biomimetics) research group spin- off called Stemmaters provides knowledge transfer through commercial activity. They act as a bridge between 3Bs research capacities and research results. Potential use of marine biological sources (animal or vegetal) as raw material to develop biological tissues presents an opportunity identified and, although not yet explored, is part of the research plans. Collaboration exists with external companies and research groups within UP and IPP.

On the Education subsector, the knowledge that is transferred by For-Mar to trainees includes the following training areas: fishing, aquaculture, fish processing, ship building and repairing and maritime operators. This entity presents a wide number of cooperation protocols in the sector, such as ship owners, fishing associations, fish processing companies and shipbuilders. Financing is obtained through public expenses. Until 2008 there has been a strong involvement and financing through INTERREG projects related to maritime professional training (mainly through the former ForPescas Institute, now merged in For-Mar). Since then, projects participation activities have been null, probably due to organizational restructuring.

WOW is one of the interviewed start-up companies that, although not an associate of OCEANO XXI, benefits from being hosted at the Sea Pole of the Science and Technology Park of University of Porto (UPTEC). Funded by the SIPIE support under the PRIME Programme (Incentives Programme for the Modernisation of Economic Activities), this company offers products and services in the recreational boating area, and other support services like supporting and crewing onboard vessels to allow offshore marine research expeditions. Investments on the development of knowledge based services in the field of coastal management are currently on going, originated from collaboration between Wow, the sea pole of UPTEC (Technological and Scientific Park of University of Porto) and University of Algarve (1 PhD and 1 master graduate). University of Algarve facilitates access to unique scientific equipment used on coastal management and oceanography research. WOW is also promoting a boat design and development project, yet to start. This project includes collaboration with an English ship design office, INEGI (technology transfer and research centre on materials study and development fields) and a shipbuilder in Alentejo. Another project promoted by WOW is in the nautical clothing development in collaboration with CITEVE (Clothing technological centre) and textile companies. Financing for these projects include applications submission to public funds under the NSRF (National Strategic Reference Framework). According to the interviewee, physical proximity to the Sea Pole of the Science and Technology Park of University of Porto revealed opportunities concerning professional networking as well as facilitation in the recruitment process of highly educated professionals through UP.

Knowledge transfer is also taking place in the area of water treatment technologies and micro seaweed research by a start-up company called Bluemater. This process takes place through partnership programs evolving the company, 5 research groups from UP and one from IPP. Due to the horizontal scope of such activity field, commercial partners include companies from different sectors, some outside of the cluster, such as waste treatment, imported codfish processing, micro seaweed, environment and public water companies.

In the example of A4TEC, and according to the 3Bs research group representative, participating in several research projects partnerships with several partners facilitate the supplying of marine based materials, either from animal or vegetal source. Knowledge transfer was identified as being facilitated and fostered through collaboration under partnership projects, as well as due to scientific publications, patents and media publications. Partnerships with biomedical companies were also established. The inclusion on the MIT Portugal initiative reinforces the institution knowledge transfer role. Partnerships exist with Amorim Cork Manufacturer, ANICP, International companies and with all the global research networks in the field. Ramirez, canned fish manufacturer and cluster member, is also a future partner. Some projects were also born from informal contacts on scientific congresses. The European Research Framework Program (FP7) recently approved projects that include marine sponges application on new biomaterial development. 11 new international partners have joined another project on the marine area. The financing is obtained mainly through national research funds and the European Union.

The UP CICGE Geo Spatial research unit reveals competences on the satellite systems and Geographic Observation Technologies (GIS) and operational implementation in the data collection stage and subsequent data processing research. The sea related knowledge field where this knowledge can be applied are, among others, marine and estuary coastal erosion, water quality and pollution control and marine environments study. Although CICGE is not formally included in the cluster, synergies in this marine knowledge field have been made. Financing is obtained through international projects participation in close relationship with the European Space Agency (ESA).

In terms of external collaboration, from the interviews conducted, University of Porto facilitates knowledge transfer on marine technologies through cooperation protocols with the Navy, the Air Force and EMEPC (Task Group for the Extension of the Portuguese Continental Shelf). This collaboration takes place through projects funding with origins on NATO, the Defence Ministry, Innovation Agency (AdI), European Research projects and interregional cooperation projects (INTERREG). International collaboration with prestigious American, German and Swedish partners in the maritime and navy research field also exist.

Collaboration in research projects exist with universities in Portugal and in several countries in Europe. There is also an example of strong cooperation protocol with seaport authorities, especially with Madeira seaport. The knowledge field studied concerns the port infrastructure safety, focusing on measuring the impact of ships docking on structural integrity of the pears. The demand for this knowledge field is so strong that Madeira seaport authorities requested continued support in this field. There were identified collaboration protocols with public water companies, city councils and industry were identified. The knowledge is transferred, in most of these cases, through service providing and graduates placement.

4.2.6. Algarve (Portugal)-Maritime Services

All interviewed researchers underlined that marine sciences have a huge application at regional level economic activities. In the fisheries, conducting the reduction of fishing efforts for sustainability, and in aquaculture, increasing the productivity by stimulating different species, produce better food and algae production. In these activities the potential of marine biotech is huge. The ocean in Portugal is part of one of the four richest sea basin systems in the world in physical and biological processes, with huge science interest because of its productivity. There is a tension of spending money in basic research that has no obvious economic return in the short-run. Who will pay? The State will need to invest but the companies need to get involved. Basic research is central to originate serendipitous benefits.

Science can contribute deeply to the understanding of sustainability, for example diminishing the mortality of species. Today the biggest proportion of added value in aquaculture is given by the last intermediary, usually abroad. In the Algarve the value added is limited and few benefits are retained by the region like in the case of the oysters that the money goes to France. Other problem in Algarve production is a deficit in Marketing. It is crucial to give relevance to the endogenous products. Aquaculture has great potentialities but in necessary to guarantee the quality that international markets require, a goal that today is impossible with the quality and quantity of infrastructures. To sum there are lots of social problems that are raised today in fisheries and aquaculture.

Science can also contribute to the understanding of environmental quality. There are different sorts of environmental and meteorological changes that require scientific attention and that are directly linked with marine research. There is potential for bio-medical applications with economic value. This links with coastal tourism activities *"because no one wants to have holidays in a place where everything is dying!"* [DP, researcher at CCMAR]. But it is crucial to pay attention to unexpected effects of economic activities. Companies are thinking too many times only in the short-term profit and not in constructing a sustainable activity. As DP underlines *"They come, see, explore and leave."*

Another researcher CIMA stresses similar aspects. Coastal tourism activities raise questions of public health that require the attention of science. One example is the maintenance of ecological quality of the systems where in areas like Golf or nautical activities there are so many things to do. Ria Formosa is a central resource to implement actions. The activities that can be easily implemented do not relate necessarily with cutting-edge research but with science communication, specifically environmental education. There is almost everything to be done; we need to study off-shore production through petroleum prospecting*."* In a different perspective, the University has several equipment that should be used to interact with the productive sector, R&D or education. MR underlines an additional feature *"There are tensions that involve the concentration and centralization of responsibilities. Sometimes there is an unsustainable economicist paradigm. The accumulation of roles can be frustrating. Check the case of IPIMAR, they study but they also report and verify. We had a project with them [IPIMAR] and bivalve producers were afraid of giving the true information and being penalized. It is necessary to create trustful relations giving more than what we ask. Cooperation among institutions depends on people. Former students assume a central position to assure transfer of knowledge and further U-E relations. In parallel, there are several old disputes among relevant companies and other institutional actors that limit cooperation. Anyway, there is some Algarve pride. If you notice the projects that go to INAG [Instituto da Água] to Lisbon are always better."*

The creation of a Sea Cluster in the Algarve needs to be supported by a central actor, probably IPIMAR, surrounded by public institutes (hydrographical and meteorological), R&D centres from the UAlg, spin-offs, and established companies (figure 9). The creation of a specific organization could be important to motivate the stakeholders. To create a Regional Sea cluster, departing from Marine Sciences Economic Activities, UAlg assumes a pivotal role but needs a full-time person to develop the activities. CCDR has the problem of being the strategists and the verifiers. IPTM, professional associations, Docapesca, ARH and groups of nautical activities need to be enrolled.

To create a regional Sea Cluster is crucial to create an association to structure and coordinate the activities. The Algarve is better than the other Portuguese regions in several branches of the cluster and is difficult to accept *"…that we don't advance"* like refereed by RS, group leader in CCMAR. In his opinion, the central actor should be UAlg and its research centres, namely CIIMAR that is in an excellent position, for basic research and education, IPIMAR to applied research. It is necessary to involve companies from the coastal tourism and not only in traditional activities like fisheries or fish-farming. "*Then we will have to include the variety of actors that intervene in coastal management."* This researcher stressed that it is crucial to plan in the mid-long run. The decision-makers are only planning in the short-run and are constrained by election cycles.

A Sea Cluster should focus economic activities but needs to be anchored in a relevant base of scientific knowledge. It should be stimulated by CCDR, and surrounded by UAlg, IPIMAR, Águas do Algarve, ARH, IPTM, AMAL among others in a more dynamic and less bureaucratic relation.

GAC [Coastal Action Groups of PROMAR] will give an incentive to cooperation not limited to fisheries but to all coastal economic activities. To be successful GACs [West and East Algarve] will have to coordinated with different types of actors from shellfish production association, DGPA that evaluates nationally the projects, DRAP that has a crucial role in the promotion of regional fisheries, to IPIMAR and UAlg that study and analyse the impacts and initiatives, to PNRF that manages the actions in the natural park, POLIS and CCDR that have planning instruments (like PROTALGARVE) to manage the territory and some available financial instruments, IPTM and captaincy to give administrative procedures. GACs will focus some tools to overcome the problems created in the fisheries, like the auction procedure that penalizes the fishermen in their opinion, and will be a relevant interlocutor to discuss the transborder problems of fisheries with Andalusia region. GACs will try to develop some projects to link the fisheries sector with scientific knowledge.

Other related opinion is that the different decision levels don't contribute enough for the contact of these realities and it is important to stress that until very recently coastal research activities were constrained by other authorities like the captaincy. The incentive to cooperate is small. The captaincy, that controls, the CCDR and ARH, that manage, the research units, including IPIMAR, that study, and the fishing communities, that use the resource, need to have mutual learning, trust to coordinate and cooperate. Stakeholders refer that in the case of the Algarve is crucial to involve the natural parks (PNRF seems to have several limitations and lack of synergies with other stakeholders in their capacity). IPTM actions are much discussed and *"…depend heavily in the persons you know in this institute"* as underlined by a researcher.

In the Algarve, the U-E relations need to address tourism companies. Coastal tourism explores biodiversity as a product so it needs to create a sustainable activity. For this goal it is crucial to communicate science effectively. The role of a research unit is to produce knowledge and translate this knowledge into action. Research must solve basic science problems to enlighten the possible interventions. It is crucial to link sustainability and environmental quality with private preoccupations. Companies begin to know more and are several start-ups being created in this area.

PR [responsible for UAlg's Marine Sciences BA] prefers to think about the Knowledge Economy of the Sea instead of a Sea Economy. This assertion is based in the requirement of knowing more before taking the full economic potential of the resources. That happens successively in the Algarve, *"…we don't know much about the sustainability of coastal tourism, off-shore impacts or the potential of regional oceanic resources. We do not know our sea. It is a third-world policy"*. The ideas of Mario Ruivo, prestigious Portuguese Professor, in the Intergovernmental Oceanographic Commission are evident of this absolute need to know more. This position is also underlined by the recent European Commission communication "Marine Knowledge 2020". The general opinion of the researchers in UAlg research units is that the University can lead Marine Science dynamics in Portugal. It has several research groups, many international projects, connections with CCDR, municipalities, airport and Águas do Algarve. In marine sciences, there is a relevant knowledge base but there is a lack of business projects that can use this knowledge. The potential is there and the territorial conditions are great. It is crucial to find some sub-sectors to focus. PB [manager at EEN] suggests three: off-shore aquaculture, transformation of fishing products and energy.

It is important to stress that is important to go from basic to applied research. There is a deficit of quality in the companies, not in the Algarve but in Portugal, maybe in Europe, that requires that public research units do a larger effort to produce knowledge. In the marine sciences, the well-known European innovation paradox may be even more difficult to overcome. In the USA or Japan is the private dynamics that pushes the public intervention. U-E relations have small continuity. In the last 5 years, the main funding sources of the research units have been the Foundation for Science and Technology, the European Commission, ERDF, and the Innovation Agency. The knowledge transfer activities in marine sciences are linked with an intensive effort in transferring the scientific knowledge accumulated in the university by the different R&D units to the innovation processes in companies, especially those operating in relevant traditional sectors as fisheries or aquaculture. This is the area, since the creation of CRIA, where the spin-out creation is more relevant in the region. The knowledge transfer process in the maritime cluster is particularly weak in terms of research contracts and IPR licensing once the companies have a very limited absorptive capacity and knowledge base. Nevertheless there is no substantial differences between regional projects for knowledge transfer in coastal tourism and those that involve external companies. The process is more limited for the characteristics of the investment than differences of organization between Algarve companies and foreign ones.

The University is having some difficulties in adapting to this reality where third-mission activities and particularly spinning-off are important. It is crucial to create a clearer framework regarding several aspects like social capital participation, exclusivity in Professor Careers, professional valorisation, to incentive a broader participation of academia. UAlg is more active in this area than ten years ago but it is not in the podium places at national level. It is relevant to continue to learn and define guidelines to these activities. Recently, CRIA was established as a formal division of the university, but it is not evident were GAPI is going to be included once its competencies are separated by two divisions, CRIA and the Statistics and Information Division. Today the financing of knowledge transfer activities in UAlg comes mainly by own funds. The participation in European projects is a way to obtain financial capacity to execute a diversity of activities and pay human resources and reduce this weight. Today there are no regional programmes to finance directly specific knowledge transfer office activities.

The transfer of knowledge in coastal tourism is manly horizontal, between companies and/or sector entities but in the marine sciences it is a cumulative process, essentially vertical from the knowledge stock of the UAlg to related companies. One limitation is that this transfer is not being stimulated by municipalities. It is completely absent from the discourse, even if today the situation is improving with an increased attention from local politicians. The regional authority CCDR gives a lot of the attention to the issue, but is delayed in launching regional calls for these kinds of activities (SIAC), planed in the regional operational programme ALGARVE 21. The limited funds, because Algarve's phasing-out status, is the main reason appointed. The national government is stimulating very intensively Knowledge Transfer activities, and particularly commercialization of research. The problem is that the kinds of support are very limited, focusing training (for example the UTEN initiative) and completely constrained by the access to the European structural funds that co-finance the thematic operational programmes that the region cannot access. The knowledge transfer process is being professionalized, from a more informal support to more structured activities.

