University of Chichester

Clustering in the Marine Industry

Report for Strand 3A

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2/9/2011

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Executive Summary

This will be written by MSE after both the French and British Reports are completed. It is anticipated that it will include the following:-

What is CAMIS. Aim of the research - scope and limitations (geography, themes and outputs) – Summary of clusters in the region – importance of Innovation and inclusion into the project – main findings – suggested facilitation to take forward and estimated impacts

1 Introduction

The CAMIS project (Channel Arc Manche Integrated Strategy) was given approval in June 2009 as part of the INTERREG IVA France (Channel) - England Programme, following on from the success of the Espace Manche Development Initiative (EMDI) project (Buleon and Shurmer-Smith 2008). The aim of CAMIS is to draft and implement an integrated maritime policy in the Channel space whilst encouraging concrete co-operation schemes between stakeholders in France and the UK. The project brings together 19 British and French partners, including a range of local authorities and universities, to work together in light of the new EU and national requirements (Devon CC 2010). The project takes the form of four strands that look at specific facets of the maritime industry that impact on the Channel space. These include – security, knowledge transfer, innovation and business clusters. This report concentrates on the innovation and business cluster strands and aims to identify areas of collaboration between the two regions of France and England.

The Arc Manche consists of the seven Counties and five Regions of the South of England and the North of France (figure 1).

Figure 1 Arc Manche Region

For the purpose of the Cluster Strand 3 research the specific industry sector scope is the marine industry as a whole, with special interest paid to four marine themes:

1. Marine Renewable Energy,
2. Marine Operations,
3. Marine Environment, and
4. Marina Tourism.

The renewable energy theme has been chosen for its relevance in technology advancement, environmental impact, sustainability and economic and political interest. This is a fairly new growth sector and therefore provides an opportunity for sustainable clusters to develop through knowledge transfer and supply chain management. The type of industry involved in this area is diverse and will include large manufacturing companies, research and development organisations, local authorities and many small support companies through the supply chain. Although this area receives a great deal of interest from researchers the majority of research is looking at the technical and environmental impacts of renewable energy. The CAMIS research aims to complement this with a view of the impacts of cluster activities on strengthening supply chains and increasing business efficiency.

Marine operations are a sector that appears to work in quiet isolation due to its specialised yet diverse and innovative nature. Pollution control, ballast solutions and fuel efficiency are all aspects of marine operations and will include many small enterprises along with research centres and policy makers. It is not anticipated that business clusters will be easily defined and the nature of the industry means cross-over into the other themes will be apparent. This research aims to increase the awareness of the importance of marine operations and help companies access the opportunities available through transparency and the identification of supply chain opportunities

The maritime industry has never had an easy relationship with the environment yet fears over the damage already done to the sea space have forced this issue into the forefront. Understanding the environment and the way it evolves is an expensive yet necessary task that is carried out by mainly research institutions and universities. The activities that impact on the environment such as aggregates and construction will also play an important role in any environmental clustering. Identifying opportunities for collaboration with France will increase the understanding of the Channel area and underpin any policy challenges necessary to control human impacts.

Marinas are a major economic growth area facilitating the leisure boat industry. Marinas are natural clusters due to their location but cluster activities may not always be apparent. Marinas, by their

very nature, have a major impact on the environment and operations themes and can also play a role in the renewable energy sector. This theme has been studied on many occasions but the research tends to concentrate on the economic impacts to local areas in respect to tourism and services. This research also hopes to increase the understanding of these impacts but also looks to facilitate cluster activities in order to highlight the importance of clustering on economic growth.

The CAMIS project is unique in that it not only aims to identify cluster activities within the four themes but it also aims to facilitate further cluster activities using the best practice that is identified. Therefore the project is disaggregated into three sections:

1. 3a – Identification of cross-border cluster opportunities
2. 3b - Cross-border cluster development
3. 3c - Thematic benchmarking activities

Although there has been a substantial amount of work into clustering and marine clusters there has been little research on the potential benefits from cross-border collaboration. It is the aim of this research to address this issue and from these aims the following objectives will be achieved:

1. Promoting genuine symbiotic business relationships throughout the region
2. Sharing best practice initiatives
3. Identification of sources of and opportunities for, innovation within clusters
4. Facilitating the development of existing clusters or the creation of new ones where they do not already exist
5. Enabling new channels to market

The following sections will outline the background to marine cluster policy in Europe and the national cluster policy objectives before analysing the current cluster practise in the UK and the cluster activities surrounding the four themes. This report is the first stage of the project and identification of best practice and suggestions for facilitating cross-border cluster practice will be identified for taking forward to the next stage.

2 Background

Maritime policy is essential to a country that includes historic maritime communities and such a diverse range of maritime activities from exploration, energy and shipping through to fishing, tourism and leisure boating. The Arc Manche region is unique in that it is one of the busiest channels in the world yet the understanding and policy control of the area remains weak. This chapter aims to highlight the International, European and National policy objectives that are currently in place and situate cluster activities at the heart of the sustainable development opportunities.

2.1 International Stance

Maritime policy is disaggregated into International, European, and National policies. The United Nations Convention on the Law of the Sea (UNCLOS) is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place from 1973 through 1982. UNCLOS defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention replaced the four treaties that originated from 1958:

- Convention on the Territorial Sea and Contiguous Zone, entry into force: 10 September 1964
- Convention on the Continental Shelf, entry into force: 10 June 1964
- Convention on the High Seas, entry into force: 30 September 1962
- Convention on Fishing and Conservation of Living Resources of the High Seas, entry into force: 20 March 1966

The Convention, although successful in standardising the use of international waters, left out the important issue of territorial waters. UNCLOS III came into force in 1994 and to date, 158 countries and the European Community have joined in the Convention.

The Convention introduced a number of significant issues covering the setting of limits, navigation, archipelagic status and transit regimes, exclusive economic zones (EEZs), continental shelf jurisdiction, deep seabed mining, the exploitation regime, and protection of the marine environment, scientific research, and settlement of disputes. The Convention was completed by 1982 but Part XI of the convention; the setting up of the International Seabed Authority to authorise seabed exploration and mining of minerals outside of territorial waters; became a contentious issue due to perceived economic and security threats that could arise from this part of the Convention and complete adoption and ratification of the entire treaty was thereby delayed until 1994. International maritime law is consistently revised and amended when new innovations and working practices alter the method and objective of maritime activity but there are no plans to instigate any major international initiatives in the near future.

The following sections outline the main international conventions that are applicable to the CAMIS research themes.

2.1.1 MARPOL

The main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes is the MARPOL Convention. It is a combination of two treaties adopted in 1973 and 1978 respectively and updated by amendments through the years. Its stated objective is: *"to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge of such substances".* Marpol includes six annexes concerned with pollution:

1. Annex I - Oil
2. Annex II - Noxious Liquid Substances carried in Bulk
3. Annex III - Harmful Substances carried in Packaged Form
4. Annex IV - Sewage
5. Annex V - Garbage
6. Annex VI - Air Pollution

The registering country remains responsible for enacting 'domestic laws' and ships can be detained by the Port Authority of the visited Country if found to be flouting the convention but response to the convention whilst in International waters remains poor.

The prevention of pollution by oil is a main theme of the convention and the current guidelines are:

- the total quantity of oil which a tanker may discharge in any ballast voyage whilst under way must not exceed 1/15,000 of the total cargo carrying capacity of the vessel;
- the rate at which oil may be discharged must not exceed 60 litres per mile travelled by the ship; and
- no discharge of any oil whatsoever must be made from the cargo spaces of a tanker within 50 miles of the nearest land.

Further amendments' to the treaty have been made including discharge criteria, packing and labelling, garbage and sewage and air pollution. Amendments are made regularly and they generally facilitate the implementation of annexes, extend the concept of "special areas", establish more sea areas as "special areas", replace lists of substances, design new construction standards for ships, precise reporting requirements and reduce the amount of oil which can be discharged into the sea from ships.

Although there have been agreements at an International level there are still 'accidents' and limitations of control. One of these issues is the 'dumping' of waste in International waters. At present there can be little control over this and also little motivation for clean up due to the lack of responsibility or ownership of the waters. All Countries have a national boundary of 12 miles (although if the span between two countries is less than 25miles the centre mile is considered 'International' to allow free passage of ships) but beyond this stretch of water minor spillages are not considered a threat to the inland waters and therefore unlikely to be controlled.

2.1.2 International Convention on the Control of Harmful Anti-fouling Systems on Ships

Anti-fouling paints are used to coat the bottoms of ships to prevent sea life such as algae and molluscs attaching themselves to the hull – thereby slowing down the ship and increasing fuel consumption. The new Convention defines "anti-fouling systems" as "a coating, paint, surface treatment, surface or device that is used on a ship to control or prevent attachment of unwanted organisms". Originally, lime, and later arsenic, was used to coat ships' hulls, until the introduction of effective anti-fouling paints using metallic compounds. These compounds slowly "leach" into the sea water, killing barnacles and other marine life that have attached to the ship. These compounds have been found to leech and persist in the water, killing sealife, harming the environment and possibly entering the food chain. The most effective, but now considered harmful, anti-fouling paint was developed in the 1960s and contains the organotin tributylin (TBT), which has been proven to cause deformations in oysters and sex changes in whelks. Anti-fouling systems will prohibit the use of harmful organotins in anti-fouling paints used on ships and will establish a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems.

This is an area that features in the new UK Marine Technology and Innovation Roadmap and is an issue that companies are responding to. It requires innovation and collaborative working practices to further the research and development of 'safe' ant-fouling systems and will therefore be an area that can be explored further for this research. Other areas that are pertinent to the safe and environmentally sound business practice are the following International Conventions.

2.1.3 The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009

The Convention is aimed at ensuring that ships, when being recycled after reaching the end of their operational lives; do not pose any unnecessary risk to human health and safety or to the environment. This will require ships, which are due to be recycled, to carry inventories of hazardous materials and for recycling yards to carry out surveys of each ship. Both parties remain responsible for the ship until recycling has been carried out. This convention came about after it was found that

some less developed countries were stripping ships at a reduced cost to the owner without disposing of hazardous waste appropriately.

Fibre Glass boats are also considered here. At present, fibreglass does not degrade when disposed of and cannot be recycled effectively. Many boats are made of fibreglass and the safe disposal of this material is an area that is being researched by many developed countries. One of the main issues with developing new techniques for recycling and disposal is the legislation and licenses necessary to obtain before any new initiatives can be tried. This is costly and time consuming and can hinder innovation considerably where industry is understandably put off from developing new ideas.

2.1.4 International Convention for the Control and Management of Ships' Ballast Water and Sediments

This convention aims to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments. The discharge of ballast water can introduce harmful and alien biological materials into the environment and are reputedly the cause of extensive ecological and economic damage to aquatic systems. Ballast water is used to stabilise ships and improve fuel efficiency as the weight of the cargo load changes from Port to Port. Water ballast has historically been the preferred choice of ballast due to the availability and ease of transfer. The main disadvantage of water ballast is the density; large amounts of space are needed to hold the water.

It is clear that there are many conventions and treaties that aim to reduce the environmental impact or prevent harmful practices within the International waters. Each of these conventions sit within the environmental, operations and energy themes and are therefore pertinent to national policy implications and possible research funding for innovation. The following section identifies the specific European policy implications.

2.2 European Maritime Policy

European legislation looks to control the safety, economy and environmental impact of activities within its waters. The European Union has a coastline twice the length of Russia’s, and three times that of the United States, and with 90% of its trade passing through European waters they are some of the most congested in the world. The legislation and regulation of policy in the European Union is taken care of by a number of organisations. Table 1 gives a synopsis of the main European Agencies and Organisations that work within the European Community.

Table 1 European Organisations with a Marine or Maritime Remit

Organisation	Remit	Comments
European Maritime Safety Agency	To provide technical and scientific assistance to the European Commission and Member States in the proper development and implementation of EU legislation on maritime safety, pollution by ships and security on board ships.	The Agency also has operational tasks in oil pollution preparedness, detection and response. As a body of the European Union, the Agency sits at the heart of the EU maritime safety network and collaborates with many industry stakeholders and public bodies, in close cooperation with the European Commission.
European Commission Maritime Affairs	Responsible for the formulation and regulation of an Integrated Maritime Policy	
European Marine Observation and Data Network (EMODNET)	A body of the EU that collects, stores and analyses high quality data for the whole of the region on all aspects of marine and maritime affairs	Developed a roadmap for a European marine Observation and Data Network
European Maritime Heritage	To encourage mutual cooperation between the community of organisations in Europe, including museums, involved in keeping maritime heritage alive	Encourages traditional crafts, restoring waterways and preserving boats and watercourses.
European Maritime Law organisation	The "European Maritime Law Organisation" (EMLO) was established to provide a neutral and independent forum for debate and research on issues of interest to those concerned with EU maritime affairs.	A membership organisation with interests ranging from competition and trade to safety and the environment.
European Network of Maritime Clusters	to learn from each other and to promote and strengthen the maritime clusters of member states and Europe as a whole	National cluster organisations under one umbrella network
European Marine Energy	EMEC is at the forefront of the development of marine-based	A limited company supporting the energy

Centre	renewable energy - technologies that generate electricity by harnessing the power of waves and tidal streams.	sector with research and development.
European Marine Equipment Council	Represents the European marine equipment industry and consists of 13 European trade associations. Subsidiaries' are: EMECrid, the Group of European Equipment Suppliers for Innovation, Research and Development: and EMECnet, a network of Marine Equipment firms in Europe offering networking and lobbying opportunities in Europe	'Marine Equipment' refers to all products and services supplied for the building, conversion, maintenance of ships (seagoing and inland) and maritime structures. This includes technical services in the field of engineering, installation and commissioning, and ship maintenance (including repair).
The European Marine Ecosystem Observatory (EMECO)	A consortium of European Marine Institutes that aim to integrate marine environmental monitoring, ecosystem modelling and coastal and ocean research.	Includes 20 marine institutes from 10 European countries.

Source: Internet Search 2011

In recent years the European maritime industry has seen renewed interest regarding research from both academia and policy makers. In 2006 the Dutch Maritime Sector (the Secretariat of the European Network of Maritime Clusters) reported on the inter-relationships between the European maritime clusters (Wijnolst 2006). Each countries maritime industry was described by representatives from the specific country. The purpose was to underline the need for an integrated maritime policy and enhance the European Commission's strategy for a holistic approach to maritime clustering.

Following on from this work, in 2007, the European Commission presented its vision for the Integrated Maritime Policy for the EU (EU 2007). The policy - commonly known as the 'Blue Book' – is accompanied by a detailed action plan and impact assessment for taking the strategy forward. The main objectives of the policy are to: improve the maritime economy by protecting and restoring the marine environment, strengthening the research and innovation into the marine environment, foster economic development in coastal and outermost regions, provide leadership in international maritime affairs, and raise the visibility of Europe's maritime dimension (EU 2007). It is intended that this would be achieved through the provision of new working methods, cross-cutting tools and a wide range of specific actions that would enhance the natural environment whilst forging collaboration between nations. The six strategic objectives highlighted in the report are:

1. Integration of maritime governance, where permanent structures for cross-sectoral collaboration and stakeholder consultation need to be put in place at European, national and regional levels of government, building on hitherto achievements.
2. Development of cross-cutting policy tools, namely maritime spatial planning, comprehensive marine knowledge and data, and integrated maritime surveillance. This will improve the management of maritime space and maritime activities and help preserve marine ecosystems.
3. Defining boundaries of sustainability, set in the framework of the Marine Strategy Framework Directive, will encourage development of all maritime activities with greater regard to their cumulative impacts on the environment.
4. Development of sea-basin strategies, which allows adapting priorities and policy-making tools to the unique geographical, economical and political context of each maritime region.
5. Development of international dimension of the Integrated Maritime Policy, to strengthen the EU's position in multilateral and bilateral relations.
6. Renewed focus on sustainable economic growth, employment and innovation through, for example, strengthened links between energy and climate change polices and the IMP which will help promote renewable energies from the sea and develop climate change adaptation strategy for coastal and maritime areas.

In order to ascertain concrete projects and initiatives that could best advance the six strategic orientations the Commission plan on consulting with stakeholders. This would be followed by a policy document, published in 2010. Developments that have led on from the 'Blue Book' have included an Action Plan. This Plan has concentrated on integrating policy across Europe and highlighted the individual areas of maritime policy and the need for understanding the structure of the various maritime sectors. Also building on the 'Blue Book' and using previous maritime cluster research (Wijnolst 2006) has led to a definitive guide to European Maritime Clusters (EC 2008; EU 2008). The main objective of the study was to enhance the exchange of knowledge and experience: knowledge on the size, specialisation and focus of the maritime sectors or clusters (mapping) and experience within the different cluster organisations. Ultimately, it was hoped that the results would provide building blocks for evidence based policy development in line with the 'Blue Book' and its aim to contribute to sustainable development and the competitiveness of the maritime sectors. This study presented the following key results:

1. An overview of European maritime clusters showing their main economic features;

2. Assessment of success factors and the role of maritime clusters in maritime policy development.

One of the key questions that the research asked, and will be of particular interest to this research, was:

What role can maritime clusters play in increasing competitiveness, in improving the attractiveness of maritime jobs and promoting a sense of maritime identity?

The majority of the work carried out by the EU on maritime policy has stemmed from the Blue Book aims and objectives and upon endorsement the European Council requested regular progress reports on the specific actions outlined in the action plan, the first of which was published in 2009 (EU 2009). Initial progress has included the completion of the Espace Manche Development Initiative (EMDI) (Buleon and Shurmer-Smith 2008) and the approval of the CAMIS project. The main objectives of the EMDI project were to contribute to increased European integration by fostering cooperation between French and English authorities on either side of the Channel. The required outcomes of the project were to highlight the strategic priorities of the Channel area, to produce a strategic vision document for the Channel area, including theme based policy directions, and to produce a printed Atlas for distribution to a wide audience (Buleon and Shurmer-Smith 2008). The CAMIS project differs in the sense that it takes the findings of the EMDI and investigates the possibilities of practical collaboration based on the policy directions that were concluded.

The CAMIS research takes the format of 'strands'. Each strand looks at a specific subject area and explores the possible collaboration that could be facilitated for the purpose of integrating both policy and practical application. This report is concerned with the 3rd strand of the research: maritime clusters. The research objective has been further disaggregated to include four distinct themes:

1. Marine Operations
2. Marine Environment
3. Marine Off-Shore Renewable Energy
4. Marina Tourism

These four themes were specifically chosen due to the known policy initiatives surrounding these topics and their ability to be transnational in their outlook and operation. The next section looks at the UK maritime policy initiatives and expands the argument for these four themes to be embedded in an integrated maritime policy within the remit of the geographical region of the Arc Manche.

2.3 UK Maritime Policy

Arguably one of the oldest maritime nations in the world, with an impressive maritime history, the UK has lacked an integrated or comprehensive marine and maritime policy. Nor does it have a specific industry related national support network as many other industry sectors appear to have. One of the reasons put forward for this lack of cohesion is the diversity of the industry and its tendency to 'bleed' into so many other industry sectors such as defence, transport, food and the environment.

The UK Government's and Devolved Administrations' vision for the marine environment – 'clean, healthy, safe, productive and biologically diverse oceans and seas' – was set out in 2002 and taken forward through the agreement of High Level Marine Objectives (DEFRA 2010). To help deliver this vision the Marine and Coastal Access Act 2009 introduced new systems of marine planning. The Marine and Coastal Access Act 2009 ensure the Marine Policy Statement has a legal implication on decision-making by public authorities[1]. The Marine Policy Statement is the first stage towards implementation and will apply to the whole of the UK waters, from the inland tidal limit out to the furthest extent of the UK Continental Shelf or Renewable Energy Zone (DEFRA 2010). The emphasis is on providing an integrated strategy towards planning sustainable developments from shore to sea.

At the heart of the Marine and Coastal Access Act 2009 is the aim for achieving integration of the socio-economic needs of all marine users with the need to protect the marine environment and preserve biodiversity. These are the key areas of interest:

1. **Marine Management Organisation** (MMO) - a centre of marine expertise, providing a consistent and unified approach which delivers improved co-ordination of information and data
2. **Marine Planning** - a strategic marine planning system that clarifies the marine objectives and priorities for the future. This will also include **Seabed Mapping**.
3. **Marine Licensing** – achieving a consistent approach to marine licensing through the MMO
4. **Marine Nature Conservation** – tools to halt the deterioration of the marine biodiversity
5. **Fisheries Management and Marine Enforcement** - conserve marine ecosystems and help achieve a sustainable and profitable fisheries sector
6. **Environmental Data and Information** - a sound evidence base for making informed policy and management decisions

[1] See sections 56 and 57 of the Marine and Coastal Access Act 2009.

7. **Migratory and Freshwater Fisheries** - a new licensing and authorisation system for fishing activities, give the Environment Agency powers to make emergency byelaws to respond to unforeseen threats to fish stocks and allow for the introduction of a new authorisation scheme for the movement of live fish in order to better protect national and local biodiversity
8. **Coastal Access** - the creation of a continuous signed and managed route around the coast plus areas of spreading room, for example beaches, dunes and cliffs, where it is appropriate
9. **Coastal and Estuary Management** – Coastal integration and synthesis between the management of the coast line.

The policies outlined here and the strategy to take it forward should ensure that business practice for evolving clusters has a much smoother and less complicated introduction. Integration is the key term and this will enable working both within sectors and outside of regions a more attractive and therefore profitable experience without impacting negatively on the environment. Access and management of the coast has always been maintained by The Crown Estate. They have recently been given increased powers to help ensure activities carried out on Crown Estate 'land' is managed more effectively.

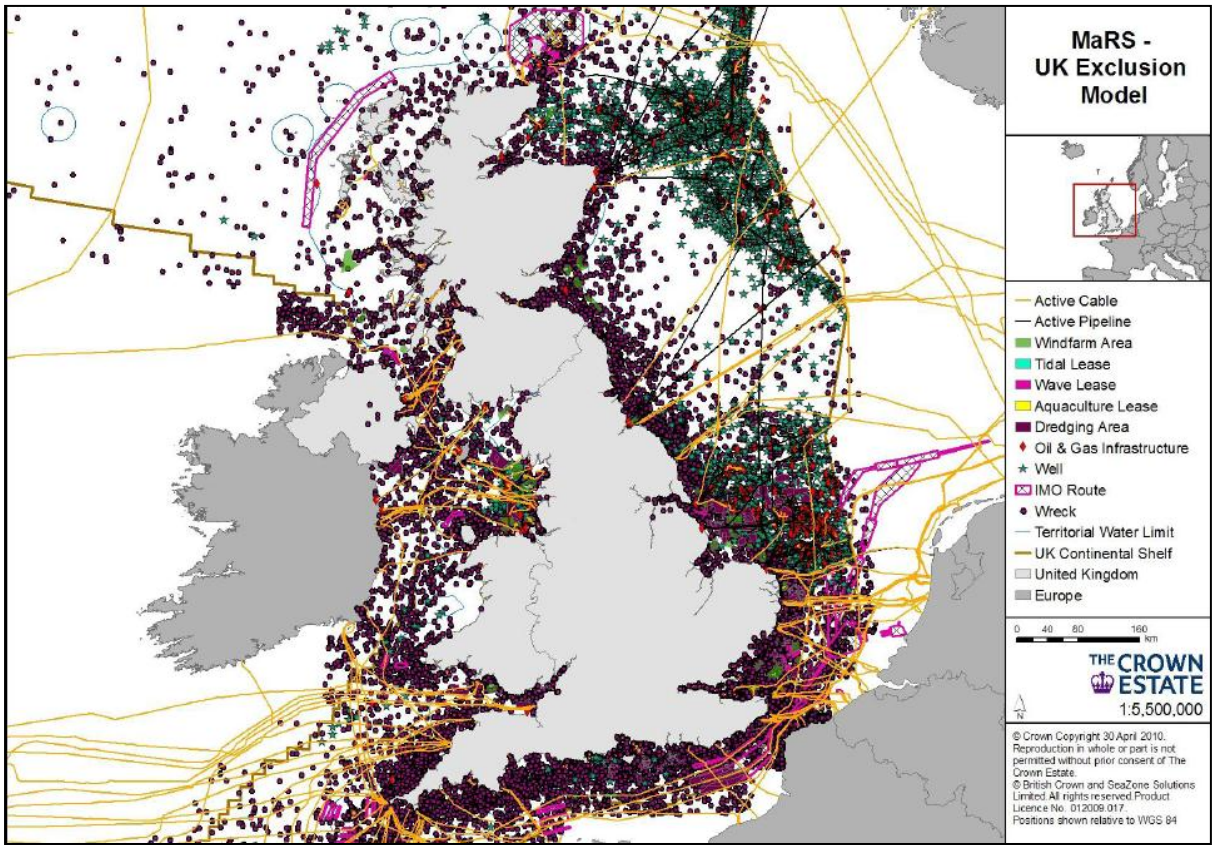
2.3.1 Coastal Ownership and Management

Britain's coastal areas are owned and maintained by The Crown Estate. There is no organisation in the world quite like The Crown Estate, with a property portfolio encompassing many of the UK's cityscapes, ancient forests, farms, parkland, coastline and communities, The Crown Estate's role as employer, influencer, manager, guardian, facilitator and revenue creator is unique (Crown Estate 2011). The Crown Estate own virtually the entire seabed out to the 12 nautical mile territorial limit, including the rights to explore and utilise the natural resources of the UK continental shelf (excluding oil, gas and coal). Rights to explore utilise or carry out activities within this area requires permission from The Crown Estate and the application of licenses. The main leaseholders of the coastline are: Local Authorities, Port Authorities, conservation bodies and other statutory bodies such as: Natural England, National Trust, and the Royal Society for the Protection of Birds (RSPB).

The Energy Act 2004 vested rights to The Crown Estate to lease the generation of renewable energy on the continental shelf within the Renewable Energy Zone out to 200nm. On 6 April 2009, this role was extended under the Energy Act 2008 to allow the offshore area to be used for methane gas and carbon dioxide storage. Any activities involving renewable energy must be carried out under the guidance and agreement of The Crown Estate who will work closely with companies to identify suitable areas. Off- shore renewable energy sites have so far been designated on a rolling

programme and although The Crown Estate has been involved in the location and environmental aspects they have not taken an active role in development. In the recent Round 3 applications for off-shore wind farm leasing The Crown Estate announced that it would co-invest with developers to ensure the technical experience of the companies would benefit from the efficiencies generated by The Crown Estates access to resources and stakeholders. This includes the Marine Resource System (MaRS), comprehensive mapping software that incorporates all activities carried out within The Crown Estate remit. Figure 2 graphically shows the density of off-shore activity through the MaRS model and highlights the current renewable energy leases.

Figure 2 MaRS UK Exclusion Model Highlighting Current Activity



MaRS is a spatial planning tool for improved decision making. It provides a framework for arbitrating between competing human activities and managing their impact on the marine environment. The objective is to achieve a balance between human activities and the natural environment thereby achieving sustainable use of marine resources in line with the EU Sustainable Development Strategy.

MaRS will deliver the first Marine Spatial Plan for UK waters in 2010. The tool will be made available to companies who plan activities that impact on the marine environment such as dredging,

aggregates, pipe laying, renewable energy and oil exploration. It is anticipated that MaRS will be commercially available in the near future.

The impact on business clustering can be seen in various ways: It is important to understand where the skills and expertise is located in the first instance – this will facilitate the understanding of where cluster activities will be occurring and; the determination of where offshore sites for renewable energy will be located will allow for the facilitation of further cluster activities in the area.

Round 3 Offshore Wind Farms was designated in January and two sites along the south coast identified; one of these west of the Isle of Wight, and the other close to Hastings on the south coast of Kent. Although wind is the main power generator in the renewable sector there are projects that look to increase the use of both tidal and wave power. The main site for this in the research area is the Wave Hub off the coast of Hayle, Cornwall. Cornwall was a pioneer in the generation of renewable energy with the first wind turbine being constructed in Redruth in 1892, and the first operational wind farm in the UK at Delabole in 1991.[2]

Off-shore renewable energy is a very expensive area of specialism requiring political backing through policy and investment and there are many large firms that control the overall process from design through to construction and finally supply. Many of these companies are foreign and few have offices of any significance in the southern coastal region. There are many smaller companies that provide supporting activities to the renewable sector that do appear to be abundant in the south west of England including, in the main, Cornwall and Devon. The next chapter looks more in-depth into the selection and definition of the research objectives.

[2] Harrison, J. (2006) Renewable Energy Case Study. Beacon Theme, Cornwall County Council. http://www.idea.gov.uk/idk/aio/4407413

3 Chapter 3 Research Platform

Both France and England have a long maritime history and the regulation of working practices have evolved according to the political and cultural behaviours applicable to each country and also region.

In 2005, France adopted a “Charter of the Environment”. The Charter lays out France's commitment to supporting the right to a 'balanced environment'. The French traditions of universalism came together with the international movement for anticipatory environmental protection which was reflected in the controversial constitutionalisation of the precautionary principle (Bourg and Whiteside 2007). The Cluster Maritime Français came into existence in 2006 and promoted the activities of the cluster members and takes up their representation. Since then there has been the creation of the regional maritime clusters Pôle Mer Bretagne and Pôle Mer PACA, the aim being to increase competitiveness through Research Development Initiatives (RDI). Public-private partnerships (PPPs) have been encouraged to invest in new terminals and accessibility of the French ports (e.g. 2nd phase of Port 2000 at Le Havre, new container terminal (Fos 2XL) at Fos, development of a new port at Donges-Est and deepening of the channel to Rouen) (EC 2008). The French Chamber of Commerce acts as a strong and influential organisation for all business within a region and is the first port of call for businesses looking for help and advice.

