



Clyde Mission Maritime Opportunities

Final Report
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Executive Summary

The Clyde Mission is a place-based initiative launched in January 2020 and led by the Scottish Government, to ‘Make the Clyde an engine of inclusive and sustainable growth for the city, the region and Scotland.’ The Clyde has a very strong maritime heritage, some of which remains today¹, so it is considered important that future opportunities, where the maritime sector can be internationally competitive, should be identified for support and development. This report presents the results of a market led study, based on desk research and wide-ranging stakeholder consultation, to identify such opportunities where the current capability and assets on the Clyde can be developed to capitalise on these opportunities. The study has also considered how international best practice in maritime sector development can be applied to enhance the development of activities on the Clyde.

A wide definition of the maritime sector was used for this study, namely the European Commission Blue Economy sector², which is segmented into established and emerging subsectors as follows:

Established	Emerging
<ul style="list-style-type: none"> • Fisheries and fish processing • Oil and gas • Port activities • Shipbuilding and repair • Maritime transport • Marine/coastal tourism 	<ul style="list-style-type: none"> • Aquaculture • Offshore wind and marine energy • Marine biotechnology • Coastal and environmental protection • Desalination

The global maritime market is already significant with expectations that it will double in size from 2016 to 2030 to a value of \$3 trillion³. All subsectors are expected to show growth over the period to 2030, with offshore wind, fisheries and fish processing, marine aquaculture and port activities demonstrating the highest global growth rates. Key drivers underpinning these growth rates are globalisation and climate change. However, rather than focus on global markets, it was considered more appropriate to assess a wide range of local market opportunities that were more tangible and accessible to the maritime sector on the Clyde. These are predominantly, but not exclusively, Scottish / UK market opportunities. Attractive market opportunities identified were:

- **Commercial shipbuilding** – a UK National Shipbuilding Strategy Refresh is being prepared. The Maritime Enterprise Working Group and the Society of Maritime Industries both identify a future UK demand for 60 to 70 ships, with annual requirements of 6 to 7 vessels, with a significant number of these to address Scottish requirements
- **Defence shipbuilding** – to optimise local supply chain opportunities generated from Royal Navy, BAE Systems (Type 26 frigate) and Babcock Marine (Type 31 frigate) requirements
- **Ship repair and maintenance** – specifically emerging opportunities for retrofitting low carbon propulsion systems in response to the Scottish Government, and other Net Zero commitments

¹ An Analysis of the Maritime Sector in Scotland, Optimat, 2018 for the Scottish Maritime Cluster and Scottish Enterprise

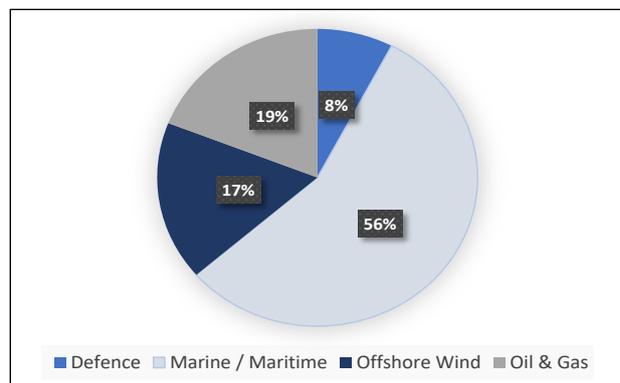
² The 2018 Annual Economic Report on the Blue Economy, European Commission, 2018

³ The Ocean Economy in 2030, OECD, April 2016



- **Ship management** – to support the sustainability and development of Glasgow’s existing company base, which is already Europe’s leading ship management cluster⁴
- **Low carbon/smart ports** – to enable Clyde ports to meet the changing / future needs of commercial and leisure customers
- **Developing Faslane’s supply chain** – addressing the range of opportunities arising from the Royal Navy’s expansion of its activity at the Faslane base, HMNB Clyde, and its wider plans for growth in Scotland (i.e., Maritime Enterprise Scotland⁵) whilst aligning with Scottish Government policy regarding nuclear weapons and their presence in Scotland
- **Offshore wind** – to exploit national / UK supply chain opportunities
- **Offshore wind decommissioning** – specifically the emerging opportunity for wind turbine blade decommissioning / recycling⁶
- **Marine tourism** – supporting the Scottish marine tourism strategy⁷, responding to marine tourism market growth
- **Water source zero emissions heating systems** – in response to The Scottish Government recently published draft heat in buildings strategy⁸ using water-source heat pumps
- **Maritime training** – extending international business and addressing local maritime engineering market demand

The scale and capacity of the maritime sector on the Clyde and its ability to access these opportunities was assessed. Over 350 companies were identified within the sector and, at a high level, can be distributed by sub-sector as shown opposite. These were further segmented into a range of secondary and tertiary categories.



Key areas of industrial strength identified were defence vessel manufacture, defence vessel repair and maintenance and ship management.

However, it should also be noted that there is scope for developing the depth of the sector / supply chain.

The industrial capability is complemented by significant strengths in maritime research, including the hosting of MarRI-UK at the University of Strathclyde, and maritime training, especially at City of Glasgow College. It is also supported by a number of land-based maritime assets along both banks of the river as shown below.

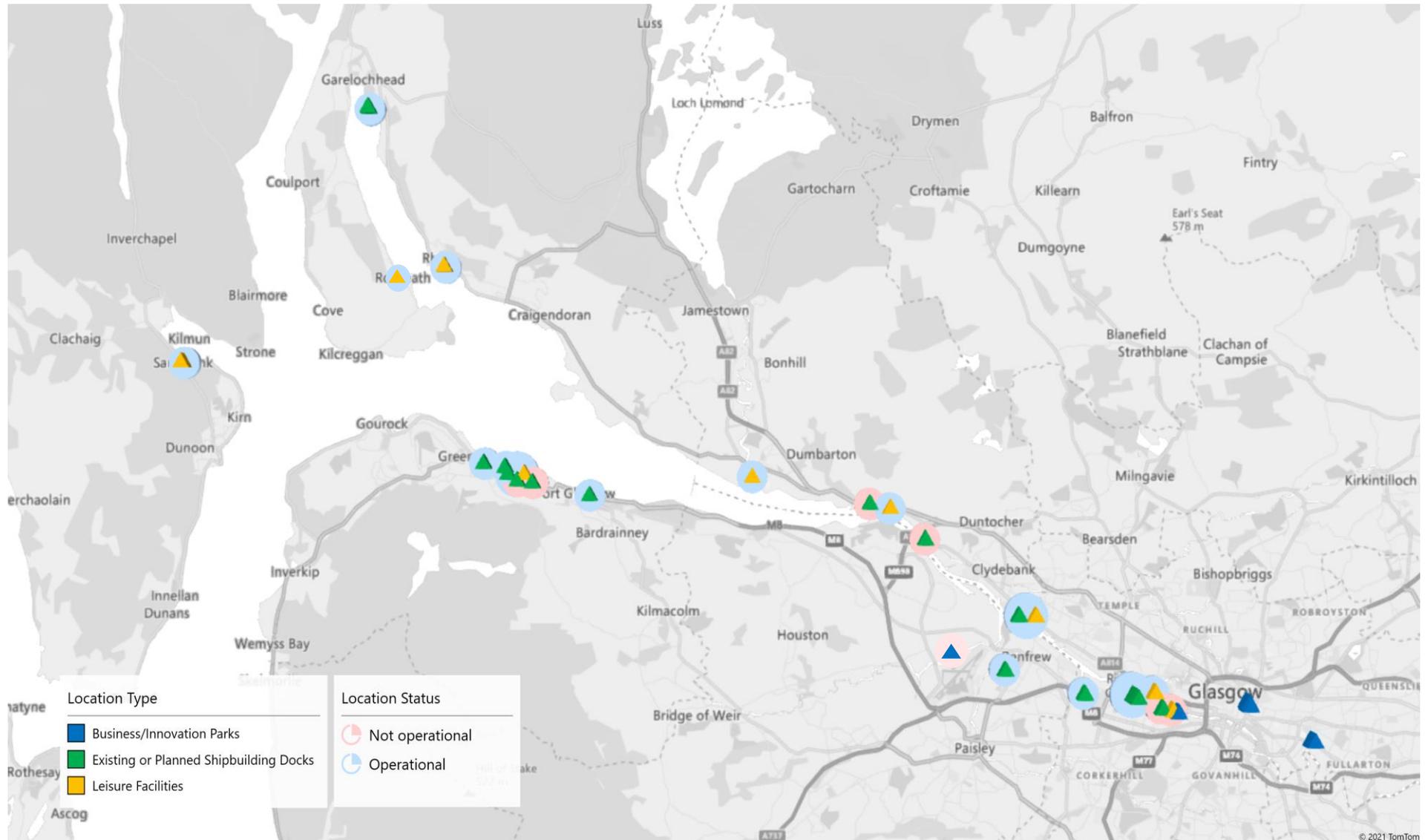
⁴ <https://www.insider.co.uk/special-reports/scotland-greatest-secret-seven-seas-21807795>

⁵ A Vision for Maritime Enterprise Scotland, Hamish Tetlow, RN Maritime Enterprise Scotland, Presentation to the Scottish Maritime Cluster, December 2020

⁶ https://ore.catapult.org.uk/wp-content/uploads/2021/03/CORE_Full_Blade_Report_March_2021-FINAL-4.pdf

⁷ https://scottishtourismalliance.co.uk/wp-content/uploads/2020/08/FINAL-Strategy-Documents_Giant-Strides-2020-2025.pdf

⁸ <https://consult.gov.scot/energy-and-climate-change-directorate/heat-in-buildings-strategy/>





A full SWOT analysis has been completed which highlights key strengths that can be used to exploit tangible opportunities and also identifies a number of areas for development.

Five maritime clusters elsewhere, namely Merseyside, Denmark, Finland, Norway and Canada, were assessed to identify best practice. Key transferable lessons for the Clyde are:

- The importance of receiving government support and commitment
- Industry leadership
- A clear national / regional strategy
- Sufficient management resource
- The importance of facilitating collaboration

The importance of these to the Clyde has been considered and are addressed in the study recommendations.

The attractive market opportunities listed above were assessed in terms of the scale of the opportunity, the current Clyde capability, the challenge / gap to bridge to access the opportunity, how to address this challenge and the potential economic impact. This analysis highlighted attractive features within all opportunities but recognised different scales of challenges to address to exploit the opportunities and different expected economic impacts and timescales to impact. Within the scope of this study these challenges and potential impacts could not be quantified and ranked in a robust way. Therefore, in identifying future actions we have endeavoured to consider all of these identified opportunities. A key first step in progressing all opportunities will be to assess the investment required and potential impact.

We have defined fourteen actions to develop the maritime sector on the Clyde. Three are sector wide actions and eleven are designed to address the eleven specific opportunities identified. These are:

a) Sector Wide Development Actions

These will develop a clear and cohesive way forward for the sector and to raise its profile, both in the UK and overseas, building on international best practice. They are:

- 1. Preparation and implementation of a Clyde maritime sector strategy** – to define a direction for the sector and gain the commitment of all key players. This should be an industry led activity with strong support from Government.
- 2. Resourcing sectoral development** – provision of an appropriate level of resource to ensure effective development of the sector
- 3. Raising the profile of the sector** through a sector marketing programme. Progress in the specific opportunities below will provide useful material for this marketing programme.

These are required to support the development of the sector and reflect best practice elsewhere.

b) Addressing Specific Opportunities

Specific opportunities for development are:

- 4. Commercial shipbuilding** – to meet local and wider UK market demand for new commercial vessels. Increased shipbuilding activity on the Clyde would act as a catalyst to developing local supply chains and many associated benefits.



5. **Defence shipbuilding** – building Scottish supply chains to meet the needs of the major defence shipbuilding companies in Scotland
6. **Ship repair and maintenance** – to develop new, innovation-led capability in low carbon / low carbon ship power systems
7. **Low / zero carbon smart ports** – a development requirement, rather than opportunity, to ensure local ports can meet the changing needs of commercial and leisure customers
8. **Ship management cluster development** – to secure and grow the “Glasgow ship management cluster”
9. **Developing Faslane’s supply chain** – to maximise supply chain opportunities at Faslane
10. **Offshore wind** – to maximise supply chain opportunities for the Clyde area in a growing national / UK market
11. **Offshore wind decommissioning** – to develop new, innovation led capability in turbine blade recycling
12. **Marine tourism** – to maximise marine tourism activity in the Clyde Mission area
13. **Water source zero emissions heating systems** – to establish the Clyde as UK / international leader in water source zero emissions heating
14. **Maritime skills centre** – to support continued exploitation of international mariner training opportunities and build maritime engineering skills development capabilities

Our recommendation is that all fourteen areas are pursued, with early and ongoing analysis of the potential economic impact for each to validate that required investments are justified. This requires the involvement of a range of different organisations, as summarised overleaf, with red bullets highlighting the lead organisation for each action.

We believe that success with these actions will deliver significant market led growth of the maritime sector on the Clyde.



Opportunity and Actions	Key Stakeholders												
	Private Sector	Infrastructure Owners	Scottish Government, Agencies and subsidiaries	UK Government	Local Authorities	Scottish Maritime Cluster	Other Trade / Sector Associations	Scottish Enterprise	Scottish Development International	Skills Development Scotland	Royal Navy	NMIS / Catapult Centres	Universities / Colleges
1. Prepare and Implement Clyde Maritime Sector Strategy	●	●	●	●	●	●		●		●	●		●
2. Resource Sectoral Development	●		●	●	●	●		●		●			
3. Raise the Profile of the Sector	●					●			●		●		
4. Commercial Shipbuilding													
Joint public and private sector commitment	●	●	●	●									
Establish and lead Commercial Shipbuilding Leadership Group	●							●					
Develop vessel designs that offer viable business opportunities	●		●										
Develop innovative, sustainable procurement approaches	●		●	●									
Develop / invest in appropriate infrastructure		●	●		●								
Identify / pursue supply chain development opportunities	●					●		●					
Invest in innovation of next generation technologies	●	●						●				●	●
5. Defence Shipbuilding													
Review existing initiatives and, if appropriate, identify scope for development	●			●			●	●			●		
Prepare and implement updated supplier development programme	●			●			●	●			●		
6. Ship Repair and Maintenance (incl. retrofit of low emission technology)													
Form cluster of relevant companies and academic groups	●					●							
Support the development of R&D / innovation proposals			●	●				●				●	●
Develop linkages with relevant shipbuilding and repair companies	●					●							
7. Ship Management Cluster Development													
Establish ship management cluster	●					●							
Develop and implement cluster action plan	●					●							
8. Low Carbon / Smart Port Development													
Establish port development group		●			●	●	●	●					
Prepare and implement development plan		●			●	●	●	●					
9. Developing the Faslane Supply Chain													
Establish supply chain development group	●			●		●	●	●			●		
Identify potential opportunities, match with cluster capabilities and quantify the opportunity	●			●	●	●	●	●			●		
Invest in innovation of next generation technologies	●			●							●		
Design and implement supplier development programme	●			●		●	●	●					
10. Offshore Wind Opportunities													
Assess existing and potential supply chain players in the region	●					●	●	●					
Identify current and potential business growth opportunities	●					●	●	●					
Implement supply chain development programme	●		●			●	●	●					
11. Offshore Wind Decommissioning													
Prepare strategy to develop innovation capability and activity												●	
Support the development of R&D / innovation proposals	●							●				●	
Encourage development of an embryonic group of industrial companies	●							●					
12. Marine Tourism Development													
Establish Clyde Mission marine tourism working group			●		●	●	●						
Prepare and implement development plan	●	●				●	●						
13. Water Source Zero Emissions Heating Systems													
Secure Heat Hub in Clyde Mission area	●		●		●		●						
Identify and develop new district heating projects	●		●		●		●						
14. Maritime Skills Centre													
Action linked to growing the share of international maritime skills training	●					●			●				●
Develop sector skills investment plan	●								●				
Implement plan	●					●			●		●		●



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Appendix A: Briefing Document for Companies and Stakeholders

Appendix B: List of Participants in the Study

Appendix C: Global Market Analysis

Appendix D: Cluster Summaries, Best Practice and Case Studies

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Approved By: Iain Weir

Date: 31/05/2021

1 Introduction

1.1 Context

The Clyde Mission is a place-based initiative set-up in January 2020 and led by the Scottish Government, to ‘Make the Clyde an engine of inclusive and sustainable growth for the city, the region and Scotland.’ Its aim is to develop and exploit the untapped opportunity for economic and social development on the Clyde. It covers an area of 500 metres each side of the river from the upper reaches of the Clyde in the east, through to the mouth of the river at Inverclyde/Argyll & Bute, as follows:

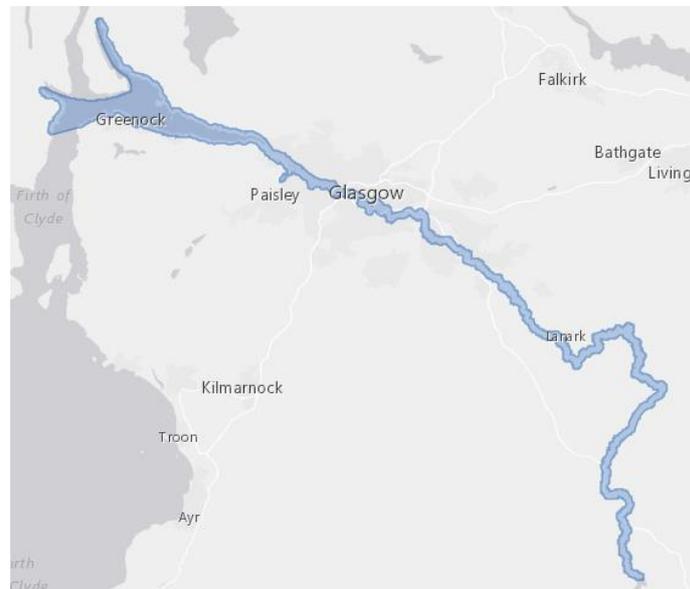


Figure 1: The Clyde Mission Area

This region has been the focus of this study, but where appropriate we have noted relevant activities and facilities outwith this area.

Clyde Mission is following a mission-based approach⁹ and has established five draft missions:

1. Create new, good and green jobs and a workforce with the skills to secure those jobs.
2. Use vacant and derelict land for the benefit of the economy, the environment and communities.
3. Adapt to climate risks, especially flooding.
4. Accelerate Scotland’s progress to net zero.
5. Use the river to create better places for people and communities.

The Clyde has a very strong maritime heritage, some of which remains today¹⁰, so it is considered important that future opportunities, where the maritime sector can be internationally competitive,

⁹ https://ec.europa.eu/info/sites/info/files/mazzucato_report_2018.pdf

¹⁰ An Analysis of the Maritime Sector in Scotland, Optimat, 2018 for the Scottish Maritime Cluster and Scottish Enterprise

should be identified for support and development. This project is designed to identify such opportunities by:

- Exploring global markets to identify opportunities where the capabilities of Clyde based companies and assets can be developed to capitalise on these opportunities
- Assessing and mapping the strengths and capabilities of the companies and assets in the Clyde Mission area
- Identifying the gaps in capability that are required to capitalise on achievable global maritime opportunities
- Assessing how other maritime clusters have developed and sustained their market position including any partnership approaches, and benchmarking the Clyde against other maritime clusters
- Developing recommendations for how the Clyde can pursue a market led approach to growth.

1.2 Defining the Maritime Sector

There are several definitions of the maritime sector. For this study we have specified the scope of the sector as the Blue Economy¹¹, as defined by the European Commission. Typically, the Blue Economy is segmented into established and emerging industry sectors as follow:

Established:

- Fisheries and fish processing
- Oil and gas
- Port activities
- Shipbuilding and repair
- Maritime transport
- Marine/coastal tourism

Emerging

- Aquaculture
- Offshore wind and marine energy
- Marine biotechnology
- Coastal and environmental protection
- Desalination

Using this definition offers the widest scope for the development of the maritime sector in the Clyde Mission area

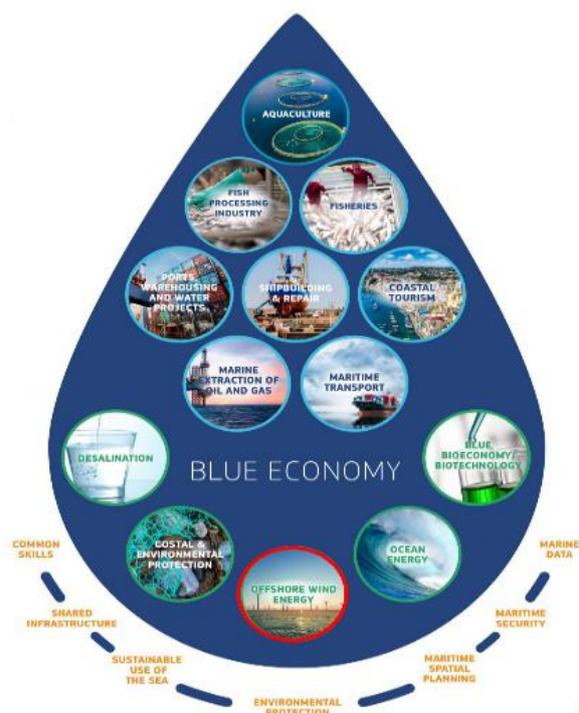


Figure 2: The Blue Economy

¹¹ The 2018 Annual Economic Report on the Blue Economy, European Commission, 2018

1.3 Methodology

The methodology adopted for this study consisted of four key stages:

1. Desk research to characterise global markets, assess the industry base, assets and infrastructure in the Clyde Mission area and evaluate maritime clusters elsewhere
2. Primary research with relevant companies, stakeholders and clusters elsewhere to understand the potential for development of the maritime sector in the Clyde area. The key areas discussed with companies and stakeholders are detailed in the briefing document included in Appendix A and those organisations that contributed to the study are included in Appendix B.
3. Completion of a “gap analysis” consisting of a SWOT analysis, cluster mapping and cluster benchmarking to identify development opportunities and actions
4. Identification of recommendations and report preparation

The work was jointly carried out in February to April 2021 by Optimat and the Scottish Maritime Cluster.

1.4 Report Structure

Following this introductory section, global maritime market growth is summarised, with more detail in Appendix C, and then local market opportunities are presented. The maritime cluster on the Clyde is then described in Section 3 and this is followed by a summary of transferable lessons from maritime clusters elsewhere in Section 4. This is supported by a summary of the clusters studied and cluster case studies in Appendix D.

Development opportunities are assessed in terms of the opportunity, current capability, the challenge of exploiting the opportunity and development options to address the challenge. Actions to address these development opportunities / needs are then presented and the report is completed with our conclusions and recommendations.

2 The Maritime Market

The maritime market has been considered at two levels. Firstly, the worldwide market has been assessed to understand global growth market segments, key drivers and trends. Thereafter, analysis of more local, Scottish/UK, markets has been carried out to identify tangible and accessible opportunities for companies in the Clyde Mission area.

2.1 The Global Market

As indicated above, we have focused on the Blue Economy, as defined by the European Commission.

OECD have assessed the development of the **ocean industries**, the definition of which is very similar to the Blue Economy. It is segmented into established and emerging sectors as follows¹²:

Established	Emerging
Capture fisheries	Marine aquaculture
Seafood processing	Deep- and ultra-deep water oil and gas
Shipping	Offshore wind energy
Ports	Ocean renewable energy
Shipbuilding and repair	Marine and seabed mining
Offshore oil and gas (shallow water)	Maritime safety and surveillance
Marine manufacturing and construction	Marine biotechnology
Maritime and coastal tourism	High-tech marine products and services
Marine business services	Others
Marine R&D and education	
Dredging	

Figure 3: Ocean Industries Segmentation

Ocean industries are predicted by the OECD to grow by a factor of two to \$3 trillion between 2010 and 2030. Further, OECD's prediction for global market growth of key segments is presented below:

Industry	Compound annual growth rate for GVA between 2010 and 2030	Total change in GVA between 2010 and 2030	Total change in employment between 2010 and 2030
Industrial marine aquaculture	5.69%	303%	152%
Industrial capture fisheries	4.10%	223%	94%
Fish processing	6.26%	337%	206%
Maritime and coastal tourism	3.51%	199%	122%
Offshore oil and gas	1.17%	126%	126%
Offshore wind	24.52%	8 037%	1 257%
Port activities	4.58%	245%	245%
Shipbuilding and repair	2.93%	178%	124%
Maritime equipment	2.93%	178%	124%
Shipping	1.80%	143%	130%
Average of the total ocean-based industries	3.45%	197%	130%
Global economy between 2010 and 2030	3.64%	204%	120% ¹

Figure 4: Ocean Industries Global Market Growth

This can be presented graphically as follows:

¹² The Ocean Economy in 2030, OECD, April 2016

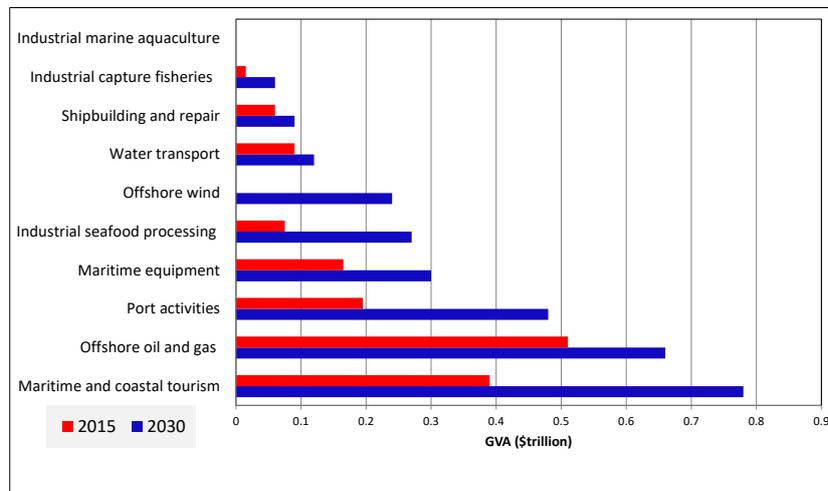


Figure 5: Ocean Industries Segmentation and Market Growth

It is recognised that these are global figures, but there are some key points to note when focusing on the Clyde, namely:

- The major growth in offshore wind, albeit from a small base
- The scale of the maritime and coastal tourism market and its expected growth
- Significant growth in port activity
- A continuing significant oil and gas sector

These are discussed further below.

The European Commission publishes annual reports on the Blue Economy. The 2020 report¹³ shows recent performance of the Blue Economy as follows:

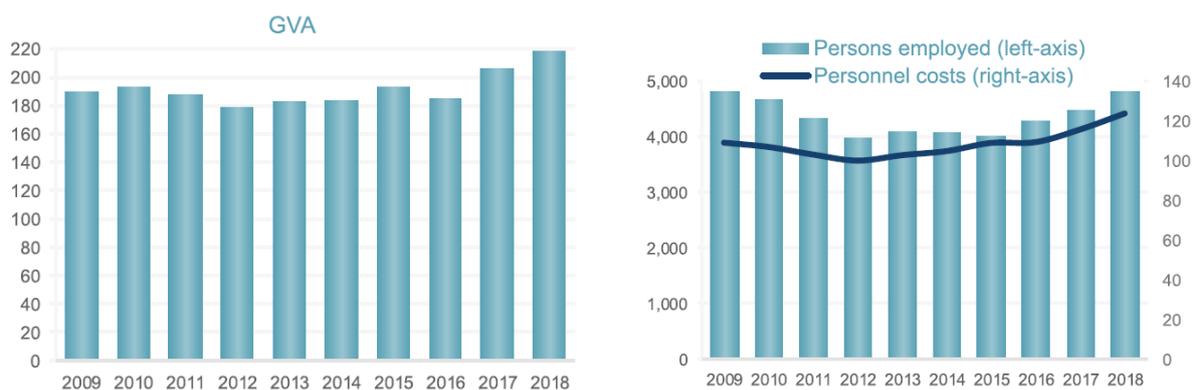


Figure 6: Recent Growth in the Blue Economy

These figures would suggest that the Blue Economy in Europe is not growing at a rate that would mean a doubling in size between 2010 and 2030, as suggested by the OECD ocean industries report described earlier.

¹³ The Blue Economy Report 2020, European Commission, 2020

In Appendix C, each of the main sectors within the Blue Economy are summarised in more detail, with data presented on the global market size and key trends and drivers.

2.2 Local Market Opportunities

Several local market opportunities have been identified, through a combination of desk research and stakeholder consultation, and assessed during this study. These are summarised as follows.

2.2.1 Shipbuilding and Repair

There is a growing commitment to re-establish the UK shipbuilding industry. The UK Prime Minister has made several statements in the last year pledging to restore UK shipbuilding. The recently announced £24 billion boost to defence spending includes the go-ahead for the construction of a new generation of warships, and the Prime Minister stated in a recent House of Commons speech that this investment will “spur a renaissance of British shipbuilding across the UK. In Glasgow and South Belfast, Appledore and Birkenhead.”¹⁴ This view of a resurgence in UK shipbuilding is supported by the response from Maritime UK, the umbrella body for the UK maritime sector, which believes that building more ships with cutting edge technology will create thousands of jobs across the UK, including across shipyards¹⁵.

2.2.1.1 Commercial Shipbuilding

Scale of the Opportunity

A UK National Shipbuilding Strategy Refresh is being prepared and the recent Society of Maritime Industries (SMI) annual conference entitled “Building the future of the UK’s shipbuilding enterprise” addressed this opportunity and strategy.

Maritime sector organisations¹⁶ estimate a UK requirement of between 60 and 70 ships, with up to 6-7 required per annum, based on:

- All Royal Navy and RFA requirements¹⁷
- Trinity House and Northern Lighthouse Board requirements¹⁸
- Border Force requirements – offshore and inshore patrol vessels
- DEFRA research vessel
- NIAFB research vessel
- Marine Scotland research vessels
- Marine Scotland patrol vessels
- Scotland’s island and inter-island ferry requirements (see below)

A significant local Scottish market for commercial vessels can be defined. This includes:

¹⁴ Prime Minister’s speech on increased military investment, made in the House of Commons, November 2020

¹⁵ Maritime UK, Press Release, November 2020

¹⁶ The Maritime Enterprise Working Group and the Society of Maritime Industries

¹⁷ <https://www.gov.uk/government/news/the-defence-command-paper-sets-out-the-future-for-our-armed-forces>

¹⁸ <https://www.gov.uk/government/publications/general-lighthouse-authorities-fleet-review>

- Caledonian Maritime Assets' (CMAL) requirement to commission over 20 replacement ferries by 2030¹⁹:
 - 7 'major' vessels (replacements for the MV Isle of Mull, MV Hebridean Isles, MV Lord of the Isles, MV Isle of Lewis, MV Caledonian Isles, MV Clansman, MV Hebrides). The procurement process has begun for a replacement for the MV Hebridean Isles to serve Islay and consideration is being given to procuring two of an identical design.
 - Small Vessel Replacement Programme Phase 1 - up to 7 'small' double ended zero/low emission vessels using electric propulsion. Length overall (LOA) of approximately 45m, with a build tender programmed for 2022.
 - 3 small passenger-only vessels – LOA circa 20m and probably aluminium. These are expected to be tendered in 2022.
 - 2 Northlink RoPax vessels (replacements for the R-Series freight vessels Helliard and Hildesay). LOA approx.140m, circa 1400 freight lane-metres, 200 Pax.
 - Small Vessel Replacement Programme Phase 2 – up to 5 'small' zero/low emission vessels built to operate in more challenging waters than in Phase 1

The draft Infrastructure Investment Plan for Scotland 2021-22 to 2025-26²⁰ details the investment for procurement of several vessels (Islay, Gourock-Dunoon/Kilcreggan, Small Vessel Replacement Programme Phase 1, Oban-Craignure, Mallaig-Lochboisdale, Northern Isles freighters) valued at £281m in the five years of that Plan, with further funding required in the rest of the decade to complete those projects and to deliver further on the programme outlined above.

- Northern Lighthouse Board
 - The Northern Lighthouse Board (NLB) currently operates and maintains 206 lighthouses and 170 buoys as well as providing radio aids to navigation (AtoN).
 - NLB operates two ships: NLV PHAROS and NLV POLE STAR. The ships carry out buoy work, deliver stores and supplies to lighthouses and inspect navigation aids on oil and gas rigs in the Scottish sector.
 - After more than 20 years of service, NLV POLE STAR is nearing the end of her life and NLB has embarked upon a project to replace – target in service date of September 2024.
- Scottish Fisheries Protection Agency
 - The Fisheries Protection Agency operates four ships in Scottish waters: Sulisker, Vigilant, Norna and Minna.
- Marine Scotland
 - Marine Scotland's marine surveillance capability is made up of three Marine Protection Vessels (MPVs): Marine Protection Vessel Jura is the first in her class and was launched in

¹⁹ Transport Scotland

²⁰ <https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2020/09/national-mission-local-impact-draft-infrastructure-investment-plan-scotland-202122-202526/documents/draft-infrastructure-investment-plan-2021-22-2025-26-strategic-environmental-assessment-environmental-report/draft-infrastructure-investment-plan-2021-22-2025-26-strategic-environmental-assessment-environmental-report/govscot%3Adocument/draft-infrastructure-investment-plan-2021-22-2025-26-strategic-environmental-assessment-environmental-report.pdf>

2005. Her sister ship, MPV Hirta, was commissioned into service in March 2008. The third vessel, MPV Minna, was commissioned in 2003.

- Oil & gas and offshore renewables service vessels
 - There is likely to be strong demand for new offshore support vessels to coincide with increased decommissioning activities and increased deployment of offshore renewable energy assets.
- Aquaculture / fish farming vessels
 - There is no available data to quantify the current and future demand for aquaculture support vessels, but market trends suggest there is likely to be strong growth in the coming years. On the Clyde, repurposing of oil and gas vessels for aquaculture is already taking place (Dales Marine) and shipbuilders such as Damen have already commenced the build of landing utility vessels, in partnership with an Exeter based company, to supply into the Scottish market.

