

## Marine Sector Plan

### Introduction

The HERDA-SW Marine Sector Plan has been prepared as part of the SWRDA funded [Knowledge Exploitation South West 2 \(KESW2\)](#) project which helps to support and encourage greater HE interaction with business in the region. KESW2 will see the development of HE sector plans for many of the priority and emerging sectors in the South West, with Marine recognised as a key growth sector for the region.

While this plan sets out the strengths and priorities of HE for engaging effectively with the sector, it is important to note that HE is in itself a significant player within Marine Science, Business & Technologies, not only as a provider of higher level skills and training, but also in terms of research, innovation and enterprise, and as a major employer of technologists, engineers, policy and regulation experts. Significant capability exists particularly within Plymouth where the Plymouth Marine Science Partnership (see <http://web.pml.ac.uk/pmsp/>) represents a body of seven of the region's major research institutes:

- (i) Plymouth Marine Laboratory
- (ii) University of Plymouth Marine Institute
- (iii) National Marine Aquarium
- (iv) Marine Biological Association of the UK
- (v) Sir Alister Hardy Foundation for Ocean Science
- (vi) Diving Diseases research Centre
- (vii) Hydrographic, Meteorological & Oceanographic Training Group

Important new collaborative partnership initiatives have started up recently which have a significant bearing on the South west marine sector:

- The Wave Hub project, to construct a sub-sea capability for Wave Energy Conversion device developers to trial their technology at sea while supplying energy to the Grid. This sits alongside a major research capacity, the Peninsula Research Institute in Marine Renewable Energy ( PRIMaRE) supported by the RDA led by the Universities of Exeter and Plymouth. <http://www.wavehub.co.uk/> and <http://www.primare.org>
- [\*The Higher Level Skills Pathfinder Project \(Higher Skills\)\*](#) is a regional initiative aiming to engage employers in the development of CPD courses and includes an engineering strand. The University of Plymouth has for example recently started a HLSP project to develop high level courses in Marine Spatial Planning.

- The Plymouth Marine Sciences Partnership as noted above is currently exploring mechanisms for enhanced collaboration between its 7 partners in the fields of research, education and training, knowledge transfer and innovation.

As a peninsula, the South West has an intimate connection to the sea. This combined with a temperate climate and relatively unspoilt countryside and coastline, with good natural harbours has not only fostered a varied marine sector in terms of the nature and range of businesses but also made the South West an important tourist destination. It is the intimate relationship between maritime activities and tourism that gives the South West marine sector its distinctive flavour, thereby helping to distinguish it from marine sectors in other regions.

Marine businesses in the South West employ 31,580 people in 2,685 companies, generating a turnover of over £1.3 billion per year. The main business activities of the South West are the building and repair of ships which account for 18% of the UK industry turnover. The building and repair of pleasure and sporting boats makes a smaller contribution to turnover but accounts for 25% of UK's employment in this area.<sup>1</sup> On the commercial side, the region has a number of shipyards specialising in repairs and refitting of small to medium sized ships. The region is the major UK centre for production of all types of leisure craft and equipment and is home to at least three prestige builders of luxury yachts and high performance power craft. It also features a number of world class marinas at major centres around the region.

The South West is considered an ideal location for a variety of marine businesses with its strong tradition of maritime activities and a well established core of healthy and diverse companies across all the major sectors from commercial and leisure to defence and marine science.

Marine science is an important marine sub sector within the region; seven leading marine science and technology organisations work closely together to optimise their knowledge and strengths for the benefit of the region, the UK and international communities through the Plymouth Marine Sciences Partnership. In total over 500 scientists work within the partnership. The region's strengths in marine science are also enhanced through the presence of major scientific Governmental and non-Governmental organisations such as the UK Hydrographic Office and the Met Office.

### **The Marine Sector business matrix**

The marine sector includes fisheries and aquaculture, ship design, construction and repair, offshore and coastal engineering, transportation systems, diving operations, dredging, pollution control, waste treatment, renewable energy, coastal

---

<sup>1</sup> Department for Business Enterprise & Regulatory Reform, available at: <http://www.berr.gov.uk/regional/clusters/clusters-assessment/page17380.html> last visited date: 03/07/2008.

development, marine technologies, research, marine tourism and leisure-related service providers and industries. It is also important to note that aspects of other sectors' activities support the marine sector, for example, advanced engineering, tourism and leisure, construction and defence industries, research and development and new technologies.

The marine sector is therefore diverse and the businesses within it geographically widespread. A framework which categorises the marine sector into different sub-sectors has been adopted for the purposes of this study. In this respect, the marine sector can be categorised into a four-fold operational framework that encompasses the main sub-sectors as follows:

1. *Marine resource-based industries: those industries directly involved in recovery of non-renewable resources such as offshore oil and gas, fisheries, marine-based pharmaceuticals, aquaculture and seabed mining, as well as those increasingly involved in marine renewable energy technologies including wave, offshore wind and tidal stream.*
2. *Marine system design and construction: ship design, construction and repair, offshore engineering and coastal engineering.*
3. *Marine operations and shipping: marine transportation systems, diving operations, dredging and waste disposal.*
4. *Marine-related equipment and service providers: manufacturers, engineering consultant firms in marine electronics and instrumentation, machinery, telecommunications, navigation systems, special-purpose software and decision support tools, ocean research and exploration, and environmental monitoring, training and education. This category also includes tourism and leisure related service providers and industries.*

### Framework of Categories for the Marine and Maritime Sector Analysis

Resource Based Industries	Design & Construction	Operations & Shipping	Equipment & Service
*Fisheries/Aquaculture *Biotechnology *Offshore Oil and gas *Renewable Energy *Minerals and Aggregates	*Coastal Zone Protection and Development  *Ship/Boat Building	*Port Operations  *Waste Disposal by Sea  *Shipping/Inter-modal Marine Transport Systems  *Navigational Dredging	*Ocean Science and Technology  *Tourism and Leisure  *Equipment and Service Providers

Businesses in the marine sector in the South West and its sub-regions have been profiled in order to place them within the framework above. This has been achieved by utilising the Equifax 'Yellow Pages' businesses classifications system which was

selected because businesses are usually classified under a self-chosen and more compartmentalised ‘Yellow Pages’ classification. In generating a sector profile for the South West and its sub-regions, 48 of the ‘Yellow Pages’ classifications were chosen for their direct relevance to the activities covered in the operational framework. Additional classifications to accommodate new and renewable energy businesses have also been included. The table below places these classifications within the framework of the four-fold operational definition which defines marine activities.

