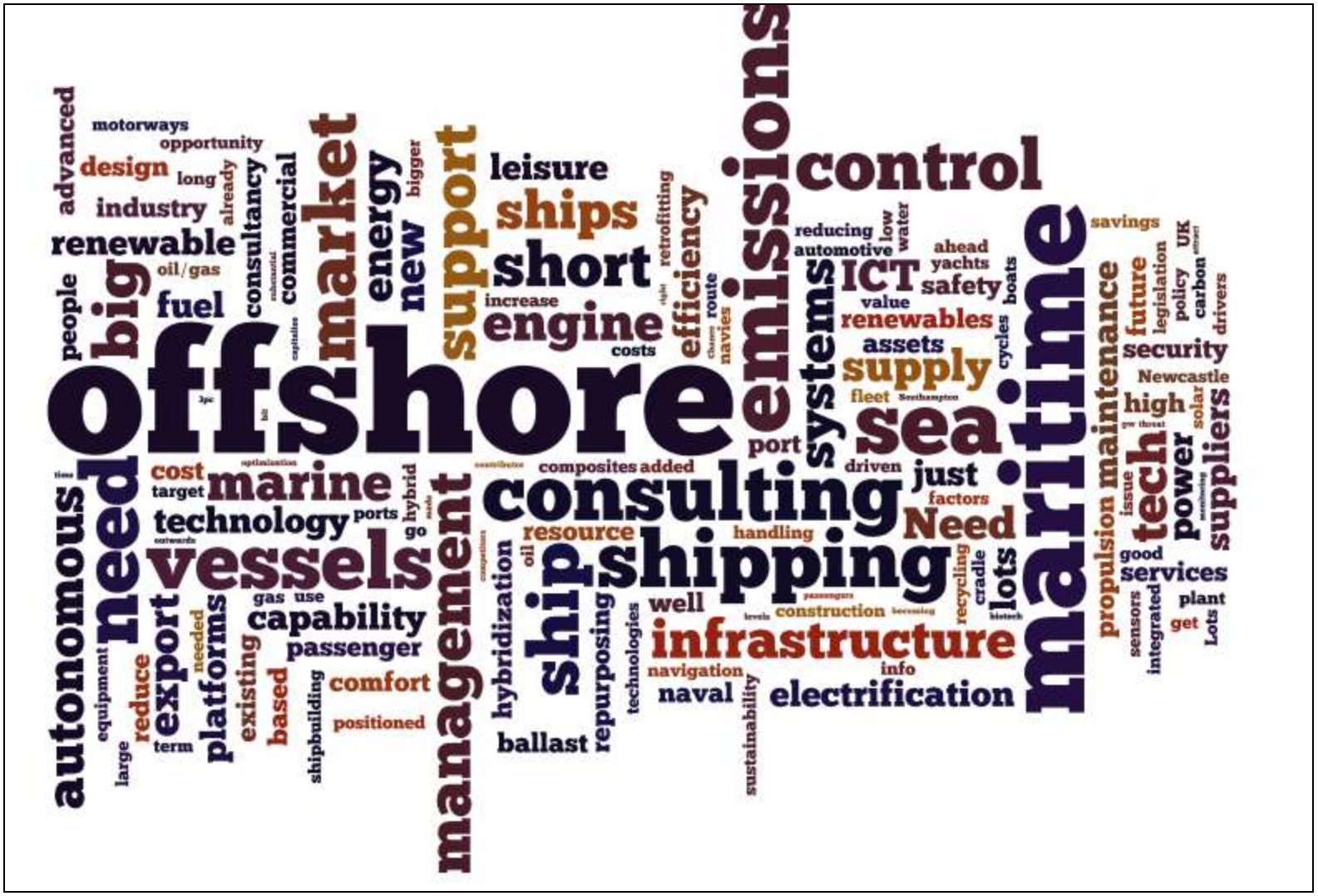
UK Marine Industries Roadmap & Capability Study

Landscape Roadmap Workshop 27th June 2011



Technology Strategy Board
Driving Innovation

UK Marine Industries Alliance

Knowledge Transfer Networks

BIS Department for Business Innovation & Skills

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Executive Summary

This report results from a one-day workshop to assist the Technology Strategy Board, BIS, Marine Industries Leadership Council and the Transport KTN to develop a roadmap to identify future priority opportunities and capability needs for the UK Marine Industries. The workshop took place at the BIS Conference Centre in London on 27 June 2011, with input from over 50 external experts drawn from across industry, academia and other stakeholders. The workshop took a baseline roadmap, developed from the Council's 2010 roadmap, published reports and input from the project steering group. This was then developed further to identify priority trends & drivers and then to characterise the 50+ opportunities that had been identified.