Key stakeholders interviewed during this study have reviewed this future “pipeline” and have considered it sufficient to support two shipyards on the Clyde. One such analysis was presented as shown opposite²¹:

It should be noted that the commercial industry is moving to a build and maintain business model. Here, the shipbuilder enters a long-term contract to maintain the vessel throughout its life. Clearly, this increases the revenue generating opportunity for the builder.

Competition

It is unlikely the UK will compete with China, South Korea, and Japan, for work building ships such as super tankers and very large crude carriers (VLCCs) due to capacity and competitive (e.g., track record and supply chain infrastructure) factors. However, there is opportunity to capture some of the local market as detailed above in the domains of ferries, support vessels and research ships. Current commercial shipbuilding capacity on the Clyde can accommodate vessels of just over 100 metres in length.

		Newbuild Programme					Annual Spend (Avg £53m)
		Loch Class			Large Ferry		
		30m (£10m)	40m (£12m)	50m (£15m)	70m (£35m)	90m (£45m)	
2023	Q1	start			start		42
	Q2		start				
	Q3	deliver					
	Q4						
2024	Q1	start	deliver				56.5
	Q2			start	deliver	start	
	Q3	deliver					
	Q4						
2025	Q1	start		deliver			58.5
	Q2		start				
	Q3	deliver			start	deliver	
	Q4						
2026	Q1	start	deliver				54.5
	Q2			start			
	Q3	deliver			deliver		
	Q4			deliver		start	
2027	Q1	start		deliver			51.5
	Q2		start				
	Q3	deliver					
	Q4						
2028	Q1	start	deliver		start	deliver	56.5
	Q2			start			
	Q3	deliver					
	Q4						
2029	Q1	start		deliver			56.5
	Q2		start		deliver	start	
	Q3	deliver					
	Q4						
2030	Q1	start	deliver				58.5
	Q2			start			
	Q3	deliver			start	deliver	
	Q4						
2031	Q1	start		deliver			47.5
	Q2		start				
	Q3	deliver					
	Q4				deliver		

Figure 7: Model of Potential Shipbuilding Programme

²¹ Delivering a Marine Technology Hub for Scotland – White Paper, The Malin Group, December 2020

Current and any future shipyard on the Clyde will face strong competition from both UK and international companies. In the UK, there is competition from shipyards with the capacity to produce vessels greater than 50m in length, such as Cammell Laird (Merseyside), of which Peel Ports, the owner of Inchgreen, is a major shareholder; Appledore (Devon); and Harland and Wolff (Belfast). Appledore and Harland and Wolff are owned by InfraStrata plc, a company focused on “strategic infrastructure projects and physical asset lifecycle management” that recently acquired two of the three BiFab yards (in Fife and the Isle of Lewis) from administrators.

In terms of international competitiveness and Scotland’s position, clearly the industry will remain dominated by Far East countries. Even highly efficient European shipyards struggle to compete against Far East shipyards. European shipyards do have a more complete supply chain, with many of the systems and components manufactured locally, whereas UK and Scottish shipyards do not have this supply chain presence. This is a significant disadvantage as it introduces delay when engineers must travel to Scotland whenever a technical issue needs resolving. Other international maritime centres of activity, such as San Diego, Abu Dhabi, and Singapore are well established – Singapore has a well-educated workforce, with major incentives supporting inward investment and minimal amounts of corporation tax.

2.2.1.2 Defence Shipbuilding

Scale of the Opportunity

In its 2017 National Shipbuilding Strategy, the UK Government proposed to overhaul the way the MOD procures surface ships, opening competition to both national and international shipyards. Since its publication, there has been continued debate both within the industry and in parliament over the implementation of the strategy and how more of the pipeline of builds can be secured by UK shipyards. It has been argued that all Fleet Solid Support (FSS) ship contracts should be restricted to UK shipyards to support the shipbuilding industry, secure jobs, and retain skills²².

Under EU procurement rules, the UK Government could restrict bids for warships to UK companies but has previously refused to class some Royal Navy support ships as warships. In October 2020, however, the Defence Secretary, Ben Wallace, made a statement referring to Royal Fleet Auxiliary (RFA) Fleet Solid Support (FSS) ships as “warships” and although international companies will be invited to contribute, the manufacturing team must be led by a British company²³. Further, there was a change in policy in the Defence and Security Industrial Strategy²⁴ which moves away from the warship/non-warship distinction.

The Fleet Solid Support (FSS) ship competition was launched in the spring of 2021²⁵ with the build of up to three large logistics ships (40,000 tonne vessels) to support deployment of the Royal Navy’s new aircraft carrier fleet. The FSS programme is expected to be worth approximately £1.5 billion.

In terms of orders for shipyards, the Royal Navy placed an order in 2017, valued at £3.7 billion, for three Type 26 anti-submarine frigates from BAE Systems Clyde shipyards with orders for another five

²² Naval shipbuilding: February 2020 update, House of Commons Briefing Paper, 5th February 2020

²³ “UK shipbuilding boosted by warship procurement”, Press Release, MOD, 21st October 2020

²⁴ <https://www.gov.uk/government/publications/defence-and-security-industrial-strategy>

²⁵ “Fleet Solid Support ship competition to resume in Spring”, UK Defence Journal, March 2021

expected very soon. It was estimated that more than £1 billion was spent within the supply chain by mid-2020²⁶. It has also committed to procure five Type 31 frigates from Babcock International at Rosyth.

BAE Systems is also building Dreadnought-class Trident missile submarines and Astute-class nuclear attack boats at its yard in Barrow, northwest England.

Examples of future orders include:

- A Multi-Role Ocean Surveillance Ship to protect underwater critical national infrastructure and improving Royal Navy ability to detect threats from Russian submarines in the North Atlantic.
- Up to five Type 32 frigates designed to protect territorial waters, provide persistent presence, and support littoral response groups.
- Up to six Multi-Role Support Ships to provide the platforms to deliver littoral strike, including maritime special operations, in the early 2030s.
- A new class of destroyer, known as the Type 83, which will begin to replace Type 45 destroyers in the late 2030s.

Clearly, there is a significant pipeline of navy ship orders and companies are securing work for Clyde shipyards. Also, with the commitment from UK Government to broaden its definition of warships, there are opportunities for Scottish companies.

Competition

There is a strong Naval shipbuilding capability on the Clyde with the presence of BAE Systems and the two shipyards at Scotstoun and Govan. The Clyde shipyards face competition from other Scottish locations, namely Babcock International on the Forth at Rosyth and from UK shipyards such as Cammell Laird (Merseyside). That being said, the future of warship building appears to lie in having ‘block’ built in several yards around UK and assembled in Scotland as was the case with the aircraft carriers and now with the Type 31.

BAE Systems and Babcock International both, therefore, offers local supply chain opportunities.

2.2.1.3 Recreational Boat & Yacht Building

The recreational boat and yacht building industry produces a range of products, spanning from small inflatable boats to kayaks and canoes, as well as larger boats and superyachts at the other end of the spectrum. The UK has a strong international presence in this industry, as the third largest producer of superyachts in the world. The UK industry was estimated to have generated revenues of £660 million in 2019, growing at rate of around 7.1%. It is also a strong export industry, with around two-thirds of revenue derived from exports²⁷. The industry is predicted to continue growing at a healthy pace, driven by the increase in income level of people living around the world and the consequent increasing in spending on recreational activities. Also, more corporate events and parties are being held on yachts which is leading to strong growth of the rental segment of the market.

²⁶ “BAE awards five contracts to suppliers for Type 26 programme”, Naval Technology, July 2020

²⁷ British superyacht industry celebrates 7th year of consecutive growth, British Marine, September 2019

In terms of technology, the industry is responding to the need to reduce its carbon footprint and environmental impact. This is leading to design of lighter and more fuel-efficient yachts and the exploration of alternative materials and power systems.

Regarding superyachts, the industry is dominated by a few large players, such as Princess Yachts and Sunseeker, which are all based in the south of England. The small recreational boat domain is, in contrast, fragmented with suppliers all over the UK.

2.2.1.4 Ship Repair and Maintenance

Several ship repair and maintenance opportunities could be accessed from the Clyde. These include:

- Maintenance of service vessels (out of water)
 - Vessels servicing fish farms on the West Coast require regular maintenance which must be done out of the water. The dry dock facilities on the Clyde, in Greenock for example, could be used for this. Similarly, the dry dock and other maritime facilities could be utilised to offer maintenance services to the growing recreational boating and yachting market on the West Coast.
- Refit of large leisure craft and superyachts
 - This is a highly specialised activity that requires skill and can be lucrative. As more prestigious superyachts arrive in the West of Scotland, as demonstrated by the growth of marinas, such as the one in Greenock managed by Peel L&P, refit work could be undertaken during the non-sailing periods in winter. One of the project management companies carrying out this work is already based in Glasgow (G. L. Watson).
- Retrofitting low carbon systems
 - National and international regulations concerning fuel efficiency and emissions have created a need for retrofit options, in addition to the normal updating of components and systems. The Scottish Government’s commitment to net zero by 2045 provides a strong driver for action in the Scottish maritime sector.

The maritime sector was responsible for 16% of Scottish transport’s greenhouse gas emissions in 2018 as shown opposite, amounting to 2.37 million tonnes of CO₂ equivalent²⁸.

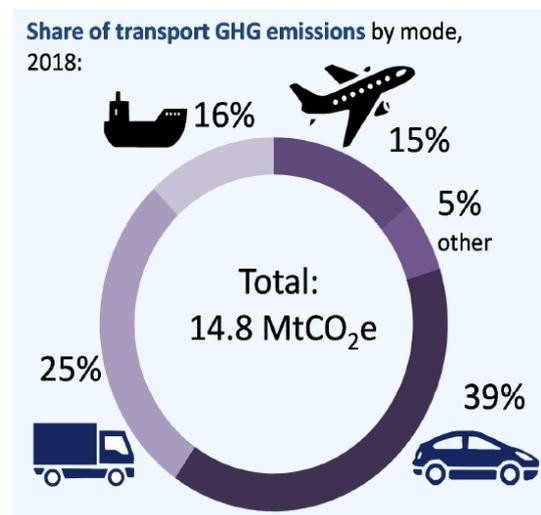


Figure 8: Scotland’s Transport GHG Emissions

²⁸ Scottish Transport Statistics, No. 39, 2020 Edition, National Statistics publication for Scotland

At a UK level, it is estimated that emissions were around 14 million tonnes of CO₂ equivalent in 2017²⁹.

Department of Transport statistics³⁰ indicate that there are over 1,100 vessels of 100 gross tonnes and over on the UK Ship Register. To meet future net zero targets all these vessels will need to be replaced or refurbished, suggesting a significant market demand, although it is difficult to quantify at this time.

Options to reduce impact on the climate and the environment can be grouped into three areas - alternative fuel propulsion, non-fuel propulsion and energy efficiency options. These are presented in the Clean Maritime Plan³¹ as follows:

	Technology/Fuel	Technology/fuel usage	Further detail
Alternative fuel propulsion	Methanol	Can be used directly in an internal combustion engine or fuel cell.	Can be used as a fuel itself or a store for hydrogen.
	Hydrogen		Can be used as an input to ammonia or methanol production as well as a fuel itself.
	Ammonia		Can either be used as a fuel itself, or as a carrier for hydrogen before the hydrogen is used as the fuel.
	Biofuels	Used directly in an internal combustion engine.	Various types of biofuels from different sources of biomass (e.g. crops, wastes) possible.
Non-fuel propulsion	Hybrid propulsion	A diesel engine acts as a power source, charging batteries, which power an electric motor, often in order to keep the diesel operating at its most efficient load point.	Diesel engine power converted to electric drive.
	Fully electric propulsion	No diesel engine. An electric motor is entirely powered by batteries, which are charged whilst the vessel is in port.	Batteries charged onshore.
	Shore-power (cold-ironing)	Use of an onshore power supply (rather than onboard diesel engines) to run auxiliary (non-propulsion) electric systems while the vessel is in port.	Does not substitute propulsion energy, only auxiliary loads and only when in port.
	Wind propulsion	Can take various forms, such as: <ul style="list-style-type: none"> - Sails - Flettner rotors - Kites 	
Energy efficiency options	Solar power	Use of photovoltaic cells to convert solar radiation into electric power using the available space on deck.	Enhances primary propulsion or auxiliary supply.
	Various	Examples include: <ul style="list-style-type: none"> - Rudder Bulb - Air Lubrication Bubbles - Pre-Swirl propeller ducts - Vane wheel - Hull scrubbing - Trim optimisation 	These are all options that have potential to improve energy efficiency of vessels ⁴³ .

Figure 9: Technology and Fuel Options for Low Carbon Shipping

²⁹ Department for Transport (2018) Energy and Environment Data Tables: <https://www.gov.uk/government/statistical-data-sets/energy-andenvironment-data-tables-env>

³⁰ <https://www.gov.uk/government/statistical-data-sets/shipping-fleet-statistics#uk-ship-register-statistics>

³¹ Clean Maritime Plan, Department of Transport, July 2019

As with other sectors³², the most appropriate decarbonisation option will be dependent on the characteristics of the vessel and its mode of operation. For example, for heavy duty vehicles, the choice between electric and hydrogen powered vehicles is expected to depend on uses, distances travelled and how zero carbon technologies develop³³. Similarly, Transport Scotland's Rail Services Decarbonisation Action Plan highlights the potential need for different technology solutions, depending on operating conditions.

It should also be noted that there will be synergies between the needs of the maritime sector and these other industries – this is discussed further in section 5 below.

Currently, other countries, particularly Scandinavian countries, are leading the field in terms of low carbon retrofits. For example³⁴:

- The Swedish Shipowners' Association has developed plans to phase out the use of fossil fuels by 2045, in line with the country's wider climate change plans. According to the association, the country's shipping companies have been moving in the right direction for some time now in their utilisation of climate-smart technologies
- In 2015, Norway launched the first all-electric ferry, Ampere, which has since gone on to cut emissions by 95%, in contrast to its fuel-powered equivalents
- Denmark and Norway have teamed up to build the world's largest hydrogen ferry³⁵, which is planned to be operating by 2027
- The Danish shipping giant Maersk has pledged to become carbon-neutral by 2050

2.2.2 Ship Management

Ship management comprises a broad range of services, such as technical management, procurement, crewing, as well as quality and safety management. Ship management activities are integrated into large owner-operator companies; however, a significant proportion of the market is served by 3rd party management companies which provide ship management services to ship owners without being significant owners themselves.

Data on the size of the ship management market is hard to obtain. Data from a 2013 report by the Fraunhofer Centre for Maritime Logistics and Services would suggest the market is in the order of £2-3.5 billion per annum³⁶. The Global Maritime Logistics and Services Market is expected to exhibit a CAGR of 7.8% from 2020 to 2026³⁷.

As with the wider shipping industry, companies offering ship management services must contend with the main industry challenges of reducing carbon emissions and improving the efficiency of service.

³² Scotland's NetZero Roadmap, NECCUS and partners, 2020 - 2022

³³ What's sparking electric vehicle adoption in the truck industry?, *McKinsey*, 2017, URL: <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/whats-sparking-electric-vehicle-adoption-in-the-truck-industry> and Scottish Hydrogen Assessment, Scottish Government, December 2020

³⁴ Green light: Sweden commits to fossil-free shipping, *Ship Technology*, April 2019

³⁵ <https://www.euractiv.com/section/energy/news/denmark-and-norway-team-up-to-build-worlds-largest-hydrogen-ferry/>

³⁶ Best Practice Ship Management, Fraunhofer Centre for Maritime Logistics and Services, 2013

³⁷ Global Maritime Logistics and Services Market Report, Marker Research Future, February 2021

One of the main opportunities in this sector is the use of digital information (e.g. satellite-based vessel tracking and monitoring and weather forecasting data – for example, see <https://spire.com/maritime/>, which offers “space data as a service” using satellites manufactured in Scotland) to realise complex logistics systems. With data becoming more accessible than ever, real-time information platforms can be used to better coordinate, plan and allocate resources.

2.2.3 Freeports / Green Ports

In this context green ports are the Scottish Government’s adaptation of the UK government’s freeport model and are defined³⁸ as large, zoned areas within a defined boundary which includes a rail, sea or airport. Green port operators and businesses in the zone can benefit from a package of tax and customs incentives.

Plans for development of green ports have been published by the Scottish Government³⁹ focusing on inclusive growth, fair work practices and delivering a net zero economy. It is not clear how many of these will be supported, but Glasgow City Region, the Cromarty Firth, Rosyth, Dundee, Hunterston, Orkney and Aberdeen have been identified as possible sites.

2.2.4 Low/Zero Carbon Smart Ports

The decarbonisation of ports and shipping has an important role to play within the wider drive to achieve Scotland’s goal of ‘net zero’ by 2045 and to meet the UK government’s 2050 Net Zero target as a result of its plan⁴⁰ to include the UK’s share of international shipping emissions in its target. In parallel, major investments in digitisation and automation are expected^{118,119} to be required to ensure future competitiveness and to meet the needs of major shipping lines.

Ports are a crucial transport interconnection between road, rail and waterborne forms of transport. They are complex pieces of infrastructure with their own mobility and movement needs and with highly fragmented ownership (most are privately owned). The energy demand of ports is currently almost exclusively met by burning diesel in combustion engines with emissions vented into the atmosphere. Transitioning away from diesel and to more environmentally friendly options, such as hydrogen or battery technology, is a complex challenge for ports to address – how to transition the vast array of diesel-powered machinery, such as straddle carriers, terminal tractors, reach lifters, etc. Also, as ports handle large amounts of bulk materials, such as food stuffs, aggregates, fertiliser and wood products, there are the inevitable problems of dust and other emissions that can affect the health of workers and contribute significantly to regional air pollution that will need to be addressed.

Reducing reliance on road haulage and making greater use of low-carbon short sea shipping could significantly reduce land-based CO₂ emission. Short sea shipping covers maritime transport services which do not involve an ocean crossing but encompass transport of goods along coasts over relatively short transit times. The global pandemic has led to a change in logistics patterns with some goods

³⁸ <https://www.gov.scot/policies/cities-regions/green-ports/#:~:text=Our%20green%20port%20model%20for,of%20tax%20and%20customs%20incentives.>

³⁹ <https://www.gov.scot/news/green-ports-to-aid-economic-recovery/>

⁴⁰ <https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035#:~:text=change%20and%20energy-,UK%20enshrines%20new%20target%20in%20law,emissions%20by%2078%25%20by%202035&text=The%20UK's%20sixth%20Carbon%20Budget,to%20net%20zero%20by%202050.>

owners moving parts of their global production systems closer to destinations, for example a new terminal service is due to commence at the Port of Gothenburg, dedicated to intra-European container transport⁴¹.

In a recently published study⁴², it was estimated that the global shipping and ports industry will need to invest at least \$1 trillion (cumulative investment up to 2050) in land-based and ship-related infrastructure in order to meet the International Maritime Organization’s (IMO) targets to cut greenhouse gas emissions by 2050. Around 87% of that investment will have to focus on land-based storage, bunkering infrastructure and production facilities for low carbon fuels; the remaining 13% of investment would have to cover new systems and onboard storage for low carbon fuels within ships. One of the study’s contributors stated:

“Our analysis suggests we will see a disruptive and rapid change to align to a new zero carbon system, with fossil fuel aligned assets becoming obsolete or needing significant modification.”⁴³

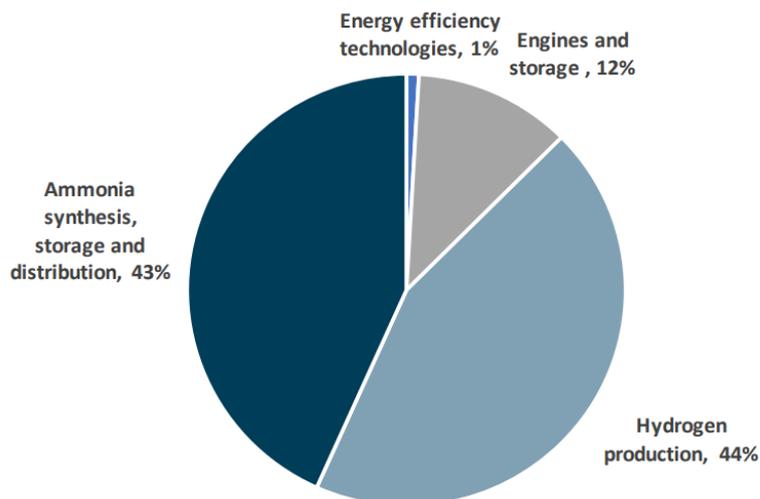


Figure 10: Decarbonising Shipping and Ports Investment Breakdown

Very recently (March 2021), the UK Department for Transport launched a new £20 million competitive fund to support the development of low carbon vessels and clean port infrastructure⁴⁴. The Government is encouraging research organisations to collaborate with UK shipping, port and shipbuilding companies to enter ambitious proposals into the competition.

As the majority of investment in port infrastructure will focus on (non-maritime) land-based storage, bunkering infrastructure and production facilities for low carbon fuels this will be a major challenge for port owners and managers to ensure future competitiveness.

⁴¹ Short-sea terminal to be opened at the Port of Gothenburg, Ship Management International, March 2021

⁴² The scale of investment needed to decarbonize international shipping, UMAS, January 2020

⁴³ Dr Tristan Smith, Lecturer at UCL’s Energy Institute

⁴⁴ Clean Maritime Demonstration Competition

2.2.5 Developing Faslane's Supply Chain

There are several opportunities for the Clyde arising from the Royal Navy's expansion of its activity at the Faslane base, HMNB Clyde, which is the largest military establishment in Scotland⁴⁵, as well as being one of the largest single site employers in the country. The MOD is implementing a programme that will see the base become the single operating centre for the Royal Navy's entire fleet of submarines. This will result in an increase in both the activities undertaken at the base and the workforce volume, which consists of both Navy personnel and commercial contractors. However, the site has spatial restrictions with limited options for expansion. Also, the facilities on site are ageing and need to be upgraded and extended to accommodate not only the growth in current activity but work associated with the future Dreadnought class submarines.

This has resulted in a rethink in how the MOD, the owners of the site, and its facilities management and engineering services commercial partner, Babcock International, can deliver the much needed improvements and accommodate the expansion without disrupting existing activity. In the past the base has adopted a 'within-the-wire' operational strategy, where as much activity as possible was conducted on site. Now, there is much more interest in exploring 'outside-the wire' possibilities, making greater use of the commercial capability both within the Clyde area and across Scotland.

Analysis of the potential economic impact of HMNB Clyde expansion was conducted in 2019 for Scottish Enterprise⁴⁶. The analysis concluded that there was potential for an increase in direct and indirect employment of around 1,700 jobs, which could lead to additional contracts of £170 million per annum. As set out in its commercial strategy⁴⁷, the Defence Infrastructure Organisation (DIO), which is part of the Ministry of Defence, aims to transform the way it does business. The strategy has a focus on increasing supplier numbers, offering greater opportunities to small and medium-sized enterprises as well as to larger suppliers.

In parallel, Maritime Enterprise Scotland is being developed by the Royal Navy⁴⁸ to respond to growth of the Royal Navy in Scotland and changes in its structure and workforce. Its ambition is to establish a Maritime Centre with Glasgow as the main hub, with links to other hubs, spokes and virtual activity. It is envisaged that the Centre will be built by 2024/25 and that its areas of activity will be skills, innovation STEM outreach and communication/coordination. As such, this links to several of the other opportunities highlighted here.

2.2.6 Offshore Wind

As part of the plans to reduce carbon emissions by 75% by 2030 and to become a net-zero society by 2045, the Scottish Government has set a new ambitious target of increasing offshore wind capacity to 11GW of energy installed by 2030, replacing the previous 8GW target. Further, the UK Offshore Wind

⁴⁵ While matters concerning defence strategy and policy are reserved to the UK Government under the present constitutional arrangements, the long-standing policy position of the Scottish Government is that it has a firm and unequivocal opposition to nuclear weapons and their storage in Scotland. However, in any future constitutional outcome, there are still opportunities available to Faslane for future development, since it would continue to play a key role in the defence of Scotland as a conventional military and naval base in an independent Scotland

⁴⁶ Faslane RN Base Expansion Economic Impact Report, EKOS Limited, August 2019

⁴⁷ DIO Commercial Strategy, MOD, January 2018

⁴⁸ A Vision for Maritime Enterprise Scotland, Hamish Tetlow, RN Maritime Enterprise Scotland, Presentation to the Scottish Maritime Cluster, December 2020

Sector Deal commits to “to increase UK content to 60% by 2030, including increases in the capital expenditure phase”⁴⁹. This clearly creates a strong market opportunity for the supply chain and shipbuilding opportunities for installation and service vessels.

However, traditionally, only a very small proportion of the fabrication potential associated with offshore wind has benefited Scottish suppliers. For example, it was recently confirmed that Paris-based GE Renewable Energy, a division of the Boston-based multinational General Electric, has been awarded a major contract to supply substations for EDF's Neart na Gaoithe (NnG) offshore wind farm. GE will work with the Dutch companies HSM Offshore and IV-One to design and fabricate the offshore substation platforms for the £2 billion wind farm, which is currently under construction off the coast of Fife. During our interview programme, there were strong feelings that, as with the shipbuilding opportunity, the Scottish Government was not doing enough to ensure offshore wind projects have a strong local content.

Scottish companies have been more successful in non-fabrication opportunities in offshore wind, such as the installation, service and maintenance of these structures and infrastructure. With the downturn of the oil and gas industry many specialist contracting firms have diversified into offshore wind.

With much of the offshore wind activity focused off the East coast of Scotland we have explored the question of how much the market could be captured by current or future capability on the Clyde. Options include:

- Regarding marine engineering, it was suggested by one stakeholder interviewed for this study that large segments, for example the foundations used in floating offshore wind platforms, could be fabricated on the Clyde and transported to the East Coast for final integration.
- Developments in offshore wind and marine renewables off the West Coast of Scotland.

In a recent report⁵⁰ commissioned by Crown Estate Scotland into the suitability of port facilities in Scotland to support future offshore wind development, it was recommended that port capacity should be increased – “the build-out rate of offshore wind required to meet net-zero targets may not be achievable without significant expansion of marshalling/assembly port capacity”. This reflects an attractive opportunity for Scotland. Further, the report identified the potential for organic growth from assembly at ports and into manufacturing, as more on-site works than planned have typically taken place.

The report also highlights the need for additional operations and maintenance capability and infrastructure – Scotland, including the Clyde region, has a strong operations and maintenance capability and further development of offshore wind will encourage supply chain investment in workforce and infrastructure. Already the Cromarty Firth has become a ‘National Strategic Asset’⁵¹, as a leading port location for offshore wind. Investments of over £55m have been made into expanding the Port’s quayside and laydown areas, to enable it to pursue large offshore wind contracts. Further,

⁴⁹ <https://www.gov.uk/government/publications/offshore-wind-sector-deal/offshore-wind-sector-deal>

⁵⁰ Ports for Offshore Wind, Crown Estate Scotland, 2nd September 2020

⁵¹ <https://www.holyrood.com/comment/view,associate-feature-port-of-cromarty-firth-vital-to-offshore-wind-revolution>

Forth Ports very recent announcement⁵² of a £40 million investment to accommodate the world’s largest offshore wind installation vessels is further evidence of both market demand and progress with infrastructure developments.

We therefore consider that although offshore wind is a very attractive opportunity for Scotland, it is challenging to see how it can become an opportunity for the Clyde Mission area.

2.2.7 Offshore Decommissioning

This covers oil and gas and offshore wind decommissioning.

2.2.7.1 Oil and Gas Decommissioning

Oil & Gas UK estimated that around 74 platforms or 1,465 wells in UK waters will be decommissioned between 2018 and 2027 costing around £1.5 billion per year, or £15.3 billion in total⁵³. This is around 20% of the total UK continental shelf (UKCS) stock⁵⁴. These platforms vary in size and complexity from less than 1,000 to more than 100,000 tonnes⁵⁵.

More recently, Oil & Gas UK estimated⁵⁶ that up to £15.1 billion will be spent on decommissioning over the period from 2020 to 2029, with 40% of expenditure in the Northern North Sea and 32%, 20% and 8% in Central North Sea, Southern North Sea and Irish Sea and West of Shetland, respectively. Further to this, it estimates that topsides and sub-structure onshore disposal will account for 2% of the expenditure at £365 million as shown opposite.

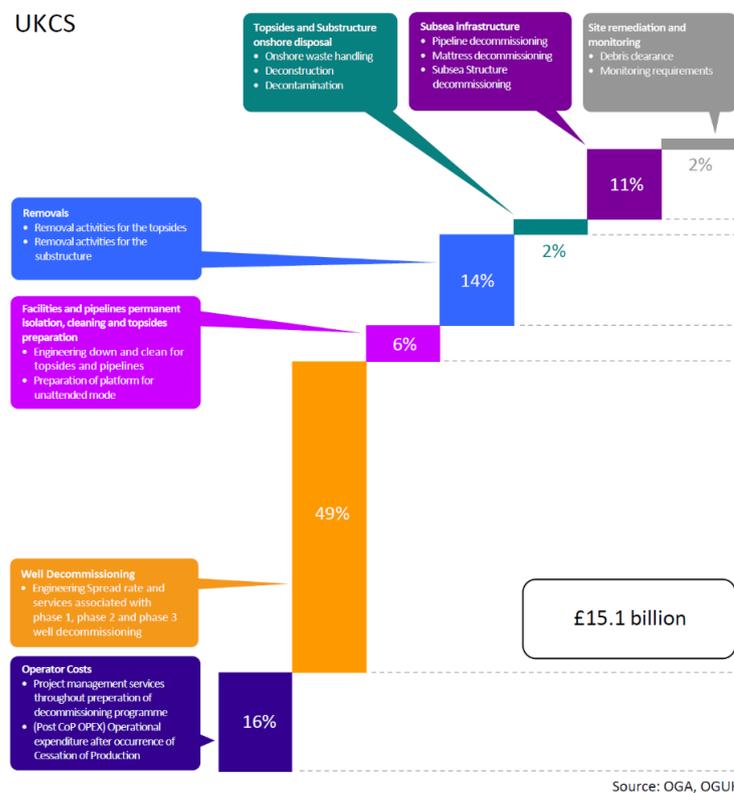


Figure 11: Breakdown of Value by Decommissioning Activity (UKCS 2020 to 2029)

Scotland has no ultradeep water ports at present, but there are at least 15 ports⁵⁷ across Scotland that could receive offshore oil and gas structures including:

⁵² <https://www.forthports.co.uk/latest-news/ambitious-renewable-energy-hub-plans-unveiled-for-the-port-of-leith/>

⁵³ Decommissioning Insight 2018 (Oil & Gas UK, 2018) - <https://oilandgasuk.co.uk/decommissioninginsight/>

⁵⁴ The UKCS includes parts of the North Sea, the North Atlantic, the Irish Sea and the English Channel

⁵⁵ In UK waters, some Norwegian assets are much larger

⁵⁶ Decommissioning Insight 2020, Oil and Gas UK, 2020

⁵⁷ Oil & Gas Decommissioning Action Plan (Scottish Enterprise, 2017)

- **Dales Voe** (Shetland) – identified in 2018 as the optimal site for the development of an ultradeep water port in Scotland (one which could accommodate single lift decommissioning contracts).
- **Nigg Energy Park** – deep water port with a dry dock and extensive laydown area that built many of the rigs deployed in the North Sea.
- **Invergordon** (Port of Cromarty) – deep water port with a large quayside and extensive laydown area that is already involved in a number of decommissioning contracts.
- **Dundee** – significant investment to strengthen the quayside and provide additional decommissioning capabilities, including a 1,500-tonne capacity crane. John Lawrie Group has announced plans to work with Forth Ports to establish a new decommissioning base at the port.⁵⁸
- **Energy Park Fife** (Methil) – involved in the construction of a number of North Sea platforms, attracted funding for the development of a new decommissioning centre as well as for onshore and offshore renewables.

CessCom Decom has recently launched a new facility here and announced a contract to decommission, dismantle and recycle over 23,000 tonnes of structure from Spirit Energy’s Morecambe Bay field. It is expected that this will create up to 50 jobs.

- **Kishorn** – a deep water port with a dry dock and extensive laydown area, that has previous experience of oil and gas production platform construction and is actively seeking offshore renewables and decommissioning work.
- **Hunterston** – a deep water port with one of the largest dry docks in Europe and extensive laydown area that has also had investment to support decommissioning of offshore oil and gas assets, but decommissioning activity has not yet developed significantly.

It is understood that CessCom Decom planned to develop decommissioning activity at Hunterston but has recently focused more strongly on Fife Energy Park as a location.

Developing additional capability on the Clyde would need to compete with other facilities, such as those listed above. This suggests a challenging task as many of these facilities have been pursuing decommissioning business for some time. Further, Peel Ports’ ownership of both Hunterston and Greenock Ports is expected to influence how each facility can be developed. Its existing plans for Hunterston⁵⁹ suggest that it will be prioritised for oil and gas decommissioning.

We, therefore, do not see this as a potential development opportunity for the Clyde Mission area as defined for this study as the nearby Hunterston offers more suitable facilities.

2.2.7.2 Offshore Wind Decommissioning

In terms of offshore wind decommissioning, there are opportunities for decommissioning older wind farms, with analysts predicting that 80 offshore wind turbines will need to be refurbished or decommissioned in 2022, 123 turbines in 2023⁶⁰ and 1,600 by 2030⁶¹ across European North Sea

⁵⁸ <https://johnlawrie.com/news/item/188-john-lawrie-group-announces-dundee-decom-facility>

⁵⁹ <https://www.peelports.com/media/4436/hunterston-masterplan-2019-digital.pdf>

⁶⁰ <https://safety4sea.com/offshore-wind-decommissioning-in-north-sea-to-increase-from-2020-new-study-shows/>

⁶¹ An economic assessment framework for decommissioning of offshore wind farms using a cost breakdown structure, Adedipe and Shafiee, The International Journal of Life Cycle Assessment, 26, 344, 2021

offshore wind farm projects. By the middle of this century, the opportunity in offshore wind decommissioning will be extensive, as already shown in Section 2.1, above. For the UK, the scale of offshore decommissioning demand is expected to grow to around 5GW by 2040 and almost 20GW by 2050. It is estimated that current decommissioning costs are on the region of £170,000 to £510,000 per megawatt⁶² suggesting a significant market opportunity.