**Marine Business Classifications Grouped Under the Four-Fold Framework**

Resource Based Industries	Design & Construction	Operations & Shipping	Equipment & Service
Fish farms	Boat builders and repairs	Cross channel services	Boat delivery
Fishermen	Naval architects	Divers	Boat hire
Shellfish	Ship builders and repairs	Dredging	Boat moorings
Wave Energy technology companies	Yacht designers	Ferry services	Boats and small craft
Offshore Wind companies		Marinas	Diving equipment
Tidal Stream companies		Port, harbour and dock authorities	Fish merchants-wholesale
Marine Mammal Observation		Wharfingers	Fisheries-sport
Environmental Services			Marine consultation
			Marine electronics
			Marine engine manufacturers
			Marine engine repairs
			Marine engineers
			Marine instrumentation
			Propeller manufacturers
			Pump and pumping equipment manufacturers
			Radio navigation equipment

## KESW2 Marine HE Sector Plan

			Sail makers
			Sailing equipment
			Sailing instruction
			Ship chandlers
			Ship towing
			Shipbrokers
			Shipping and forwarding agents
			Shipping companies and agents
			Ships' fittings
			Ships' stores
			Smokeries
			Surveyors-marine
			Underwater engineers
			Water sports
			Yacht brokers
			Yacht chandlers
			Yacht charterers
			Yacht equipment

### The Scale of the Marine Sector in the South West

The table below details the number of South West businesses that are in each employment band within the framework of the operational definition.

#### South West Marine Sector Employee Numbers by Sub-sector

Employee Band	Resource based industry	Design & Construction	Operations & Shipping	Equipment & Service	Totals
Unknown	33	94	91	998	1,216
1-5	116	87	110	715	1,028
6-10	14	20	28	160	222

## KESW2 Marine HE Sector Plan

11-19	5	6	17	62	90
20-49	3	8	14	44	69
50-99	0	2	4	25	31
100-200	1	1	2	8	12
200+	0	5	2	10	17
<b>South West Total</b>	<b>172</b>	<b>223</b>	<b>268</b>	<b>2,022</b>	<b>2,685</b>

Source: Data Integration Model, University of Plymouth

The table below shows the estimated employment levels in each of the marine sub-sector and also details the sub-sector's share of employment on a percentage basis. In summary, across the South West there are 31,580 people employed in 2,685 marine related businesses.

### South West Marine Sector Employment Levels Numbers by Sub-sector

Employee Band	Resource based industry	Design & Construction	Operations & Shipping	Equipment & Service	Totals
Unknown	165	470	455	4,990	6,080
1-5	348	261	330	2,145	3,084
6-10	112	160	224	1,280	1,776
11-19	75	90	255	930	1,350
20-49	105	280	490	1,540	2,415
50-99	0	150	300	1,875	2,325
100-200	150	150	300	1,200	1,800
200+	0	3,750	1,500	7,500	12,750
<b>Totals</b>	<b>955</b>	<b>5,311</b>	<b>3,854</b>	<b>21,460</b>	<b>31,580</b>
<b>% of total</b>	<b>3.02</b>	<b>16.82</b>	<b>12.2</b>	<b>67.95</b>	<b>100</b>

Source: Data Integration Model, University of Plymouth

The table below shows all of the 2,685 marine sector businesses identified in the region placed into their respective activity related categories. It can be seen that the majority 75.31% of marine businesses in the region are in the equipment and service providers sub-sector. The operations and shipping sub-sector forms the next largest category with nearly 10% of the total number of businesses recorded, closely followed by the design and construction sub-sector with just over eight percent. The

smallest sub-sector relates to the resource based industries with 6.41% of all recorded businesses in this category.

### Marine Sub-sectors in the Region

Sub-Sector	No.	%
Resource Based Industries	172	6.41
Design & Construction	223	8.31
Operations & Shipping	268	9.98
Equipment & Service	2,022	75.31
<b>Total</b>	<b>2,685</b>	<b>100</b>

Source: Data Integration Model, University of Plymouth

Geographically breaking the information down in more detail clearly highlights that Devon is the major regional marine sector hub as it contains 33.4% of all marine businesses, followed by Cornwall, 25.55%, then the Bournemouth, Dorset and Poole sub-region, 18%. The other four sub-regions of the South West contain fewer marine sector businesses with only 22.31% of the total between them.

### Sub-regional Marine Businesses by Sub-sector

Sub-regions	Resource based industry	Design & Construction	Operations & Shipping	Equipment & Service	Totals	Percentage of total by area
West of England	7	13	46	162	228	8.49%
Bournemouth Dorset & Poole	20	13	49	401	483	17.99%
Cornwall	44	90	53	499	686	25.55%
Devon	63	89	90	655	897	33.41%
Gloucestershire	10	6	12	89	117	4.36%
Somerset	13	7	9	84	113	4.21%
Wiltshire and Swindon	15	5	9	112	141	5.25%
Unknown	0	0	0	20	20	0.74%

## KESW2 Marine HE Sector Plan

<b>South West</b>	<b>172</b>	<b>223</b>	<b>268</b>	<b>2,022</b>	<b>2,685</b>	<b>100.00%</b>
-------------------	------------	------------	------------	--------------	--------------	----------------

Source: Data Integration Model, University of Plymouth

The table below details the results of the business count for these seven clusters broken down into the eight employment bands.

### South West Marine Businesses—Distribution by Employment Bands

	unclassified	1 to 5	6 to 10	11 to 19	20 to 49	50 to 99	100 to 200	200+	Totals
Bristol	90	61	16	14	4	4	1	1	191
Falmouth/Penryn	90	62	11	6	7	1	2	2	181
Penzance/Newlyn	29	27	9	3	2	1	0	0	71
Plymouth	142	74	18	9	13	6	1	7	270
Poole	96	77	21	4	4	2	2	2	208
South Hams	69	63	19	4	2	2	0	0	159
Torbay	38	62	18	5	2	0	0	0	125
<b>Totals</b>	<b>554</b>	<b>426</b>	<b>112</b>	<b>45</b>	<b>34</b>	<b>16</b>	<b>6</b>	<b>12</b>	<b>1205</b>
<b>% of total</b>	<b>45.98</b>	<b>35.35</b>	<b>9.29</b>	<b>3.73</b>	<b>2.82</b>	<b>1.33</b>	<b>0.50</b>	<b>0.99</b>	<b>100</b>

Source: Data Integration Model, University of Plymouth

### South West Marine Business—Distribution by Estimated Employment Levels

Multiplier	5	3	8	15	35	75	150	750	Totals
Bristol	450	183	128	210	140	300	150	750	2,311
Falmouth/Penryn	450	186	88	90	245	75	300	1,500	2,934
Penzance/Newlyn	145	81	72	45	70	75	0	0	488
Plymouth	710	222	144	135	455	450	150	5,250	7,516
Poole	480	231	168	60	140	150	300	1,500	3,029
South Hams	345	189	152	60	70	150	0	0	966
Torbay	190	186	144	75	70	0	0	0	665

## KESW2 Marine HE Sector Plan

<b>Totals</b>	<b>2,770</b>	<b>1,278</b>	<b>896</b>	<b>675</b>	<b>1,190</b>	<b>1,200</b>	<b>900</b>	<b>9,000</b>	<b>17,909</b>
<b>% of total</b>	<b>15.46</b>	<b>7.14</b>	<b>5.00</b>	<b>3.77</b>	<b>6.64</b>	<b>6.70</b>	<b>5.03</b>	<b>50.25</b>	<b>100</b>

Source: Data Integration Model, University of Plymouth

In summary, these 1,205 businesses make up 45% of the regional total of 2,685 businesses. The 17,909 estimated workforce makes up 56.7% of the overall estimate of 31,580 employees.