Participants contributed before the workshop by identifying the most important opportunities in short, medium and long timeframes, where UK capability could deliver against major global market needs. These assessments were based on defined criteria for Value (global & UK market, competitive strength, added value and impact on societal and environmental challenges) and Capability (in the marine industry, academia, research organisations and from adjacent industries – see Appendix E for details.)

In prioritising relevant Trends & Drivers (see section 1), there was a strong emphasis on "Green Shipping" - energy efficiency and emissions reduction; skills and safety; opportunities in serving growing markets (eg marine renewables and blue biotech); and meeting new regulations (eg for ballast, emissions and end-of-life management). A strong trend towards service provision and through-life support was a recurring theme as was the influence of enabling technologies, for example in integrated transport, communications, positioning, autonomous operation and design tools.

Executive Summary (continued)

Priority Opportunities (see section 2) were identified right across the broad spectrum of Marine Industries, with the top 15 opportunities being: Maritime consulting; Engine technology for reduced energy / emissions; Emission control & Exhaust Heat recovery; Marine ICT & Information infrastructure; Construction of offshore renewable energy assets; In-service support of military and civilian vessels; Military shipbuilding (for Export & UK); Autonomous systems & vehicles; Marine biofuels & blue biotech; Low friction coatings & Anti fouling; Electrification of Propulsion (including Hybrid drives); Specialist vessels eg for offshore renewables; Efficient hull design; Training and education facilities for seafarers and New leisure marine products for developing markets .

A number of these opportunities were explored in more detail – to characterise the market value and identify relevant sources of UK capability for delivery (and potential gaps that will need to be filled – see section 3) Whilst there are strong similarities between these priorities and the 2010 MILC roadmap, there are also important additions – see Appendix F for a comparison.

In support of these opportunities, a wide range of capabilities were identified from within the Marine Industries but also in academia and research organisations. Technology transfer from other industries, notably in the transport sector, were also identified as bringing significant potential value in delivering these opportunities.

This report will now form the start point for the next phase of the Marine Industries Roadmap and Capability Study. The priority opportunities (not limited to the sample which were investigated in greater detail in this workshop) will be developed further through a number of sub-sector roadmaps. In parallel, the identified capability sources will be used as inputs to the targeting of a study of UK capability. These will ultimately be brought together to identify the most promising opportunities where significant global market value can be delivered by UK capability – and to identify the capability gaps (and other enablers) that will need to be put in place for success.

Contents

Supported by:

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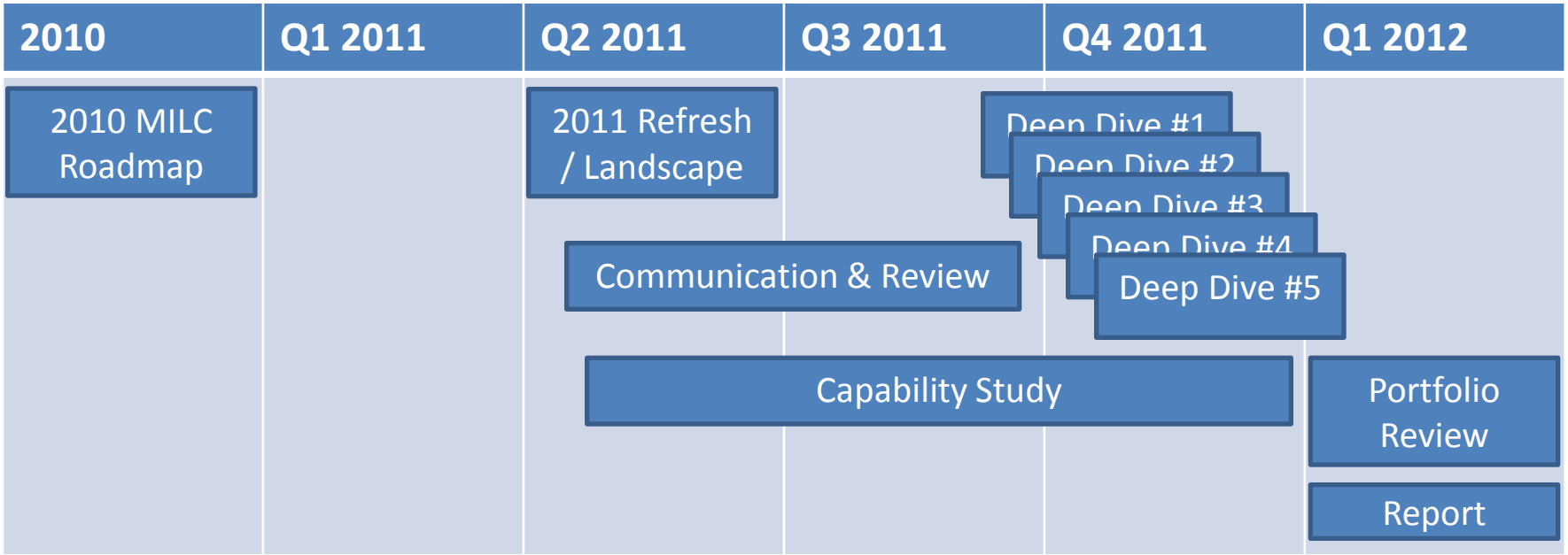
1.1 Introduction: Marine Industries Roadmap Programme

