AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

NUI Galway
OÉ Gaillimh

Whitaker Institute

Ireland's Ocean Economy

SEMRU
Socio-Economic Marine Research Unit

Authors:

Amaya Vega
Stephen Hynes

For further information please contact:

Dr. Amaya Vega
Socio-Economic Marine Research Unit (SEMRU)
Whitaker Institute of Innovation and Societal Change,
National University of Ireland, Galway
Office: +353(0)91 49 5679
Email: amaya.vega@nuigalway.ie
Web: http://www.nuigalway.ie/semru/

Acknowledgements

The authors would like to thank Gerard Doolan, Andrew Murray and Barry Sobey (Central Statistics Office), Liam Lacey and Edel O'Connor (Irish Maritime Development Office), Nessa Skehan (Fáilte Ireland), Emmet Jackson, John Dennis, Caitríona McCarthy and Michael Keatinge (BIM), Rebecca Corless (NUIG) and Jenny O'Leary (Marine Institute).

Finally, we would like to thank all the companies that kindly gave their time to complete the SEMRU Marine Enterprise Survey.

SEMRU

The main research focus of the Socio-Economic Marine Research Unit (SEMRU) at NUI Galway involves examining the economic utility of the marine environment (e.g. transportation, recreation) and ecological value (e.g. fisheries, aquaculture) derived from the productivity of associated ecosystems. The coastal and contiguous marine environment surrounding Ireland and the EU in general provides the geographical focus for the research of the unit. Consideration of the human dimension in the management of marine ecosystems is also a critical component of all research projects within the unit.

SEMRU has been commissioned under the Marine Research Sub-Programme PBA/SE/16/01 to report on the performance of Ireland's ocean economy. The focus is not only on continuing to collect reliable and comparable marine socio-economic data across all the marine sectors, but also to satisfy one of the specific core tasks for SEMRU, namely to develop a methodology which will provide reliable estimates of the economic contribution of the marine sector and its growth over time.

This work was carried out with the support of the Marine Institute and it is funded by the Marine Research Sub-Programme PBA/SE/16/01 Valuing and understanding the dynamics of Ireland's Ocean Economy.

For a full breakdown on the recent research outputs of SEMRU go to www.nuigalway.ie/semru/publications.html

Photographs courtesy / copyright:
Malcolm McGettigan; Pauhla McGrane; Marine Institute; SEMRU

Dedication

Dedicated to the memory of friend and NUIG colleague Dr. Richard Fitzgerald who passed away on December 5th, 2016; a man with a passion for all things marine.

Table of Contents

Executive Summary	1
Introduction	4
Direct and Indirect Gross Value Added	7
International Comparison	9
A Profile of Ireland's Ocean Economy	11
Established Marine Industries	19
Shipping and Maritime Transport	21
Tourism and Leisure in Marine and Coastal Areas	24
International Cruise Industry	26
Marine Retail Services	28
Sea Fisheries	30
Marine Aquaculture	32
Seafood Processing	34
Oil and Gas Exploration and Production	36
Marine Manufacturing, Construction and Engineering	38
Emerging Marine Industries	41
Advanced Marine Products and Services	43
Marine Commerce	45
Marine Biotechnology and Bioproducts	47
Marine Renewable Energy	49
A note on Marine Training	51
Conclusions	52
Appendices	55

Executive Summary

Marine socio-economic data are not readily available in Ireland. However, they are essential in determining the value of Ireland's ocean economy, so as to realise its full potential. SEMRU began the extensive task of data collection and analysis of Ireland's ocean economy in 2009. This resulted in the publication of a series of bi-annual ocean economy reports, to which, this report is the latest addition. The report provides a quantification and realistic monitoring of Ireland's ocean economy over time and presents a complete and comparable sectoral profile across the ocean economy, which allows us to observe progress on the targets set out in the Government's Integrated Marine Plan for Ireland - Harnessing Our Ocean Wealth (2012).
The reference year for this report is 2014. The report includes a set of economic projections that forecast Ireland's ocean economy up to 2016. For the first time, this report includes a full 2008-2016 data series illustrating Ireland's ocean economic performance and trends over an eight-year period.