### Key Industry Players

<b>Company</b>	<b>Main Service</b>	<b>Website</b>
ABB Offshore Systems	Subsea control systems manufacturers	<a href="http://www.abb.com">www.abb.com</a>
A & P Falmouth	Refitters of commercial vessels	<a href="http://www.ap-group.co.uk">www.ap-group.co.uk</a>
Babcock Marine	Builders of Tamar-class lifeboats and responsible for the fitting and maintenance of the Royal Navy submarine fleet	<a href="http://www.devonport.co.uk">www.devonport.co.uk</a>
BMT Defence Services	Ship designers and engineering consultancy	<a href="http://www.bmtdsl.co.uk">www.bmtdsl.co.uk</a>
The Select Group	Builders of classic sailing boats, including the Cornish Crabber Range and British Hunter	<a href="http://www.selectyachts.co.uk">www.selectyachts.co.uk</a>
Hamworthy KSE	Designers and manufacturers of rudders, compressors, pumping and waste treatment equipment for use on vessels and offshore applications	<a href="http://www.hamworthy.com">www.hamworthy.com</a>
J & S Marine	Underwater acoustic sensors, electro-mechanical based technology	<a href="http://www.jsmarine.co.uk">www.jsmarine.co.uk</a>
Ocean Yacht Systems	Manufacturers of rigging and hydraulic sailing systems	<a href="http://www.oceanyachtsystems.co.uk">www.oceanyachtsystems.co.uk</a>
Pendennis Shipyard	Builders of one-off custom designed superyachts	<a href="http://www.pendennis.com">www.pendennis.com</a>
Princess Yachts International	Builders of high performance power boats and luxury motor yachts	<a href="http://www.princess-yachts.com">www.princess-yachts.com</a>
Rolls Royce	Suppliers of engines and propulsion systems to the Royal Navy	<a href="http://www.rolls-royce.com/marine">www.rolls-royce.com/marine</a>
Sabre Engines	Producers of a range of diesel propulsion and auxiliary engines for leisure and commercial applications	<a href="http://www.perkins-sabre.com">www.perkins-sabre.com</a>
Seacore	A specialist marine drilling contractor	<a href="http://www.seacore.com">www.seacore.com</a>
Sunseeker International	Builders of high performance power boats and luxury motor yachts	<a href="http://www.sunseeker.com">www.sunseeker.com</a>
Teignbridge Propellers	Designers and manufacturers of propellers	<a href="http://www.teignbridge.co.uk">www.teignbridge.co.uk</a>
Thales Underwater Systems	One of the world's major players in the naval industry, with activities in ten countries, it provides advanced systems meeting strategic and operational requirements and covering every aspect of naval warfare	<a href="http://www.thales-underwater.com">www.thales-underwater.com</a>
Wynn Marine	Manufacturers of windscreen wiping systems for ships	<a href="http://www.wynn.co.uk">www.wynn.co.uk</a>

Source: South West of England Regional Development Agency, 2008

### Regional Sector Organisations

## KESW2 Marine HE Sector Plan

Organisation	Brief Profile	Website
Marine South West	Marine South West is a company formed in order to increase the business competitiveness of marine sector companies in the South West region. It is supported by a group of public sector bodies which includes South West RDA, Government Office SW, SW Tourism, SEMTA and trade associations such as British Marine Federation and Engineering Employer's Federation.	<a href="http://www.marine-south-west.org.uk/">www.marine-south-west.org.uk/</a>
South West Regional Development Agency	The South West RDA leads the development of a sustainable economy in South West England, investing to unlock the region's business potential.	<a href="http://www.southwestrda.org.uk/index.asp">http://www.southwestrda.org.uk/index.asp</a>
Government Office South West	Government Office for the South West works with regional partners and local people to help deliver the Government's central aims in the region, to achieve high and stable levels of growth and employment and build an inclusive and prosperous society that can develop in a sustainable way.	<a href="http://www.gosw.gov.uk/">http://www.gosw.gov.uk/</a>
South West Tourism	South West Tourism is the Regional Tourist Board for the South West of England, a partnership of both private enterprise and the public sector. It works to encourage the promotion and development of tourism across the South West (Bath, Bristol, Cornwall and the Isles of Scilly, Devon, Dorset, Somerset, Gloucestershire and Wiltshire).	<a href="http://www.swtourism.co.uk/">http://www.swtourism.co.uk/</a>
Sector Skills Council for Science, Engineering and Manufacturing Technologies	Industry owned and led, Sector Skills Council for Science, Engineering and Manufacturing Technologies aims to increase the impact of skilled people throughout the science, engineering and manufacturing technologies sectors.	<a href="http://www.semta.org.uk/">http://www.semta.org.uk/</a>
British Marine Federation	The British Marine Federation is the trade association for the leisure and small commercial marine industry.	<a href="http://www.britishmarine.co.uk/">http://www.britishmarine.co.uk/</a>
Engineering Employer's Federation	As a trusted partner to businesses across Britain, Engineering Employer's Federation provides manufacturing and engineering support and advice as well as general business support to over 6000 manufacturing, engineering and technology companies. It delivers services at a local level, working through a network of sites across England and Wales by providing engineering and manufacturing support on each of these levels.	<a href="http://www.eef.org.uk/UK/default.htm">http://www.eef.org.uk/UK/default.htm</a>
South West Fish Producers Organisation	Supports the South West Fishing Industry	<a href="http://www.swfpo.com">www.swfpo.com</a>

### Key Research Centres

Research Centre	Research Area	Website
UK Hydrographic Office	Provision of navigational products in the Royal Navy and merchant marine	<a href="http://www.ukho.gov.uk/">http://www.ukho.gov.uk/</a>
Marine Biological Association of the UK	Promotes scientific research into all aspects of life in the sea, including the environment on which it depends, and disseminating this knowledge to the public	<a href="http://www.mba.ac.uk/">http://www.mba.ac.uk/</a>
Met Office	Research in the field of oceanography and atmospheric science	<a href="http://www.met-office.gov.uk">www.met-office.gov.uk</a>
National Marine Aquarium	Marine biology, education	<a href="http://www.national-aquarium.co.uk">www.national-aquarium.co.uk</a>
Plymouth Marine Laboratory	Core strategic and applied research in marine science and technology	<a href="http://www.pml.ac.uk">www.pml.ac.uk</a>
Diving Diseases Research Centre	Promotes and take part in the medical treatment, training and research associated with the use of hyperbaric oxygen in the treatment of diving diseases and other medical problems.	<a href="http://www.ddrc.org">www.ddrc.org</a>
Sir Alister Hardy Foundation for Ocean Science	Operates the Continuous Plankton Recorder Survey	<a href="http://www.sahfos.org">www.sahfos.org</a>
National Lobster Hatchery	Promotes and contribute to responsible management of coastal marine resources and to act as a resource for education, conservation and research.	<a href="http://www.nationallobsterhatchery.co.uk">www.nationallobsterhatchery.co.uk</a>

Source: South West of England Regional Development Agency, 2008

### National and International Maritime Organisations

Organisation	Status	UK Lead Department	Other Departments Involved	Briefing Mechanisms
<a href="#">European Environment Agency (EEA)</a>	European Agency	Defra	NERC, DENI, SEERAD, WO	Reports and Newsletters
<a href="#">EC Maritime Industries Forum (MIF)</a>	<i>ad hoc</i> body reporting to EC	BERR	DfT	Circulation of papers for comments by other Departments
<a href="#">WEGEMT Association</a> , A European Association of	Non-profit Making Association		EU	An eight man Executive Committee nominated by an