British maritime regulation has also changed over the years, with the abolition of the National Ports Council in the early 1980s, labour deregulation, and the option to privatise and gain strategic independence from government, all making major contributions to the industry’s strength and vitality. Ports act as commercial entities now, and do not receive any form of government support (British Port Association, 2008). The establishment of “Maritime UK”, in order to combine the energies of the maritime cluster on policy and political issues (Dutch Maritime Network, 2006) was set up to unite the different factions and provide a political lobby for building excellence within the industry. The British maritime industry has a host of associations and societies as well as trade unions. Many organisations cater for specific themes such as shipping or yachting whilst others bring together all maritime industries within a specific area: Marine Southeast being one such organisation. In 1873 the Franco British Chamber of Commerce was set up to promote and build cross-border business relationships but the generic membership does not appear to appeal to the maritime sector as there are currently no maritime industries represented.

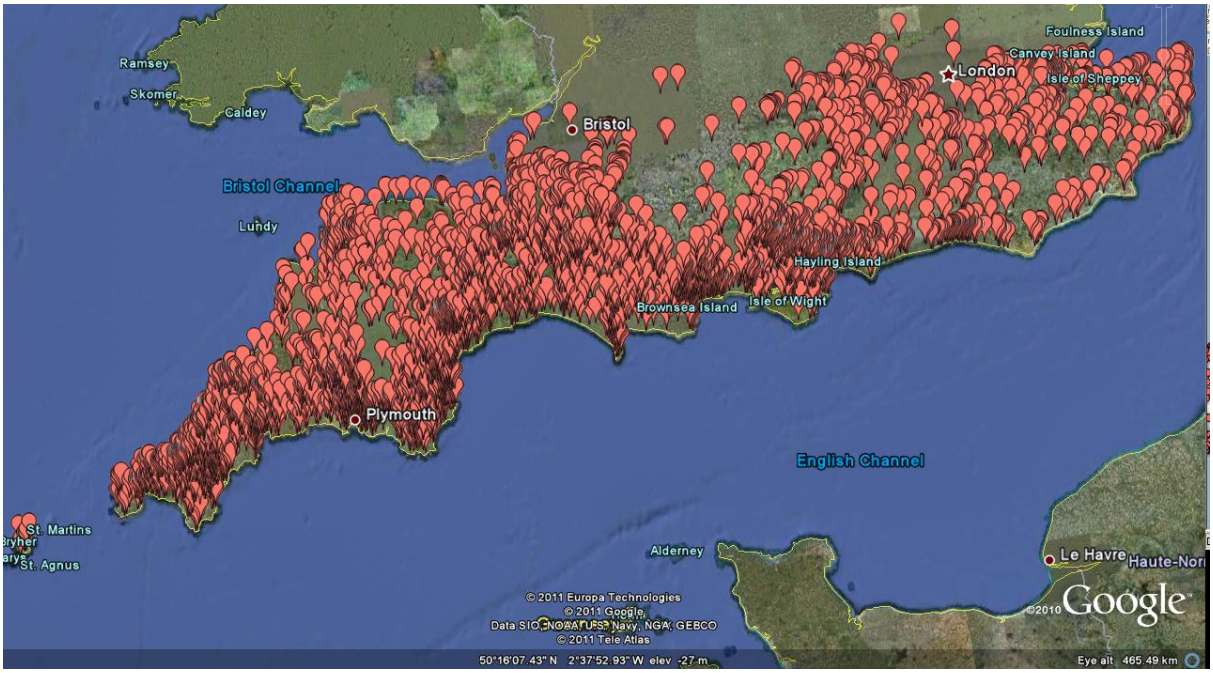
As seen in the previous chapter the British marine industry appears to be large and unwieldy regarding cluster management and lobbying. Many organisations and associations represent small facets of the complex and diverse stakeholders and because the majority of the companies tend to be micro rather than SMEs there is a lack of time and money that can be devoted to supporting and

facilitating growth. This is not to say that efforts are not being made in helping to overcome the problems. Many individuals, local authorities and development areas are making a concerted effort to increase the sustainability of the maritime industry in the UK. It appears that much of the support is through technology and innovation. In order to identify the progress that has been made the location of the industry themes should first be found. The following section gives a brief synopsis of the marine and maritime industry across the south of England and identifies the locations of firms and their agglomeration within the research themes.

3.1 Location of Marine and Maritime Industries in the South of England

Nearly 7,000 marine related companies have been located along the south coast of England. Although not all of these companies work in the themed sectors many of them may support the themes or companies working within them. Figure 3 represents the entire database of marine companies that has been developed over the research period.

Figure 3 Marine Company Locations



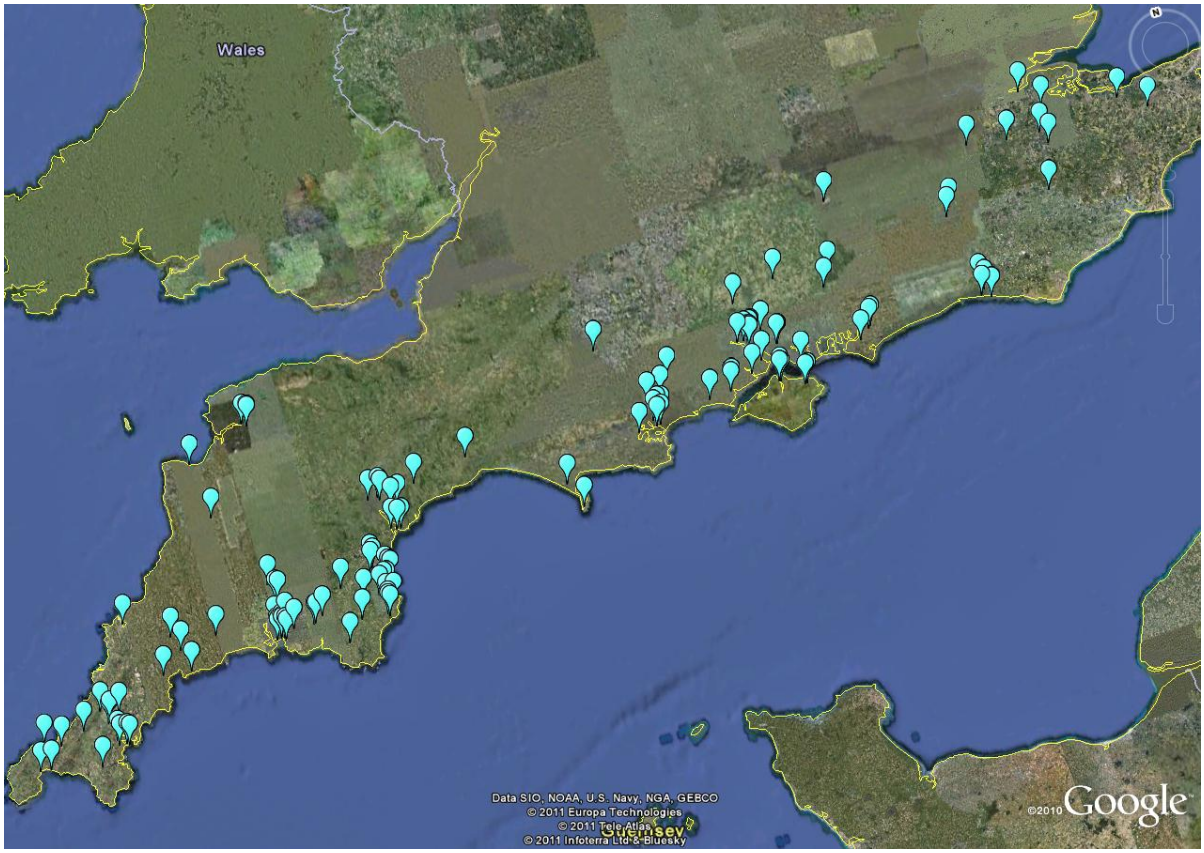
There are areas where the marine and maritime sectors are fairly densely populated. These areas tend to have long maritime associations such as Falmouth, Plymouth and the Solent region. The company data was categorised into the four themed areas and companies that worked within the themes were then identified. Figure 4 show the location of those companies that worked within the marina tourism theme. These include companies such as hotels and restaurants that are located within a marina or deal directly with a marina to the point where their existence is reliant on the marina.

Figure 4 Marina Tourism Theme Locations

The majority of companies are along the coastline or up-river for inland marinas. The Solent area has the largest marina tourism density although there are significant densities in North Kent, Falmouth and South Devon. The two largest marinas in the research area are Chichester and Brighton in Sussex. Although large in berthing spaces neither of these marinas are sited in traditional maritime areas. The Solent area is home to several marinas and also the location of Cowes, Isle of Wight, the traditional internationally renowned sailing area.

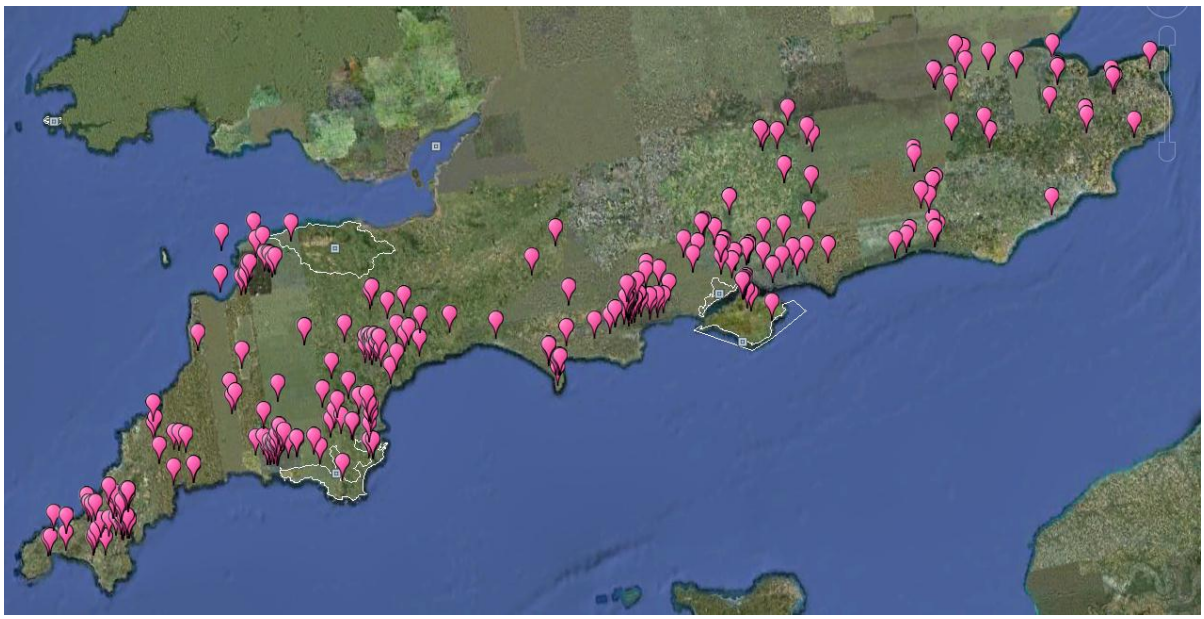
The marine operations theme has been difficult to identify due to its diversity. Figure 5 shows the location of those companies that have been located and highlights the apparent lack of locational clusters. The three regions – Cornwall, Devon and the Solent contain the highest density of companies but as traditional maritime areas with a high density of marine industry compared to the rest of the research area this is not surprising.

Figure 5 Operations Theme



It was apparent when looking at the companies associated with renewable energy, and specifically off-shore renewable energy, that many of the claims that were made in respect to working within this theme were actually desires to work rather than actual practice. Figure 6 identifies the location of companies with both a desire and actual experience.

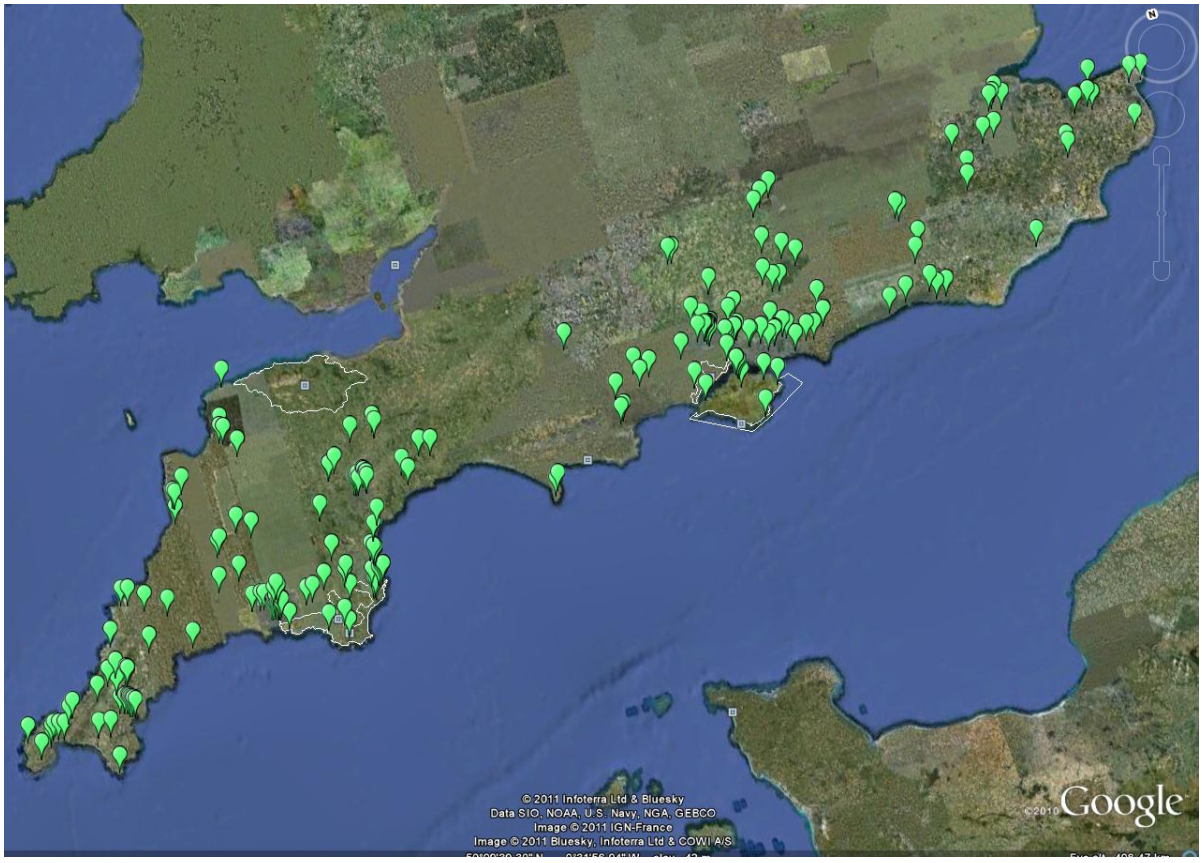
Figure 6 Renewable Energy Company Locations



The southwest of the research area has the strongest conglomeration of companies and there are a significant number working in the area of the north Kent coast. Poole, in Dorset, has a significant renewable sector that appears to be in the manufacturing and engineering industries whereas Exeter's sector concentrates on the service sector with consultancy, insurance and legal advice. The large renewable sector in Cornwall will have been generated by the instillation of the Wave Hub and the convergence funding that has supported this sector in this region.

The Environmental theme is located in the far southwest, central and far southeast of the research area. The two most densely populated areas are around the University of Plymouth and the University of Southampton and the associated research centres Figure 7.

Figure 7 Location of Companies in the Environment Theme



The following section looks at the strengths and weaknesses (SWOT) of the marine industry along the south of England.

3.2 SWOT Analysis

Britain's long maritime history means it has been world leader in many technological developments. This can be a strength as the industry has a huge wealth of knowledge and experience to draw from, but also a weakness when it is considered that the structures that were put in place to manage the industry have also had to evolve over time; something that may not happen as quickly or as

effectively as necessary. Britain may therefore be in the position where its strengths fast become its weaknesses. The following strengths and weaknesses appear to highlight this problem and conflicts are apparent.

UK Marine Industry Strengths

- Long maritime traditions – Naval, defence and commercial trade
- Major knowledge base – Innovation and technological advancement
- Offshore oil & gas expertise – a major world player
- Marine services market leader – Internationally renowned
- Leisure boat sector market leader – major yacht designer and builder
- Strong R&D, education & training sectors – NOC, PRIMaRE,

UK Marine Industry Weaknesses

- Historic lack of Government support – no dedicated ministry for marine
- Lack of a long-term marine strategy – New Marine Act is now addressing this
- Fragmentation and lack of coordination of marine industries – SIC codes do not work with marine and overlap of industry sectors makes classification difficult
- Lack of UK integrated suppliers – micro and SMEs mainly, few large companies
- Lack of business data – reporting tends to be on a local basis, national reporting is sparse
- UK high cost environment – population density and land shortage, gentrification of traditional marine areas and cheaper labour abroad
- Financing difficulties – even more important during a recession and historically an area that is the first to see cut backs from the Government
- Short term thinking – funding long term is difficult, many large projects go abroad
- No 'product champion' – lobbying has been ineffective in the past

The opportunities and threats to the industry were highlighted in the UK Marine Industries World Market Potential (2000) and the original comments are found in Table 2 with up dated comment included. There has been little change over the last ten years with the exception of the off-shore renewable sector that has seen considerable growth in not just wind power but also wave and tidal – especially along the south coast of England.

Table 2 Opportunities and Threats to the UK Marine Industry 2000 - 2011

	Opportunities	Threats	Updates 2011
General	Many growth markets	Rise of low cost manufacturing locations	China and India have increased their manufacturing
	Application of offshore industry skills	Foreign-owned integrated suppliers	Still a problem in renewable energy
	Further development of services sectors	Personnel recruitment & retention	Mainly a desire to work, difficult to enter supply chain
	Low-volume, high-value, high-tec situations	Sector cyclicality	
	Technology development and ownership	Different UK regional policies (e.g. no English enterprise agency)	Local Enterprise Partnerships will localise policy and difficulties with integration into regional policy may arise
Off-Shore Oil & Gas	Deepwater sector	Future decline of UK sector reserves and investment	BP Incident detrimental to industry
	Subsea production	Rise of 'new' regions (e.g. West Africa)	Health & Safety and Risk Assessments for the oil industry carries over into renewable sector
	Floating production	Foreign state oil companies	
	Diversification into other marine sectors	Lack of major UK contractors	
Naval	Knowledge Experts	Strong foreign support of local suppliers	Reduction of Navy in recent years
Shipbuilding	Equity participation	Lack of comparable environment to European competitors	
	Complete ship and through-life services packages		
	Special vessels sectors	Increased presence of S E Asia in special vessel sectors	
	Kit ships/ Electric ship		iship (Technology Roadmap initiative)
Conversion & repair	Passenger vessels		Problems with ship dismantling and environment
	Floating Production Storage & Offloading (FPSOs)		
Marine equipment	Build major integrated suppliers	Integrated systems supply	
	Marine electronics		
	Integrated propulsion		

Marine IT	New high growth potential sector		
Renewable energy	Apply offshore industry skills	Low oil prices – although trend has now reversed	Increase in funding innovation
	Wind power short-term, others long-term		Wave and Tidal power experimentation – Wave Hub
Leisure boating	Develop on market strength		
	Large yachts (>24m)		
Ports	Port management		Lack of Funding to expand
	Port development		
Intermodal	Growth market		
Education & training	Target key markets		Apprenticeships
	Global implementation of training standards		TYHA awards
Submarine cables	Installation & maintenance		
Marine services	Target key markets		

Source: (Westwood 2000) including updated trends

3.2.1 Valuing the Marine and Maritime Industry

The overall economic and growth forecast for the maritime industry remains buoyant and shows an upward trend. The Marine Industries Leadership Council (MILC) has recently calculated the value of the marine industries to the UK economy[3]. The sector makes an economic contribution of £3.7 billion every year and employs around 120,000 people across the country. Together, marine companies generate turnover of £10 billion a year – the sector is defined as suppliers to naval, commercial, leisure and renewables but does not include ports, shipping or oil and gas. This is far in excess of many other industry sectors and according to the MILC the projected growth in the renewables sector and leisure industry will increase the opportunities to expand and generate more overseas trade.

In March 2010 MILC, in conjunction with the Department for Business Innovation and Skills, published their strategic framework for the UK Marine Industries. This document sets out the objectives for the marine industry and highlights specific growth areas that will be developed. Marine renewable energy is one such objective and the focus is on design and manufacturing. As current leaders in the world for off-shore wind powered renewable energy the vision looks to expand on the technical expertise and to encourage smaller firms to compete in the support services

[3] BDO 2011 http://www.bdo.uk.com/business-news/2011/2/marine-industries-worth-3-7bn-a-year

sector (BIS 2010). How the industry is to achieve the objectives is defined by specific activities that are seen as UK strengths:

1. Innovate and Develop – building on current expertise and reputation, develop through the Technology Road Map
2. Design and Deliver – exploit the UKs proven design record internationally, support manufacturing through lean processes and enterprise resource planning
3. Service and Operate – adapt service requirements to customer needs, flexibility, and look towards automation.
4. Dispose and Recycle – build on the Governments strategic approach to environmentally sound recycling and encourage safe disposal of old craft (BIS 2010).

In general, statistics for the maritime industry have been hard to obtain. Shipping is covered by transport (DfT), off-shore renewables by Dept. Energy & Climate Change, marina and tourism by the British Marine Federation (BMF) and Fishing by Dept. For Environment, Food and Rural Affairs. Dept. for Business, Innovation and Skills maintains statistics for the manufacturing and technology sectors but disaggregating these statistics by sector and associating them with purely maritime is an impossible task. Seavision published a maritime breakdown in 2007 (Table 3) comparing turnover and employment to 2001.

Table 3 Comparision of Turnover and Employment in the UK marine Industry Between 2001 and 2007

Sector	**Turnover £bn**		**Employment**	
	2001	**2007**	**2001**	**2007**
Oil & Gas	9.20	4.00	25,000	20,000
Shipping	5.12	10.80	31,500	38,400
Manufacturing	5.20	3.87	40,600	51,000
Shipbuilding	2.54	1.95	24,000	25,000
Marine Equipment	2.66	1.92	16,600	46,000
Maritime Services	4.54	3.01	13,800	14,100
Ports	1.69	19.40	25,000	138,000
Defence	6.66	8.19	61,500	74,760
Leisure	1.61	2.95	26,378	35,680
Renewable energy		0.67		600
Construction		0.59		6,200
Decom Platforms		0.08		1,200
Other	2.82	2.45	30,460	30,833
Telecom	0.50			
R&D	0.61	0.80	8,040	10,360

New Technologies	0.23			
Education & Training	0.14	0.07	1,100	350
Ocean Survey	0.10	0.10		
Navigation & Safety	0.32	0.45	4,200	5,000
Aggregates			2,000	1,670
Fisheries	0.92	1.02	15,120	13,453
TOTAL	**36.84**	**56**	**254,738**	**410,773**

Source: Seavision (2011) Facts and Figures

They estimate that the maritime industry employs over 410,000 people (and at least that again indirectly). The £56bn industry is larger than the automotive industry and probably the largest maritime sector in Europe. Oil and Gas production has seem the most systematic reduction over the time period and the traditional marine services have seen a rise in employment but a decrease in turnover. The biggest growth market has been the ports. Privatised purely to end public ownership rather than instil competitive practice (Baird and Valentine 2006) ports have seen an increase in turnover, but not necessarily an increase in economic and social benefits, since 2000. Education and training in the maritime sector suffered greatly in the years between 2000 and 2007 but recent progress through apprenticeships' has seen a reversal to this trend in some maritime areas and across some of the regions. Skills' training is an area that has not shown consistency across either mode or location and is an area that needs addressing.

The British Marine Federation (BMF) estimated that the leisure boat industry, made a significant contribution to the national economy that would increase in size due to an aging population, affordability of boats, quality of services and added value of entertainment. They gave the following figures covering the south of England:

Table 4 BMF Coastal Marina GVA 2005

	GVA Core Operations £'ooo	GVA Impact £mil	% Regional Share	Total GVA £mil	GVA Impact as % of Total GVA
Southeast	23,661	171	34.3%	166,300	0.10%
Southwest	12,233	89	17.7%	84,600	0.10%
Total UK	69,000	500	100%	1,090,300	0.05%

Source: (BMF 2005)

The south coast of England has the largest marina share with over 50% of the total marina locations situated here. The impact of marinas in the CAMIS research region is therefore highly significant.

The marine and maritime industry is large and diverse and, although segregated for policy and support purposes, the industry itself tends to integrate for working practice. Managing this diversity is not the remit of just one ministerial department therefore there is a disparity in the support offered to the different sectors and when the interaction between the sectors occurs there are policy, funding and support implications that surface. This is particularly apparent in the current economic climate where funding has been reduced in some departments and maintained in others. Companies that work in the maritime sector have to monitor the different funding opportunities and policy approaches coming out of the different ministerial departments and adapt their aims and objectives for growth accordingly. There is a time consuming maze of opportunities to work through and many companies rely on networks, clusters and maritime associations to keep them informed.

The themes that this research is interested in are also the core sectors for growth. Renewable energy has received commitment from policy through funding and growth targets. The support necessary to ensure the targets are attained will be in the environmental and operations theme due to the need for environmental impact assessments and a greater understanding of the seascape and more fuel efficient and less polluting support vessels to supply the construction and maintenance phase.

Each of the themes was chosen for its relevance, impact and collaborative potential. Although all clusters involve an element of each of the themes it is the technical and innovation clusters that will work specifically within a theme. The next sections look in more detail at the themes and the types of companies that work within the theme, the importance of innovation within the theme, and the potential for clustering and collaborative working.

3.3 Marine Renewable Energy

Marine renewable energy comes in three main forms – wind, wave and tidal. Marine renewable energy is specifically off-shore but the wind energy sector, in general, is both on-shore and off-shore. The UK has set a target of 29 GW offshore wind energy by 2020 and a target of 15% of the total energy consumed to be produced from renewable sources – not just off-shore sources. Scotland is the major player in the UK for this theme but there has been a considerable amount of funding and development along the south coast of England in recent years to ensure the sector continues to grow.

Organisations like the Carbon Trust make serious attempts to encourage the renewable energy production by consulting firms on the benefits of investing in the industry and of using renewable

sources. Europe excels in the renewable energy sector (94% of employment in this industry takes place in Europe) yet many companies play a limited role within the sector including supply, training, consultancy, planning and policy, and engineering and technology. This is a relatively new area and many companies will have diversified from more traditional forms of energy and it may still play only a small role both within the sector and as a part of their own company structure. It is important to be clear about the size and time dedicated to renewable energy that constitutes inclusion as part of a cluster. The types of company expected to be represented are:

- Fuel and Energy Suppliers
- Manufacturers of specific parts for wind farms etc.
- Policy makers
- Planners
- Educational and training establishments specialising in Engineering and Environment

There are also smaller industries that will play a role in domestic and small scale energy technology such as:

- Solar Panel manufacturers
- Carbon reducing and environmental manufacturers and suppliers
- Research institutions

Many of these companies will also come under other themes if they supply to marinas, marine environment or work towards government policy on emissions for marine operations. The next sections take the energy themes and look at how they are located and managed in the UK and along the south coast specifically.

3.3.1 Off-Shore Wind

The UK has the largest offshore wind resource in the world, with relatively shallow waters and strong winds extending far into the North Sea. Offshore wind is expected to make the single biggest contribution towards the Government's set targets (DUKES 2010). Along the South Coast there is an estimated potential capacity of 2.5 GW offshore wind power. If this is achieved, it could reduce the energy cost by 40%, the carbon dioxide emissions by 7% and potentially create 70,000 new jobs for the South of England. The London Array situated off the northern coast of Kent is probably the most widely known off-shore wind farm in the UK. This is mainly due to its size and location. Phase 1 of the construction is due to be completed in 2012 and will include 175 wind turbines covering 100km^2 and generating enough power for the equivalent of two thirds of the homes in Kent. The project is

being run by the consortium London Array Ltd which includes, as the main stakeholders, three non-UK based companies. The substation at Cleve Hill in Kent began the construction phase in July 2009 and is expected to be complete by the end of 2011.

Both Kentish Flats and Thanet Off-shore are now owned by the Danish company Vattenfall and managed from their wind department in Esbjerg, Denmark. The wind farms have been operational since September 2005. The Thames estuary is a very busy area for wind farms and research is now being carried out on the impacts of the farms to the natural environment. PRIMaRE are considering the long term impacts of vibrations from the turbines on sea life (King, Maclean et al. 2009) and research into migrating birds and soil behaviour (Lambkin, Harris et al. 2009) are ongoing.

Current locations for Offshore Wind Farms, either working or under consideration, close to the Arc Manche region being studied are:

- Thanet Offshore (Owner: Vattenfall), 12km east of Margate Kent. Total capacity expected to be up to 300MW supplying 240,000 homes
- Kentish Flats (Owner: Vattenfall), 8.5Km due north of Herne bay and Whitstable Kent. 60Km east of central London
- London Array (Owner: London Array), When complete this farm will generate up to 1,000MW of electricity, enough for 750,000 homes – a quarter of Greater London or all of Kent and East Sussex.
- Gunfleet Sands 1 (Owner: G. E. Ltd.), just off the southern Norfolk coast in the Thames estuary. This farm will save annually 317,315 tonnes of carbon dioxide emissions.
- Gunfleet Sands 2 (Owner: G. E. Ltd.), 7Km from Clacton-on-Sea. A 108MW facility.
- Galloper (Owner: Greater Gabbard Offshore Winds), identified as a good location.
- Inner Gabbard (Owner: Greater Gabbard Offshore Winds Ltd.), 23Km from southern Suffolk coast adjacent to two sandbanks

Round 3 Offshore Wind Farms was designated in January and two sites along the south coast identified; one of these west of the Isle of Wight and the other, near Hastings.