This report forms part of a programme sponsored by the Technology Strategy Board along with its partners BIS and the Transport KTN, working together with the Marine Industry Leadership Council (MILC) and UK marine related industries to develop a road map and UK capability study that seeks to maximise economic growth from within the UK Marine Industries.

This "Landscape" roadmap builds on and refreshes the 2010 MILC road map (see MILC website for this report) together with data gathered from a search of public domain roadmaps and reports to update and develop an overview of the most promising market opportunities where Global market needs could be delivered from UK Capabilities. 1.2 shows the roadmap evolution from 2010 to 2011. The outputs from this roadmap will be used to provide the focus for five further "deep dive" roadmaps exploring targeted sub-sectors of the Marine Industries during Autumn 2011, together with a parallel activity to map related UK Capability. The figure below illustrates the full process:



1.2 Evolution of 2011 Landscape Roadmap from 2010 MILC Roadmap

Opportunities			Value	Fit	Total	Comparison with MILC TIG Review 11 March 2011		
ID	Topic	Opportunity	Weighted score of all Value criteria	Weighted score of all Capability Fit criteria	Combined Value & Fit	ID	TIG Theme	11 March 2011 Ranking
S2	a	Maritime consulting				MILC 3	Maritime Consultancy	
X3	b	Engine technology (reduced energy / emissions)				MILC 8	Green Propulsion Systems	
N5	c	Emission control & Exhaust Heat recovery => New build & retrofit (Naval & Commercial)				MILC 8	Green Propulsion Systems	
U3	d	Marine ICT & Information infrastructure						
R3	e	Construction of offshore renewable energy assets						
N6	f	In-service support of military and civilian vessels				MILC 5	Through Life Support Services	
N4	g	Military shipbuilding (for Export & UK)						
U1	h	Autonomous systems & vehicles						
A2	i	Marine biofuels & blue biotech						
X10	j	Low friction coatings & Anti fouling				MILC 6	Anti-fouling, tank and low friction coartings	
X7	k	Electrification of Propulsion (including Hybrid drives)				MILC 8	Green Propulsion Systems	
R2	l	Specialist vessels eg for offshore renewables construction & support or exploitation of nev				MILC 4	Offshore renewables - ships and support	
X5	m	Efficient hull design						
S4	p	Training and education facilities for seafarers (inc. from abroad)						
L4	n	New leisure marine products for developing markets						
X8		Ballast water systems				MILC 7	Ballast Solutions	
P1		Short sea shipping: infrastructure, ports and vessels						
L1		New leisure craft (Ergonomic & Ease of Use) for first-time owners (developed markets)				MILC 9	Ergonomics/ease of use leisure craft	
R1		Services for operation, maintenance & management of offshore power plant				MILC 4	Offshore renewables - ships and support	
X1		Recycling / Re-purposing of ships, platforms, oil rigs etc.						
X2		New Submarines, AUVs & UUVs (Naval, Commercial & non-naval market (eg surveillance						
E4	o	Easy to use leisure navigation system (Sea TomTom)						
X11		Enhanced passenger comfort & safety						
N2		Ship management systems: I-ship (Naval & Commercial)				MILC 1	I-Ship	
E3		Technologies (radar, navigation) for export vessels				MILC 2	Exportable naval technologies	
C4		Very large offshore platforms						
S5		Ocean information provision (metocean, chemical, biological, geological)						
U2		Underwater sensors & monitoring systems						
L6		Create volume produced smaller leisure craft types for affordable participation						
C2		Luxury shipbuilding (new build & retrofit)						