## KESW2 Marine HE Sector Plan

Universities in Marine Technology and Related Sciences				Annual Conference of all University Associates
<a href="#">European Boards for Marine &amp; Polar Sciences (EMaPS)</a>	Joint ESF/EC Committee	NERC CCMS SOC		Series of Euro Conference
<a href="#">International Council for the Exploration of the Sea (ICES)</a>	Intergovernmental Council	Defra SEERAD	NERC	Defra/SEERAD liaison
<a href="#">North East Atlantic Fisheries Commission (NEAFC)</a>	International Convention	Defra	SEERAD FCO	Defra has responsibility for producing and coordinating briefing
<a href="#">Marine Stewardship Council (MSC)</a>	International Charitable Organisation			Reports and Newsletter
<a href="#">Oslo and Paris Commissions (OSPAR)</a>	Intergovernmental Commission	Defra	SEERAD, WO, DENI, DANI, DfT, BERR, FCO	Merged under OSPAR
<a href="#">London Convention</a>	International Convention	Defra		Defra coordinates briefing meetings for interested UK Government Department
<a href="#">United Nations Environment Programme (UNEP)</a>	UN programme	Defra	FCO DFID	
<a href="#">Advisory Committee on Protection of the Sea (ACOPS)</a>	Independent Charitable Organisation			No formalised briefing mechanisms
<a href="#">International Council of Scientific Unions (ICSU)</a>	Nongovernmental Scientific Union	Royal Society		Newsletter
<a href="#">United Nations Convention on the Law of the Sea (UNCLOS)</a>	UN Convention	FCO	Defra, CEFAS, SERR, DfT, NERC	The Aviation and maritime Department of the FCO keeps interested parties in Whitehall informed of developments
<a href="#">Scientific Committee on Oceanic Research (SCOR)</a>	Nongovernmental Organisation	Royal Society	NERC	Briefing is through a specialist working group
<a href="#">Scientific Committee on Antarctic Research (SCAR)</a>	Nongovernmental Organisation	Royal Society	NERC, BAS	Briefing through UK National Committee or Antarctic Research Chairman
<a href="#">The Arctic Ocean Sciences Board</a>	Nongovernmental Organisation	NERC	Defra, CEFAS, MoD	Direct consultation with

## KESW2 Marine HE Sector Plan

<a href="#">(AOSB)</a>				scientific community or more formally through UK national Arctic Research Forum
<a href="#">International Whaling Commission (IWC)</a>	Intergovernmental Organisation	Defra	FCO, NERC	Consultative Forum
<a href="#">International Atomic Energy Agency (IAEA)</a>	UN Agency	BERR	Defra, DoH, NRPB, DFID	Through working groups, advisory groups and technical committees
<a href="#">Nuclear Energy Agency (NEA)</a>	OECD Agency	BERR	Defra, CEFAS	NEA working groups and standing committees working through BERR, in consultation with Defra and other interested bodies
<a href="#">World Meteorological Organisation (WMO)</a>	UN Agency	Met office	NERC	Coordinated by International Section of Met Office
<a href="#">Food and Agriculture Organisation (FAO)</a>	UN Agency	DFID	SEERAD, CEFAS, Defra, FCO	DFID United Nations and Commonwealth Department have responsibility for assembling briefing material
<a href="#">Intergovernmental Oceanographic Commission (IOC)</a>	Autonomous body within UNESCO	NERC	DIFD, Defra, CEFAS, MoD	Through IACMST International Sub-Committee
<a href="#">International Hydrographic Organisation (IHO)</a>	Intergovernmental Organisation	UK Hydrographic Office	NERC	Through the Chief Executive, the Hydrographer of the Navy
<a href="#">International Maritime Organisation (IMO)</a>	UN Agency	MCA, DfT	MoD, FCO, HSE, Defra	Through technical committees and sub-committees
<a href="#">Partnership for Observation of the Global Oceans (POGO)</a>	International nongovernmental organisation	POL, SOC, PML, Met Office	NERC	Reports to its sponsoring organisations worldwide
<a href="#">Commission on Sustainable Development (CSD)</a>	Commission of the Economic and Social Council of the UN	Defra		
<a href="#">Joint Group of Experts on the Scientific Aspects of Marine Environmental</a>	Body of independent experts			

<a href="#">Protection (GESAMP)</a>				
-------------------------------------	--	--	--	--

Source: Inter-Agency Committee on Marine Science and Technology, 2008

### Current HE (& FE) Strengths in the Marine Sector

The following data is a compendium of known courses at South West educational establishments. In addition to the offerings at HE level, a number of FE and other offerings have been identified because providing a match for the broad range of needs of businesses across such a broad geographical area and through the many marine industry subsectors requires an holistic approach where all areas of academic input can be recognised. Marine businesses often look for ‘practical’ support which is sometimes best delivered by FE. FE events are also listed here because they provide a well defined access route to HE for many students and Foundation degrees, BTEC or higher NVQ within FE are in many respects can contribute significantly to future study within an overall HE educational framework.

#### Bournemouth and Pool College of Further Education

Course	Type	Duration	Qualification
Geography and Coastal Conservation	Full time	7 terms	BTEC HND

#### Bournemouth University

Course	Type	Duration	Qualification
Coastal Zone Management	Full time	1 year	MSc
Geography and Coastal Conservation	Full time	2 years	BTEC HND
International Maritime Management	Full time	1 year	MSc
Environmental and Coastal Management	Full time	3 years	BSc

#### Cheltenham Tutorial College

Course	Type	Duration	Qualification
Maritime Management	Learn at home course	Variable	MA/MBA awarded by Leicester University

#### Cornwall College

Course	Type	Duration	Qualification
Yacht & Boat Building and Ship Joinery	Full time	2 years	C & G 2450
Marine Craft Technology	Full time	2 years	BTEC HND
Marine Leisure Management	Full time	2 years in Falmouth	BTEC HND

## KESW2 Marine HE Sector Plan

Boat Design	Full time or Part time	2 years in Falmouth	BTEC C&G 2450
Boat Restoration	Full time	2 years in Falmouth	NVQ Level 2
Maritime Studies	Full time	2 years in Falmouth	BTEC HND
Marine Engineering	Full time	2 years in Falmouth	BTEC
Marine Leisure Studies	Full time	2 years in Falmouth	BTEC
Marine Science	Full time	2 years in Falmouth	BTEC
Environmental Management	Full time	2 years in Falmouth	BTEC HND
Marine and Freshwater Biology	Full time	2 years at Camborne Community Centre	BTEC HND
Marine Craft Fitting	Part time	1 year in Falmouth	C & G 2440 Part 2
Outdoor Education	Full time	2 years	BTEC HND