There is some regional focus in spin-out creation in the Sea cluster. This attention emerges from the regional policy that is structuring a regional maritime agenda, but also because of operational expertise of CRIA in the area. Even the ALGARVE 21 gives relevance to this cluster, highlighted by the 2007's Regional Innovation Plan. In marine sciences there is a huge potential but with no expression regarding protection or licensing dynamics. There are programmes prepared to finance the patenting that are not yet fully explored. In marine sciences, some technologies have great potential, namely in living organisms. There is some attention in the IPR protection and the stimulation of connection with companies where previous relations existed with the researchers. Commonly it is tried to create technology transfer contracts, but it seems that to reach companies it is required an aggressive approach to sell and license IP. In this area it is important to think the transfer at least at European scale since the very beginning, and then go to other markets like the USA. Regional economies have no critical mass to create dynamics in this area. It is difficult to guarantee partnerships even if there are some companies with potential.

The transfer is from mainly from the University to regional companies, but is a need to communicate more effectively the science results without endangering the protection of IPR. The region lacks of incubation and localization areas. There are only office spaces available but no laboratorial areas, essential to marine science related activities. Only the university is able to give some spaces, mainly for pre-incubation phases for a short period occupation. If there was a possibility to invest it would be crucial to create a regional S&T area with a specific focus in marine sciences (but due to the small dimension of the Algarve it should permit also the access to other relevant scientific and economic areas). Regarding IPR policies, the major stimulus is coming from INPI and from the UTEN that offers free training for TTOs. The regional authority didn't open SIAC, an incentive system for collective actions in the ALGARVE 21, that could include IPR fostering and KT promotion. The phasing-out status of the Algarve complicated this situation. Other GAPIs created the GAPI 2.0 project in the context of COMPETE but the Algarve had no possibility to advance at the same time because of the specific status of the region. These topics are not relevant for municipalities. The role of the university was central at regional level, otherwise it was avoid.

Professors have a limited capacity to engage knowledge transfer activities. Today they have a demanding commitment in terms of hours to classes and have to engage in research once they are evaluated mainly by their international publication ranking. Linking with companies, for example through applied research contracts, may be counterproductive to academic career. Spinning-off can be very interesting for graduates that finish the studies and don't find the possibility to be integrated in the university as professor and don't want to face science careers that today are very fragile and unstable. People is the central aspect, the informal channels are the most important for knowledge transfer. Professors and researchers don't feel the need to spin-off creation because that is not their interest. They are focused in knowledge production outputs, normally publications. Nonetheless today the incentive scheme is changing a large attention is given to extension activities as can be confirmed in the

new evaluation rule. JG [researcher at CCMAR] underlines *"(…) today there are more incentives to go for a spin-off. The support of CRIA is well-known and the fact that are three or four cases that emerged from CCMAR help to think in this possibility."*

Besides the proximity between UAlg research units and fishing and aquaculture companies the cooperation is often arranged by the research-side, it is very difficult to manage due to the small company feedback. The university is also participating in both GACs [in GAC Barlavento the representative is CCMAR] but there is a limited interest for advanced activities because *"(...) it is focused in a narrow vision of fisheries, where the main objective is the upgrade of the quality of life of fishermen and their families and the construction of basic fishing infrastructures."*

RCS [director of FCT UAlg] thinks that the linkages with society are crucial. But it is not only a question of commercialization of cutting-edge research. Often the crucial is the communication activities to create a more relevant knowledge in several stakeholders in terms of research results possibilities of application. RS stresses the interconnection (crucial but not explored) of coastal tourism and marine sciences. There are areas of marine sciences with huge potential. The Algarve seems an obvious location for aquaculture off-shore production. FCT UAlg is particularly linked with the aquaculture companies, the municipalities in particular Olhão and with CRIA. Regarding CRIA it is important that communication is better done inside of the university. An example is the need of public information regarding a pool of presented ideas and patent portfolio. CCMAR has paid particular attention to science communication and has an active role in the dissemination of marine sciences and best practices.

RS [CCMAR-Algae] underlines other tension: *"we had interest from some companies in the algae that we produced [to purify the aquarium waters] but in the end there was no market. In terms of energy applications is difficult... it is not profitable with the actual technologies and seems very difficult."* Companies are not aware of what are the benefits of research: *"(…) there are few companies arriving to the university for a solution for a technical problem. In marine sciences this never happens in the Algarve. What happens is that companies sometimes want to cooperate with the university, and then the researchers make the question and the answer. CCMAR has an unexploited potential to offer advanced services to companies."*

The vision of other institutional decision-makers is also relevant. MC, president of AMAL, believes that as government initiatives supporting / facilitating the knowledge transfer the University of Algarve and IPIMAR have been able to develop solutions and enhance business development. The respondent also notes that "*in the Algarve conditions exist to transfer this knowledge within firms, more than elsewhere in that particular area of marine sciences."* MC makes clear, during the interview that is not part of the powers of AMAL coordinate with other agents around the issues of the sea. The interviewee says that *"it is very much the philosophy of AMAL to handle it. Each organization has its mission, its purpose [...] AMAL is but a partner of these processes".*

An important organization is IPIMAR that throughout its history acquired the status of institute to support the fishing sector, CM [IPIMAR responsible]*"as the first line has to produce knowledge, but is facing a knowledge support innovation in a chain-value, in this case of fishing, from fishing, aquaculture, manufacturing industry to associated marine environment."* CM believes that *"whatever the history, what has always been the policy of this organization is to define its strategy and its research priorities in terms of sectorial support, or direct its research to innovation, to what we call pre-competitive research, going a little beyond what is the laboratory, the knowledge and try and practice on a scale that can be reproduced by entrepreneurs."* The transfer of knowledge to other actors outside the maritime cluster is made in view of MC by various actors in the integration processes. *"[...] To integrate all stakeholders, the stakeholders as possible [...] through the aggregation of all those who have an interest in the process or add value in knowledge of the result. I see no other way we can do."* The IPIMAR, according to its director, *"maintains a balance between what is relatively important to the production and the transfer of scientific knowledge for economic agents."* CM underlines that as regards the transfer of knowledge the government has a central role in providing funds to support economic activity. In his opinion, the actors that collaborate under the Sea Cluster are the fishermen, fish farmers, manufacturing, shipping, environment protection (monitoring and surveillance) and renewable energy. Regarding co-operation states that *"it is good that people keep this ability to interact because we are coming to the party to take all that effort was an investment, the level of research, planning and in terms of their own administrations. Now it's up to entrepreneurs take part also, they who take the steps and hopefully have the capacity to do so, to what advantage was the result of research, experimental development and policy planning. And the Algarve is able to be a pilot in this question; we know how to go a little further on the practical effects of this cluster."* CM believes that IPIMAR supports indirectly incubation since many of the companies established in the market in this sector are a result of passage of their promoters by the institute. It also refers the support to spin-offs and for the creation or stimulation of new activities by PROMAR.

Another important organization is the PNRF. According to JD [PNRF Board] it doesn't exist knowledge transfer in PNRF, *"(…) the only relations that exist with others actors linked to the marine and lagoon environments, is at the level of administrative entity that manage the occupation of the Maritime Public Domain by aquaculture, salt-culture, among others, and in the regulation of maritime and nature tourism in the Park".*

Other organization, Docapesca find its role as social, both in the management of the social rights of fishermen and at the level of knowledge transmission: "*In terms of transmission of knowledge we have a very didactic concern with the fishermen and fish buyers, especially with regard to compliance with laws and compliance with the rules of Food Security*". HC [responsible of Docapesca] refers that the company has a very direct communication with fishermen's associations and producer organizations, always looking to have *"a very open dialogue"* and even with the fish buyers, so can confer on their needs and objectives. In addition, HC considers that the company have *"a direct dialogue, a didactic position very conscious, collaboration with the universities, the IPIMAR... we always have the concern to collaborate with studies... It is normal to have people doing PhD at auction or to make Master's theses because our concern is really large in passing our knowledge and transmit it to the fullest".*

The role of PROMAR is often referred in the support of singular entrepreneurs as well as corporations, associations and collective enterprises. In addition, the universities and the research centres are also using this co-financing scheme. PM [DRAP – managing body] states that the knowledge transfer is a continuum between DRAP and the beneficiaries. At the beginning of PROMAR there were organized several meetings to clarify the beneficiaries about the changes, but now this transfer is made especially by e-mail and through the DRAP's internet home page. This information concerns all the legislative changes that are being made and other particular subjects, such as financing and management of fisheries. Nevertheless the enthusiasm, it is a Program with huge delays that jeopardize the implementation of several projects.

Focusing the company's side some examples can be referred. For SPAROS [spin-off] the knowledge transfer is mostly horizontal and begins with the establishment of partnerships with the Science and Technology National System, particularly through the promotion of industrial research projects co-financed by public and private sectors. Other spin-off Marsensing underlines the relevance of KTO support [CRIA] in its launching phase. The activities of this company are focused in the signal processing, but they are expanding they activities. One example is a study involving CCMAR about cetaceans and underwater stress or the representation of a north-American company for underwater sound that can be applied to swimming pools in hotels.

It is crucial to stress the role of three organizations in the linkages of the cluster with external organizations. The first is CCDR that is engaging serious work in consolidating the regional economy strengths. This was related often in the last five years to search commitments with external organizations support to the creation of a regional Sea cluster. The main example is the interaction of the initiative "Mar Algarve" with the national Sea Economy and Knowledge Cluster managed by OCEANO XXI.

The second organization is the UAlg that participates in several external networks. The work of CCMAR and CIMA are particularly relevant by its scale and the involvement in excellence initiatives and granting a solid international reputation in the field.

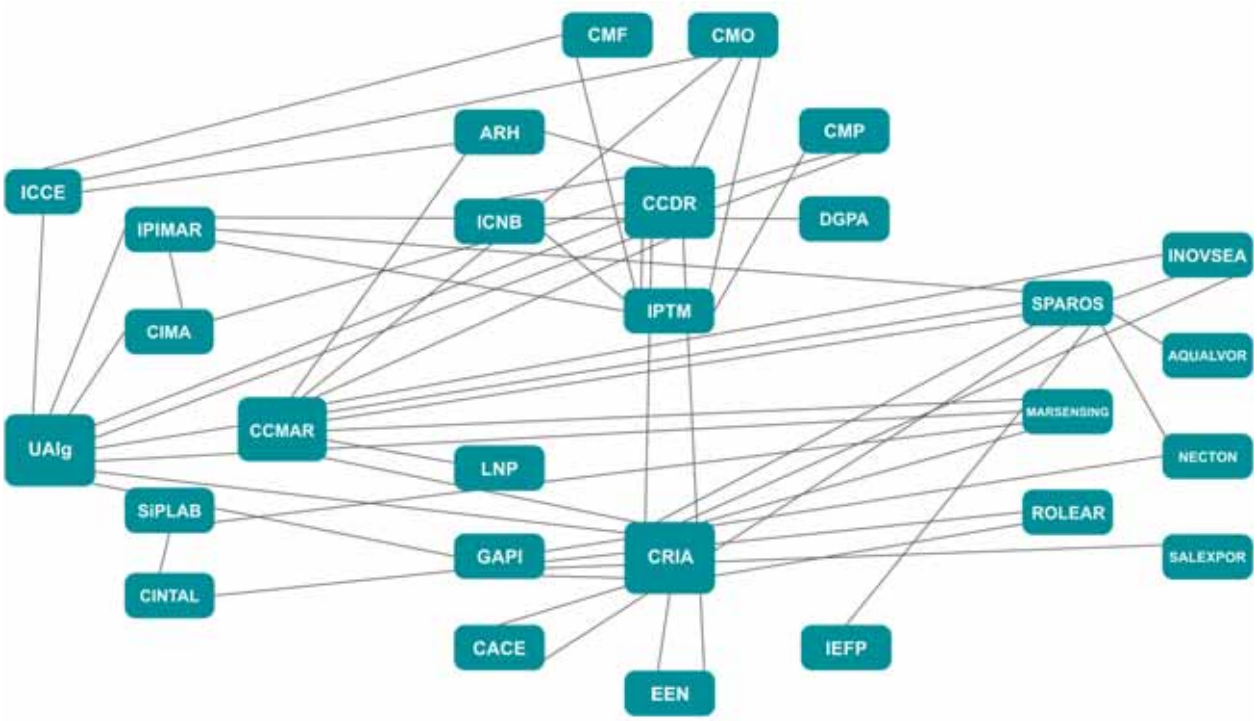
Finally, a third organization to refer is ICCE mainly because of its (not yet fully explored) potential. During its initial phase of installation, ICCE benefited several institutions gathered around this project to support the establishment of the centre in the Algarve, having had a crucial role in the creation of the fundamental conditions required by UNESCO. These institutions were the Regional Hydrographical Administration of Algarve (ARH Algarve), the company ALGAR (Treatment and valorisation of wastes), the municipalities of Albufeira, Faro, Olhão, Tavira and Vila Real Santo António and the University of Algarve. ICCE, at this initial phase, is focusing efforts mostly in building networks in the area of coastal ecohydrology, in different regions of the world. Such networks are made available to the scientific and educational communities, from Portugal and worldwide, with whom the centre is seeking to establish close partnerships. Thus, ICCE will act as a platform both bringing UNESCO programs and networks to the scientific and education communities, but also taking expertise from such communities to UNESCO member-states. Based on such exchange of experiences and expertise, the ICCE-UNESCO role will be to contribute and support the creation of knowledge and the promotion of education and capacity building in the area of Coastal Ecohydrology (addressing the Millennium Development Goals and the Decade for Education of UNESCO, among other UNESCO programs), as a basis for achieving the sustainable use of water and coastal ecosystems worldwide.

The economic crisis had a specific impact in the University of Algarve and specifically in CRIA. Internally the office tried to upgrade internal competencies (though advanced studies and training) in KT and was very attentive to financing opportunities in

EU granting to CRIA the participation in EU projects in the KT topic for best-practices exchange creating the financial conditions for the growth of the office and to broaden the activities. The local KTO has strong linkages with all GAPI network members but especially with IST, UBI, IPN, Tecminho and UPIN. Abroad the connection with UTEN members, Carnegie Mellon University, University of Texas at Austin and Cambridge Enterprise Lt are being relevant to benchmark experiences.