3.3.2 Wave and Tidal

The UK is currently seen as the world leader in wave and tidal stream energy. Many of the leading device concepts were developed in the UK, including the Limpet, the Pelamis, the Aquamarine Oyster, the Seagen tidal turbine and several others. In 2010 renewable energy sources supplied 9% of the total electricity, an increase of 23.1% on 2009. Wind energy had increased by 36.9%. Wave

energy is believed to be a promising industry for the UK, as the country is placed among the highest in the world regarding potential. There have been various small projects in the past, either directed by organisations, like the Wave Hub of SWRDA, or by individual innovators, such as (Dettmer 2008) and (Smith 2005). Tidal energy is still at early stages of development, but it has the advantage that it is very predictable. Tidal energy is produced with marine current turbines, some underwater propelled turbines that spin with the rise in the sea level during tides and produce electricity (Fraenkel 2001). The first commercial tidal stream generator was installed in North Devon. Nevertheless, despite all the last years intensified efforts, Elliot (Elliott 2009) suggests that the commercialisation of the renewable energy in the UK is still slow and the country should try develop its own technologies to harvest it, rather than rely on the technology of other countries (Elliott 2004).

Offshore Wave Power is relatively new to the South Coast; the main hub for this sector is the WaveHub recently constructed off the northern coast of Cornwall (Convergence 2007). The Wave Hub construction was blighted by delays and ran behind schedule causing concern by some companies in the sector that the final project would not be able to compete with the Scottish, Portuguese and Canadian markets that operate in direct competition. The WaveHub is now operational as a testing site for new wave power generating technologies and is supported by the Technology Strategy Board funding for innovation in the wave device technology sector.

The Crown Estate has developed a software tool (MaRS) for the planning of future Offshore Energy Sites and this was used for the first time in the Round 3 designations. MaRS is a spatial planning tool for improved decision making. It provides a framework for arbitrating between competing human activities and managing their impact on the marine environment. The objective is to achieve a balance between human activities and the natural environment thereby achieving sustainable use of marine resources in line with the EU Sustainable Development Strategy. MaRS uses multi criteria analysis to identify areas of opportunity as well as areas of constraint.

3.3.3 Summary

Mapping the networks that this specialist theme dictates and ascertaining the necessary linkages between companies and the public sector has allowed for a better understanding of how clustering is occurring and how it helps encourage dynamic economic growth in an area. This is a very expensive area of specialism requiring political backing through policy and investment and there are many large firms that control the overall process from design through to construction and finally supply. Many of these companies are foreign and few have offices of any significance in the southern coastal region. The Crown Estate has taken a pivotal role in the Round 3 installations to encourage a

greater participation by UK companies. There are many smaller companies that provide supporting activities to the renewable sector that do appear to be abundant in the County of Cornwall and this is the main activity that has been researched for cluster activities and potential.

3.4 Marine Environment

This sector deals with the conservation of the marine environment whether this be maintaining current environmental and conservation areas or researching new unidentified areas. The theme looks at the current initiatives that are focussed on the Arc Manche region, the research and funding streams available and the potential restrictions to marine activities. This is not necessarily a commercial cluster but rather a study of the environmentally sensitive areas and the research taking place in order to better understand how the economic viability of marine activities in these areas could be affected and how clustering could potentially exploit them to the economic advantage of the region.

The main industries that will be identified will be research facilities, charities, environmental groups, scientists, lawyers, consultants, local, regional and central government departments, policies and funding streams, and regional development agencies. There will also be interest from ports, the fishing sector, leisure sector and companies that design and manufacture the equipment used in exploration. Areas of interest have historically been designated Sites of Specific Scientific Interest (SSSIs). Under the Marine and Coastal Access Act 2009 there is the ability to de-designate an area of a SSSI in England or Wales that is below the low water mark if it would be more appropriately managed as a Marine Conservation Zone.

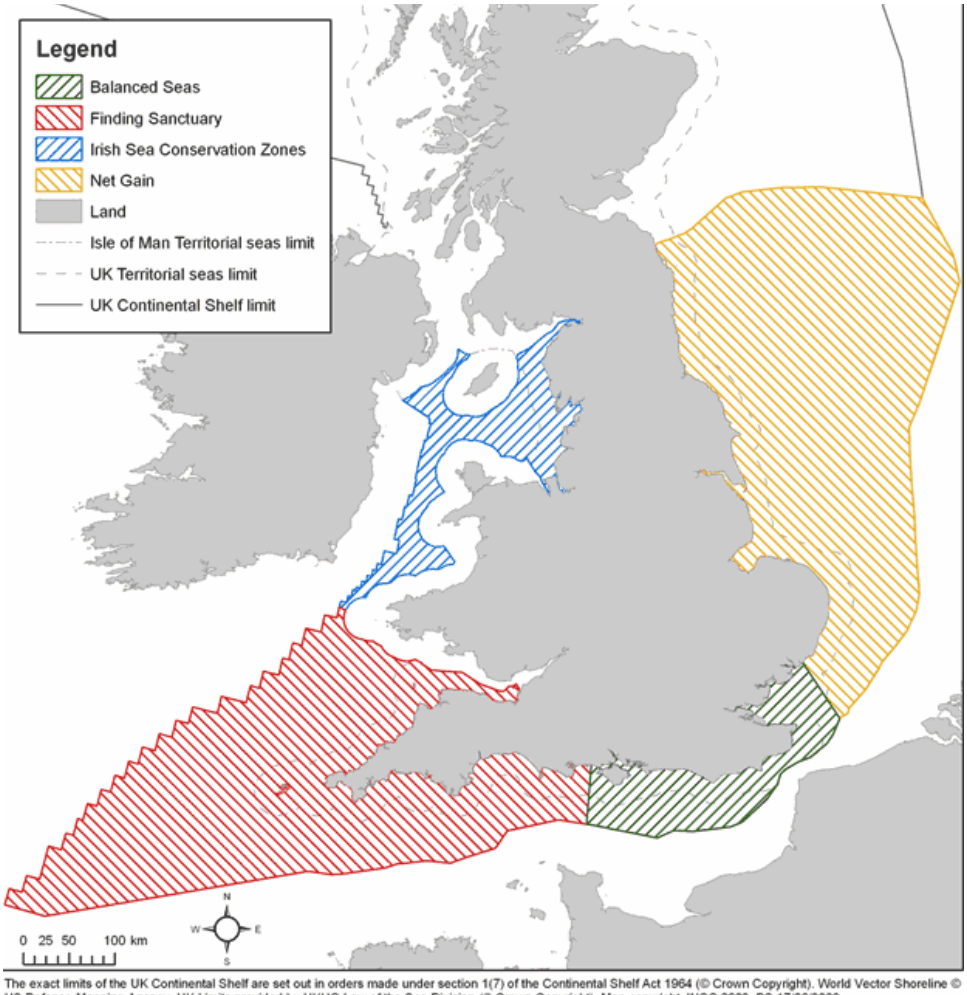
Marine Conservation Zones (MCZs) can be established to protect nationally important marine wildlife, habitats, geology and geomorphology and can be designated anywhere in English and Welsh inshore and UK offshore waters. They are established under the Marine and Coastal Access Act (2009). The purpose of MNRs is to conserve marine flora and fauna and geological features of special interest, while providing opportunities for study of marine systems. They are a mechanism for the protection of nationally important marine (including subtidal) areas. Their designation requires the agreement of statutory and voluntary bodies and interest groups. There were originally three designated MNRs: Lundy Island (in England), Skomer Island (in Wales) and Strangford Lough (in Northern Ireland). Following the introduction of the Marine and Coastal Access Act (2009) MNRs in England and Wales were replaced by Marine Conservation Zones.

The UK has signed up to international agreements such as the Convention on Biological Diversity and the OSPAR Convention that aim to establish an 'ecologically coherent network of Marine Protected

Areas (MPAs)' by 2012. The sites in the network will work together to provide more benefits than an individual area could on its own. MPAs established under International, European and National legislation will all contribute to this network. Defra have published an MPA Strategy outlining how the network will be achieved.

Balanced Seas and Finding Sanctuary are the two regional agencies that work alongside sea users and interest groups to establish areas of both inland and offshore waters that should be protected for further environmental research. Both organisations work with stakeholder engagement and involvement within the stakeholders comes from a wide spectrum of regulatory, strategic, and leisure interests. The main aim of the organisations is to protect and understand the environment whilst balancing this protection with the need to exploit and engage in activities. The range of stakeholders will ensure that all sides of the argument are heard and designated sites are chosen with this balance in mind. Figure 8 shows the location and areas that are covered within the schemes.

Figure 8 Location remit for the Marine Conservation Zone Organisations



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Source: Natural England 2011

PRIMaRE is one research centre that works closely with industry to monitor and research the environment. Although the main stakeholders are researchers and scientists there is evidence of small commercial involvement in respect to fishing, diving and ports. The National Oceanographic Centre, Southampton, delivers integrated marine science and technology from the coast to the deep ocean. Both these organisations offer the potential for cluster activities and will be explored in greater depth later in this report.

3.5 Marine Leisure

Marinas are a major economic growth area facilitating the leisure boat industry. Marinas are natural clusters due to their location but cluster activities may not always be apparent. Marinas, by their very nature, have a major impact on the environment and operation themes and can also play a role in the renewable energy sector. The marina sector has been studied on many occasions but the research tends to concentrate on the economic impacts to local areas in respect to tourism and services. This research also aims to increase the understanding of these impacts but also looks to identify areas of potential cluster collaboration and best practice and to increase the economic impact of marinas by facilitating collaborative cluster activities in order to highlight the importance of clustering on economic growth.

In 2005 The British Marine Federation carried out a comprehensive analysis of the marina industry in Great Britain (BMF 2005). The report highlighted the management structure and growth within the industry and the impact on the local areas through case studies and industry analysis. The main aims of the BMF study were to:

1. Provide a comprehensive overview of the coastal marine sector
2. Evaluate the economic benefits of coastal marinas
3. Provide nine coastal marina case studies for comparison

Marinas appear to cluster in three ways:

1. Self sufficient marinas where the majority of services are provided from within the marina boundary and outside impacts remain minimal. These marinas tend to have a large amount of commercial unit spaces and are large enough to contain entertainment facilities.
2. Star shaped clusters where limited services are provided within the marina and local services are utilised including the local entertainment. This is particularly prevalent where there is a

group of marinas within an area of differing size and ownership that support the local marine services and local tradesmen work with more than one marina.

3. Development Company owned marinas where a marina is part of a larger group and benefits from the branding, marketing and membership benefits that a large group can offer.

A survey was carried out, as part of this study, to look at how marinas in the research area were clustering. 38% of the marinas completed the questionnaire and the results were analysed and published separately from this report (Robins 2011). The analysis chapter of this report will look at this research in greater detail.

Over the last 40 years the marina industry has increased in size with marinas developing almost anywhere the coastlines geology, land costs, real estate taxes, planning restrictions and environmental protection regulations enables. An ageing population with increased disposable income has meant that in some areas the demand out strips supply. The variety of marine business types associated with marinas is much larger than the other themes and many of the companies are small companies that work on a local scale. These include: traditional boat sale, service and repair companies, engineers, electrical engineers, fuel suppliers and antifouling companies as well as Harbour Authorities, local councils, retail, restaurant and catering companies, niche manufacturers (sailing memorabilia etc.), entertainment such as; cinema, bowling, theatre, clubs and pubs; plant hire, valet services and technological firms developing innovative and sustainable boat services. Some companies will serve more than one marina by either opening outlets at each location or positioning themselves between marinas and some marinas will provide the important marine services from in-house. How location, ownership and size influence a marinas cluster abilities will be the main study for this theme.

3.6 Marine Operations

Although closely linked to the renewable energy sector this theme is also very different. Marine operations control pollution, safety and security of the environment. Pollution contributes to the increase in greenhouse emissions and, regardless of the promotion of renewable energy, unless steps are taken to reduce the impact of the current polluting maritime operations, the CO2 reductions necessary to achieve the agreed targets are unlikely to be met. The main problem with pollutants in international waters seems to be the lack of responsibility taken by any country therefore these emissions do not count towards an individual countries targets and the motivation and incentive to reduce emissions is missing. That said there are many initiatives apparent in the marine industry to combat fouling and increase fuel efficiency.

The European Union (EU) is putting intense pressure on the global shipping industry to develop concrete plans to cut greenhouse gas (GHG) emissions. The EU is threatening to impose unilateral measures on the industry if it cannot resolve the situation itself, and quickly (IMO 2009). Countries are loath to include emissions from shipping in their targets because the amount of emissions is high:

"The US trillion-dollar industry carries nearly 90% of world trade, by volume, on more than 50,000 merchant ships. The industry accounts for 10% of worldwide sulfur dioxide emissions, and 3–5% of the world's GHG emissions, a number expected to rise by more than 30% in the next 12 years." (IMO 2009 p4)

The GHG emissions are secreted far from the coast, in many instances in International waters; therefore it is arguable as to whether they warrant inclusion in the targeted reductions necessary to reduce the threat of global warming. The impact of this section is pronounced. It has a political, economic and social impact on the business operations, land use and standard of life for the area. Sustainability along the Arc-Manche in respect of the environment is potentially difficult to quantify due to continually moving emissions targets and government policy.

The development of legislation and policies at European level has had important impacts on enterprises in EU Member States and abroad. Legislation to create the Single Market, environmental legislation, trade policy, transfers for the agricultural sector and the various initiatives summarised under the expression Lisbon agenda have lead to changing environments for businesses and necessitates a continuing dialogue with industry (Wijnolst 2006).

The stakeholders that will be apparent in this theme are: International, Central, Regional and Local Government policy makers, funding providers and regulators. Marine servicing companies, marine parts manufacturers, Ports, Harbour Authorities, Marinas, fuel suppliers, valet companies, waste disposal and recycling companies, research organisations, scientists, environmental groups, professional associations and societies, regulators and certification companies, fibreglass manufactures, boat builders, haulage and freight companies, translators, customs and excise, safety and security companies and training and education establishments.

The UK Marine Innovation and Technology Roadmap sets out nine marine industry areas that compliment the Governments marine policy and legislation. Green Propulsion Systems is one of the nine objectives that covers the marine operations theme of this research. Green Propulsion Systems aims to draw together legislation with industry emerging green operators. The areas covered include: reduction of oil leakage, noise reduction, and heat recovery. These will, in turn, improve fuel

efficiency, reduce costs, and ensure efficient use of resources to achieve the legally binding targets agreed on climate change.

This is not a theme that can be identified as a natural cluster due to the obscurity of the work that is carried out and the secondary, rather than primary, focus of stakeholders in the main. The Technology Road Map has provided significant evidence of cluster activity and potential collaboration with cross-border countries but because such technology and knowledge driven investment is needed the element of trust can become an issue. What is apparent in the Technology Road map, and the analysis of the strengths of the maritime industry in the beginning of this chapter, is the importance of technology innovation to all sectors of the marine and maritime industries. Clearly, each theme included in this research requires innovation in order to succeed in its intentions. Innovation is a fundamental part of cluster activities as it involves the transfer of knowledge and provides a platform for sharing ideas and best practice. The next chapter looks at how innovation has been fostered in the UK and the impact that is has on the marine and maritime industries.

4 Innovation

A commonly accepted definition of innovation is the successful introduction of a new or improved product, process or service to the marketplace (Hobday 2005). Joseph Schumpeter characterised innovation as a "creative destruction" (Tidd 2006). According to Freeman and Engel (2007), Innovation is about developing new ideas and marketing them for financial gain. It is the financial aspect that distinguishes innovation from invention in a university laboratory or research centre (Freeman and Engel 2007). Innovation now constitutes a fundamental part of business research and it is estimated that for a businesses to excel in the future they will have to innovate; thus innovation has become an integral part of the decision making process and business functioning for many business models today. Firm-level innovation has been one of the key growth factors for industrially advanced countries and is believed to be the driving force to development for developing countries as well (Hobday 2005) .

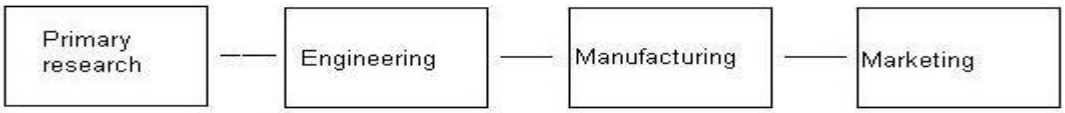
4.1 Generational Innovation Models

Innovation models have adapted to the economic and technological climate. The most widely accepted classification of innovation models is the 'five generations of innovation models' (Rothwell 1994). Starting in the 1950's, each model is progression on the previous model, without mutual exclusion of each other: therefore, businesses may adopt several different models at the same time. The transition from one model to the next is often regarded as a change in the perception of what the best practice should be, rather than as a real progress (Hobday 2005). Rothwell's five generations of innovation models are as follows:

4.1.1 First generation: "Technology Push" (1950s – Mid 1960s)

These models of innovation attempt to describe innovation as a linear process starting with primary research and ending with marketing of the final product. According to these models, innovation starts with primary research in universities which then triggers further research at a business level; usually inside some company's engineering department; which leads to manufacturing and mass production of the business idea in a formed product before finally, the product is marketed. A schematic representation of a characteristic first generation models (often called, "the linear model") is given in Figure 9.

Figure 9 1st Generation - Technology Push Model



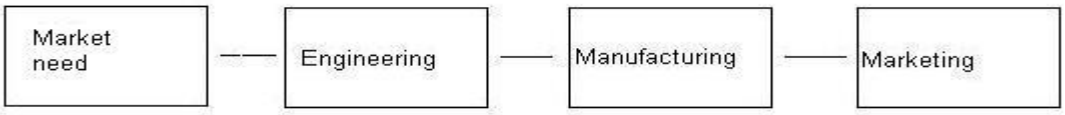
Source: *(Hobday 2005)*

This model highlights the importance of technology, hence its name, as the driving force for innovation. Although studies show that first generation models of innovation are still in use (Godin 2005), the linear model is broadly considered outmoded due to its simplistic linear nature.

4.1.2 Second generation: "Demand Pull" (Mid 1960s – 1970s)

The rise of the "market need" theories in the 1960s led to 2nd generation models which emphasize the role of the market in the production and propagation of innovation. Again, they were linear, with the focus on the proactive market and the reactive R&D. Figure 10 represents a typical 2nd generation model.

Figure 10 2nd Generation – Demand Pull[4].



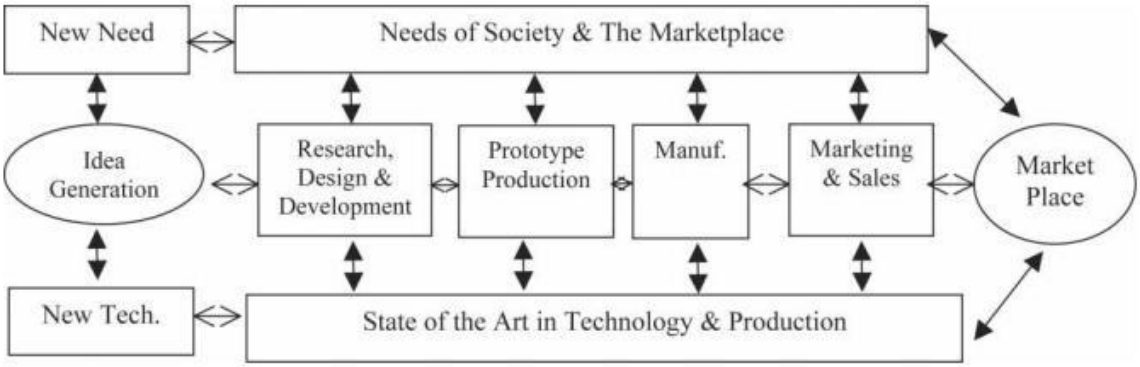
Source: Hobday 2005

4.1.3 Third generation: "Coupling or Interactive models" (1970s)

The main problem with the first two generation models was their linearity: insufficient explanation of the innovation process and its complex interactions. This inefficiency gave birth to the third generation of innovation models which depict interaction with science & technology and the marketplace. As shown in Figure 11, a typical 3rd generation model still includes the main core concepts of the previous two generations but there are feedback loops between science & technology and the marketplace from the later stages to the earlier. The input of R&D and marketing is equally balanced and they both contribute to the innovation process.

[4] *Note the difference from Figure 9 on the driving force (Market need instead of primary research)*

Figure 11 3rd Generation – Coupling or Interactive (1970s)

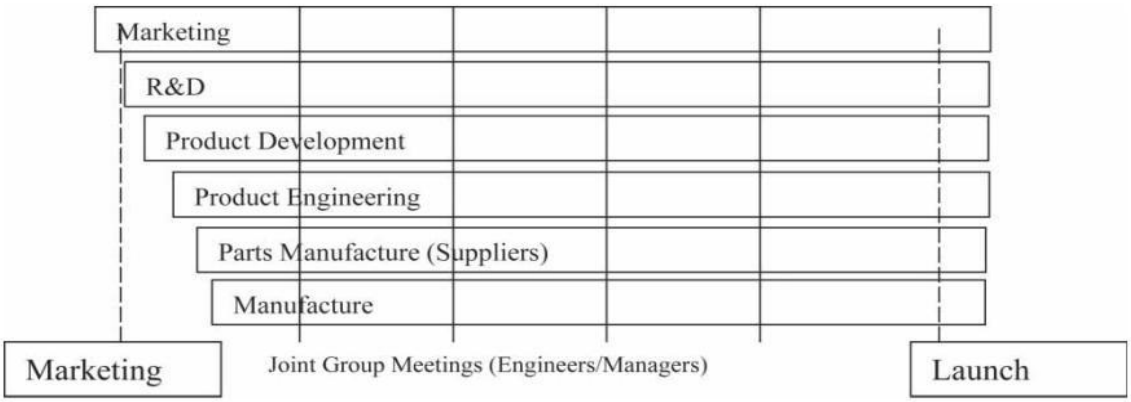


Source: Hobday 2005

4.1.4 Fourth generation: "Integrated models" (1980s)

Although the input of R&D and the marketplace are better balanced in 3rd generation models they are still linear in nature. The 4th generation models, inspired by the Japanese automobile industry, include overlapping or integrated areas between the various departments of the business (see Figure 12). These models are not characterised by sequential processes and consider interactions with external partners such as suppliers, universities and public organisations, as well as customers.

Figure 12 4th Generation – Integrated models (1980s)



Source: Hobday 2005

4.1.5 Fifth generation: "Systems Integration and Networking models" (Post 1990s)

The last generation of innovation models, widely used by firms today, are an extension of the 4th generation models depicted previously. The focus is on networking with suppliers and customers to achieve vertical integration with all levels of the supply chain. By maintaining extensive use of IT facilities, R&D, simulations, and CAD systems for product design, they stress the importance of total

quality management and other non-price factors. Fifth generation differs from previous models through the use of advanced computing and high-tech which according to Rothwell, "5th generation represents the *electronification* of innovation" (Hobday 2005).

Classifying innovation into generations is useful but has its limitations: the list cannot be exhaustive, and like any model it is based on assumptions and simplifications. Innovation may also be discontinuous, its diffusion might not follow any of the models described above, or it could, instead, be S-shaped (Tidd 2006). S-shaped (or logistic) means a slow rate of adoption at the beginning with only the "innovators" adopting the new idea. The curve extends when the "early adopters" follow, and the "late majority" adopt as the idea matures. Finally, the curve straightens and gets the S shape as the "laggards" are the last to adopt (Tidd 2006).

There are several other classifications of innovation models that exist. One of the most popular is the distinction between open and closed innovation. Some of the models in the Rothwell's five generations could be classed as open or closed innovation models. A firm is said to follow a closed innovation policy when it undertakes all the stages of the production process, from the conception of the idea to the marketing of the product from within the company. It is a model dominated by secrecy and total internal control. Open innovation, on the other hand, is a model with several external partners involved in the production process, collaborations and ventures, but who have different vested interests, which can, in turn, slow down and undermine the production process. According to Munsch (Munsch 2009), the open model approach can provide three clear benefits to the firm:

1. New ideas considered from different perspectives.
2. Mitigation of business and financial risk by the participation of many different parties.
3. Speed to market when good coordination exists and all parties make valuable contributions.

Open and closed innovation models have also been examined from a mathematical viewpoint, with the development and testing of simulation models (Almirall and Casadesus-Masanell 2010), showing that open innovation can be restrictive when a firm wishes to adopt a particular technological procedure for a product.

Further models that have developed include incremental innovation which is an extension or improvement to an existing product and is therefore deemed to be safer than developing a new product. The entrepreneurial model, on the other hand, is focused on the role of venture capitalists and the innovation process is centred on the business itself from the beginning to the end.

4.2 Regional Innovation Systems

The Regional Innovation System (RIS) is one of the most modern approaches for supporting innovation and assessing the effects of innovation on specific regions and its contribution to economic development. It is an innovation policy that promotes regional science, technology and innovation with the participation of regional stakeholders (Zabala-Iturriagagoitia, Jimenez-Saez et al. 2008). Business clustering is intertwined with the model of RIS as the latter provides necessary conditions for the formation of clusters, it is associated with knowledge spillovers and encourages innovative activities through R&D and investments in technology.

The main aim of the RIS initiative (Zabala-Iturriagagoitia, Jimenez-Saez et al. 2008) is to:

- Promote more open processes to help the development of regions.
- Create an innovation culture.
- Identify the needs of regional firms in terms of innovation support services.
- Help Small and Medium Sized Enterprises (SMEs) grow.
- Coordinate existing innovation support strategies.
- Promote inter-firm and public-private networking and collaboration.
- Encourage horizontal clustering.
- Identify new pilot innovation projects and themes.
- Integrate interregional cooperation and policies within Europe.

Each RIS has three main phases: Consensus building and awareness phase (contacts and discussions among key regional actors), analysis phase (identification of firms' innovation needs, analysis of the innovation capital of the region etc), and elaboration of the RIS (identification of pilot projects, designing and implementation of evaluation systems etc). In terms of methodology, there is no global method of implementing RIS, each region and policy differs according to its needs. However, it is commonly accepted that a successful RIS strategy requires an effective combination of quantitative and qualitative methods in order to understand the economic and social impact of the policies.

The European Research Area (ERA), an initiative launched in 2000 as part of the Lisbon Strategy (Bruijn and Lagendijk 2005), aims to integrate research programmes and structural funds to improve the European competitiveness in the "knowledge society" (Heraud 2003). The ERA is based on the concepts of the RIS and can bring together regional development organisations, universities, local authorities, stakeholders and sponsors. Its main characteristic is its regional nature, nevertheless, the network of organisations and people involved might exceed the geographical borders of a

specific region. RIS is focused on science and technology and although it is related to the contemporary innovation models, its basis can be found in the linear models of innovation, the first generation model (Heraud 2003): Any increase in research inputs (R&D, facilities, infrastructure etc) will statistically lead to increased output of technological creation and industrial innovation. RIS's relationship to more recent innovation models can be found in its emphasis on scientific knowledge and general education at every stage of the process leading to innovation (Heraud 2003). Local socio-economic conditions play an important role for the creation of successful RIS (Rodriguez-Pose and Crescenzi 2008). Although the realisation of the Lisbon Strategy has not been to the full aspiration of the policy makers and more than R&D and technological advancements are needed (Bruijn and Lagendijk 2005), it is agreed that RIS has been an important catalyst to increase innovation in Europe.

Studies about RIS have criticised the relationships developed between technological SMEs in terms of competition and co-operation (Gnyawali and Park 2009), as well as the issue of SMEs versus Transnational Corporations (TNCs) (Christopherson and Clark 2007). It is believed that when SMEs coexist with TNCs in the same region, SMEs have more opportunities for innovation to foster and it is easier to become established in the global markets. Christopherson investigates three factors that explain why, in practice, this phenomena does not really occur: political power, existence of research centres and the regional labour market (Christopherson and Clark 2007). TNCs dominate all three of these factors: they have enough political power to influence regulatory policy, they own or have control of major research centres and attract the most educated and talented workforce from the labour market. Yet if this is the case, why do SMEs still exist and continue to be great innovators? One answer is found in the RIS structure: TNCs have a limited role in RIS, they are not region-oriented (Christopherson and Clark 2007) and target global markets to establish networks in other countries. Another explanation may be found in the perception of networks as hierarchies of companies: TNCs may only be interested in networks where they are going to be at the top of the hierarchy, and even then only if this will increase their profitability internationally. Finally, exclusivity found to be another deterrent for TNCs to work in regional networks as they find no incentive in belonging to a network where they have no control of who is or isn't a member. For these reasons, SMEs are able to form networks and prosper within the boundaries of RIS.

Although in principle RIS sounds like an effective strategy to boost innovation, the reality of tackling innovation disparities across regions is more complicated. The ability of different localities to promote innovation varies considerably and in many instances funding initiatives can be something of a postcode lottery (see Finland below). Identifying the regions that are effective at promoting

innovation is important to a technology based company and joining a cluster is usually an up-hill struggle. Effective RIS should have both top-down and bottom-up characteristics (Iammarino 2005). Top-down, or Macro-to-Micro, is the shift from national scale to regional scale and it is necessary to integrate it with bottom-up (micro-to-meso) perspectives (Iammarino 2005).

In Finland, a country with small population and few resources, RIS has placed the country among the top innovators in several international rankings (Jauhiainen 2008). With an organised innovation policy since the early 1990s Finland has climbed up the rankings of innovation. It also systematically reviewed the innovation concepts and models and paid special attention to regional clusters. Although Finland is a leading innovation country overall, there are disparities among the regions some might demonstrate remarkable performance, such as the Lahti region (Pekkarinen and Harmaakorpi 2006; Aula and Harmaakorpi 2008) but others lag behind (Jauhiainen 2008).