This report aims to:

- Provide a profile of Ireland's ocean economy for 2014 and 2016;
- Provide estimates for turnover, Gross Value Added[1] (GVA) and employment for the 2008-2016 period;
- Assist in monitoring progress of a number of targets set out in the Government's Integrated Marine Plan for Ireland - Harnessing Our Ocean Wealth (2012);
- Provide an overview of the policy environment and outlook of the sector where appropriate;
- Revise and update, where necessary, the methodology and data used in previous reports;

In 2016, Ireland's ocean economy had a turnover of €5.7 billion. The direct economic value was worth €1.8 billion or approximately 0.9% of GDP. Ireland's ocean economy provided employment for 30,176 FTEs. Compared to 2014, 2016 saw a 23% increase in turnover, a 20% increase in gross value added (GVA) and a 10% increase in employment.

The indirect GVA that is generated from ocean related activity in Ireland in 2016 amounts to a €1.57 billion, with a total GVA (direct and indirect) of €3.37 billion, which represents 1.7% of GDP.

This report is divided into two broad types of marine industries:

The Established Marine Industries in 2016 had a turnover of €5.3 billion and provided employment of 28,231 FTEs representing 93% of the total turnover and 94% of total employment in Ireland's ocean economy. This sector includes shipping and maritime transport, tourism and leisure in marine and coastal areas, international cruise, sea fisheries, marine aquaculture, seafood processing, oil and gas exploration and production, marine manufacturing, construction and engineering and marine retail services.

> Oil and gas exploration and production, marine aquaculture and tourism and leisure in marine and coastal areas experienced the largest increase in activity in 2016, with overall turnover, GVA and employment increasing across established marine industries in the 2014-2016 period. The oil and gas exploration and production and the seafood processing sectors experienced the largest increase in employment.

The Emerging Marine Industries in 2016 had a turnover of €383 million and provided employment to 1,945 FTEs representing 7% of the turnover and 6% of employment in Ireland's ocean economy. Emerging industries refer to those that are still at a relatively early stage of development or growth, and are primarily R&D intensive and/or use the latest cutting edge technology in their pursuit of economic growth. Ireland's ocean economy includes a number of emerging industries with considerable growth potential. It includes advanced marine technology products and services, marine commerce, marine biotechnology and bio-products and marine renewable energy

1 Gross value added is the value of output less the value of intermediate consumption and it is a measure of the contribution to GDP made by an individual producer, industry or sector.

IRELAND'S OCEAN ECONOMY 2016

Direct Impact

Employment
30,176

Turnover
€5.71bn

% GDP
0.9%

GVA
€1.8bn

Indirect Impact

GVA
€1.57bn

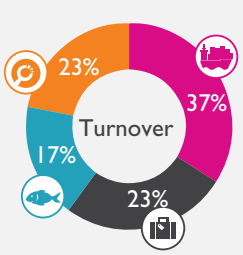
Total Direct & Indirect Impact

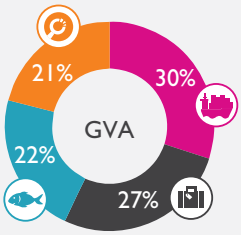
% GDP
1.7%

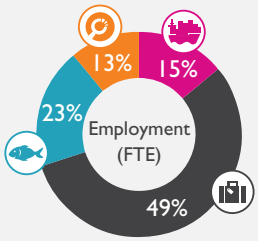
GVA
€3.37bn

Breakdown

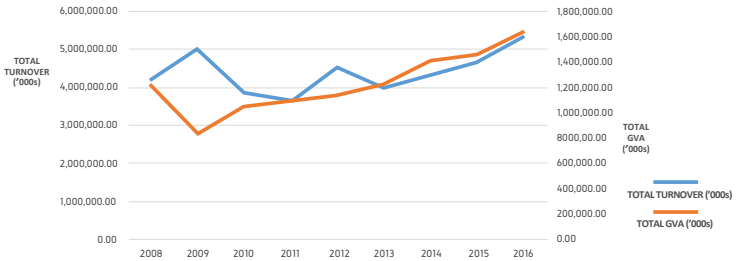
- MARITIME TRANSPORT SERVICES
- TOURISM & LEISURE IN MARINE & COASTAL
- SEAFOOD (INCLUDING FISHERIES, AQUACULTURE, SEAFOOD PROCESSING)
- OTHER SECTORS