The University of Algarve is very active with CRUP and CRUE [Rectors Organisations in Portugal and Spain]. An example is the joint organization with University of Huelva, the university with more collaboration in projects with UAlg, of the 1st Iberian Technology Transfer Conference in 2010. As previously referred the university congregates a diversity of projects that are an indicator of the academic and scientific excellence in this Sea Cluster branch.

Figure 9: Innovation Actors in the Marine Sciences Cluster in the Algarve



Source: Own elaboration

5. POLICY DISCUSSION

This section will highlight the cluster policy as well as policies relating to the maritime economy, knowledge transfer, networking, innovation and collaboration, for each of the regions. For these cases, the policy can be at the national or regional level which will be specified. To provide a more robust understanding of the implementation of national policy at the regional level, where available (Portugal)[10], the partner's discussions will be condensed. Nonetheless, any specific policies, initiatives that have been introduced at the regional level, will be discussed at that level.

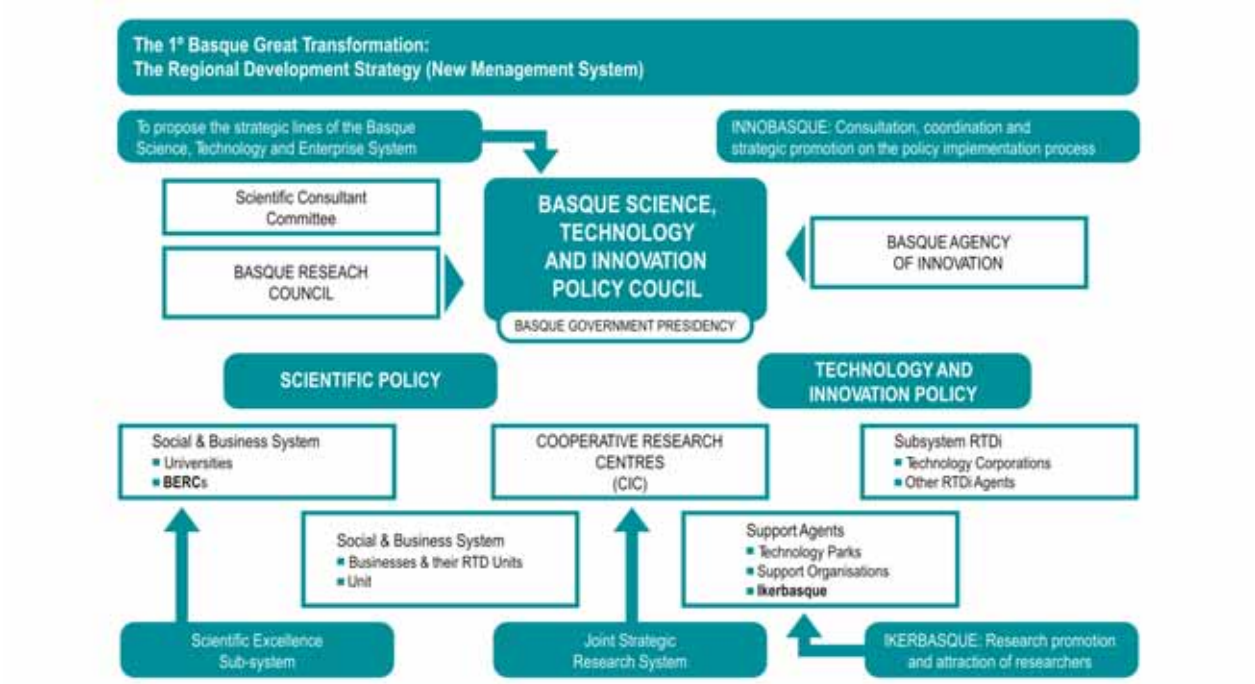
This policy discussion will proceed as follows. In the next section, there will be an examination of national and regional cluster policy. Following this, there will be a review of the 'other' policies that are pertinent to this report including knowledge transfer, collaboration, etc. (see above). The conclusion will focus on best practice examples amongst the regions/nations while providing indicators for success.

5.1. Basque Country (Spain)

Unlike some of the other regions, the Basque Country has its own Parliament, its regional institutions are responsible for collecting main taxes and it has a high degree of autonomy that allows it to govern and administrate directly on matters such as: Public Funds and Tax Collection, Industry and Economic Promotion, Transport, Housing, Environment, Education, Health, Public Order, etc. A multiannual economic agreement regulates financial and fiscal relations with the Spanish State. Given this divide between state and region, the policies discussed here will focus on the regional level. Figure 10 illustrates the significance of the Basque government policy relating to technology & innovation.

[10] While Basque Country and Huelva are both located in Spain, similar to Norte and Algarve in Portugal, due to the emphasis on regional governments in the country, they will be discussed separately.

Figure 10: Basque Regional Development Strategy



At the beginning of the 1990s the Basque Country was in a process of economic decline. Until then most industry was competing on price, a competitive advantage that was now being lost. The necessity of developing new, specialised and sustainable advantages was recognised by the Government, in particular in the light of the impending consolidation of a common European market. New policy responses were sought and, in particular, the Basque government pioneered, together with Catalonia (Spain) and Scotland (UK), with the establishment of a Porterian cluster policy that is still in operation today.

The specified aim of the Basque cluster policy is the improvement of the competitiveness of firms and the region through cooperation in strategic projects related to three main areas: technology, quality management and internationalisation. This was operationalized by the Department of Industry, Trade and Tourism (DITT) of the Basque government with the establishment of Cluster Associations (CAs). The CAs are institutions for collaboration whose main objective is to improve each cluster's competitiveness by facilitating and fostering cooperation/collaboration among their members; these include firms, R&D centres, universities, government and so on.

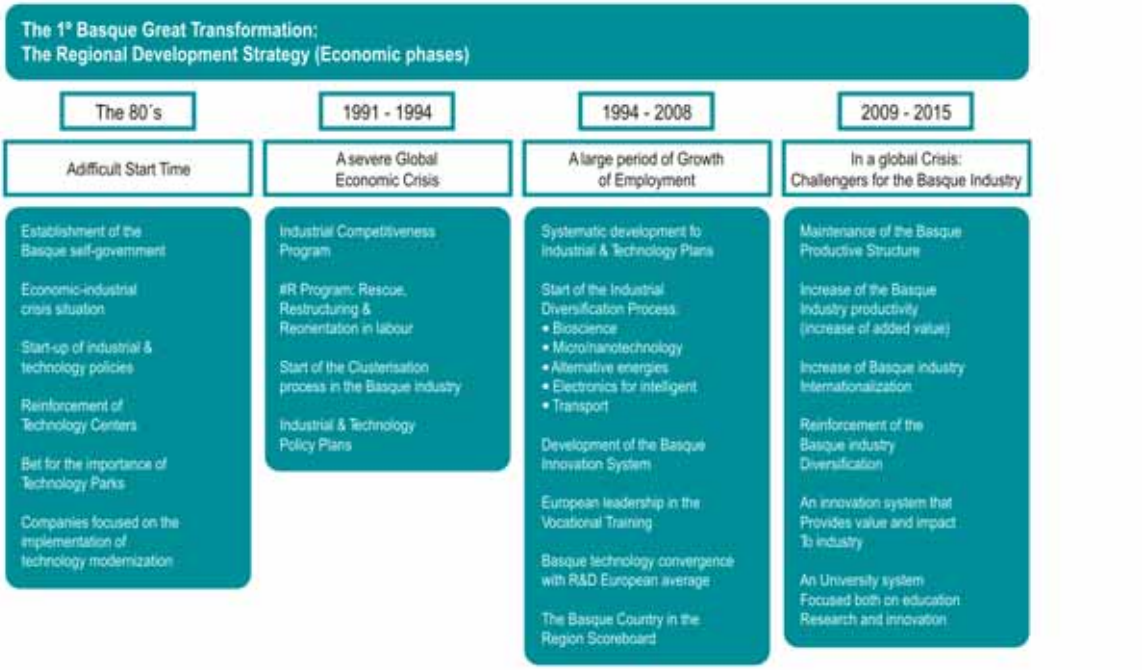
Cluster associations:

- Uniport Bilbao, Port of Bilbao
- HEGAN, Basque Aerospace Cluster
- MLC-ITS Euskadi, Mobility and Logistics Cluster
- EIKEN, Basque Audiovisual
- Foro Marítimo Vasco, Basque Maritime Forum
- CLUSTERPAPEL, Paper Cluster
- AFM, Machine Tool Manufacturer's Association of Spain
- ACLIMA, Environmental Industries
- Cluster Energía, Energy Cluster
- ACEDE, Domestic Appliance Cluster
- GAIA, Electronic and Information Technologies
- ACICAE, Basque Automotive Industry

Earlier in this report, the question of cluster evolution vs. cluster resilience was discussed. Due to the significant impact the recession has had on the economy of the Basque country, their regional development strategy is greatly focusing on recovery

measures. To this extent, current regional cluster strategy is based on economic recovery through innovation. Figure 11 illustrates the change of strategy over time.

Figure 11: Phases of Economic Strategy over Time



5.2. Huelva (Spain)

Although there are no direct policies relating to the creation of clusters in this region, there are different initiatives in the creation of collaboration networks and in knowledge transfer. In the frame of the Junta de Andalucía, it created in 2007 the Andalusian Research, Development and Innovation Plan 2007-2013, which pretends make up a common initiative in these three aspects. The main aim of this plan is to impulse the labour of the Andalusia Universities and the access of the society to the knowledge, promoting the education and the technological infrastructures. It pretends to create a new economy of the knowledge, innovation and human resources. Inside this plan it was created the Andalusian Knowledge System (R&D) as the scenario of the interaction of different agents in the creation, planning and execution of research, technological development and innovation policies in this region. It has specific programs like the cooperative research program between scientific groups in different universities, a program to promote the creation of technological enterprises, the creation of the Andalusian Knowledge Map, the creation of a network to the scientific and technological spreading in Andalusia, etc (http://www.andaluciainvestiga.com/espanol/investigacionAnd/investigacionAnd.asp). The Junta de Andalucía created other institutions to transfer the knowledge like the TTO, which promote the collaboration and the cooperation between public and private entities, nationals and internationals, to join the efforts in the research.

Andalusia is also a part of the Mobility Centres Network, trough the public enterprise Innovation and Technology Transfer Centre in Andalusia (CITAndalucía). It tries to create a net where the Andalusian and foreigners could move through different centres transferring the knowledge.

In Marine Economy there is in Madrid, with different offices in Spain like for example in Huelva, a private initiative called Spanish Maritime Cluster (http://www.clustermaritimo.es/) which it's an institution born by the collaboration and cooperation between all the Spanish activities related to the sea.

There are as well many other associations in relation to the sea, and the different marine activities, which join the enterprises' efforts to provide an environment in which the information and the common interests could be presented, discussed and transferred to benefit the members. Some examples are the Association of shipbuilder of the shell fishing fridge ships, Shipbuilder Association, Aquiculture Association, Gatherers Shellfish Association, National Association of fridge ships of shellfish fishing, South Atlantic Shipbuilding Association of siege ships.

At the local level, there are other initiatives like the Trade, Industry and Navigation Chamber, a private institution that gives services to the maritime and other enterprises, such as the creation of new companies, the management of funding, education activities... and the Federación Onubense de Empresarios FOE, a private organization created by businessmen to promotion and defence of the business interests.

5.3. Border, Midland and Western (Ireland)

Investing in the development of natural resources requires an integrated and informed strategic planning process that engages both the Western communities and the Irish Government. In the last 10 years the Irish Government has funded a number of initiatives. Such investments serve to develop this future base of resource and create the economic and infrastructural environment to attract the significant new investment in Marine and Energy. This investment will be substantial and in renewable energy alone is likely to exceed 20 billion Euros.

To foster the development of the Marine sector as an important economic opportunity for the region, The Irish Marine Institute, which is the national agency responsible for Marine Research, Technology Development and Innovation (RTDI), has launched a consultation process aimed at creating a *SmartOcean* Innovation Cluster which will establish Ireland as a European and Global Centre for Innovative and Specialist Ocean Technologies. Its vision is that by 2020 Ireland will be a recognised leader in the development, testing, commercialisation and delivery to market of the next generation of innovative technologies addressing evolving global markets in marine renewable energy, environmental monitoring and water technologies.

SmartOcean

On the 22nd March 2010, the Irish Marine Institute launched a Consultation Document outlining a Vision and presenting a Strategy to create a SmartOcean Innovation Cluster which will establish Ireland as a European and Global Centre for Innovative and Specialist Ocean Technologies. Key aspects of the consultation process are the identification/development of the following

- Specific areas of market opportunity;
- Test bed needs and opportunities to support development;
- Supports needed to enable networking and brokerage and added value;
- Formation of commercial vehicle for industry partners;
- Joint public-private sector project opportunities; and
- SmartOcean Graduate Programme: Graduate skills of relevance.

The intention is that the existing SmartOcean Innovation Cluster stakeholders will work collaboratively to realise the full potential of the significant investments to date in R&D. This will create a profile for Ireland as a cutting edge location for carrying out research into specialist ocean technologies, leveraging convergence opportunities which can be used to leverage market intelligence and international networks. In addition, this can lead to commercialisation of innovative ocean technologies, targeting niche elements of the value chain associated with emerging marine and environmental markets. Furthermore, it can act as a catalyst for public private partnership and collaboration between technology developers, systems integrators and solutions service providers and government while locally creating jobs. Critical to the creation of the SmartOcean Innovation cluster is the consolidation of a core suite of test bed infrastructures. These will provide the key enabling framework and represents an essential contribution by policymakers to support and influence the cluster foundation. The potential success of this programme is based on the success of other cluster programmes in operation in Galway. This will be discussed in the following section on 'other policies'.

5.4. Wales (UK)

The Welsh Assembly Government (WAG) has a similar role at the national level as the Basque government has at the regional level. Wales is one of four nations that compose the UK. Initially, the UK government, based in England, was responsible for setting policy for all four nations; however, at the current time, Wales, Scotland and Northern Ireland all have devolved governments. WAG is devolved from the UK government meaning that on certain issues Wales can create its own policy. While there may be a divide on certain issues such as entrepreneurship, other issues are not devolved, as is the case of the renewable energy, therefore Wales follows the UK government policy.