In another study of three German metropolitan regions, Bremen, Munich and Stuttgart the emphasis was on Knowledge Intensive Business Services (KIBS) (Koch and Stahlecker 2006). KIBS were introduced in the early 1990s and operate in the same way as providers, purchasers or partners in the context of innovation usually providing specialised expert knowledge, R&D and problem solving applications for local businesses. The study tries to identify how the regional techno-economic and institutional structures in the RIS affect the development of KIBS. The differences in the structure of innovation systems across regions appears to be due to different knowledge dissemination and endowment with incubator organisations which provide this knowledge, human capital and opportunities for development for KIBS.

The majority of European countries have seen innovation and even innovative clusters promoted to one degree or another. The Lombardy region, Italy, is one of the most industrialised and innovative regions in Europe and an area where local SMEs are particularly well networked and clustered (Muscio 2006). The RIS in place allows local firms to access help from various public and private institutions, while lots of attention has been put on the technological development of the region (Bosco 2007). In Spain, the 'Mondragon Cooperative Experience' (Lopez, Lopez et al. 2009) has been in existence since 1956 and is formed of 106 cooperative firms, 136 subsidiaries and 18 entities promoting the same business values, such as cooperation, participation, social responsibility and innovation. In Greece, the RIS of European regional policies in Central Macedonia, Western Macedonia and Thessaly have benefited due to their ability to establish operative external environmental conditions (Kyrgiafini and Sefertzi 2003).

RIS does not necessarily have to be restricted within specific geographical borders, expertise can be accessed from anywhere if the technology and knowledge is available.There is also evidence to support that establishing a regional advantage is just not enough (Cooke 2007). Regional learning may be inadequate to sustain regional development and the key to achieving regional development should lie with consistent policy platforms.

4.3 Innovation and Clustering

Innovation is often linked to business clustering with empirical evidence suggesting that firms that share a geographical proximity tend to network and therefore collaborate on projects, innovation and knowledge transfer. Porter (1990) provides six hypotheses on why business clustering promotes innovation and they are described and challenged by (Simmie 2004):

1. Rapid perception of new buyer needs.
2. Concentrates knowledge and information.
3. Knowledge-based economies are more successful when knowledge is localised.
4. Facilitates on-going relationships with other institutions, including universities.
5. Allows the rapid assimilation of new technological possibilities.
6. Provides richer insights into new management practices.

Although close cooperation with suppliers, contractors, customers and support institutions will encourage interactive learning and create an innovative environment (Asheim 2007), an optimal breadth and depth of business clustering is not generally accepted. Some studies advocate high clustering and reach (Schilling and Phelps 2007), and others support that the location makes no difference with respect to innovation performance (Doloreux, Amara et al. 2008). An important aspect for the formation of clusters seems to be the cluster identity (Romanelli and Khessina 2005), i.e. the type of firms that consist the cluster. Even clusters located in areas with inferior resources but with strong identity can thrive. Clusters might also consist of companies of the same sectors and still be characterised by significant differences, as the evidence from the British financial services in London, Edinburgh/Glasgow and Bristol have shown (Pandit and Cook 2003).

There are numerous papers on innovative business clusters spanning several sectors and geographic regions. One of these is looking at Principal Component Analysis (PCA)[5] for innovation clusters in EU-

[5] Principal Component Analysis is a method that transforms a set of possibly correlated variables to a set of uncorrelated variables, called principal components. The method is derived from the linear regression model

15 (Tokumasu and Watanabe 2008) and reveals the existence of three clusters that incorporate different countries in Europe. The northern countries are found to be in a much stronger position in terms of inputs and innovation resources and with IT-focused institutions that lead IT-based economy growth. Studies of innovation clusters in Europe by Moreno (Moreno, Paci et al. 2006) also examined how specialisation, diversity, or and other local factors (e.g. home market effect, agglomeration phenomena etc) affect innovation in a local industry cluster. They show that clustering is highly affected by institutional and geographical proximity, although technological proximity does not appear to be a strong factor. Examples frequently mentioned in business literature are the Silicon Valley in California (Osama and Popper 2006), the "Third-Italy" (Asheim 2007) and the Silicon Fen in Cambridge (Garnsey and Heffernan 2005). The last demonstrates a unique case of how technology companies around a science centre can transform the local economy and how collective firms can effectively solve problems that individual enterprises would struggle with (Garnsey and Heffernan 2005). Similar clustering phenomena have been observed in Oslo, Norway, where companies find it useful to interact with consulting companies and important customers (Isaksen 2004).

A study of Flanders, Belgium (Cabus and Vanhaverbeke 2006) reveals that business clusters are highly associated with external economies, which are taking over internal economies. Networking cannot be explained in terms of urban networks, but in terms of relationships between firms located in territories with dynamic industrial communities. Innovation systems with similarities have been observed in Wales, Scotland, East Anglia, Stockholm and East Gothia (Sweden) as being underdeveloped due to deep reliance on public support (De-Laurentis 2006). It is found that a combination of public and private governance at the regional level to promote innovation can be more efficient (De-Laurentis 2006). Another study of 13 clusters in Sweden illustrates four distinct models of cluster approaches:

a) industry-led initiatives,
b) top-down public policy exercises in brand-building,
c) projects to produce an industry cluster from thin-air and

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and is defined as an orthogonal linear transformation that transforms the data into a new coordinates system. Every principal component accounts for a percentage of variance to the regression model, with usually the first 2 or 3 components to account for over 90% of the total variance. Principal components with insignificant variance can be discarded from the model. In case of two principal components, the first principal component is the line of best fit of the regression model and the second principal component is a line vertical and perpendicular to the line of best fit. Therefore, the axes system of the linear regression is rotated to a new coordinates system whether the two principal components are now the new axes. This way, the cloud of data in the scatter plot is regressed more accurately around the line of best fit.

d) small scale, geographically dispersed clusters that link to deep global rather than national systems, sources of innovation and competitive advantage (Lundequist and Power 2002).

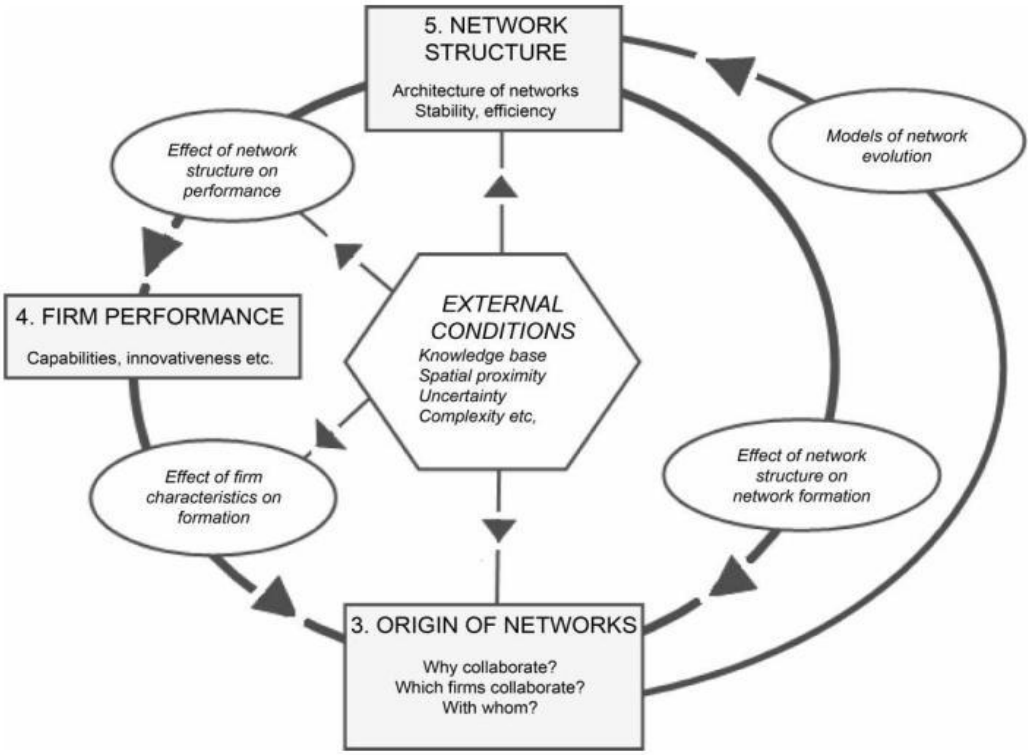
In Germany, a strong tendency towards clustering of industries or of strengthening existing clusters is observed (Brenner 2005) which is in contrary to the Randstad region of The Netherlands where studies on high-tech SMEs showed that regional clusters hardly exist (Wener and Stam 1999).

By examining the innovativeness and importance of local cooperation, it is can be shown that highly innovative firms are more likely to cluster. Furthermore, clustering seems not to be restricted to high-tech companies and companies with clustering dynamics tend to cooperate well with suppliers and universities (Brenner 2005). Clustering has also been shown to be positively correlated with regional development, as is the case in Australia (Roberts and Enright 2004), or, it increases the innovation, knowledge depth and interaction of high-tech personnel, as shown in Taiwanese science parks (Hu 2008).

According to (Arikan 2009), a cluster exists to create a competitive advantage for collective and individual firms by the creation of knowledge. Knowledge creation and spillovers are believed to be major characteristics of business clusters and inherently intertwined with innovation. Arikan studies inter-firm knowledge exchange in business clusters and defines it as formal or informal interactions between firms that involve either voluntary or involuntary forms of knowledge exchanges (Arikan 2009). In his study to find evidence of such inter-firm knowledge in clusters, he devises and tests eleven propositions concerning knowledge: lead time, modularity in product technology, level of technological dynamism, exploration-based search strategies, number of industries that use the same technology, the lead firm's level of cooperation, tacit knowledge, information channels and knowledge brokers, knowledge overlap between cluster firms, knowledge exchanges between cluster firms and outside entities, and the dissolution of knowledge relationships that no longer enhance knowledge creation. He studies the relationships between these factors and the creation of knowledge and exchange of knowledge in the cluster. He also tries to explain why some clusters may perform better than others. Knowledge intensity, presence of strong firms, inter-firm knowledge exchanges and institutional environment for cooperative relationships seem to be some of the main success factors.

However, most of the research on inter-firm knowledge and clusters is not generic (Arikan 2009), but focused on different business sectors which makes it increasingly difficult to draw universally acceptable conclusions (Ozman 2009). According to (Ozman 2009), the most common studies on inter-firm networks can be represented in a flow diagram such as Figure 13.

Figure 13: Circular flow diagram of network research



Source: Ozman 2005

These are the main areas of distinction to this diagram:

a) origins of networks,
b) firm performance and
c) network structure.

Studies on the origins of networks try to ascertain why firms collaborate, who they collaborate with, and what the effect of collaboration is. Firm performance studies answer the question how the structure of the network or the environment influences the firm performance. Network structure studies look at how the overall structure is shaped and how the external conditions affect the

network. The diagram above shows the commonalities among the three different approaches and how the change of focus transfers from one study to another, e.g. by focusing on effect of network structure on performance we move from “network structure” study to a “ firm performance study” etc.

There have been many models of business clustering that investigate the potential and effects of knowledge exchange. Cowan developed a model in which pairs of firms come together and exchange their knowledge in order to innovate (Cowan, Jonard et al. 2006). The success of this collaboration seems to be dependent on whether the two firms had successfully collaborated in the past. The model is agent-based, consisting of firms motivated only by knowledge creation, and it shows that firms tend to form pairs with firms that offer complementary knowledge. It seems that there is also an optimal degree of similarity, companies that are too similar will not collaborate successfully as they have too little to exchange. On the other hand, companies that are too diverse will have little in common and therefore communication processes will be too difficult when trying to establish a knowledge exchange portal. In an updated model, the collaboration is determined by cognitive, relational and structural embeddedness and successful collaboration of the past dynamically increases the probability for collaboration in the future (Cowan, Jonard et al. 2007). Also the opinions of one firm’s partners matter in this updated model: If my partners had a good experience working with A, then probably firm A will be a good partner for me. It is interesting to note that when information about third parties comes indirectly from former partners, firms tend to form triangles that then lead to clustering. When innovation sharing and the importance of structural embeddedness form a star-like cluster, companies at the centre of the star perform better than the other firms. Similar results are observed even when the model is extended from a static to an iterative game of network formation (Baum, Cowan et al. 2008; Cowan and Jonard 2009).

Although it is widely believed that clustering is correlated with inter-firm knowledge and innovation, certain studies fail to provide any such evidence at a regional level (Fleming, III et al. 2007). Clusters will be explained in greater detail in the next chapter but it is clear that there is a strong link between innovation and clustering and therefore it is advantageous to the understanding of, and facilitation of, clusters to include innovation as a desirable natural facet.

4.4 Innovation and the Maritime Industry

There are quite a few examples of maritime clusters specialising in innovation in the UK that adhere to geographical boundaries. Clusters in the South of England include:

- Chatham Maritime in Kent - a marine business park in Kent, hosting over 60 companies of both marine and non-marine specialism, providing employment and accommodation to almost 5000 people and having convenient transport links to London and other major parts of the South East.
- Cowes Cluster in the Isle of Wight - an alliance of boat builders, marine industry manufacturers, equipment and material suppliers and related service providers situated in the famous Cowes boating region
- Devon Maritime Forum – an alliance of industry and educational firms and including local and regional authorities and main users associations.
- National Oceanographic Centre in Southampton – the foremost centre for ocean exploration.

Universities and research centres are pivotal in the sustainability of innovation clusters in the marine and maritime industry. Many of the universities along the south coast specialise in marine and maritime research and the industry in the immediate area tends to reflect this specialism. The University of Portsmouth operates the Centre for the Economics and Management of Aquatic Resources (CEMARE). CEMARE was established in 1960 for interdisciplinary research in marine resources, with focus on fisheries, and since then it has developed into an international centre for interdisciplinary research. Although the main focus remains on the economics and management of fisheries, one of its research activities nowadays includes coastal zone management. Another interdisciplinary research centre, the Centre for Enterprise Research and Innovation (CERI), consisting of four teams of researchers who specialize in researching how to enhance an organisation's performance, seek partnerships with organisations to exchange research results with opportunities for further research and student learning.

The Centre for Coastal and Estuarine Research in Sussex (CERAS), run by the University of Sussex, is another interdisciplinary centre covering coastal and estuarine processes, biodiversity and coastal management. The centre has extensive experience of Interreg projects (Interreg II and Interreg III). The Centre for Research in Innovation Management (CENTRIM) at the University of Brighton comprises of a team of 27 academics, administrators, PhD students and KTP associates and partners as well as large research bodies and organisations, such as the European Union, ESRC, EPSRC, HEFCE, NESTA.

The University of Plymouth is also heavily involved in maritime and marine research with the Centre for Research in Coastal and Ocean Science and Engineering (CCOSE). The centre consists of a group of research staff across the marine physical sciences, coastal geography and coastal engineering. Its

mission is to understand and predict how coastal and ocean systems function in support of appropriate management of resources and activities. From a commercial point of view, the Centre for Maritime Logistics, Economics and Finance (CEMLEF) is of interest to CAMIS. As its name implies, the main research activities of the centre revolve around logistics, economics and finance and its mission is to promote the principles of sustainable enterprise, encourage knowledge transfer, social science underpinning practice and skills development through interdisciplinary research and apply them in the three core areas the centre researches. Additionally, the Centre for Marine and Coastal Policy Research (MarCoPol) aims to provide sound scientific, social, legal and economic basis for better policy for the management, sustainability and protection of the marine and coastal environment. MarCoPol constitutes collaboration between the University of Plymouth and the University of Exeter. The latter also conducts research on energy issues through the Centre for Energy and Environment (CEE) in the School of Physics (South West Energy & Environment Group – SWEEG).

The Peninsula Research Institute for Marine Renewable Energy (PRIMaRE) is a response from the Universities of Exeter and Plymouth to the challenges facing businesses involved in marine renewable energy and in support of Wave Hub, the South West of England's £42 million development centre for testing of wave energy device arrays. PRIMaRE has brought together a team of international researchers and world class facilities to accelerate the development of technology and address the most critical challenges facing the marine renewable energy industry. PRIMaRE collaborates with industry to support research and development activity across a number of areas, for example, design, engineering, environmental impact and grid connection, and conducts research in six main areas, which are outlined throughout this overview document (PRIMaRE 2011).

Intensive marine and maritime related research is performed at the University of Southampton, mainly from the energy and environment perspective. The School of Civil Engineering and the Environment often undertakes projects on sustainable energy, ocean water energy, urban energy studies, offshore and coastal hydrodynamics and coastal structures. Research centres worth mentioning are also the Energy and Climate Change Research Division, Sustainable Energy Research Group, Coastal Engineering and Management Group and the Centre for Coastal Engineering and Management. Also located in Southampton are two research centres that are paramount to the CAMIS research are collaborations between the government research associations and associated universities.

It is clearly evident that innovation and the maritime and marine industry are very closely related. It may be true to say that the majority of the research and innovation carried out is in the

environmental and energy sector rather than the manufacturing and operations processes but this appears to be handled separately under a new initiative by the governments Technology Strategy Board and the Department for Business Innovation and Skills under the remit of a Technology Road Map.

4.4.1 The Technology Road Map

The Marine Industries Leadership Council Technology and Innovation Group (MILC TIG) and the Technology Strategy Board are currently working towards a UK Marine Industries Innovation and Technology Road Map. There are nine technology themes that have been identified as areas for growth and development in the roadmap and they are:

1. I-ship (inc Ship Management & Decision support systems and some "Lean" ideas)
2. Exportable naval vessels and systems
3. Maritime consultancy and related services
4. Offshore deployment vessels and energy farm support through life
5. Lean support processes
6. Anti fouling, tank and low-friction coatings
7. Ballast water solutions
8. Green Propulsion Systems (Exhaust)
9. Ergonomics/ ease of use of leisure craft/ and others

The aim of the road map is to stimulate collaboration for R&D projects between the sectors in order to further the profitability of the marine industry and help achieve the environmental targets set by the government. With national government and EU technology funding now concentrated on a collaborative, cross-sectoral basis, there is an advantage for industry & academia to have a clear set of technology and R&D priorities. The marine sector has previously been seen as a disparate industry sector made up of tourism, manufacturing, transport, defence and fisheries, to name but a few interests, and therefore lacked the leadership from both government and industry to further the growth and technological innovation that it serves best. This road map is therefore seen as an opportunity for the different disciplines' to collaborate and enhance both the profitability and profile of the industry as a whole.

The road map also offers the opportunity for cluster development within the business sectors. As innovative technological ideas are developed it is envisaged that companies will collaborate through the supply chain pulling in resources from both the EU Framework Programme and central and

regional development opportunities. This will be looked at in greater depth the next chapter when the background and theory to clustering is discussed and the opportunities for clustering identified.

5 Clusters

Clustering has long been seen as an activity based tool for the economic enhancement of a specific geographical location (Krugman 1991; Martin and Sunley 2003; Novelli, Schmitz et al. 2006). Clustering occurs in order to maximise profits, increase competitive advantage and make best use of natural physical and built environments including labour and skill sets. Clustering in the maritime industry already has the geographical benefit of positioning along a harbour, marina, port, or even just the coastline, and is often seen as an ideal natural cluster formation for facilitating cluster activities (Michael 2003).

Theoretically, companies that locate and collaborate on joint working projects and tasks such as shared marketing, logistics or research and development, will benefit from reduced costs, wider participation and therefore improved profitability (Porter 1990). Yet, although there appears to be established marine clusters along the south coast of England they do not seem to work to any specific model, and few enjoy the benefits of incentives such as funding, training and leadership. Clustering along the coast is mainly for geographical and political reasons and little activity related to clustering actually takes place.

Spatial competitiveness is the ability to attract and keep business enterprise and enhance the living standards of the residents (Josephine Chinying 2009). The marine industry had a turnover of £37bn in 2000 which was more than the combined aerospace and agriculture industry turnover (Brownrigg 2006). The British marine sector produces some of the most admired high-level technology, safeguards the nation's food supply, and provides globally significant marine and oceanographic research, yet the towns along the coastline of Britain are historically some of the poorest in the country. Cohesive working practices and formalised partnerships appear to be lacking and it is here, in cluster formation, that the maritime industry could help strengthen its economic position.

There is a wealth of recent literature on clustering from an explanatory (Martin and Sunley 2003; Fleming, King Iii et al. 2007; Jensen, Johannessen et al. 2009), economic (Rosenfeld 1997; Michael 2003) and policy (Bolland 2002; Learmonth, Munro et al. 2003; Wickham 2005; Aziz and Norhashim 2008) perspective, as well as studies of marine specific clustering (Brownrigg 2006; Thedoropopoulos 2006; Wijnolst 2006). Clustering as a tool for economic advancement has been seized upon by international, national and regional policy makers such as the OECD, World Bank, national governments and regional development agencies, as a method for rejuvenating economies, developing a skilled workforce, thereby facilitating growth in the economy. Clustering lends itself to the idea of being a tangible business policy tool that can be empirically grounded with identifiable outcomes making it a saleable concept to stakeholders. Government spending can be targeted and

evaluated, training can be standardised and offered across business sectors, growth measured and infrastructure implemented. Clustering should be a natural process where likeminded businesses recognise the benefits of clustering and actively seek to enhance their own economic sustainability through collaboration but interference, albeit well intended, from local and regional authorities has meant that clustering has essentially become a method rather than a natural outcome which has, arguably, resulted in a diluting of the original concept and a varying success rate across both industry sectors and geographic locations.

5.1 What Constitutes a Cluster?

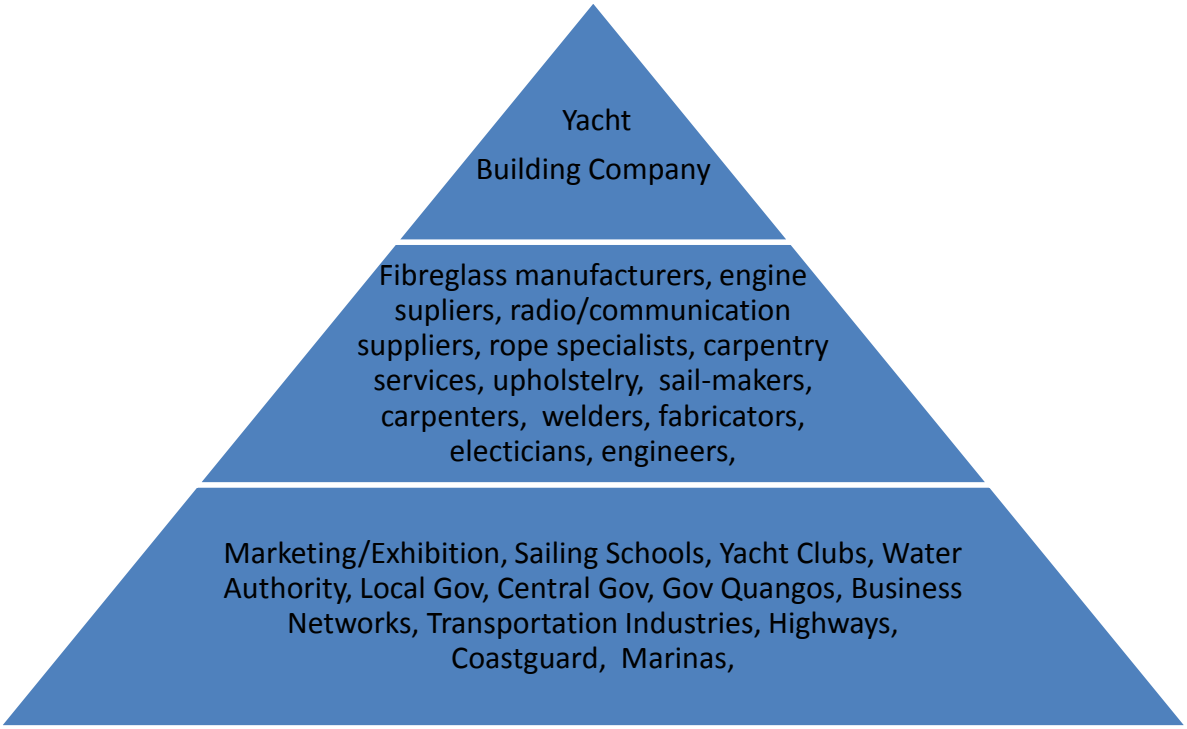
Clusters are geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition (Porter 1998). Clusters extend vertically to customers and horizontally to manufacturers of complementary products and to companies in industries related by skills, technologies, or common inputs (Reid, N. 2009). Clusters can form diagonally to include governmental and other institutions - such as universities, think tanks, vocational training providers, and trade associations - that provide specialised training, education, information, research, and technical support (Porter 1998). Geographically concentrated networks and value chains of suppliers and/or knowledge institutes collaborate with the aim of developing innovations (Hospers and Beugelsdijk 2002).

Clustering allows firms to have better access to resources such as technology, information, inputs, customers, and channels, than they would normally have if they operated in isolation. Clustering can save a company valuable time and money through collaboration on knowledge and sharing of resources (Smith and Brown 2009). Clustering can also improve efficiency and benefit the end user through high quality products at lower cost due to reduced development and production costs (De Langen 2002). Clustering provides an environment that encourages new business formation, lowers the barriers to entry, and spreads the risk of start-up (Porter 1998). Better knowledge transfer results in increased innovation and speeds up economic growth (Isaksen 2009). Clustering is not automatic though, the success of a cluster cannot be explained by agglomeration economies alone, there has to be clustering activities taking place such as collective efficiency which in turn is highly dependent on the input of social capital (Porter 1998; Reid, Carroll et al. 2007).

Numerous methods exist for the identification of companies suitable for establishing a cluster-based economic development strategy. Although clusters are essentially a naturally occurring business focussed phenomenon there are good economic reasons for identifying and strengthening the ties in order to help sustain and develop them. The main key to success tends to lie in collaboration and

trust (Reid, Carroll et al. 2007). Porter's cluster map (Figure 14) specifies all related and supporting elements of major industries.

Figure 14 Maritime Industry Example of Porter's Cluster Map

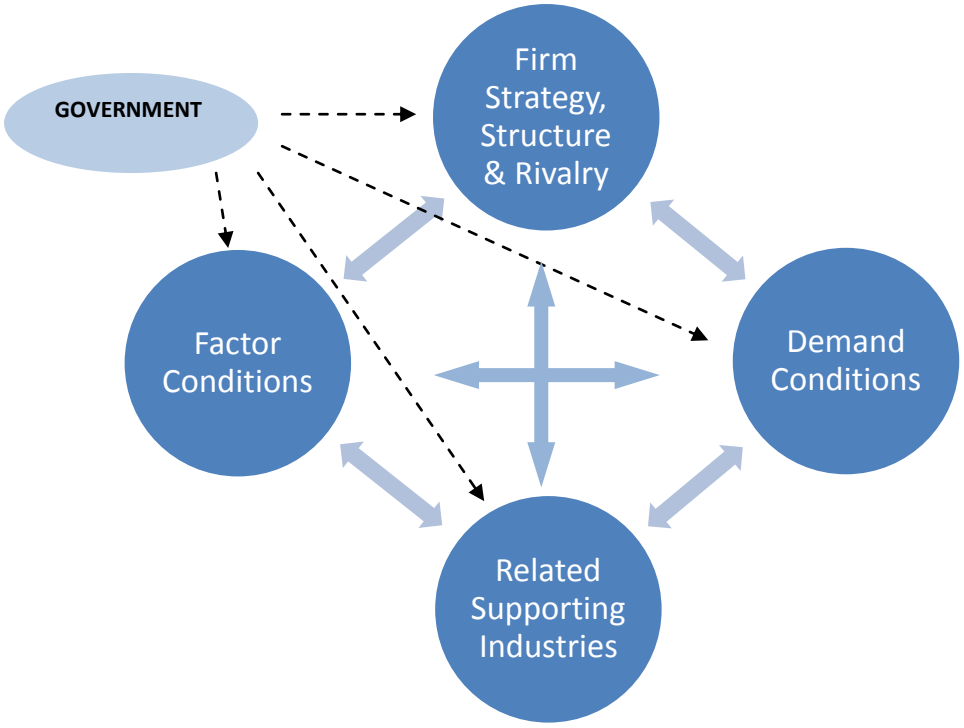


Source: Porter 1998

In addition, it illustrates the linkages between such elements, their strength or weaknesses, and indicates absent industries. The cluster analysis provides a pattern for understanding how major industries conduct their business and the way they compete, whilst simultaneously complementing and supporting one another. Physically mapping these cluster formations will allow spatial awareness of the inter-relationships between France and Britain and help identify the types of business cluster that are already forming cross-border relationships and those that have the potential with encouragement.

Porter also developed the theory of the 'Diamond' Cluster relationship. Clusters encompass one facet of the diamond, but are best seen as a manifestation of the interactions between all four facets. Figure 15 shows an example of a 'Diamond' cluster relationship.

Figure 15 Diamond Theory Cluster



Source: Porter 1998

Clustering occurs in order to maximise profits, increase competitive advantage and make best use of natural physical and built environments including labour and skill sets. This can also include a generic branding across a region – Sussex Foods for example will engender a sense of organic and healthy farming that has nothing to do with the product or companies but increases the profile. Companies may not carry out activities, network or develop any relationship other than benefiting from the generic but potent association with being part of a local or regional cluster brand. Successful clusters will affect competition in three broad ways:

1. by increasing the productivity of constituent firms or industries;
2. by increasing their capacity for innovation and thus the growth of productivity; and
3. by stimulating new business formation that supports innovation and expands the cluster.

Many cluster advantages rest on external economies across firms and industries of various sorts. A cluster is thus a system of interconnected firms and institutions whose entirety is more than the sum of its parts (Jensen, Johannessen et al. 2009).