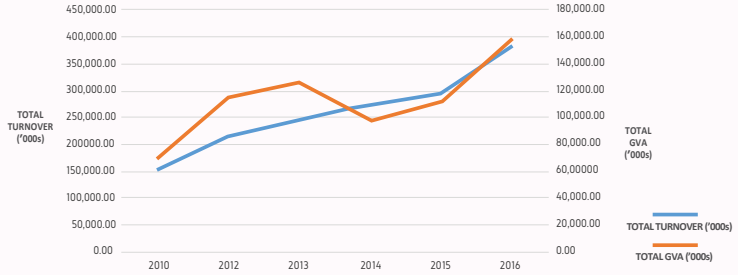


Established Marine Industries - Trends 2008-2016



Note: 2008 and 2009 figures exclude International Cruise Services, Marine Retail Services and Marine Manufacturing, Construction and Engineering

Emerging Marine Industries - Trends 2010; 2012-2016



HOOW Targets

- Double the value of Ireland's ocean wealth to 2.4% of GDP by 2030
- Increase the turnover from Ireland's ocean economy to exceed €6.4bn by 2020

All of the emerging industries are excelling in terms of growth. Advanced marine technology products and services and marine renewable energy experienced the largest increases in turnover and GVA. Employment rose in all four emerging sectors, with an overall 13% increase in the 2014-2016 period.

The methodology used in compiling this report has built on and progressed from that used in previous reports. To allow for comparability across the periods, figures from earlier reports have been revised and updated. See the Appendix for details.

The Ocean Economy - Definition

For the purpose of this report, the ocean economy is defined as any economic activity that directly or indirectly uses the sea as an input or produces an output for use in a sea-specific activity.

The coastal economy, on the other hand, represents all economic activity that takes place in the coastal region, for example, agriculture, which is not part of the ocean economy.

Introduction

The first attempt at quantifying the size of Ireland's ocean economy was presented in the 2005 publication by the Marine Institute "Ireland's Ocean Economy and Resources"[2]. That initial briefing document provided a profile of Ireland's ocean economy in 2003, and explained why, and how, Ireland should seek to develop its marine resources. The Socio-Economic Marine Research Unit (SEMRU) subsequently published three additional reports on the economic value of Ireland's ocean economy in 2010, 2012 and 2015 using 2007, 2010 and 2012 data respectively.

This report builds on these previous works by profiling and analysing Ireland's ocean economy using 2014 data. For the first time, the full 2008-2016 data series is published illustrating Ireland's ocean economic performance and trends over an eight-year period. As in the previous report and in order to enhance its relevance for policy making, this report presents economic estimates and projections up to 2016.

The importance of marine socio-economic data collection and analysis has been recognised by the Irish Government in *Harnessing Our Ocean Wealth – an Integrated Marine Plan (IMP) for Ireland*. Published in 2012, the IMP presents "the Government's vision, high-level goals and integrated actions across policy, governance and business to enable Ireland's marine potential to be realised"[3].

Harnessing Our Ocean Wealth Targets (Baseline year for targets: 2007)
Double the value of Ireland's ocean wealth to 2.4% of GDP by 2030 Increase the turnover from Ireland's ocean economy to exceed €6.4bn by 2020

Source: Government of Ireland, Inter-Departmental Marine Coordination Group (MCG), Harnessing Our Ocean Wealth - An Integrated Marine Plan (IMP) for Ireland," July 2012

Table 1: Sectoral targets set out in the Integrated Marine Plan

Sector	Ocean Wealth 2020 Target*
Seafood (fisheries, aquaculture, seafood processing)	€1,000 million
Maritime Commerce and Ship Leasing	€2,600 million
Marine and Coastal Tourism and Leisure (including Cruise Tourism)	€1,500 million
Marine ICT and Biotechnology	>€61 million
Ports and Maritime Transport Services, Maritime Manufacturing, Engineering, Offshore Oil and Gas, other marine industries	>€1,200 million

*Source: Harnessing our Ocean Wealth – An Integrated Marine Plan for Ireland; *Projected Annual Turnover by 2020. Baseline period: 2007*

The overarching aim of this report is to assist in policy making by providing a profile of Ireland's Ocean Economy in the 2008-2014 period and sector-by-sector economic projections for 2015 and 2016 against which future marine socio-economic data can be compared. Data is also being provided to support the implementation of the EU Marine Strategy Framework Directive (MSFD) and Marine Spatial Planning (MSP) in Ireland.