This industry has not yet been established and potentially offers more attractive, longer-term opportunities than oil & gas decommissioning. It is already accepted that 85 – 90% of turbines are recyclable⁶³ with materials like concrete, steel and other metals following well-established recycling routes. The challenge is to identify effective routes to recycle turbine blades⁶⁴, with between 40,000 and 60,000 tonnes of composites expected to reach end of life in the global sector by 2023. It is predicted⁶⁴ that the opportunity for blade reuse, refurbishment, re-manufacturing and recycling could generate up to 20,000 additional jobs in the offshore wind sector. However, at this stage, the focus is on innovation with a number of players trying to develop appropriate recycling technologies. Key UK research players identified include:

- The National Composites Centre, through the SusWIND initiative⁶⁵
- The University of Strathclyde, which is also pursuing innovation activities to address this challenge in aircraft components via The Lightweight Manufacturing Centre
- The Wind Blades Research Hub at the University of Bristol
- The University of Nottingham
- The University of Leeds
- The University of Hull

2.2.8 Marine Tourism

The Scottish Tourism Alliance has recently developed two five-year marine tourism strategies:

- Awakening the Giant (2015 – 2020)⁶⁶ targeted to drive “visitor expenditure from £101 million to £145 million and increase the overall economic value of the sector from £360 million to over £450 million by 2020”
- Giant Strides (2020 – 2025)⁶⁷ aims to grow the industry’s overall economic contribution to £500 million by 2025 through four strategic themes:
 - Ensuring clean and blue waters
 - Developing marine tourism as a career choice
 - Developing high quality “authentic and seamless experiences”
 - Developing profitable businesses

⁶² Developing policies for the end-of-life of energy infrastructure: Coming to terms with the challenges of decommissioning, D. C. Invernizzi, G. Locatelli, A. Velenturf, P. E. Love, P. Purnell, and N. J. Brookes, Energy Policy, vol. 144, p. 111677, Sep. 2020

⁶³ Offshore wind: Tackling the blade recycling challenge, Peter MacDonald, ORE Catapult, Energy Voice 31/03/2021 https://ore.catapult.org.uk/wp-content/uploads/2021/03/CORE_Full_Blade_Report_March_2021-FINAL-4.pdf

⁶⁵ <https://www.nccuk.com/sustainable-composites/activities/suswind/>

⁶⁶ <https://scottishtourismalliance.co.uk/wp-content/uploads/2019/03/Awakening-the-Giant-final.pdf>

⁶⁷ https://scottishtourismalliance.co.uk/wp-content/uploads/2020/08/FINAL-Strategy-Documents_Giant-Strides-2020-2025.pdf

These strategies coupled with plans to regenerate the Clyde have led to new infrastructure improvements, such as new berthing and mooring facilities. In both strategies there is a focus on driving growth of sailing tourism and the west coast of Scotland is recognised as having some of the best and most varied sailing water in the world. Berthing facilities on the Clyde could become important origin points for tourists looking to access these waters. As identified in a 2016 study on Sailing Tourism in Scotland⁶⁸, demand for resident berthing in the Clyde Estuary, as highlighted opposite, most of which is outwith the area covered by this study, is expected to continue growing for the foreseeable future which could offer further opportunities to extend existing facilities and create new ones towards Greenock and Glasgow.



Figure 12: Clyde Estuary Zone Extending Past Greenock

More recently, Peel L & P have increased capacity of its marina in Greenock from 40 to 150 boats with plans to increase to 350 over the next period.

Greenock is already known as the ‘cruise capital’ of Scotland and since the Greenock Ocean Terminal opened it has witnessed healthy growth in the volume of visiting cruise passengers. Scottish ports received approximately 862 cruise calls and 773,000 passengers in 2019 and it was estimated that £40.6 million was spent directly onshore by the passengers and crew of cruises – Greenock was estimated to account for 76 calls, over 143,000 passengers⁶⁹.

To support continued growth and ensure the facility can accommodate the world’s largest cruise liners, Inverclyde Council is leading a £19.2 million project, as part of the Glasgow City Region Deal, to create new berthing facilities. Development of port facilities to support sustainability / Net Zero ambitions are identified as a key area of opportunity⁷⁰. The new facilities are expected to increase visitor numbers to around 150,000 passengers a year. Already there are plans for a large number of cruise ship visits this year, once COVID restrictions are lifted.

Although the increase in cruise traffic will have a positive economic impact in the Greenock port area, the opportunity to broaden this to the rest of the Clyde area has, to date, been more limited. It is understood that one of the reasons for this is the cost of pilotage north of Lamlash (Arran).

2.2.9 Water Source Zero Emissions Heating Systems

In assessing potential opportunities for the Clyde, it is important to consider the water within the river and estuary as a valuable resource. The Scottish Government has recently published its draft heat in buildings strategy⁷¹ which sets out the following targets and commitments:

⁶⁸ Sailing Tourism in Scotland, EKOS, December 2016

⁶⁹ Cruise Tourism in Scotland: Review & Sustainable Development Opportunities, Visit Scotland, October 2020

⁷⁰ Cruise Tourism in Scotland: Review & Sustainable Development Opportunities, Ekosgen for VisitScotland, Scottish Enterprise, Highlands and Islands Enterprise and the Scottish Government, October 2020

⁷¹ <https://consult.gov.scot/energy-and-climate-change-directorate/heat-in-buildings-strategy/>

- Pledges to invest almost £1.6 billion of capital funding in zero emissions heat and energy efficiency during the next 5 years.
- Requires that new buildings, starting with new homes consented from 2024, will use zero direct emissions heating and also feature high levels of fabric energy efficiency to reduce overall heat demand so that they do not need to be retrofitted in the future.
- Sets a target of over 1 million homes and over 50,000 non-domestic buildings in Scotland to be converted to a zero or zero emissions heating system, by 2030.
- Sets an ambition to double the rate of low and zero emissions heat installations every year from current rates of 3,000 per annum to 64,000 per annum in 2025 and 200,000 per annum in 2030.
- Estimates that, as investment ramps up towards the late 2020s, the number of full-time equivalent jobs supported by the zero and zero emissions heat sector could almost double, from the current level of 13,000 to around 24,000.

Key actions to meet these requirements are investment in heat pumps and district heating networks. Water source heat pumps could be deployed on the Clyde to help meet the targets set. It is estimated that there is 150 MW of heat capacity in the river from flowing water without considering the additional energy from tidal effects. A low carbon district heating network powered by a water source heat pump system on the Clyde has already been demonstrated at Queens Quay⁷². This offers the template for potential other similar developments to heat both new and existing domestic and commercial buildings.

Further to this, the Royal Navy and Babcock confirm their interest in water source heating. Faslane has the largest ‘hotel’ in Europe and currently has no renewable energy generation.

Developing this opportunity could place the River Clyde as a UK / international leader in zero emissions heating – it is understood that planning is well underway, including the development of Local Heat & Energy Efficiency Strategies for all parts of Scotland by 2023.

2.2.10 Maritime Training

This covers two separate opportunities:

1) *Further development of international mariner training opportunities, building on the global position of City of Glasgow College*

A survey on maritime training needs for vessels operations was conducted in 2020 as part of the MarTID (Maritime Training Insight Database) initiative ⁷³ (a non-commercial initiative collaboratively funded by the World Maritime University, New Wave Media and Marine Learning System). A total of 278 responses were received from three groups of stakeholders: ship operating / management companies, maritime education and training institutes, and seafarers. The survey showed:

- Vessel operators are continuing to increase their training budgets – approximately two thirds of vessel operators spent between 2% and 10% of their operating budgets on training.

⁷² <https://www.queens-quay.co.uk/district-heating/>

⁷³ 2020 Training Practice Report, MarTIDm, June 2020

- While face to face training is still the common method, the gap between face to face and online learning is closing – 65% of respondents indicated increased online learning over the last 12 months and 84% anticipate increased usage over the next 12 months.

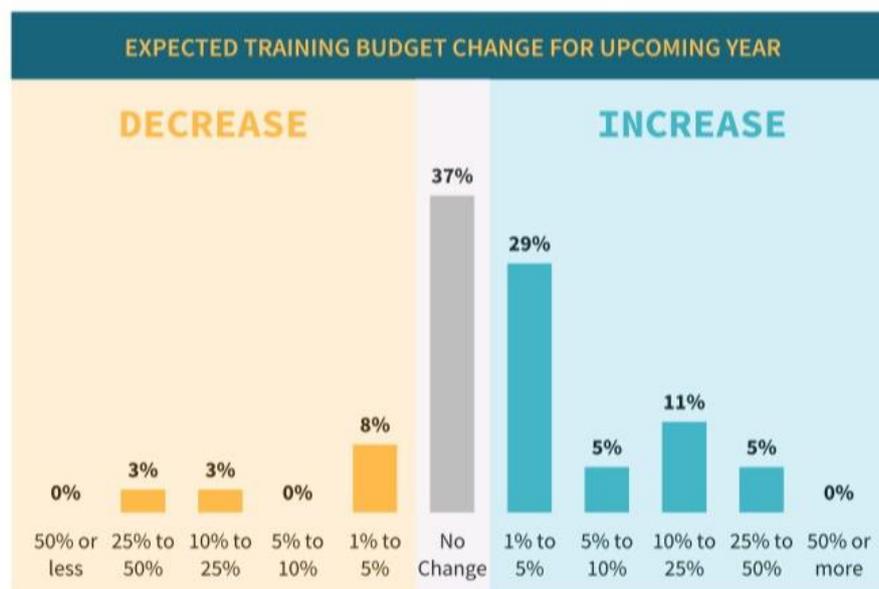


Figure 13: Increase in Maritime Training Budgets

With the lockdowns due to the COVID-19 pandemic, many organisations have offered training remotely where possible, with the approval of the Maritime Coastguard Agency and other accreditation bodies. This has enabled providers to reach new customers, as far away as Australia for example, which would otherwise have not been practical.

2) Development of maritime engineer skills development to address the specific needs of the maritime sector and its supply chain

There are a number of training needs within the land-based segments of the maritime sector, especially if there are developments to pursue several of the different opportunities identified. Earlier workshops on maritime skills⁷⁴ identified a number of key skills issues, including:

- Developing a digitally capable workforce – both upskilling the existing workforce and developing a radically different future workforce.
- Establishing accreditations for transferable skills that were acceptable across several segments of the maritime sector.
- Supporting the large cohort of individuals with sea going experience to find shore-based roles.
- Developing skills provision that addresses the disparate geography of the sector in Scotland.

⁷⁴ An Analysis of the Maritime Sector in Scotland, Optimat, 2018 for the Scottish Maritime Cluster and Scottish Enterprise and MAXiMAR Skills Evidence Base, Optimat for Skills Development Scotland, June 2019

Extending the scope of this maritime engineering skills development requirement, work by MarRI-UK⁷⁵ has identified the need for the shipbuilding sector to develop “Industry 4.0” manufacturing capabilities to support future sector / supply chain productivity and competitiveness.

Further, there is a growing interest in more flexible training methods, where the trainee has more control over the learning and smaller units of learning is provided at the right time. Within these methods the basics and specialist skills are covered in shore-based training centres combined with just in time training done remotely and possibly even on-ship. These methods are expected to include technologies such as virtual reality (VR) / augmented reality (AR). For example, the ship management company, Anglo-Eastern, has already adopted VR and AR in their overall training programmes⁷⁶.

⁷⁵ UK Shipbuilding Productivity, Patrick Carnie and Sheena Mackenzie, MarRI-UK at the Society of Maritime Industries Annual Conference, March 2021

⁷⁶ Anglo-Eastern incorporating augmented and virtual reality into seafarer training, Seatrade Maritime News, March 2019

3 The Maritime Sector on the Clyde

3.1 The Maritime Company Base

3.1.1 Company Base

A database of the maritime company base on the Clyde has been developed using the following process:

- Extracting relevant companies based on location from these sources:
 - A database of Scottish Maritime companies developed for the 2018 analysis of the Maritime Sector in Scotland, based on the following SIC Codes:
 - Marine vessel manufacture – SIC 30.11 and 30.12
 - Marine vessel repair and maintenance – SIC 33.15
 - Shipping – passenger and freight transport – SIC 50.1, 50.2, 50.3 and 50.4
 - Ports and harbours – operations and services – SIC 52.101, 52.22 and 52.241
 - Shipping – renting and leasing of vessels – SIC 77.341 and 77.342
 - Marine support activities – SIC 09100
 - The high value manufacturing and infrastructure database developed by Scottish Enterprise⁷⁷.
- Using a three-level categorisation of companies, based on these sources – the first (landscape) and second (primary categories) are shown in the table below and the third level (secondary category) has been used in the cluster map below to provide more granularity in the core maritime supply chain.
- Including all companies that are operating within the Clyde area, even though they are registered elsewhere or their assets (e.g., ship management companies) are operating elsewhere.
- Removing companies that are registered in Glasgow but have economic activity elsewhere.
- Reviewing the database, using project team knowledge to identify gaps.

Here the Clyde Mission area was based on companies within the following postcode areas:

- Glasgow G1 to G84, which includes the city of Glasgow and the area north of the river including West Dunbartonshire.
- Paisley PA1 to PA19, which includes the area south of the river from the city of Glasgow to Greenock.

Based on this analysis, 347 maritime companies were identified that are operating within the defined area, as follows:

⁷⁷ www.directories.scot

Landscape	Unique Companies	Primary Category	Number of Companies
Defence	24	Bespoke manufacturing services	13
		Naval vessels – submarines	6
		Naval vessels – surface	5
Marine / Maritime	199	Bespoke Manufacturing Services	11
		Building of pleasure and sporting boats	9
		Cargo handling for water transport activities of division 50	3
		Construction of water projects	1
		Inland passenger water transport	2
		Installation and Commissioning	1
		Land and property	1
		Management consultancy activities (other than financial management)	2
		Manufacture of metal structures and parts of structures	2
		Marine/Maritime Technical Services	45
		Marine Consultancy	1
		Marine/Maritime Infrastructure	19
		Warehousing and storage facilities for water transport activities of division 50	4
		Other business support services	1
		Other engineering activities	1
		Other professional, scientific and technical activities	3
		Other transportation support activities	1
		Renting and leasing of freight water transport equipment	1
		Renting and leasing of passenger water transport equipment	2
		Repair and maintenance of ships and boats	25
		Sea and coastal freight water transport	23
		Sea and coastal passenger water transport	10
		Service activities incidental to water transportation	5
Systems and Equipment for Vessels	21		
Vessel Manufacture	5		
Offshore Wind	57	Balance of plant	11
		Development and project management	17
		Installation and commissioning	3
		Operation, maintenance and service	13
		Sector support functions	7
Oil & Gas	67	Wind turbine	6
		Oil and gas exploration services	1
		Support activities for petroleum and natural gas extraction	66

Figure 14: The Company Base in the Clyde Mission Area

The company database that underpins this categorisation is provided separately for information (in excel format).

3.1.2 Cluster Mapping

Using this company database and extending it to include university, college and research facilities, the maritime cluster in the Clyde area can be presented as shown overleaf. This is based on the definition of the sector used for this study and the company database summarised above.

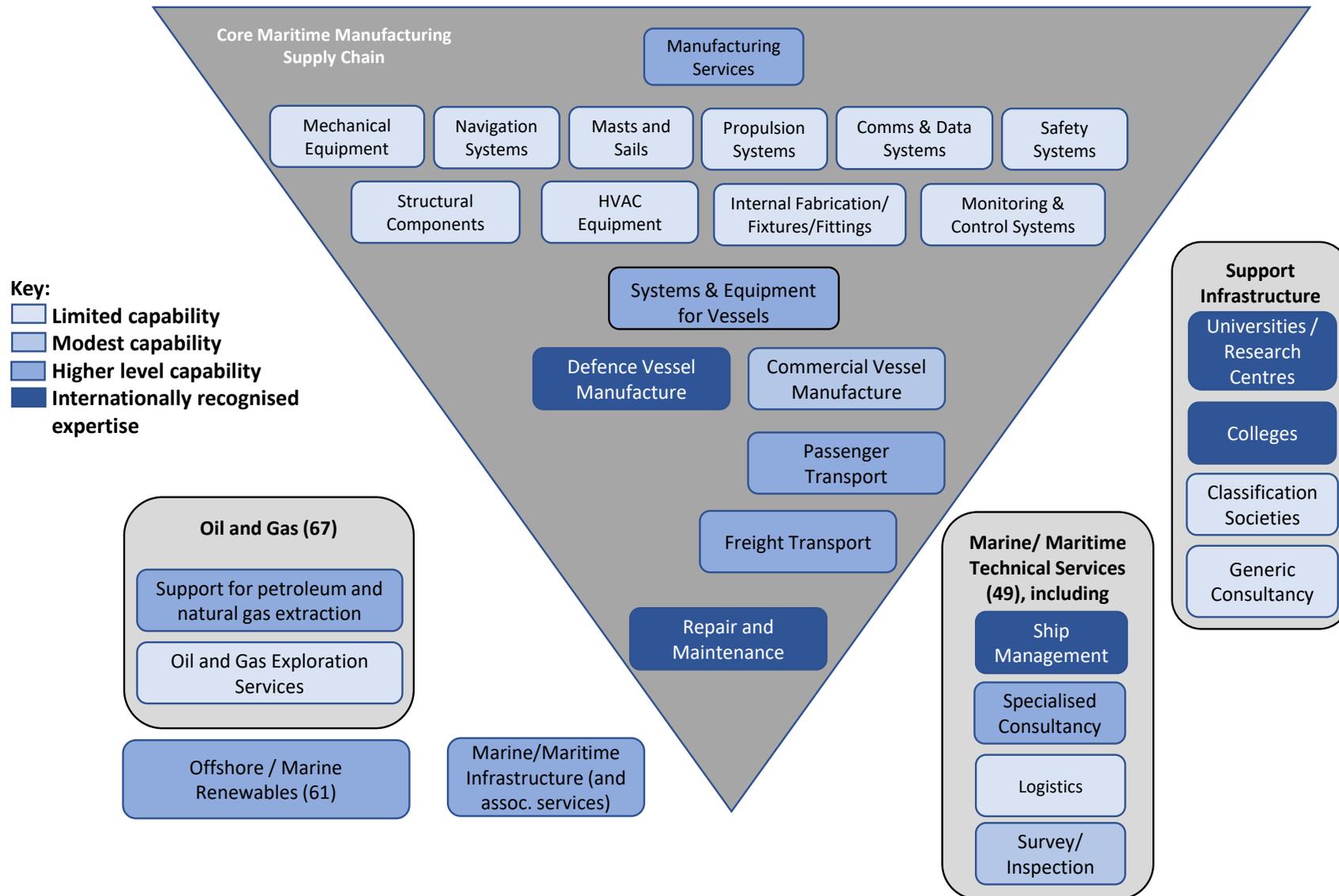


Figure 15: The Clyde Maritime Cluster

The shading of the different categories in Figure 15 reflects the level of activity within each segment, as shown in the key on the left-hand side.

Key areas of capability are described below.

Internationally Recognised Expertise

1. *Defence vessel manufacture*

The key player here is **BAE Systems**. It is already building three Type 26 frigates for the Royal Navy valued at £3.7 billion and is expecting an order for another five, valued at around £6 billion in the near future – further work is expected in the future as international business develops, as already highlighted. Employment at the company’s two yards in Glasgow is around 4,000.

2. *Repair and maintenance*

The core capability of scale here is defence vessel repair and maintenance. The **Royal Navy** base at Faslane is the Royal Navy’s main presence in Scotland and is “home to the core of the Submarine Service”⁷⁸. It is currently the base for six submarines and a number of surface vessels.

The base workforce⁷⁹ consists of around 3,500 military staff and approximately 2,300 civilians, mainly employed by the royal Navy’s main contractors, such as Babcock International, Lockheed Martin and Serco. It is planned that by 2022 Faslane will become the UK’s only submarine operating base. This will result in an increase in both the activities undertaken at the base and the workforce volume, consisting of both Navy personnel and commercial contactors. It is expected that the number of service personnel on the base will increase by 1,400 by the mid-2030s.

3. *Ship management*

Glasgow is the leading European centre for ship management⁸⁰ with 2000 ships managed from the city. The cluster of companies, including **Anglo Eastern, V. Ships, Northern Marine, Norbulk Shipping and Teekay Shipping**, successfully competes internationally, built on Scotland’s seafaring heritage, with Anglo Eastern and V. Ships being two of the largest ship managers in the world⁸¹.

The ship management businesses in the Clyde area benefits from access to a highly qualified workforce because of the excellent local maritime education and training infrastructure. However, the industry is aware that there is increasing competition for this skilled resource and is keen to promote the industry.

A cluster of support organisations, such as classification societies (e.g. Bureau Veritas, Lloyds Register, etc.) are co-located in Glasgow to support these ship management companies.

4. *Universities and Research Centres*

The **University of Strathclyde** is a leading international maritime academic centre.

⁷⁸ <https://www.royalnavy.mod.uk/our-organisation/bases-and-stations/naval-base/clyde>

⁷⁹ Faslane RN Base Expansion Economic Impact Report, EKOS for Scottish Enterprise, August 2019.

⁸⁰ Ship management covers a range of activities - provide the crew, train the crew, manage the crew, manage the machinery, repairs, maintenance, provide new building services, in-house naval architects, prepare tenders, go out to shipyards

⁸¹ <https://www.insider.co.uk/special-reports/scotland-greatest-secret-seven-seas-21807795>

Its **Department of Naval Architecture, Ocean & Marine Engineering (NAOMI)** is a world leading centre of marine technology with research activities covering sustainable shipping, maritime health and safety, oil and gas and marine renewables opportunities⁸². The first naval architecture chair was established here in 1883 and the department is the largest of its kind in the UK and Western Europe. It has a global reputation as a centre of excellence in marine technology and hosts the largest ship model experiment tank in the UK.

The **Department for Design, Manufacturing & Engineering Management (DMEM)** hosts MarRI-UK and has an established track record in maritime sector⁸³.

MarRI-UK is a collaborative innovation initiative for UK industry and academia to pursue research and innovation activities to support the development and commercialisation of maritime technologies and systems. It has been setup by eight maritime companies (Babcock, BAE Systems, BMT Group, Cammell Laird, Lloyd’s Register, QinetiQ, Rolls-Royce and Shell), the Society of Maritime Industries and four universities (Newcastle, Southampton, Strathclyde and UCL). Its aim is to provide cohesion and value within maritime research and innovation in the UK to support the global competitiveness of the UK maritime sector. It will do this by taking a collaborative approach to developing and exploiting new and emerging opportunities.

It has funding for an initial five-year funding programme to 2024/25 from the Department of Transport, Babcock International and BMT⁸⁴.

It has already awarded:

- £1.4 million to support ten TRL 3 to 7 “clean maritime” innovation projects which are designed to deliver low carbon shipping solutions⁸⁵.
- £1.5 million to support research and innovation projects to assist the maritime sector to address some of the goals and challenges defined in the Maritime 2050 vision⁸⁶.

A further call to support smart maritime land operations is currently underway.

The **Offshore Renewable Energy Catapult**, the leading UK innovation and research centre for offshore renewable energy, is also headquartered on the University of Strathclyde campus. It has numerous locations across the UK and internationally. Its key services include:

- Carrying out research on the testing and validation of new technologies, operational performance and disruptive innovation.
- Using its facilities and expertise to drive innovation and commercialisation of renewable energy technologies.
- Operating open-access research, test, innovation and validation services to support the development and deployment of new technologies.
- Supports supply chain development.

⁸² <https://www.strath.ac.uk/engineering/navalarchitectureoceanmarineengineering/>

⁸³ <https://www.strath.ac.uk/research/subjects/designmanufacturingengineeringmanagement/>

⁸⁴ <https://www.marri-uk.org/>

⁸⁵ <https://www.marri-uk.org/funding-opportunities/clean-maritime-call/clean-maritime-call-outcome-press-release>

⁸⁶ <https://www.marri-uk.org/projects-we-funded/technology-and-innovation-projects>

There are additional academic / research facilities in the Clyde area, including:

- The **University of Glasgow Marine Science Group** – covering biodiversity and conservation, marine resources and services, environmental change, ecology of marine organisms and bio-sedimentology⁸⁷.

5. Colleges

The **City of Glasgow College** is a global leader in maritime education and training, offering a range of accredited deck, engineering, oil and gas, offshore and maritime training courses approved by the MCA, RYA, MNTB and other awarding bodies. Stakeholder input indicates that it is one of the top five maritime education and training centres worldwide. Its heritage dates back to 1967 with the establishment of the Glasgow College of Nautical Studies⁸⁸.

It should also be noted that the College is complemented by a range of private sector training organisations, including Clyde Marine Training, which claims to be the largest maritime training provider in the UK, with a focus on trainees for the British Merchant Navy, and Stream Marine Training.

Higher Level Capability

6. Manufacturing Services

There are a number of fabrication and precision machining companies located in the Clyde area that actively support both the defence and commercial segments of the maritime sector. These are typically companies that offer such capability to a number of sectors rather than being specialised in the maritime sector. Contrasting examples of the types of companies included within this category are:

- **Castle Precision Engineering Limited** – turnkey supplier of complex machined components and assemblies to UK and international customers.
- **Dales Engineering Limited** – providing fabrication and engineering services to the oil, gas, chemical, power generation, marine, general and civil engineering sectors.
- **European Circuits Limited** – printed circuit board manufacturer and provider of turnkey contract PCB assembly solutions.
- **ICL Tech Limited** – plastics vacuum forming and fabrication company working with a variety of thermoplastics.

This base of companies will be in a position to support new entrants in the maritime supply chain in the Clyde area.

7. Systems for Equipment and Vessels

This category includes companies ranging from local suppliers to established global players, such as:

- **Thales** – global optronics company which has over 100 years’ experience⁸⁹ in Glasgow in design and manufacture of state-of-the-art periscopes and optronics masts for submarine platforms around the world. The company employs around 700 staff at its facilities in Glasgow and Rosyth.

⁸⁷ <https://www.gla.ac.uk/researchinstitutes/bahcm/research/sigs/marine/>

⁸⁸ <https://www.cityofglasgowcollege.ac.uk/work-with-us/nautical-training>

⁸⁹ <https://www.thalesgroup.com/en/united-kingdom/news/thales-centenary-submarine-periscope-supply>

- **Chadburns-Mollart PT** – world leading manufacturer of manual and power transmission products for use in both land and sea applications.
- **Howden Group** – global leader in manufacturing air and gas handling solutions, originally founded in 1854 as a marine engineering firm.
- **MML Marine** – world leading marine door manufacturer and supplier, supplying blast and fire door solutions a range of maritime sectors.
- **NCE Switchgear** – locally owned company that provides a range of electrical switchgear to commercial and defence segments of the maritime sector.
- **Wartsila** – global supplier of marine propulsion systems, with a base on the Clyde.

8. Passenger Transport

Passenger transport companies includes **CalMac**, key providers of lifeline ferry services with around 1,000 seagoing staff; **Western Ferries**, a private sector ferry operator; **Waverly Excursions**, the operator of the PS Waverly; and a number of other small operators.

This is a significant and critically important segment of the maritime sector for Scotland.

9. Marine / Maritime Infrastructure

This is a critical segment for the development of maritime activity on the Clyde as it includes a number of operators of land based maritime facilities. These are addressed in more detail in Section 3.2 below.

This analysis shows that the Clyde hosts a number of key industry, government and academic organisations with international credibility, which offer both opportunities and support capabilities to develop the scale and capabilities of sector supply chain. We believe that supply chain development will enhance the maritime sector development potential and influence the opportunities that can be exploited. This is the underlying rationale for focusing on “local opportunities”, that is Scottish / UK opportunities, as detailed in Section 2.2 and discussed further in Section 5.

3.2 Supporting Assets and Infrastructure

The Clyde Mission area can boast a number of assets and infrastructure that can support the maritime sector. These can be classified as:

- Existing / planned shipbuilding docks (and associated facilities)
- Leisure docks / marinas
- Business / innovation parks
- Research and training capability – as described above.
- Demonstrator projects

The locations of the facilities within the first three categories are shown geographically below and then described in the following section:

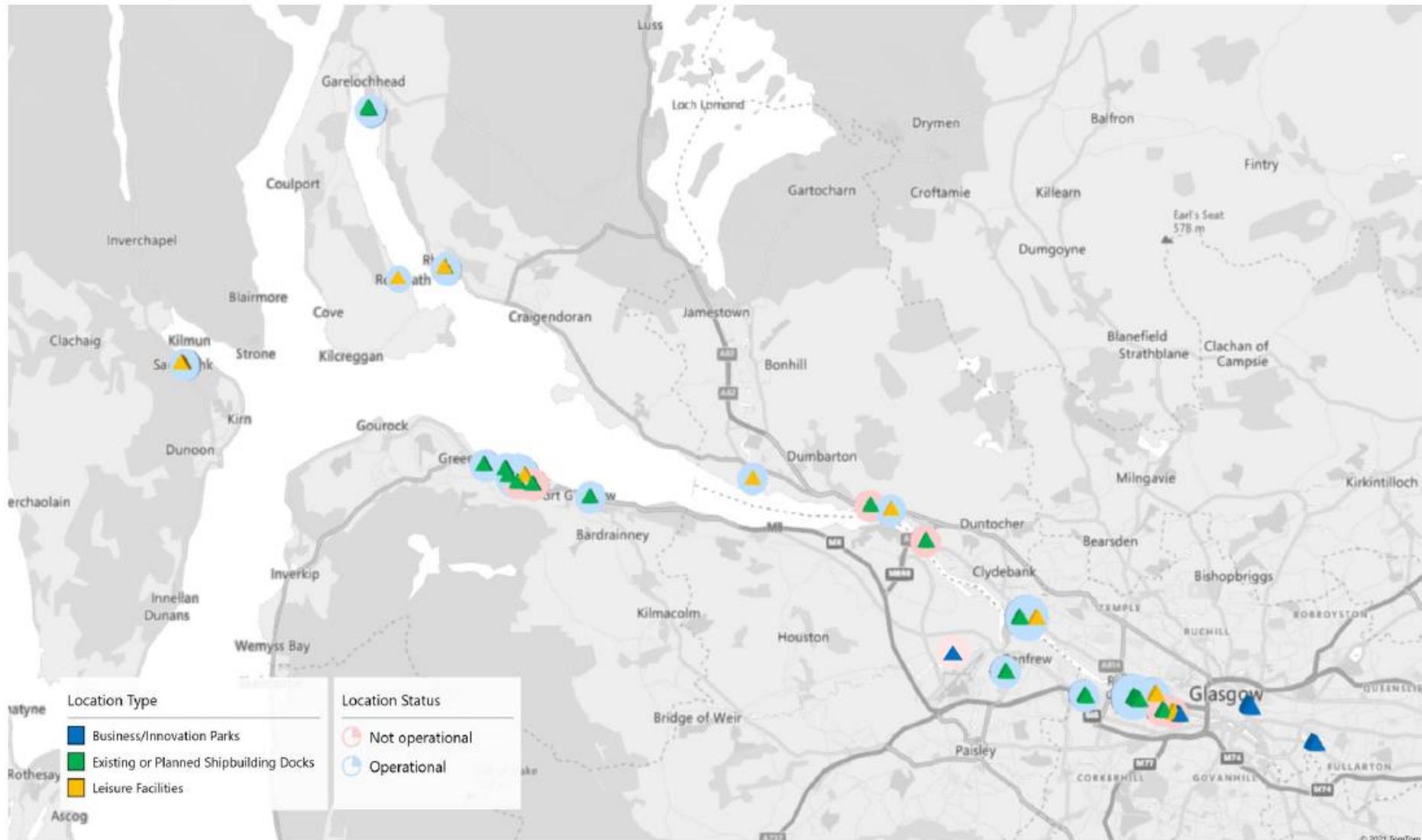


Figure 16: Mapping of Infrastructure Assets

3.2.1 Existing / Planned Shipbuilding Docks (and Associated Facilities)

With reference to the map above (Figure 27), the list below commences on the north of the river in the West, follows the river to the city centre and then follows the south of the river westward to Greenock.