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1.3 Workshop Participants

Ian Stock 3 Spheres UK
John Paine A&P Group
Stewart Boak A&P Group Ltd
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Jeff Owen Babcock
David Dobson Babcock
Stuart Hunt BAE Systems
Peter Joyce BIS
Tom Gibbs BMT Defence Services
Adrian Waddams British Marine Federation
Martin Ziarati C4FF
David Cummings Carnival
David Balston Chamber of Shipping
Richard Burt Chelsea Technologies Group
Justine Heeley Chemring Marine
Colin Seabrook Consultancy Services
Alan Groves DSTL
John Griffiths EMEC Ltd
Adrian Payne Frazer-Nash Consultancy
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Russell Gould Kelvin Hughes Ltd
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Dr Sean McCartan University of Coventry
Kevin Forshaw :
Prof Ajit Shenoi University of Southampton
Stephanie Moffatt Zodiac Maritime Agencies Ltd

2.1. Trends & Drivers (Top 20)

Rank	Driver	Priority
1	Energy & Fuel scarcity/cost => demand for reduced consumption / alternative fuels	
2	NOX, SOX and Particulates regulations	
3	Increasing global demand for seafarers	
4	Marine Renewables (R.E.D. 15% target by 2020)	
5	Safety (People, Ships & Cargo)	
6	Demand for greater maritime security (eg Piracy & Terrorism)	
7	IMO Ballast Water Convention expected to be ratified	
8	Climate change Mitigation (Low Carbon)	
9	Green shipping	
10	Integrated / Multi-Modal Transport Systems	
11	Migration of freight from road to inland waterways & coastal shipping	
12	Through life support & Servitisation	
13	Autonomous vehicles	
14	Positioning & Communications Technologies	
15	Service and Integration are key competitiveness factors	
16	Statutory End of Life disposal & recycling requirements for all products	
17	3D CAD/CAM/CAE/simulation & modelling/rapid tooling	
18	Changing demographics/consumer demand/ageing population	
19	Recycling, Reuse & Technology Insertion	
20	Climate change Adaption (Resiliance / Coast & Waterways Impact)	

2.2. Trends & Drivers (21 to 40)

Rank	Driver	Priority
21	Climate change; the rise of sea levels, acidification, increasing water temperatures, and	
22	Increased automation	
23	Changing nature of military threat / engagement & spread of WMD capabilities	
24	Cost of new fuel infrastructure (H2 vs HC vs MeOH etc)	
25	Food security / scarcity	
26	Increasing & shifting patterns of Global trade & BRIC Growth	
27	Marine ecosystem management & sustainability (EU maritime integrated strategy)	
28	Statutory EU Fuel Consumption data for pleasure boats (CO2 like cars)	
29	Cost reductions in MoD => longer lifespan & higher levels of in-service support	
30	Efficient use of resources	
31	New Business Models	
32	UK MoD SDSR 2010 => 2 aircraft carriers & 7 Astute	
33	Blue Biotechnology	
34	Declining demand for recreational boating from ageing baby boomers	
35	Shortage of marina berths	
36	Urbanisation & Congestion	
37	Water scarcity / security (=> Desalination)	
38	Accelerated NPD process	
39	Increased usability of computers	
40	Disability and Equality Legislation	