5.2 Clustering and the Marine Industry

Whether formal or informal, clustering in the marine industry is diverse and specific to local regions, technologies, personalities and demands. Clustering in the marine sector is appearing along the south coast of England in three distinct ways:

1. **Innovation and Technology** driven clusters consisting of a few companies working closely on a specific project. Within this cluster type there can be two distinct themes:
    a. Single project based cluster that works to a known timescale and financial commitment. Cluster activities are purely based around the research and development of a new technology and there are no joint marketing, branding or member benefits although some cost efficiency may be apparent through the collaborative business plan. Cluster is only sustainable during the life cycle of the project.
    b. Research and development centre based clusters where, similar to the single project cluster, activities centre on projects and are time specific, but sustainability is achieved through crossover of knowledge and the birth of new projects and innovative ideas. The sustainability is achieved usually due to the central hub of the research centre facilitating this process.
2. **Branded marine networks** that encourage cluster activities through either a niche market or collaborative membership benefits. Evaluating the benefit of these clusters is difficult due to the difficulties in monitoring the impact of networking on future business. Sustainability tends to be achieved only if the membership remains at a level that ensures the fees cover the cost of administering the cluster.
3. **Local Authority** or 3rd sector branded marine clusters that are supported by the public sector and work alongside other public sector organisations to actively encourage sustainability in the marine industry. These clusters are rarely technologically facing and usually relate to policy and awareness.

There are also examples of clusters that naturally occur, generate little visibility, and usually remain unrecognisable as a cluster, even to them. These informal clusters can work in a variety of ways and will usually be dependent on a product or service such as complete service packages around a marina or boatyard or supply chain clusters. There are examples of all the different types of cluster along the south coast of England and even within these frameworks there are different types of cluster structures, remit and leadership. The following sections give an indication of the different

types of cluster found along the south coast and brief descriptions of the remit and impact on the local area as well as possible collaboration opportunities.

5.2.1 Innovation and Technology Clusters

These clusters differ from the branded cluster networks in the sense that they usually come together for a specific project and disband once the project has reached completion or the need to cluster no longer exists. The short life span of some of these clusters makes them difficult to find until the results or achievements of the collaborative partnership are published. In the UK, The Technology Strategy Board is a good source of cluster formation as it is apparent that the majority of these types of cluster are a long time in the formation stage compared to the relatively brief project timescale. Much of this is to do with the development of trust within a group situation as much as it is to do with the actual bid process. Companies that have not worked collaboratively before will need to spend a considerable amount of time developing a working relationship with the proposed cluster members; not least because of the sensitivity of potential knowledge transfer involved in technology and innovation advancements. Companies that have forged lasting relationships may not need such an amount of time but if the timescale between collaborative projects is considerable there may be changes in personalities and working practices that need to be tested.

Government support in the form of funding for innovation and technology advancement in the renewable energy sector is a prime source of cluster generation. Funding is usually awarded through 'competitions' in specific technology sectors and recent calls for technology collaboration have been in marine subjects such as carbon capture at sea, tidal stream energy, and composites.

Where there is a research centre at the heart of the cluster that continually generates new clusters as research and technology needs advance it becomes easier to follow and monitor a clusters success. Two such clusters are based around PRIMaRE, in Plymouth Devon, and the National Oceanographic Centre in Southampton Hampshire. Evidence of technology and innovation clusters that have evolved for a specific project are usually the result of a funding stream or policy implication and the Technology Roadmap is an example of how numerous clusters have chosen to work together to take forward the specific interests in marine technology and innovation. The following sections look at the differences between the two cluster types and highlights the strengths and weaknesses of the cluster formations.

5.2.1.1 PRIMaRE

The Peninsula Research Institute for Marine Renewable Energy (PRIMaRE) is based in Plymouth and brings together a team of world-class researchers from the University of Plymouth and the University of Exeter who provide expertise and research capacity to address the wider

considerations of all aspects of Marine Renewable Energy (PRIMARE 2011). PRIMaRE currently focuses on six research areas:

1. Resource Characterisation
2. Marine Renewable Energy Systems
3. Environmental & Biodiversity Impacts
4. Safe Operations & Navigational Risk
5. Underwater & Surface Electrical Systems, and
6. Associated Socio-Economic factors.

PRIMaRE collaborates with industry partners to support the research and development of areas such as design, engineering and environmental impact and has worked closely with stakeholders of the WaveHub off the coast of Cornwall. Cluster activity tends to work from two main perspectives – research carried out and technology supported for specific projects, and knowledge transfer through partnerships for scoping future research and development projects. PRIMaRE has worked closely with A&P Falmouth, Mojo Marine, Chelonia, and Wills Ridley in order to advance the southwest's interests in renewable energy. As a cluster, PRIMaRE offer a focus for innovation and design, they provide the necessary knowledge and skills for taking innovation forward and through their knowledge exchange specialists they aim to accelerate knowledge transfer thereby increasing the potential growth of the sector in the south west.

5.2.1.2 National Oceanographic Centre (NOC)

The National Oceanography Centre, Southampton is the integrated collaboration between the Southampton-based part of the Natural Environment Research Council's National Oceanography Centre and the University of Southampton's School of Ocean and Earth Science. The University of Southampton is a hosting partner of the National Oceanography Centre, which is a new, national research organisation created on 1st April 2010, delivering integrated marine science and technology from the coast to the deep ocean, working in partnership with the UK marine research community (NOC 2011). The focus is to achieve scientific excellence as the national organisation on an international platform. Although primarily a research institution that carries out specific research into ocean and earth science they also act as a hub for business cluster activities in an informal basis by providing network meetings for industry to learn about current research activities and to collaborate in discovering methods of solving specific technological problems. These 'breakfast clubs' serve to bring together many of the leading marine technology companies that would not normally get such a dedicated opportunity and the facility is a respected forum for knowledge transfer and both informal and formal collaboration activities.

The NOC also has a strong record of transferring technologies to companies, through collaborative projects and licensing opportunities, to bring innovative products to the market place (NOC 2011). One example is the spin out from NOCS of OHM Ltd. The NOC also leads with a hydrocarbon consortium that includes theme based research with commercial partners. Business partnerships are actively encouraged but collaboration is generally with larger engineering and technologically driven companies working in the off-shore and communications sector although there is a desire to expand these relationships to a wider range of commercial sectors.

The activities of the NOC with regards to clustering are sustainable and self-propelling and the Southampton area has seen an increase in high end technology companies locating to the area or evolving from academic research into a commercial concern. It could be seen more as a series of sustainable partnerships rather than clusters for many of the activities carried out and because there is a natural hierarchy it is unlikely that small marine companies would be either attracted or in a financial position to participate, therefore, this cluster is considered a niche cluster.

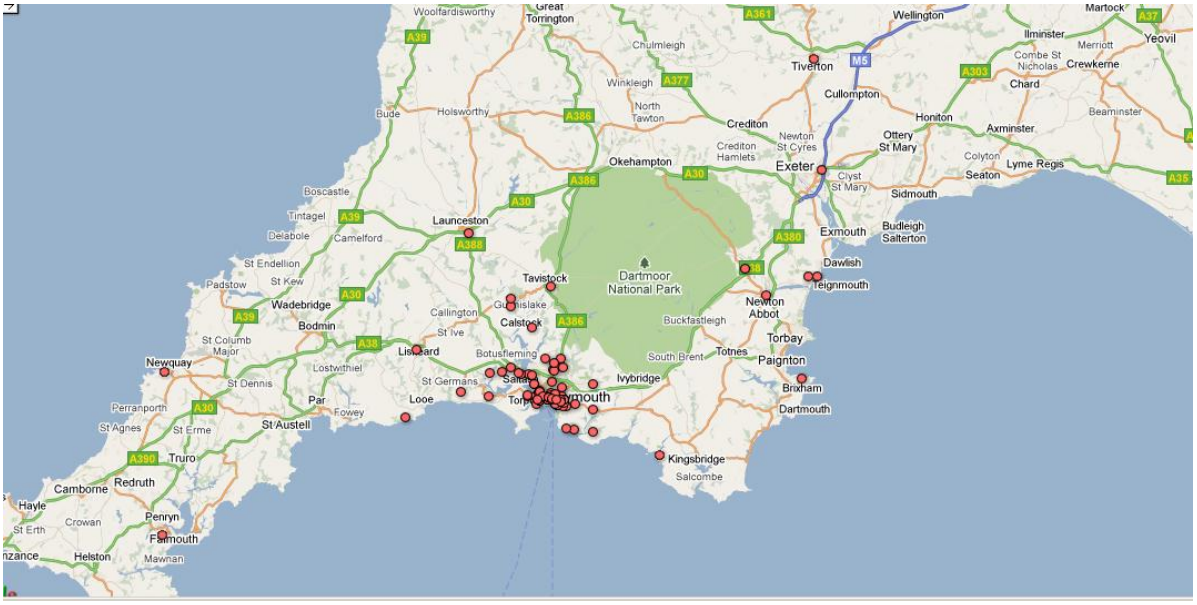
5.2.1.3 Innovation and Technology Cluster Conclusions

This type of cluster will be attractive to local policy makers due to its sustainability and tendency to attract new business and innovation to the local area. There is a distinct element of exclusivity to these clusters that may prevent many other companies from developing innovatively and attaining their potential. The cost of research in this area is high (the new research ship for the NOC is costing in excess of £70million) and funding is usually funnelled through a university and the research councils and may therefore be tied to specific policy driven ideas. The potential for collaboration with cross-border countries is high and already effective in the off-shore energy sector and environment sector.

5.2.2 Marine Networks and Clusters

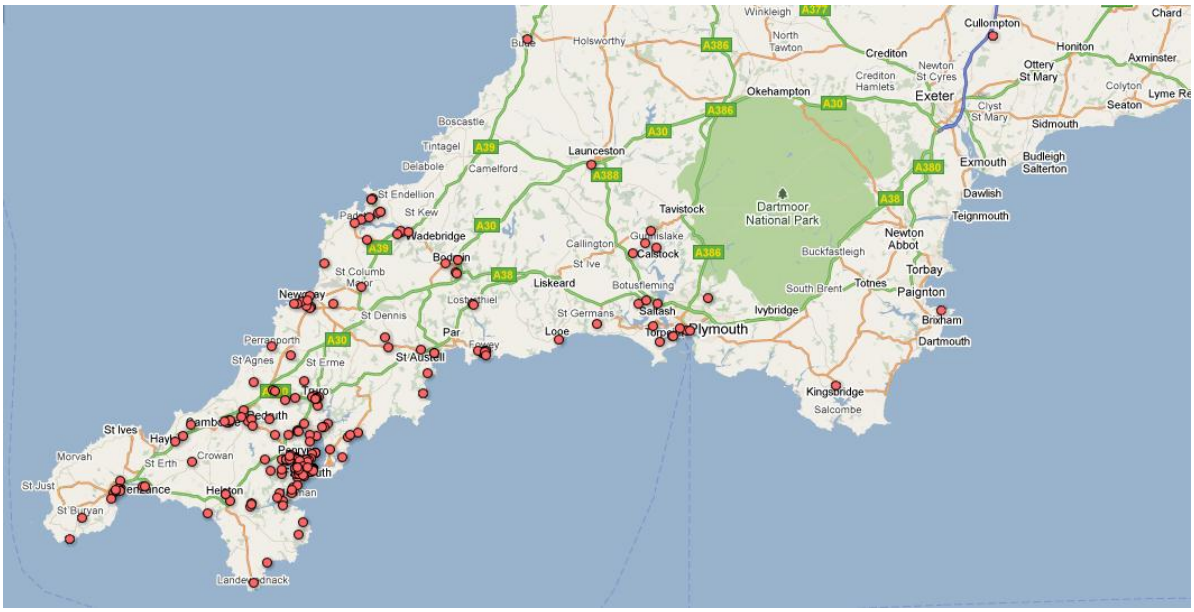
These types of clusters are usually branded to give a sense of belonging and identity and usually include the town/county name – Cornwall Marine Network, Maritime Plymouth, Cowes Marine Cluster and Chatham Maritime. The management, purpose and sustainability of each of these clusters differs according to the location and needs of the region in which they are situated. One thing they do appear to have in common is the start–up funding that was received from the Regional Development Agencies at the beginning of the century when clustering was seen internationally as a tool for sustaining growth in the marine sector. The size and structure of the clusters have evolved over the time period and sustainability remains a constant problem for many of them. The following maps show the locations of the members for three networks.

Figure 16 Maritime Plymouth Membership Location



Although Maritime Plymouth is primarily a Plymouth network (Figure 16) the membership of this network has stretched further afield to include members from other areas of Devon and Cornwall. The picture is similar in Cornwall where the membership has reached into Devon (Figure 17). There are close ties between the two networks, although they are very different from each other, and some elements of sharing best practice are evident.

Figure 17 Cornwall Marine Network Membership Location



Cowes Marine Cluster started as a Cowes only cluster and membership was dependent on the company being based in the Cowes area. Membership is still difficult to obtain but does now include companies that work for the majority of the time with other companies within the cluster. There are

two other companies not shown on the map (Figure 18) – one in Tunbridge Wells and one in Hook. Both these companies work closely with the Cowes Cluster.

Figure 18 Cowes marine Cluster Membership Location

There are many reasons for the spread of membership and associated with this are benefits and disadvantages. The main reasons for geographical enlargement:

- Company moves to new area and wants to continue with membership
- There are no marine networks in the location of a company and so they prefer to join an established cluster outside the area
- The specialism of a cluster outside the area appeals to a company and they believe joining an outside cluster will bring greater benefits to them
- Companies may want to spread a wider net and join more than one network believing the benefits outweigh any extra time or resource commitment.

These reasons will be explored further and empirical data given to support them in the analysis chapter.

5.2.3 Policy Driven Clusters

There are clusters apparent in the research areas that are driven by either local authorities or regional development initiatives. Some of these clusters may evolve into a branded membership cluster but some have remained and strengthened as a policy driven network. In Cornwall the ESF Convergence investment, co-financed by the Learning and Skills Council developed 'Cornwall Clusters'. The *Cornwall Clusters* (The Learning Partnership for Cornwall and the Isles of Scilly) aimed to develop sustainable cluster groups that were responsive to local circumstances, promoted the

benefits of training to employers and up skilled the workforce. It is particularly focused on Penwith; Camborne, Pool and Redruth; St Austell and the Clay Country; North Cornwall/Caradon; and Newquay. It is a top down approach that centres on training provision to enhance skills, fill skill shortages, and encourage a standardised workforce. The initial concerns with this scheme, from a cluster perspective, are the focus on training and skills rather than knowledge transfer and the building of networks and joint working practice.

Cornwall Clusters initiative has had a varied success. Many of the projects failed to maintain the required outcomes and benefits have been sporadic and in some cases almost nonexistent. One cluster that has succeeded beyond the initial expectations has been the Falmouth area and the award to Cornwall Marine Network (CMN) of training provision for first, the Falmouth area, and secondly, the entire County of Cornwall. CMN will be looked at in greater depth as a case study in the following chapters.

Devon Maritime Forum (DMF) is a strategic county-wide partnership that acts as a 'champion of the sea' for Devon and the wider area. Although membership is not publicised it is apparent from the network descriptions that many of the members are research and education centres and large marine companies. The focus of this forum is to influence regional policy for the benefit of the Devon area. Involvement in environmental challenges and regional policy groups help to situate Devon as a key player in the marine sector and encourage growth through knowledge transfer and awareness.

There are other maritime clusters that are working in the research area but the majority are situated in the Southwest. One reason for this agglomeration of clusters in the south west could be the strength of the organisation Marine Southeast (MSE) in the southeast of the Country. Marine South East is a business-led consortium developed to address the needs of the marine sector in the South East region. It was also the marine division of the South East England Development Agency (SEEDA). MSE is particularly strong in the south east region and rather than behave as a specific cluster, it acts as a facilitator for all marine and maritime industry in the southeast. The main aims of MSE are:

1. Increasing productivity through innovation.
2. Increasing market share by promoting business support services, clusters, networks and joint venturing.
3. Developing skills for the marine sector and workforce development initiatives.
4. Cross-sectoral collaboration to improve innovation, research and development.
5. Development of international trade opportunities.

6. Liaison with Government to raise the profile of the industry

MSE are the first port of call for many marine and maritime industries looking to increase their economic and industry focus. MSE is also the project leader for the CAMIS research

The clusters themselves will be looked at in more detail as part of case studies in the next chapter and the four themes explored within the remit of clustering.

In order to identify best practice within maritime clusters it was necessary to carry out a series of mixed methods data collection. The following chapter looks at the methods that were employed and the reasoning behind the chosen methodologies.

6 Research Methodologies

Both the industry sectors and research geographical area are large and diverse. Before any cluster research can take place it is important to understand the type and location of the marine and maritime industries in the research area. The first research that was carried out was the design of a comprehensive database of all the marine and maritime companies that could be located. The following section looks at the process of data collection and the impact this activity has had on the cluster identification.

6.1 Database of Marine and Maritime Industries

This task, although deemed necessary in order to achieve a full understanding of the research platform, was a time consuming and desk based activity. Marine Southeast provided a comprehensive list of marine companies that they were aware of and Devon County Council supplied a list for the south west. This became the foundation for what has become a comprehensive database of nearly 7000 marine and maritime companies located in the research area. This database will be used throughout the research to underpin the analysis of the economic impacts and policy drivers and it will also be essential for Strand 3B and 3C as it will provide the contacts and networks that will allow the benchmarking of best practice and cluster facilitation. It is also important that the database is designed in such a way that the English and French data can be combined.

The database is fairly simple in content and includes contact details, business activity, whether the company contributes to one of the four themes, and which societies, associations or clusters they are members of. The database, once cleaned and finalised, became the feed for a series of interactive maps using the Google Earth and Google Fusion Mapping software. Companies could be sorted, filtered and graphically shown and compared enabling a greater understanding of the geographical, geological and demographic features that would influence cluster development. This information was seen as a crucial aspect of identifying cluster practice and potential due to the ability to filter companies by business activity, theme, location and memberships. Geographical clusters could easily be identified and an agglomeration of specific marine specialism's found.

The database was developed using directories, online databases, society and association membership lists as well as the original data supplied by MSE and DCC. One problem that was encountered during the data collection was the terms to be used for business activity. SIC codes are not compatible with marine activities as the sector is so diverse and one marine engineer may be completely different from another. It was decided to be as broad as possible in the descriptions and cross-tabulate with the themes to identify the types of companies and their activities.

It became apparent that the database had a significant number of uses once the mapping ability was added. Interest in the data and the interactive capabilities has come from various industry sectors and the remit of the database is currently being reconsidered from a tool to aid research into a resource for the marine and maritime sectors. The analysis chapter uses the database and mapping software to highlight specific themes and clusters.

6.2 Interviews with Key Maritime Stakeholders

Cluster analysis was a fundamental part of the research and something that necessitated primary research in the form of interviews. Once the database had been developed and clusters identified the cluster leaders were contacted and interviewed to ascertain the structure and activities of each cluster, their strengths and weaknesses and the aims for sustainability. Interviews were also carried out with marina owners in order to supplement a comprehensive online questionnaire.

The aim of the interviews was to gain an understanding of the organisational structure and main objectives of each cluster so the identification of best practice could be ascertained. The research themes are fairly broad and determining who, within each theme, would be best placed to offer insight into the cluster activities was a decision that could not be made at the start of the research process. High profile individuals and networking opportunities were taken advantage of and through these connections access was granted to some of the key figures in the industry. A good resource was found in the branded network cluster leaders. They were willing to participate and were in the position of introducing further key players into the process. Even though many of the local authorities are designated members of this project only a few were co-operative in helping with the primary research.

Attending major marine and maritime conferences and workshops gave an opportunity to meet local companies working through supply chains in the four themes and to discover the interconnectedness of the tier industries, the direction their company was taking and the barriers to entry that they were experiencing. This relationship building with companies at all levels was seen as important for not only information gathering and the essential primary research, but also for future cluster facilitation activities that would take place in the future.

For the marina tourism theme it was discovered that each marina works to a different set of objectives depending on the size, ownership and location of the marina. It was decided that a questionnaire based survey would be appropriate in order to compare the best practice found and platform necessary for this to be successful. The marina questionnaire was developed with the aim of identifying cluster activities and the impact on economic growth in both the marina and local

area. This survey was completed by 38% of the marinas in the research area and provided a cross-section of the population in terms of marina size, ownership and location. The survey was also translated into French and the French marinas asked to complete. Once analysed and compared this will give an indication of the differences in working practices and lay the foundations for collaborative working through best practice.

For the marine operations theme the technology roadmap workshops and networking events provided an opportunity to follow cluster formation from initial stages through to technology development and cluster activities. This process has been slow to develop and the progress made, although positive, will not allow best practice to be reported on. There will be further research into this theme as it continues and potential cluster facilitation and collaborative working will be developed.

Once contacts had been made the relationships needed nurturing and due to the distance involved this has been a time consuming but fruitful task. The research analysis summarises the opportunities that have been accessed and the results that have been found.

7 Research Analysis

During the research data collection period a variety of case studies were carried out in order to ascertain the working practices of marine clusters within the four themes. The following chapter looks at these case studies and identifies the unique characteristics of each one and highlights the evidence of best practice that was found. All the clusters that were identified appear to have little in common with each other in terms of management and leadership or purpose and the organisation and structure of each one tends to have evolved during the course of its lifetime to adapt to the specific needs of the industry sector, location, available resources, and lifecycle stage. Due to the differences and problems of identification the following chapter will be sectioned in three parts:

1. Counties – some counties were used as case studies but all counties have been mapped for thematic cluster potential
2. Cluster/Networks – these are established and 'named' clusters that operate on a more general marine theme and are mainly locational in nature
3. Themed clusters – although quite hard to find and even harder to infiltrate these clusters are a direct response to either policy, innovation or funding and work on a supply chain basis rather than locational

7.1 County Clusters

Each County will be taken in turn but not all counties will be analysed to the same depth.

7.1.1 Cornwall

Cornwall was a pioneer in the generation of renewable energy with the first wind turbine being constructed in Redruth in 1892, and the first operational wind farm in the UK at Delabole in 1991. The county has the longest coastline, is the gateway to the English Channel, and has a long history of maritime industry. Currently, the Council is actively encouraging the formation and sustainability of six maritime clusters in the area. Renewable Energy is one of the main themes, but maritime industry in general accounts for a large proportion of the county's economy.

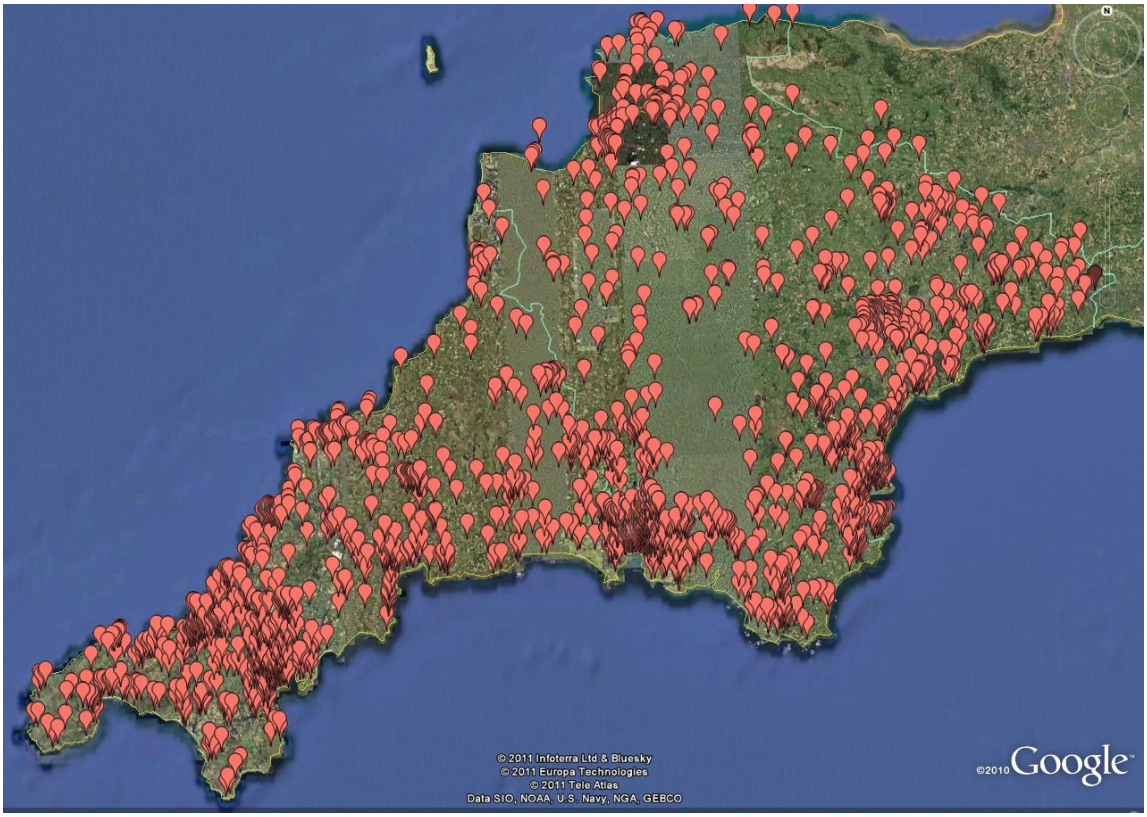
Cornwall Clusters are only one initiative to develop from the Cornwall Convergence. This large scale social and economic development initiative aims to build a stronger and more diverse economy through employment and training. The South West was the first area of the UK to be designated a Low Carbon Economic Area because of its strength in marine renewables in July 2009. SWRDA's flagship marine energy project is the Wave Hub, which will create the world's largest test site for wave energy technology by building a grid-connected socket on the seabed, ten miles off the coast of Hayle, to which wave power devices can be connected and their performance evaluated.

Renewable energy and sustainable business activities are the fundamental basis for the strategic vision that Cornwall has planned. The convergence operational plan 2007-2013 sets out the strategy for furthering the economic growth in the marine sector but there have been complaints from local businesses about the benefits of the Cornwall funding going to companies outside the County and even the Country. The nature of the renewable sector and the geography of the region appears to prevent wave devices being manufactured in Cornwall and although there is a growing support network for the renewable sector it will be shown further on in this report that many companies claim they work within renewables when it is actually just and interest in this field that they are showing.

Cornwall has one of the largest marine and maritime industries in the Country and also one of the largest coastlines of any County. Many of the marine industries in Cornwall are small or medium enterprises (SMEs) and the largest sector appears to be micro companies of often just one or two employees. Cornwall has seen extensive investment through Convergence Funding over the last few years that has tried to tackle the problems of unemployment and seasonal, temporary work through sector building and re-skilling. Off-shore renewable energy has been a major feature in this and SWERDA have jointly invested into the area with the development of the wave hub, 10 miles off the shore of Hayle on the north coast of the County.

Although from Figure 19 it appears that the marine and maritime industries are fairly evenly spread across the County, it is Falmouth, and the locality to Falmouth, that has the greatest concentration. Falmouth is also a major port and home to the majority of marinas in Cornwall.

Figure 19 Marine and Maritime Industries in Cornwall



Renewable energy is mainly found in the support sector and service sector and the greatest agglomeration is found in the Falmouth region (Figure 20). PRIMaRE works closely with many of the small renewable energy companies alongside the wave hub and provides research and support.

Figure 20 Renewable Energy Company Locations

Due to the large renewable sector the environment theme is also becoming well established (Figure 21). Fishing is a large feature in Cornwall, especially shellfish, and the focus on research into fish stocks and environmental degradation is concentrated in the Penzance area.

Figure 21 Environmental Themed Industry Locations

A&P Falmouth is one of the largest employers in the Cornwall marine sector and it is estimated that the supply chain contains approximately 2000 employees both directly and indirectly. A&P Falmouth are the largest ship repair, conversion and marine service company in Falmouth and also control the docks. A main issue that was raised during the primary research was the need to dredge the port and build the new marina. Dredging would encourage the cruise ship market into Cornwall and increase the potential economic benefits to both Falmouth and the wider area. By extending the port facilities to include cruise ships, and in turn allow Penndenis – a major super yacht builder - to increase both the size and amount of super yachts it could build, could increase jobs in the Falmouth area by a further 500-1000 (CMN 2010). Although the marina has been given planning approval, if the dredging is unable to take place, the marina will not be able to be built (A&P Falmouth 2010). A lack of funds and environmental concerns has stalled this project for nearly four years, and although support is received from the local authorities and the marine sector generally, a perceived lack of 'joined up thinking' seems to prevent a project that could potentially offer increased economic benefits to the local area and increase the attractiveness of the port for further development of wave devices from becoming a reality.

This situation in Falmouth clearly underlines the uneasy relationship that industry has with the environment. For the dredging to be allowed the company needs to prove that disturbing the micro-

organisms currently under scrutiny in the harbour would not damage the ecosystem or have a long term impact on the surrounding sea life. The scientists/conservationists/agencies that have raised the concern do not have to prove that there is an impact, nor that the dredging would even interfere with the micro-organisms, therefore there is an uneven balance between the two parties. There is an apparent stalemate situation where no one is in a position to be able to prove otherwise and therefore all dredging will have to be delayed.

Another argument that has been put forward in support of the dredging is the ability to use the deep water port for the development of wave and tidal devices in preparation for the WaveHub testing. Although Falmouth is in the same county as Hayle (site of the WaveHub) the devices would have to be taken overland or around Lands End by sea. Southern Wales is therefore seen as a better location for ease of transportation. A&P Falmouth has recently announced that it has applied for a license to develop wave devices in the port area, regardless of the issue of dredging that continues to hang over the port. They have recruited a renewables manager to liaise with the different stakeholders with the aim of integrating the issues and finding solutions.