Site / Owner or User	Sector	Main Use	Description of Activity	Status	Use / Potential Development Options
Faslane (HMNB Clyde)	Defence	Dock	Will become the centre for the entire UK submarine fleet. Activities include maintenance and training. Up to 8000 personnel can be located in accommodation on site.	Operational	Currently being used and under-development
Bowling (Former ExxonMobil Site, now West Dunbartonshire Council)	Previously oil terminal	To be defined	This site includes an area from the old Scott's of Bowling shipyard to Westfield and Sheepfold at Milton.	Plans for development	Recent approval has been given for a £34million mixed use development
Old Kilpatrick (Scottish Marine Technology Park (Malin Group))	Shipbuilding and / or Maintenance	Brown-field Site	The Malin Group own this 50-acre site and have plans to develop involving high value manufacturing for vessel builds	Not operational	Plans include a 1100 tonne ship hoist and a deep-water heavy lift berth
Elderslie Dry Dock Scotstoun (BAE Systems)	Shipbuilding and / or Maintenance	Dock	Currently used for outfitting frigates by BAE Systems	Operational	Currently being used by BAE Systems
Rothsay Dock, Clydebank (Peel Ports)	Shipbuilding and / or Maintenance	Dock	Currently used by the River Clyde Boatyard. There is a 75-tonne hoist and it is a secure 10-acre site. Peel ports operate a fuel terminal at this location for refined fuels.	Operational	Potential to be developed
Graving Dock Govan (New City Vision)	Shipbuilding and / or Maintenance	Dry Dock	Currently not in use. Developers have published a plan ⁹⁰ with three priorities – delivering appropriate maritime heritage and cultural activity on site, reinstating Dry Dock 1 for berthing and ship repair and developing 310 homes, 50 per cent of which will be 'affordable'.	Not operational	Potential to be developed. Currently used for film sets.
Govan Fitting Out Quay (BAE Systems)	Shipbuilding and / or Maintenance	Dock	Currently being used by BAE Systems for fitting out vessels from Scotstoun and Govan yards	Operational	Currently being used by BAE Systems

⁹⁰ <https://www.reglasgow.com/new-blueprint-for-govan-graving-docks-combines-maritime-heritage-culture-and-housing/>

King George V (KGV) Dock (Peel Ports)	Shipbuilding and / or Maintenance	Dock	Most recently used for lay-up of vessels including Royal Caribbean cruise ships and is available for other oceangoing vessels. Largest dock in the upper Clyde and is fully operational with cargo vessels offloading here.	Operational	Potential to be developed. Recent activity demonstrates the potential of the dock to become a cruising destination with extremely good access to the City of Glasgow.
Westway (Canmoor)	Shipbuilding and / or Maintenance	Dock	Westway industrial distribution and office park is the largest in the area and has an onsite docking facility. It is located in Renfrew.	Operational	Potential to be developed
Newark dock (FMPG)	Shipbuilding and / or Maintenance	Dock	Currently owned by Ferguson Marine Port Glasgow which is owned by the Scottish Government. Capability to build vessels up to approx. 100 metres. Development potential is restricted by Newark Castle, a grade 1 listed building.	Operational	Currently being used by Ferguson Marine Port Glasgow
Inchgreen (Peel Ports)	Shipbuilding and / or Maintenance	Dry Dock	Inchgreen has potential to be a first-class multi-modal port with road and sea access. It includes an operational dry dock, berthing quay and adjoining land with road and sea access, one of Scotland's largest dry docks (305m long x 45m wide), a repair quay (390m long, with a minimum water depth of 7.5m, capable of increasing to a dredged depth of 9m) and was identified in the National Renewables Infrastructure Plan 2014 as a potential offshore renewables site.	Not operational	Potential to be developed, depending on the priorities of the owner. There have been significant recent developments and there are expectations of new activities.
James Watt Dock (Peel Ports)	Shipbuilding and / or Maintenance	Dock	Partly used by HMNB this dock has been mainly developed for housing with a marina onsite. Capability remains for larger vessels.	Operational	Potential to be developed
Garvel Dry Dock (Dales)	Shipbuilding and / or Maintenance	Dry Dock	Currently operated by Dales and used for maintenance and new build of smaller vessels. Many of the CalMac fleet annually overhauled at this facility.	Operational	Currently owned and operated by Dales. Potential opportunities.
Scott's Dry dock (owned by Peel Ports)	Shipbuilding and / or Maintenance	Dry Dock	Believed to be the oldest dry dock in Scotland, this is now on the Buildings at Risk register. There have been discussions to make this part of a coastal heritage trail.	Not operational	Potential to be developed

East India Harbour (Peel Ports)	Shipbuilding and / or Maintenance	Dock	A proposed initiative (the East India Harbour Pocket Place) has been put forward by Sustrans, to make this area more attractive, including paintings, trees and benches for recreational use. Smaller vessels can still use this dock.	Operational	Potential to be developed
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Figure 17: Existing / Planned Shipbuilding Docks (and Associated Facilities)

This figure shows a number of facilities where there is potential for development, although limited access to parts of this infrastructure was identified by several stakeholders as a key barrier to their development. Engagement with the owners to understand barriers to development and discuss potential future use may offer new opportunities to support the cluster.

3.2.2 Leisure Facilities

Facilities in the Clyde Mission area can be listed as follows, using the same approach as above (commencing on the north of the river in the West, follows the river to the city centre and then follows the south of the river westward to Greenock):

Infrastructure Site	No of Berths	Depth	Max Length	Boat Lift	Storage	Boat Services	Other Services	Status	Potential Opportunity
Holy Loch Marina, Dunoon	250	6m	240m	23 tonnes		Various repair	Cafe	Operational	Fully developed
RB Marine Services, Roseneath	70 moorings	8m	80 ft (24.3 m)	18 tonnes	10 acres, 6 work sheds	Various repair	Boat sales	Operational	Fully developed
Rhu Marina, Rhu	235 pontoons, 35 moorings	5m	35m	35 tonnes	140 boats	Various repair	Restaurant Chandlery Boat sales	Operational	Fully developed
Sandpoint Marina, Dumbarton	30 pontoons	1.5m	80 ft (24.3 m)	40 tonnes and 85 tonnes	Outdoor and undercover	Various repair	Chandlery	Operational	Fully developed
Bowling Basin (Scottish Canals)	17 berths	1.02m	18m	-	-	-	Cafe	Operational	Opportunities for development
Clyde Boatyard, Clydebank	-	2m	16.4m	75 tonnes	10 acres, workshop units	Various repair	-	Operational	Opportunities for development at Rothesay Dock
Kelvin Harbour, Glasgow	20 berths	2m	-	-	-	Launch slip	Boat hire	Operational	Fully developed

Princes Dock/Canting Basin, Glasgow (Scottish Enterprise)	-	2m	-	-	-	-	-	Not operational	Potential to be developed
James Watt Dock, Greenock (Peel L&P)	170	5.2m	100m	11 tonnes	Outdoor and undercover	-	Boat sales	Operational	Development ongoing, plans to increase to 350 berths

Figure 18: Leisure Facilities

There are also a number of pontoons on the Upper Clyde, namely:

Pontoon	Location	Length	Max. Displacement Weight	Freeboard Section	Comments
Queens Quay	Near Titan Crane, Clydebank	30m	-	-	
Yorkhill	Riverside Museum	50m	200 tonnes	600mm	Additional 9m length 300mm freeboard section for canoe access
Crown Plaza	Crown Plaza hotel near the SECC	30m	-	-	Will be more accessible when Bell's bridge can open
Plantation Quay	Media Quarter near Glasgow Science Centre	40m	200 tonnes	600mm	
Govan	Near Govan town centre	30m	200 tonnes	600mm	
Braehead	Near Braehead Shopping Centre	35m			

Figure 19: Pontoons on the Upper Clyde⁹¹

Additional facilities in the Clyde Estuary (see Figure 12), listed using the same location convention, include:

- Tarbert
- Portavadie
- Rothesay
- Port Bannatyne
- Inverkip
- Largs
- Ardrossan
- Troon

⁹¹ <https://www.peelports.com/media/1370/8-clyde-leisure-navigation-guide-5th-edition.pdf> and <https://www.glasgow.gov.uk/index.aspx?articleid=17662>

A number of these are significantly larger facilities than those listed above.

3.2.3 Innovation Districts

These offer locations for innovation businesses and organisations, including those exploiting maritime opportunities. These include:

Infrastructure Site	Sector	Main Use	Description	Status	Potential Opportunity
Advanced Manufacturing Innovation District (AMIDS) (Renfrewshire Council)	Advanced Manuf.	Business location	52-hectare multi-use business location hosting industry and research activities	Under development – plans to develop 150,000 square metres of demand-led commercial floor space. Uses will include advanced manufacturing, aviation services and life sciences.	A number of companies and research facilities already located there. Potential opportunities for collaboration.
Westway Park (Canmoor Ltd) – linked to AMIDS	Multi-sector	Business location	Over 150,000 square metres of accommodation	Established, but several industrial units (up to 67,000 square metres) available	Would suit companies ranging from heavy engineering to logistics
Glasgow City Innovation District (University of Strathclyde)	High tech innovative sectors	Business location	A business location for entrepreneurship, innovation, and collaboration	Established, at high utilisation levels – Inovo2 was given planning permission in late 2018	The Technology and Innovation Centre (22,000 sq. m), Inovo (3,900 sq. m), The Tontine Building (3,015 sq. m) and The Garment Factory are already established locations for businesses and research activities.
Clyde Gateway Green Innovation District (partnership between Glasgow City Council, South Lanarkshire Council and Scottish Enterprise)	Low carbon sectors	Business, commercial and residential location	A multi-use location for business - over 100,000 sq. m of business space developed	Facilities available and others under development	Business space available but development is ongoing
Glasgow Riverside Innovation District (Glasgow University)	Medical / Quantum Tech. / Creative Industries	Business location	A location for innovative hi-tech companies	Under development – plans for 3,000 square metres of commercial space for businesses	Phase 1 expected to be completed by 2023

Figure 20: Business Locations

In addition, we understand that a **Clyde Engineering and Innovation Cluster** is planned. This initiative is planned with support from the Argyll and Bute Rural Growth Deal and will support the development of local economic activity, linked to the MOD's Maritime Change Programme, by addressing the lack of commercial accommodation for supply services.

In combination, these land-based maritime assets and business locations offer very attractive locations for development of maritime activity on the Clyde, assuming any commercial interests can be addressed.

3.2.4 Demonstrator Projects

A key demonstrator project that shows the potential of low/zero emissions heating is **Queens Quay**. The Queens Quay District Heat Network is the first, large-scale, water source heat pump scheme of its kind in Scotland. It has been developed as a demonstration of how water from a river can provide heat to a number of different types of customer via a connected heat network. The development is part of the increasing drive to decarbonise heat in Scotland. The network acts as a showcase so that other organisations can see the technology 'in action' and how it might be replicated in different areas of the country and beyond.

3.3 SWOT Analysis

Based on the evidence gathered in both primary and secondary research activities we have developed a SWOT analysis for the maritime sector on the Clyde, as follows:

3.3.1 Strengths

The key strengths identified are:

- High profile presence of large, global players in the defence sector.
- Major local demand and a key local customer (Scottish Government).
- The leading European ship management cluster.
- World leading academic centres of excellence.
- An international recognised maritime training centre (City of Glasgow College).
- A strong innovative culture and high-quality industry and academic innovation facilities.
- Available land assets for sector development.
- A focused and active sector association (The Scottish Maritime Cluster).
- Well-developed ship building and ship maintenance organisations (e.g. BAE Systems, Royal Navy)
- Established dry docking facilities that could be made available and used by sector companies.
- Good port assets for development.
- Strong Net Zero government policy.

3.3.2 Weaknesses

The key weaknesses identified are:

- A fragmented industry with low collaborative intensity – companies are following their individual strategies, rather than collaborating to access bigger opportunities.
- Lack of a national maritime / shipbuilding strategy for Scotland
- Lack of collective, cohesive approaches that include all key companies and stakeholders.
- Lack of industry commitment to commercial shipbuilding development.

- Lack of industry leadership in developing partnership approaches to opportunities.
- Only one active commercial shipbuilder of scale.
- Weak government intervention to support local shipbuilding.
- A weak shipbuilding supply chain compared to European competitors.
- A lack of a collective vision to develop the sector on the Clyde.
- Higher base costs compared to Poland, Turkey, etc, due to, for example, less supportive industrial policy, repeated need for set-up costs (lack of business continuity), higher business rates, higher taxes and less support infrastructure available.
- Lack of access to key infrastructure inhibiting development opportunities.
- Some key sites in need of development.
- Digital communications infrastructure, especially when remote working is required.

3.3.3 Opportunities

The main opportunities identified are:

- Interest in the sector by the Scottish Government via Clyde Mission
- UK National Shipbuilding Strategy Refresh
- Accessing supply chain opportunities in the manufacture of Type 26 and Type 31 frigates.
- Significant pipeline of business through future ferry contracts and other government owned vessels (e.g., NLB, fishery protection and naval base support vessels).
- Strong desire within UK Government to revive UK shipbuilding.
- MOD's Maritime Enterprise Scotland Programme.
- Expansion of activity at HMNB Clyde to anticipate future demands and need to use 'out-of-wire' capacity.
- Cluster development at the Scottish Marine Technology Park.
- Development of low carbon power systems – linking with other transport sectors.
- Low/zero emissions (water source) heating development.
- Offshore wind decommissioning innovation and development.
- Research and development on net zero carbon opportunities.
- Exploiting existing innovation infrastructure (e.g., NMIS, universities, etc).
- New business from offshore wind vessels.
- Fabrication of large segments to support deployment of large floating wind structures.
- Underutilised dry-docking facilities at Inchgreen and Glasgow could be reactivated and developed.
- Growth in marine tourism

3.3.4 Threats

Key threats identified are:

- Loss of local shipbuilding to low-cost competition in Eastern Europe /Far East.
- International competition leading to a lack of critical mass in key segments, such as ship management, in turn leading to significant decline.
- Brexit in relation to uncertainty within established supply chains.
- Competition / displacement from other Scottish areas.
- Disconnect between aspirations of Scottish and UK Governments regarding local shipbuilding.

- Strategic partnerships between foreign shipbuilders and English shipyards.
- Significant support from overseas governments to support their indigenous shipbuilding
- Better financial incentives from other international agencies.
- The impact on defence shipbuilding of a different constitutional future.

This analysis is developed further in Section 5, below, with particular reference to the potential opportunities identified.

4 Maritime Cluster Development Elsewhere – Transferable Lessons

4.1 Overview of Case Studies

Six maritime clusters from around the world were reviewed and consulted to identify best practice in developing and sustaining a maritime cluster. Case study summaries, including key messages, and full case studies are included in Appendix D).

Key areas of best practice identified are:

1. Clearly defined vision / mission, aims and objectives
2. Industry leadership, especially at Board level
3. Government supporting the cluster
4. National strategies underpinning or aligning with the cluster
5. An experienced and dedicated management team
6. Diverse income streams / stable financial position
7. Inclusive membership but with boundaries set
8. Effective integration of disparate groups
9. Broad spectrum of accessible assets and infrastructure
10. Facilitating collaboration

Based on these, the main transferable lessons for Scotland are detailed below.

4.2 Transferable Lessons

4.2.1 Government support

The importance of receiving government support and commitment is one of the main lessons learned from studying the cluster examples discussed above – it was an area that was emphasised as being significant to the long-term success and sustainability of the cluster, according to each cluster organisation consulted. Government support does not exclusively mean subsidies / financial support, it means a commitment to helping the cluster develop. Regular ministerial attendance (or other political representatives) at, for example, cluster meetings demonstrate commitment to listen; acting on specific matters, with fiscal policy or other interventions, is another matter. Maintaining a constant and open dialogue between industry and government is, therefore, a key transferable lesson for the Clyde Mission and Scottish maritime cluster more broadly.

4.2.2 Industry-led

One case study example described industry leadership as a must to ensure the success and sustainability of a maritime cluster. Other cluster organisations similarly echoed the importance of industry playing a leading role in the development of the cluster. What is clear is that there must be a positive and proactive relationship between industry and government, but it is important that industry leads, shapes and steers the cluster, not the other way round. For the Clyde Mission and Scottish maritime cluster more broadly, taking action to identify industry leaders that could be recruited to support these initiatives may be worth consideration - this could be in a Board role or some other capacity.

4.2.3 National strategy

The Department for Transport’s recent Maritime 2050: Navigating the Future strategy sets out ambitions that will cement the UK as a ‘world leading maritime nation long into the future’⁹². The strategy was developed around a set of five building blocks, is underpinned by a set of five values, outlines 10 strategic ambitions, and contains seven thematic chapters. It is structured to support the long-term vision and objectives of the UK maritime sector and, reinforcing the transferable lesson above, emphasises the importance of forging a ‘real partnership between government and industry’⁹³. While Scotland is of course represented in the strategy, it was clear from consultation with some of the cluster organisations during this study that a dedicated national strategy would focus and underpin the cluster, integrating disparate groups and providing guidance for the sector. It is understood that a national strategy was being developed by Transport Scotland in 2019 but this was never completed. This suggestion can be taken further and justify the need for both national and Clyde Mission regional maritime strategies.

4.2.4 Sufficient management resource

Another crucial component to the success of maritime clusters elsewhere is a sufficiently resourced cluster organisation with a dedicated team that manages the day-to-day running of the cluster services, activities and operations. In the case of Finland, one Project Manager was seconded from a partner organisation to run the operations of the cluster – this is in comparison to Canada’s Ocean Supercluster which has >20 full time staff and the Merseyside cluster that has around 10 staff. The table in section 4.2 shows that Finland was ranked as ‘Moderate’ compared to Canada, ‘Very Strong’, in the area of Management Team. Defining what a *sufficient* management team is in terms of number of staff, departments, etc, is of course relative to the characteristics of the sector and the region and, importantly, the vision and ambitions of the cluster. The case studies that demonstrated real strength in the area of management had several staff, across various departments, treating the cluster organisation as a full-time business operation. Reviewing the resources available to support the Clyde Mission, and more broadly the ambitions of the maritime cluster in Scotland, should be considered.

4.2.5 Facilitating collaboration

Perhaps more of an objective or outcome of the cluster, but again, a common view between the cluster organisations case studied for this project was the importance of collaboration. Abandoning siloed ways of working and nurturing a collaborative and cooperative ethos that drives the cluster in the same direction with common goals and shared commitment to the good of the cluster. Facilitating collaboration was a key part of the cluster organisation’s remit and was often top of the list in the cluster’s history of achievements. Possible recommendations for the Clyde Mission / Scotland: secure large companies as members of the cluster, provide access to key assets and infrastructure, demonstrate government support and commitment, deliver services / activities that align with the national strategic ambitions for the sector, and resource the lead cluster organisation with the right people; these all contribute to create an environment where collaboration can occur.

⁹² Secretary of State for Transport quoted in Department for Transport, Maritime 2050: Navigating the Future

⁹³ This is one of the five values laid out in the Maritime 2050: Navigating the Future strategy

5 Development Opportunities

The potential of the maritime sector on the Clyde to pursue the specific opportunities identified is considered in this section. This is followed by consideration of more general development options to support growth of the sector, with key development actions identified.

5.1 Exploiting Specific Opportunities

The local opportunities discussed in Section 2.2 are assessed further here, considering local company capability, existing assets/infrastructure and the gaps that need to be addressed to enable the Clyde to pursue these opportunities. Development options and timescale to impact are then identified for each opportunity.

5.1.1 Commercial Shipbuilding

The Opportunity

This is a significant opportunity for the Clyde. As indicated in Section 2.2 there is a clearly identified long-term requirement for commercial vessels in Scotland and the rest of the UK. This includes:

- All Royal Navy and RFA requirements
- Trinity House and Northern Lighthouse Board (2 vessels) requirements
- Border Force requirements – offshore and inshore patrol vessels
- DEFRA research vessel
- NIAFB research vessel
- Marine Scotland research vessels
- Marine Scotland patrol vessels (3 vessels)
- Scotland’s island and inter-island ferry requirements (21 vessels)
- Oil and gas /offshore renewables support vessels

A total demand of 60 to 70 vessels is estimated by sector representative bodies⁹⁴.

A number of stakeholders strongly believe that the Clyde could rebuild its shipbuilding capacity in response to this opportunity, with some analysis, as already presented, suggesting a sufficient demand to support two yards on the Clyde.

If not, this demand will be addressed by overseas companies, such as the recent purchase of tugs from Damen by Clyde Marine Services.

Current Capability

There is currently one commercial shipbuilder on the Clyde that can build vessels of over 500 gross tonnes / 50 metres in length, namely Ferguson Marine (Port Glasgow) Ltd in Port Glasgow⁹⁵. The company was brought into public ownership on 2 December 2019, establishing the new group of companies, wholly owned by Scottish Ministers.

⁹⁴ The Society of Maritime Industries and the Maritime Enterprise Working Group

⁹⁵ UK Shipbuilding Competitiveness and Market Focus, 2019, Damien Bloor, First Marine International, Presentation to SMI Annual Conference, March 2021

The Malin Group plans⁹⁶ to develop shipbuilding capability at The Scottish Marine Technology Park which will be capable of building vessels up to 60 metres in length. Work began on this development in 2020 and recent funding of £1,980,000 from the Scottish Government’s Clyde Mission is supporting its development, although the total anticipated investment cost is £83.9 million. It is expected to be fully operational by 2024. According to the economic impact assessment commissioned by the Malin Group, and also quoted in its White Paper, it will support around 1,100 additional jobs in the Glasgow area.

In addition, there are facilities that could be developed to support shipbuilding, such as one of Europe’s largest dry dock facilities at Inchgreen in Greenock⁹⁷.

The Challenge / Gap

These observations indicate that there are some tangible assets, either existing or under development, to support long-term shipbuilding on the Clyde but that there are a number of gaps/issues to overcome to establish a strong proposition. These include:

- Addressing current issues and supporting the long-term sustainability of Ferguson Marine.
- Developing additional shipbuilding infrastructure to complement the limited space in the Ferguson Marine Yard in Port Glasgow.

Addressing the Challenge – Development Options

We believe, based on the work carried out in this study, that several parallel initiatives need to be implemented to reposition and develop commercial shipbuilding assets on the Clyde. These initiatives include:

- **Joint public and private sector commitment and action.** The Scottish Government (and its agencies) as the main influencer, as it is procuring a significant number of vessels over the foreseeable future, is considered the key figure in addressing the challenge. We believe that constructive engagement between the Scottish Government, its agencies and industry is critical to redeveloping shipbuilding on the Clyde. If the Scottish Government does not commit to working constructively with key industry players, we believe that this opportunity will be seriously affected. A key message from stakeholder consultation was that not enough has been done, either at a Scottish and UK level to use public procurement to support local, in-country shipbuilding. It was suggested that the tendering process should be such that local content is favoured – this is successfully implemented in many other countries and Canada was highlighted as one example.
- **Identifying and attracting an established, internationally respected shipbuilding operation to “partner” with current and planned yards on the Clyde** would deliver short term expertise, competitiveness and credibility so that early orders are won locally and enable credibility to be demonstrated going forward. However, the structure of such a “partnership” is difficult to define at this stage. It would also be expected that a committed inward investor would bring some of its supply chain, which could lead to further inward investment and catalyse development of the maritime supply sector.

⁹⁶ Delivering a Marine Technology Hub for Scotland White Paper, Malin Group December 2020, see <https://malingroup.com/wp-content/uploads/2021/01/MG-DMTHS-WP004-Final-December-2020.pdf>

⁹⁷ <https://www.peelports.com/campaigns/inchgreen>

- **Establishment of a planned pipeline of business, not one-off builds** – the margins in shipbuilding are very tight and often a shipyard will lose money on the first of a series of builds but will recoup that loss during the second or third build⁹⁸. The potential to increase build efficiency and optimise operations corresponds directly to the number of units to be produced within the series. Further gains are possible if the same design of vessel can be resold to more than one customer. The opportunity to be successful as a shipyard is greatly reduced if every build is bespoke. Naval shipbuilders like BAE Systems have multiple vessel orders, with secured contracts with the MOD, which provides them with the confidence to invest in their manufacturing and technical capabilities. Similarly, non-military shipyards like the Damen Shipyards Group⁹⁹, have a similarly stable order book. Also, both companies are able to sell the same vessel design to multiple customers. For any shipyard to be successful, regardless of its location, securing series builds is a key requirement. This regular work, gives both the shipyards and their suppliers the confidence to invest and build local capability, including workforce confidence.

Key to development and growth in shipbuilding on the Clyde, therefore, is strong commitment and support from the Scottish Government to ensure public procurement of vessels creates viable business opportunities for in-country suppliers. It is understood that, with Brexit, we may have more freedom with procurement.

However, it is recognised that future procurement needs to be carried out on a commercial basis and arrangements need to be put in place to ensure an effective cost competitive, credible supply chain is developed.

- **Develop ‘build and maintain’ procurement contracts** – to increase the rationale for a local supplier and to deliver a long-term business opportunity.
- **Minimise bespoke design** – a particular issue that was repeatedly highlighted when discussing shipbuilding opportunities for the Clyde was the need to standardise and modularise vessels whenever possible. Looking again at shipyards that have been successful, it is clear that one of the factors in that success has been the drive to minimise bespoke design. A good example of an area for development in Scotland that would contribute strongly to realising the opportunity of increased shipbuilding activity on the Clyde is to work with ferry owners and other customers to try to standardise vessel design. There will always be a requirement for slightly different design for certain routes and certain port infrastructure, but such modifications should be limited and should be an adaptation and not a complete redesign.
- **Support the development of next generation technologies** – for shipbuilding on the Clyde to be successful, it would need to be at the forefront in the development and adoption of new technologies, especially those that will deliver low carbon / net zero solutions. There are Scottish organisations involved in such developments through, for example, participation in HySeas III and there are already some very strong innovation assets around the Clyde, both within industry and academia that would support such developments. For example, recent discussions with a

⁹⁸ Damien Bloor, First Marine International, Building the Future of the UK’s Shipbuilding Enterprise, Society of Maritime Industries, March 2021

⁹⁹ <https://www.damen.com/en>

company that is pursuing low carbon train power systems expressed strong interest in maritime opportunities.

Timescale / Potential Future Economic Impact

It is expected that it would take several years to deliver the above requirements which would reposition the Clyde as a competitive commercial shipbuilding location.

The impact of success could be shipbuilding orders of tens of million pounds per annum. For example, the value of the pipeline to supply Scottish ferries over the next period is of the order of £30 million per annum.

Further to this, increased shipbuilding activity on the Clyde would act as a catalyst to developing local supply chains and deliver many associated benefits. However, it must be stressed that this is likely to be a longer-term opportunity and a sustained commitment from all stakeholders would be required.

Summary

There is an opportunity for the Clyde to rebuild shipbuilding capacity as there is significant Scottish and UK demand for vessels in the coming years which can support additional commercial shipbuilding businesses. It is, however, also an extremely challenging opportunity. Ferguson Marine is still going through a business turnaround process as it looks to establish a sustainable future. Further, to fully realise this opportunity, there is also a need to support the development of the infrastructure required to support additional shipbuilding capacity on the Clyde.

There would need to be major government commitment to support the industry going forward and there would need to be a strong collaborative approach required by all players.

5.1.2 Defence Shipbuilding

The Opportunity

There is a major opportunity here for the Clyde. The central position of BAE Systems in the manufacture of 8 Type 26 frigates on the Clyde has already been detailed. The recent Defence Command Paper¹⁰⁰ reiterates the UK Government’s commitment to “build eight Type 26 anti-submarine warfare frigates on the Clyde” and commits to doubling shipbuilding investment over the life of the current Parliament to over £1.7 billion a year. As already highlighted the value of the contract for the first three ships, announced in 2017, was around £3.7 billion. It is understood that a contract in the order of £6 billion will be placed for the further five ships announced. It is also reported that more than £1 billion has been spent in the Type 26 supply chain¹⁰¹ in 2020, with companies such as the Malin Group and J&J Denholm winning major contracts.

Further to this, the Australian Navy has announced that it will acquire nine frigates in a deal worth £20 billion¹⁰² and Canada plans to acquire fifteen frigates under the Canadian Surface Combatant (CSC) programme at a cost of around £40 billion over 26 years¹⁰³. However, it should be noted that both

¹⁰⁰ Defence in a Competitive Age, Ministry of Defence, March 2021

¹⁰¹ “BAE awards five contracts to suppliers for Type 26 programme”, Naval Technology, July 2020

¹⁰² <https://www.defensenews.com/naval/2018/06/29/australia-officially-announces-26b-frigate-contract-here-are-the-build-details/>

¹⁰³ <https://www.naval-technology.com/news/canadian-surface-combatant-project-found-to-cost-more-than-52-7bn/>

Canada and Australia have built their own naval platforms in the past and have sophisticated local supply chains.

In addition Babcock International has secured the contract to build five Type 31 frigates at an estimated total cost of £1.25 billion¹⁰⁴. Babcock have committed to develop an “extended supply chain, with an emphasis on UK suppliers, both at a large company level and with small to medium enterprises, at all tiers of the supply chain”¹⁰⁵, which may offer opportunities for the supply chain on the Clyde.

Current Capability

The position and capabilities of BAE Systems in particular, and Babcock International to a lesser extent, are key to this opportunity due to the scale and duration of their contracts.

Other companies on the Clyde, as mentioned above, have already demonstrated their capabilities to win supply chain contracts. Other companies, identified in this report, have the potential to win future contracts, given foresight of these and the opportunity to position themselves. The Navy’s development of Maritime Enterprise Scotland may support some companies to develop to be able to pursue such opportunities.

The Challenge / Gap

The challenge here is two-fold. Firstly, to optimise the opportunities for BAE Systems and Babcock International to win UK and international business that builds on their current positions and, secondly, to maximise their local supply chain spend.

The key gap here is the capability of the supply chain to respond to supplier opportunities. As indicated in the analysis of the company base on the Clyde and the Clyde Maritime cluster map, the capability of the equipment and systems supply chain for vessel manufacture, especially naval vessels, is relatively weak.

Addressing the Challenge – Development Options

The priority here is to be closely engaged with both BAE Systems and Babcock International – to support its activities and to be aware of supply chain opportunities. We understand that this is already the case through, for example, Scottish Enterprise supported activities, but we believe it is timely to consider the scope for further development of these.

We assume that an awareness of future procurement exercises will be developed from these engagements. Matching these procurement needs with local supply chain capability, assuming relevant capability can be identified, should offer the potential for further business in the Clyde area. The scale of future demand could support local supply chain development / inward investment in specific areas.

Timescale / Potential Future Economic Impact

As indicated in Section 2.2, this is a current and long-term opportunity, with activity to date focusing predominantly on the first of these frigates, HMS Glasgow. It is assumed that the £1 billion of supply

¹⁰⁴ <https://www.forces.net/news/type-31-babcock-signs-ps12bn-frigate-contract>

¹⁰⁵ <https://www.babcockinternational.com/what-we-do/marine/defence/type-31/sustainability/>

chain opportunities to date will be replicated for future vessels, offering a number of opportunities. It is difficult, however, to estimate the share won by Clyde based businesses.

Summary

This is a major, current, tangible opportunity, already secured by BAE Systems, that will support long-term employment on the Clyde. There is potential for local supply chain opportunities, assuming local capability can be matched with customer needs.

5.1.3 Recreational Boat and Yacht Shipbuilding

As detailed in Section 2.2, while there are a number of recreational boat builders on the Clyde, this is not considered one of the more attractive opportunities for the Clyde area.

5.1.4 Ship Repair and Maintenance

The Opportunity

Three different opportunity areas for ship repair and maintenance were identified in Section 2.2:

- Fish farm vessel maintenance
- Large leisure yacht refits
- Low carbon technology refits

We believe that the first two of these are not attractive opportunities to pursue. For fish farm vessel maintenance it is considered the location of the Clyde is not suitable for maintenance of vessels that are predominantly located around the lochs, bays and islands on the west and north west coast of Scotland. Suppliers that are located in, or close to, these areas are likely to be used for this activity. The existing company base to refit large leisure yachts is considered to be comparably weak, compared to established locations elsewhere and this is seen as a major barrier for development on the Clyde. However, with the owner of these vessels seeking more ‘off the beaten track’ destinations there may be opportunities for this type of work, but more likely in other parts of the Clyde estuary.

The third opportunity is at the development stage with a number of players worldwide seeking to develop the optimum low carbon technologies for new vessels and for retrofitting existing vessels (examples included in Section 2.2). Developing appropriate solutions is a key priority to meet net zero targets, which is expected to result in opportunities – both to develop the technology and subsequently to fit on vessels.

We believe that this opportunity offers potential to the Clyde area due to this innovative element – existing industry players can collaborate with relevant academic expertise to develop the Clyde as an innovation centre that will underpin industrial activity to address local and UK markets. Of course, Scotland’s commitment to achieving net zero by 2045 imposes a need to deliver solutions earlier than elsewhere.

Current Capability

Several companies are developing technologies for this type of retrofit. Examples in the Clyde include:

- Caledonian Maritime Assets Limited (CMAL) participation in the EU funded HySeas III project¹⁰⁶, to develop a hydrogen fuel cell powered ferry.
- Naval architects, Marine Design International, that have experience of electric powered boats and hydrogen powered boat design.
- The BMT Group have in recent years announced a new hybrid ferry design that uses a ‘Hybrid-Drive’ system, comprising both batteries and diesel, where the battery power is used most of the time with support from the diesel engines whenever high power is required.

There are also companies already active in similar activities, such as Arcola Energy, which is developing a hydrogen fuel cell powered train in Scotland that may be interested in maritime opportunities.

The research community in the Clyde area, such as the advanced engineering capability in universities and within NMIS, as well as elsewhere in Scotland (e.g., the University of St Andrews’ expertise in fuel cell, battery and energy conversion technologies), would be important to support this opportunity.

The Challenge / Gap

There are capacity, facility, and skills gaps to address here to develop this opportunity.

The first challenge here is to develop a new industry as there is currently little local capability, in terms of companies, skills or labour force. But this is not such a significant challenge as this is an emerging opportunity rather than an established market. The first stage in the development of this opportunity would be to establish innovation activities that can build and demonstrate that the Clyde is a key centre for low carbon maritime power systems. The embryonic company base, such as those companies listed above, and key academic and innovation centres, would be the building blocks of this opportunity.

Addressing the Challenge – Development Options

There are academic centres, particularly the University of Strathclyde, and some emerging companies that would need to come together to develop this opportunity. Initially, this would be through developing and demonstrating relevant technologies, potentially utilising facilities such as Inchgreen or the Scottish Marine Technology Park.

The importance of innovation and technology demonstration in this area is highlighted by the current Department of Transport funded Clean Maritime Demonstration Competition¹⁰⁷.

Timescale / Potential Future Economic Impact

This is a long-term industrial opportunity that would build on an established innovation reputation, which firstly has to be built. In the short to medium-term, the impact would be limited to innovation activities with modest economic impact.

Summary

This is an innovation driven long-term opportunity to build a new activity in the Clyde area. The first stage in its development would be to establish internationally recognised innovation activities. Such

¹⁰⁶ <https://www.hyseas3.eu/the-project/>

¹⁰⁷ <https://apply-for-innovation-funding.service.gov.uk/competition/888/overview>

activities would highlight the forward-looking cluster on the Clyde and would be a valuable asset when promoting the cluster internationally.

5.1.5 Ship Management

The Opportunity

This is a multi-billion pounds global market with projected future growth where the Clyde already has a strong presence. The sector must adapt to the challenges of reducing carbon emissions and improving the efficiency of service. It is expected that adoption of digital technologies will be critical to addressing these challenges and future competitiveness.

If it is successful in doing so, the cluster can expect to grow in line with the overall market growth.

Current Capability

The Glasgow ship management cluster is already operating on a worldwide basis with 2000 ships managed from the city. The cluster of companies, including Anglo Eastern, V. Ships, Northern Marine, Norbulk Shipping and Teekay Shipping, successfully competes internationally, built on Scotland's seafaring heritage, with Anglo Eastern and V. Ships being two of the largest ship managers in the world with numerous global locations.