3.1. Opportunities (Top 30)

Opportunities			Recurrence	Market Attractiveness:					Triple bottom-line benefits (or		Value	Fit with UK Capability					Time-liness	Fit	Total
ID	Topic	Opportunity	How many identified as priority in pre-work	Global Market Size	Home (UK) market size	Strength of competition (Global)	Added Value / Margin	Cross-sector opportunity (selling into	Planet / Environmental	People / Societal	Weighted score of all Value criteria	Marine Industry	University / Academic	RTO / Design Services	Non-Marine transport / Other Industry	Other UK resources / infrastructure / context	UK Capability matches market need	Weighted score of all Capability Fit criteria	Combined Value & Fit
S2	a	Maritime consulting	9	9	2	1	13					10	3	8	2	2	2		
X3	b	Engine technology (reduced energy / emissions)	3	14	1	1			9			14	5	2	7		1		
N5	c	Emission control & Exhaust Heat recovery => New build & retrofit (Naval & Commercial)	5	15		1	2	2	7			6	8	1	4		1		
U3	d	Marine ICT & Information infrastructure	2	12	1	1	4	3				7	4	4	3	1	4		
R3	e	Construction of offshore renewable energy assets	7	6	12	1			3			9	1	6			1		
N6	f	In-service support of military and civilian vessels	2	9	2							13	3	1	3		1		
N4	g	Military shipbuilding (for Export & UK)	7	7	3	1	2			1		9		8					
U1	h	Autonomous systems & vehicles	3	5	3	1	3	2	1	2		2	8		8	1			
A2	i	Marine biofuels & blue biotech	2	6			3	4	2	1		4	3		9	1			
X10	j	Low friction coatings & Anti fouling	2	8			2	1	6			9	3						
X7	k	Electrification of Propulsion (including Hybrid drives)	4	10		2	1	3	1			1	3		7		1		
R2	l	Specialist vessels eg for offshore renewables construction & support or exploitation of ne	2	12	4		1					6			1				
X5	m	Efficient hull design	2	7					3			3	8	5					
S4	p	Training and education facilities for seafarers (inc. from abroad)	1	3	1	2				11		4	4	2	6		1		
L4	n	New leisure marine products for developing markets	3	7		1	1			1		5	3	2	4	1	1		
X8		Ballast water systems	2	9			1		3			3	1	1		2			
P1		Short sea shipping: infrastructure, ports and vessels	3	1	8		1	1	1			8	2		1	2			
L1		New leisure craft (Ergonomic & Ease of Use) for first-time owners (developed markets)	1	6	2	1				3		2	1	4		2			
R1		Services for operation, maintenance & management of offshore power plant	4	2	9			1				6	1	2			1		
X1		Recycling / Re-purposing of ships, platforms, oil rigs etc.	3	6	3	1	1	1				5				1			
X2		New Submarines, AUVs & UUVs (Naval, Commercial & non-naval market (eg surveillance	1	3			2					6	4	1		1			
E4	o	Easy to use leisure navigation system (Sea TomTom)	5	4		1	2			1		1	2	2	6				
X11		Enhanced passenger comfort & safety	4	4		1				4		2	4	3					
N2		Ship management systems: I-ship (Naval & Commercial)	2	3	1		3		1			1	1	2					
E3		Technologies (radar, navigation) for export vessels		4	1							5		1					
C4		Very large offshore platforms	3	3	1					1		3		3					
S5		Ocean information provision (metocean, chemical, biological, geological)	1	2	2								9						
U2		Underwater sensors & monitoring systems	1	1	1				1				4	2			2		
L6		Create volume produced smaller leisure craft types for affordable participation	1	4	1					1			1	2	2				
C2		Luxury shipbuilding (new build & retrofit)	2	1			4					4					1		

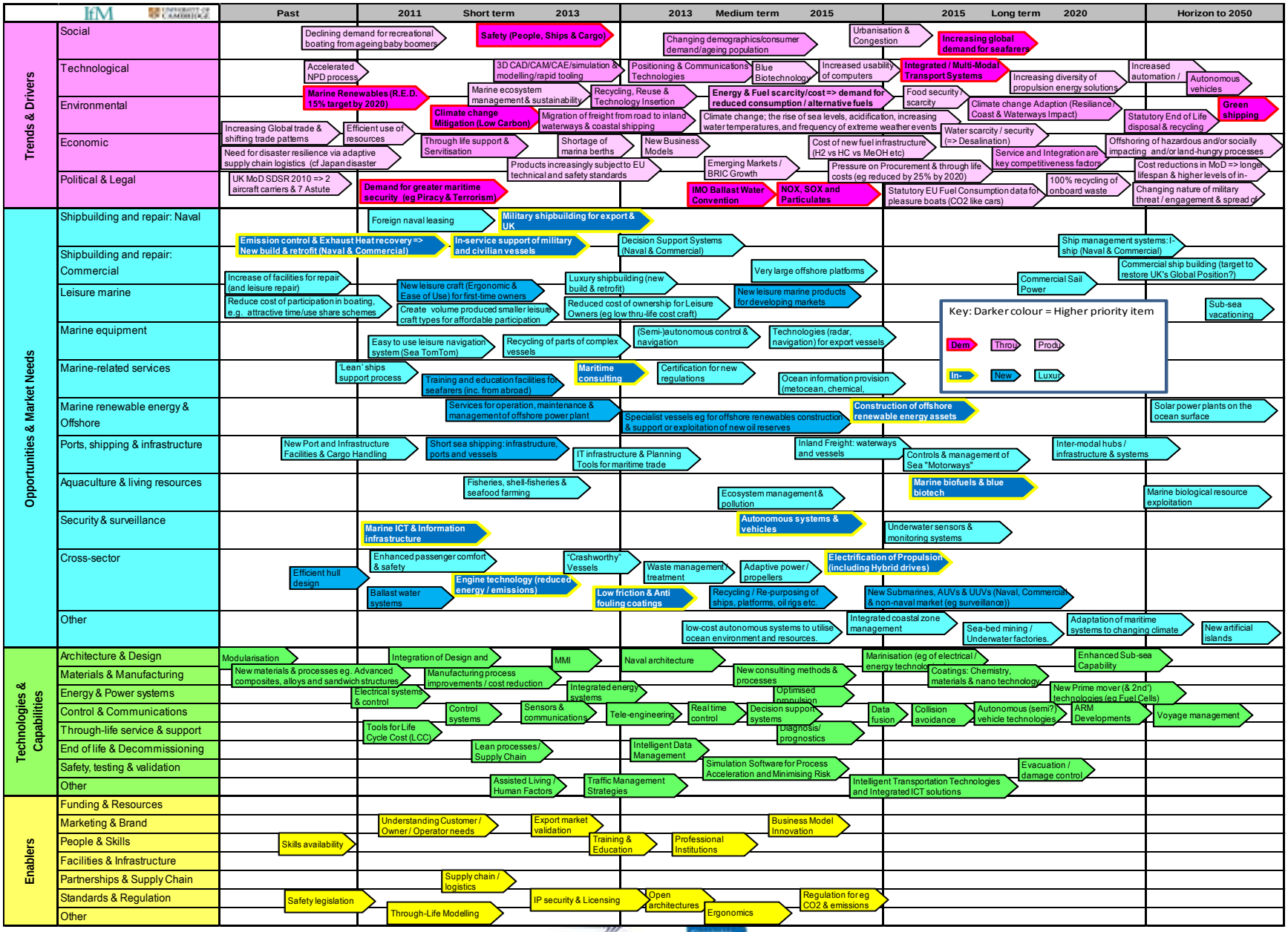
3.2. Opportunities (31 to 60)