Cornwall is also home to the Cornwall Marine Network (see next section) and SW Marine Academy. Training in the maritime trades is seen as paramount to the sustainability of the County and CMN are central to this initiative. Cornwall has developed strong links with its neighbouring County, Devon, both in terms of industry and cluster activities through the CMN.

7.1.2 Devon

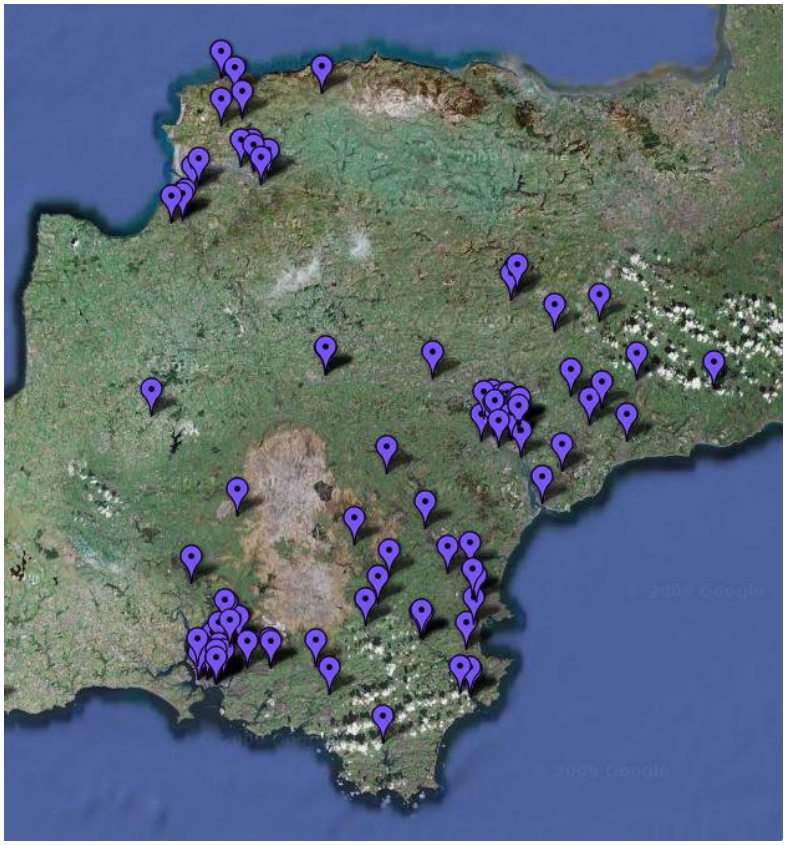
The marine industry in Devon is large and vibrant and, although spread across the county, there are pockets where the density of provision is greater. These areas are also main urban areas including Exeter, Plymouth and Torbay/Paignton. Two of the main urban areas in Devon are Unitary Councils: Plymouth and the Torbay region. Both these areas are large marine business areas – Torbay has a niche market in Fisheries and a large environmental theme; Plymouth is home to PRIMaRE, a centre for research and technology in off-shore renewable energy. Although this may add a layer of complication for policy development there does not appear to be a serious hindrance to growth in the marine industry.

Devon also has a variety of marine networks including Maritime Plymouth (MP), South Devon Marine (SDM) and Devon Maritime Forum (DMF). MP and SDM are both ‘bottom up’ business orientated networks that look to increase the profitability of its members through network activities and inter-trading. DMF is a ‘top down’ approach and looks to influence wider marine interests and policy by being involved with projects such as coastal zoning and marine planning.

Devon's marine sector is diverse and includes all four themed research areas. Renewable energy is an emerging sector and, with the attraction of PRIMaRE, companies are seemingly diversifying to promote a presence in this sector. The University of Plymouth is central to the maritime and oceanographic research in the region and collaboration between the university and local businesses is continually growing. Although Devon is a County, it has three main councils: Devon County Council, Plymouth City Council, and the Torbay Unitary Council. This poses potential problems for funding and policy issues and is something that should have been helped by the proposed Devon Local Enterprise Partnership if the LEP had been approved.

Devon has a vibrant renewable energy sector due to its clear policy towards this theme and the location of the wave hub in neighbouring Cornwall, and the work of PRIMaRE in environmental impact on off-shore renewable energy and research into wave devices. Figure 22 identifies the location of companies in Devon that either expressed an interest or actively worked in the off-shore renewable energy theme.

Figure 22 Companies Expressing a Renewable Energy Interest



Types of industries that work in this sector tend to cluster in different areas of the county. Exeter has a large marine service sector that provides consultancy, insurance, design and legal advice to the renewable energy sector whereas Plymouth has a higher proportion of support and practical

applications. It seems that a ripple effect has occurred in the renewable sector as Cornwall has benefited from a considerable amount of funding for the Wave Hub and the renewable energy sector in the south west has grown considerably in recent years.

Interviews were carried out in the Plymouth area for the research into the effectiveness of Maritime Plymouth. From these interviews it became apparent that although companies may stipulate their ability to work within the renewable sector this may, in some circumstances, be a desire to work in the industry rather than actual practice. As one respondent commented:

“So you want to work in the off-shore renewable energy sector? You and every other marine company in Devon”

Torbay is known as the English Riviera and is an attractive tourist destination and also home to a large section of industries operating in the environmental theme of this research (Figure 23). There are 10 companies in Brixham that are working to some extent in the environment industry. This is mainly in the fisheries sector and appears to provide a clear cluster for the fishing industry. The three main stakeholders in this area are: Astra Zeneca, DEFRA (fisheries office), and the Devon Sea Fisheries Committee. Targeting this area and encouraging growth could impact on the regional economy. As the Fish Wholesale sector is well established here, there could be opportunities to facilitate further development by looking at the supply chains that are currently operating with a view to tightening and strengthening the economic impact on the immediate area. Fishing is not part of the CAMIS themes so although a cluster may be apparent, it cannot be facilitated through the research.

Figure 23 Environmental Theme in the Torbay region

Plymouth is an historic maritime city and also home to a significant marine and maritime research community. There are seven marinas that serve the Plymouth area, each one of a different size and providing a variety of different services. The Mayflower Marina is a member of the TransEurope Marina Group that collaborates with European Marinas to provide discount moorings through loyalty and membership schemes. Dry stack and Marina services are provided by the Yacht Haven Group at two locations and Sutton Harbour Marina has three marina areas within the Barbican section of the city. Regeneration of the harbour area in Plymouth and the increase in up-scale apartment living accommodation coupled with the new shopping mall has resulted in Plymouth being an attractive destination for living and working. Transport links to Plymouth by rail are not particularly good and a journey to London averages 3 ½ hrs compared to only 2 ½ hrs from Exeter; although the distance between the cities is only 43 miles.

Plymouth has close business relationships with Cornwall with many employees travelling into Plymouth each day from Cornwall. Plymouth is also a unitary council and this may impact on the administration and funding availability for the area when looking at County wide cluster facilitation.

The renewable energy theme is significant in the Plymouth area. The industry consists of research and consultancy fields and innovation carries a central theme through the sector. Many of the companies listed in the renewable energy theme also operate within the environmental theme due to the nature of the industry. This cluster is already well developed and will be discussed in the following section.

7.1.3 Dorset

Dorset is the only County that is not an active member of the CAMIS Partnership but the county itself is within the research area. Data has been collected where possible but support has understandably been limited. The main issues regarding clustering in Dorset revolve around the established Dorset Marine Network and the Olympics 2012. Weymouth and Portland will host the water sport activities for the Olympics in 2012 and preparation for this event has involved a series of cluster activities such as networking events and collaborative partnerships. The loss of the Navy to Portland had a significant impact on the area that the National Sailing Academy and the new marina developments are trying to address. Inward investment has seen considerable improvements into infrastructure and service provision and Dorset has started to establish a vision for the region.

Bournemouth and Poole are both large cities with a significant maritime sector. Sunseeker build yachts here and the marina sector is considerable. Dorset has a good cross section of industry types and the main network, DMN, is establishing strong links with the CMN to take best advantage of the best practice identified in this area.

7.1.4 Hampshire

The Solent area of Hampshire dominates the marine and maritime sector agglomeration. Southampton is home to two universities that specialise in specific marine and maritime research and also the National Oceanographic Centre (NOC). Marine South East is based in Southampton and the area is a continually growing and developing region for marine related innovation and technology driven clusters. The NOC acts as the centre for cluster based activities and this is looked at in greater detail in the next sections. There are many other local networks and forums that carry out certain cluster activities but due to the nature of the region as a major marine business centre, there are also many generic business networks, forums, societies and associations that provide a predominately marine or maritime theme to their activities. Following all of the networks and monitoring the activities for best practice is not possible, and as the nature of many of these groups is to splinter off into more industry specific sections the list of possible clusters increase and decrease as networks evolve, develop, merge and reform.

The Solent Forum was established in 1992 as a predominately local authority and agency based forum with the specific remit of understanding the policy and management of planning in the Solent region. The Solent Maritime Community is a recent initiative with a more commercial interest and includes many marine companies across the region as well as local authorities. Marine SouthEast also have their own networking brand, MareNet, which carries out specific events and projects aimed at increasing the economic growth of the Solent region and the rest of the South East.

Marina tourism is well established in the Solent area and the River Hamble is affectionately known as the 'car park for boats'. All types of marina size, ownership and location are represented in the Solent and the amount of choice for potential members ensures that competition amongst marinas is achieved yet growth and diversity is not hindered.

The Navy has a prominent presence in Portsmouth and the marine defence industry features highly in the type of industry in the area. Southampton has the largest and busiest dockyard along the south coast and is also the port for many large ships and ocean liners to make their maiden voyage from. Transport in the area is a potential problem for the future due to the density of population and capacity constraints that this entails – Southampton and Portsmouth are in the top five most densely populated cities outside of London. The Solent area is the busiest shipping area along the south coast and many ferries use both Southampton and Portsmouth for journeys to the Isle of Wight and beyond.

Researching the marine and maritime industry in the Solent area is a major feat that could arguably warrant its own project dedicated to the diversity and interplay that occurs here. For the benefit of the CAMIS research the NOC will be looked at further in the next section.

7.1.5 Sussex – East and West

Sussex contains the two largest marinas along the south coast – Chichester Marina and Brighton Marina. Brighton marina is a multipurpose leisure complex and the largest marina in the UK with more than 1500 berths. Although a man-made port for many years, due to its proximity to London, Brighton is not regarded as a maritime city and marine activity is limited to the marina, which is quite self-contained. Chichester Marina is very different. Also owned by Premier Marinas the focus is on the marina itself and the few commercial units that are situated in the development are marine orientated rather than entertainment.

Sussex is a densely populated commuter county with natural harbours situated in Chichester, Littlehampton, Shoreham and Newhaven. Figure 24 highlights the location of marine and maritime

industries in Sussex and clearly shows the main density lies along the M23 Brighton – London road and the coastline.

Figure 24 Maritime Industry in Sussex

Sussex is primarily a marine service sector although boat building and marine engineering are apparent. There are two ports at Shoreham and Newhaven and a cross-channel ferry service from Newhaven to Dieppe. All four themes are represented in Sussex but evidence of clustering in these themes has been found to be limited to services rather than technology or networking. Chichester once had a vibrant marine cluster calling itself The Chichester Maritime Cluster. It was originally set up by the majority of the larger marine and maritime companies in the Chichester District when it became apparent that there was a lack of understanding between the policy makers and the marine companies with regard to planning.

Maritime locations can easily be seen as 'messy' industrial sites and because they are historically built around the coastline and river estuary and harbour areas they come into direct competition with tourism and leisure pursuits. Development of traditional maritime locations into expensive, gentrified apartment living and leisure complexes has become a regular occurrence in many of the town and cities in the research area. Chichester Harbour is also a SSSI area and conservationists work hard to maintain the natural environment. Expansion of maritime business is not necessarily seen as a main priority for regional development plans as the impact of marine and maritime industry is not always understood and encouraged. One of the main maritime companies in the Chichester district applied to expand his business to increase the number of jobs he could provide as well as the scale of the product (bigger boats). The application was refused and the district looked likely to lose one of the largest marine companies it had to another region.

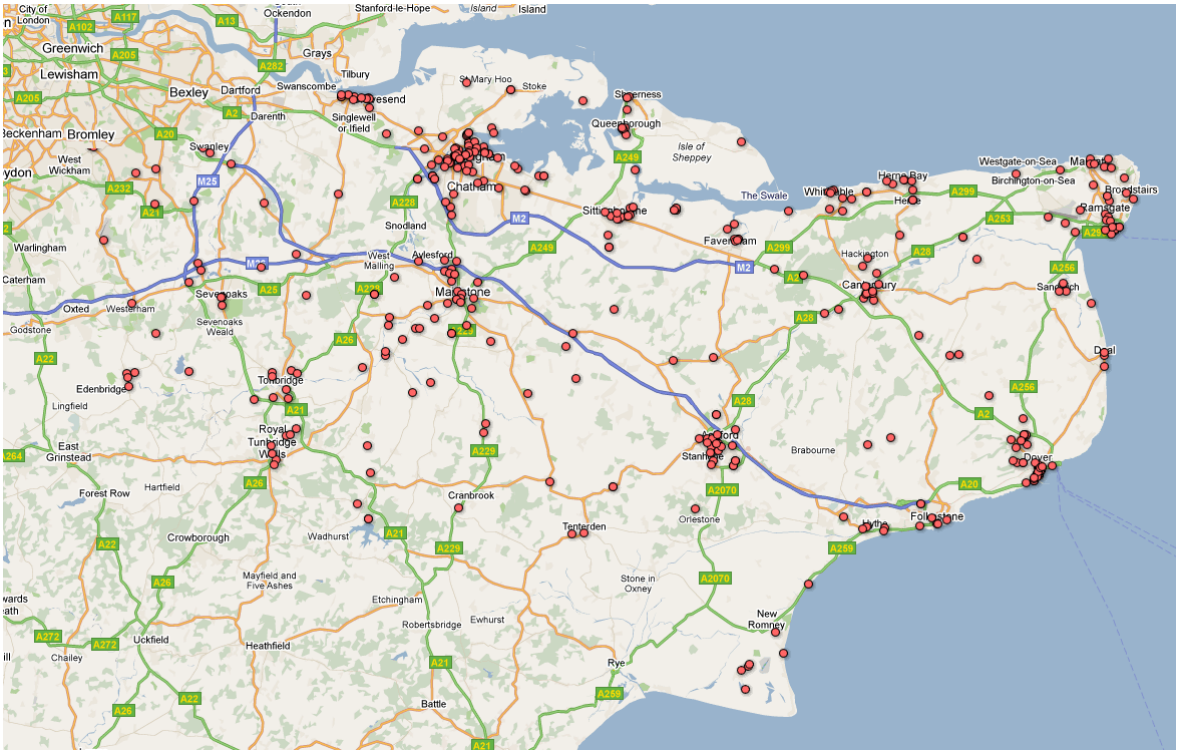
The Chichester Maritime Cluster came into existence to tackle the threat posed by this perceived lack of understanding by the Council and lobbied collectively to highlight the importance of the sector to the economic sustainability of the district. The cluster activities were ultimately successful – the company got its plans approved and relationships with the Council improved – so the cluster disbanded. This is a good example of Clusters needing a purpose in order to achieve sustainability.

The Consortium of Sussex Maritime International Consultants (COSMIC) is an informal group of Maritime Consultants, situated in the Sussex region, that are engaged in providing specialist consultancy services to the Maritime and Transport industry. Collectively they cover a wide spectrum of maritime services and expertise including the oil and gas industry, risk and insurance, shipping and training. Collaboration in this regard is something that is also being considered by the TSB Technology Roadmap. Many companies can provide a variety of specialism's but may need a specific knowledge, equipment or ability in order to complete a contract. A collaboration of companies that could draw on each other's experience may mean the difference between a winning bid and a failed bid. This could be just a consortium of like-minded industries through a contact list or an established facility such as a portal that customers could search for specific knowledge or products that combined would provide the service they require.

7.1.6 Kent

Kent is known as the gateway to Europe due to its proximity to France and the existence of the Channel Tunnel and frequent ferry services to Northern France. Dover is the main transport and passenger port to France and Ramsgate runs services to Oostende, Belgium. Figure 25 identifies the clear clustering of marine industries in Kent and underlines the significant differences between the locations of the maritime industry in the County compared to other Counties.

Figure 25 Marine and Maritime Industry in Kent



Kent has a wide cross section of industry and the four themes are apparent in different areas. The Chatham/Gillingham area has the largest density of marina leisure industry with Dover and Ramsgate also well established. Renewable energy tends to be located towards the north of the County and serves the wind power industry supporting the wind farms in the Thames estuary. Due to the location of Kent as an established commuter area with the High Speed 1 rail link into central London and the Channel Tunnel across to France, the region tends to be a transit area for goods and services and a County that has learnt to look outwards rather than inwards for sustainability.

Kent's strengths lie in its diversity and transport infrastructure yet this diversity can also be seen as its weakness. From the location and type of industry it is apparent that towns and cities cluster independently of each other and each local authority is strong in its own right. Kent could therefore be interpreted as a County of diverse individual regions rather than a County with specific overall traits.

7.1.7 Conclusions

Each County works to its own unique strengths as they arise and have the opportunity to develop. The southwest has enjoyed significant funding through regeneration and convergence that has enabled it to develop a significant renewable energy sector and develop clusters for sustainable maritime industries. The southeast, in contrast, has had the benefit of a strong regional marine centre in MSE and the need for specific clusters has either not been needed, or the necessary

platform for this to occur has not been apparent. History and tradition plays a major part in the formation and evolution of the marine sectors in each County, as does the geology and geography of the landscape. Politics and regional policy may provide a direction for companies to evolve but the necessary platform to facilitate clustering and economic growth is not always in evidence.

Due to the physical and historical differences between the Counties identifying best practice to translate across the regions is not something that can be easily defined. The mix of industry type and size will also dominate cluster activities and although the coastlines geology is significant, the transport infrastructure inland will also play a major role in the type of industry to be found.

The following sections look at established clusters and networks in the South of England and the strengths and general best practice that have been found.

7.2 Clusters and Networks in the South of England.

There are a variety of established and 'named' clusters operating along the south coast of England. Many of these were established as part of the Regional Development Agencies drive to encourage economic clusters in the beginning of the 21st century. These clusters were initiated and funded for a limited period and at the end of the funding period they were left to continue with reduced resources. Not all clusters survived and most of those that have are constantly aware of the problems of achieving sustainability. Most of the clusters that have survived have looked for new ways of funding or new management structures. The three prominent clusters that were studied are Cornwall Marine Network, Maritime Plymouth, and Cowes Marine Cluster. There are other networks and clusters along the coast but it is these three clusters that chose to diversify in very different ways in order to survive.

7.2.1 Maritime Plymouth

Maritime Plymouth (MP) is a locational cluster with a generic marine membership. The members pay a fee to join and in return they are able to attend regular network events, receive monthly newsletters and can access a comprehensive database of other members. MP also has a dedicated 'friends' area where anyone with a marine interest can ask to join free of charge in order to be kept up to date on the activities of the cluster. Once RDA funding ran out there were concerns about sustainability and funding of the activities. In December 2010 a selection of interviews were carried out with members of the cluster. The aim of the research was to ascertain the benefits and perceptions of membership of Maritime Plymouth and to look for ways to increase these benefits through cluster activities thereby increasing the attractiveness of the group and achieving sustainability.

The cluster was perceived to be an important part of the maritime framework in Plymouth. Members felt the networking ability and branding of the group gave them a sense of belonging to a successful maritime focussed organisation. The network itself does not have a particular niche to market but prefers to work with the general consensus of the members on issues that are pertinent at the time. This encourages the majority of maritime industries to be part of the cluster but as there is no specific direction for the group to work towards there is a limited commitment by members. The main issues that were raised during the interviews seemed to be concerning communication and relationship building with both each other and outside agencies. The current relationship with the Local Authority and the Chambers of Commerce was perceived to be weak. The Chambers of Commerce in Plymouth has a limited maritime membership and therefore little maritime activities. Considering the LEPs will be utilising the CofCs to identify necessary support in the future it is important that the marine and maritime industry is able to strengthen the ties and build a good working relationship with them. Communication between members and also between other local maritime industries also appears sporadic and limited and this is mainly felt to be due to lack of trust and a sense of losing competitive advantage if too much information is divulged.

Training and maritime awareness are seen as issues that need addressing both within the network and as an industry. Collaboration with Cornwall Marine Network is starting to impact on this positively and the beginnings of a larger marine cluster are emerging through sharing of best practice and knowledge transfer. Maritime Plymouth provides good networking opportunities but the potential for business to engage in activities drawn from these opportunities is not being taken full advantage of. Many of these opportunities lie in cost savings and collaborative working. Joint tenders, group savings and bulk buying are all aspects of cost efficiency that need to be investigated. The aspect of membership fees should also be raised here as there appears that many 'friends' receive a great deal of benefits from the cluster without having to contribute towards the costs.

This also raises the issue of worth – how valued is something that comes at little cost? The original idea for clusters through RDA funding was to provide benefits freely to the industry. Now funding is an issue there is a reluctance to pay for something that was once free and therefore deemed as a 'right'. This is not just applicable to MP but can also be taken across all clusters and networks and is a point for further consideration in any cluster facilitation. Encouraging interest through a free 'friends of Maritime Plymouth' area in the first instance was a unique idea that allowed many people the opportunity to understand what issues were pertinent in the marine industry and also how important the marine industry is to Plymouth. Unfortunately this initiative has not evolved enough to encourage full membership as it appears that information is all the 'friends' actually want. Until

Maritime Plymouth can show that full membership comes with a range of benefits that makes the membership fee worth paying the friends will continue to reap the benefit of free information. This is one particular area that needs addressing and is something that the next phase of CAMIS can help to facilitate.

7.2.2 Cornwall Marine Network

CMN was formed in 2002 by local businesses as it was felt the sector wasn't recognised as a sector in its own right. By 2005 about 36 companies had joined although there were little activities run and it was mainly seen as an opportunity for companies to use the logo, attend the AGM and access the membership lists for both marketing and information. In 2005 the director team put together an EDF bid to develop marketing support for local businesses. Some of this funding was for direct grants but the strategy was to link funding to developing a marketing plan for area. £1.5million, 50% match funded, allowed the network to employ staff for the first time. The organisational structure of the CMN is that of a not for profit, limited by guarantee, and owned by the membership.

The marketing scheme that was set up through the funding opportunity had to support , through funding and advice, 75 marine businesses over three years and generate 100 F/T jobs. Sector turnover for the marine industry was estimated to be approximately 600 individual businesses with £130million turnover overall. The sector therefore needed to improve by 10% to achieve its target. CMN were successful in achieving their target and actually supported 104 businesses with the majority of money going into direct support. It is estimated that 224 jobs were created and a £51.8million increase in turnover was achieved as a direct result of the investment. These estimates were further backed up by an independent auditors report into the added value that the funding had generated and contributed to further convergence funding being agreed. One of the smaller initiatives that were implemented during this time was the development of a 'photo bank' with more than 500 aerial photographs made available to all members of CMN. These photos were professional high quality digital images of the Cornwall region that focuses on the marine and maritime history and landscape. Coupled with training and advice that was made available to companies along with guest speakers and networking opportunities the marine and maritime industries became a focus of the County with an increased profile and a mature outlook on growth.

Since the Convergence funding started there have been fears raised over the shift from supporting SMEs towards larger companies and concern over the type of assistance that is generated – generic rather than company led. This is a valid but common problem with successful enterprising initiatives. Once companies see the benefits of belonging to a scheme the membership grows and benefits have to be spread wider and account for more diversity. If this continues there is a likelihood that the

large group will splinter and smaller groups form to target specific areas or specialisms. There is a limitation on size in many respects and a large group may still be too small to support several smaller groups therefore the intervening time between the original group starting to expand and the growth reaching the peak necessary to splinter can be a slightly turbulent time. CMN have appeared to have been able to control this problem and although there is little evidence of any splintering of the main network into smaller networks they have reached further out of their region to form an alliance with neighbouring networks which will have a similar effect.

CMN, after their initial success with the EDF funds, took the opportunity of increasing the awareness of the training provision within the County. Training in the marine and maritime industries is an area that has seen little support and development and CMN have been instrumental in developing the current NVQ skills in the different marine sectors. Although training was being provided by the colleges the timing, duration, commitment and cost was not within the range of many of the micro industries which make up 84% of Cornwall's marine sector. In conjunction with SEMPTA, CMN developed 300 new NVQ units with 17 new NVQ pathways meaning trainees could be trained and qualified in more marine industry sectors.

The new NVQs were launched at the boat show three years ago. According to Paul Wickes (CMN) the only companies who contributed to the standards were CMN companies. Traditional wooden boat companies helped write the standards for traditional wooden boat building and so on and so forth. CMN applied for 'train to gain' contracts to be able to facilitate the training. These contracts are government led opportunities for training to facilitate re-entry into employment. As Cornwall has traditionally suffered from a lack of available employment and skills opportunities these contracts provide the means for many people to retrain and secure sustainable employment within the maritime sector. From a small base of just 20 training places CMN now have the capacity to facilitate over 200 trainees in workplace settings. The benefits of this scheme are proving to be instrumental in securing the sustainability of the maritime sector – companies have the opportunity to take on new staff and tailor training to their specific needs and employees are able to obtain nationally recognised qualifications while earning a wage.

Now the training itself has been changed and geared towards the industry and learning adapted to accommodate industry working practices, there is a surge in both the number of applicants and number of companies willing to partake. This increase in skills has strengthened the overall marine sector in Cornwall and is considered as evidence of best practice that is being transferred into other marine networks and also local authorities.

CMN are also raising awareness of the marine industry among young people. Traditional marine industries are not always at the forefront of career opportunities and CMN has tackled this by targeting the local schools and promoting their marine academy. CMN are now actively working to give young people the opportunities to discover the industry and train for the future.

Another training and enterprise activity that CMN now promotes is through access to convergence funds to enable young people to become engaged in water sport activities. The scheme gives the young a chance to develop life skills such as team work and initiative as well as challenging them to try something different. Research had shown that as many as 60% of young people had not taken part in any marine or maritime activities and even though Cornwall has the longest coastline of any county an astonishing 20% of young people had never even been to the coast and seen the sea. Many marine companies had complained about the poor attitude and lack of understanding of trainees and this initiative reduces the problems employers have experienced and also encourages employers to become involved in helping the young and moulding them for future training and career opportunities. This initiative is fairly unique on such a large scale. Ellen MacArthur started a similar scheme in Cowes, Isle of Wight, for disadvantaged children and there are trusts and charities that provide sailing opportunities for the sick and disabled but nothing has been trialled for a whole generation of young people in one area.

Although the schemes are fairly new they have provided a platform for further knowledge sharing and cluster activities to take place. Training may be a direct benefit to local companies but the opportunities of sharing best practice through the development of the training qualifications has had the added benefit of bringing sector specific best practice to all companies that get involved. This is an area that has historically been seen as difficult to nurture. Companies tend to be reticent at giving out knowledge for fear of losing competitive advantage yet by encouraging companies to come together to develop skill strategies and to divulge technical and market knowledge to trainees, the industry as a whole is becoming better informed and therefore more productive.

CMN network has increased in size and all members that were interviewed felt that the network had benefited their company in some way. Many of the ideas and challenges that CMN have tackled can be taken forward for use in the next part of this research where cluster facilitation will be explored.

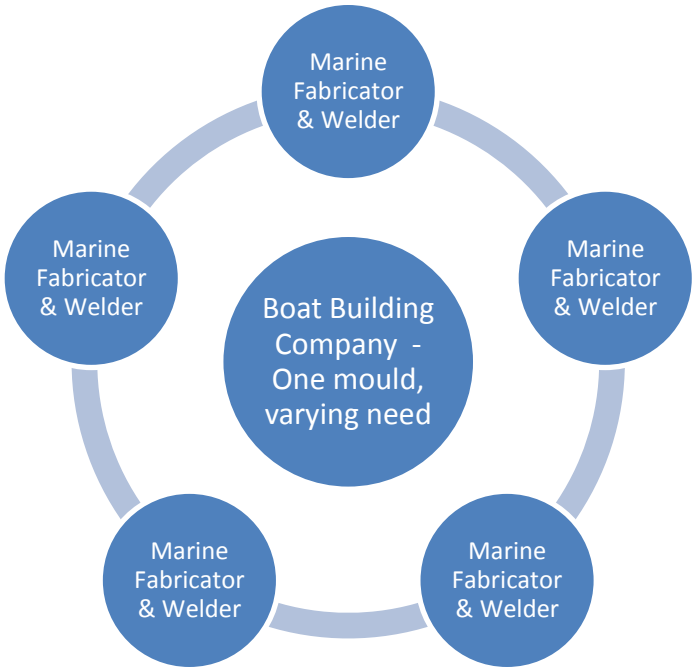
7.2.3 Cowes Cluster

The Isle of Wight is internationally renowned as a centre for sailing and Cowes Week is a major international sailing event each year. Cowes is home to three marinas and many marine and maritime industries and is able to draw from the location – Cowes – and also the region – Solent – to

increase and sustain its industries. The Cowes Cluster (CC) was first started in 2000 and was one of the first specifically marine clusters to develop. Funding came originally from the RDA and membership fees and benefits were in the form of network events and directories giving a platform for knowledge exchange and collaborative working. Once RDA funding finished the cluster needed to evolve in order to survive. As is the case with many clusters, a leader and direction is necessary to achieve sustainability and time needs to be devoted to this. The cluster approached the local Chambers of Commerce (CofC) to help facilitate the continuance of the cluster and Cowes Cluster is now run by the Cowes Chamber of Commerce. Membership of the CC also entitles the member to membership of the CofC and the added benefits that this offers.