The Challenge / Gap

The challenge is to ensure that this cluster can remain competitive and grow in an established but changing market. Based on the consultations in this study, we understand that there are skills, labour force and infrastructure gaps. These include expertise in / access to digital technologies, access to skilled mariners, high quality digital connectivity to address the operational challenges imposed by COVID, good international transport links, and support from key supply chain players, such as classification societies.

Addressing the Challenge – Development Options

Collective action by the group of ship management companies to optimise their business environment on the Clyde is required. The development of a focused ship management cluster, where companies that traditionally compete with each other take a collaborative approach to addressing skills, infrastructure and supply chain needs is proposed.

The value of a cluster specific digital technology innovation and skills programme should also be developed. It would be expected that existing local assets, such as the City of Glasgow College, CENSIS, and local technology companies, particularly Spire, would have a key role in this programme.

Timescale / Potential Future Economic Impact

The focused cluster can be implemented very quickly. Impact can be measured by monitoring the scale (e.g., turnover or employment data) of the cluster going forward.

Summary

This opportunity focuses on supporting an existing internationally competitive group of companies to ensure that they can develop and thrive in a changing marketplace. Retention of the cluster that grows in line with the market is considered to be an appropriate target.

5.1.6 Freeports / Green Ports

This is considered to be a mechanism to support the competitiveness of locations to develop opportunities, such as those discussed in this section and is therefore not considered as an opportunity in its own right.

Should ports within the Clyde Mission area be designated Freeport/Green port status, the zone(s) will benefit from a package of tax and customs incentives.

5.1.7 Low/Zero Carbon Smart Ports

As indicated in Section 2.2.4, there is a major need for ports to develop automated and zero carbon operations, to deliver sustainable land-based operations and provide appropriate interfaces and services for visiting vessels.

The Opportunity

The development / upgrading of port facilities, such as Greenock Ocean Terminal, to address the low carbon and smart port requirements that will be demanded in the future is the major development requirement¹⁰⁸. This investment in infrastructure, new technologies and new operational procedures (to align with the need to reduce carbon emissions) will be an essential requirement for port owners and operators to ensure their facilities meet client (e.g. cruise liner) needs and will also assist other companies that may use specific facilities.

Current Capability

Within the concept of Zero Carbon Smart Ports, it is understood that there are significant development needs to upgrade port facilities on the Clyde. Further, if there are plans to develop other docks, for examples those close to Glasgow, then similar development will be required to address zero carbon and smart port operations.

The Challenge / Gap

In depth engagement with port operators (e.g. Peel Ports) is required to develop this opportunity (address this need). As is evident from examples of best practice (for example APM Terminals Gothenburg), port owners need to develop and drive the programme of transition. It requires strong commitment to invest in the supply chain and explore alternative technological options.

Addressing the Challenge – Development Options

The first stage in addressing this challenge is in depth engagement with port owners (e.g. Peel Ports) to fully understand its development plans and the barriers identified. Thereafter we envisage a potential requirement for provision of support to port owners/operators where appropriate to ensure it is able to develop supply chains to ensure that facilities that meet future user needs.

Summary

This is considered an important development opportunity where in-depth engagement with port owner/operators is critical. It is recommended that a working group comprising port owner / operators

¹⁰⁸ It is assumed that it is part of the Scottish Marine Technology Park investment plans to address low carbon and smart port requirements

and other key stakeholders is developed to identify and implement relevant support programmes to ensure that ports are developed so that they are “fit for the future”.

5.1.8 Developing Faslane’s Supply Chain

The Opportunity

This is a major maritime sector and supply chain development opportunity. The development of Faslane as the UK’s only submarine operating base and the Royal Navy’s ambition to develop stronger local integration have already been highlighted. This is expected to offer both infrastructure development and supplier opportunities. The capital infrastructure programme for the development of Faslane is estimated at £1.3 billion – it is understood that it will include a range of opportunities from basic building projects to specialised infrastructure development.

Focusing on more specific maritime opportunities, strong interest has been expressed in utilising supporting infrastructure in the Clyde area to address gaps in Faslane capabilities, for example the Faslane base does not have a dry dock and instead a ship lift is used when maintenance of a submarine is required. Further to this, we understand that, in order to modernise the Faslane base, this site must be ‘decompressed’ with work sent off-site and there is certainly strong interest in utilising supporting infrastructure in the Clyde area.

Maritime Enterprise Scotland, developed by the Royal Navy (as already described), widens the scope and potential of this opportunity.

Current Capability

It is understood that the Inchgreen dry dock and the Scottish Marine Technology Park are potential ‘facilities of interest’. With expansion of activities at the base, there is likely be greater need for dry docks and the Inchgreen dry docks, under Peel Group control, could be used to address that demand. Similarly, there is good potential to distribute marine engineering work to locations such as the Malin Group’s Scottish Marine Technology Park. However, as already indicated, there may be challenges in accessing facilities at Inchgreen and it will take time for the Scottish Marine Technology Park to be developed.

Dry dock specialists, such as Dales Marine Services, are already used for the maintenance of surface vessels.

The Challenge / Gap

There are facility and capability gaps to overcome to fully exploit this opportunity.

The Royal Navy, as indicated above, is committed to using local maritime assets and suppliers and is already actively identifying and trying to access facilities and capabilities on the Clyde. Ensuring that the Royal Navy is able to pursue these is essential to maximise the opportunities for the Clyde.

Utilising the local maritime supply chain is, and will continue to be, critically dependent on the capabilities within this supply chain. As already indicated in Section 3, the depth of capacity / capability in the supply chain is relatively weak and there are significant opportunities for supply chain development.

Addressing the Challenge – Development Options

The first stage in addressing this challenge is in depth engagement with the Royal Navy to fully understand its current and future needs, the opportunities that these will offer and the barriers identified. Thereafter we envisage a potential requirement for:

- Engagement with key asset owners, where appropriate, to facilitate access to key facilities.
- Development of local supplier capability to meet specific Royal Navy needs. This may require development of existing capability or inward investment of new companies. We would expect that these will be predominantly focused on Royal Navy needs, but there will be potential to address wider UK maritime opportunities.

Timescale / Potential Future Economic Impact

This is a current opportunity with long term potential. The scale of the economic opportunity for the maritime sector could not be quantified.

Summary

This is an attractive long-term opportunity. We consider that public sector intervention, as described above, will be required to fully access this opportunity.

5.1.9 Offshore Wind

The Opportunity

With UK Government commitment to reach an installed offshore wind energy capacity of 40GW by 2030 and the Scottish Government’s target of 11GW by 2030, there is clearly a significant supply chain opportunity. Further, there is commitment within the Offshore Wind Sector Deal, to increase the UK lifetime content of UK projects to 60% by 2030.

The key opportunity for the Clyde, is to continue to capture the value of work that needs to be done locally, such as installation, project management, service, and maintenance. There is additional opportunity for marine engineering businesses to try to diversify into the offshore wind fabrication, as volumes increase and the need for local content is pursued.

Current Capability

Our analysis shows there is a strong cluster of companies within the Clyde area already supplying into the marine renewables market, including offshore wind. This includes large organisations, such as Atkins, that provide project management services, and Aggreko which provided power and control equipment and services. There are also several ‘balance of plant’ and ‘operation and maintenance’ companies in the Clyde area.

With regards to fabrication, there are several companies with the capability to diversify into elements of offshore wind fabrication, producing for example large structural segments for floating offshore wind foundations.

Challenge / Gap

There are two main challenges here. The first is capturing a greater proportion of the market opportunity for work that needs to be done locally. Businesses in the Clyde area that already supply into this market need to position themselves to respond to demand as installed capacity of offshore wind increases

towards 2030. Secondly, companies looking to diversify into offshore wind fabrication need to develop a competitive offering and need support to access the market.

Addressing the Challenge – Development Options

The main priority is to support companies access a greater proportion of the offshore wind opportunity. Greater dialogue between Clyde-based businesses / organisations and sector development organisations, such as the Scottish Offshore Wind Energy Council (SOWEC), a partnership between the Scottish public sector and the offshore wind industry, and an appropriate supply chain development programme is required to explore and respond to options for increasing local content.

Timescale / Potential Economic impact

This is a current and long-term industrial opportunity that would build on the existing activity. In the short and medium the impact is likely to result from capturing a greater share of the project management, service and maintenance provision into offshore wind. In the longer term, additional revenue streams and job creation could result from a diversification into manufacturing activities.

Summary

This is a potential high growth opportunity for companies already supplying into or looking to diversify into this domain. The degree to which Clyde-based businesses can increase/capture market share and enter new areas of the offshore wind supply chain, as demand increases towards 2030, is the key challenge.

5.1.10 Offshore Decommissioning

The Opportunity

Oil and gas and offshore wind decommissioning were considered as development opportunities. As indicated in section 2.2, development of oil and gas decommissioning is not considered attractive and is not discussed further.

However, **the emerging offshore wind decommissioning opportunity presents a specific development opportunity for the Clyde.** Much of a wind turbine (e.g., concrete and metal parts) is decommissioned using well established techniques. **The key challenge, and opportunity for the Clyde, is development of composite turbine blade recycling.** Effective recycling techniques have not yet been developed, so this is an innovation driven opportunity. Success in developing technologies would position the Clyde as a leader in the field and would attract recycling business activity to address a major growth market.

Current Capability

Assessment of current capability focuses on those organisations with relevant innovation expertise as these would be the critical building blocks to develop this opportunity. There is already capability within the region, specifically:

- The Lightweight Manufacturing Centre / University of Strathclyde which
 - Is already active in wind turbine blade development and is developing technologies for aircraft composite structure recycling

- Has expertise in GRP Recycling which it is applying to turbine blade recycled in partnership with Aker Offshore Wind and Aker Horizons¹⁰⁹.
- Other University of Strathclyde activities to develop decommissioning / recycling technologies under Low Carbon Challenge Fund support.

There are also strong synergies with activities supported by the Ayrshire Growth Deal to develop an aircraft decommissioning centre and an aerospace and space innovation centre at Prestwick airport, where we understand that a key focus for the innovation centre will be the development of composites recycling technologies.

The Challenge / Gap

There are capacity, facility, and skills gaps to address to develop this opportunity. The first challenge here is to develop a new industry as there is currently no specific local capability in terms of companies, skills or labour force. But this is not considered a major barrier as this is an emerging opportunity rather than an established market. The first stage in the development of this opportunity would be to establish innovation activities that can build and demonstrate that the Clyde is a key centre for composite turbine blade recycling. Key academic and innovation centres would be the building blocks of this opportunity and we would envisage that new companies will cluster around this capability.

Addressing the Challenge – Development Options

This is an important area for innovation to deliver a solution for end-of-life turbine blades. Supporting academic groups and the Lightweight Manufacturing Centre to develop recycling and reuse technologies is a key first step in developing the economic opportunity. Co-location of future industrial activity with the research capability would be a longer-term goal.

Timescale / Potential Future Economic Impact

This is a current and long-term industrial opportunity that would build on an established innovation reputation once this has been developed. In the short to medium-term, the impact is likely to be innovation activities with modest economic impact, although it is estimated, as defined in section 2.2.7.2, that 80 offshore wind turbines will need to be refurbished or decommissioned in 2022, 123 turbines in 2023 and 1,600 by 2030 across European North Sea offshore wind farm projects. Figure 16 shows what the potential longer-term growth in demand is predicted to be.

As already indicated in section 2.2.7.2, it is expected that this opportunity will generate an additional 20,000 jobs in the offshore wind sector.

Summary

This is an innovation driven long-term opportunity to build a new activity in the Clyde area. The first stage in its development would be to establish internationally recognised innovation activities.

¹⁰⁹ <https://www.strath.ac.uk/whystrathclyde/news/akeroffshorewindakerhorizonsandstrathclydetocolaborateonrecyclingglassfibreproducts/>

5.1.11 Marine Tourism

The Opportunity

Scotland has a number of well-developed tourism and marine tourism strategies, as highlighted earlier, and the importance of the wider Clyde estuary has already been established¹¹⁰. However, the Clyde Mission area is a small part of that and here the focus is on the opportunity for the Clyde Mission area, particularly near Glasgow, to develop its infrastructure, facilities and marketing to maximise its share of this – Glasgow offers considerable attractions, activities, shopping and heritage to increase the spend per visitor in the local economy.

Current Capability

The marine tourism activities of the Clyde area consist of the cruise liner port at Greenock owned by Peel Ports and the several leisure marinas in the area, some of which are reporting significant growth in recent years, predominantly from non-local users. Marinas in the upper Clyde benefit from their location close to major transport hubs, such as Glasgow Airport. However, as noted in Section 3.2, the more established leisure marinas in the Clyde estuary, such as Inverkip and Largs, are outwith the Clyde Mission area.

There are additional assets that could be developed into marine tourism facilities – an example being King George V dock in Govan where several small cruise ships are currently being berthed but, as already highlighted, the future use of this facility will be controlled by Peel Ports. It is also understood that a major dredging exercise on the river is about to take place, driven by the need to access Glasgow by river for the COP26 event, which would optimise access to the city of Glasgow.

The Challenge / Gap

The key challenges here are to make the case for encouraging marine tourism into the upper Clyde nearer to Glasgow and develop the facilities to accommodate leisure vessels close to Glasgow.

There have been questions raised about the attractiveness of sailing / cruising this far up the river and work would be required to ensure there were activities of interest to pursue for those making the trip. Obviously, proximity to the centre of Glasgow and its attractions is one key advantage, as is closeness to transport links. There is already evidence that Greenock is winning business due to the proximity to Glasgow Airport – developments at King George V dock would be even closer.

It is also important to point out that the Glasgow city centre does not have a “maritime district” where locals and visitors can partake in marine leisure activities. During consultations, the opportunities to develop the river in the city centre to do this by developing jetties and moving the weir were highlighted.

Addressing the Challenge – Development Options

Addressing this challenge requires **collective action from a number of stakeholders to ensure a joined up, cohesive plan that would develop the facilities, connectivity and experiences to attract visitors is developed**. We understand that work has already been done on this in the past, therefore, the first

¹¹⁰ <https://scottishtourismalliance.co.uk/wp-content/uploads/2019/03/Sailing-Tourism-in-Scotland-Final.pdf>

stage in this activity would be to bring key industry stakeholders together, review prior work, facilitate discussions and support future planning.

Timescale / Potential Future Economic Impact

This is a medium-term activity (3 to 5 years) that has the potential to deliver modest economic impact. If developments were such that the region accounted for 10% of the projected growth in the Giant Strides (2020 – 2025) strategy, this would account for around £10 million per annum by 2025. However, we believe that if access to the numerous attractions in the city of Glasgow were accessible, this figure could be a lot higher.

Summary

This is an attractive opportunity to regenerate some of the land-based maritime assets further up-river from Greenock / closer to Glasgow but is likely only to offer modest economic impact.

5.1.12 Water Source Zero Emissions Heating Systems

The Opportunity

The Scottish Government Draft Heat in Building Strategy commits to significant investment in zero emissions heating, as described in Section 2.2. One of the attractive options to delivery of zero emissions heating is water source heat pumps, linked to heat networks. An example of a low carbon heating network at Queen’s Quay, a £14.5 million capital investment, supported by the Scottish Government’s Low Carbon Infrastructure Transition Programme, based on water source heat pumps, has already been highlighted. There are major opportunities to develop several similar initiatives to support established and new areas of business, commercial and housing developments.

Current Capability

The major asset that underpins this development is the River Clyde itself. It is estimated that there is 150 MW of heat capacity in the river from flowing water without considering the additional energy from tidal effects. There are also a number of sites along both banks of the Clyde where systems could be located.

Star Renewables, based in Glasgow, is Scotland’s only manufacturer of water source heat pumps and a leader in the development of water source heating networks and was a key supplier to the Queens Quay development already referenced. There is also a strong network of local project developers and other key players in the zero emission heat sector¹¹¹.

There is also the potential to develop systems on barges for location in areas where the banks of the river are not appropriate for development. There are a number of local suppliers, such as the Malin Group, that could provide such barges.

The Challenge / Gap

The major gap to overcome to develop this opportunity is the capital funding required. Further to this, there are challenges in persuading investors to commit to such systems and there are capacity constraints within the supply base, with only one water source heat pump manufacturer in Scotland.

¹¹¹ www.directories.scot

Addressing the Challenge – Development Options

The Scottish Government commitment to zero emissions heating and to achieving Net Zero by 2045 are key factors in overcoming the challenges here.

With so much potential for water source heat pumps linked to the growth in district heating, the Clyde Corridor is an ideal location for the development of the “Heat Hub” proposed by Scottish Enterprise and supported by the sector. This will be a centre that will foster collaboration as the sector develops, including a manufacturing accelerator, skills academy, business incubator and living lab. This will also assist developers and investors to understand the requirements of installing district heating in new developments.

Timescale / Potential Future Economic Impact

This is a current opportunity with long-term potential. Based on the capital cost of the Queens Quay development the scale of this opportunity could be over £100 million in capital investment alone, with additional long-term operational income from the supply of heat.

Summary

This offers an opportunity for the Clyde corridor to become a leader in net zero heating.

This is fully aligned with Scottish Government policy and significant funding has already been committed to support the development of zero emissions heating.

Linkages could be made to net zero marine power systems and offshore wind blade recycling to develop a broader Net Zero theme and identity on the River Clyde.

5.1.13 Training Sector Development

The Opportunity

This opportunity focuses on both the international and local maritime sector market for training and skills development. As presented in Section 2.2, recent evidence suggests the following:

- The potential to increase international activity as a result of increasing training budgets within vessel operators and a trend towards online learning.
- Numerous training and development opportunities to support local maritime engineering activities, including:
 - Address the skills gap that has developed due to the reduced shipbuilding activity on the Clyde. These have been identified as an issue during stakeholder consultations. It was highlighted that the Clyde lacks the complex engineering services such as those found in for example Germany (e.g., Flensburg) or Poland.
 - Support the maritime industry’s digital transition – linking with NMIS and Industry 4.0 for marine engineering.
 - The training and skills development opportunities catalysed by the Royal Navy’s development plans for Faslane.

These will further raise the profile of the Clyde as leading region for maritime skills development.

Current Capability

The Clyde area is home to several important maritime education and training assets, including:

- Naval architecture, ocean and marine engineering at the University of Strathclyde.
- The City of Glasgow College, which has a world-class reputation in maritime, nautical science and marine engineering.
- Private sector companies, such as Clyde Marine Training which claims to be the largest maritime training provider in the UK with a focus on trainees for the British Merchant Navy, and Stream Marine Training.

The Challenge / Gap

The challenge here is to harness existing capability to deliver the skills required to enable local maritime sector growth, while continuing to exploit current business opportunities. The challenge is to encourage all key players in the region to come together to understand the scale of the opportunity, both local and international, to understand how established international providers can support local needs and to work together to develop the required provision. For example, Maritime Enterprise Scotland, being developed by the Royal Navy, is expected to have a strong skills development element.

Addressing the Challenge

The first stage in developing this opportunity is to establish a working group of key local players to scope out the scale of the opportunity and to commit to collaboration to maximise the potential opportunity for the Clyde. It is expected that further gaps will be identified, such as potentially, capital, facilities and capacity, when the opportunity is fully analysed, but these could not be assessed within the scope of this study.

Timescale / Potential Future Economic Impact

This is a current and long-term opportunity that offers opportunities to grow an already significant business activity on the Clyde.

Summary

This is a significant opportunity to enhance and grow a local capability that is already internationally recognised.

5.2 Addressing Sector Wide Development Needs

The above section has focused on specific opportunities. It is considered important that these are placed within a wider sectoral development strategy / framework. Evidence of best practice elsewhere as described in section 4, above, indicates that the following sector wide actions should be pursued.

It is recommended that these are all pursued, so they are not assessed further and ranked in Section 5.3 below.

5.2.1 Preparation and Implementation of a Clyde Maritime Sector Strategy

This is considered a critical activity to develop a sectoral direction and the commitment of all key players. This should be an industry led activity with strong support by Government.

A number of the key building blocks of such a strategy are included within this document, but it is critically important that it is developed and owned by the sector. The Scottish Maritime Cluster is an appropriate organisation to initiate and lead this industry activity.

5.2.2 Resourcing Sectoral Development

One of the key lessons from the examples elsewhere is the level of resource allocated to maritime sectoral development, in many cases supported by Government. This is often a number of full-time equivalents, for example, ten in the case of the Mersey maritime cluster. A suitable level of resource needs to be committed to development of the sector on the Clyde.

5.2.3 Raising the Profile of the Sector

Typically the Clyde is recognised for its maritime heritage. There have been some activities to present the positive aspects of the maritime sector on the Clyde, such as a recent report in Business Insider¹¹². but more needs to be done to raise the profile of the maritime sector on the Clyde.

This report has highlighted some internationally recognised strengths in the region. It is also encouraging the development of Net Zero innovation activities. These should both be used to develop a strong, future looking international profile for the sector. Promotional collateral should be developed to present the sector and its potential for growth. For example, the presentation of key sectors on the Scottish Development International website could be used as a potential template.

A presence at maritime sector events to use and complement the promotional material should also be pursued, reflecting the typical behaviour of other clusters.

These combined activities will help enhance the Clyde’s visibility in international markets.

5.3 Development Actions

A number of opportunity areas that offer growth potential for the maritime sector on the Clyde have been identified. These cover a range of maritime sub-sectors, have different characteristics and challenges and will deliver economic return over different timescales. At this stage, the potential economic benefit / return on investment of each cannot be identified or compared. More detailed analysis of each opportunity and the associated challenges would be required. Therefore, development actions are identified for all opportunities, with the caveat that the attractiveness of investment in each opportunity is continually assessed and evaluated.

These development actions can be described as follows, with the lead organisation for each action identified by bold, italic typescript:

5.3.1 Preparation and Implementation of a Clyde Maritime Sector Strategy

Objective: Define a development path for the sector and gain the commitment of all key players for its implementation. This should be an industry led activity with strong support by Government, which should extend beyond the Clyde region to the rest of Scotland.

Actions:

Action	Owner(s)
Prepare and implement a Clyde maritime sector strategy	<i>Scottish Maritime Cluster</i> Industry Infrastructure owners

¹¹² <https://www.insider.co.uk/special-reports/scotland-greatest-secret-seven-seas-21807795>

	Scottish Government and its agencies UK Government Local Authorities Scottish Enterprise Skills Development Scotland Royal Navy Universities / Colleges
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5.3.2 Resourcing Sectoral Development

Objective: Provision of a suitable level of resource to ensure effective development of the sector.

Actions:

Action	Owner(s)
Resource sectoral development	Scottish Maritime Cluster Industry Scottish Government and its agencies UK Government Local Authorities Scottish Enterprise Skills Development Scotland

5.3.3 Raising the Profile of the Sector

Objective: Implement a sector marketing programme.

Actions:

Action	Owner(s)
Raising the profile of the sector	Scottish Maritime Cluster Industry Scottish Development International Royal Navy

5.3.4 Commercial Shipbuilding

Objective: Develop a significant shipbuilding presence on the Clyde.

Approach: Strong partnership working to establish a sustainable procurement and delivery model— from both the public and private sector, including:

- Companies such as Ferguson Marine, The Malin Group and Dales
- Key infrastructure owners, particularly Peel Ports
- Key players in vessel procurement, such as the Scottish Government, CMAL, the Northern Lighthouse Board, etc.

Actions:

Action	Owner(s)
Joint public and private sector commitment	Industry Infrastructure owners Scottish Government and its agencies

	UK Government
Establish and lead Commercial Shipbuilding Leadership Group	Scottish Enterprise to establish Private sector champion to lead
Develop vessel designs that offer viable business opportunities	Industry Scottish Government and its agencies
Develop innovative, sustainable procurement approaches	Scottish Government and its agencies/ subsidiaries UK Government Industry
Develop / invest in appropriate infrastructure	Infrastructure owners Scottish Government and its agencies Local authorities
Identify / pursue supply chain development opportunities	Scottish Enterprise Industry Scottish Maritime Cluster
Invest in innovation of next generation technologies	Industry Infrastructure Owners Scottish Enterprise NMIS / Innovation Centres Universities / Colleges

Outcomes:

- A partnership that enables a pipeline of orders and continuity of business for participating companies.
- Job security that is offered as a result will support the sustainability of local communities.
- Development of maritime hubs clustered around shipbuilding activity that supply companies will gravitate to due to the attraction of long-term business opportunities.

It must be stressed that the commitment of all relevant parties is critical to achieve success. We believe that a piecemeal approach will not be effective.

5.3.5 Defence Shipbuilding

Objective: Maximise supply chain opportunities from BAE Systems and Babcock International.

Approach: Build on existing (e.g., Scottish Enterprise, ADS Scotland) activities

Strong engagement with BAE Systems and Babcock International to gain early awareness of opportunities

Early engagement with potential suppliers to pursue opportunities.

Actions:

Action	Owner(s)
Review existing initiatives and, if appropriate, identify scope for development	Scottish Enterprise Private Sector UK Government Other Trade / Sectoral Associations Roya Navy

Prepare and implement updated supplier development programme	Private Sector UK Government Other Trade / Sectoral Associations Scottish Enterprise Royal Navy
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Outcomes:

- Increased share of supply contracts to BAE Systems and Babcock International for Clyde Maritime companies.

5.3.6 Ship Repair and Maintenance

Objective: Develop new, innovation led capability in low carbon / low carbon ship systems.

Approach: Support academia and emerging industrial companies to develop innovative low carbon power systems.

Actions:

Action	Owner(s)
Form cluster of relevant companies and academic groups	Scottish Maritime Cluster Industry
Support the development of R&D / innovation proposals	Scottish Enterprise Scottish Government UK Government NMIS/Catapult Centres Universities
Develop linkages with relevant shipbuilding and repair companies	Scottish Maritime Cluster Industry

Outcomes:

- Innovation funding for relevant projects in short term.
- In longer term, clustering of technology-based companies on the Clyde.

5.3.7 Ship Management Cluster Development

Objective: Ensure growth of the “Glasgow ship management cluster”.

Approach: Develop focused ship management cluster, consisting of all local players, that can collectively optimise the business environment.

Actions:

Action	Owner(s)
Establish ship management cluster	Scottish Maritime Cluster Ship management companies
Develop and implement cluster action plan	Scottish Maritime Cluster Ship management companies

Outcomes:

- Enhanced competitiveness of local ship management cluster.

- Cluster growth in line with market growth.

5.3.8 Low Carbon / Smart Port Development

Objective: Ensure ports on the Clyde are “future-proof” so they can address changing client requirements.

Approach: Port owner / operator engagement to identify challenges and implement actions to develop low carbon and smart capabilities.

Actions:

Action	Owner(s)
Establish port development group	Scottish Maritime Cluster Port owners and operators Scottish Enterprise Local Authorities Other Trade/Sector Associations
Prepare and implement development plan	Scottish Maritime Cluster Port owners and operators Scottish Enterprise Local Authorities Other Trade/Sector Associations

Outcomes:

- Low carbon /smart port development plans.
- Business retention and growth for Clyde area ports.

5.3.9 Developing Faslane’s Supply Chain

Objective: Maximise supply chain opportunities at Faslane.

Approach: Build on existing activities

Strong engagement with the Royal Navy to understand potential opportunities

Early engagement with potential suppliers to pursue opportunities

Identify and, where appropriate, develop Clyde maritime capabilities.

Actions:

Action	Owner(s)
Establish supply chain development group	Scottish Maritime Cluster Industry UK Government Scottish Enterprise Other Trade/Sector Associations Royal Navy
Identify potential opportunities, match with cluster capabilities and quantify the opportunity	Scottish Maritime Cluster Industry UK Government Local Authorities

	Scottish Enterprise Other Trade/Sector Associations Royal Navy
Invest in innovation of next generation technologies	Industry UK Government Royal Navy NMIS/Catapult Centres
Design and implement supplier development programme	Scottish Maritime Cluster Industry UK Government Scottish Enterprise Other Trade/Sector Associations

Outcomes:

- Increased business opportunity to supply Faslane.

5.3.10 Offshore Wind

Objective: Maximise Clyde region market share of offshore wind sector growth

Approach: Support existing and, potentially, new suppliers to pursue new opportunities.

Actions:

Action	Owner(s)
Assess existing and potential supply chain players in the region	Scottish Maritime Cluster Industry Scottish Enterprise Other Trade / Sector Associations
Identify current and potential business growth opportunities	Scottish Maritime Cluster Industry Scottish Enterprise Other Trade / Sector Associations
Implement supply chain development programme	Scottish Enterprise Scottish Maritime Cluster Industry Scottish Government Other Trade / Sector Associations

Outcomes:

- Understanding of offshore wind supply chain opportunities
- Optimised market share for business on the Clyde.

5.3.11 Offshore Wind Decommissioning

Objective: Develop new, innovation led capability in turbine blade recycling.

Approach: Support academic and research organisations to develop innovative recycling technologies.

Actions:

Action	Owner(s)
Prepare strategy to develop innovation capability and activity	NMIS/Innovation Centres
Support the development of R&D / innovation proposals	NMIS/Innovation Centres Industry Scottish Enterprise
Encourage development of an embryonic group of industrial companies	Scottish Enterprise Industry

Outcomes:

- Innovation funding for relevant projects in short term.
- In longer term, clustering of recycling business on the Clyde.

5.3.12 Marine Tourism

Objective: Maximise marine tourism activity in the Clyde Mission area.

Approach: Stakeholder engagement to identify and implement actions to optimise marine tourism in the Clyde Mission area, especially the city of Glasgow.

Actions:

Action	Owner(s)
Establish Clyde Mission marine tourism working group	Scottish Maritime Cluster Scottish Government Local Authorities Other Trade / Sector Associations
Prepare and implement development plan	Scottish Maritime Cluster Industry Infrastructure owners Other Trade / Sector Associations

Outcomes:

- New / redeveloped marine tourism infrastructure.
- Increased marine tourism activity and expenditure.

5.3.13 Water Source Zero Emissions Heating Systems

Objective: Establish the Clyde as UK / international leader in water source zero emissions heating.

Approach: Secure the location of the proposed “Heat Hub” in the Clyde Mission area
Develop further projects, based on the Clyde.

Actions:

Action	Owner(s)
Secure Heat Hub in Clyde Mission area	Local Authorities Industry Scottish Government

	Other Trade / Sector Associations
Identify and develop new district heating projects	Local Authorities Industry Scottish Government Other Trade / Sector Associations

Outcomes:

- Scottish focal point for zero emissions heating in the Clyde Mission area.
- Network of district heating systems along the river.

5.3.14 Maritime Skills

Objectives: a) Support established international training business activity

b) Develop a centre of excellence, potentially across several locations, in maritime engineering skills development.

Approach: Build on and integrate existing skills development capabilities to address local cluster needs, while ensuring international business activity continues to grow
Integrate with the ambitions of Maritime Enterprise Scotland.

Actions:

Action	Owner(s)
Action linked to growing the share of international maritime skills training	Industry Universities and Colleges Scottish Maritime Cluster Scottish Development International Skills Development Scotland
Develop sector skills investment plan	Skills Development Scotland Industry
Implement plan	Skills Development Scotland Industry Scottish Maritime Cluster Royal Navy Universities / Colleges

Outcomes:

- Reinforcement of the region’s international leadership in maritime skills provision.
- A strong pipeline of skilled staff for the cluster as it grows.

6 Conclusions and Recommendations

6.1 Conclusions

6.1.1 Key Observations

This study has identified several opportunities for development of the local maritime sector, ranging from shipbuilding to offshore wind decommissioning to marine tourism. It has also quantified the scope and scale of the local maritime cluster and its supporting assets and infrastructure. This analysis has highlighted that:

- There is a number of opportunities that can be pursued to achieve sustainable growth.
- There is significant work to be done to exploit these opportunities, due to its current position.
- It is critical that the public sector actively commits to enable these opportunities to be achieved.

Collaboration and co-operation are key to developing and exploiting these opportunities. The current position of the maritime sector on the Clyde is a result of a company focused rather than collaborative approach. As companies, in general, do not have the breadth of capability or the facilities to exploit significant opportunities on an individual basis then collaboration is essential.

The opportunities identified will underpin significant growth of the maritime sector on the Clyde if key players work together.

6.1.2 Areas for Development

Fourteen areas for development have been identified, covering both sector-wide actions and addressing specific opportunities, as follows:

a) Sector Wide Development Actions

Three sector wide development actions have been identified to develop a clear and cohesive way forward for the sector and to raise its profile, both in the UK and overseas. These are:

- 1) **Preparation and implementation of a Clyde maritime sector strategy**
- 2) **Resourcing sectoral development**
- 3) **Raising the profile of the sector**

These are required to support the development of the sector and reflect best practice elsewhere.

b) Addressing Specific Opportunities

Eleven specific opportunities for development have been identified, assessed and ranked. These are:

- 4) **Commercial shipbuilding** – to meet local and wider UK market demand for new commercial vessels. Increased shipbuilding activity on the Clyde would act as a catalyst to developing local supply chains and many associated benefits.
- 5) **Defence shipbuilding** – to meet needs of the major defence shipbuilding companies in Scotland
- 6) **Ship repair and maintenance** – to develop new, innovation led capability in low carbon / low carbon ship power systems.

- 7) **Ship management cluster development** – to secure and grow the “Glasgow ship management cluster”
- 8) **Low carbon/smart ports** – to ensure ports on the Clyde can meet the developing future needs of customers
- 9) **Developing Faslane’s supply chain** – to maximise supply chain opportunities at Faslane.
- 10) **Offshore wind** – to maximise local supply chain opportunities as the sector grows to meet government targets
- 11) **Offshore wind decommissioning** – develop new, innovation led capability in turbine blade recycling.
- 12) **Marine tourism** – to maximise marine tourism activity in the Clyde Mission area.
- 13) **Water source zero emissions heating systems** – to establish the Clyde as UK / international leader in water source zero emissions heating.
- 14) **Maritime skills**– to develop a centre of excellence, potentially across several locations, in maritime engineering skills development.

Our recommendations to develop these areas are included below.