Opportunities			Recurrence	Market Attractiveness:					Triple bottom-line benefits (or		Value	Fit with UK Capability					Time-liness	Fit	Total
ID	Topic	Opportunity	How many identified as priority in pre-work	Global Market Size	Home (UK) market size	Strength of competition (Global)	Added Value / Margin	Cross-sector opportunity (selling into	Planet / Environmental	People / Societal	Weighted score of all Value criteria	Marine Industry	University / Academic	RTO / Design Services	Non-Marine transport / Other Industry	Other UK resources / infrastructure / context	UK Capability matches market need	Weighted score of all Capability Fit criteria	Combined Value & Fit
C1		Commercial ship building (target to restore UK's Global Position?)	1	4	1	2								1		1			
N1		Decision Support Systems (Naval & Commercial)	1	4								1	1				1		
O1		Integrated coastal zone management	1				1	2	3	1		1	2				1		
O2		Adaptation of maritime systems to changing climate	2	2				1		1		1	2	1	1				
E1		(Semi-)autonomous control & navigation		3		1	1								2				
S3		Certification for new regulations		1								4			1				
P5		Controls & management of Sea "Motorways"	1	1	1	1			1				2	1	1				
P6		New Port and Infrastructure Facilities & Cargo Handling Systems	1	2	2									1	1				
X6		Waste management / treatment		2		1						2							
S1		'Lean' ships support process	1	1			2						1						
X9		"Crashworthy" Vessels	2			1				1			2	1					
P3		IT infrastructure & Planning Tools for maritime trade	1				2					1	1						
A3		Ecosystem management & pollution		2									1						
A1		Fisheries, shell-fisheries & seafood farming		1	1							1	1						
C3		Increase of facilities for repair (and leisure repair)			2							1			1				
O4		low-cost autonomous systems to utilise ocean environment and resources. (defence + co	1	1									1						
L2		Reduced cost of ownership for Leisure Owners (eg low thru-life cost craft)			1							1							
C5		Commercial Sail Power										1							
R4		Solar power plants on the ocean surface	2		1								1						
P2		Inland Freight: waterways and vessels							1				1						
E2		Recycling of parts of complex vessels											1						
N3		Foreign naval leasing																	
L3		Sub-sea vacationing																	
L5		Reduce cost of participation in boating, e.g. attractive time/use share schemes																	
P4		Inter-modal hubs / infrastructure & systems																	
A4		Marine biological resource exploitation																	
X4		Adaptive power / propellers																	
O3		Sea-bed mining / Underwater factories.																	
O5		New artificial islands																	