2 O'Connor, J., O'Leary, J. & Shields, Y., 'Ireland's Ocean Economy and Resources', Marine Institute 2005

3 Government of Ireland, Inter-Departmental Marine Coordination Group (MCG), Harnessing Our Ocean Wealth - An Integrated Marine Plan (IMP) for Ireland," July 2012

The methodology used in compiling this report on Ireland's ocean economy has built on and progressed from that used in previous reports. In this report, estimates from the previous published reports have been revised and updated to align our Ireland's ocean economy data with the new revised 2008-2014 Central Statistics Office (CSO) data series, which has brought coherence between the CSO Business Demography (BD) and Structural Business Statistics (SBS) data series and the National Accounts (Income Method) series for Gross Value Added (GVA). Estimates have also been updated with more up-to-date information on some of the categories of activity that has become available in the intervening period.

The reference year, or the latest year for which data is available, is 2014. There is a two-year time lag in the release of SBS from the CSO. However, more up-to-date data is available for some sectors such as Sea Fisheries and Marine Aquaculture. To allow for a complete and comparable representation of Ireland's ocean economy across all sectors, the report presents estimates based on economic projections of Ireland's ocean economy up to 2016. These estimates are based on forecasting exercise on the economic performance of a number of sectors on a sector-by-sector basis. The methodology used combines the latest published economic data from the CSO, government economic forecasts and expert judgement obtained from interviews with marine-related businesses and relevant government departments and agencies. Details on the methodologies used for the economic projections are presented in the Appendix.

The substantial growth in Ireland's ocean economy over recent years is a reflection of the economic recovery that Ireland is experiencing as well as of an increased level of activity in shipping and maritime transport, the seafood sector, tourism and leisure in marine and coastal areas and oil and gas production. This latter sector has given an important boost to turnover and GVA in the Irish ocean economy through the coming on line of the Corrib gas field in December 2015.

General trends in the Irish economy are inevitably reflected in the ocean economy. However, figures presented in Table 2 suggest that Ireland's ocean economy keeps performing on average better than the general economy. While growth in Irish GDP from 2012 to 2014 was approximately 8%, the ocean economy grew by over 19% in the same period. Estimates suggest that GVA growth rates in Ireland's ocean economy for the 2014-2016 period are approximately 20%, which is again above the recently released growth trends from the CSO that show an increase of 9% in Ireland's GDP for the same period.

Table 2. The Irish Ocean Economy key figures and trends, 2012, 2014 and 2016

	2012	2014	% Change 2012-2014	2016	% Change 2014-2016
GVA	€1.2 billion	€1.5 billion	19%	€1.8 billion	20%
% GDP	0.8% GDP	0.85% GDP		0.94% GDP	
Turnover	€4.7 billion	€4.6 billion	-2%	€5.7 billion	23%
Employment	25,523 FTEs	27,391 FTEs	7%	30,176 FTEs	10%

Direct and Indirect Gross Value Added

Under the Beaufort Socio-Economic Award (2008 – 2016), SEMRU in association with colleagues in Teagasc developed a Bio-Economy Input-Output (IO) model for Ireland which can be used to analyse the linkages between the bio-economy sectors and the wider economy. As part of the development of the model, the main ocean economy sectors analysed in this report were disaggregated from the national IO tables. This facilitates examining the wider economic impacts originating from economic activity that uses marine resources. Input-Output Modelling is a linear modelling approach which involves the examination of the economic cycle of production by analysing the relative relationship between the flow of production inputs and resultant flow/destination of produced outputs in an economy[4]. In essence, an Input-Output model tracks the flow of activities between sectors and final demand uses.

In this section, the Bio-Economy Input-Output model is used to study the relationship between Ireland's marine sectors and the rest of the economy in order to estimate the indirect macroeconomic impact of value added in the ocean economy on the wider economy. The indirect impact of a marine sector is the value-added generated in other industries supplying inputs to the marine sector of interest.