6.2 Recommendations

A number of actions to address these development opportunities have been identified. These can be summarised as shown overleaf with key organisations to achieve success identified (those highlighted in red are identified as the lead organisation for each activity).

We recommend that each action is pursued to deliver cluster growth with, as already highlighted, regular monitoring of the relevance and progress of each activity to ensure future economic impact will be achieved.

We believe that success with these actions will deliver significant market-led growth of the maritime sector on the Clyde.

Opportunity and Actions	Key Stakeholders												
	Private Sector	Infrastructure Owners	Scottish Government, Agencies and subsidiaries	UK Government	Local Authorities	Scottish Maritime Cluster	Other Trade / Sector Associations	Scottish Enterprise	Scottish Development International	Skills Development Scotland	Royal Navy	NMIS / Catapult Centres	Universities / Colleges
1. Prepare and Implement Clyde Maritime Sector Strategy	●	●	●	●	●	●		●		●			●
2. Resource Sectoral Development	●		●	●	●	●		●		●			
3. Raise the Profile of the Sector	●					●			●		●		
4. Commerical Shipbuilding													
Joint public and private sector commitment	●	●	●	●									
Establish and lead Commercial Shipbuilding Leadership Group	●							●					
Develop vessel designs that offer viable business opportunities	●		●										
Develop innovative, sustainable procurement approaches	●		●	●									
Develop / invest in appropriate infrastructure		●	●		●								
Identify / pursue supply chain development opportunities	●					●		●					
Invest in innovation of next generation technologies	●	●						●				●	●
5. Defence Shipbuilding													
Review existing initiatives and, if appropriate, identify scope for development	●			●			●	●			●		
Prepare and implement updated supplier development programme	●			●			●	●			●		
6. Ship Repair and Maintenance (incl. retrofit of low emmission technology)													
Form cluster of relevant companies and academic groups	●					●							
Support the development of R&D / innovation proposals			●	●				●				●	●
Develop linkages with relevant shipbuilding and repair companies	●					●							
7. Ship Management Cluster Development													
Establish ship management cluster	●					●							
Develop and implement cluster action plan	●					●							
8. Low Carbon / Smart Port Development													
Establish port development group		●			●	●	●	●					
Prepare and implement development plan		●			●	●	●	●					
9. Developing the Faslane Supply Chain													
Establish supply chain development group	●			●		●	●	●			●		
Identify potential opportunities, match with cluster capabilities and quantify the opportunity	●			●	●	●	●	●			●		
Invest in innovation of next generation technologies	●			●		●	●	●			●	●	
Design and implement supplier development programme	●			●		●	●	●					
10. Offshore Wind Opportunities													
Assess existing and potential supply chain players in the region	●					●	●	●					
Identify current and potential business growth opportunities	●					●	●	●					
Implement supply chain development programme	●		●			●	●	●					
11. Offshore Wind Decommissioning													
Prepare strategy to develop innovation capability and activity												●	
Support the development of R&D / innovation proposals	●							●				●	
Encourage development of an embryonic group of industrial companies	●							●					
12. Marine Tourism Development													
Establish Clyde Mission marine tourism working group			●		●	●	●						
Prepare and implement development plan	●	●				●	●						
13. Water Source Zero Emissions Heating Systems													
Secure Heat Hub in Clyde Mission area	●		●		●		●						
Identify and develop new district heating projects	●		●		●		●						
14. Maritime Skills Centre													
Action linked to growing the share of international maritime skills straining	●					●			●	●			●
Develop sector skills investment plan	●								●	●			
Implement plan	●					●			●	●			●

Figure 21: Development Actions

Appendices

Appendix A – Briefing Document for Companies and Stakeholders

Clyde Mission Maritime Opportunities

The potential for Growth in the Maritime Sector on the Clyde

Optimat and the Scottish Maritime Cluster (SMC) have been commissioned by Scottish Enterprise to undertake a study to identify and scope development opportunities in the maritime sector where the Clyde can be internationally competitive. This work is part of the Clyde Mission, a place-based initiative led by the Scottish Government, that will ***‘Make the Clyde an engine of inclusive and sustainable growth for the city, the region and Scotland.’***

The key outputs of this study will be industry driven and evidence-based recommendations on how the maritime sector on the Clyde can grow and enhance its international profile and competitiveness. The specific objectives of the study are to:

- Identify key emerging opportunities in the global maritime sector and define what capabilities, licenses and pre-qualifications are required to access and capitalise on these opportunities.
- Define the strengths and capabilities of the companies and assets in the Clyde Corridor.
- Identify and characterise gaps in capability that are required to capitalise on global market opportunities.
- Assess how other maritime sectors have developed and sustained their market position and benchmark the Clyde against appropriate clusters.
- Map the Clyde maritime ecosystems and identify what else needs to be in place to build the necessary capabilities.
- Make recommendations on how the Clyde can increase its visibility in the international marketplace.

To gather this evidence, we are contacting several organisations to obtain information on opportunities for the Clyde. Specifically, we are seeking information on the following:

- Your views on the opportunities for the maritime sector on the Clyde
- What additional capacity, capabilities and infrastructure are required to exploit these opportunities
- The main barriers and challenges facing the industry currently, and in the future
- Opportunities to make the sector attractive to new entrants
- Lessons we can learn for other successful maritime clusters
- How best can the Clyde Mission (see <https://www.gov.scot/publications/clyde-mission/>) support access to and development of these opportunities

All information will be treated in the strictest confidence and will be anonymised and collated to present an aggregated analysis.

We hope that you will be willing to provide input to this important study. A report on the findings of the study will be made available on completion.

Thank You.

Appendix B – List of Participants in the Study

We would like to thank the following organisations for their contribution to this study.

a) Companies and Stakeholders

- | | |
|---------------------------------------|--|
| 1) Anglo Eastern Ltd | 20) First Marine International |
| 2) Argyll and Bute Council | 21) Inverclyde Local Authority |
| 3) Babcock International | 22) J & J Denholm |
| 4) BAE Systems | 23) Malin Group |
| 5) BEIS | 24) Marine Design Technology |
| 6) British Marine Scotland | 25) National Manufacturing Institute Scotland (NMIS) |
| 7) British Marine Technology | 26) Newcastle University |
| 8) City of Glasgow College | 27) Northern Marine |
| 9) City of Glasgow Council | 28) Peel L and P Ltd |
| 10) Cleanship Group | 29) Royal Navy |
| 11) Clyde Marine Services | 30) Scottish Renewables |
| 12) Clyde Maritime Assets Ltd | 31) Star Renewables Ltd |
| 13) Clyde Mission Division | 32) Stream Marine Training Ltd |
| 14) Clyde Port Authority (BPA) | 33) Transport Scotland |
| 15) Dales Marine | 34) University of Strathclyde |
| 16) Damen | 35) V-Ships Ltd |
| 17) David McBrayne Ltd | 36) Waverley Excursions Ltd |
| 18) Department of International Trade | 37) West Dunbartonshire Council |
| 19) Ferguson Marine | 38) Western Ferries Ltd |

b) Clusters Elsewhere

- 1) Canada – Canada's Ocean Supercluster
- 2) Denmark – MARLOG (Maritime & Logistics)
- 3) Finland – Finnish Maritime Cluster
- 4) Merseyside / UK – Mersey Maritime
- 5) Norway – Maritimt Forum

Appendix C – Global Market Review

The scale and expected growth of key segments of the global maritime market are summarised in this Appendix.

1) Shipbuilding and Repair

Shipbuilding encompasses the design, construction and maintenance of a broad range of vessels. Large shipyards can employ a significant number of workers, use a broad range of fabrication technologies and generate significant income. The industry is dominated by large shipyards in the Far East, such as China, Japan and South Korea. This is a highly competitive industry and state supported yards in low labour cost countries have a significant advantage. European shipyards tend to focus on specialised vessels, such as ferries and research vessels, etc., and on the use of technology to remain competitive.

The global shipbuilding market is estimated at around \$133 billion and is forecast to reach over \$175 billion by 2025 with a compound annual growth rate (CAGR) of 5.7%¹¹³.

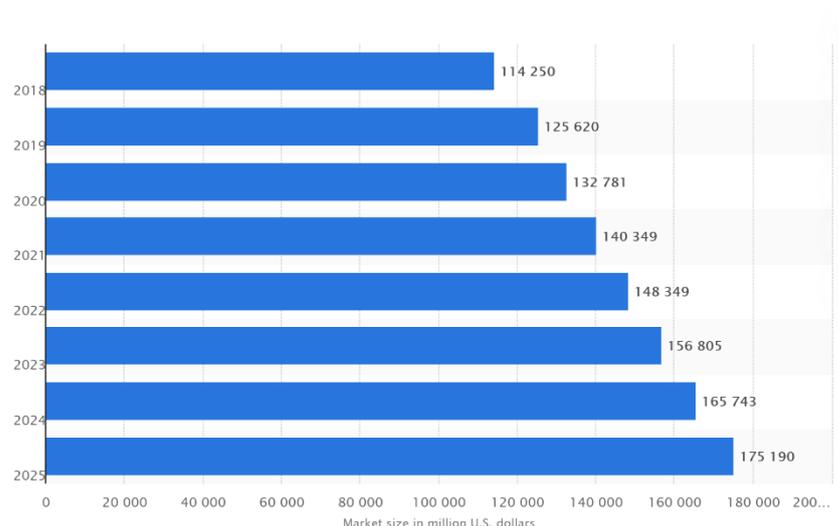


Figure 22: Global Shipbuilding Market Growth by Value

As a highly competitive industry, shipyards must look to new technologies and innovative approaches to reduce costs. For example, there is the opportunity to use simulation technology to improve design and use robotics to improve efficiency and safety. One major driver of change is the need to reduce emissions, which is leading to exploration of alternative propulsion technologies.

Another potential development trend is the move to semi-autonomous and autonomous ships. At the lowest level of autonomy, certain aspects of the ship can be automated at certain times, but control is maintained by the crew. At the highest level of automation, the ship is unmanned and equipped with the ability to make decisions and act itself. Autonomous ships are expected to improve safety, reduce operating costs, increase efficiency and minimize the effects of shipping on the environment.

¹¹³ Size of the global shipbuilding market 2018-2025, Statista, February 2021

2) Maritime Transport

Maritime transport is the main means of transport used to ship raw materials, ranging from oil to food and consumer goods, over long distances via sea routes. The sector also encompasses people transport and the cruise industry.

As shown in the figure below, world seaborne trade amounted to 10.7 billion tonnes in 2017, growing at 4%. Key segments include containerised trade, transport of dry bulk commodities and crude oil shipments. World seaborne trade is forecast to grow at around 3.8% in the coming years.

It is too early to comment on what impact Brexit will have on seaborne trade. With the UK leaving the EU in January 2021, the industry has had to realign itself to new border controls and customs procedures. Of course, Brexit not only creates challenges but opportunities, such as a possible increase in shortsea shipping.



Figure 23: World Seaborne Trade

Regarding the cruise industry, as shown in the table below, the number of passengers on cruise trips has increased from 16.3 million in 2008 to 28.52 million in 2018¹¹⁴ and nearly 30 million in 2019¹¹⁵. With the advent of COVID-19, the industry has had to suspend operations worldwide. The industry is expected to recover and grow at a CAGR of 10% during the period 2020-2027¹¹⁶.

In recent years, there has been a continued trend of increased ship sizes for all segments (tankers, container carriers and cruise ships.). The aim here is to achieve economies of scale. This trend has led to ports and terminals needing to expand capacity in order to accommodate larger vessels.

¹¹⁴ The Contribution of the International Cruise Industry to the Global Economy in 2018, CLIA, 2019

¹¹⁵ 2021 State of The Cruise Industry Outlook, CLIA, 2021

¹¹⁶ Global Cruise Tourism Market, Data Intelligence, January 2021

As discussed in the earlier section on shipbuilding, the industry is exploring the use of autonomous systems to reduce costs and improve efficiency. Digitisation, particularly applied to tracking of cargo and provision of end-to-end supply chain visibility is of high interest. Combining onboard systems and digital platforms allow maritime transport to exploit the Internet of Things (IoT).

The industry is committed to reducing greenhouse gas emissions, which will include the adoption of alternative vessel propulsion systems. In 2018, the International Maritime Organisation (IMO) reached a first global agreement to cut total GHG emissions from shipping by at least 50 % by 2050 (compared to 2008).

3) Ports and Terminals

Port and terminal activities play a key role in trade, economic development and job creation. The global port and terminal operations market was valued at \$38.76 billion in 2019 and is projected to reach \$43.40 billion by 2024, with a CAGR of 2%.¹¹⁷

The sector is expected to change quite dramatically over the next decade, in response to major drivers such as increased use of technology and a greater focus on sustainability. In its analysis of the industry, Deloitte highlights demographic, technological and sustainability driver and trends that will impact port operations¹¹⁸:

Considering technological drivers, ports and terminals are expected to increase the implementation of innovations ranging from big data analytics and the Internet of Things to making greater use of automated systems. The global smart port market size was valued at USD 1.69 billion in 2019 and is expected to grow at a CAGR of 32.4% from 2020 to 2027¹¹⁹. The breadth of technical innovations that could be implemented are also detailed by Deloitte¹¹⁸.

4) Marine Tourism

Maritime tourism covers water-based activities and nautical sports, such as sailing, scuba-diving and cruising. The global marine tourism market was valued at \$5.89 billion in 2019 and is forecast to reach \$8.1 billion by end of 2024, with a CAGR of 6.8%¹²⁰.

The marine tourism industry is a large employer with many small and micro businesses that support local economies. As summarised in the figure below, domestic visits to seaside locations in Scotland generated an average of 1.5 million trips and £323 million per annum – with the west of Scotland generating the largest amount of volume and value. Although in the longer term the sector is expected to continue growing strongly, the outbreak of COVID-19 has resulted in unprecedented pressure on the tourism industry. The sector must also battle with growing concern over the environmental damage that can result from increased coastal tourism activity.

¹¹⁷ Global Ports and Terminal Operations Market, Technavio, 2020

¹¹⁸ Global Port Trends 2030, Deloitte Global Port Advisory, April 2020

¹¹⁹ Smart Port Market, Grand View Research, September 2020

¹²⁰ Global Marine Tourism Market, Absolute Reports, January 2019

£323m	Domestic visits to seaside locations in Scotland generate an average of 1.5 million trips, 6.5 million nights, and £323 million per annum.
	Holiday trips are by far the most popular purpose of trip to seaside locations by the domestic market , generating an average of 1 million trips, 4.7 million nights, and £236 million in expenditure.
W 	The west of Scotland generates the largest amount of volume and value of domestic trips of all the regions of Scotland, with an average of 612,000 trips, 2.2 million nights, and £112 million in expenditure per annum.
	Self-catering properties are the most popular form of accommodation utilised by domestic consumers visiting seaside locations in Scotland, generating an average of 582,000 trips per annum.
	The car is by some distance the most popular mode of transport for domestic consumers to visit seaside locations, generating an average of around 1.2 million trips per year, 5.1 million nights, and £240 million in expenditure.
	Visitors from Northwest/Merseyside take an average of 108,000 trips each year to coastal locations in Scotland. They also stay for the longest period on average, generating 5.7 nights per trip. They are the largest market within England that travel to Scotland and utilise seaside locations.
35-44	Figures indicate the domestic coastal tourism market is mostly utilised by the 35-44 year old demographic group , who generate an average of 378,000 trips, 1.6 million nights, and £76 million in spend per annum.
	Generally, domestic day trips to seaside resorts or towns are for leisure pursuits such as going out for a meal, visiting friends or family for leisure, or undertaking outdoor leisure activities such as walking.
	Sandwood Bay of Sutherland averages the most monthly organic searches with Scottish consumers researching Scottish beaches.
26%	26% of overseas respondents visit a beach while on their holiday in Scotland.

Figure 24: Scottish Tourism Trends

5) Marine Living Resources

This sector includes harvesting of renewable biological resources and the conversion of these resources into food, feed and bio-based products and bioenergy. The main segments within this category are fishing and aquaculture. Global fish production is estimated at about 179 million tonnes in 2018¹²¹, with a first sale value estimated at \$401 billion, of which 82 million tonnes, valued at \$250 billion, came from aquaculture production. Global fish consumption increased at an average annual rate of 3.1% from 1961 to 2017 – twice that of world population growth. The contribution of world aquaculture to global fish production reached 46% in 2018, up from 25.7% in 2000.

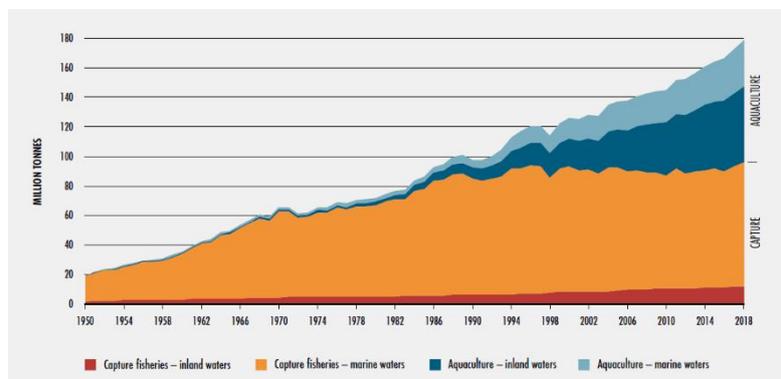


Figure 25: Global Fish Production

¹²¹ The State of World Fisheries and Aquaculture, Food and Agriculture Organisation of the United Nations, 2020

The EU is the fifth largest producer of fishery and aquaculture products, accounting for around 3 % of global production. Scotland has some of the most productive waters in Europe with vessels from Scotland, the UK, and Europe fishing from the northern North Sea to waters west of Scotland. Fishing is recognised as an important industry in coastal regions with deep cultural, historical, and social roots to the local community.

A continued major challenge facing the industry is fish stock management. For many decades there has been concern over available fish stocks and over exploitation of resources. Several international instruments and initiatives have been established to prevent uncontrolled and excessive fishing (such as the EU's Common Fisheries Policy) and to promote sustainable fishing practices, for example reducing discards by using more selective gear and fishing operations. There is certainly an opportunity to explore the use of new technology to enable better management of stocks, for example using machine vision technology and big data analytics to greatly improve the way fisheries data is collected and interpreted.

The major challenge for inland fisheries and aquaculture is to increase yields without destroying delicate local aquatic habitats and negatively impacting hydrological characteristics of rivers and lakes. Various technologies are being explored to sustainably improve the efficiency of fish farms, such as widespread use of sensing technologies, automated systems and robotics and artificial intelligence to improve decision making.

6) Marine Non-Living Resources

This sector encompasses offshore oil and gas activity and extraction of other minerals and resources, such as sand and gravel.

Due to decreasing production and rising production costs, the mature offshore oil and gas industry has been in decline for some years. The COVID-19 pandemic has resulted in a drop in global energy demand which in turn has further reduced the price of crude oil. Further, the energy industry in general is transitioning away from fossil fuels and to renewable power generation options. As shown in the figure below, in 2019 hydrocarbons (oil, gas and coal) met 81% of global demand, with oil and gas accounting for roughly 55% (31% and 23%, respectively). By 2040, oil and gas will provide 46% of energy needs.¹²²

¹²² Oil 2020, IEA, March 2020

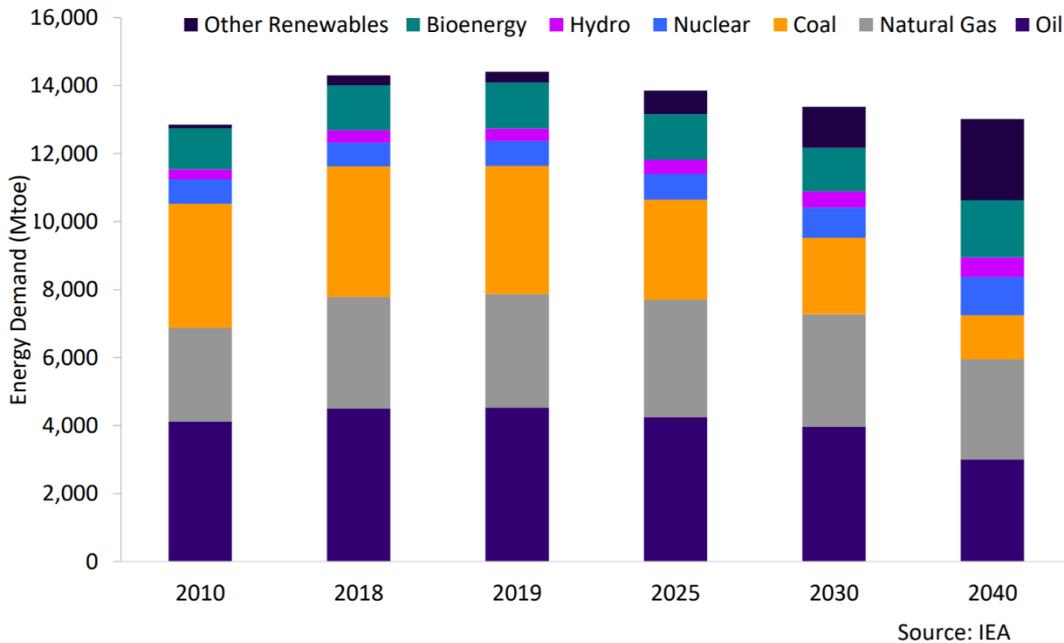


Figure 26: Addressing Future Energy Demand

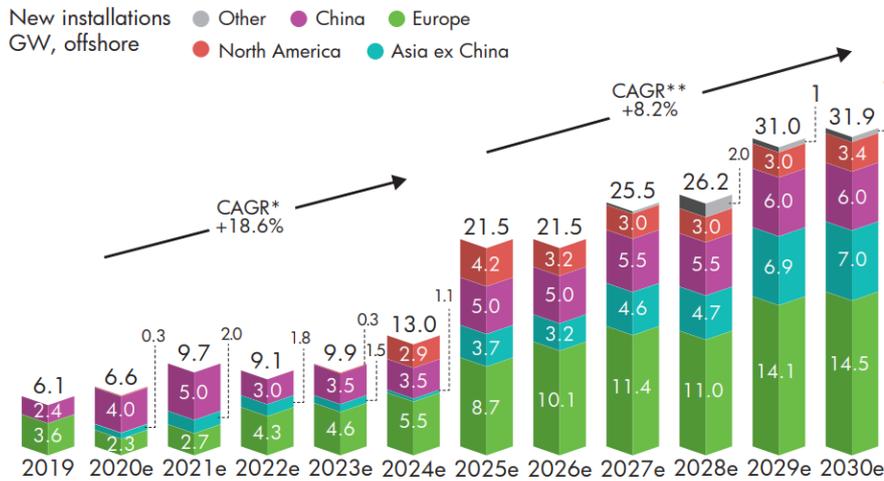
In contrast to offshore oil and gas, demand for other minerals and non-living resources is expected to rise dramatically. Low-carbon technologies, particularly solar photovoltaic (PV) and battery-based systems, are more mineral intensive relative to fossil fuel technologies. The World Bank estimates that to meet future demand, the production of key materials, such as cobalt and lithium, will need to increase by more than 450% by 2050 (compared to 2018 production levels). Plans for seabed mining are advancing, although there is continued concern over the potential damage to delicate ecosystems.

7) Marine Renewable Energy

Marine renewable energy includes all renewable energy sources that can be generated at sea such as offshore wind, wave and tidal. Currently, only offshore wind is commercially deployed at scale.

The global offshore wind market has grown by 24% on average each year since 2013, with total installations reaching 29.1 GW. Europe remains the largest offshore market, accounting for 75% of total global offshore wind installations. As shown in the figure below, significant growth is projected for the global offshore wind market, with the number of new installations per year continuing to increase.

Global offshore wind growth to 2030



* CAGR = Compound Annual Growth Rate
Source: GWEC Market Intelligence, June 2020

Figure 27: Global Offshore Wind Growth to 2030

Market growth for the period to 2040, predicted under a number of different scenarios as follows¹²³:

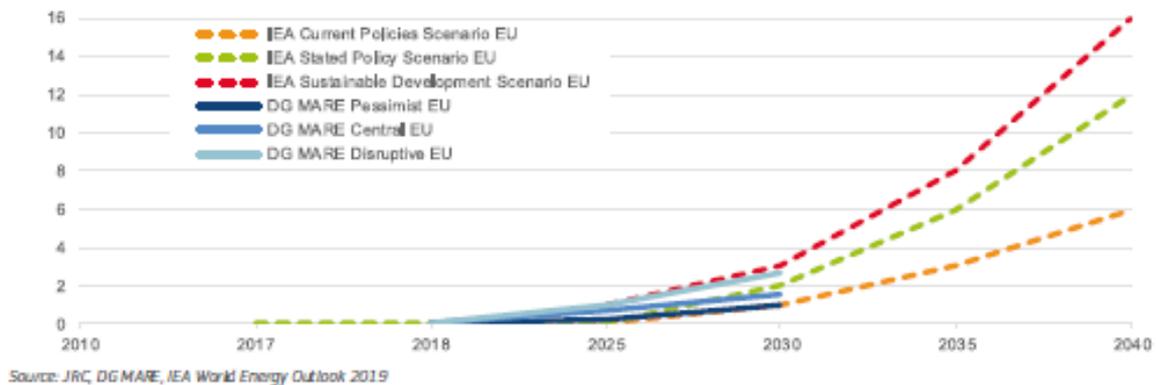


Figure 28: Project Growth in Marine Renewables Capacity

The UK is the world’s largest offshore wind market, and the UK government is aiming to source 40% of UK power from offshore wind by 2030 – targeting 40 GW offshore wind generation by 2030, up from 10 GW today. The Scottish government is aiming for 11GW of offshore wind capacity to be installed by 2030.

Although strong market growth is projected, the design, manufacture and operation of offshore wind assets have their own set of challenges including corrosion, fatigue, erosion, lightning strikes and biofouling. For example, as offshore wind farms move to increasing water depths and aim to operate with larger turbines, foundation designs have needed to adapt accordingly. Further adaption and new designs will be required going forward which will result in a range of opportunities for the supply chain.

¹²³ The EU Blue Economy Report 2020, European Commission 2020

The option of floating offshore wind is highly attractive as it expands the feasible area for offshore wind energy development, reducing visibility from shores, and can be placed in areas with more consistent and stronger wind speed. A cumulative total of 73 MW of floating offshore wind power has been installed in Asia and Europe and up to 10.7 GW of floating wind is feasible by 2030 and 70 GW by 2040 (at a total investment of £195 billion)¹²⁴. To enable larger scale deployment of floating offshore wind various technical challenges around for example power export and maintenance, need to be resolved. Also, methods used for installation need to be improved, with demand for new installation vessels or alternative lifting solutions.

Regarding wave and tidal energy, the global market was estimated at \$542.8 million in 2020, and is projected to reach \$5.1 Billion by 2027, growing at a CAGR of 37.7% over the period 2020-2027¹²⁵. Various projects around the world are continuing with further investments secured and new technology tested. The UK is home to some of the best marine energy resource in the world and it has a strong development pipeline and company base. Several technical challenges still need to be overcome for large scale deployment of wave and tidal devices – for example, reducing the operation and maintenance cost of devices installed under water and in hard-to-reach places.

8) Offshore Decommissioning

This covers oil and gas and offshore wind decommissioning.

a) Oil and Gas Decommissioning

The projected scale of oil and gas decommissioning over the period from 2019 to 2028 is estimated at £67 billion ¹²⁶, segmented geographically as shown opposite:

The high market share of the UK should be noted here.

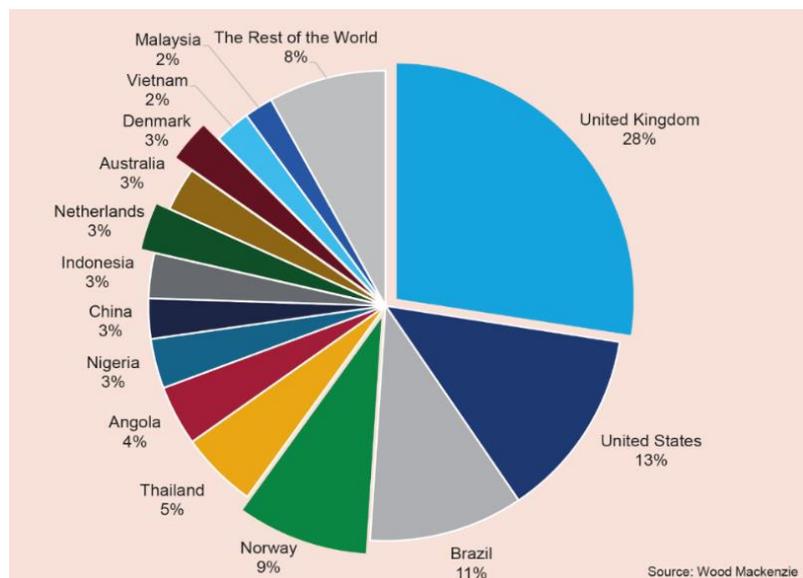


Figure 29: Global Oil and Gas Decommissioning Market – by Country

¹²⁴ Phase 2 Summary Report, Floating Wind Joint Industry Project, The Carbon Trust, July 2020

¹²⁵ Global Wave and Tidal Energy Industry, ResearchAndMarkets, February 2021

¹²⁶ Decommissioning Insight 2019, Oil and Gas UK, 2019

b) Offshore Wind Decommissioning

In terms of offshore wind decommissioning, there are opportunities for decommissioning older wind farms, with analysts predicting significant growth in demand for decommissioning of structures over the period to 2050. This is shown below for the global offshore wind sector¹²⁷. The high market share of the UK offshore wind sector can again be noted here.

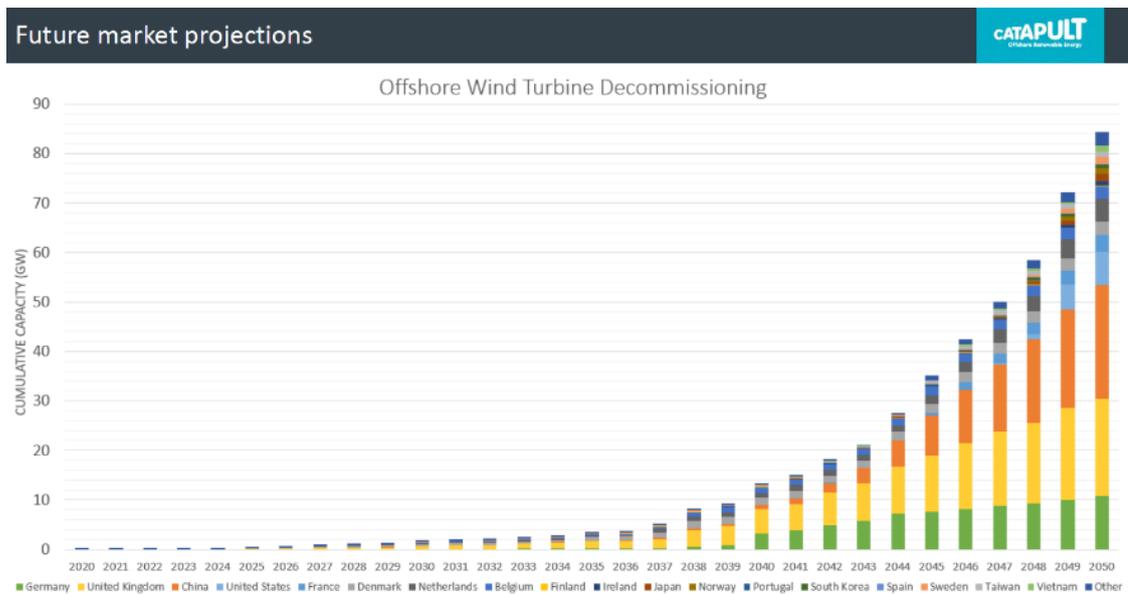


Figure 30: Global Offshore Wind Decommissioning Projections

¹²⁷ https://ore.catapult.org.uk/wp-content/uploads/2021/03/CORE_Full_Blade_Report_March_2021-FINAL-4.pdf

Appendix D – Cluster Summaries and Case Studies

Cluster Summaries

1. Canada

Canada's Ocean Supercluster (OSC) is the 'national brand' for Canada's marine and maritime sectors (or ocean economy) which are around 3 times the size of the sector in Scotland¹²⁸. It is a government initiative, but also an industry-led collaboration, and part of the broader government-led Innovation Superclusters Initiative (ISI) which includes four other superclusters. It describes itself as a 'transformative cluster model that is bringing cross-sectoral collaborating, accelerating innovation, and growing Canada's ocean economy in a way that has never been done before'. The OSC is underpinned by the Ocean Supercluster Strategic Plan 2018-2023 which is currently being implemented. The OSC's vision is to:

'Realise the potential of Canada's ocean economy to establish and grow companies, achieve commercial outcomes, and engage in cross-sectoral collaboration'

The overarching aims are to increase the economic value of Canada's ocean sectors by \$14 billion¹²⁹ by 2030 and add 3,000 jobs, while also doubling the number of ocean tech start-ups.

The OSC is comprised of almost 350 industry and associate members representing 13 ocean industries across the country. Members span ocean industries, not-for-profit organisations, post-secondary institutions, indigenous organisations, and other organisations that have a shared interest in solving ocean challenges, developing, attracting and retaining talent, improving supply chain opportunities, doubling the number of ocean tech start-ups to strengthen the innovation ecosystem, and growing Canada's ocean economy in a unique way.

Key Messages

- Industry-led is key, supported by a Board of industry leaders.
- Strong relationship with / backing from government is important (especially in this case as part government funded) and makes for effective policy shaping.
- Launching projects is the best PR the cluster could have to showcase the sector and raise the profile of the industry and the cluster.
- Encouraging disparate groups to work together on projects is an effective solution for overcoming industry or regional silos.
- Having the ability to be agile and adapt to market (or other macro) conditions is important – e.g., launching a new programme during COVID-19 to mitigate the effects, presents new opportunities for the industry and demonstrates the value of the cluster organisation.