The clusters in Wales are market-led as there are no cluster policies provided by the Welsh Assembly Government. While this lack of policy can be difficult given the current economic crisis, it is also a positive given the demand for the products created in the country. Despite the lack of cluster policy, there are strategies in place to support the marine industries and the networks (MEP) mentioned above which are largely derived from policies and initiatives set forth at the UK level and adopted in Wales (renewable energy). These policies are pertinent to this report and will be discussed in the following section.

5.5. Norte and Algarve (Portugal)

5.5.1. Cluster Policy at the National Level

In comparison to countries with established cluster policy that date back decades, the Portuguese cluster policy is relatively new. The subject of Portugal's potential for innovative development was particularly popular after Michael Porter's study (1994) on "Building up competitive advantages in Portugal" was published. The aim of the research was to identify the areas in which Portugal had competitive advantage and the obstacles that were obstructing their development. Some clusters have been identified as having potential to develop, as it was the case of forest products, textiles and furniture. On the other hand, more developed and geographically concentrated clusters were identified, like cork, footwear, stone and moulds. Additionally, Porter defined the following priority clusters for Portugal: wine, tourism, wood, textiles, footwear and automotive. As a result, working groups were defined for these priority areas.

However, mainly due to changes in the national political scenario, actions relating to clusters were put on hold for some time. The clusters theme emerged again in 2001 in the scope of *PROINOV* – Integrated Program of Support for Innovation. This programme was part of the Portuguese Innovation Agenda. The main goal of the Agenda was to "develop innovation clusters in key areas", either in traditional activity areas (textiles, footwear, ceramic and construction materials, forest and tourism) and in emergent activity areas (software). This goal was to be implemented through the collaboration between companies, business associations, education, research and innovation institutions. Shortly after, again due to a difficult political cycle, PROINOV was interrupted. Until 2005 several other initiatives were outlined and implemented as to strengthen the activities around the clusters. That was the case of several initiatives implemented by the Portuguese Innovation Agency (AdI).

Nowadays, as the Portuguese economy aims for sustained growth and the ability to compete at the international level – objectives which are consistent with creating added value, regional qualification and more and better jobs – it faces a number of challenges and constraints. These, in turn, called for a strategy that acknowledges competitiveness as a systemic reality and required the State to play a dynamic and leadership role in creating business attitudes and behaviours that really value innovation and knowledge. Continuing the work done in previous decades, this strategy is reflected in the *National Strategic Reference Framework*, whose main aim is the qualification of population through an emphasis on knowledge, science, technology and innovation, as well as the promotion of high and sustained levels of economic and socio-cultural development and territorial qualification. The achievement of this strategic aim is ensured with the support of the Structural Funds and the Cohesion Fund by the concretisation by all Operational Programmes during the 2007-2013 period of three major thematic agendas: the Human Potential Agenda, the Competitiveness Factors Agenda and the Territorial Enhancement Agenda.

For the purpose of this report, we refer to the *Operational Agenda for Competitiveness Factors (OACF),* whose central objective is to stimulate economic growth to levels that will produce a sustained recovery of the Portuguese economy towards real convergence with the European Union – based on the competitiveness of the country and its regions, enterprises and geographical areas. Like in the other thematic agendas, the strategic objectives of the OACF are being implemented not only by its Operational Programme but also by the Regional Operational Programmes (ROP), which are structured thematically and in such a way as to ensure the implementation of the thematic priorities at the regional level and in accordance with the specificities and potentialities of each region.

Clusters are specifically framed within the Operational Agenda for Competitiveness Factors under the so called "*Collective Actions - Collective Efficiency Strategies*". These strategies are presented under two different typologies: Clusters and Territorial based Economic Valorisation Strategies. Under the Cluster typology, a distinction has been made between "Technology and Competitiveness Centres" (TCC) and "Other Clusters". Technology and Competitiveness Centres are partnerships that have national scope and value international projection of the projects, whilst Clusters are mainly regional partnerships, aggregating companies and other institutions that must share a common vision of the territorial economy and show the key role of physical proximity in the innovation process. Until this moment, eleven TTCs and eight clusters were set up across the differing regions, being recognised as *Collective Efficiency Strategies*.

Of particular interest in relation to this report is the Portuguese government's policy specifically relating to maritime clusters. Unlike the other partner regions or nations, the Portuguese government addresses the particular issues surrounding maritime clusters in their country. In the end of 2006 *the National Strategy for the Sea* became a central political instrument to allow Portugal to protect and make the best use of the invaluable resource of the sea. In defining for the first time priority strategic guidelines for the "Maritime Affairs" the Portuguese Government committed in promoting novel ways to make the best use of ocean resources in a sustainable manner, contributing to the development of the maritime economy and industries, investing in ocean sciences and technologies and creating jobs, amongst other. This recognition paved the way to the revision of existing programmes and of course to the implementation of a new strategy for the Sea, both at national and regional levels.

5.5.2. Maritime Cluster Policy at the Regional Level

Norte (Portugal)

Following the national recognition of the importance of the Sea, through the National Strategy for the Sea, and in line with the National Strategic Reference Framework, the Regional Operational Programme for the North Region 2007-2013 defined a set of Regional Thematic Agendas as part of its Regional Development Strategy, called "*North 2015*". The aim of the Regional Agenda for the Sea, which derived from "North 2015 initiative", was to perform a SWOT analysis in the scope of a regional maritime diagnosis, identification of the main marine economic activities as well as R&D activities, besides defining 10 strategic lines of action. On the other hand, the elaboration of the Regional Agenda for the Sea was based on a participatory process open to a wide range of actors – either regional or national – and has contributed to the birth of several projects and actions submitted as proposals to financial instruments included in NSRF. This document became a crucial reference in the support to national interregional cooperation, namely between the Norte and Centro regions, being afterwards formalized in the launching of the Sea Knowledge and Economics Cluster. International regional cooperation was also established between Norte, Galiza and other Atlantic Areas, framed under the European Territorial Cooperation Programs INTERREG IVB Atlantic Area - and INTERREG IVC.

As explained above, the creation of a maritime cluster in the Norte region was one of the lines of action of the Agenda for the Sea of the Norte region. In this context, on 27 July 2009 the Maritime Knowledge and Economics Cluster was recognised as a *Collective Efficiency Strategy* by the Portuguese managing authorities. Still, two aspects should be highlighted concerning the Sea Cluster birth. First, we are talking about a root creation project, where enterprises and support organizations are being induced through public financing. The entities proximity is twofold: geographical and strategic, since their activities are based near their fundamental resource: the sea. An association from the Norte region called IDCEM was created in order to promote the sea knowledge and economy development. Founded by Research and development institutions (CIIMAR, University of Porto, INEGI and IHRH), a municipalities association (Valimar) and a sea port public company (APDL), it grew to include several other partners from different social intervention areas. Later on, IDCEM joined efforts with another sea-related association, AFM

(Forum Mar Centro Association), an entity responsible for promoting the sea-cluster in the Portuguese NUTS II region of Centro. From this collaboration between IDCEM and AFM a new association was born, called OCEANOXXI, whose goal is to support the development of maritime activities in Portugal. According to recent information, and based on the evaluation commission feedback, there are signs that this cluster could be structured at an inter-regional level, with extensions including the Norte, Centre and Algarve regions.

Algarve (Portugal)

In close coordination with the strategic document, the ALGARVE 21 - Regional Operational Programme for 2007-2013, under the NSRF, reinforces the need to invest strategically in the Algarve Sea providing the opportunity to support specific projects or economic activities associated with it, or others that compete indirectly to consolidate the strategy around the Sea Algarve. The programme is managed by CCDR Algarve. By the end of 2010 contributed to ALGARVE 21 over 420 applications, 221 projects were approved, with a volume of eligible investment exceeding 185 million and a financial support of around 68 million Euros. Qualitatively, the distribution of the approved investment focuses predominantly on Axis 1, in direct support to typologies of companies – incentive schemes representing 32% of total approvals of the Program. The typologies "School Network" (16%), "Partnerships for Urban Regeneration" (10%) and “Recovery actions of the Coast"(8%) are other relevant axis. The municipalities with the largest volume of approvals were Portimão (22,3%), followed by Vila do Bispo (17,2%) and Faro (15,9%). The Algarve ended 2010 with a performance of about 13% compared to the allocation schedule (2007-2013). This level of implementation is around 53 million Euros with a corresponding reimbursement of funds (ERDF) of 22 million Euros.

Beyond the Regional Operational Programme, the development of a *Sea Regional Agenda* (December 2008) intended to optimize use of resources linked to the sea, ensuring their protection, their joint operation with scientific research and innovation, ensure sustainable use of marine, coastal dynamics monitoring and diversify tourism products, combining all this in an integrated policy of governance. The bet on a network of efficient port infrastructure (commercial, recreational, fishing), support for the fishing, aquaculture and other economic activities linked to the resources of the sea, the fleet support and sustainability of resources, exploitation of sea products, training and research and innovation are top priorities. This agenda was instigated by CCDR Algarve.

It is intended that in 2015 the brand name "Mar Algarve" has national and international recognition. The website www.maralgarve.com aims to be a platform for dissemination and debate on the strategic importance of the Sea, to the Algarve and to the country, stressing the need for synergy between the various economic activities, directly or additionally linked to the sea. It allows extending the mobilization of society and its institutions, particularly agents linked to oceanic economy as well as researchers and professionals, with areas of economic, direct and indirect scientific links, to cast, in a participatory way, the wide range of Sea opportunities offered. The connection of the Initiative “Mar Algarve” with the national Sea Cluster is currently under discussion.

Chronology of the Creation of the Regional Sea Cluster:

- March 2005 to March 2006 → Participation of the Algarve region in the cooperation project "Seas of Europe", coordinated by the Conference of Peripheral Maritime Regions of Europe, on the theme of the role of regions in European Maritime Policy.
- March 2006 → Establishment of working group for discussion and input for developing a strategic plan for the sea in the Algarve. Speakers: CCDR Algarve, IPTM – Delegation of Algarve, ICNB - PNRF, INAG, DRPA Algarve, AMAL, University of Algarve, IPIMAR and Portuguese Navy - Command of the Southern Coast.
- May 26, 2006 → Portimão. Algarve Conference 2015 "Algarve Sea: an ocean of opportunities".
- November 16, 2006 → Faro. Maritime Museum Almirante Ramalho Ortigão. Launch of portal Maralgarve (www.maralgarve.com) on the occasion of National Day of Sea.
- April 4, 2007 → Olhão. Expomar. CCDR Stand allusive to sea and participation in the seminar's opening presentation with the outline of the regional strategy for the sea.
- December 2007 → CCDR Algarve awards at the International Centre for Research in Planning and Tourism (CITT) of University of Algarve study on "Potential Profile and Economic and Social Nautical Tourism in the Algarve".

6. OTHER POLICIES

6.1. Basque Country (Spain)

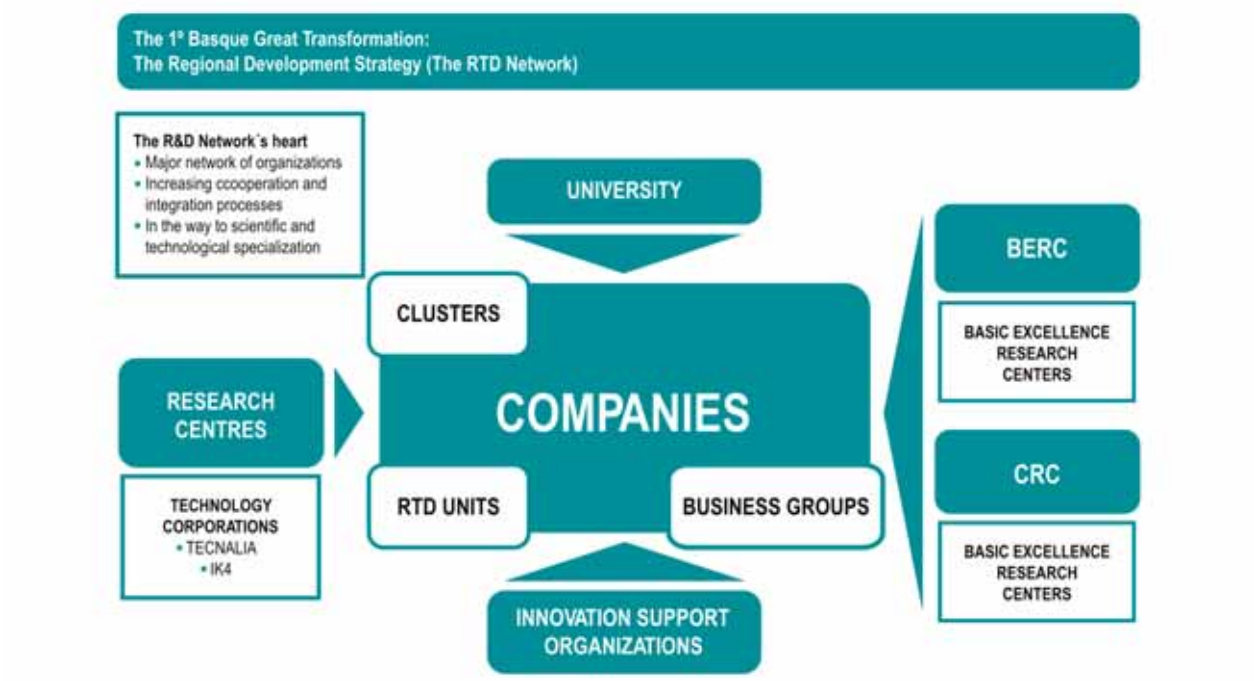
Euskadi (Basque Government) 2020-2030. Towards the knowledge and innovation economy

The challenge with the greatest significance for Euskadi presented in the horizon 2020-2030 is the financial sustainability of the welfare state. In economic terms, the equation we face is extremely complex. In that timeframe, our economic development model will be conditioned by the proximity of the ceiling of conventional oils, as announced by the International Energy Agency, and by the urgent need to move towards a low-carbon economy. At the same time, we will see an increased presence of emerging economies in international markets, competing not only in prices, but also in technology and added value.

Furthermore, the recession has highlighted the need to undertake a deep economic reform agenda in Spain, absolutely relevant for the Basque economy as well. In this framework, the central commitment would be for a knowledge and innovation economy, open to international markets, with a strong industrial base and high technological content. This commitment involves passing a series of strategic routes, including but not limited to: the creation of the network of cooperative research centres (CIC) and centres of excellence research (BERC), along with Ikerbasque program of attraction of research talent. Political forces and institutions in this country should conjure to make the Basque Public University be among the top three universities in Spain and the 150 first in the world in the decade 2020-2030. To position Euskadi severely as a country in the knowledge economy, a scientific and research environment of international excellence must be taken into account.