Table 3: GVA Multipliers for Marine Sectors from Bio-Economy Input-Output Model

Sector	GVA Multiplier
Sea Fisheries	1.31
Aquaculture	1.39
Oil and Gas Exploration and Production	1.53
Seafood Processing	2.26
Marine Manufacturing, Engineering and Construction	2.03
Marine Retail Services	1.44
Shipping & Maritime Transport	2.42
Tourism in Marine and Coastal Areas	1.59

Source: Teagasc SEMRU Bio-Economy IO Model as described in Grealis, E. and O'Donoghue, C. (ed.) (2015). The Bio-Economy Input-Output Model: Development and Uses, Teagasc Publication, Dublin;

Table 3 presents the estimated GVA multipliers for the disaggregated marine sectors from the Bio-Economy Model. Shipping and Transport and Seafood Processing provide the largest GVA multipliers across the marine sectors while the lowest GVA multipliers are witnessed in the primary production sectors namely fishing and aquaculture. Using these multipliers we then estimate the indirect GVA that is generated from ocean related activity in Ireland in 2016. As shown in table 4 this amounts to a €1.57 billion indirect effect from Ireland's ocean economy activity and a total GVA (direct and indirect) of €3.37 billion.

4 Grealis, E. and O'Donoghue, C. (ed.) (2015). The Bio-Economy Input-Output Model: Development and Uses, Teagasc Publication, Dublin

Table 4: Direct and Indirect GVA, 2016

Sector	Direct GVA (€'000)	Indirect GVA (€'000)	Direct and Indirect GVA (€'000)
Shipping & Maritime Transport	533,151	757,074	1,290,225
Tourism in Marine and Coastal Areas	489,646	288,891	778,537
International Cruise	9,765	5,761	15,526
Marine Retail Services	63,889	28,111	92,000
Sea Fisheries	187,000	57,970	244,970
Marine Aquaculture	71,533	27,898	99,431
Seafood Processing	140,457	176,976	317,433
Oil and Gas Exploration and Production	71,674	37,987	109,661
Marine Manufacturing, Construction and Engineering	70,989	73,119	144,108
Marine Advanced Technology Products and Services	60,632	62,451	123,083
Maritime Commerce	41,763	18,376	60,139
Marine Biotechnology and Bioproducts	16,989	17,499	34,488
Marine Renewable Energy	38,099	20,192	58,291
Total	**1,795,587**	**1,572,305**	**3,367,892**

Harnessing Our Ocean Wealth (HOOW) – An Integrated Marine Plan for Ireland, published in July 2012, set out an overarching target to double the value of Ireland's ocean economy to 2.4% of GDP by 2030. This 2.4% figure was based on a total GVA estimate (both direct and indirect) in 2007 for the Irish Ocean economy that amounted to 1.2% of GDP at that time. The total direct and indirect value of the Irish ocean economy is estimated here to be €3.37 billion which represents 1.7% of total GDP in 2016. This would suggest that HOOW is moving steadily towards its 2030 target.

International Comparison

European policies such as the Integrated Maritime Policy (IMP) for the European Union, the Blue Growth Strategy, etc. have recognised the importance of economic data to inform future decision making, management and regulation of marine sectors. European policy, such as the IMP, emphasizes the need for economic and social information on maritime affairs in its objectives. These include the construction of a decision-making framework, involving national and local authorities and stakeholders in maritime and coastal areas. Many countries, both in the EU and globally, now compile 'marine/ocean' sector accounts and produce ocean economy reports similar to this one, making international comparisons possible. However, the definitions used are not always directly comparable.

Table 5: International Comparisons

Country	Year	Direct Ocean GDP (€ billions)	% National GDP	% National Employment
USA*	2013	262.28	2.17	2.2
Canada*	2006	12.42	1.2	1.1
Iceland*[1]	2010	0.88	10.2	5.1
South Korea^	2014	30.35	3.02	2.8
China^[2]	2016	571	5.8	4.7
United Kingdom*	2006	67.62	4.2	3
New Zealand*	2013	2.48	1.9	1.3
France^	2013	35.5	1.73	1.7
Ireland	2016	1.8	0.9	1.5
Australia*^	2014	28.52	2.7	2.1

**Figures from official national reports, ^ Figures from communications with national representatives,*
Sources: UK: Socio-economic indicators of marine-related activities in the UK economy, https://www.thecrownestate.co.uk/media/5774/socio_economic_uk_marine.pdf, Canada: Economic Impact of Marine Related Activities in Canada, http://www.dfo-mpo.gc.ca/ea-ae/cat1/no1-1/no1-1-summary-eng.htm, Iceland: http://skjol.islandsbanki.is/servlet/file/store156/item110209/Sjavarklasinn_Skyrsla-enska-low.pdf, NZ: http://www.stats.govt.nz/browse_for_stats/environment/environmental-economic-accounts/nz-marine-economy-2007-13.aspx, USA: State of the U.S. Ocean and Coastal Economies - 2016 Update, http://www.oceaneconomics.org/Download/, Australia: The AIMS Index of Marine Industry, http://www.aims.gov.au/docs/media/latest-news/-/asset_publisher/EnA5gMcJvXjd/content/australia-s-burgeoning-blue-economy-
1. Data for Iceland is only for the fisheries sector
2. The direct GVA figure for China is based on the portion of total Gross Ocean Product that is referred to as "marine industries".