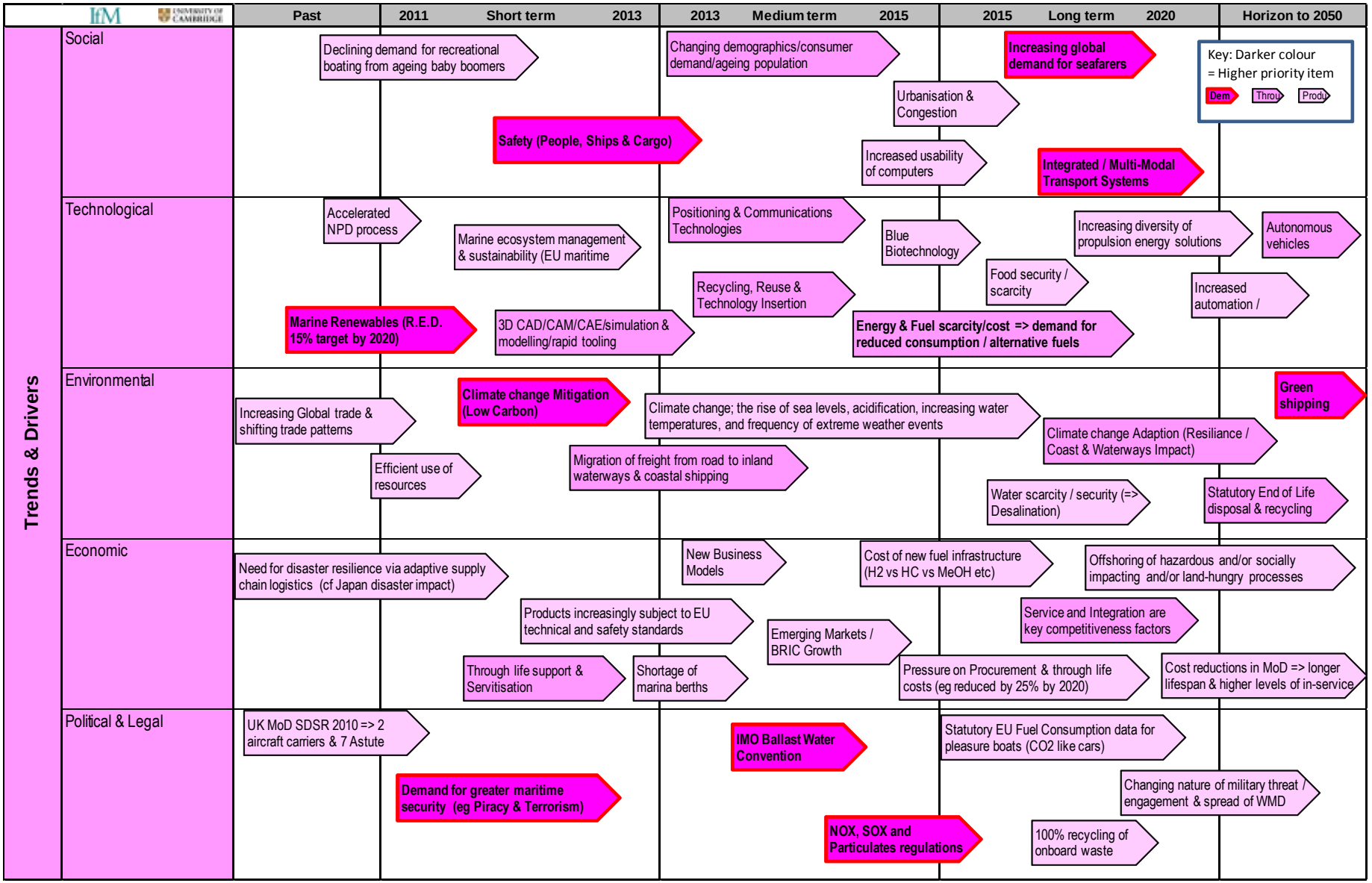
3.3. Priority Opportunities reviewed in breakout groups

Opportunities			Recurrence	Market Attractiveness:					Triple bottom-line benefits (or		Value	Fit with UK Capability					Time-liness	Fit	Total
ID	Topic	Opportunity	How many identified as priority in pre-work	Global Market Size	Home (UK) market size	Strength of competition (Global)	Added Value / Margin	Cross-sector opportunity (selling into	Planet / Environmental	People / Societal	Weighted score of all Value criteria	Marine Industry	University / Academic	RTO / Design Services	Non-Marine transport / Other Industry	Other UK resources / infrastructure / context	UK Capability matches market need	Weighted score of all Capability Fit criteria	Combined Value & Fit
S2	a	Maritime consulting	9	9	2	1	13					10	3	8	2	2	2		
X3	b	Engine technology (reduced energy / emissions)	3	14	1	1			9			14	5	2	7		1		
N5	c	Emission control & Exhaust Heat recovery => New build & retrofit (Naval & Commercial)	5	15		1	2	2	7			6	8	1	4		1		
U3	d	Marine ICT & Information infrastructure	2	12	1	1	4	3				7	4	4	3	1	4		
R3	e	Construction of offshore renewable energy assets	7	6	12	1			3			9	1	6			1		
N6	f	In-service support of military and civilian vessels	2	9	2							13	3	1	3		1		
N4	g	Military shipbuilding (for Export & UK)	7	7	3	1	2			1		9		8					
U1	h	Autonomous systems & vehicles	3	5	3	1	3	2	1	2		2	8		8	1			
A2	i	Marine biofuels & blue biotech	2	6			3	4	2	1		4	3		9	1			
X10	j	Low friction coatings & Anti fouling	2	8			2	1	6			9	3						
X7	k	Electrification of Propulsion (including Hybrid drives)	4	10		2	1	3	1			1	3		7		1		
S4	p	Training and education facilities for seafarers (inc. from abroad)	1	3	1	2				11		4	4	2	6		1		
L4	n	New leisure marine products for developing markets	3	7		1	1			1		5	3	2	4	1	1		