Finally, Euskadi must invest in scientific research, technological development and innovation, R&D, given the positive correlation between it and the achievement of high levels of income and welfare. See figure 12.

Figure 12: Government Established R&D Network



In 2008, the average of the Basque Country was 1.85% and the average of the European Union 1.90%. By 2020, the European Union has set out to reach an investment of 3%, but benchmark regions with which Euskadi should compare would invest by that date 5% of their Gross Domestic Product.

6.2. Huelva (Spain)

At the national level there is no concrete policy in relation to the maritime cluster or marine economy, but there are many policies relating to the maritime sector and maritime activities. In the national range, there are some policies in relation to the marine activity. The *Law 10/1977, 4th January, on Territorial Sea,* defines the exact meaning of the words Territorial Sea, to know the exact area of the Spanish Competence. It stated clearly the width of the area and the limit established by the rest of the States to know the area where the authorities has jurisdiction in fishing (*Law 20/1967*, 8th April, on extension of jurisdictional waters).

The *Law 3/2011, 26th March, on State Maritime Fishing,* according to the principles and rules in the common fishing policy and the international treaties and agreements, gives the regulation of the maritime fishing, the basic rules in the fishing sector and fishing products trade regulation and his exterior trade regulation, the organization of the fishing and oceanic researches, State Competence (art. 149.1.15. a *SC*), the establishment of the infractions and sanctions in maritime fishing in exterior waters matter.

The *Law 27/1992, 24th November, on the State Port and the Merchant Navy,* regulates the ports, public state maritime-earth dominion, and the support of the port service. The SC gives to the Regional Authorities, in his articles 148.1.6 and 149.1.20, competences in this matter, according to the Port Policy Resolution, approved by the European Parliament in November 1988, which gives recommendations to have independence or autonomy in port management. So the main aim of this law is to give rules to get a large autonomy in the management, procedures, and in the application of updated business accounting, statistic and control manage systems. In relation to the Merchant Navy and the Maritime Transport they need a constant attention to safeguard the 7 880 Kilometres coast, Spain has.

The *Law 22/1988, 28th July, on Coasts,* regulate the public state maritime-earth dominion, the coasts, the beaches, the territorial sea and the natural resources of the economic area and the continental shelf. This Law was signed because of the threat of the environment conservation and the progressive deterioration of the coasts. The main aim of this law is the management and the conservation of the natural heritage, following the instructions of the *article 45 of the SC*, and the criterion of the recommendation *29/1973 of the Council of Europe* on coast areas protection, in the *Littoral Letter in 1981 of the European Economic Community* and in other plans and programmes. This law pretends to regulate the maritime building works to assure there are no damaging effects in the marine environment life, the marshes, the organic and biological production… produced because of the littoral privatization.

The National Authority created in the *Law 33/1980, 21th June, the Regulation and Organization of the Fishing Product and Marine Farming Market Fund* (Fondo de Regulación y Organización del Mercado de los Productos de Pesca y Cultivos Marinos – FROM). The FROM is an autonomic organization inside the undersecretary's Fishing and Merchant Navy Office, of the Transport and Communication Ministry, whose most important activity is to promote the fishing products consume, besides the promotion and assistance of Associations, Cooperatives and Enterprises in relation to the marine culture extraction.

The National Authority works always to give actualized policies, and they offer the new *Bill 121/000111 General on Maritime Shipping,* that pretends to guarantee the coordination between the Spanish and European rules and other international agreements. This Bill try to allow a better intervention of the Ministry in the defence of the maritime safe and the rescue of the human live in the sea, besides the protection of the environmental and coastal interest. And there is a new regulation regarding the Protection of the Marine Environment, under the guidelines of the 2008/56/CE, 17th June 2008, the Common Policy that gives the instructions to maintain the good environment state in the marine means. So each State has to have his own marine strategies to each region.

There are other concrete decrees in relation to the marine activity like the Inspections of the Recreation Boats (Royal Decree 1434/1999, 10th September), the Safety Equipment, rescue, navigation regulation (Order FOM/1076/2006), and the marine radio communications inside Spanish civil vessels (Royal Decree 1185/2006).

At the regional level and in to the Andalusian Authority, they follow the Andalusian Autonomy Statute and Spanish Constitution (SC) instructions although there are other laws in relation to the marine activities like the *Law 1/2002, 4th April, on the Regulation, Promotion and Control of the Maritime Fishing, Shellfish and Marine Aquiculture* that is the most important marine law in the Region. The importance of this sector in Andalusia forces the creation of a law to regulate the rational exploitation of the resources and his responsible trade of the products to guarantee the sustainable development of this activity and the marine environment. This law promotes also the research, technological development and the education in fishing and aquiculture.

The Law 12/1999, 15th December, on Tourism, under the instructions of the Andalusian Autonomy Statute (AAS) that gives to the Autonomic Region the exclusive competence in promotion and regulation of the tourism (12.3.3.o , AAS), regulates one of the most important economic sectors in Andalusia. The tourism is the first industry in the Andalusian economy, that's why this law pretends to regulate the sustainability of ours cultural resources and heritage coordinated with the promotion of the activity. The Regional Authority has to impulse the tourism as a strategic sector in the Andalusian economy that creates employment, always regulating the culture, environment and social sustainability, protecting them.

The *Law 21/2007, 18th December, on Legal and Economical Regime of the Andalusian Ports,* regulates the necessities of the autonomic port system in trade, fishing and sports. There are other decrees in relation to the marine activity, signed by the Agriculture and Fishing Regional Ministry, like the *Recreational Maritime Fishing in Interior Waters, the Submarine Fishing, and Continental Fishing.*

In the local level there are some rules that concrete the execution of the other laws, decrees and rules in a higher level, as for example the resolutions of the Maritime Captaincy in Huelva. We can example it with a resolution on the establishment of a restricted navigation area near the petrol unload area in the "Cepsa-La Rábida" Refinery located in Huelva's Port. There are rules like it that give specific regulations in relation to the concrete case of Huelva's areas.

The *Article 54 of the Andalusian Autonomy Statute, passed by the Organic Law 2/2007, 19th March,* gives the autonomic competences in relation to the Research, Development and Innovation.

The *Law 16/2007, 3th December, Andalusian of the Science and the Knowledge,* establishes the general frame to regulate the science and technology activities and its translation to the innovation in Andalusia. It regulates the competences of the Autonomic Community of Andalusia in science and technology research, the development and innovation. This law looks for shaping an Andalusian Knowledge System that favour the interaction between the different Actors, to get an efficiency that benefit the population, the society and the economic development. It pretends to promote the improvement of the capacity to create knowledge trough a research with quality and his transfer to the productive sector. It wants to strengthen the improvement of the quality of the system and the technological improvement of the enterprises, the Public Administration and the society.

The *Organic Law 6/2001, 21th December, of the Universities,* must systematize and update the academic aspects, of the teaching, the research and the administration, that allow the Universities deal with, in the frame of the information and knowledge society, the challenges derivate from the innovation in the shape of the creation and transfer of knowledge.

The *Organic Law 4/2007, 12th April, that changes the Organic Law 6/2001, 21th December of Universities,* looks for the harmonization of the High Educative Systems in the frame of the High Education European Space and assumes the needed reform in the structure and organization of the education, based in the Grades, Master and Doctorates. This new education model gives a different way to understand the University and his relation with the society, giving a quality education to answer the needs of the population. The universities must be the engine of the social and economic development of the country, and moreover the research, the university must impel the transfer of the research results to the productive sector, in relation to the science and technology systems actors.

6.3. Border, Midland and Western (Ireland)

BUILD-UP - the Cross Border Marketing Programme for the Construction Industry Product Cluster; is a cross border initiative of WESTBIC and NORIBIC and supported by the EU INTERREG IIIA Programme for Ireland/Northern Ireland through North West Region Cross Border Group. The aim of the project was to strengthen the construction industry product sector, improve its profile in the region and enable it to become more competitive, nationally and internationally. The project arose from the *Clusternet Programme*, which identified four sectors, including Construction Industry Products, with a potential to develop cross-border clusters. The aims and objectives of the project were:

- Increase the level of cross-border collaboration between companies in the construction industry sector;
- Consolidate existing jobs in the construction industry products sector in the North West Region;
- Examine new product development opportunities, new markets and new partners in their own jurisdictions or across the border;
- Encourage strategic development particularly focusing on cross-border partnerships between construction industry products companies leading to additional employment, consolidation of existing jobs and related economic and social benefits to the local community.

Results included development of strategic development plan and implementation of marketing strategy for the sector, engagement of 32 companies in cluster, increased sales and employment, including increased cross border activity and increased collaborative activities amongst participants.

6.4. Wales (UK)

There are several policy areas that overlap when discussing the maritime economy in South West Wales, such as: energy policy, environment conservation policy, and economic stimulus policy. The overarching aim of all of these policies is to use the natural environment but in a sustainable manner. In the same way that there are overlapping themes relating to the marine economy, there are also several different actors that influence strategies for the natural environment, namely: Welsh Assembly Government, Pembrokeshire County Council, the Crown Estates, the National Parks, the Department of Environment and Climate Change, and the South West Wales Tourism Partnership. Nonetheless, there are no policies or strategies directed at knowledge transfer amongst these actors; however, a knowledge transfer facilitator, Marine Energy Pembrokeshire (network), was a product of the Marine Protected Areas Plan.

The following is an overview of the policies, strategies, and initiatives in place regarding the marine economy in South West Wales.

To correspond with the Department for Energy and Climate Change (DECC) policy, WAG set for the *Protecting Welsh Seas: Strategy for Marine Protected Areas (MPAs) in Wales (2009)*, highlighted the geographic area that is protected, both on and off shore, and discussed the conservation of dual-use spaces. In addition, the protection of biodiversity was addressed which, although not explicitly mentioned, is very important for both coastal tourism and marine energy. The tourism is based on the biodiversity, but given the tourists eco-footprints it could be what is also killing it. In terms of marine energy, several of the University consortiums listed above are working on models that help to explain the ecological impact of (for example) a turbine on the sea floor. In addition, *The* Wales *Fisheries Strategy (2008)* created by WAG continues to support the development of sustainable fisheries in Wales setting guidelines for fishing tourism, fish farms and fish trade.

The DECC is part of the UK government, which, in most cases, does not create or influence policy in Wales due to the devolved nature of the government. However, in the case of climate change and renewable energy, Wales is not devolved[11]. The *UK Renewable Energy Strategy (2009)* DECC, documents the strategies that are currently in place and what needs to be done in the future to tackle climate change through an increase in renewable energy production and use. It is broad in scope and can be considered the overarching document for renewable energy that precedes the 2010 *Marine Energy Action Plan (*MEAP) that focuses solely on marine energy. In addition, the MEAP *(2010)* is also headed by DECC and highlights, across the UK, the opportunities for marine energy growth as well as the estimated impact of that growth across the UK. In addition, it highlights the UK's place amongst European countries in terms of marine energy research, supply chain needs, and feasibility of production. It provides a well-balanced assessment of the current state of the industry and the potential to reach the government-led and industry-led goals. In response to this plan, due to the need for industry involvement to fund projects, a consortium of industry leaders composed a response to the plan that was also published and will be a part of the interview findings. Finally, DECC's *Strategic Environmental Assessment (SEA)* due early 2011 will highlight the areas of South West Wales that can be developed and what can be developed in these specific areas. Essentially, this will highlight what land, on and offshore, can be used, and what it can be used for multi-use, dual use, research, tourism, etc.

To coincide with the release of the DECC energy policies, WAG created policy that had the same message in promoting renewable energy and addressing climate change issues. In terms of marine energy, the *One Wales* document *(2008)*, drafted by WAG, seeks to tackle climate change through diversified renewable energy generation. The strategy was introduced in 2006 and sets forth the sustainability challenges and aims for Wales. The marine environment is mentioned at length, particularly regarding conservation practices, ecological footprint of the population, including tourism and renewable energy. However, given the scope of the document, the most important aspect of the strategy is that it showcased the government's stance on climate change and sustainability and paved the way for further, more specific, initiatives.

The *Wales Spatial Plan (2009) Part 2*- Pembrokeshire Coastal Forum & WAG, explain the possibilities for marine energy growth in West Wales as well as how to strengthen ties with Ireland. Both the current state of the marine energy sector in the region at that time, as well as the potential growth of the sector, were addressed. As a result of this document, the Coastal Forum was given the responsibility of setting up the Marine Energy Pembrokeshire network to concentrate solely on marine energy in West

[11] Scotland has a devolved government, making the SEA an important determinant for market growth and competition regarding the ROCs.

Wales. This included providing government officials and funders with more information on marine energy as firms in this high-tech sector need to have an availability of funds to grow, otherwise they can locate elsewhere.

Slightly less narrow was *The Low Carbon Revolution (2010) strategy* by WAG, which provides an update on the existing strategies focusing on the energy usage of the population and how it can be converted to renewable energy usage through utilising marine, wind, and other renewable energy. The Energy Policy Statement sets out Wales' ambitions to accelerate the transition to a low carbon economy in Wales. Targeting marine energy, the government provides its goals for 2020/2025 for: tidal stream, offshore wind, wave energy, tidal range and hydropower.

Finally, *Capturing the Potential- A green jobs strategy for Wales (2009*) WAG, is similar to the *New Industries, New Jobs (NINJ)* (2009) initiative set forth by the UK government's Business, Innovation & Skills (BIS) department. The former is specifically for Wales as the latter is for England due to entrepreneurship (under the remit of the BIS) being devolved to the Welsh government. Nonetheless, both documents outline, in the height of the recession, the new jobs that can be created giving growth of both existing (if green) and new businesses in the respective areas. While NINJ looks at employment growth in new industries, which are often renewable energy related given the incentives, it also focuses on other high-tech endeavours. The Wales strategy is solely to enhance employment opportunities in green industries.

Regarding to Economy, many of the aforementioned policies could also come under this section, which supports the 'overlapping' nature of the policy and the significance of the sectors to the region. The *Coastal Tourism Strategy (2008)* by WAG, defines the environmental and economic significance of the Welsh coastline, reviews current and future trends affecting the market for coastal tourism and sets out the vision, outcomes, and challenges to the strategy. This is also the basis for the South West Wales Tourism Partnership which is responsible for conducting research and disseminating material in the region.