2) Denmark

MARLOG¹³⁰ (Maritime & Logistics) is the official cluster organisation for maritime and logistics in Denmark – in early 2021, the leading maritime cluster organisation, Maritime Development Centre, merged with logistics to form the new 'super-cluster', MARLOG. The Maritime Development Centre

¹²⁸ Analysis of Global Blue Economy Strategies, Optimat for Scottish Enterprise, 2020

¹²⁹ In line with the OECD's prediction that the Blue Economy will represent a \$3 trillion market by 2030, *The Ocean Economy in 2030* (OECD, 2016)

¹³⁰ <https://www.marlog.dk/en/home/>

(MDC) was the principal recognised cluster organization for (and within) the Blue Denmark¹³¹ and a network organization for maritime businesses and stakeholders. It was founded in 1999 and counted around 170 members.

MARLOG works to promote Denmark as a sustainable and innovative leading maritime and logistics powerhouse. Its mission¹³² is to be the preferred partner across the maritime and logistics sector and a leading international cluster organisation, creating value by knowledge transfer, network facilitation, and fostering innovation across the maritime and logistics industries through collaborative projects. It also aims to promote competitive advantage for the maritime and logistics industries through innovation, transformation and competence development. It supports companies' green transformation, digitalisation and access to a qualified workforce which in turn produces a world-leading industry.

The MARLOG cluster contains approximately 300 members¹³³, broken down as follows:

- > 200 SMEs
- 25 Large Companies
- 15 Research Organisations, Universities, Technology Centres

It is similar, in terms of employment to the Scottish sector¹³⁴.

Key Messages

- Positive framework conditions are important to enable industry to grow and compete. These include favourable taxation and a supportive regulatory approach (by the government).
- Innovation is crucial to realise a vision of becoming a global “maritime powerhouse”.
- Collaboration between industry and research provides the foundations for innovation.
- Large maritime companies can form the bedrock of a cluster but cannot / should not drive it.

3) Finland

The Finnish Maritime Cluster (FMC) project is a development project based around a collaboration network organised by the Finnish Shipowners' Association, the Finnish Marine Industries, the Finnish Port Association, and the Finnish Port Operators Association in cooperation with the Centrum Balticum. It aims to create innovation through collaboration and seeks to support organisations and industry stakeholder in accessing EU funding for the development of sustainable solutions. A key objective of the cluster is to be a global forerunner in sustainability and digitization; another is to increase blue growth, Baltic Sea protection and the competitiveness of the cluster.

Finland also develops national strategies for its maritime sector. The Maritime Transport Strategy for Finland 2014 – 2022 was published by the Ministry of Transport and Communications. It analyses the changes that have taken place in the past years and future challenges, highlighting topics including the development of efficient transport chains that support competitiveness, the international activities of

¹³¹ Blue Denmark is the collective ocean sector, of which Maritime is the largest ocean industry

¹³² European Cluster Collaboration Platform, <https://clustercollaboration.eu/cluster-organisations/maritime-logistics-innovation-denmark-marlog#section-4>

¹³³ <https://clustercollaboration.eu/cluster-organisations/maritime-logistics-innovation-denmark-marlog#section-5>

¹³⁴ Analysis of Global Blue Economy Strategies, Optimat for Scottish Enterprise, 2020

the sector, and green growth. The strategy also sets out a vision for maritime transport in 2030, which was determined in collaboration with the maritime sector¹³⁵.

The FMC encompasses approximately 3,000 companies from various industry sectors, all of which are connected by their maritime expertise. According to FMC leaders, it is the cluster's 'diversity that differentiates us from many other countries.' Among the members are cargo ship owners, specialist ship owners, marine industries ranging from leading marine equipment manufacturers, turn-key suppliers, designers, software and system providers, shipyards, the ports which handle almost 90% of Finland's foreign trade, and passenger traffic – the Port of Helsinki is the busiest passenger port in Europe.

It is also similar, in terms of employment to the Scottish sector¹³⁶.

Key Messages

- Cohesive collaboration and work for the 'common good of the field' is possible when organisations are committed to put in the time and effort.

4) Merseyside

Mersey Maritime is the regional cluster organisation for the £4 billion maritime sector and wider supply chain in the Liverpool City Region and the greater North West. It represents the Ports and maritime sector, helping create the right conditions for business growth. Set up in 2003, it aimed to create an environment where 'joined up thinking could occur', linking the various maritime stakeholders who, prior to Mersey Maritime, operated independent of one another in a 'fractured'¹³⁷ sector.

Mersey Maritime's mission is to continue to be a catalyst for growth, influencing policy and driving change for the good of the sector. It represents the interests of over 1700 maritime, logistics and energy businesses, spanning the 33 sub-sectors that make up the sector in the Liverpool City Region and beyond. This is around five times as many companies as was identified in the Clyde region. It is open to all maritime sector businesses, associated public sector partners, trade associations and charitable organisations. Members can be based anywhere in the UK or overseas provided they have interests in Merseyside's Maritime sector. Non-maritime and non-maritime specific business may apply to be members on individual merit.

Its resource consists of a senior team of five and a total of 10 staff.

There are eight Key Partner organisations, including Maritime UK, Manufacturing Technology Centre, and Peel Ports. Five personnel manage the day-to-day operations of Mersey Maritime, including a CEO, Head of Commercial and Partnerships and Policy Co-ordinator. This compares to less than one full time equivalent for the Scottish Maritime Cluster.

Key Messages

The main lesson learned is that 'industry-led but with political will is the only way the cluster can work'.

- Having the right people in place is crucial.

¹³⁵ OECD (2018), *Peer Review of the Finnish Shipbuilding Industry*

¹³⁶ Analysis of Global Blue Economy Strategies, Optimat for Scottish Enterprise, 2020

¹³⁷ Quote from CEO of Mersey Maritime

- Building a strong board of industry leaders is important as it lends credibility and weight to the cluster's voice.
- Clear messaging is key to ensure the vision and direction of the cluster is adopted by all members. Being ruthless with those who do not adopt the cluster vision is also key.
- Transparency and independence are vital to instil trust and allow members to share industry knowledge and insights in a 'safe space'.
- Collaborating and openly engaging and sharing with other clusters supports national industry growth and strengthens the UK's competitiveness in foreign markets.
- Favourable industry (tax) conditions are a major boost, e.g., 'Freeports' status.

5) Norway

Maritimt Forum¹³⁸ ('Maritime Forum') is an interest organisation that brings together the entire Norwegian maritime industry. Over time, the members have contributed to the development of a world-leading and comprehensive maritime cluster. Maritime Forum brings together both the employee and employer side of the industry and represents the common interests of the cluster. Since 1990, it has spearheaded the promotion of knowledge about the country's most knowledge-intensive and innovative industry, also serving as a meeting place for industry, the authorities and education and research communities.

The Forum has the following objectives:

- Contribute to increased cooperation between organisations and companies within Norwegian export-oriented maritime business.
- Create an increased understanding of, and awareness of, the maritime industry's significance for the Norwegian economy and society.
- Contribute to further developing Norwegian maritime competence and quality with a view to increased deliveries and more exports of maritime goods and services.
- Promote the common interests of the maritime industries before the Norwegian and foreign authorities.

The Norwegian maritime cluster consists of nearly 700 members, including world-leading companies across shipping, shipyards, equipment and services and Norwegian seafarers. The maritime cluster works for almost 90,000 women and men, creating value of almost NOK 150 billion (£12.7 billion) every year. The maritime industry is also Norway's second largest export industry after petroleum.

It has twice the employment of the Scottish sector¹³⁹ and five times the GVA, although this figure is significantly affected by high oil and gas revenues in Norway.

Key Messages

- A major strength is to represent both the employee and employer side; a collaboration based on common interests.
- A structure with regional clusters, organised and managed by their own individual teams, alleviates resource and capacity constraints (compared to, e.g., one central hub).

¹³⁸ <https://www.maritimt-forum.no/>

¹³⁹ Analysis of Global Blue Economy Strategies, Optimat for Scottish Enterprise, 2020

- Regional clusters also allow coastal locations to play to their strengths, developing technologies and undertaking projects relevant to them before scaling to other markets.
- A strong relationship with government is key to achieving the objectives and outcomes of the cluster – regular meetings with politicians makes lobbying government much more effective.
- The Board must consist of leading members of the industry, to lend credibility but also to obtain access to resources and assets from an operational perspective.

Cluster Best Practice

There are a number of best practices that contribute to the effective development and sustainment of a maritime cluster. These are listed below with case study comparisons in the table that follows:

- c) Clearly defined vision / mission, aims and objectives
- d) Industry leadership, especially at Board level
- e) Government supporting the cluster
- f) National strategies underpinning or aligning with the cluster
- g) An experienced and dedicated management team
- h) Diverse income streams / stable financial position
- i) Inclusive membership but with boundaries set
- j) Effective integration of disparate groups
- k) Broad spectrum of accessible assets and infrastructure
- l) Facilitating collaboration

The degree to which each of the case studies has implemented these is represented in the Figure below.

Case Study	Vision / Mission	Industry Leadership	Government Commitment	National Strategies	Management Team	Financing / Funding	Member Scope / Inclusivity	Integrating Stakeholders	Assets & Infrastructure	Collaboration
Canada	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	Strong	Strong	V. strong
Denmark	V. strong	V. strong	Strong	Strong	Strong	Strong	V. strong	V. strong	V. strong	Strong
Finland	Strong	V. strong	Strong	V. strong	Moderate	Moderate	V. strong	Strong	Moderate	Strong
Merseyside	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong
Norway	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong	V. strong

Figure 31: Implementation of Key Cluster Best Practices

The individual best practices are described in further detail below, with supporting evidence provided for some of the cluster examples in relation to the ratings provided in the table above.

1) Clearly defined vision / mission, aims and objectives

All case study examples have a clear vision and either specific and defined aims and objectives or more generalist ones. For example, Canada's Ocean Supercluster aims to increase the value of Canada's ocean sectors by \$14 billion by 2030, adding 3,000 jobs alongside. It also sets four key objectives designed to meet these overarching economic impact aims. Denmark, on the other hand, is more generalist, on a mission to promote Denmark as a sustainable and innovative leading maritime and logistics powerhouse.

2) Industry leadership, especially at Board level

All case studies emphasised the importance of industry leadership, especially at a Board and governance level. All cluster organisations have a Board of industry leaders in place. This is seen as important to lend credibility and help steer the cluster but also to leverage resources. For example, Norway's Maritimt

Forum Board consists of 14 representatives from key maritime industry organisations, including Norwegian Shipowners' Association, Norwegian Industry, The Norwegian Engineers' Association, etc, who lend resource, assets and infrastructure to help with the operation and delivery of Maritimt Forum activities. Finland's maritime cluster (FMC) project is led by a collaboration of key industry associations that represent the different segments of the maritime industry. A steering group consisting of the managing directors from the partner associations essentially serves as a Board of management.

3) Government supporting the cluster

All case studies placed government relations / government backing as an important characteristic for the effective development and sustainment of their cluster. For example, Canada's Ocean Supercluster is an initiative originated by and funded by the government; Mersey Maritime (Merseyside) is well-backed by the government, demonstrated by the recent announcement of 'freeports'¹⁴⁰; Denmark's MARLOG cluster organisation is supported by favourable framework conditions implemented by the government; Norway hosts politicians at all of its Board meetings and defines lobbying as one of its key services, influencing political framework conditions in favour of its members; and Finland is in regular dialogue with government and has public sector members.

4) National strategies underpinning or aligning with the cluster

Several of the case studies have national maritime strategies that underpin their maritime industry and therefore underpin or *align* with the cluster (this does not necessarily mean the cluster organisation adopts the strategy as its sole underpinning strategy). For example, the Norwegian Ministries (2019) Blue Opportunities: The Norwegian Government's Updated Ocean Strategy underpins the nation's large maritime industry and helps shape the direction of the industry – the strategy aligns with the work of Maritimt Forum and vice versa but is not the sole or exclusive strategy adopted and by Maritimt Forum who, for example, focuses mostly on national interests and not on international connections, which is conversely an area of interest in the Blue Opportunities strategy. Canada's Ocean Supercluster is underpinned by its Ocean Supercluster Strategic Plan 2018-2023. Mersey Maritime was influential in the development of the UK's Maritime (2050) Strategy¹⁴¹ and was included as a case study example of exemplar cluster development.

5) An experienced and dedicated management team

A dedicated management team was a strength for all case studies. With the exception of Finland, who appoints a Project Manager seconded from the Finnish Shipowners' Association (lead organisation), each cluster organisation has an executive management team and the necessary capacity to execute the services and activities designed and implemented for its cluster members. Canada has grown its team from a handful to 22 in roughly one year, counting various executive positions like CEO, VP Government Relations and Communications, and so on. Merseyside similarly has a small but experienced executive management team of five, supported by 5 additional staff, that is well equipped to rollout the programmes and services offered to members. Whilst industry experience has its obvious benefits, the CEO of Mersey Maritime (Merseyside) suggested fresh perspectives were always welcomed in senior

¹⁴⁰ Freeports are usually located around shipping ports or airports. Goods that arrive at freeports from abroad are not subjected to the tax charges (tariffs) that are normally paid to the government.

¹⁴¹ Dept. for Transport, Maritime and Coastguard Agency (2019), *Maritime 2050: Navigating the Future*

leadership roles as the maritime industry can often fall into and under traditional viewpoints which can stifle progress.

6) Diverse income streams / stable financial position

Some of the case study examples have relied heavily – almost exclusively – on government funding, combined with private sector investments. Other clusters, those more established, have reached a stage of self-sustainment, using membership income to support the cluster organisation and the services it offers. Canada, for example, has a five-year mandate with a government budget of approximately CAD 300 million. All projects funded through the OSC are 50% funded by the government and 50% from companies (usually large companies) within the cluster; typically, a large company will invest in a more agile start-up exploring an emerging technology. Mersey Maritime and Norway, on the other hand, self-sustain themselves with membership fees. Mersey Maritime has over 1700 members and adopts a membership package pricing model, with options from £300 per year to £3,000 per year, plus bespoke ‘Partner’ packages. Mersey Maritime explained that it is important to achieve, or at least aim, for self-sustainability as it makes it easier to return to the public sector for funding as and when needed. The FMC (Finland’s maritime cluster) project had been funded by the Finnish Government until 2021 but this funding line has since stopped – it is not clear how the FMC funds itself moving forward.

7) Inclusive membership of cluster organisations but with boundaries set

Diversity within the cluster is important to reflect and, more importantly, represent the broad interests of the industry in the region / country. This must, however, come with limits otherwise the scope of the cluster may deviate from its original vision and the activities delivered and actions taken by the cluster organisation may not serve or reflect the interests of the cluster members. Mersey Maritime implements a ruthless approach, cancelling membership if members do not share in the vision and direction of the cluster (this is assumed to be after a period of consultation with the member). Canada prioritises inclusivity and diversity, championing and representing the nation’s indigenous people with a specific programme tailored to support indigenous businesses, an appointed indigenous member of the Board and an indigenous member of the management team. This latter point is an example of inclusion on a cultural level whereas the former example (Mersey Maritime) demonstrates that importance of setting boundaries in terms of a member’s interests and motivations for joining the cluster.

8) Effective integration of disparate groups

One of the more important, and also more challenging, best practices is integrating the various stakeholders that comprise a cluster. Several of the cluster examples integrate companies, industry associations, academia, and government. These stakeholder groups have varying characteristics and must be managed effectively to ensure interests are represented in a balanced way and dialogue is open and fair. Moreover, the cluster organisation must maintain its role as an integrator but also, ultimately, a voice for the maritime sector. A number of case study examples referenced ‘integration’ of different groups as one of the biggest challenges faced when developing the cluster. Norway allows its regional cluster offices to manage their own membership, liaising directly with industry to obtain insights and feedback, before reporting back to HQ. This alleviates any capacity constraints and ensures regional clusters play to their strengths and manage themselves without promoting regional silos. Whilst Finland’s maritime cluster has not experienced any significant issues integrating disparate groups, it has struggled at times to engage member companies and encourage them to join projects due to their

limited engagement in the overall FMC cluster development project. Canada resolves any integration issues, like member companies not participating regularly, by forcing members to partner on projects otherwise funding will not be administered – e.g., an SME must be part of a consortium for a project, private funding must amount to 50% of project costs, etc.

9) Broad spectrum of accessible assets and infrastructure

Generally speaking, the more established clusters, or the cluster projects (e.g., Canada Ocean Supercluster) designed with longevity in mind, have access to a broad spectrum of maritime assets and infrastructure. Mersey Maritime, for example, includes the full spectrum, e.g., (5) universities, Ports, Ship canals, Offshore facilities, Data centres, and so on. The cluster organisation can request access to these assets when required. It is understood that having major port operators as partners in the cluster is hugely beneficial. It is not clear what access Finland has to key maritime assets, but it is assumed that in general access to key assets and infrastructure is facilitated and not restricted.

10) Facilitating collaboration

Collaboration is central to the aims and objectives of all cluster examples. It often features as part of the vision or mission statement of the cluster organisations. For example, the (Canada) Ocean Supercluster’s vision statement includes ‘engaging in cross-sectoral collaboration’; (Denmark) MARLOG’s mission is to foster innovation ‘across the maritime and logistics industries through collaborative projects’; (Finland) the FMC’s aim is ‘to create innovation through collaboration’; (Merseyside) Mersey Maritime asserts that ‘collaborating and openly engaging and sharing’ not only within the maritime cluster but with other clusters around the UK supports national industry growth and strengthens the UK’s competitiveness in foreign markets; (Norway) Maritimt Forum offers various collaboration opportunities through its projects and networking events, claiming that one of the Forum’s major strengths is the fact it brings together both the employee side and employer side, ‘a collaboration based on common interests’.

Maritime Cluster Case Study (1) – Canada

Overview

Canada's Ocean Supercluster (OSC) is the 'national brand' for Canada's marine and maritime sectors (or ocean economy). It is a government initiative, but also an industry-led collaboration, and part of the broader government-led Innovation Superclusters Initiative ¹⁴² (ISI) which includes four other superclusters. It describes itself as a 'transformative cluster model that is bringing cross-sectoral collaborating, accelerating innovation, and growing Canada's ocean economy in a way that has never been done before'.

The OSC is underpinned by the Ocean Supercluster Strategic Plan 2018-2023 which is currently being implemented. The motivations for the strategy (and the OSC) are economic and environmental in equal measures – supporting ocean economy development whilst also supporting the low carbon / sustainability agenda and inclusivity and diversity.

Headquartered in Atlantic Canada, the OSC represents a varied member-base across all regions of Canada – 40% of cluster membership is located outside of Atlantic Canada¹⁴³.

Aims & Objectives

The OSC's vision is as follows:

'Realise the potential of Canada's ocean economy to establish and grow companies, achieve commercial outcomes, and engage in cross-sectoral collaboration'

The overarching aims of the OSC are to increase the economic value of Canada's ocean sectors by \$14 billion by 2030 and add 3,000 jobs, while also doubling the number of ocean tech start-ups and engaging over 200 organisations through technology leadership project participation or involvement in innovation. The OSC strategy indicates that ocean economies contributed \$36bn to national GDP in 2018; the same 1.5% share of GDP as in 2015¹⁴⁴.

Other key objectives are as follows:

1. Build a shared competitive advantage for Ocean Supercluster members by developing and commercialising technologies and positioning the entity as a world-leading ecosystem for technology and capability development.
2. Position firms, in particular SMEs, to scale and integrate into global value chains, transition to high-value activities, and become global market leaders.
3. Foster a critical mass of growth-oriented firms and strengthen connections and collaborations between private, public, and academic organisations.
4. Transform Canada into a global hub for ocean innovation and collaboration.

The OSC measures success and achievement by the progress made in the development of the ecosystem, not just on jobs created and contribution to GDP, which are typical metrics used by

¹⁴² ISI in an initiative launched by the department of Innovation, Science and Economic Development (ISED)

¹⁴³ Source: Ocean Supercluster staff member

¹⁴⁴ Government of Canada, Fisheries and Oceans Department GDP statistics 2012-2015. Statistics beyond 2015 were not available, and while the Supercluster Strategy report indicated a contribution of \$36bn from the maritime sector to national GDP in 2018, the statistic cannot be verified. The percentage of contribution has remained consistent 2015 to 2018; 1.5%.

government for measuring impact. This can cause some tension but has not been a major issue at this early stage in the OSC’s development – i.e., halfway through a five-year mandate / strategic plan.

Membership

The OSC is comprised of almost 350 industry and associate members representing 13 ocean industries across the country¹⁴⁵. Members span ocean industries, not-for-profit organisations, post-secondary institutions, indigenous organisations, and other organisations that have a shared interest in solving ocean challenges, developing, attracting and retaining talent, improving supply chain opportunities, doubling the number of ocean tech start-ups to strengthen the innovation ecosystem, and growing Canada’s ocean economy in a unique way.

Industry members are private sector firms who make a cash investment. Industries include:

- Fisheries
- Aquaculture
- Offshore resources
- Shipping
- Defence
- Marine renewables
- Marine bio-products
- Ocean technology

Associate members include private sector firms, not-for-profit corporations, indigenous organisations, post-secondary institutions, and other organisations with an interest in ocean innovation. They can develop, make in-kind investments, and participate in Technology Leadership Project and Innovation Ecosystem activities (see Services below).

Membership fees are paid relative to the tier / class the organisation selects when joining the cluster. Class A members pay more to receive greater privileges, e.g., a Board seat. Board members are expected to invest in projects, where 50% match funding comes from the government¹⁴⁶.

Services

The OSC adopts a project and programme approach, offering the following:

1. Technology Leadership Projects

These projects bring together investors and partners from across ocean industries to develop and commercialise innovative solutions to shared challenges, while increasing connectivity, strengthening capabilities, growing supply chain, and expanding international reach. At the heart of every Technology Leadership Project is a strong industry partnership. An OSC member can initiate a project idea and enlist participation from other organisations including start-ups and research institutions.

¹⁴⁵ <https://oceansupercluster.ca/members/>

¹⁴⁶ A budget is split between the (5) *Superclusters* each year as part of the government’s *Superclusters Initiative*

2. Innovation Ecosystem Activities

These activities focus on access to shared resources, regional connectivity and innovative culture, strengthening the links between small and large companies to foster new supply chain partnerships, increasing commercialisation from post-secondary institutions and encouraging new entrants into the ocean economy, both talent and companies. This programme is designed to address shared talent challenges identified by OSC members, attracting the best entrepreneurs to the cluster and supporting the growth of work integrated learning environments and skills development.

3. Accelerated Ocean Solutions Programme

The OSC launched a Call for Proposals under its new Accelerated Ocean Solutions Programme. Through the programme, the OSC will invest up to \$35 million in short-term ocean projects to help continue to build resiliency in ocean sectors during COVID-19. This will supplement the OSC's core programmes (as listed above) and is intended to trigger additional industry investment in innovation, capability-building, and resilience strengthening in the ocean economy.

4. Indigenous Engagement Strategy

In 2019-20, the OSC developed its Indigenous Engagement Strategy together with the Indigenous Working Group. The strategy is designed to: encourage indigenous participation in OSC project and partnerships; create more innovative indigenous ocean companies; enhance the marine and ocean technology capacity and partnerships of the Aboriginal Aquatic Resources and Oceans Management groups in the Atlantic region, and more (as found in the OSC Annual Report 2019-20).

Structure & Operations

The OSC is one of five superclusters selected in early 2018 by the department of Innovation Science and Economic Development (ISED). However, a Board of Directors, with representation from companies, academia, and associations, drives the OSC strategy and holds the OSC to account. Launching in early 2019, the team grew from three to 22 full-time employees working across six cities by March 2021.

The Senior Management Team is comprised of: Chief Executive Officer, Chief Administrative Officer, Chief Technology Officer, Chief Engagement Officer, VP Government Relations and Communications. For each of the main programmes (described above), there is a dedicated Working Group that holds ongoing meetings.

The Board of Directors¹⁴⁷ meets at least quarterly and engages regularly in OSC events and activities. The role of the Board is to provide strategic oversight and guidance to the OSC's team in their delivery of its mandate. A Senior Management Team reports on the programmes and activities and all other priorities being delivered under the organisation's five-year strategy. Senior Management also have regular meetings with Federal Deputy Ministers to provide updates on programmes and projects.

Inclusivity and diversity are important themes, which is why 50% of the Board Directors are female and one member is an indigenous person.

¹⁴⁷ Example Board members include: CFFI Venture (private investment company), Memorial University / Marine Institute, Confederacy of Mainland Mi'kmaq (Tribal Council in Nova Scotia)

The OSC’s funding¹⁴⁸ (revenues) is provided by its industry members as well as via a non-repayable contribution from the Innovation Superclusters Initiative (ISI) via ISED. ISED provides a non-repayable contribution to the Corporation of:

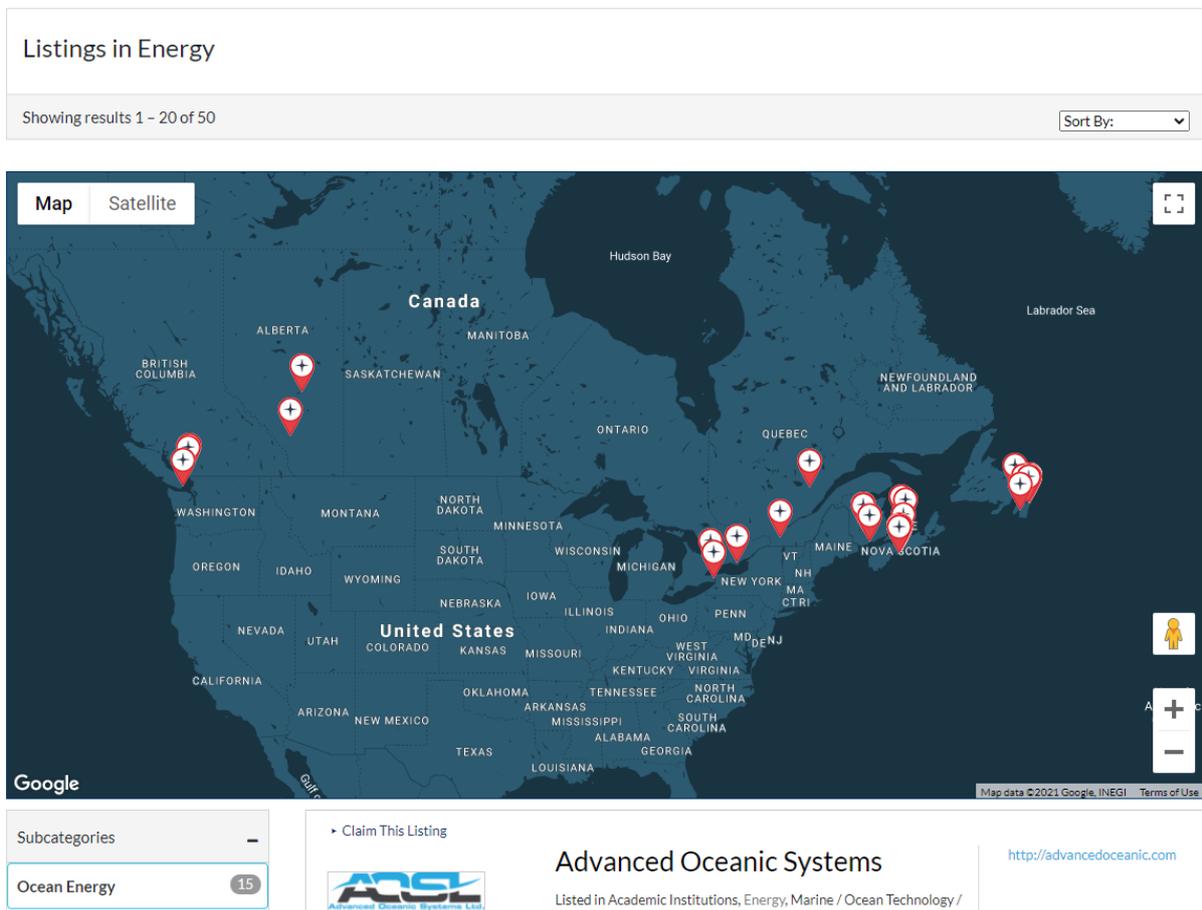
- Up to 75% of eligible costs to support the OSC’s operations/administration
- Up to 100% of eligible project costs

All ISED funding must be equally matched by industry overall.

Funding received from all sources for OSC’s operating and administrative expenses in 2020 totalled \$4,307,445 comprised of \$1,464,537 (34%) from ISI and \$2,842,908 (66%) from Members.

Assets & Infrastructure

The membership spans eight provinces and one territory¹⁴⁹. The OSC website contains a section dedicated to ‘ocean assets’¹⁵⁰ across the country, including a searchable ‘Directory’ of 3,000 organisations filtered by maritime industry and with results (companies) plotted on a map:



The screenshot displays a web interface for 'Listings in Energy'. At the top, it shows 'Showing results 1 – 20 of 50' and a 'Sort By:' dropdown menu. Below this is a map of North America with red location pins indicating the presence of organizations. The map includes labels for 'Canada' and 'United States' with various provinces and states listed. Below the map, there is a 'Subcategories' filter set to 'Ocean Energy' with a count of 15. To the right, there is a listing for 'Advanced Oceanic Systems' with a 'Claim This Listing' button and a link to their website: <http://advancedoceanic.com>. The listing also includes the text 'Listed in Academic Institutions, Energy, Marine / Ocean Technology /'.

Figure 32: Canada’s Ocean Assets Ecosystem Directory

¹⁴⁸ Canada’s Ocean Supercluster Annual Report 2019-2020

¹⁴⁹ Alberta, British Columbia, New Brunswick, Newfoundland and Labrador, Nova Scotia, Nunavut, Ontario, Prince Edward Island, Quebec

¹⁵⁰ <https://canadoceanassets.ca/>

Achievements & Impacts

Some of the major achievements and impacts of the OSC are as follows:

- \$250 million of project funding committed
- 50 projects announced
- 40% cluster members based outside of Atlantic Canada (HQ of OSC)
- 80% of projects SME led – projects must include an SME, but do not have to be led by SME
- 50% of project partnerships span two different coasts
- 2300 jobs created

One particular success story is the launch of the Accelerated Programme, described earlier. This was a programme designed to support companies pivoting or trying to retain their staff in reaction to COVID. It is understood that a Call for Proposals is not something the OSC would normally do but has been extremely successful and resulted in a large number of ‘cluster champions’ emerging as a result – this is valuable for raising awareness about the cluster at this early stage in its development.

Issues / Challenges

One of the key challenges at the early stages of the cluster’s development has been raising awareness and showcasing the benefits of joining the cluster¹⁵¹. The OSC has attempted to raise its profile and overcome this challenge by launching projects and committing funds to ocean economy companies and ideas. This has, in return, generated support from companies who have secured funding. These ‘champions’ are helping spread the word about the OSC.

Another challenge has been integrating disparate groups – again, a problem amplified by Canada’s size and the distance between coastlines. The OSC resolves this by ‘forcing’ companies who may reside on opposing coastlines to work together or a project will not get funded.

Emerging Opportunities

Digitalisation and decarbonisation are the main focus areas being pursued by the OSC. For example:

- Battery-based Energy Storage Systems for large marine vessels, helping reduce greenhouse gas emissions
- Smart integrated ocean sensors / environmental monitoring sensors integrated with the ocean’s autonomous platforms
- Low-carbon Green Fuel

Lessons Learned

Some of the key lessons learned¹⁵² whilst developing the Ocean Supercluster, include:

- Industry-led is key, supported by a Board consisting of industry leaders.
- Board members and other large companies in the cluster represent key investors in the projects that are match-funded by government – an effective model for cluster growth.

¹⁵¹ This challenge is amplified in Canada, where the majority of the population live in and around densely populated cities and towns. Canada’s coastline is the longest in the world (>200,000km) but is considered to be relatively untapped.

¹⁵² Taken from discussions held with the VP Government Relations and Communications

- Strong relationship with government (with a mandate to support the cluster with funding over a period of time) is crucial.
- Launching projects is the best PR the cluster could have to showcase the sector and raise the profile of the OSC.
- Forcing disparate groups to work together on projects is an effective solution to combat silos.
- Ability to be agile and quickly adapt to market conditions – e.g., launching new programme mid-COVID-19 – presents new opportunities and demonstrates value of the cluster.

Maritime Cluster Case Study (2) - Denmark

Overview

MARLOG¹⁵³ (Maritime & Logistics) is the official cluster organisation for maritime and logistics in Denmark – in early 2021, the leading maritime cluster organisation, Maritime Development Centre, merged with logistics to form the new ‘super-cluster’, MARLOG. The Maritime Development Centre (MDC) was the principal recognised cluster organization for (and within) the Blue Denmark¹⁵⁴ and a network organization for maritime businesses and stakeholders. It was founded in 1999 and counted around 170 members. MARLOG members view the cluster organisation as an ‘incubator for good ideas, an industry community, a platform for strong partnerships, and a mediator of knowledge between businesses and knowledge institutions.’ It is also perceived as a ‘direct entry ticket to all relevant operators and stakeholders in the maritime industry and the transport chain.’¹⁵⁵

MARLOG was formed after the Danish Government reviewed all industries and the instruments used to support industries with a view to simplifying and professionalising the instruments of support. The aim was to make local support tools more generalist and national support tools more specialist. Close to 50 clusters were receiving public funding before the government exercise to streamline industry support was conducted.¹⁵⁶

The Danish Maritime Authority, in conjunction with the Ministry of Industry, Business and Financial Affairs, produced the Maritime Denmark Strategy (2018), following a directive from the Danish Government to develop Denmark’s maritime industry into a ‘global, maritime power hub’. This strategy has underpinned the industry and, it is assumed, the cluster, since its release.

Aims & Objectives

MARLOG works to promote Denmark as a sustainable and innovative leading maritime and logistics powerhouse. Its mission¹⁵⁷ is to be the preferred partner across the maritime and logistics sector and a leading international cluster organisation, creating value by knowledge transfer, network facilitation, and fostering innovation across the maritime and logistics industries through collaborative projects.

MARLOG also aims to promote competitive advantage for the maritime and logistics industries through innovation, transformation and competence development. It supports companies’ green transformation, digitalisation and access to a qualified workforce which in turn produces a world-leading industry.