Table 5 provides a comparison of figures from a number of ocean economy studies around the world. The highest share of direct ocean economic activity in national GDP can be seen for countries such as China, Iceland and the UK. Similar to the case in Ireland, shipping and maritime transport and tourism in marine and coastal areas are key marine sectors in terms of contribution to economic value and employment in the USA, Canada, UK, France and Australia. For South Korea and China shipbuilding and fisheries are also important in terms of contribution to their ocean economies while the wild fishing sector is one of the most important sectors in terms of employment and output in Iceland. Oil and Gas is also a key sector for many of these countries and particularly in the case of the USA and the UK. At the European level it has been estimated that the ocean economy represents approximately 5.4 million jobs and generates a gross added value of approximately €500 billion per annum across the EU[5].

5 https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en

While it is interesting to compare the ocean economy across the different countries it should be noted that the structural composition of the industries in each case differ. For example, the Irish ocean economy figures do not include marine related public sector output such as naval defence services, publicly funded research or education. This is included in the estimated figures in Table 5 for France, Canada, the UK, New Zealand and South Korea. An area for future research therefore is to develop ocean economy statistics related to output from the Irish public sector.

The EU Interreg IV (Priority 1) project MARNET (Marine Atlantic Regions Network) brought together eight partners across the five European Atlantic Arc countries – France, Ireland, Spain, Portugal and the United Kingdom. A primary aim of the project was to develop a framework for the collection of marine socio-economic data across the participating countries. The framework developed a comparable and replicable data collection methodology using available data sources. To ensure consistency among countries, Eurostat statistical classifications were used – NUTS (Nomenclature of Territorial Units for Statistics) for the spatial dimension and NACE codes for the sectoral dimension of the data. The figures presented in this report have also adhered to the principles of the MARNET framework[6].

6 Foley, N., Corless, R., Escapa, M., Fahy, F., Fernandez-Macho, J., Gabriel, S., Gonzalez, P., Hynes, S., Kalaydjian, R., Moreira, S., Moylan, K., Murillas, A., O'Brien, M., Simpson, K., and Tinch, D. (2015). Developing a Comparative Marine Socio-Economic Framework for the European Atlantic Area, Journal of Ocean and Coastal Economics, 14, Article 3.

A Profile of Ireland's Ocean Economy

Ireland's ocean economy had a turnover[7] of €4.6 billion in 2014, of which €1.5 billion was direct gross value added (GVA)[8]. The Irish Marine sector employed 27,391 FTEs. Ireland's total Gross Domestic Product (GDP) in 2014 was approximately €175 billion. The GVA from marine economic activity is approximately 0.9% of national GDP. In 2016 Ireland's ocean economy had an estimated turnover of €5.7 billion and provided estimated employment to 30,176 FTEs.

The established industries in Ireland's ocean economy account for 94% of total marine turnover. This category is dominated by shipping and maritime transport and tourism and leisure in marine and coastal areas (Table 6). Shipping and maritime transport was the largest contributor in terms of turnover and value added in 2014. Tourism and leisure in marine and coastal areas is the next largest category overall and is the largest contributor in terms of employment.

Within the emerging marine industries, marine commerce and marine advanced technology make the largest contribution in terms of turnover and value added. The marine advanced technology products and services category along with the marine biotechnology sector is also an important category in terms of employment.

7 Turnover is the value of sales

8 GVA refers to a sector's turnover (output) minus intermediate consumption (the inputs into the production process). It is measured at basic prices, excluding taxes less subsidies on products.