6.5. Norte and Algarve (Portugal)

The environment in which technology transfer takes place plays a key role in defining the best approaches and, ultimately, their success. Over the last years innovation and technology and knowledge transfer have assumed large importance, hence the creation of support instruments and policies by the State are crucial.

Portugal concentrates most of its policies in supporting SMEs, possibly reflecting a need to restructure the industrial fabric, increasing its competitiveness and an emergent predisposition to support innovative start-ups [reflected in measures such as NEOTEC Initiative (PT 51); FINICIA-High Innovation Content Projects (PT 56), and NEST New Technology Based Companies (PT 34). All of these measures were designed to support the creation of technology based ventures and increase the ability of SMEs to perform R&D in house.

The research projects that receive financial support need to contribute to the development of the region. Portugal implemented the "Doctoral Grants in Companies" measure (PT 72), aimed at attracting doctoral students to focusing their dissertation on issues relevant for firms, encouraging a strategy of cooperation between companies and research units.

The Program FINICIA is a tool to facilitate the access to financing solutions and technical assistance in setting up businesses, or companies in early stage of its life cycle, with business differentiation, close to the market research or high potential economic value. To ensure access to financial resources the State, through IAPMEI, shares the risk of these transactions with venture capital companies, banks, mutual guarantee companies and business angels. FINICIA is structured along 4 axes of intervention: axis 0 - for the results of research or projects in proof of concept of high and medium technology to move to market via the creation of business or industrial licensing; axis I - for the creation of enterprises or SMEs with existing activity begun, to submit projects with a high innovative potential for growth and axis II - Funding for start-ups or start-up SMEs with less than 3 years; axis III - SME existing or being created, with business activity or project of significance in local municipalities that are members FINICIA Funds. FINICIA is an initiative managed by IAPMEI for establishing public-private partnerships (Regional Platforms).

There are also a number of policy initiatives in the field of strengthening the use of IPR in public science, including financial support, expert advice, and administrative support. Solid examples of some of those policies are the GAPI - Industrial Property

Support Offices (PT 26), financing small units specialised on the provision of information and on the development of actions concerning the promotion of industrial property and the incentives and SIUPI - Incentive Scheme for the Use of Industrial Propriety (PT 18) to subsidize the internationalisation of patents. A more modern version of this policy is found in PT 81 - Collective Actions Support System (SIAC) that allowed the creation of the project GAPI 2.0, a network of centres that aim to value knowledge generated by companies, entrepreneurs and education and research entities through the promotion of entrepreneurship, innovation and industrial property. The objectives of the network are, amongst other, to promote an entrepreneurship culture by fostering innovative business ideas with economic potential, to foster the creation of technology-based enterprises in higher added value sectors, support national companies in the systematic and sustainable development innovation activities, and promote industrial property near companies as a mechanism that supports innovation and enhances competitiveness.

Recently, other measures have been implemented to help technology transfer offices and university incubators to develop international links and access high level training. The University Technology Enterprise Network (UTEN) is a network of scientific and academic institutions in Portugal that was launched in 2007 oriented towards fostering technology transfer and commercialization at an international scale. It is promoted and supported by the Portuguese Foundation for Science and Technology (FCT), in close collaboration with the Council of Rectors of Portuguese Universities (CRUP) and the Portuguese Industrial Property Institute (INPI) involving strategic partnerships with leading institutions worldwide, such as MIT, Carnegie Mellon and the University of Texas at Austin. While UTEN has evolved over the past four years, its mission has being strengthened: to help build a professional, globally competitive and sustainable technology transfer and commercialization network in Portugal oriented for global markets.

At the clusters level, technology and knowledge transfer, innovation, and networking and collaboration activities are mostly seen as a transversal issue. This means that there are no specific policies at cluster level on these topics. Although clusters comply with the national and regional policy guidelines, clusters define their own programmes of action, according to their activity sectors. Therefore, each specific programme of action may define a strategy concerning technology and knowledge transfer, innovation, and networking issues according to their reality. Eventually, similar strategies are adopted by different clusters.

7. CONCLUSION

This section will provide concluding remarks for the previous sections pertaining to the maritime sectors, interviewed clusters, and government policy. After the overview of the report is complete, a few additional comments will be made regarding issues that came up in the text, predominantly relating to the impact of the recession on the maritime economy in the Atlantic Area. Guidance for this matter will not be presented here but will be the focus of further research within the project.

7.1. Maritime Sectors

At the sector level, there were several interesting cases that deserve further recognition, predominantly relating to maritime services, fishing and yacht building. The reason these three cases were chosen is based on their diverse assessment within the respective regional marine economies. First, the maritime services sector was present in the majority of the regions and had a strong enough showing in Portugal that both Portuguese partners chose it as their growth potential cluster example. For the other partners that completed a sector analysis in this section, it was clear that maritime-based research was highly organised within the regions. In addition, for the Portuguese cases, as well as for many other partners that discussed these research centres due to their involvement in other clusters, these centres are key innovation actors that facilitate both knowledge transfer and collaboration within the region. This is of paramount importance given that one of the aims of KIMERAA was to examine the level of knowledge transfer specifically from Universities to the maritime economy.

Second, the fishing sector was only chosen by one partner, Huelva, as the growth potential example for cluster analysis but was discussed by the vast majority of the other partners at the sector level. This was of importance due to the sector being rooted firmly in tradition. Unlike maritime services and yacht building (see more below), the fishing sector is a heritage- based sector that can be greatly impacted by external forces such as competition, economy and climate change. Nonetheless, it is

operational, to some extent, in the partner regions which, if working more directly with the KIMERAA partnership could be of great help to the sector in identifying best practice cases and providing support through an Atlantic Area network.

Finally, the yacht building sector was only discussed briefly within the regions, in Wales and Huelva but it can provide information in terms of diversification. Originally, yacht building was solely considered a luxury market that was a spin-off of shipbuilding. Some regions still consider these practices of shipbuilding and yacht building as one in the same. Due to a need to remain competitive and provide a service to those clients that were using their products, marinas started to appear. Prior to this time, marinas were used but more for commercial purposes. This is why marinas are considered a sub-sector of yacht building. Intra-sector knowledge transfer provided this opportunity to create a more sustainable yacht building sector. In addition, at a more innovative level, this diversification could also be applied to the offshore services if discussing using non-renewable energy platforms to produce renewable energy. In the same way that the traditional fishing sector could benefit from a long term KIMERAA network, the yacht building sector, and offshore services, could equally benefit.

7.2. Interviewed Clusters

Throughout the six partner regions, six different views of knowledge transfer and collaboration were provided. To highlight the discrepancies, three cluster/sector comparisons will be made using the information provided above:

- Wales (UK) and Border, Midland and Western (Ireland) – Offshore Services
- Norte and Algarve (Portugal) – Maritime Services
- Basque Country and Huelva (Spain) – Coastal Tourism

For the first comparison between West Wales and Western Ireland, the focus is on the offshore services based in renewable energy. For the former case, this sector operates at the cluster level and for the latter case this sector operates at the sector level. Both partners used this sector as their growth potential example. The main difference is the lack of knowledge transfer and collaboration, at any level, from those interviewed in BMW. There is University involvement but no apparent interaction. On the other hand, the South West Wales region, while having an emerging cluster, has knowledge transfer in this sector with government, industry, University and SMEs. This may be due to the operational energy port that shares its facilities with renewable energy firms. The next step would be increased collaboration as there were only a few cases of this identified, most of which are with firms outside of the region. While this sector has the potential to grow in both locations, they both have their individual issues-government policy, regional innovation system- which needs to be addressed.

This second comparison with the Norte region of Portugal and the Algarve in Southern Portugal is completely different than the aforementioned case in Northern Europe. Both partners used maritime services as their growth potential example for the cluster analysis. There are many similarities as both regions comply to the same national policy that focuses on IPR, knowledge transfer and collaboration. In addition, both partners are identified as technology transfer offices which provide a better base for comparison. These likenesses continue in terms of the emphasis on spin-offs, particularly in marine biotechnology. However, despite these similarities and largely due to economic variations amongst the regions and regional policy, the major difference lies in the impact of the recession on the individual regions. While some of the knowledge transfer organisations span the country and are equally affected, other initiatives, particularly relating to spin-off/start-up support are regional. This, along with the heightened competitiveness for grant funding, is causing distress amongst research centres particularly in the Algarve.

The final comparison is between Basque Country and Huelva for coastal tourism. This case is different than the two aforementioned cases as MIK chose to use this as its growth potential example and examine it at the sector level while Huelva used this as its socioeconomic significance example and examined it at the cluster level. Unlike the BMW examples that focused on the sector-level and demonstrated no knowledge transfer or collaboration, Basque Country's results at the sector level demonstrated knowledge transfer and collaboration which largely tied in with other maritime sectors in the region. Their research demonstrated that there is a foundation for coastal tourism in the region that can be explored beyond this project. On the other hand, Huelva has an established coastal tourism cluster that is important to the region due to the employment numbers and

social dependence on it. The level of knowledge transfer is high but increased collaboration that is fewer events based on more project based is needed.

This brief comparison provides an overview of the half of the clusters/sectors analysed focusing on the strengths and weaknesses of the regions. The next section will highlight the government policy which addresses some of the issues raised here.

7.3. Government Policy

The policy analysed in this report pertains to networking, knowledge transfer, financing, IPR, and collaboration. These are essential policy areas to support clusters. Looking solely at cluster policies, given the variations between the partner countries, as well as the partner regions, in terms of the government authority at each level, finding one best practice example is difficult. From the bottom up, the Basque Country's regional cluster policy should be considered the best practice example given the dynamic methods that are implemented, the success of these methods, and the forward focus on recovery through employment, education and innovation. At the national level, the Portuguese cluster policy can be considered the best practice example mainly due to the additional focus on the maritime economy. For both the national and region cases, this grouping is not an indication of the effectiveness of the policy; rather, it is an assessment of the government interest and actions in this field. Overall, these are the main indicators for success that can be drawn out of the aforementioned policies at both the national and the regional level:

- Emphasis on education, research & innovation;
- Ability to recover from economic 'shocks' such as the rising oil prices (ex. shipping);
- Highlight the significance of cooperation and collaboration at the firm and, more importantly, the cluster level;
- Maintain competitive edge through innovating in new fields (ex. renewable → non-renewable energy).

Beyond best practice situations, and looking at each partner region as an individual case, it would appear that the top-down approach to cluster creation adopted in Portugal is more effective than the market-led approach used in Wales.

In terms of the 'other policies', highlighting University engagement, there seemed to be an emphasis, particularly in the Portuguese, Basque Country, Galway, Wales cases, on the networking of Universities, as well as the networking of Universities with government, and R&D facilities. This issue were also highlighted in cluster policy as an essential component of the regional innovation system. In terms of best practice for 'other' policies, there was one standout case which was Portugal.

The Portuguese government has provided strategies and policies at the national level for everything from knowledge transfer to IPR. These policies have created action at the regional level in the same way as the national cluster policy. This is not an indication of the effectiveness of the policy; rather, it is an assessment of the government interest and actions in this field. Overall, these are the main indicators for success that can be drawn out of the aforementioned policies at both the national and the regional level:

- Ease of entry into market for SME's or entrepreneurs;
- Increase skill level amongst 18-25 year olds;
- Focus on creating new jobs in new industries (ex. renewable energy/cleantech);
- Initiate knowledge transfer, particularly with University & Industry.

While there may be policies that address every aspect of knowledge transfer and IPR available, their effectiveness cannot be guaranteed. This is further stressed during times of economic recovery due to lack of funding and the reduction of services available.

7.4. Impact of Recession

As discussed in the introduction, and periodically throughout this report, the Atlantic Area is going through a time of uncertainty and instability. This is not solely in relation to the economy, but also in relation to other factors that impact the maritime economy such as: the environment; climate change; the redistribution of labour and wealth; and the destabilisation of markets. These factors, including the economic crisis, are 'shocks' which, if occurring at different times could be attributed to a long wave pattern; however, the fact that several of these shocks may be impacting the clusters, and sectors, discussed simultaneously not only marks a significant change from the past but the potential for significant success. For the most part, according to the partners' accounts, these shocks are impacting clusters that are socioeconomically significant before those that are listed for their growth potential. This could be attributed to the involvement of the local community in the former type or the sensitivity of the traditional sectors that usually characterise the socioeconomic examples.

This section will review the shocks relating to each of the partners' regions based on the partner contributions. A comparison will then be made of the problems and potential solutions on a cluster-to-cluster basis focusing on the best practice innovation actors.

Basque Country (Spain)-Shipbuilding

At the cluster level, the shocks are more related to maintaining competitiveness through innovation. The current situation is becoming worse and new challenges are arising when it comes to the future of shipbuilding. For the case of the Basque Country cluster, this extends beyond the problems created by the recession in terms of a lack of job growth and lack of funding and is directly related to competitiveness. The global crisis that started in 2008 has accentuated the economic recession that the shipbuilding sector was suffering due to the introduction in the offer of countries like South Korea and China with an increasing strength and a rapid demand of the ships. Notable for their low prices, they have destabilized the market in their favour. Generally speaking, taking an in-depth approach to the industry as a whole, one can notice that when it comes to knowledge management or innovation, there is an important gap to be covered and it is a real challenge to address this kind of issues in such traditional sector.

Huelva (Spain)-Coastal Tourism & Fishing

In relation to the Coastal Tourism, it usually has had a lot of international tourism, although since the economical problems started, the number of international tourists has decreased substantially which has put more emphasis on the number of national tourists, who have changed the internationals destinations for national ones. The tourists have also changed the organization of the travels and now they choose the cheapest places and hotels. They look for alternatives and replace the rent of flats or the biggest hotels for the reservation of smaller hotels for a shorter period of time (between 5 and 10 holidays). The flats to rent have suffered the effects of the crisis, although the SMEs have gained new clients. Furthermore, in relation to the coastal tourism employment, the service sector, mainly in restaurants and bars has suffered greatly due to the recession and the effects it has had on tourist numbers.

This kind of shocks produces the renovation of the economical strategies in a political level and in the business, and for example in both sectors (tourism and fishing), the enterprises which have had the most problems are merging or, on the other hand, the big companies, which do not have economic problems, are buying the small ones, which have big economic problems. In the canned, smoked and salted fishing sector different enterprises have joined to create a big company that complete the whole production process (breed, catching, handmaking...). Other strategy in the fishing sector is that the enterprises are connecting the activity with the tourist one, diversifying their work.