The CC differs from many of the other marine clusters in the sense that it is one of the only clusters to have a strong relationship with the CofC and that many of its activities are business related and strategic rather than centred on networking or training. The CC has had varying success with the initiatives that it has tried to create and is a good example of where the problems with cluster activities and the absence of trust can prevent success. An example of this is a boat building company that needed an unspecified amount of a particular product manufactured continually but with varying demands. Unable to employ sufficient staff to produce the product due to the varying demands each week the solution appeared to lie in cluster activities. It was proposed that a group of companies would share the mould for the product and each week a member of the group would manufacture either the desired amount, or a proportion of, depending on their own company employee availability and workload (Figure 26).

Figure 26 Horizontal Clustering in the Boat Building Industry



In principal this was seen as an ideal solution to a number of issues:

1. The boat builder achieved their manufacturing targets
2. The risk is shared
3. Individual fabricating and welding companies had a supply of work to ease the problems of 'down time'
4. Increased job security for employees

The problem with the solution tends to lie with the issues of trust and competition. By agreeing to manufacture a specific number of items was felt to give out negative messages of lack of work and company difficulties. Trust between each firm had to be achieved for the solution to become reality and the inherent competitive nature of small companies and the fear of losing competitive advantage ensured that this cluster initiative did not see fruition.

One case that was seen as successful for the cluster itself was the issue that arose around aluminium welding expertise. In May 2008, an American super yacht manufacturer, Palmer Johnson, established a European Production Facility through a SEEDA 'Inward Investment' opportunity. Located on the west side of Southampton Water the company specialises in the production of luxury powerboats with lengths in excess of 170 feet. A recruitment drive saw hundreds of people applying for various skilled positions within the new company and many of these were already employed with other marine companies in the area – many of these companies located in the Cowes area. It was soon clear that a skills issue was developing as many small companies found they were losing staff to the bigger company and trained replacements were not forthcoming. The impact on Cowes was significant. Due to the fact that the Isle of Wight is an island, and therefore has a smaller workforce to pull from and a greater problem attracting new workforce to the island, many of the companies affected by the loss of skilled workforce found themselves in a precarious position.

Marine SouthEast, in conjunction with the BMF, Southampton City College, Cowes Marine Cluster, SEEDA and the Learning Skills Centre developed a solution to the problem by providing demand-led training in the short term and a comprehensive training package to be provided on dual sites by the 'Marine Welding Centre of Excellence' in Southampton and South Boats, based in Cowes. The programme was seen as a method of re-skilling individuals from various non-marine industry sectors and also as a 'fast-track' for those who needed minimal training. One of the problems that arose during the training was the difference between the training at the college and South Boats. One is a commercially competitive industry and the other a platform for teaching and learning. Practical

training could not be the same for both sites and there were questions raised on the validity of achieving the necessary training from one centre over another.

Where this initiative did succeed was in the provision of training in a specific sector across the industry – horizontal cluster activities. It also highlights that for cluster activities to be carried out there may need to be a perceived crisis that will force individual companies to collaborate in order to survive. This is a good example and underlines the need for a purpose that was shown with the Chichester Cluster who formed in order to tackle a specific planning policy threat, where strength was seen in numbers, and who disbanded once the threat had gone.

Cowes Cluster remains part of the CofC and continues to work towards sustainability through networking and the marketing of business cluster opportunities. It appears that its main strengths lie in the commitment and drive of specific personalities within the industry and Chamber of Commerce as well as its ability to promote the Cowes name. History, geology and policy provide the sustainability for the cluster but its demographic profile (most young people leave the island and most incomers are older and retiring), increased infrastructure costs due to its island status and limited membership due to capacity constraints mean innovative ideas and relationship with the Solent area are essential. The cluster supports a significant renewable energy sector and maintains excellence within the marina tourism sector. Recent collaborative ideas with both Maritime Plymouth and Cornwall Marine Network will hopefully provide further sustainability options with training and cluster options but the Cowes Cluster must balance its desire for sustainability with its unique selling point – its location and history.

7.2.4 Conclusion

Emerging from this research is evidence of cluster collaboration at different levels of cluster participants. Each of the branded networks function in different ways yet each are successful within this remit. Where the cluster does not have the expertise, or has not tackled a specific cluster activity, there is evidence of knowledge sharing and collaboration between the clusters themselves to adopt certain practices and learn from, eg. each other. This is particularly interesting as it highlights the natural tendency of clusters to form and evolve as the market changes and provides opportunities for clusters, unable due to size or resources, to take advantage of best practice without committing huge resources or changing the focus of the cluster in any way.

This also provides the evidence for transparency and mobility within clusters. Companies themselves may be hindered by competitive forces but the actual clusters do not work in isolation and are much more open to collaborative practice. Movement of companies between clusters and initiating membership to outside clusters also transfers this knowledge of best practice and there is an

element of organisational change from local to regional that has been seen in many other sectors[6]. Clusters start as a local idea in different areas – they grow and develop – the weaker tend to fail or be absorbed into other clusters – collaboration and merging of clusters takes place – clusters become too large for the original purpose and small local clusters start again in the local areas where needed, taking advantage of the knowledge gained through the emerging super cluster.

One area that the generic branded clusters do not seem to have achieved their potential is in the activities of collaborative working practice. Companies rarely work together on cost saving initiatives or any scheme that could potentially save them time and/or money if it means divulging something they may consider detrimental to their competitive advantage. This is a fundamental problem around the issue of trust and something that the clusters do not seem to have the long term vision for that is necessary. The case study by Reid (Reid, Carroll et al. 2007) on greenhouses in Ohio USA showed how lack of trust was the main cause of cluster failure and the generation of trust could take years to develop. Taking the long term option proved worthwhile though, all companies within the cluster now receive significant cost savings through the collaboration on distribution, packaging and marketing that they carry out through the brand. Branded clusters are therefore in an ideal position to offer cost saving packages to their members and should consider the impact on their membership through doing this.

7.3 Themed Clusters

Each theme is taken in turn and the primary research that was undertaken will be identified and discussed. The themes differ greatly in their ability to operate cluster activities and the scope in which these activities can occur. Marinas are natural geographic clusters whereas clustering in the off-shore renewable energy sector tends to work in either technology or policy driven clusters. Environmental clusters are found to be located in the vicinity of research centres and areas of specific environmental interest whereas the operations theme is purely a technological cluster that only uses location as a tool for solving logistical problems thereby lessening the economic impact on the local area.

7.3.1 Marina Tourism Clusters

Marinas are a major economic growth area facilitating the leisure boat industry. Marinas are natural clusters due to their location but cluster activities may not always be apparent. Marinas, by their very nature, have a major impact on the environment and operation themes and can also play a role in the renewable energy sector. The marina sector has been studied on many occasions but the

[6] Transport, in particular railway management has completed this cycle twice!

research tends to concentrate on the economic impacts to local areas in respect to tourism and services. The purpose of this research was to increase the understanding of these impacts but also looks to identify areas of potential cluster collaboration and best practice and to increase the economic impact of marinas by facilitating collaborative cluster activities in order to highlight the importance of clustering on economic growth.

Almost 40% of marinas completed the questionnaire and a fair representation of the population in terms of size, ownership and location was achieved. Marinas were asked for factual statistics such as berth spaces, average occupancy and business activities as well as being asked to return their views on the business and economic strengths and weaknesses of marinas and their strength of feelings towards specific marina activities.

Marinas were divided into four size types according to berth/mooring capacity: Small - <100 spaces. Medium – 101<300 spaces, large – 301<500 spaces, and extra-large – 500+. The research found that all size types were apparent in the south and boat owners tended to weigh up their membership preference using a cost versus value scenario. Although many marinas are located in urban coastal areas there are a considerable amount of rural marinas of all size types. Urban marinas can be restricted in size due to planning regulations whereas rural marinas tend to have more freedom to expand yet they lack the transport and entertainment infrastructure that urban marinas enjoy. Urban marinas benefit from the added entertainment and leisure facilities of the town and see a higher percentage of visitors than rural marinas that depend on membership.

Although half of all respondents were independent marinas there was a good response from local authority, port authority and marina development companies. The difference in ownership played an important part in how the marina tended to view its economic impact and how the majority of its income was achieved. In many instances the original objectives for developing the marina became secondary to additional benefits that developed in the preceding years. Regeneration was seen as a main objective by Local Authority owned marinas although many urban marinas felt regeneration was the objective of expansion rather than original development.

Diversification was seen as additional income yet size and ownership impinge on this potential. The majority of Marina Development Management Company's (MDMC) provide few services yet lease space for outside companies to support the marina whereas many independent marinas provide the core services as either part of the membership or at additional cost. Membership fees were the main income stream and the majority of diversification came from the medium/large marinas and mainly independent and MDMC owned marinas. Interestingly, many of the services provided through

leased units had little to do with the marine industry itself and marinas find themselves in the unique position of being attractive workplaces for non-marine businesses. Where only a few services were provided these tended to be in the core marina sectors: fuel, engineering and chandlery.

Generally, marinas appear to have a good relationship with the business residents on the site and more than half agreed that the marina was a 'hub' for business activity. Only one marina- a Local Authority owned marina - disagreed with the statement. When it came to helping the marina based business directly, no respondent disagreed although more than half expressed no opinion. In many instances Local authorities were not seen as supportive to the marinas and some felt they did not realise the true potential of the marinas on the local economy. Where local authority support is felt to be lacking the most there are very strong local marine networks that have risen up to fill the gap. This underlines previous findings from research into general marine industry perceptions and is something felt mainly in the south west.

Cluster activities were a significant theme of the research and it is here that the main weaknesses were found. Although the majority of marinas advocated networking and cluster activities as a desirable initiative, very few actually carried out anything significant. Clustering and networking are essential areas that appear to need further assistance in order to become sustainable and to flourish. All marinas belong to at least one marine association but maintaining links with each type of association/organisation can be time consuming and costly therefore marinas appear to pick and choose their affiliations based on the time and cost commitment versus the benefit received. Informal networking is apparent, and knowledge transfer evident, yet the competition for members seem to prevent marinas from instigating joint working practices or longer term sustainable business collaborations.

From the interviews that were carried out to support this research area the specific benefits and costs of clustering in the marina theme were highlighted. Roles and responsibilities of the marina are not clearly defined - It seems that the level of engagement of companies within the marina depended on the commitment by the marina manager. Ownership also played a significant role and medium sized independently owned marinas tended to be more open to collaboration than the small marinas. Marina Development Management Company owned marinas were open to opportunities that would increase their marinas performance whilst saving them time and therefore money.

Cluster activities were surprisingly sparse considering the location and facilities. Marinas are ideally situated to provide a central point for cluster activities. Networking does not currently appear to be

a main priority for marinas and only one marina hosted networking events on a regular basis with 60% of marinas never holding events. 42% of marinas supported networking events on an occasional basis with just over half of marinas attending events at least four times a year. Contradicting these statements slightly is the assertion by 58% of respondents that the marina is a central hub for the business community, with 90% of these strongly agreeing with this statement. The research has shown that marinas generally feel they would like to work with business units but time and resources prevent this.

Marinas are also in a position to act as an umbrella for disseminating information to the local businesses by networking themselves through larger associations and cluster networks. More than half of the marinas that responded belong to a network or cluster organisation with half of these belonging to more than one. Associations are also a popular option with 95% of marinas saying they belong to the British Marine Federation (BMF) and the Yacht Harbour Association (TYHA). Local networks are less popular and membership appears to depend on the location of the marina and the size and ownership – independent marinas will join rather than other ownership types possibly due to the readymade support service that comes with belonging to a larger group such as an MDMC. The main reasons for joining the networks differ according to the size and scope of the association. The BMF and TYHA provide the specific legal, technical and advisory service including best practice for the leisure boat industry and the TYHA award system is recognised internationally. Local networks provide support and local information and the ability to build business relationships within the local area. Larger, more generalised organisations such as Marine South East (MSE) provide the knowledge and advice for funding opportunities and diversification in the wider marine field; and clusters and networks – Cornwall Marine Network and Cowes Cluster being two of these – provide training opportunities and a wider group of contacts within the marine sector.

A marinas membership to the more generic business associations is sporadic. The Chambers of Commerce are the largest of the business support networks yet the marina membership appears to vary across the region. The Chambers of Commerce in the Isle of Wight are responsible for the Cowes Cluster and are supported by the marinas in the area. In Cornwall the Chambers of Commerce does not appear to play a major role in the marina industry and there were no marinas who expressed an interest in this organisation. Interestingly in other areas it seems that the CoC have tried to encourage marine membership but have not been successful. The question that arises from this is whether the more generic business networking is understood to be as useful as the marine orientated networking.

When looking at marinas as a natural cluster and networking hub, i.e. chandlers contracting with sail makers for repairs, it has been pointed out that the majority of networking tends to take place informally rather than formally. The 'chance meetings' that take place within the marina between marina members/visitors can prove to be as useful as attending an organised event. It is important to realise that although the marina may consist of an assortment of businesses there are also a far greater assortment of regular visitors to the marina who bring with them a wealth of business opportunities that may often remain untapped.

Comments were also made regarding niche markets and unique positioning. Strengthening relationships with the local area will need a variety of different tactics depending on the size of the marina, the role they portray within the local area and the unique characteristics of the locality. Environmental awareness appears to be an increasing theme among marinas. Marinas are aware of the impact they have on the environment from an infrastructure as well as an operational aspect. Reducing their impact on the environment appears to have become a priority area over the last few years and encouraging members to become environmentally aware is also of importance.

Cluster activities do appear to be occurring on a fairly regular basis but are very informal. Quite often it seems that the participants are unaware of the fact the activities are an opportunity to increase their economic potential and the potential benefits are therefore ignored. Although it is not necessary to formalise cluster activities it is a benefit to the potential impact if the participants were able to ascertain the benefits to themselves and the wider community to enable wider participation and further benefits to be accessed.

There appear to be many barriers that marinas have to overcome to be able to grow and develop, not least planning legislation, environmental impacts, and the physical geology constraints. Relationships with the local authorities are not always positive and support appears sporadic and varied across the coast. Ownership, size and location all impact on the customer base and service provision and although almost all marinas provide the core services they differ from each other in many other ways due to their unique geographical locations and associated service provision. Yet even though there is evidence of demand in excess of capacity in many areas competition between marinas is strong and possibly counterproductive to increasing sustainability.

The BMF and TYHA are well respected amongst the marina industry and the award scheme fully supported. It is clear that marinas provide a unique opportunity for increasing the economic growth and sustainability of an area yet their contribution does not always seem to be understood. The marinas themselves also need to be aware of their potential and make best use of their location,

geography and service provision. Enhancing their uniqueness and expanding on niche markets will enable collaboration without competitive threat.

This research has further underpinned the conclusions of the BMF study into coastal marinas and highlights two possible scenarios that may alleviate the problems the report emphasised:

1. Increasing awareness – collaboration and exploration with local authorities to identify specific areas of mutual benefit to increase the economic sustainability of the local area
2. Restrictive health and safety legislation – organise joint training and awareness to reduce the cost of training and ensure the marina businesses and marinas themselves are informed.

There is potential to increase the cluster activities and provide a sustainable network for marinas through strengthening their local relationships and activities and by collaborating with other marinas, and cross-border marinas to enhance their visibility and knowledge of best practice.

7.3.2 Marine Operations

As it has been mentioned before in this report, the theme marine operations is a difficult theme to monitor best practice in cluster activities. In order to analyse the activities within this theme and any clusters that have developed the research centred on the Technology Road Map and associated strategic aims of the government. The Technology Road Map has been in development since 2009 and was instigated to address the MILC and Department for Business Innovation and Skills strategic plan for the marine industry.

Initially the stakeholders were large commercial firms, marine associations and Governmental bodies, but this has now widened to include Universities and research centres and smaller marine companies with a specific interest in the Road Map themes. Each of the themes applies to marine operations and in many respects supports the cluster best practice for this research. Table 5 shows the nine subject areas that the road map covers and some of the ideas that have been generated to take the initiatives forward.

Table 5 Technology Road Map

Theme	Comments
I-ship	This includes lean management and support systems and looks to innovative ideas to reduce the human activities onboard ships through automaton and virtual control. I-ship aims to reduce energy consumption and operational costs by 10%. This theme requires high level technology and knowledge transfer and will need to be managed by a number of stakeholders in order to fulfil the requirements.
New Exportable	This theme will incorporate many of the I-ship innovations but will also look

Naval Vessels and Systems	to include technology development in the naval support and defence systems; including weaponry. A global specification will be sought so the global market can be exploited.
Maritime Consulting and Related Services	Focuses on increasing awareness and attracting new students towards marine related services and technical innovation. Also seeks to develop the current methods and processes to streamline and increase benefits.
Off-Shore Deployment Vessels	Necessary to support the construction and maintenance of off-shore energy sites. Improving design and performance will increase the efficiency and reduce overall costs.
Lean Support Processes	Aims to improve efficiency and standardise processes through accreditation and business model innovation. Enhances supply chain infrastructure and therefore reduces costs and increases outputs.
Anti-Fouling, Tank and Low-Friction Coatings	In order to reach the agreed climate change targets the current anti fouling systems need to be enhanced. This will be achieved through research into chemical applications and refined testing and application processes.
Ballast Solutions	Requires knowledge transfer and specialist research to accommodate consumer needs with environmental protection. Improved systems for decommissioning and recycling.
Green Propulsion Systems	By utilising heat recovery systems and catalytic reduction and filtering cost reduction and emission targets should be achieved. Requires interface between consumer needs and technology advancement. Will also include New builds and decommissioning of units.
High Usability Leisure Craft, Ships and Equipment	Technology and design in this area is comparable to other industry sectors therefore knowledge transfer and collaborative working will reduce costs, prevent duplicate research and increase efficiency.

The timescale for achieving the desired results from this list of aims and objectives takes the industry to 2020. This also ensures the results of the road map correspond to the Government targets for emissions. The schemes are already a year into discovery and innovative ideas and resources are currently being explored. This is also the beginning of cluster development. Companies are able to explore initiatives in a controlled yet versatile platform with other companies from similar disciplines and also other stakeholders from supporting disciplines without the threat of competition and loss of competitive advantage.

To date, controlled workshops have facilitated discussion on a wide range of topics within the nine themed areas and already there are groups starting to develop potential working relationships based on trust and compatible solutions. Involvement has come from Universities and research departments in large marine companies and influence has been brought by leading marine and maritime associations including the BMF and MSE. Government support has come from BIS and DE&S whilst industry contributions have been seen from Babcock, BMT, Rolls Royce and BAE

Systems. Due to the technology needs there has been a significant input from universities and research has already taken place to look at feasibility studies and sustainable projects. One of the aims of the technology Road Map is to create a platform for 'Champions' to take a lead and also take ownership of specific sections of the road map in order for interested parties to collaborate.

What was originally perceived to be a strength of the roadmap development process could potentially become a serious weakness. The roadmap itself has been designed through a 'bottom-up' approach to identifying and ultimately solving issues of technology needs in the marine industry – almost a pull an idea out of a hat scenario, ideas were chosen from a selection put forward and those with the most interest from the original working group were taken forward. The ideas and subsequent themes that evolved were generated by the large marine industries with little consultation with the small marine companies that make up the majority of the sector. The themes are also within the area that the instigating companies want to develop and there is a danger that rather than provide a roadmap for an industry sector, the themes are targeted to a select few industries with the specialism and knowledge necessary to take them forward. This has shown itself to be an emerging problem and one that the Technology Strategy Board wants to address.

One of the main problems the marine industry constantly has to manage is the lack of an overarching leadership and it is here that the roadmap so desperately needs a leader with both the responsibility and power to follow through. If no-one is able to take ultimate control with the decision making process and ensure that there is an element of 'joined-up-thinking' in the arguments then the situation will arise where different factions of the wider marine and maritime industry will diverge further from each other and any developments will be limited in their impact. This is a significant issue with the marine and maritime sector in general and not necessarily limited to the roadmap.

Marine Operations is a fast growing and vibrant industry sector that has received policy recognition and subsequent funding opportunities. Potential for collaboration with France will depend on the type of research and policy implications that are coming from France.

7.3.3 Marine Off-Shore Renewable Energy

The renewable sector is one of the fastest growing in the south and a clear candidate for clustering. Research into this area has looked at emerging clusters and their primary components and the networks that have evolved over the short time the sector has been in existence. Interviews were carried out with a selection of companies in both a technical and support role and clarity was sought in order for the cluster potential to be identified.

The wind energy sector is fairly well established but due to the complete lack of manufacturing companies making the structures the support network is wide, diverse and difficult to monitor. As we have shown in previous sections, there is a desire to work in this area and many companies have stated that they want to support the life of the wind farms through provision of services and specialist technology but find it difficult to compete along the established supply chains that are in place due to the international nature of the companies involved. Many supply chains are already established prior to the development of the farm and although some local companies have been successful in securing contracts these tend to be limited to those companies who are able to infiltrate the almost closed network that has arisen. Through-life-support systems are an area of the technology roadmap that is being looked at closely to see if any development can be made in this area of specialism. The development of support vessels and innovation into quieter turbines are also themes that are apparent but all are being carried out by larger commercial companies or research centres. The opportunities for the smaller companies to move into the sector are still very limited.

Regarding location, the south west of the country is the main area for innovation and cluster potential in this theme. The Wave Hub in Cornwall is now operational and new devices are actively being sought to test here. Various large and small marine companies along the south coastal region have secured government funding for innovation and research into this area and there is potential for cross border collaboration in the future within the tidal and wave device sector.

Funding is currently available in this theme through various initiatives from the EU and Central Government. One company in the south to achieve some of this funding was Gurit. The Isle of Wight based developer and manufacturer of composite materials and technologies, Gurit, secured an agreement in 2009 with Sheffield based Pulse Tidal, the tidal stream power provider, to engineer, supply tooling, and manufacture the blades for Pulse Tidal Pulse Stream 1MW demonstrator. Pulse Tidal, which specialises in sourcing energy from shallow waters, received a grant of €8m from the EU's technology Framework Programme 7 to develop its first fully commercial tidal energy generator. This 1MW generator will be commissioned in 2012 and will provide electricity for up to 1,000 homes.

Gurit is working alongside an international group of companies to form a secure supply chain for volume production. The partners include Pulse Tidal, Bosch Rexroth, Herbosch Kiere, DNV, IT Power, Niestern Sander, and the Fraunhofer Institute. This is a good example of a technology driven cluster that has formed for a specific purpose and will only continue in its present form if the product continues to develop, or a new innovation is developed.

Over 35 British businesses and universities have, to date, been offered support worth £7 million to help them to develop the wave and tidal energy technologies of the future. The investment has been allocated through a collaborative research and development funding competition designed to support innovation that will lead to the cost effective exploitation of UK and global wave and tidal stream resources. One of these projects is the OWEL Marine Demonstrator led by Offshore Wave Energy Ltd. in conjunction with IT Power, A&P, Mojo, Gifford, NaREC, Plymouth University (PRIMaRE), NPL and DNV. The OWEL team have developed a highly practical, cost-effective and environmentally friendly design for a Wave Energy Converter. The concept has been verified by extensive tank-testing and mathematical modelling and they are now planning the deployment of a seagoing prototype which will lead to the establishment of fully commercialised wave energy "farms" that can be deployed around the world (OWEL 2011).

Each cluster member provides an element of expertise and specialism to take the design forward. In order to further the potential of off-shore renewable energy A&P Falmouth have recently taken on a renewable energy manager as part of a knowledge transfer partnership with the University of Exeter. As the closest deep water port to the Wave Hub and with a growing renewable sector interest in the region, A&P are ideally located to facilitate clustering in this sector and to increase the potential through further engagement with industry and research.

The current members and potential members of this sector are the highly technical and innovative industries rather than support industries. Although support for the sector is both necessary and available the large amount of companies that wish to work within the sector is hindering any sustainable clustering from occurring. Even though the industry is quite immature, the companies involved in the sector are established centres that work in a niche market. Clusters are technology clusters and short lived, due to the timescales of a project, although evidence suggests that as one project finishes another one forms and the players move round attaching themselves to the technology or specialism that they do best leaving the support side as a supply chain heaving with potential candidates.

Organisation and strategy is needed if the support sector stands any chance of emerging as a reliable contender for facilitation of clustering either in a regional context or cross-border. The Wave and Tidal energy technology is emerging as a sector to be encouraged and promoted as it is here, rather than with wind power, that the south coast marine sector appears to flourish.

7.3.4 Marine Environment

Natural England see the threats to the marine environment as those issues arising from climate change – sea level rise, flooding, increased sea temperatures, and acidification of seawater. All of these will impact on the fish stocks, habitat and general ecosystem of the marine environment. Achieving a balance between utilising the sea as a resource and maintaining the diversity of the environment is a battle that is fought from a scientific, technological and welfare aspect. As it has already been explained, Finding Sanctuary and Balanced Seas are working with industry, environmental groups and local authorities to ascertain which areas are most under threat from human activity and to monitor these designated Marine Conservation Zones to identify solutions or maintain the status quo.

The environment theme can be seen from two slightly different perspectives – understanding the environment and protecting the environment. These two tasks do not always share the same objectives and commercialisation and environmental benefits do not always see eye to eye. PRIMaRE and the NOC are both working with industry to assess the environment and to increase the understanding of the seascape and are both centres for current and future cluster activity in this theme. Smaller companies are also active in the field and due to the nature of the theme there is evidence that clusters will be sustainable rather than project based. One of these companies is Earth to Ocean, an environmental consultancy company working from Hamble in the Solent area.

Earth to Ocean developed and managed The Green Blue, the Royal Yachting Association and British Marine Federation's Environmental Awareness programme, now widely considered to be the leading environmental awareness programme amongst national and international sporting governing bodies. They also work with companies to ensure government guidelines for sustainable materials are achieved throughout the supply chain. There is evidence emerging that this initiative is leading to companies adopting sustainable practices in order to work with specific supply chains and an agglomeration effect is occurring as companies locate near likeminded companies and supply chain tiers. The main lynch-pin that has allowed this to take effect has been the work with the former Team Origin, British America's Cup Team in the 'Race for Change' carbon reduction programme.

Working with the Carbon Trust – a government organisation charged with reducing the nation's carbon emissions – Team Origin aim to raise environmental awareness through their media presence and to actively reduce their emissions through technological innovation and boat design and also through their supply chain. Working with Team Origin is seen as an attractive prospect and companies have shown willing and undertaken assessments to learn how they can reduce their

environmental impact thereby further reducing the environmental impact of the end user – Team Origin.

Although not essentially a cluster, the activities that are taking place and the agglomeration effect this is instigating may have the effect of cluster development and sustainable cluster activities into the future. The benefits of clustering within this theme are twofold. Not only do the companies themselves benefit from the reduced costs and increased knowledge that clustering promotes but the environment itself will also benefit through a reduction in CO2 emissions as cluster activities such as transport and logistics collaboration reduce the need travel. An increase in the understanding of the environment will also impact on the activities that are allowed to take place and conversely understanding the impacts of activities will help reduce the impact on the environment.

A case in point may be the situation in Falmouth. Currently it is the unknown impact of dredging on a specific micro-organism that is preventing the dredging from going ahead (A&P Falmouth 2010). If this impact could be understood; to a positive outcome for the port; then the economic benefits to the local community could become reality. Even so, if the outcome was negative, at least the port could move on from the decision and develop alternative plans rather than remain in a stalemate situation. It is this knowledge of the environment that needs to be gained in order for industry to flourish yet industry, in the UK at least, sees it more as a threat than benefit. To date, the only research and innovation that is taking place within the environmental theme is research by universities and government research centres and a few large commercial companies that rely on environmental impacts for their business eg. Ballast and water companies, aggregates and fisheries. Awareness is increasing and public demands are starting to force industry to act but where the sea environment is concerned, what cannot be seen is not always viewed as important and the 'NIMBY' culture so applicable to the UK and other densely populated areas does not apply to the sea.

8 Research Conclusion

Marine and maritime clusters are an essential part of the current and future marine industry. Clusters are seen in the industry in 3 distinct ways:

1. **Innovation and Technology driven clusters** consisting of a few companies working closely on a specific project. Within this cluster type there can be two distinct themes:
    a. Single project based cluster that works to a known timescale and financial commitment. Cluster activities are purely based around the research and development of a new technology and there are no joint marketing, branding or member benefits although some cost efficiency may be apparent through the collaborative business plan. The cluster is only sustainable during the life cycle of the project.
    b. Research and development centre based clusters where, similar to the single project cluster, activities centre on projects and are time specific, but sustainability is achieved through crossover of knowledge and the birth of new projects and innovative ideas. The sustainability is achieved usually due to the central hub of the research centre facilitating this process.
2. **Branded marine networks** that encourage cluster activities through either a niche market or collaborative membership benefits. Evaluating the benefit of these clusters is difficult due to the difficulties in monitoring the impact of networking on future business. Sustainability tends to be achieved only if the membership remains at a level that ensures the fees cover the cost of administering the cluster.
3. **Local Authority or 3rd sector branded marine clusters** that are supported by the public sector and work alongside other public sector organisations to actively encourage sustainability in the marine industry. These clusters are rarely technologically facing and usually relate to policy and awareness.

There are also examples of clusters that naturally occur, generate little visibility, and usually remain unrecognisable as a cluster, even to them. These informal clusters can work in a variety of ways and will usually be dependent on a product or service such as complete service packages around a marina or boatyard or supply chain clusters. There are examples of all the different types of cluster along the south coast of England and even within these frameworks there are different types of cluster structures, remit and leadership. Each of the four themes in this research maintain clusters within these three types to varying degrees and the sustainability of the clusters is dependent on the

type of cluster and reason for clustering. Porter (1998) states that clustering will achieve the following benefits:

1. increased productivity of constituent firms or industries;
2. increased capacity for innovation and thus the growth of productivity; and
3. new business formation that supports innovation and expands the cluster.