MDC’s guiding aim¹⁵⁸ was to support Denmark in being the most innovative nation amongst the world’s maritime nations, by ‘being a catalyst, facilitator and motivator’. This emphasis on innovation and competitiveness on an international stage remain true under MARLOG.

Membership

The MARLOG cluster contains approximately 300 members¹⁵⁹, broken down as follows:

¹⁵³ <https://www.marlog.dk/en/home/>

¹⁵⁴ Blue Denmark is the collective ocean sector, of which Maritime is the largest ocean industry

¹⁵⁵ <https://www.marlog.dk/en/marlog-in-brief>

¹⁵⁶ Taken from discussions held with the Managing Director of MARLOG

¹⁵⁷ European Cluster Collaboration Platform, <https://clustercollaboration.eu/cluster-organisations/maritime-logistics-innovation-denmark-marlog#section-4>

¹⁵⁸ <https://mdc.center/about-mdc>

¹⁵⁹ <https://clustercollaboration.eu/cluster-organisations/maritime-logistics-innovation-denmark-marlog#section-5>

- > 200 SMEs
- 25 Large Companies
- 15 Research Organisations, Universities, Technology Centres
- 10 Other Ecosystem Actors

The MDC (before becoming MARLOG) consisted of circa 170 members from the following categories:

- Brokering, shipping and logistics
- Finance, insurance, law and classification
- Industry, unions and interest groups
- Offshore operators and services
- Shipowners and operators
- State and public organisations (authorities)
- Suppliers of products and services
- Ports and related
- Universities, education and research

As MARLOG is a membership organisation, the companies set the agenda. All projects, events and webinars stem from suggestions and requests from members and steering groups. Paying members receive the full package – projects, events, webinars, networks – covering all employees in the member company.

Membership package / fees¹⁶⁰ range from DKK 3,500 for start-up enterprises to DKK 26,000 for educational & knowledge institutions to DKK 51,000 for companies with 500+ employees.

Services

MARLOG provides services relating to key themes and activities of interest:

Events

Members have access to a range of events, seminars and conferences throughout the year. Topics and content originate from eight steering groups – the ‘trend spotters’. Each steering group meets at the start of each year and plans the programme of events based on specific topics of interest. There is also emphasis placed on ‘Visits & Social’ events, to stimulate ideas and forge new business connections.

Green Transformation

MARLOG’s Innovation Board for Green Transformation brings together small and large enterprises, entrepreneurs and knowledge institutions to support the low carbon / climate agenda, switching transport to climate-neutral energy carriers. It achieves this through the projects it coordinates.

Digitalisation

MARLOG’s Innovation Board for Digitalisation works to support businesses in their efforts to become more digital and to make opportunities with this more accessible. This involves knowledge transfer and experience sharing, achieved through the projects and demonstrations it coordinates.

¹⁶⁰ <https://www.marlog.dk/en/become-a-member>

Competence Development

MARLOG's Innovation Board within Competence Development works purposefully on competence development to identify and tailor courses which match the needs and realities of businesses.

Entrepreneurship

MARLOG's initiative for Entrepreneurship aims to promote innovation and new solutions within both logistics and the maritime sector. It achieves this through the projects it coordinates, such as the Maritime Stars project which selects and works with five of Denmark's best maritime start-ups.

Structure & Operations

MARLOG is the combined 'super-cluster' for maritime and logistics sectors. It is governed by a Board of Directors¹⁶¹ that seeks to promote innovation and development in the industry and has a broad geographical base and covers every branch of the industry, namely:

- Ship designers
- Equipment manufacturers
- Logistics
- Shipping companies
- Ports
- Research and education

MARLOG is managed out of five locations: Copenhagen, Frederikshavn, Svendborg, Bornholm, Esbjerg.

There are 27 employees spread across eight departments, including: Management, Communication & Community, Technology & Innovation – Green Transformation, Technology & Innovation – Digitalisation, People & Business, Shared Service, Frederikshavn Hub / Danish Maritime Apprenticeship Scheme, and Svendborg Hub.

As described in the section above, each of the core 'Services' offered by MARLOG has a dedicated Innovation Board to hold the service (e.g., Green Transformation) to account.

There are nine steering groups dedicated to core topics of interest. Example groups include Vessel Performance Forum, Maritime Communication Forum, Maritime HR Forum, Nordic Green Shipping. These groups are typically composed of representatives from shipping, public authority/knowledge institution and a consultant, as appropriate to the topic concerned. The groups set and steer the agenda, particularly in relation to the programme of events scheduled throughout the year.

MARLOG also performs the secretariat¹⁶² function for CIMAC Denmark, a non-profit member organisation under CIMAC International¹⁶³. The secretariat performs such functions as: member care, Board work, external communications, and more.

¹⁶¹ <https://www.marlog.dk/en/marlogs-board-of-directors>

¹⁶² <https://www.marlog.dk/en/secretariat-assistance>

¹⁶³ CIMAC is a worldwide non-profit association consisting of National Member Associations, National Member Groups and Corporate Members in 26 countries. It brings together manufacturers of diesel and gas engines and gas turbines, users such as shipowners, utilities and rail operators and also suppliers, oil companies, classification societies and scientists.

Assets & Infrastructure

The full spectrum of maritime assets and infrastructure is included in the cluster. These include, for example:

- Maritime academies
- Universities
- Maritime Research Alliance
- Ports

The emphasis is on science and research as a stimulant and driver of innovation.

Denmark is a true maritime nation and, as such, various maritime hotspots have emerged and developed over the years catering to the 1000 maritime companies¹⁶⁴ spread across the country.

A great asset to Denmark is its heritage in shipping and logistics. World-renowned companies, like Maersk¹⁶⁵, represent Denmark on a global level but also serve as the foundation of the Danish cluster domestically. Maersk is an example of a large company setting an example for the cluster by, for example, ‘spearheading our industry’s digital transformation’¹⁶⁶ and setting goals like being fully carbon neutral by 2030. Maersk could be seen as the bedrock of MARLOG, a company to *cluster* around. It does not, however, drive the cluster nor set the cluster’s agenda – this remains the role of MARLOG.

Achievements & Impacts

The Danish maritime industry employs approximately 40,000 people. This is roughly 40% of the overall Blue Denmark – i.e., all ocean industries. Of all Danish maritime companies (circa 1000), 45% are considered innovative. This compares to 20% of remaining Danish companies across all other industries.¹⁶⁷ This somewhat demonstrates the impact of maritime on Denmark’s economy and, therefore, the importance of a cluster organisation like MARLOG in steering and shaping it. In recognition of its value, MARLOG received the Gold Cluster Management Excellence standard.

Issues / Challenges

The main issues for the maritime cluster centred around the identification of support for maritime businesses, access to funding, collaboration opportunities and consensus on targeting emerging opportunities, like the green transition and digitalisation of the maritime industry.

Collaboration between maritime companies has also been a problem area. Co-financed projects were, in volume, far fewer than other Northern European countries – this saw fewer Danish companies breaking into European markets compared to neighbouring countries.

Emerging Opportunities

The key emerging opportunities are around the green transition, autonomous shipping and the broader climate crisis and digitalisation agendas. However, it is understood that Denmark, whilst obviously researching and developing innovative technology solutions, is focusing on shifting the traditional mindset of Danish business; it is cultivating a business environment where innovation and collaboration are central.

¹⁶⁴ <https://danskemaritime.dk/presentation-of-the-danish-maritime-industry/>

¹⁶⁵ Integrated shipping company; \$40bn turnover; 80k employees <https://www.maersk.com/>

¹⁶⁶ <https://www.maersk.com/about>

¹⁶⁷ <https://danskemaritime.dk/presentation-of-the-danish-maritime-industry/>

Lessons Learned

Some of the key lessons learned¹⁶⁸ whilst developing the Danish maritime cluster, include:

- Positive framework conditions are important to enable industry to grow and compete. These include favourable tonnage taxation, neutral tax for Danish seafarers, and a supportive regulatory approach (by the Danish Government).
- Innovation is crucial to realise a vision of Denmark becoming a global “maritime powerhouse”, shifting the focus from knowledge sharing to more practical innovation projects.
- Collaboration between industry and research provides the foundations for innovation.
- Large maritime (shipping) companies can form the bedrock of a cluster but cannot (or should not) drive the cluster.

¹⁶⁸ Taken from discussions held with the MD of MARLOG (and previously MD of MDC)

Maritime Cluster Case Study (3) – Finland

Overview

The Finnish Maritime Cluster (FMC) project is a development project based around a collaboration network organised by the Finnish Shipowners' Association, the Finnish Marine Industries, the Finnish Port Association, and the Finnish Port Operators Association in cooperation with the Centrum Balticum. The cluster's primary channel of communication is through the Finnish Maritime Association whose purpose is to work for the benefit of the FMC, maritime culture and to promote activities related to the sea.

The Finnish Maritime Association, headquartered in Helsinki, covers the entire nation and has a strong presence outside the EU because of its *Maritime and Offshore from Finland programme*. The programme was designed for and delivered to Finnish companies engaged in shipbuilding, offshore and marine technologies and construction. It was supported by the Ministry of Employment and the Economy¹⁶⁹.

Finland also develops national strategies for its ocean sectors. The *Maritime Transport Strategy for Finland 2014 – 2022* was published by the Ministry of Transport and Communications. It analyses the changes that have taken place in the past years and future challenges, highlighting topics including the development of efficient transport chains that support competitiveness, the international activities of the sector, and green growth. The strategy also sets out a vision for maritime transport in 2030, which was determined in collaboration with the maritime sector¹⁷⁰.

Aims & Objectives

The FMC aims to create innovation through collaboration and seeks to support organisations and industry stakeholder in accessing EU funding for the development of sustainable solutions. A key objective of the cluster is to be a global forerunner in sustainability and digitization; another is to increase blue growth, Baltic Sea protection and the competitiveness of the cluster.

A Strategic Research Agenda¹⁷¹ (SRA) has been developed for the cluster for the period 2017-2025. Compilation and implementation of this is coordinated by the cluster's research committee. The SRA indicates that 'competitiveness will be based on developing high level competence in the integration of the latest technologies to specialised marine technology solutions and offshore applications such as energy, environmental and sustainable technologies as well as smart ships and systems.' It believes that collaboration will be key to achieving this and the other aims and objectives of the cluster.

Membership

The FMC encompasses approximately 3,000 companies from various industry sectors, all of which are connected by their maritime expertise. According to FMC leaders, it is the cluster's 'diversity that differentiates us from many other countries.'¹⁷²

Among the members are cargo ship owners, specialist ship owners, marine industries ranging from leading marine equipment manufacturers, turn-key suppliers, designers, software and system providers,

¹⁶⁹ The aim of the programme was to increase international business by at least EUR 500 million in the period 2015 to 2017, as well as a 10% increase in the turnover of Finland's maritime cluster, a 10% increase in its exports, and so on. http://tem.fi/en/article/-/asset_publisher/meriteollisuuden-kasvuohjelmalle-jatkoraioitusta-vuodelle-2016

¹⁷⁰ OECD (2018), *Peer Review of the Finnish Shipbuilding Industry*

¹⁷¹ <https://www.finnishmaritimecluster.fi/research/>

¹⁷² <https://fmc-yearbook.com/column/the-finnish-maritime-cluster-knows-collaboration/>

shipyards, the ports who handle almost 90% of Finland’s foreign trade, and passenger traffic – the Port of Helsinki is the busiest passenger port in Europe¹⁷³.

A breakdown of the FMC membership is illustrated in the figure below.

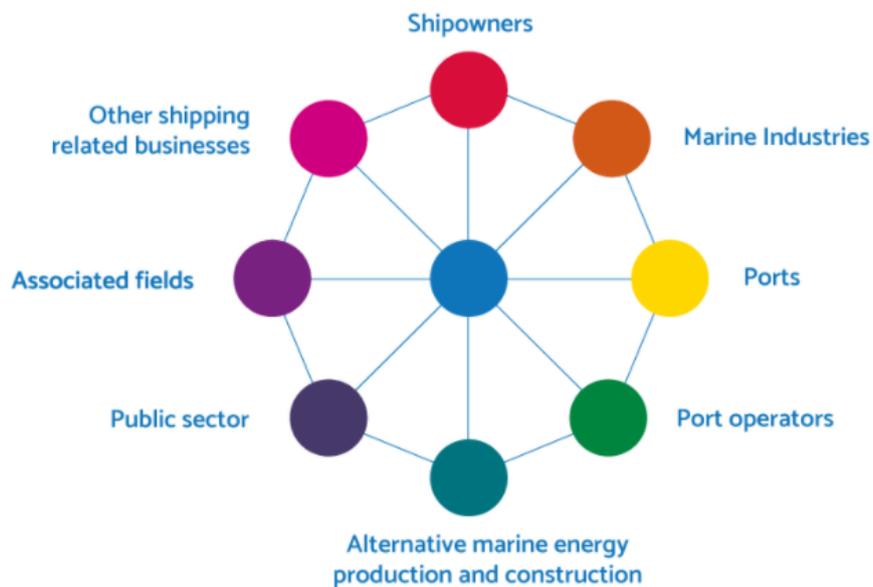


Figure 33: Finnish Maritime Cluster Membership Categories

Services

The FMC aims to develop and increase information exchange between all kinds of organisations in the maritime sector – this is achieved through the delivery of the SRA described earlier.

Key themes¹⁷⁴ explored within the scope of the SRA are as follows:

- Competitiveness and competence development
- Cross-cutting technological segments
 - Energy, Environment and Sustainability
 - Intelligent Ship, Systems and Solutions
- Specific product areas
 - Cruise and Ferry
 - Arctic Technology
 - Offshore

¹⁷³ <https://fmc-yearbook.com/column/the-finnish-maritime-cluster-knows-collaboration/>

¹⁷⁴ https://www.finnishmaritimecluster.fi/wp-content/uploads/2018/05/SRA2016_raportti_final_pages_0.pdf

The objectives of the themes include development of new product or concept (0.5-2 years), integration of innovation (1-3 years), application of innovation (3-5 years) and basic research (4-10 years).

The research committee, which consists of companies and stakeholders, coordinates the research activities of the marine industries. The committee conducts extensive background work before forming development guidelines. In addition, the committee monitors changes in regulations, environmental matters and new technologies. This provides a basis for future research needs in order to develop technologies, business models, environmentally friendly products and productivity. The committee is active also in initiating new projects and therefore many marine industry projects originate from the members of the committee.

Structure & Operations

The FMC is a collaborative project organised by four key partners:

- Finnish Shipowners Association
- Finnish Marine Industries
- Finnish Port Association
- Finnish Port Operators Association

These partners represent their member companies, and therefore the members of the cluster.

A steering group, consisting of the managing directors from each association mentioned above, work together to lead and hold the FMC (and each other) to account. The FMC also collaborates with administration and other sector representatives.

The FMC project was funded by the European Maritime and Fisheries Fund and Centre of Economic Development, Transport and the Environment as part of the Operational Program of Finland, European Maritime and Fisheries Fund in 2019. This funding ceased after 2020.

Assets & Infrastructure

The four partner associations 'represent shipowners, ports and harbours, as well as many different types of maritime companies'¹⁷⁵. It is, therefore, assumed that the member companies have access to their respective associations' assets and infrastructure, but it is not clear how easily they can access other associations assets and infrastructure resources if they are not a member of that given association.

Achievements & Impacts

The project sets out objectives and each year the management team report and analyse on progress.

According to one of the management team at FMC¹⁷⁶, one of the most significant achievements is furthering collaboration between the companies represented. Other achievements include the creation of a reporting mechanism between companies and authorities, the undertaking of studies, hosting numerous events, forging business connections, lobbying efforts, and so on.

Finland's maritime cluster is one of the country's most significant business sectors with annual revenues of EUR 14 billion and 50,000 employees across the country¹⁷⁷. The cluster has experienced steady growth from 2009-2019, increasing cumulative turnover by 33%¹⁷⁸.

¹⁷⁵ Taken from discussions held with a representative of FMC

¹⁷⁶ Project Manager at Finnish Shipowners Association

¹⁷⁷ <https://fmc-yearbook.com/column/the-finnish-maritime-cluster-knows-collaboration/>

¹⁷⁸ Brahea Center, University of Turku

Issues / Challenges

One challenge experienced during the development of FMC has been to engage people from member companies in different projects, as they are not involved in the FMC on a regular basis.

However, according to a representative of the management team at FMC, there have been no major issues or challenges during the development of FMC. Inclusivity and diversification of the cluster have not presented any issues, and as nurturing collaboration between sectors has been the FMC's aim, there have been no issues integrating the various different stakeholder groups – 'government authorities and companies have a very open dialogue and good collaboration in the field'.

Another challenge that may be posed that could have material impact for the future is the ending of the funding provided by the 'government's programme for maritime politics and EU's European Maritime Fisheries Fund'. According to the same representative of the FMC, without this funding the project would not have been possible in the same scope. This funding ended after 2020.

Emerging Opportunities

Finland is a forerunner in the field of green shipping and in digitalisation and new technologies. In the coming years, the cluster sees huge opportunities to exploit the growing market for technological solutions that reduce carbon emissions.

R&D collaboration between companies, research organisations and public sector service providers is also expected to continue under the guidance of Team Finland, a group of institutions promoting growth and exports of Finnish companies including those of its maritime cluster. Projects aim to reduce emissions in the maritime transport sector and technology development in big data, industrial Internet, artificial intelligence and robotisation for operational efficiency gains¹⁷⁹.

Lessons Learned

The main lesson learned¹⁸⁰ in the development and operation of FMC is that 'tightknit collaboration and work for "the common good of the field" is possible when organisations are committed to put in the time and effort'.

¹⁷⁹ OECD (2018), *Peer Review of the Finnish Shipbuilding Industry*

¹⁸⁰ Taken from discussions held with a representative of FMC

Maritime Cluster Case Study (4) - Merseyside

Overview

Mersey Maritime is the regional cluster organisation for the £4 billion maritime sector and wider supply chain in the Liverpool City Region and the greater North West. It represents the Ports and maritime sector, helping create the right conditions for business growth. Set up in 2003, it aimed to create an environment where ‘joined up thinking could occur’, linking the various maritime stakeholders who, prior to Mersey Maritime, operated independent of one another in a ‘fractured’¹⁸¹ sector.

Strategic investments in the region have also made for an attractive inward investment for companies from varying sectors and locations: £3 billion of construction and infrastructure projects; an £800 million Grosvenor retail redevelopment; over £60 million invested at the Port of Liverpool. A national *Maritime 2050: navigating the future* strategy sets out the UK Government’s vision and ambitions for the future of the British maritime sector; Mersey Maritime helped inform the strategy and was included as a case study example of exemplar cluster development.

More importantly, the re-introduction of ‘freeports’¹⁸² to Liverpool City Region strengthens the conditions for maritime to thrive due to favourable tax treatment on goods that arrive from abroad. Freeports are considered to be a major instrument in regenerating deprived areas.

Aims & Objectives

Mersey Maritime’s mission is to continue to be a catalyst for growth, influencing policy and driving change for the good of the sector.

Membership

Mersey Maritime represents the interests of over 1700 maritime, logistics and energy businesses, spanning the 33 sub-sectors¹⁸³ that make up the sector in the Liverpool City Region and beyond.

It is open to all maritime sector businesses, associated public sector partners, trade associations and charitable organisations. Members can be based anywhere in the UK or overseas provided they have interests in Merseyside’s Maritime sector. Non-maritime and non-maritime specific business may apply to be members on individual merit.

Mersey Maritime adopts a sponsorship model with a range of packages¹⁸⁴ available, providing business with a range of benefits including networking, business support, lobbying support and training and education. Available sponsorship packages are as follows:

Standard:	£300-£600 per year (includes breakfast events and other limited opportunities)
Executive:	£1,250 per year (includes breakfast events, workshops, limited communication/PR, digital and business services)
Sponsor:	£3,000+ per year (includes range of networking events, communication/PR, digital, relationship management, and other business services)
Partner:	Bespoke proposal including tailored/full suite of opportunities

¹⁸¹ Quote from CEO of Mersey Maritime

¹⁸² <https://www.bbc.co.uk/news/uk-politics-55819489>

¹⁸³ <https://merseymaritime.co.uk/our-members/>

¹⁸⁴ <https://merseymaritime.co.uk/memberships/>

The cluster boasts such members as Atlantic Container Line, Maersk, CMA CGM, Hapag Lloyd, Associated British Ports, Peel Ports, Cammell Laird and a growing range of other companies such as Coutts, Unilever, Alliance & Leicester, US Airways, Bosch, IBM, Bank of Scotland, and more.

Services

Mersey Maritime works across four main areas of activity:

Business Support

Helping business improve performance and create new jobs by offering a range of support services, such as:

- Business development
- Marketing support
- Access to funding

Communications

Mersey Maritime's role is to promote the sector far and wide, to local, national and international audiences.

Knowledge and Skills

Cluster members are given access to accredited partners who provide the education, skills and training programmes required to meet business needs.

Supply Chains

Mersey Maritime harnesses the expertise in the local and surrounding areas to help businesses build local supply chains, adding wealth and jobs to the local economy and facilitating industry growth.

Mersey Maritime also lobbies government on policy issues.

Structure & Operations

Mersey Maritime is a company limited by guarantee and not-for-profit organisation at the public-private sector interface. It engages with a range of key stakeholders and strategic partners across a range of business interests within the maritime industry, specifically across the following:

- Shipping
- Ports
- Maritime professional services
- Engineering
- Leisure marine

There are eight Key Partner¹⁸⁵ organisations, as follows:

- Kays Medical
- Manufacturing Technology Centre
- Maritime UK

¹⁸⁵ <https://merseymaritime.co.uk/key-partners/>

- Royal Haskoning DHV
- Royal Navy
- Peel Land & Property
- Peel Ports
- Western Union Business Solutions

The Mersey Maritime is resourced with 10 staff, including a leadership team consisting of the following:

- Chief Executive Officer
- Head of Commercial
- Partnerships and Policy Co-ordinator
- Business Development Executive
- Office Manager

A Board of industry leaders lends credibility and helps steer the cluster.

Mersey Maritime generates income from member fees but also receives grant funding, for example, via the European Regional Development Fund (ERDF) to deliver business support to SMEs as part of the New Markets 2 programme which ran until 2018.

Assets & Infrastructure

The assets and infrastructure included in the cluster, and leveraged by its members include, for example:

- 5 universities
- Ports
- Ship canals
- Offshore facilities
- Data centres

In terms of regenerating / redeveloping derelict sites and transforming them into valued assets, Mersey Maritime was instrumental in the regeneration of a Wirral Waters 750 acres brownfield site and is also spearheading support for the restoration of a Wirral landmark, the Grade 2 listed Hydraulic tower building¹⁸⁶. The local council is investing in its redevelopment to help maintain the momentum of regeneration in the area, including creating hundreds of jobs, whilst working closely with the Wirral Waters developer, Peel Land & Property (one of Mersey Maritime's eight key strategic partners).

It is understood that Mersey Maritime would not lead projects like those mentioned but would deliver them in partnership. The cluster works together, advocating and supporting regeneration projects, appealing to the government for funding, and then delivering the projects themselves.

Achievements & Impacts

Mersey Maritime's impact is measured mainly on jobs and growth. To enable it to appeal to the government for funding, it is also measured on its ability to self-sustain and self-fund; operational sustainability is therefore another important measurement metric. Its core strength lies in having a

¹⁸⁶ <https://merseymaritime.co.uk/author/maritime/>

broad and independent overview of the sector in the region; what is happening, who the key players are, what the common issues might be, what the trends are and how these various strands fit together. In order to deliver real value to local businesses Mersey Maritime builds strong relationships with a wide range of policy makers, MPs, local authorities and other strategic partners, allowing it to act as an effective interface between the two.

One of its greatest recent achievements is the successful application for 'Freeport' status. Mersey Maritime, alongside the Liverpool City Region LEP and other business leaders, came together to submit a comprehensive bid for the Freeport Zone to the government. An estimated GVA boost of £850 million and 14,000 jobs are expected as a result of the Freeport status, as well as incentives to hit net zero carbon targets. Other opportunities arising from a Freeport Zone include, attracting inward investment, regenerating areas of deprivation and sustainable job creation.

In recognition of its achievements and impacts on the maritime sector, Mersey Maritime was awarded the Coastal Powerhouse Award at the inaugural Maritime UK Awards in 2019. The award recognised Mersey Maritime's role as the leading regional cluster organisation in the UK.

Issues / Challenges

One of the main challenges developing the cluster was integrating different groups who, oftentimes, would have different motivations, requirements, and so on. Mersey Maritime would overcome this by being clear on the vision and direction of the cluster and being ruthless about who could become members. On occasion membership has been cancelled.

Emerging Opportunities

The major emerging opportunities are around digitalisation and decarbonisation. In particular, hydrogen, offshore wind, tidal power and other renewable technologies. The multi-gateway, multi-modal Freeport will enable key sites across the Liverpool City Region to attract new investment, create jobs, support the wider economy and increase levels of innovation.

Lessons Learned

Some of the key lessons learned¹⁸⁷ whilst developing Mersey Maritime include:

- The main lesson learned is that 'industry-led is the only way the cluster can work'.
- Having the right people in place is crucial.
- Building a strong board of industry leaders is important as it lends credibility and weight to the cluster's voice.
- Clear messaging is key to ensure the vision and direction of the cluster is adopted by all members. Being ruthless with those who do not adopt the cluster vision is also key.
- Transparency and independence are vital to instil trust and allow members to share industry knowledge and insights in a "safe space".
- Collaborating and openly engaging and sharing with other clusters supports national industry growth and strengthens the UK's competitiveness in foreign markets.

¹⁸⁷ Taken from discussions held with the CEO of Mersey Maritime

Maritime Cluster Case Study (5) - Norway

Overview

Maritimt Forum¹⁸⁸ ('Maritime Forum') is an interest organisation that brings together the entire Norwegian maritime industry. Over time, the members have contributed to the development of a world-leading and comprehensive maritime cluster. Maritime Forum brings together both the employee and employer side of the industry and represents the common interests of the cluster. Since 1990, it has spearheaded the promotion of knowledge about the country's most knowledge-intensive and innovative industry, also serving as a meeting place for industry, the authorities and education and research communities.

Norway's position as a leading ocean economy is to a large extent due to its well-developed business clusters¹⁸⁹ and local communities along the coastline, with skilled employees and thriving businesses. Their expertise and the business clusters give Norway an important competitive edge globally. The nation's Blue Opportunities¹⁹⁰ strategy emphasises the importance of knowledge and research clusters alongside future-oriented ocean industry policy, underpinned by research, technology and innovation, education, skills and the labour market, sound management and a predictable framework, and international cooperation and diplomacy.

Aims & Objectives

The Maritimt Forum's overarching ambition is to gain support for an active maritime policy.

The Forum has the following objectives:

- Contribute to increased cooperation between organisations and companies within Norwegian export-oriented maritime business.
- Create an increased understanding of, and awareness of, the maritime industry's significance for the Norwegian economy and society.
- Contribute to further developing Norwegian maritime competence and quality with a view to increased deliveries and more exports of maritime goods and services.
- Promote the common interests of the maritime industries before the Norwegian and foreign authorities.

Membership

The Norwegian maritime cluster consists of nearly 700 members, including world-leading companies across shipping, shipyards, equipment and services and Norwegian seafarers. The maritime cluster works for almost 90,000 women and men, creating value of almost NOK 150 billion¹⁹¹ every year. The maritime industry is also Norway's second largest export industry after petroleum.

The cluster consists of the following membership categories:

- Companies
- Shipyards
- Service providers

¹⁸⁸ <https://www.maritimt-forum.no/>

¹⁸⁹ There is a strong industrial cluster around the METCEN-TRE, and the Norwegian Offshore Wind Cluster

¹⁹⁰ Norwegian Ministries (2019), Blue Opportunities: The Norwegian Government's updated ocean strategy

¹⁹¹ £12.7 billion

- Suppliers
- Municipalities and public institutions
- Education
- Confederation

Members pay a fee to cover operational costs of Maritime Forum and also contribute funds where required for other activities, initiatives, programmes, etc.

Services

Each region represented has core areas to focus on in relation to the services and activities they offer their members.

Generally speaking, core areas that are common across the cluster regions are as follows:

Networking

The Maritim Forum will serve as a relevant meeting place for members. This is done by:

- Arranging meetings and networking events for members
- Being in close dialogue with member companies to gain insight into what issues they are interested in
- Being a mouthpiece for members
- Collaborating with regional and national partners

Political influence

The Forum will influence political framework conditions and work for issues that are important to members. Key political issues to be addressed include:

- Framework conditions in line with competitor countries
- More goods from road to sea
- Oil and energy
- Climate and environment
- Competence, research and innovation

Recruitment and reputation

Each region aims to increase recruitment to the industries it represents, as well as increasing knowledge of, and knowledge about, the industry in general. The Forum will contribute to raising the industry's reputation to ensure good framework conditions are maintained, political issues are given due attention, and recruitment into the maritime industry increases.

To achieve this, the Forum must:

- Show the opportunities that exist by choosing a maritime education
- Communicate actively with schools by arranging trade fairs
- Spread good stories and results to as many relevant and interested target groups as possible
- Create an understanding of the industry's societal benefits

Structure & Operations

The Forum is headquartered in Oslo and has offices in major maritime regions throughout the country, namely, Northern Norway, Central Norway, the Bergen area, Haugalandet and Sunnhordland, the Stavanger region, Sorlandet and the Oslofjord region. Each regional office is staffed accordingly. For example, Maritimt Forum Central (Oslo HQ) consists of CEO, Secretary, and Cadet Coordinator / Advisor. Conversely, four regions have only a single CEO in station.

The Forum is governed by a Board¹⁹², consisting of 14 organisations representing the maritime industry (including associations), for example:

- Norwegian Maritime Exporters
- The Norwegian Engineers' Association
- Norwegian Industry
- Norwegian Shipowners' Association
- Norwegian Shipbrokers' Association

The Board is critical as it lends credibility to Maritimt Forum and ensures its voice is heard and respected by politicians.

Income is derived from membership fees and funds made available by the Norwegian Government.

Assets & Infrastructure

The maritime cluster's access to physical infrastructure for development and innovation is crucial for competitiveness and future value creation in Norway. Norwegian authorities are contributing to the opening of test areas for autonomous ships, strengthening Norwegian competency development. The establishment of Ocean Space Laboratories in 2025¹⁹³ further demonstrates the strength of authorities, research institutions and businesses working together to foster suitable infrastructure for the maritime industry to develop. Norway's coastline has been described as "a laboratory for new technologies"¹⁹⁴.

Moreover, the Forum can access and leverage various resources and assets, made available through the organisations who sit on the Board.

The Maritimt Forum has three portals that can be accessed via its main website. These are:

Cadet Database¹⁹⁵

Maritimt Form administers the national cadet scheme. Through the scheme and the Cadet Database, the Forum will assist both students who want a cadet place and shipping companies that need qualified personnel.

Maritime Career¹⁹⁶

This portal displays the educations and professions in the maritime industry, demonstrating the attractiveness and future-oriented nature of the Norwegian maritime industry. It is a campaign run by

¹⁹² <https://www.maritimt-forum.no/om-maritimt-forum/styret>

¹⁹³ <https://www.maritimt-forum.no/naeringspolitikk/kompetanse>

¹⁹⁴ Quote from Managing Director of the Maritimt Forum

¹⁹⁵ <https://www.kadettdatabasen.no/>

¹⁹⁶ <https://maritimkarriere.no/>

the Forum and Norwegian Shipowners' Association, with funding support from the Norwegian Maritime Competence Foundation.

Shortsea Promotion Centre¹⁹⁷

This is a centre for competence in short sea shipping. It contributes to obtaining and disseminating knowledge that is useful to actors and authorities in the work and objective of transferring more goods from road to sea.

Achievements & Impacts

Maritimt Forum's greatest potential impact comes from its influence on decision-makers, lobbying politicians for the best possible framework conditions for its maritime industries – this means better opportunities, more jobs, greater wealth creation.

Currently, the cluster is advocating government policies to support the cluster's recovery from COVID-19, but also more shipbuilding, better conditions for yard workers and seafarers.

There are also a range of technology testbeds being setup along the coastline to test new technologies, including the development of:

- Two hydrogen ferries
- 70 battery-powered ferries
- Autonomous shipping test facility

Issues / Challenges

Specific challenges the Forum itself has faced include “drawing a hard line” on which industries / organisations can become cluster members. For example, certain fishing vessels are not represented in the cluster.

Other broader industry challenges include the requirement to strengthen the financing of technological and maritime subjects to ensure Norway keeps up with the increasing global competition. There is also a need for a national strategy for maritime education that addresses the importance of increasing digitalisation. This should be seen in connection with a continuation of MARKOM 2020, which is a collaborative project within higher, maritime professional education¹⁹⁸.

Emerging Opportunities

Digitalisation and decarbonisation are the main focus areas being pursued by the cluster. As mentioned above, certain technologies are being developed in line with these priority areas. Implementing educational programmes and initiatives that get children engaged with maritime and the career opportunities the maritime sector presents is also a priority for the Forum.

Lessons Learned

Some of the key lessons learned¹⁹⁹ whilst developing Maritimt Forum, include:

- One of the Forum's major strengths is the fact it brings together both the employee and employer side; a collaboration based on common interests.

¹⁹⁷ <https://www.shortseashipping.no/>

¹⁹⁸ <https://www.maritimt-forum.no/naeringspolitikk/utdanning>

¹⁹⁹ Taken from discussions held with the Managing Director of Maritimt Forum

- A structure with regional clusters, organised and managed by their own individual teams, allows interaction with companies to be managed by those teams, alleviating any capacity constraints if it were one central hub only.
- Regional clusters also allow coastal locations to play to their strengths, developing technologies and undertaking projects relevant to them before scaling to other markets.
- Having a strong relationship with government is key to achieving the objectives and outcomes of the cluster – this is done through regular meetings with “parliamentarians” and inviting them to Board meetings. This makes lobbying government much more effective and efficient and means the Forum’s voice carries weight on issues experienced by cluster members.
- The Board must consist of leading members of the industry, to lend credibility to the Forum but also to obtain access to resources and assets from an operational perspective.



Business
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