Wales (UK)-Coastal Tourism & Offshore Services- Marine Energy

In some senses, the West Wales coastal tourism cluster is benefiting from the recession as the number of visits that surpass two bed nights has increased during the peak season. Cluster analysts attribute this to the lack of affordable oversees packages forcing consumers to find alternative, domestic holiday options. There is still the ever present problem of seasonality as the tourist facilities are largely closed from October to May.

The shock that concerns the marine energy cluster in West Wales the most is based on the economic crisis. There is a lack of venture capital in Wales so many small firms rely on public funding, particularly when starting up; however, with the recession, and the many cuts established, there is less public funding. There is still the potential to recover the cluster through industry involvement through either funding or collaboration. This is already the case in one of the examples mentioned above where an SME collaborated with the multinational corporation E.On.

Algarve (Portugal)-Coastal Tourism & Maritime Services

The Algarve is a tourism mono-culture very exposed to economic crisis. There was a reduction of national and international tourists. On the impact of recession, ERTA, says it could affect the number of tourists visiting the region and therefore the amount of revenue of the sector. This has economic and social consequences like the increased unemployment rate. This assessment applies especially to the traditional tourism products, like Sun and Sea or Golf, but also affects others such as nautical tourism.

In terms of maritime research, the economic turbulence creates tensions in Science, the financial resources do not arrive in time, and the grants are not obtained, showing the science precarity in its worst meaning. The scenario of economic crisis can make the execution of programmes difficult. In addition, mobility is important but research also demands stability for a certain period of time. Today these periods are getting shorter.

These brief overviews provide accounts of a recurring theme: the recession has had a negative impact on the regional maritime economy. As analysts are now saying that countries will begin to emerge from the recession, the long-term implications of the impact can start to be felt. This leaves a lot of unanswered questions about the feasibility of these sectors in the long term, such as:

- How can the sector recover from the recession?
- What lessons can be learned from other regions in the Atlantic Area, and the world, where the maritime economy was more resilient to the economic shock?
- What other shocks should we be aware of and potentially prepare for?

Many topics that are of importance for the sustainability of our regions, and these sectors, are addressed in those questions, namely: employment, economy, climate change, peak oil, diversification and innovation. In relation to the maritime economy, these themes will be the focus of further research from the KIMERAA partnership.

ANNEX

Table A1: Number of Interviews by Region and Type of Innovation Actor

Region	University	Government	SME	Industry	Intermediaries	R&D Centres (non-University)	Total
Basque Country	0	3	6	1	3	1	14
Huelva	4	4	11	2	3	1	25
BMW	3	2	6	1	1	0	13
Wales	3	7	5	4	3	0	22
Norte	5	3	4	1	6	1	20
Algarve	12	15	6	4	10	4	51
Total	27	34	38	13	26	7	145

Table A2: Interviewed Innovation Actors-Basque Country-Shipbuilding

Name of Organisation Interviewed	Type of Actor
ADIMDE- Basque Association of Marine Industry	Intermediary
AZTI-tecnali	R&D (non-University)
ASTILLEROS BALENCIAGA	Industry
CREDEBLUG	SME
GUASCOR	Intermediary
Basque Government	Government
ASTILLEROS de MURUETA	SME
SENER	Intermediary
VICINAY	SME

Table A3: Interviewed Innovation Actors-Huelva-Coastal Tourism

Name of Organisation Interviewed	Type of Actor
Local Development Institute Research Group	University
Transfer of Research Results Office	Intermediary
Huelva's Port Authority	Industry
Ayamonte's Official Chamber of Commerce, Industry & Shipping	Government
Isla Cristina's Town Council	Government
Salinas del Astur Fish Farm	SME
Idamar S.A.	SME

Table A4: Interviewed Innovation Actors- Border, Midland and Western- Marine Biotechnology

Name of Organisation Interviewed	Type of Actor
Errigal Seafood Ltd.	SME
Oilean Glas Teo	Industry
Donegal West Adventure Company	SME
Irish Salmon Producers Group	Intermediary
Ri Na Mara	SME
Letterkenny Institute of Technology (LYIT)	University
Udaras Na Gaeltachta	Government

Table A5: Interviewed Innovation Actors-Wales-Coastal Tourism

Name of Organisation Interviewed	Type of Actor
BlueStone	SME
Visit Wales	Government
Countryside Council for Wales	Government
Pembrokeshire County Council	Government
Pembrokeshire Coastal Forum	Intermediary
Milford Haven Port Authority-Cruise	Industry
Milford Haven Port Authority	Industry
TYF	SME
South West Wales Tourism Partnership	Government
Welsh Assembly Government	Government

Table A6: Interviewed Innovation Actors-Norte-Fish Processing

Name of Organisation Interviewed	Type of Actor
AAPN-Associacao de Armadores de Pesca do Norte	Intermediary
Association of Fishing Shipowners of Angeiras	Intermediary
Esposende Council Professional Fishermen's Association	Intermediary
ANICP (including QUALIMAR)	Intermediary
NorAtlantico	SME
Matosinhos	Government
APDL	Industry
CIM Alto Minho	Government
APMSHM	Intermediary

Table A7: Interviewed Innovation Actors-Algarve-Coastal Tourism

Name of Organisation Interviewed	Type of Actor
NATURA	SME
Ecoceanus	SME
Sunquays	SME
EEN	Intermediary
CCMAR	University
ANJE	Intermediary
University of Algarve (UAlg)	University
Technology Transfer Office at UAlg	Intermediary
IP Legal Advisor at UAlg	Intermediary
CITeL	University
Faculty of Economics at UAlg: FEUALg	University
Mar Algarve at CCDR	Government
CCDR (Vice-President)	Government
CCDR (Incentive System)	Government
CMO	Government
Agência do Barlavento	Intermediary
GAC Barlavento	Intermediary
DRE	Government
DocaPesca	Government
IPTM	Government
AMAL	Government
IPIMAR	R&D (non-University)
ERTA	Government
PNRF	Government
POLIS	Government
Capitania do Porto de Faro	Government
DRAP	Government
NERA	Industry
AHETA	Industry
MARLAGOS	Industry

Table A8: Interviewed Innovation Actors-Basque Country-Coastal Tourism

Name of Organisation Interviewed	Type of Actor
Algorri Interpretazio Zentrua	SME
The Naval Museum	Government
Aquarium San Sebastian (Oceanographic Foundation of Gipuzkoa)	SME
Insub	SME
Urdaibai Biosfera Erreserba	Government

Table A9: Interviewed Innovation Actors-Huelva-Fishing

Name of Organisation Interviewed	Type of Actor
Local Development Institute Research Group	University
Local Development Institute Research Group	University
Transfer of Research Results Office	Intermediary
Huelva's Port Authority	Industry
Ayamonte's Official Chamber of Commerce, Industry & Shipping	Government
Isla Cristina's Town Council	Government
Salinas del Astur Fish Farm	SME
Idamar S.A.	SME
Ice Fortes, S.L.	SME
USISA, Union Salazonera Islena	SME
Peix	SME
Lopez Ponce Shellfish	SME
Huelva's Prawn	SME
Aquaconsultant Aquiculture and Services	Intermediary
South Marine Farms	SME
CT Garum	R&D (non-University)

Table A10: Interviewed Innovation Actors-BMW-Offshore Services

Name of Organisation Interviewed	Type of Actor
Moore Marine Ltd	SME
Marcon Computations International	SME
Aquafact International Services Ltd	SME
Coastal & Marine Resources Centre, University College Cork	University
Irish Marine Institute	Government

Table A11: Interviewed Innovation Actors-Wales-Offshore Services

Name of Organisation Interviewed	Type of Actor
Milford Haven Port Authority	Industry
Marine Energy Pembrokeshire Network	Intermediary
Wave Dragon	SME
E.On	Industry
Tidal Energy	SME
Far Offshore Renewables	SME
Countryside Council for Wales	Government
Marine Energy Working Group, Swansea University	University
Low Carbon Research Institute, Cardiff University	University
Pembrokeshire College	University
Welsh Assembly Government	Government
Pembrokeshire Coastal Forum	Intermediary

Table A12: Interviewed Innovation Actors-Norte-Maritime Services

Name of Organisation Interviewed	Type of Actor
Interdisciplinary Centre of Marine and Environmental Research	University
Oceano XXI	Intermediary
LSTS-Underwater systems and technology laboratory	University
CICGE-Geo-Space Sciences Research Centre	R&D (non-Uni)
A4TEC-Association for the Advancement of Tissue Engineering and Cell Based Research	University
Stemmatters	SME
CBQF	University
IPP-Porto Polytechnic Institute	University
FOR-MAR-Matosinhos Operational Unit	Government
Bluemater	SME
WOW-Walk on Wind	SME

Table A13: Interviewed Innovation Actors-Algarve-Maritime Services

Name of Organisation Interviewed	Type of Actor
NECTON	SME
SPAROS	SME
Marsensing	SME
SIPLAB	R&D (non-University)
EEN	Intermediary
LPN	Intermediary
University of Algarve (UAlg) - Rector	University
Technology Transfer Office at UAlg	Intermediary
IP Legal Advisor at UAlg	Intermediary
FCT UAlg	University
CCMAR	University
Coastal Fisheries Group-CCMAR	University
Algae Research Group-CCMAR	University
CIMA	University
Microbiology-CIMA	University
ICCE	R&D (non-University)
Annals of Tourism Research Former Editor	University
CCDR	Government
IPIMAR	R&D (non-University)
DRAP	Government
Águas do Algarve	Industry

List of Acronyms

AAS	Andalusian Autonomy Statute
3B's	Research Group in Biomaterials, Biodegradables and Biomimetics
AdI	Agência de Inovação [Innovation Agency]
ADIMDE	Agrupación de Industrias Maritimas de Euskadi [Group of Maritime Industry in Euskadi]
AEM	Asociación Española de Museos [Spanish Museums Association]
AFM	Associação Fórum Mar Centro [Forum Mar Centro Association]
AHETA	Associação dos Hotéis e Empreendimentos Turísticos do Algarve [Association of Hotels and Resorts in the Algarve]
AIZA	Asociación Ibérica de Zoos y Acuarios [Iberian Association of Zoos and Aquariums]
ALGAR	Valorização e Tratamento de Resíduos Sólidos, SA [Algarve Recovery and Solid Waste Treatment]
AMAL	Comunidade Intermunicipal do Algarve [Comunity Intermunicipal of the Algarve]
ANA	Aeroportos de Portugal, S.A. [Portugal Airports Company]
ANICP	Associação Nacional dos Industriais de Conservas de Peixe [National Association of Conserve Industries of Fish]
ANJE	Associação Nacional de Jovens Empresários [National Association of Young Entrepreneurs]
AOV	Autonomous Operated Vehicles
APDL	Administração dos Portos do Douro e Leixões [Douro and Leixões Port Administration]
APMSHM	Associação Pró-Maior Segurança dos Homens do Mar [Association to Enhance the Safety of Men of the Sea]
ARH	Administração da Região Hidrográfica do Algarve [Administration of the Algarve Hydrographic Region]
ASEMA	Asociación de Empresas de Acuicultura Marina de Andalucía [Association of Marine Aquaculture in Andalusia]
ATA	Associação de Turismo do Algarve [Association of Tourism of the Algarve]
ATN	Asesoramiento Técnico Naval y Proyectos [Naval Technical Advice and Projects]
AZTI	Itsas eta Elkagaien Zentru Teknologikoa [Marine and Food Technological Centre]
BCP	Basque Contact Point Waterborne
BERC	Centros de Investigación Básica y de Excelencia [Centres of Excellence Basic Research]
BIS	Business, Innovation & Skills
BMF	Basque Maritime Forum
BMW	Border, Midland and Western (Ireland region)
BUILD-UP	Cross Border Marketing Programme for the Construction Industry Product Cluster
CA	Cluster Association
CACE	Centro de Apoio à Criação de Empresas [Support Center for Business Creation]
CADE	Centros de Apoyo al Desarrollo Empresarial [Support to the Business Development Centre]
CAE	Código de Classificação das Actividades Económicas [Portuguese Standard Industrial Classification of All Economic Activities]
CASS	Centre for Advanced Studies
CBQF	Centro de Biotecnologia e Química Fina [Center for Biotechnology and Fine Chemistry]

CCDR	Comissão de Coordenação e Desenvolvimento Regional [Regional Development and Coordinating Commission]
CCMAR	Centro de Ciências do Mar [Centre of Marine Sciences]
CEA	Centro de Estudos de Águas [Water Studies Centre]
CEO	Chief Executive Officer (corporate title)
CEPSA	Compañía Española de Petroleos Sociedad Anónima [Petroleum Spanish Company, Inc.]
CFE	Centro de Formalidades de Empresas [Centre for Companies Formalities]
CIACOMAR	Centro de Investigação dos Ambientes Costeiros e Marinhos [Research Centre for Coastal and Marine Environments]
CIC	Centros de Investigación Cooperativa [Cooperative Research Centres]
CICGE	Centro de Investigação em Ciências Geo-Espaciais [Geo-Space Sciences Research Centre]
CIDERTA	Centro de Investigación y Desarollo de Recursos y Tecnologías Agroalimentarias [Research Centre and Resource Development and Food Technology]
CIDTUR	Centro de Investigación, Desarrollo e Innovación en Turismo [Centre of Research, Development and Innovation in Tourism]
CIECEM	Centro Internacional de Estudios y Convenciones Ecológicas y Medioambientales [International Centre for Ecological and Environmental Research and Conventions]
CIFPA	Centro de Investigación y Formación Pesquera y Acuícola [Research and Training Centre of Fishery and Aquaculture]
CIIMAR	Centro Interdisciplinar de Investigação Marinha e Ambiental [Interdisciplinary Centre of Marine and Environmental Research]
CIMA	Centro de Investigação Marinha e Ambiental [Centre for Marine and Environmental Research]
CIM-Minho	Comunidade Intermunicipal do Minho [Municipalities Association of Minho]
CINTAL	Centro de Investigação Tecnológica do Algarve [Technological Research Centre of the Algarve]
CIQSO	Centro de Investigación en Química Sostenible [Center for Research in Sustainable Chemistry]
CITeL	Centro de Investigação em Turismo e Lazer [Research Centre for Tourism and Leisure]
CITEVE	Centro Tecnológico das Indústrias Têxtil e do Vestuário de Portugal [Technological Center of Textile and Clothing Industries of Portugal]
CIT-GARUM	Centro de Innovación y Tecnología de la Pesca y Transformación de Productos Pesqueros de Andalucía [Technology Research Centre in the Fishing Sector]
CITT	Centro Internacional de Investigação em Território e Turismo [International Centre of Territory and Tourism Research]
CMF	Câmara Municipal de Faro [Municipality of Faro]
CMO	Câmara Municipal de Olhão [Municipality of Olhão]
CMP	Câmara Municipal de Portimão [Municipality of Portimão]
CMRC	Coastal and Marine Resources Centre
COMPETE	Programa Operacional Factores de Competitividade [Operational Agenda for Competitiveness Factors]
CRIA	Centro Regional para a Inovação do Algarve [Algarve Regional Centre for Innovation]
CRUE	Conferencia de Rectores de Universidades Españolas [Conference of Rectors of Spanish Universities]
CRUP	Conselho de Reitores das Universidades Portuguesas [Council of Rectors of Portuguese Universities]
CSIC	Consejo Superior de Investigaciones Científicas [Spanish National Research Council]
DAP	Empresa Pública de Desarrollo Agrario y Pesquero [Public Enterprises for Agriculture and Fisheries Development]
DECC	Department for Energy and Climate Change
DFB	Diputación Foral de Bizkaia [Regional Government of Bizkaia]
DFG	Diputación Foral de Gipuzkoa [Regional Government of Gipuzkoa]
DGPA	Direcção-Geral das Pescas e Aquicultura [General Board for Fisheries and Aquaculture - Portugal]
DITT	Departamento Industria, Comercio y Turismo [Department of Industry, Trade and Tourism]
DRE	Direcção Regional de Economia [Regional Board of Economy]
EBT	Empreendedorismo de Base Tecnológica [Technology Based Entrepreneurship]
ECI	Environmental Change Institute
ECTA	Encuesta de Coyuntura Turística de Andalucía [Tourism Situation Survey of Andalucia]
EDP	Energias de Portugal [Portugal Energy]
EEN	Enterprise Europe Network
EIA	Environment Impact Assessment
EMEPC	Estrutura de Missão Para a Extensão da Plataforma Continental [Task Group for the Extension of the Portuguese Continental Shelf]
ENI	Encuentros Navales Internacionales [Naval International Meetings]