## College of Falmouth, Cornwall

Course	Type	Duration	Qualification
Boat Restoration	Part time	2 years	NVQ Level 2
Boat Restoration and Conservation	Full time	1 year	College Certificate
Watersports Instructor Studies	Part time	1-2 years	NVQ Level 2
Traditional Boat Building	Full time	1 year	C & G Level 3
Watersports Instructor	Full time or part time	2 years	National Certificate
Marine Engineering and Design	Flexible full time or part time	2 years	BTEC HND
Marine Biology and Ecology	Full time	2 years	BTEC HND
Yacht and Boat Design	Full time	1 year	C & G 2450
Boat Building and Boat Reinstatement	Modern apprenticeship	Up to 4 years	NVQ Level 3
Light Marine Engineering	Full time	1 year	C & G 2440 and SEMTA NVQ Level 1
Boat Design	Full time or part time	2 years	BTEC HND
Marine Leisure Management	Full time or part time	2 years or 4 years	DipHE/HND/HNC
Marine Science	Full time	2 years	BTEC HND

## Open University

Course	Type	Duration	Qualification
Earth Sciences	Self study	Variable	OP Diploma
S 180 Life in the Oceans: Exploring our Blue Planet	Self study	Up to 5 months	10 points towards a degree (360 total)
Oceanography	Self study	9 months	30 points towards a degree

## City College Plymouth, Devon

Course	Type	Duration	Qualification
Ship Construction & Naval Architecture	Part time 1 day and evening per week	2 years	BTEC
Long Range Certificate	Flexible course	Variable	AMREC Certificate

## KESW2 Marine HE Sector Plan

			radio operator (GMDSS)
Restricted Operators Certificate	Full time	3 days	AMREC Certificate radio operator (GMDSS)
Short Range Certificate	Full time	3 days	BTEC HND
Ship Construction & Naval Architecture	Part time 1 day and evening per week	2years	BTEC
Efficient Deck Hand	Full time	1 week	Part NVQ
Stability 1, 2, 3	Full time	1 week	Part NVQ
Basic Safety	Full time	1 day	Part NVQ
Cargo	Full time	1 week	Part NVQ
Navigation and Radar	Full time	2 weeks	Part NVQ
Management	Full time	1 week	Part NVQ
Medical Care	Full time	1 week	Part NVQ
Vessel Operations 1, 2	Part time	1 week	Part NVQ
Basic Fire Fighting	Part time	3 days	Part NVQ

### Stoke Damerel Community College, Plymouth, Devon

Course	Type	Duration	Qualification
Leisure Studies	Full time	2 years	BTEC

### South Devon College, Paignton / Dartmouth, Devon

Course	Type	Duration	Qualification
Yacht Operations	Full Time	1 year	Foundation Degree
Marine Studies	Full Time	1 year	Foundation Degree
Marine Engineering	Full time	36 weeks	NVQ 2
Boat Maintenance			NVQ 2
Assorted RYA Courses	FT/PT	1 day - 22 weeks	RYA qualified
Leisure Studies	Full time	2 years	BTEC

### University of Plymouth, Devon

Course	Type	Duration	Qualification
Ocean Exploration	Full time	3 years	BSc Hons
Chemistry with Ocean Science	Full time	3 years	BSc Hons
Geography with Ocean Science	Full time	3 years	BSc Hons
Geology with ocean Science	Full time	3 years	BSc Hons
Ocean Science with Computing	Full time	3 years	BSc Hons
Ocean Science with Mathematics	Full time	3 years	BSc Hons
Marine Sediment Dynamics	Full time or Part time	2 or 3 years or 4 or 6 years	MPhil pr PhD
Physical Oceanography	Full time or Part time	2 or 3 years or 4 or 6 years	MPhil pr PhD
Ocean Science with Geography	Full time	3 years	BSc

## KESW2 Marine HE Sector Plan

Rheology	Full time or Part time	2 or 3 years or 4 or 6 years	MPhil pr PhD
Ocean Science with Geology	Full time	3 years	MSc Hons
Environmental Modelling	Full time or Part time	2 or 3 years or 4 or 6 years	MPhil pr PhD
Meteorology	Full time or Part time	2 or 3 years or 4 or 6 years	MPhil pr PhD
Science and the Media	Full time	3 years	BSc Hons
Marine Bio Science	Full time	3 years	BSc Hons
Applied Marine Sports Science	Full time	3 years	BSc Hons
Environmental Science and Biodiversity Conservation	Full time	3 years	BSc Hons
Environmental Science and Environmental Health	Full time	3 years	BSc Hons
Environmental Science and Environmental Sustainability	Full time	3 years	BSc Hons
Environmental Science and Environmental Change	Full time	3 years	BSc Hons
Environmental Science and Marine Conservation	Full time	3 years	BSc Hons
Port Management	Full time	1 year	MSc
Applied Marine Science	Full time	1 year	MSc
Coastal Ocean Policy	Full time	1 year	MSc and MRes
Geomatics	Full time	1 year	MSc and MRes
Sustainable Environmental Management	Full time	1 year	MSc and MRes
Applied Fish Biology	Full time	1 year	MRes
Aquatic Ecotoxicology	Full time	1 year	MRes
Biological Diversity	Full time	1 year	MSc
Biological Conservation	Full time	1 year	MSc
Marine Biology	Full time	1 year	MRes
Global Change	Full time	1 year	MSc and MRes
Micro Palaeontology	Full time	1 year	MRes
Environmental Analysis	Full time	1 year	MRes
Environmental Monitoring and Management	Full time	1 year	MSc

### Marine Sector Priorities

Higher Education offers a broad range of knowledge based services and support to business and the community in the South West. These include expert consultancy by academic staff, access to specialist facilities such as scientific and engineering laboratories, business development events, serviced incubation space for start up companies, rapid prototyping, research and development services, tailored training

provision and CPD, engagements in knowledge transfer and student/graduate placements. HE also contributes to the skills base of the region through the supply of graduates in marine disciplines that find their way into local and regional businesses. For example, the intake of graduates at the South West's leading shipbuilding, repair and refit company, typically numbers 25 each year, many of whom are sourced locally.

In the process of establishing its priorities and actions for working with the marine sector, the SW HE community is fully engaged with many businesses through the various mechanisms described above. In the South West, it is apparent that these engagements happen at different levels depending on the sub-sector the business is categorised in. For example, HE engagement with the region's scientific and research community is very much focused on the development of major collaborative research of national and international importance, particularly in relation to climate change, and resource management. In this respect the HE priority is to play a leading role in defining and developing programmes in collaboration with the major stakeholders (Government agencies, NGOs) in and around this community. This draws specialised scientific services, marine environmental businesses and research intensive companies. The number is relatively small but increasing as more and more developments embrace scientific and environmental challenges in order to proceed through various planning stages. HE's interaction with the more traditional business community follows many different paths to establish enduring relationships through research collaboration, and particularly through knowledge exchange programmes. Matching the regions HE research interests to such a diverse community means that many research groups across the region (see Annex 1) are engaged in activities which impinge upon the marine sector and involve different marine actors.

Table 1 below shows SW HE priorities in the context of a proposed marine development Framework, with strengths and potential activity areas, barriers and indicative programmes and tools for HE engagement under each priority heading.