Clustering has been shown to increase the productivity of firms, and when clusters fail as with the welding and fabricating mould sharing initiative on the Isle of Wight, it has been shown that potential productivity increases are not achieved. The technology clusters that have developed in the marine operations and renewable energy sectors have proven that clustering increases innovation and shown that collaboration can encourage a sector to emerge as a world leader in marine design and tidal and wave energy systems. It has also been shown that clustering must have three essential elements in order to survive:

1. Trust
2. Leadership
3. Purpose

For clusters to remain sustainable each of these elements must exist in some form or another. The purpose can change – new direction, innovation, challenge or threat – and leadership can change as the project or direction changes, but if trust disappears then the cluster will doubtless fail to survive. It is the trust that appears to be the hardest to achieve, sustain and build on. Developing trust takes a long time, sometimes years and the strength of the cluster relies on the level of trust that is maintained.

Leadership can come in the form of a person – a personality that can bring together likeminded companies for networking and knowledge sharing – or an innovation that other companies want to be part of. In this sense it is the technology clusters that may be easier to develop and facilitate. Knowledge transfer has recognised benefits and therefore the individual company's gains outweigh any loss of competitive advantage. Research and innovation centres are adept at publicising their findings and sharing their expertise, and although academia may be very competitive, it is this competitive nature that drives innovation forward.

One underlying issue that appears to run throughout the research has been that of communication in relation to the three essential elements necessary for clustering and also within the framework of the marine and maritime industry itself. Communication; lack of or mismanagement of, can be seen as a barrier to understanding and economic growth of the industry. The unwieldy organisational

structure has proven to be a problem that offers no immediate solution, yet until this is addressed there will continue to be communication and management problems. The situation with the TSB Roadmap is an example of this in action. Clusters form as a direct result of this structure either because of it or despite it – but rarely as a positive response. The huge amount and variety of societies, associations and advisory groups that support the marine and maritime industry are too confusing for the SMEs to circumnavigate and opportunities could often be missed that could provide a benefit to both individual clusters and cluster formation. It is possible that the management structure is a contributor to the diversity of the clusters: a reason they have formed in the variety of ways that they have. A lack of leadership will mean a lack of knowledge transfer on best practice and one reason why clustering has been sporadic and unplanned. It may also be a reason why many companies expressed their frustration at their inability to infiltrate supply chain networks and funding opportunities and their lack of understanding about who to talk to for any advice they needed.

Essentially, the marine and maritime industry in the UK is much larger than can be accounted for. This problem with identifying and evaluating impacts is a hindrance to the growth and sustainability of the sector. If companies do not fit into SIC codes, or belong to more than one sector, it makes it difficult to attribute benefits and therefore ascertain the true economic impacts that the marine and maritime industry asserts. This will, in turn, lead to a possible underfunding of potential growth areas and adds to the instability of many of the SME companies in the region. This is clearly a multi-faceted issue with wide reaching impacts and one that needs addressing for any sustainable growth or collaboration to achieve its potential. The CAMIS research can recommend that part of a collaborative marine strategy for the Arc Manche area addresses the problem head-on, and the cluster research can help alleviate some of the problems that result from it. Using the database that has been collected through the primary research it will be possible to develop a portal for the marine and maritime stakeholders that could have the potential of bringing together all of the societies, associations, clusters and advisory services to help SMEs to search for the information and knowledge they require. The portal idea will be looked at in the next section after each theme is taken in turn.

8.1 Cluster Themes

Marina Tourism is a natural locational cluster that appears to be underachieving in its potential to facilitate increased economic growth in the marine sector. Concentration on the main purpose of a marina – achieving and maintaining capacity in their berths - is shadowing the possibility of diversification through cluster activities within the marina and the local area. Enrichment and diversity could be achieved with a change of tact towards the wider marine industry and the

development of the marina as a hub for cluster activities. The benefits could spread further into the local community and generate regional economic growth through employment and skills. This is one area where facilitation of clustering and knowledge transfer can be made and the effects measured.

Marine Operations is an emerging sector that funding and policy intervention is helping to nurture. This sector needs to build on the knowledge and technology innovation available in both the marine sector and other industry sectors and facilitation is already being carried out through the technology road map and the networks that are evolving through this initiative. Cross-border collaboration will only be achievable if the policy drive in France is of a similar technological area to the UK due to the difficulty in locating cluster potential without the help of the technology road map.

Renewable energy is the fastest growing marine industry in the UK and shows the greatest potential for clustering. It also appears to have the most barriers at the lower tiers for sustainable clusters and collaboration at this level would be difficult to achieve and sustain due to the lack of perceived benefits to the companies involved. Collaboration at the technology level would be achievable and is occurring on an international basis in the innovation of energy devices. Although the Crown Estate are responsible for issuing licences for testing and siting of the devices, their role as facilitator in clustering is limited. Government support through technology grants and essential policy and regulation will need to continue for this sector to continue to grow and flourish.

The changes in regional policy and the adoption of Local Enterprise Partnerships come with a new set of concerns for the large technology driven clusters and also the Regional Innovation Systems that promote innovation and technology. LEPs will determine the focus of a local region and support will be targeted at the local rather than regional level. The support itself may be more targeted to specific areas and the amount of support will be limited to the funds available. It will be interesting to see how the LEPs adapt to the challenges of regional, and even national, issues with a local budget and focus. We may see LEPs start to collaborate and pool resources where common interests are found in neighbouring areas. What we do not want to see is duplication of initiatives as a means to increase the local profile at the expense of collaboration to increase the regional profile.

In all of this the environment remains a central focus. Industry and the environment will probably never sit well together but the surge in environmental awareness and the social responsibility that this brings is already starting to impact on the regions carbon footprint and government targets for energy efficiency. Research into understanding our natural environment will only occur where funding allows and this funding will only occur if the need to understand benefits the economy and helps achieve set goals. The environment theme is a top down approach through necessity but

commitment to this theme is allowing companies to assess their impact and determine their own level of responsibility. For funding purposes it would be useful for cross border collaboration to occur as this will increase the environmental research taking place and ensure a greater understanding of the Arc Manche region is achieved.

8.2 Best Practice

Identifying best practice has proven to be an interesting journey for this research. The diversity that has been apparent and the changing economic and business environment have meant companies have embraced challenges and adapted working practices to accommodate and move forward. Best practice can be described in two ways; that which is inherently generic and non-specific, and that which is applicable to specific circumstances of industry, location, economics and policy. Best practice that can be prescribed across regions tends to centre on issues such as training and technology – activities that are not necessarily cluster activities but can be used to generate clustering. Best practice that has occurred in localised areas is usually as a response to local issues. How successful these practices would be if translated across regions will depend on the circumstances and needs of the area and the best practice that is encouraged.

Cornwall Marine Network has been very successful in facilitating training for first its member companies and secondly the marine industry in general. Most of the initiatives designed around training can be rolled out – and in some instances there is evidence this has occurred – across the country. It is important to remember though, that CMN have been fortunate to have had access to considerable funding through Convergence Funding (EDRF). This is not to say that the funding was the only reason their achievements have been possible, it has also taken a lot of time and commitment from the network to identify the need and carry out the activities. The best practice here has been in the network first identifying – through listening to its members – what the main issues have been and then consulting with the members throughout the process of designing the training to ensure the identified need was fulfilled to its potential.

This initiative translates into cluster activities through the exchange of trainees and training practices. This has the effect of getting companies to talk about their training needs and abilities thereby transferring knowledge and best practice. Individual companies gain an awareness of what other businesses are experiencing in the local area and further collaborative activities have the opportunity to develop. The success of this best practice initiative can be seen not only in the amount of trainees that receive training and job security but also in the growth in the networks membership.

Best practice does not always have to be successful though. In some instances cluster initiatives have failed but are clearly activities that continue to be encouraged and explored. Collaborative working – such as that seen on the Isle of Wight - is one of these initiatives. The need to secure economic stability and growth in a challenging political and economic environment may require additional support and collaborative working as it spreads the risk and increases sustainability. Taking the step towards this has been shown to be a huge leap of faith on the part of many companies who are already competing for business. Best practice in clustering provides the platform for this collaboration to occur yet providing the necessary additional incentives and resources to ensure success may not be within the power of the cluster facilitator. This is not to say that the platform should not be provided, nor does it mean that the methodology for facilitation is incorrect. It could be said that the mere act of attempting to facilitate these types of activities is best practice in itself – that it succeeds or fails is almost purely down to the individual companies committing to them.

Where technology is concerned, best practice has been provided in the funding incentives from organisations such as the Technology Strategy Board, SEEDA, BIS, and other political and government agencies. Providing funding with the proviso of collaboration with other companies and research establishments encourages innovation and technology advancement and therefore knowledge transfer. This type of practice provides the essential element of purpose to a cluster and allows the trust element to foster. There is a tendency for companies that have previously worked together to re-group and can prevent individual companies with an interest in collaboration from entering the cluster. This is particularly pertinent in the renewable energy sector where the myriad of advice, funding and industry scope ensures new entrants are kept bewildered and confused rather than encouraged to collaborate. This in itself breeds mistrust and works against clustering activities rather than for them. The current situation is not helped by the lack of leadership and over-arching responsibility that plagues the marine and maritime industry.

Encouraging clustering and providing a platform for cluster activities to take place has been found to be a prominent activity in itself. The success of these activities can sometimes be seen to be despite the industry organisation rather than because of it. For clustering to become successful and sustainable there are a variety of initiatives that have to be cleared first – Leadership of the sector, clear communication strategies, recognition of the economic impacts and the need for sustainable maritime support networks.

8.3 The Way Forward

An important finding of this research has been the mobility of clusters and the changeling approach that seems to take place. This will have an impact on the type of facilitation that needs to take place and the sustainability of any cluster formations. The south west has strong cluster development that is showing evidence of adapting to the economic and industry environment by collaborating, merging, concentrating on niche areas, and strengthening their market. Technology clusters carry out these actions on a regular basis as they adapt to new technologies, new innovations and policy and funding opportunities. Counties are less fortunate due to the fixed nature and long term planning necessary to adapt to change. Any alteration in policy direction needs a long run time and dedicated resources therefore County Councils tend to benefit from supporting and guiding the natural process of industry clusters.

An important aspect of this research has been the development and utilisation of the marine database developed initially as a tool for identifying clusters. Interest has been shown in adapting this database and allowing industry to use the information to increase their own awareness of the marine and maritime industry in both their immediate area and in the whole of the southern region. Maintaining databases of contacts and up-dating websites can be a time consuming and costly exercise that many clusters are unable to achieve. A portal that provides all the marine and maritime companies and highlights their activities, interests and memberships to the different associations and societies may prove to be a cluster facilitator in itself.

In order to take the research forward to the next stage it is proposed that a toolkit should be developed as part of the strand 3B activities which would include:

1. A bi-lingual portal developed by the University of Chichester and piloted in 3 or 4 areas to support a knowledge network
2. Events to encourage and promote growth, innovation and collaboration within clusters
3. An event to examine what the Marina of the Future (2020) could look like.

A summary of how each activity will be structured and delivered is given below.

8.3.1 Marine Business Portal

As a result of the activities of the CAMIS programme, a requirement for a tool to enable the support of economic activity within the marine industry has been identified. Much of this has been designed around the database of marine and maritime companies that has been developed during the research phase and has been identified as a significant contribution towards the encouragement of

best practice through communication and knowledge transfer. Currently most of the web based services in the marine and maritime industry are either sector type specific – shipping, fisheries, renewable energy etc. or cluster specific (locational) – CMN, Maritime Plymouth, Devon Maritime, etc. or society and association specific – BMF, MSE, MILC. Communication therefore involves a series of searches and piecing together information from a variety of sources and focuses. It is here that the issue of communication can be felt the most. Focussing on a particular section of the industry does not help to encourage stakeholders to see the wider picture. Bridging the gap between knowledge and understanding of the extent of the marine and maritime industry will require a less fragmented and more cohesive way of viewing it. That is not to say that the wealth of individual web based portals are superfluous, each portal is specialised and specific to the individual sector they represent and provide a necessary service, but it does allow for a unique opportunity to provide an over-arching portal that acts as a gateway to these sites whilst providing the necessary information applicable to all maritime industries to be supported.

An MS Excel spreadsheet of companies, including information containing known membership of clusters within the industry sector has already been created and is constantly evolving as other sources of data are made available. To maximise the potential of this database it is suggested that the data should be stored in a central location and accessed via a suitable method such as a portal.

It is proposed to create a database structure which enables the storage and manipulation of the expanding data; in parallel to develop an internet based portal to allow subscribers to gain access to this centralised resource; promoting innovation and assisting in the identification of opportunities and potential partnerships. The main proposal for this initiative is contained in a separate annex to this report but the fundamental objectives are to provide an interactive platform for all marine and maritime stakeholders to engage in activities to support their economic sustainability through clustering.

The portal will allow companies to search for other companies based on industry type and specialism, allow individuals to communicate with each other in a safe environment, provide an information base for legislation, regulation, policy and funding, provide space for individual clusters to promote their activities and encourage growth, and to allow collaborative efficiency and cost saving activities to develop.

Interest for this service has been widespread and from a diverse range of stakeholders – local authorities, branded clusters, individual companies and consortiums have all shown a desire to benefit from specific aspects of the portal. Requests for services and information to be included has

highlighted the importance of ensuring the portal is designed and developed based on sound empirical research. It will be necessary to carry out a series of scoping exercises to identify the depth and breadth of the usability to ensure the competed tool is of interest and use to as wide a population as possible without making it an unwieldy and therefore disused service.

The initial portal development research will take the form of three different stages:

1. Primary research through completion of an online questionnaire; further in-depth interviews with key cluster stakeholders; and approval of the proposed identified portal development.
2. Design, develop and build the web based portal from the initial research.
3. Trial the portal in three key areas to test the usability, information and activity generation

The ultimate aim of the CAMIS research is to ensure the rigorous research and testing enables the portal to become the chosen utility by maritime stakeholders for their information and cluster generation activities that will be self-financing through the interaction and ownership of the users.

8.3.2 Marine and Maritime Cluster Awareness Initiatives

It is expected that a series of posters and information on best practice can be developed from this research that can be tailored to each region within the research area. By utilising the local authority involvement it is hoped to promote the research through these resources by placing them in key locations within each region. Events and publicity will be held in the different regions to encourage stakeholders to participate in the debate on how to increase economic growth through clustering and how to disseminate best practice and collaborative activities.

A lack of understanding between stakeholders of the size, scope, and importance of the marine and maritime industry was a recurring theme throughout the research phase. We have already described the probable causes of many of the issues that are perceived and although solutions have been identified it is through the policy recommendations of the Strand 1 strategy that these can be addressed. Facilitation, such as the cluster activities described in this report can be carried out through a series of workshops and awareness events that will, in turn, promote the industry and its unique reach across economic sectors and facilitate the preparation of an audience that will be receptive and embracing of the strategy recommendations once they are developed.

It is anticipated that the events will be tailored towards the region that they are held and will include real case studies of cluster activities that have taken place in that area. Incorporated into these events will be information on the size, scope, location and impacts of the marine and maritime industries in the region and suggestions for increasing the potential for further economic growth and sustainability. It is anticipated that the events will include a platform for gathering additional

information to support cluster activities and the development of a roadmap of policy, specialism, and need that will allow the regions to increase the potential of the marine and maritime industry in their area through the provision of a base line account. Much of this can be done through the generation of a series of maps that will identify the industry and potential clusters that will in turn generate discussion on the necessary direction that each individual region can follow.

In essence, stakeholders from each region will be asked to take a step back from their own individual remit within the industry and look at the 'bigger picture'. For growth and sustainability to be achieved it will be necessary for all stakeholders to be working from the same base line information with the understanding of each other's needs and roles. Transferring of knowledge and best practice will also be a main objective of these events and will allow the stakeholders to understand not only what they have to work with in their own individual areas but also how other regions have tackled many of the problems that are generic to the sector.

8.3.3 Marina 2020

Separate from this knowledge transfer will be a project aimed at identifying a vision for marinas to work towards. Marinas have been shown to be an important part of a local economy that has a greater potential than is currently being utilised. Plans are now being developed to take this idea forward and it is anticipated that a series of events will take place to gather the necessary research culminating in a report on A Vision for Marinas in 2020.

Utilising the research that was generated for this report, additional information will be sought from marinas on what capacity for diversification and utilisation of resources they currently have and what the potential regarding interest and availability is for taking any identified objectives forward. One of the main features of the research in this report is the perceived misunderstanding between local authorities and marinas on what activities take place, where the benefits of marinas lie, and the scope for increasing the economic growth of the local area through marina activities. Bridging this gap will be one of the objectives of this activity.

A key difficulty with comparing marinas is the three fundamental elements of marina constraint that were identified in the research: location, ownership, and size. Whereas most industrial units work to a similar set of conditions regardless of these elements, marinas appear to be dependent on them. This is an aspect of marina activity that needs further exploration in order to generate a vision for best practice that can be translated across the marina type and also cross border. It will also be important to gain the understanding of the local authorities and the policies that impact on marinas in order to ensure facilitation of growth is wedded to local interests and plans.

It will be particularly important to ensure marinas are the main developers of the vision for activities to stand any chance of success. By encouraging the transfer of current best practice and opening up opportunities for efficiency gains and cost reduction will contribute to the success of the vision and increase the chances of sustainability and economic growth to the local area.

8.4 Finally

This report should be taken as a work in progress rather than a definitive analysis of the marine and maritime sector across the four themed areas. It is hoped that the knowledge and understanding that has been identified should be used as the foundations for further understanding and increased activity that although targeted, should not be all-inclusive. Collating the evidence with the best practice found in the French partner regions will increase the potential of collaboration and sustainability and may lead to further ideas and activities that can be taken forward. Many co-operative relationships have been developed during the research period that will hopefully translate into strong collaborative partnerships that will ensure sustainability beyond the scope of the CAMIS project.

9 Annex 1

Proposal

As a result of the activities of the CAMIS programme, a requirement for a tool to enable the support of economic activity within the marine industry has been identified.

An MS Excel spreadsheet of companies, including information containing known membership of clusters within the industry sector has already been created and is constantly evolving as other sources of data are made available. To maximise the potential of this spreadsheet it is suggested that the data should be stored in a central location and accessed via a suitable method.

It is proposed to create a database structure which enables the storage and manipulation of the expanding data; in parallel to develop an internet based portal to allow subscribers to gain access this centralised resource; promoting innovation and assisting in the identification of opportunities and potential partnerships.

The project will consist of three separate aspects interlinked.

The Resource: - Relational Database
Access to Resource: - Internet Portal
Meeting the Business Need: - Development / Informative

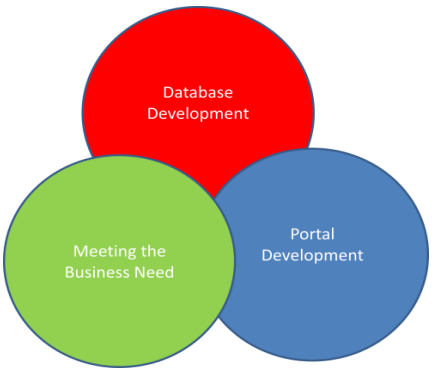


Figure 27 Relationship between Three Outcomes

The Business Need

The business need can be simplified into two areas, Informative and Development. The ***informative*** allows subscribers to become informed and, or indeed, to inform others of various opportunities, skills, and services, amongst other aspects as demonstrated in **Figure 28**.

The ***development*** side allow subscribers the opportunity to have input either directly, such as conveying a view on a policy document or potentially collaborative/partnership opportunities on a new product for example. See **Figure 28** for a range of suggested topics.

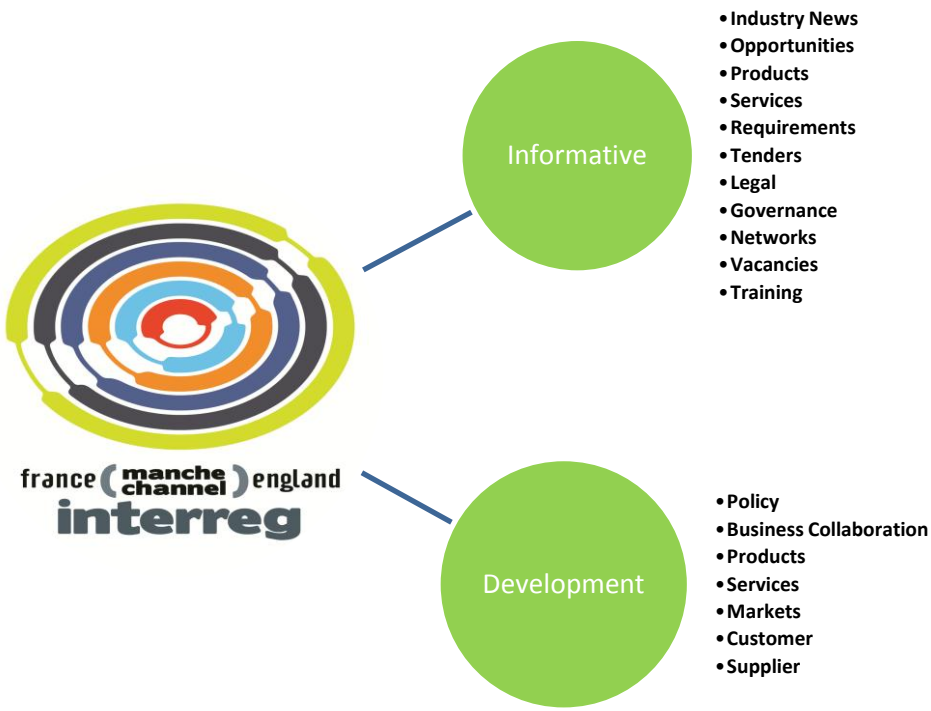


Figure 28 The Business Need (Informative & Development)

Background

Channel Arc Manche Initiative Strategy (CAMIS) is a programme looking at business development activities centred on a defined geographical area (as defined within other documents). The business interest is focused on Marine Business and in the widest context includes any business which has a relationship with the maritime industry. Specifically this will include the obvious such as marinas, ship builders, chandlers to the less obvious such as architect's, insurers etc.

The focus of activity is around the concept of clustering, examining the "grouping" of business by a number of different factors.To date a database of business has been created to represent the UK side of the activities. The databases encompasses <7000 sites (the word sites is used as relationship exists between the company and sites were one company may have many sites e.g. Premier Marinas). The anticipation is that the database can be used to support economic activity promoting innovation and assisting in the identification of opportunities and potential partnerships.

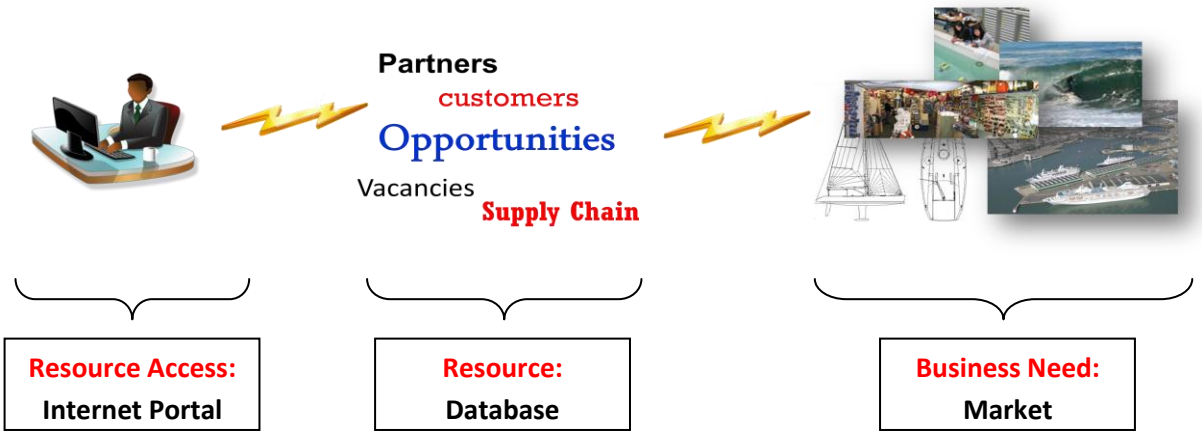
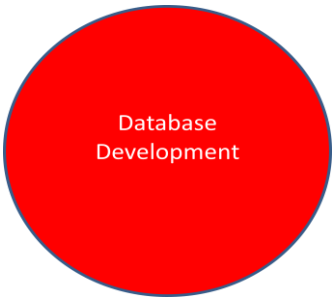


Figure 29 Representation of Process

Elements of the Proposal

Data base Development

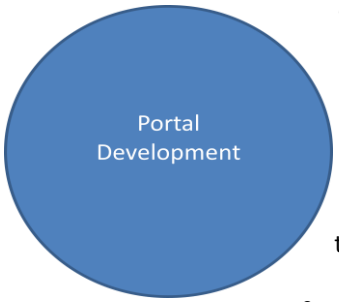


- Current data stored in Excel, UK <7000 records, France Building
- Standard Relational Database
- Storage / Hosting (Possible 3rd Party : Cloud)
- To maintain integrity will require continuous administration (1 x FTE)

Main Challenge of the Database: Language

- Privileges granted for organisations to create / edit and take ownership of data
- Organisation allowed to create own translations and entered as records (language will be flagged for the user) otherwise data can be translated using online translators with caveat of limitations.
- Create a dictionary, "working document", which will be used to assist query searches etc.

Portal Development

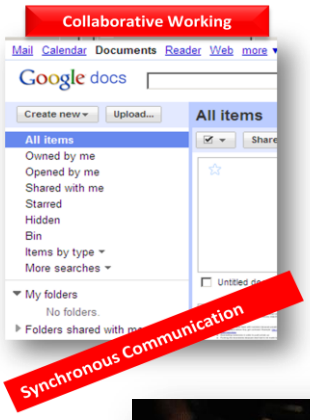


- Customised, Personalised and Adaptive
  - Type: Vertical Industry Portal
  - Based around database
  - User to Login to gain access, additionally allowing the portal to reflect user preferences
- User can enter location which will automatically display the geographical cluster which they are included and therefore displaying more relevant information in the first instance (It may be beneficial for the user to associate with a "Business Type" Cluster(s))
- Home Page Will Split into Areas Of "Topics" the user will be able to rearrange according to user preference (e.g. Enlarging Window, Decreasing Window, Moving Topic Heading to "Dead Zone" located on the home page)
- "Scrolling Topic" similar to status section within Facebook will be populated by:
  - **User:** Edits / Update user will asked "do you want to announce this change"
  - **User:** User Can Create An Announcement

- **Admin:** Placing Relevant Announcements

- Provide Tools (Amazon) to allow Users to place all or aspects of the portal within their own website

Wish List



- **Meeting Rooms**

  - A representative of an organisation can book space within a virtual meeting room where they will invite others to join them. In the meeting room the group can view, discuss and create documents

- **Different Platforms**.

- Develop portal to operate other platforms i.e. mobile telephones and the latest ranges of tablets.

Meeting the User Needs

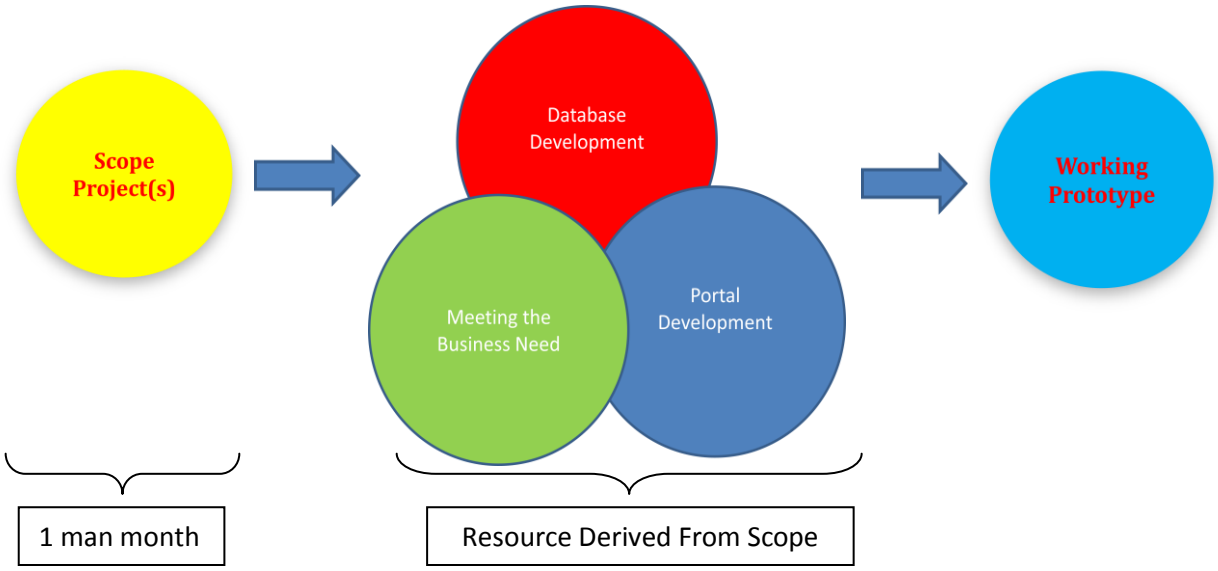
The database and the portal are both more technical in nature, to avoid potential under usage and poor uptake research into establishing the user requirements should be undertaken and monitored.

Next Stages

The next stage will be to effectively scope the project to establish the deliverables and create a project brief to form the basis of the project(s)

It is anticipated that resource required would be equivalent to a 1 man month.

After the scoping the subsequent stages would involve the development of the intended resource and access to a working prototype stage for evaluation.



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