4.1 Draft Roadmap Landscape



4.2 Draft Roadmap – Trends & Drivers



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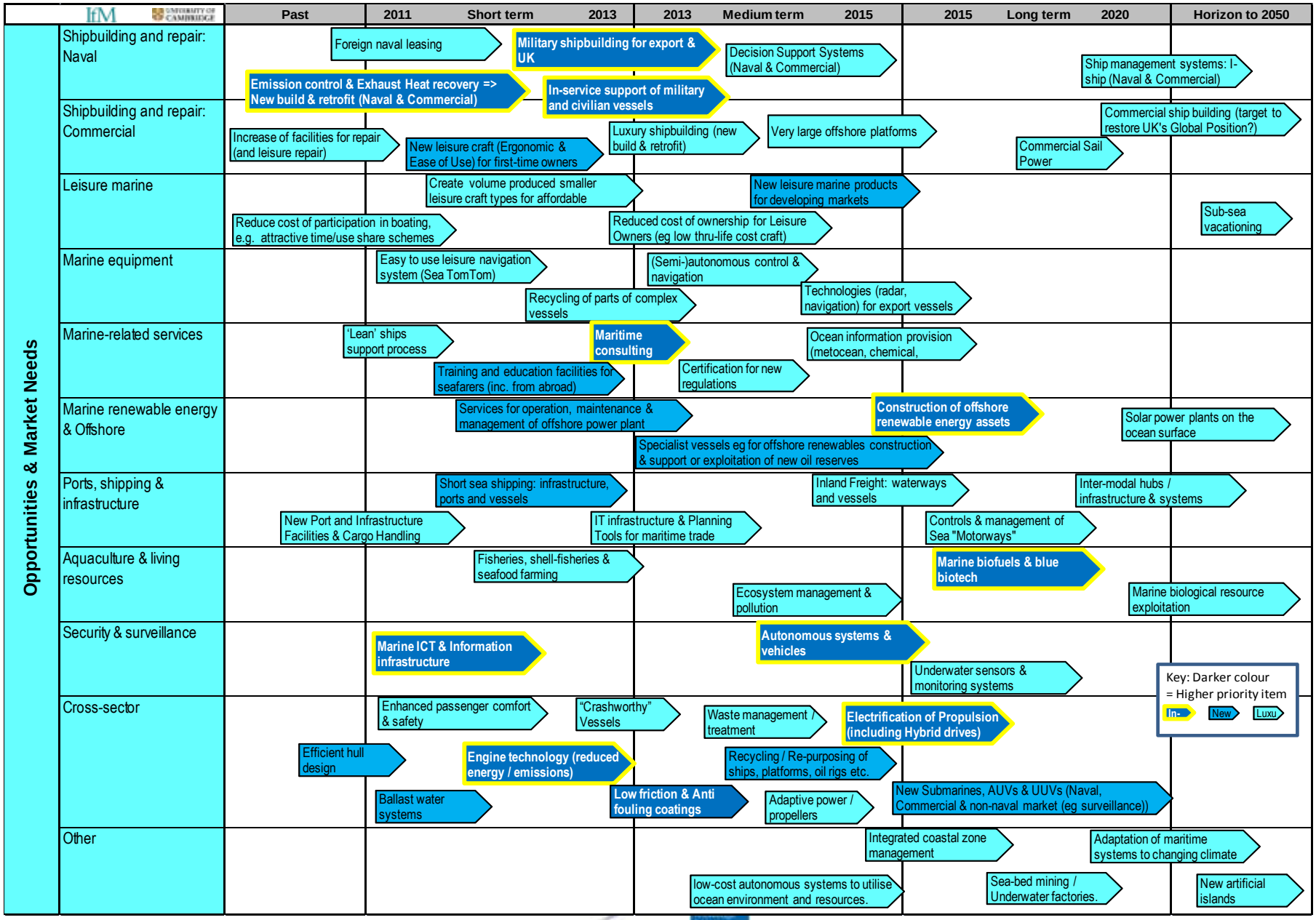
4.3 Draft Roadmap – Opportunities & Market Needs



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