**Table 1: HE Priorities for Marine Sector Engagement**

<b>HE Sector Priorities</b>	<b>HE Strengths and Potential Activity Areas</b>	<b>Barriers/Risk Assessment</b>	<b>Programmes/tools for HE Engagement</b>
<b>Building Dialogue</b>	<p>Communicating and translating the HE offer to the sector and engaging with the sector to understand the demand for HE services and support.</p> <p>Identifying new opportunities for intervention.</p>	<p>Differences in language and terminology used by HE and business.</p> <p>Not responding to opportunities quickly enough.</p> <p>Potential for competition and confusion over advice</p>	<p>Networking and promotion of the offer to simplify the message.</p> <p>Dialogue and engagement with other business support organisations including Business Link.</p> <p>Development of consolidated cross-institutional sector support</p>
<b>Supporting the Sector</b>	<p>A cutting edge HE offer which attracts the most promising practitioners and companies.</p> <p>Providing an innovative and challenging learning environment with expert staff and specialist equipment and facilities.</p> <p>Providing research capacity and expertise to support the advancement of knowledge and the use of new technologies in the sector.</p> <p>Sector specific business support.</p>	<p>HE offer must be responsive: Diversity of portfolios and ambitions of HEI's are not necessarily couple coupled with the different needs of the marine sector which creates knowledge gaps.</p> <p>HE needs to work closer with the marine sector in order to anticipate gaps and changing consumer behaviour.</p> <p>HE staff need to maintain high levels of sector specific knowledge in a rapidly changing industry but may be able to offer less support as HE are less able to attract academics in some engineering and technology disciplines.</p> <p>Traditional marine industries are perceived as sunset industries that do not embrace innovation and change</p>	<p>Teaching &amp; learning and research activity</p> <p>Knowledge transfer activities with marine businesses.</p> <p>Greater peer to peer interaction between businesses and HE sector to ensure suitable throughput of graduates and relevance of supporting mechanisms</p>

KESW2 Marine HE Sector Plan

		Fragmentation and geographical disparity within the marine sector makes it hard to address	
<b>Embedding Enterprise in the Curriculum</b>	Entrepreneurship: Business and entrepreneurial skills are a key priority with delivery contextualised appropriately to the sub sector: building entrepreneurship into HE courses and encouraging higher levels of entrepreneurship across the sector.	Academic staff resistant to change  Enterprise culture difficult to embed  Results and outputs of successful engagement are not necessarily regarded as suitable currency	Teaching & learning activity  Curricular development Student Enterprise Clubs and competitions Start-up toolkit  Seed funds Work experience programmes Graduate mentoring Incubation/first-rung workspace  Create opportunities for student work-based projects.  Improve potential rewards for academic involvement in commercial, applied and collaborative activity.
<b>Graduate retention and progression</b>	Graduate skills and employability:  Equipping graduates with creative and entrepreneurial skills.  Accurate, realistic and regularly updated careers information to present the breadth of employment in all sectors, highlighting the education and skill sets needed both in the present and those that are anticipated for the future. Careers guidance, advice on intellectual property rights and business skills training for entry into creative industries and clarification/advice on routes	The need for greater general business knowledge amongst new graduates.  Lack of information or promotion of local and regional businesses and opportunities in the sector.	Teaching & learning activity  HERDA projects:  Graduates for Business, Higher Skills,  Great Western Research

## KESW2 Marine HE Sector Plan

	Supporting/facilitating dialogue between students and industry (e.g. through placements)		
<b>High Growth and Investment Readiness</b>	Increasing innovation and uptake of new technologies and processes in marine science & technology and development of capabilities in emerging marine sectors such as marine renewable energy	<p>Size - predominance of SMEs lacking resources or incentives to engage with HE</p> <p>Difficulties in engaging with embryonic sectors concerned more with first phase business development</p> <p>State aid regulations - limits on how much a single business can be supported financially.</p>	<p>HEIF3/KESW Business Account Manager and Sector Specialist networks</p> <p>Knowledge Transfer Partnership (KTP) programmes (and 'mini KTP')</p> <p>Focus groups to engage new businesses and identify demand pull opportunities for research, knowledge exchange and innovation</p>
<b>Business innovation</b>	<p>Innovation &amp; Productivity:</p> <p>Helping to improve productivity (through the application of expert knowledge)</p> <p>Access to expertise and resources including product development</p> <p>HE as a source of intelligence to businesses particularly on technological developments and up to date sector specific information.</p> <p>IP Issues:</p> <p>IP awareness amongst HE staff/students and in SMEs: recognising the value of IP in the creative industries and how to protect and commercialise intellectual capital.</p> <p>Interdisciplinary and cross-sectoral initiatives: Interaction between ET and other sectors e.g. marine</p>	<p>Prioritisation of targets by funders of HE resulting in lack of flexibility to respond to needs of business.</p> <p>Human resources need: To be able to buy out academic staff to engage in non research Knowledge Sharing</p>	<p>HEI sector specialists</p> <p>Research/innovation links HEI/industry links HERDA/KESW2 Great Western Research Industrial Studentships</p>

## KESW2 Marine HE Sector Plan

<p><b>Social Enterprise</b></p>	<p>Supporting and energising local communities</p>	<p>Lack of knowledge and experience in this area</p> <p>Lack of marine social enterprise business development means low intervention opportunities</p>	<p>Student and staff placements</p> <p>HEIF, EU programmes</p>
<p><b>Employer Engagement/CPD provision</b></p>	<p>HE-industry liaison and partnership:</p> <p>Encouraging and establishing models of partnership between higher education and industry.</p> <p>Peer groups.</p> <p>Facilitating networks and relationships with businesses and creative hubs to encourage graduate retention in the region</p> <p>Supporting/facilitating interaction between students and industry</p> <p>Skills/CPD provision:</p> <p>Link to Higher Skills project (esp. CPD for SMEs and sole traders).</p> <p>Establishing business skill and CPD needs by sub sector – finely grained research.</p> <p>Using industry expertise to design curricula (e.g. through Higher Skills).</p> <p>Engage with regional skills developers</p> <p>Developing cultural management skills and</p>	<p>Diversity/fragmentation of sector - different sub-sectors have different challenges and agendas</p> <p>Lack of communication &amp; understanding of help &amp; support/opportunities available. HE must understand how to meet marine business needs for affordable and flexible training.</p> <p>Funding/resource issues:</p> <p>Lack of continuity caused by different funding cycles and likely government constraints following the 2007 Comprehensive Spending Review (CSR) The government agenda has been too reliant on output targets (better to focus on impact &amp; outcomes)</p> <p>Business needs not always focused at the HE level. The nature of many businesses means that the problem may be more readily addressed by FE or specialist CPD providers. Most skills surveys focus on practical requirements rather than high level needs.</p>	<p>Higher Skills Project</p> <p>KESW2, HEIF3</p> <p>Graduates for Business</p>

## KESW2 Marine HE Sector Plan

	leadership and broadening understanding of where the sector is heading (convergence etc.). Need to ensure suitable provision for SMEs and sole traders.		
<b>Infrastructure</b>	<p>Funding and Resources:</p> <p>Coordinated lobbying for additional funding/resources (regional, national, international)</p> <p>Enterprise and incubation:</p> <p>Incubation for business start ups: increase provision and share good practice between HEIs and with other organisations</p>	<p>Need for more incubation space (with support and advice)</p> <p>Constraints on funding &amp; resources – including a lack of investment in capital equipment &amp; lack of available physical/flexible space.</p>	<p>Targeted programmes of funding for key sectors eg PRIMaRE capital funding programme to underpin the HE's ability to support research and knowledge transfer within the embryonic marine renewable energy sector</p> <p>HE pump-priming capital equipment through HEIF to assist in more commercially oriented engagements with businesses</p> <p>Further external capital funding required in targeted areas e.g. from EU Convergence and Competitiveness funds, HEFCE, SWRDA</p>
<b>Widening Participation</b>	Blurring of boundaries between different sectors enables cross fertilisation of support	Unchanging employment profile within certain marine sub sectors	Aim Higher
<b>Branding, Marketing &amp; Promotion</b>	<p>Awareness/promotion:</p> <p>Ways of increasing awareness of the range of support services available from HE, how to access them and how to identify and access new markets</p> <p>International markets:</p> <p>Identification and development of the International potential of marine businesses.</p>	Culture clash within HE - Business support v. teaching and research agendas.	Engagement with other organisations to promote the strengths of the marine sector as a whole both in the UK and overseas eg. MSW, sub regional business networks, other sector support agencies.