ENVC	Estaleiros Navais de Viana do Castelo [Shipyards of Viana do Castelo]
Erasmus Mundus	Cooperation and mobility programme in the field of higher education
ERDF	European Regional Development Fund
ERDF	European Regional Development Fund
ERTA	Entidade Regional de Turismo do Algarve [Tourism Regional Entity of the Algarve]
ESA	European Space Agency
ESGHT	Escola Superior de Gestão, Hotelaria e Turismo [School of Management, Hospitality and Tourism]
ESTHE	Escola Superior de Turismo e Hotelaria do Estoril [School of Tourism and Hospitality of Estoril]
EU	European Union
EUAC	European Union of Aquarium Curators
FAMAR	Feria Andaluza del Mar [Andalusian Fair of the Sea]
FCT	Fundação para a Ciência e a Tecnologia [Portuguese Science and Technology Foundation]
FCT Ualg	Faculdade de Ciências e Tecnologias da Universidade do Algarve [Faculty of Sciences and Technologies of the University of Algarve]
FCUP	Faculdade de Ciências da Universidade do Porto [Faculty of Sciences of the University of Porto]
FEUAlg	Faculdade de Economia da Universidade do Algarve [Faculty of Economics of the University of Algarve]
FEUP	Faculdade de Engenharia da Univwersidade do Porto [Faculty of Engeneering of the University of Porto]
FFUP	Faculdade de Farmácia da Universidade do Porto [Faculty of Pharmacy of the University of Porto]
FINICIA	Programa de soluções financeiras para pequenas empresas [Programme of financial solutions for small businesses]
FITUR	Feria Internacional de Turismo [Spanish International Tourism Fair]
FOE	Federación Onubense de Empresarios [Federation of Employers of Huelva]
FOR	Far Offshore Renewables
FP7	Seventh Framework Programme for research and technological development
FROM	Fondo de Regulación y Organización del Mercado de los Productos de Pesca y Cultivos Marinos [Regulation and Organization Fund for the Fish and Marine Cultures Market]
FTE	Full-time Equivalent
GAC	Grupos de Acção Costeira [Coastal Action Groups]
GAPI	Gabinete de Apoio à Promoção da Propriedade Industrial [Unit for Promotion of Industrial Property Rights]
GDP	Gross domestic product
GEIDETUR	Generando Conocimiento Científico, Innovando para los Agentes Sociales, Desarrollando el Turismo [Research Group in Innovation and Tourism]
GIS	Geographic Information System
GMIT	Galway-Mayo Institute of Technology
GNP	Gross National Product
GT	Gross Ton
GVA	Gross Value Added
HEFCW	Higher Education Funding Council for Wales
HMI	Hospitality and Management Institute
HRB	Health Research Board
HSE	Health Service Executive
IAPMEI	Instituto de Apoio às Pequenas e Médias Empresas e à Inovação [Institute of Support to Small and Medium Enterprises and Innovation - Portugal]
IC	Instituto da Construção [Construction Institute]
ICBN	Instituto da Conservação da Natureza e da Biodiversidade, I. P. [Institute for Nature Conservation and Biodiversity]
ICCE	International Centre For Coastal Ecohydrology
ICOM	International Council of Museums
ICT	Information and Communication Technologies
IDCEM	Instituto para o Desenvolvimento do Conhecimento e da Economia do Mar [Institute for the Development of Knowledge and Economy of the Sea]
IDEA	Agencia de Innovación y Desarrollo de Andalucía [Agency for Innovation and Development of Andalucia]

IDL	Instituto de Desarollo Local [Local Development Institute Research Group]
IEA	Instituto de Estadística de Andalucía [Statistical Institute of Andalusia]
IEFP	Instituto de Emprego e Formação Profissional [Office of Employment and Vocational Training]
IEO	Instituto Español de Oceanografía [Spanish Institute of Oceanography]
IFAPA	Instituto de Investigación y Formación Agraria y Pesquera [Research and Training Institute for Agriculture and Fisheries]
IHRH	Instituto de Hidráulica e Recursos Hídricos [Hydraulics and Water Resources Institute]
INAG	Instituto da Água [Water Institute]
INE	Instituto Nacional de Estatística [Statistics Portugal]
INEGI	Instituto de Engenharia Mecânica e Gestão Industrial [Institute of Mechanical Engineering and Industrial Management]
INESC	Instituto de Engenharia de Sistemas e Computadores [Institute for Systems and Computer Engineering]
INPI	Instituto Nacional da Propriedade Industrial [Portuguese Institute of Industrial Property]
INRB	Instituto Nacional de Recursos Biológicos [National Institute of Biological Resources]
INTERREG	Community initiative that aims to stimulate interregional cooperation in the European Union
IPIMAR	Instituto de Investigação das Pescas e do Mar [Research Institute of Fisheries and Sea]
IPN	Instituto Pedro Nunes [Pedro Nunes Institute]
IPP	Instituto Politécnico do Porto [Porto Polytechnical Institute]
IPR	Industrial Property Rights
IPTM	Instituto Portuário e dos Transportes Marítimos [Port and Maritime Transport Institute]
ISCTE	Instituto Universitário de Lisboa [Lisbon University Institute]
ISN	Instituto Socorros a Naufragos [Portuguese Institute of Shipwreck Rescue]
ISO	International Organization for Standardization
IST	Instituto Superior Técnico da Universidade Técnica de Lisboa [Instituto Superior Técnico of the Technical University of Lisbon]
ITP	Instituto de Turismo de Portugal [Portuguese Institute of Tourism]
IWEA	Irish Wind Energy Association
KIMERAA	Knowledge transfer to Improve Marine Economy in Regions from the Atlantic Area
Km	Kilometre
Km2	Square Kilometre
KT	Knowledge Transfer
KTO	Knowledge Transfer Office
KTP	Knowledge Transfer Partnership
kV	Kilovolt
Kw	Kilowatt
LCRI	Low Carbon Research Institute
LDIR	Local Development Institute Research Group
LEPAE	Laboratório de Engenharia de Processos Ambiente e Energia [Laboratory for Process, Environmental and Energy Engineering]
LNG	Liquefied Natural Gas
LOU	Ley Orgánica de Universidades [Universities Act]
LPN	Liga para a Protecção da Natureza [League for the Protection of Nature]
LSA	Laboratórios de Sistemas Autónomos [Autonomous Systems Laboratory]
LSRE	Laboratório de Processos de Separação e Reacção [Laboratory of Separation and Reaction Engineering]
LSTS	Systems and Underwater Technologies Laboratory
LSTS	Laboratório de Sistemas e Tecnologia Subaquática [Underwater Systems and Technology Laboratory]
LYIT	Letterkenny Institute of Technology
m	Metre
m2	Square metre
Mais Centro	Programa Operacional Regional do Centro [Centro Portugal Operational Programme]

MEAP	Marine Energy Action Plan
MEL	Marine Energy Ltd
MEMPES	Modelización Econométrica y Matemática de Pesquerías [Econometric and Mathematical Modelling of Fisheries]
MEP	Marine Energy Pembrokeshire
MER	Museum Education Roundtable
METG	Marine Energy Task Group
MHPA	Milford Haven Port Authority
MHSR	Milford Haven Ship Repairers
MIK	Mondragón Ikerketa y Kudeaketan [Mondragón Innovation and Knowledge]
MNC	Multi-National Corporation
MPA	Marine Protected Area
MRI	Martin Ryan Institute
MW	Megawatt
MWh	Megawatt hour
NATO	North Atlantic Treaty Organization
NdFeB	Neodymium
NEOTEC Iniciative	Novas Empresas de Base Tecnológica [New Technology-based Enterprises]
NERA	Associação Empresarial da Região do Algarve [Business Association of the Algarve Region]
NEST	Novas Empresas de Suporte Tecnológico [New Technology Based Companies]
NINJ	New Industries, New Jobs
NIRSA	National Institute for Regional and Spatial Analysis
NPWS	National Parks and Wildlife Service
NSRF	National Strategic Reference Framework
NUI Galway	National University of Ireland, Galway
NUTS	Nomenclature of Territorial Units for Statistics
OACF	Operational Agenda for Competitiveness Factors
Oceano XXI	Associação para o Conhecimento e Economia do Mar [Association for the Knowledge and Economy of the Sea]
OHSAS	Occupational Health and Safety Assessment Services
ON.2	O Novo Norte - Programa Operacional Regional do Norte 2007/2013 [North Portugal Regional Operational Programme 2007/2013]
OTRI	Oficina de Transferencia de Resultados de la Investigación [Transfer of Research Results Office]
OWC	Oscillating Water Column
PCF	Pembrokeshire Coastal Forum
PIN	Projecto de Potencial Interesse Nacional [Project of Potential National Interest]
PNRF	Parque Natural da Ria Formosa [Natural Park of Ria Formosa]
PO Algarve 21	Programa Operacional Regional do Algarve 2007-2013 [Algarve Regional Operational Programme]
POCG	Pembrokeshire Outdoor Charter Group
POCTEFEX	Programa Operacional de Cooperación Transfronteriza España – Fronteras Exteriores [Operational Cooperation Programme Cross Border Spain-External Borders]
POCTEP	Programa Operacional de Cooperação Transfronteiriça Espanha-Portugal [Operational Cooperation Programme Cross Border Spain-Portugal]
POLIS	Programa de Requalificação Urbana e Valorização Ambiental das Cidades [Programme of Urban Renewal and Environmental Improvement of Cities]
PRIME	Programa de Incentivos à Modernização da Economia [Incentives Programme for the Modernisation of Economic Activities]
PROINOV	Programa Integrado de Apoio à Inovação [Integrated Program of Support for Innovation]
PROMAR	Programa Operacional de Pesacas 2007-2013 [Portuguese Fisheries Operacional Programme 2007-2013]
PROT ALGARVE	Plano Regional de Ordenamento do Território do Algarve [Regional Plan of Territorial Planning of the Algarve]
R&D	Research and Development
RENFE	Red Nacional de Ferrocarriles Españoles [Spanish National Railway Network]

ROC	Renewable Obligation Certificate
ROP	Regional Operational Programmes
ROV	Remotely Operated Vehicles
RTDI	Research, Technology Development and Innovation
RTT	Rotech Tidal Turbine
S&T	Science and Technolgy
SAC	Special Area of Conservation
SAR	Search and Rescue
SC	Spanish Constitution
SEA	Strategic Environmental Assessment
SEACAMS	Sustainable Expansion of the Applied Coastal and Marine Sectors
SEF	Serviço de Estrangeiros e Fronteiras [Portuguese Foreigners and Borders Services]
SEMRU	Socio-Economic Marine Research Unit
SIAC	Sistema de Incentivos às Acções Colectivas [Incentive Scheme for Colective Actions]
SIPIE	Sistema de Incentivos a Pequenas Iniciativas Empresariais [Incentive Scheme for Small Business Initiatives]
SIPLAB	Laboratório de Processamento de Sinais [Information Processing Laboratory]
SIUPI	Sistema de Incentivos à Utilização da Propriedade Industrial [Incentive Scheme for the Use of Industrial Propriety]
SME	Small and Medium Enterprises
SOS	School of Ocean Sciences
SUDOE	Programa de Cooperação Territorial do Espaço Sudoeste Europeu [Territorial Cooperation Programme for the Southwest European Area]
SWWTP	South West Wales Tourism Partnership
TBS	Technology Strategy Board
TCC	Technology and Competitiveness Cent
TCGL	Terminal de Carga Geral e de Graneis de Leixões [General Cargo Terminal and Bulk of Leixoes]
TCL	Terminal de Contentores de Leixões, SA [Leixoes Container Terminal, SA]
tdw	Tonnage Dead Weight
TEL	Tidal Energy Limited
TEU	Twenty-foot Equivalent Units
TTO	Technology Transfer Office
UAlg	Universidade do Algarve [University of Algarve]
UBI	Universidade da Beira Interior [University of Beira Interior]
UCP	Universidade Católica Portuguesa [Portuguese Catholic University]
UHU	Universidad de Helva [University of Huelva]
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNWTO	United Nations World Tourism Organization
UP	Universidade do Porto [University of Porto]
UPIN	Universidade do Porto Inovação [University of Porto Innovation]
UPTEC	Parque de Ciência e Tecnologia da Universidade do Porto [Science and Technology Park of University of Porto]
UPV	Universidad Politécnica de Valencia [Polytechnical University of Valencia]
USA	United States of America
UTEN	University Technology Enterprise Network
WAG	Welsh Assembly Government
WEC	Wavw Energy Conversion
WEFO	Welsh European Funding Office

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