## **Appendix 1 Current HE strengths in the Environmental Technologies Sector – details of Programmes, Centres and Research Groups**

### **University of Bristol**

#### **BRITE – the Bristol Technologies for the Environment Institute**

The Institute is focused on sustainability, with a particular emphasis on solutions, through mitigation, adaptation and education, as well as prevention. The long-term marine related research opportunities on which the University is building are:

**Energy;** wind, tidal, **Severn barrage**, nuclear, micro-generation, geothermal

**Materials;** **composites**, smart materials, nature inspired materials, soil, geology, ice

**Water;** water and health (e.g. Aquatest), flood risk, **river basins**, dams and reservoirs, weather and climate

#### **Water Research Group**

<http://www.bristol.ac.uk/civilengineering/research/water/>

#### **Hydraulic Modelling**

**Marine current turbines** which are, in principle, much like submerged windmills will be installed in the sea at places with high tidal current velocities, to take out energy from the huge volumes of flowing water. A team of academics have come together to supervise a HydroLab research project which will run for four months and carry out preliminary model experiments on the latest design of marine current turbine for the capture of tidal power.

#### **Bristol Research Initiative for the Dynamic Global Environment (BRIDGE)**

<http://www.bridge.bris.ac.uk/>

BRIDGE was set up in 2003 to improve the understanding of natural climate and environmental variability and to use this knowledge to predict future changes more accurately and assess its impact on all aspects of human society. In the context of UK research, this remit is uniquely wide. BRIDGE will provide information to the

Intergovernmental Panel on Climate Change and ultimately feed into the government's policy considerations.

The research will focus on the emerging area of 'Earth System Science', which looks at the complex interactions between all the Earth's components: **the oceans**; atmosphere; ice sheets; biosphere; as well as the influence of human activity on global change. This approach requires the input of multidisciplinary teams drawn from across the University. The main research effort of the group within Geography is to improve the understanding of the causes of climate change, by testing the computer climate models used to predict future climate change. Major themes include:

- Quantifying environmental and climate change in the distant past through the combined use of data and models;
- Evaluating climate models with accurate proxy climate records, especially during periods of rapid climate change;
- Improving climate models by incorporating additional components of the Earth System and detailed analysis of these processes for past, present and future change;
- Assessing the impact of future climate change on spatial and temporal scales relevant to society and including timescales from decadal to millennial.

### Earth System Science Research Group

[http://www.gly.bris.ac.uk/research/earth\\_system/index.html](http://www.gly.bris.ac.uk/research/earth_system/index.html)

The Earth System Science group studies large-scale processes and interactions including biogeochemical cycles, biosphere-climate interactions (on all timescales), contemporary global environmental change, and the linkages among environmental change, human activities, policy and sustainability. The group blends fundamental and applied science with expertise in geobiology, biogeochemistry, biosphere-atmosphere interactions, the carbon cycle, and climate change.

The research interests of the group range from local observations to global biogeochemical cycles. Examples include the study of methane emissions and consumption in soils, wetlands and **marine sediments** via weathering; studies of life-cycle of soils and the response of soil organic carbon to climate warming; water-rock interaction in carbonate environments; and global sources and sinks of CO<sub>2</sub> in the terrestrial and **marine biosphere**. Approaches involve a combination of observational, experimental and modelling techniques, as well as data assimilation methods, on multiple temporal and spatial scales.

**Energy** within the Engineering Faculty: wind and **tidal stream** energy within Aerospace and Civil Engineering (Pete Bunnis, Askin Isikverin, Colin Taylor); micro generation, power scavenging and energy management within Electrical Engineering (Phil Mellor, Bernard Stark); thermal and nuclear energy within Mechanical Engineering (David Smith, Mike Tierney, Joe Quarini); geothermal energy (Terry Seward, Earth Sciences)

Other research within Engineering:

- *Civil Engineering*
  - Student project investigating solar powered water purification
  - Design of **seabed mounted structures** for accelerating the flow in tidal channels and hence allowing increased energy yield from tidal stream devices. Structures can also be used as a means of coastal protection.

**Materials science** in Aerospace and Mechanical Engineering, Physics and Chemistry. This includes the Advanced Composites (ACCIS) centre <http://www.bristol.ac.uk/composites/> , Interface Analysis Centre <http://www.bristol.ac.uk/mcest-mission/findus/interfaceanalysiscentre.html> and a recognised strength in structural health monitoring and smart structures to manage life of ageing infrastructure (Mike Friswell, Bruce Drinkwater, David Smith).

**Biodiversity** in Geography, Civil Engineering, Earth Sciences, Policy Studies and Biology (Sandy Harrison, Alan Feast, Mike Benton, Jo House, Colin Farquar, Jane Memmot).

### **University of Exeter**

School of Biosciences Research Groups:

[Ecotoxicology and Ecophysiology](#)

[Ecology & Conservation Biology](#)

[Centre for Ecology and Conservation](#)

School of Geography Research Groups:

Environmental Processes and Change research group conducts work within three-inter-linked research clusters:

## KESW2 Marine HE Sector Plan

The [River Basin Science](#) cluster studies geomorphological, hydrological and biogeochemical processes within rivers and their drainage basins.

The [Environmental Change](#) cluster addresses environmental and human responses to Quaternary climate change at global, hemispheric and regional scales.

The [Environmental Modelling](#) cluster focuses on the development and application of new approaches to modelling, evaluating and elucidating environmental systems, processes and feedbacks.

### Advanced Technologies Research Institute

<http://www.secam.ex.ac.uk/index.php?nav=83> combines research in the areas of materials, manufacturing and electronics, with particular interests in auxetic materials, bioengineering and biomedical materials, data storage and memory materials, devices and systems, agile and dynamic manufacturing systems and [sea-wave prediction](#).

### Informatics Research Institute:

<http://www.secam.ex.ac.uk/index.php?nav=213> concentrates on the increasingly important areas of [hydroinformatics \(water systems\)](#), bioinformatics and biomedical informatics, together with computational statistics and data analysis, artificial intelligence and information systems research.

### Camborne School of Mines (CSM)

[http://www.ex.ac.uk/cornwall/academic\\_departments/csm/research/index.shtml](http://www.ex.ac.uk/cornwall/academic_departments/csm/research/index.shtml)

**Renewable Energy** The renewable energy research group focuses on the development of specific technologies and their interaction and connection with the distribution network. A strategic focus is placed on marine energy research, the group having a lead involvement in the PRIMaRE research consortium, a £15million initiative in support of the WaveHub project, funded by the South West Regional Development Agency.

## University of Plymouth

The University of Plymouth [Marine Institute](#)

<http://www.research.plymouth.ac.uk/marine/default.htm>

## KESW2 Marine HE Sector Plan

The Marine Institute has been formed to help consolidate the ongoing marine activities in the Faculties of Science, Technology and Social Science and Business into a coherent programme. A number of research groups and centres focus on Environmental Technologies, which include:

### [Biogeochemistry & Environmental Analytical Chemistry \(BEACH\)](#)

<http://www.research.plymouth.ac.uk/beach/>

Its aim is to conduct research on biogeochemical processes in environmental systems using interdisciplinary approaches underpinned by novel analytical techniques

### [Speciation and Environmental Analysis \(SEA\)](#)

<http://www.research.plymouth.ac.uk/sea/>

Research Aims include: The study of cycling, uptake and bioavailability of organometallic and inorganic compounds in environmental, industrial, clinical and agricultural contexts; Development of novel analytical methodology and instrumentation, and fundamental research in analytical science and chemical metrology.

Current Research Projects include: Chemical and Biological metrology using isotope dilution analysis and elemental tagging of molecules for protein quantitation; Speciation analysis in the marine, estuarine and freshwater environments; Uptake and bioavailability of trace elements and environmental pollutants.

### [Marine Biology and Ecology Research Centre \(MBERC\)](#)

<http://www.research.plymouth.ac.uk/mberc/>

The group consists of closely collaborating biologists and ecologists from marine, freshwater and terrestrial backgrounds, with research interests ranging from epigenetics to ecosystem function and climate change.

MBERC has three main research themes: Biodiversity, Developmental Ecology, Behavioural Ecology

### [Geomatics Research Group](#)

<http://www.research.plymouth.ac.uk/geomatics/>

The aim of the group is to develop new areas of collaborative research and links with commercial organisations in areas that include coastal zone management, hydrography, geodesy, GIS, GPS, meteorology, navigation & remote sensing.

## KESW2 Marine HE Sector Plan

The areas of interest are applied to multi-disciplinary applications such as: application of Earth Observation data to climate change; the prediction of pollutant fluxes and environment vulnerability in the UK coastal zone; an improved understanding of ecological and biological variability within the Celtic shelf-sea and Atlantic ecosystems; the application of new visualisation techniques to improve the provision of hydrographic data; the development of renewable energy in the south west of the UK.

### Marine and Industrial Dynamic Analysis (MIDAS)

[http://www.tech.plym.ac.uk/Research/marine\\_and\\_industrial\\_dynamic\\_analysis/index.htm](http://www.tech.plym.ac.uk/Research/marine_and_industrial_dynamic_analysis/index.htm)

This research group comprises a multidisciplinary team with expertise across artificial intelligence (AI), advanced control systems engineering theory, multi-sensor data fusion, dynamics, thermodynamics and fluids, SMART materials, marine power plant, marine vehicle performance prediction, propulsors, integrated navigation systems and marine renewable energy.

Of particular interest is the application of AI techniques to the navigation, guidance and control of autonomous vehicles, wave energy devices and marine propulsion systems.

### Shelf Sea Oceanography and Meteorology Research Group

<http://www.research.plymouth.ac.uk/shelf/>

The main objective is to understand and predict physical processes, which facilitate exchanges of matter and energy across the continental shelves, and to provide underpinning research for biogeochemical studies of the coastal and shelf waters. The specific processes include mesoscale eddies, internal waves and dense water cascades over the shelf break. Understanding of these processes contributes to the development of modelling capabilities and the assessment of the potential response of coastal marine environment to global changes.

### Catchment and Coastal Environments Research Group

<http://www.plymouth.ac.uk/pages/view.asp?page=15513>

This group focuses on understanding contemporary processes operating within two areas of the physical environment: (1) hydrological processes linked to soil water movement and catchment sediment dynamics; and (2) coastal processes and

ecosystems, particularly those characteristic of muddy, sandy and gravel coasts and estuaries. In addition, the ecological and biogeographical linkages in both areas are researched. Research into such processes is seen as a necessary precursor to applied physical geography and environmental management. Estuarine environments and their dynamics represent a core area for research into catchment-coastal and terrestrial-marine interaction.

### Centre for Coastal Dynamics and Engineering (C-CoDE)

<http://www.research.plymouth.ac.uk/c-code/>

C-CoDE undertakes research of international excellence in the field of coastal dynamics and engineering by providing a focus for fundamental and applied research, research training, and technical service support for coastal agencies and industry. The centre undertakes research in modelling and measurement of overtopping and wave impact, flood and coastal protection, monitoring and modelling long-term coastal and beach changes. It is the largest grouping of coastal researchers in the UK who have expertise in civil engineering, marine science, mathematics, geography and geology.

### Marine and Coastal Policy

<http://www.research.plymouth.ac.uk/marine-policy/>

The research strategy of the group is based upon the adoption of a holistic approach towards sustainable development, use and protection of the marine and coastal environment.

The main research areas of the group are at the science-policy interface, where scientific (including social science) research can actually be translated into, for example, management tools, new policy guidance, effective legislation or regulations. Research areas include: Improved Assessment of the state of the environment and, the identification of causes of environmental degradation which can be directly related to management and regulation. Understanding Global and Regional Pressures; Management Techniques and Tools; Participatory Processes, Policy and Law; Improvement of Environmental Education

### Coastal Processes Group

<http://www.coastalprocesses.org/>

This centre for coastal process research, specialises in field studies of natural coastlines, beaches and estuaries, video monitoring of coastal systems, coastal

## KESW2 Marine HE Sector Plan

process modelling, cohesive and non-cohesive sediment dynamics and water column turbulence. The aim is to understand and predict the behaviour of coastal and estuarine systems in support of appropriate management of coastal resources and activities.

### Centre for Climate and Coastal Change

<http://www.plymouth.ac.uk/researchcover/rcp.asp?pagetype=G&page=286>

General research areas include: palaeoceanography, marine geology, sea-level change, marine micropalaeontology, coastal pollution, and coastal sedimentology. More specific research topics include: coastal erosion; marine isotope geochemistry; major extinction events; stable isotope stratigraphy & analysis; Phanerozoic record of global change; Holocene record of global change; biosphere-geosphere interactions; terrestrial versus marine climate signals; pollution monitoring of estuarine environments; sediment tracing in estuaries; coastal neotectonics; carbon cycling and river basin sediment dynamics

### Other Research Groups include:

#### Ecotoxicology and Stress Biology Research Centre (ESBRC)

<http://www.plymouth.ac.uk/researchcover/rcp.asp?page=169&pagetype=G>

The ESBRC aims to understand how organisms deal with exposure to environmental stresses (anthropogenic & natural, chemical & physical) and biotic stresses (infection & disease) and apply this knowledge to improve human and ecosystem health.