Table 6: Direct Turnover, GVA and Employment by sector, 2014

2014	Direct Turnover € Millions	Direct GVA € Millions	Direct Employment (FTEs)
Established Industries			
Shipping & Maritime Transport	1,945.46	488.50	4,375
Tourism in Marine and Coastal Areas	984.58	396.53	13,865
International Cruise	24.30	9.79	…
Marine Retail Services	152.63	60.05	743
Sea Fisheries	311.90	168.10	2,395
Marine Aquaculture	116.30	49.16	941
Seafood Processing	517.05	135.21	2,360
Oil and Gas Exploration and Production	199.64	23.96	85
Marine Manufacturing, Construction and Engineering	121.00	64.96	906
Established Industries Sub-Total	4,372.85	1,396.26	25,670
Emerging Industries			
Marine Advanced Technology Products and Services	80.07	36.11	561
Marine Commerce	138.45	42.17	322
Marine Biotechnology and Bio-products	29.51	4.63	436
Marine Renewable Energy	26.89	15.40	401
Emerging Industries Sub-Total	274.92	98.30	1,720
Total	**4,647.77**	**1,494.56**	**27,391**

Tables 7-9 show the direct turnover, GVA and employment by sector from 2008 to 2016. Estimates for the 2014-2016 period suggest an overall increase in turnover of 23% to €5.7 billion, with an increase in GVA and employment of 20% and 10% respectively in the 2014-2016 period.

Turnover in the traditional, established marine industries fell from €4.5 billion to €4.4 billion in the 2012-2014 period. This represented a 3% reduction, which was mainly driven by shipping and maritime transport, oil and gas production and exploration and marine aquaculture. Employment in the established industries category rose from 24,324 FTEs in 2012 to 25,670 in 2014, an increase of 5.5%. Estimates for the established marine industries suggest that in 2016, turnover increased to €5.3 billion, an increase of 22% on 2014. Estimates show an increase of 17% in GVA to €1.6 billion and an increase of nearly 10% in employment to 28,231 FTEs in the established industries in the 2014-2016 period (See Tables 7-9).

Turnover of firms in the emerging marine industries increased from €218 million to €274 million in the 2012-2014 period, an increase of 26%. Employment in the emerging industries category experienced an increase of 43%, while GVA decreased by 15%. In Tables 7-9, estimates for the 2014-2016 period suggest that established trends are likely to continue with an estimated increase in turnover, GVA and employment, of 39% to €383 million, 60% to €157 million and 14% to 1,945 FTEs, respectively.

Table 7: Direct Turnover by sector (Euro Million), 2008-2016

	Direct Turnover (€ millions)									% Change	
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2012 -2014	2014 -2016
Established Markets											
Shipping and Maritime Transport	2,065.22	3,078.48	1,684.81	1,722.46	2,247.40	1,636.86	1,945.46	2,081.64	2,123.27	-13%	9%
Marine Tourism and Leisure	961.05	948.41	1,003.38	864.47	775.75	890.83	984.58	1,157.31	1,304.29	27%	32%
International Cruise Industry	…	…	21.66	21.44	20.83	25.72	24.30	27.00	25.94	17%	7%
Marine Retail Services	…	…	57.69	…	119.23	109.50	152.63	158.58	162.38	28%	6%
Sea Fisheries	225.20	168.30	187.80	235.30	268.90	276.40	311.90	244.17	279.80	16%	-10%
Aquaculture	94.30	106.60	122.50	128.50	130.30	117.72	116.30	148.66	167.17	-11%	44%
Seafood Processing	467.78	472.09	470.22	530.69	535.49	576.84	517.05	548.07	537.11	-3%	4%
Oil and Gas Exploration and Production	346.14	279.37	212.59	205.11	229.88	215.73	199.64	186.06	597.28	-13%	199%
Marine Manufacturing Construction and Engineering	…	…	110.81	…	199.08	164.91	121.00	128.64	132.23	-39%	9%
Established Markets Sub-Total	4,159.69	5,053.25	3,871.46	3,707.97	4,526.86	4,014.51	4,372.86	4,680.13	5,329.47	-3%	21%
Emerging Markets											
Advance Marine Products & Services			55.92		71.28	74.03	80.07	90.94	139.68	12%	74%
Marine Commerce			53.60		86.56	108.18	138.45	134.55	140.73	60%	2%
Marine Biotechnology and Bio-products			29.87		44.51	46.40	29.51	39.61	43.61	-34%	48%
Marine Renewable Energy			11.54		15.83	18.75	26.89	29.03	59.00	70%	119%
Emerging Markets Sub-Total			150.93		218.17	247.35	274.92	294.13	383.02	26%	39%
Total			**4,022.39**		**4,745.03**	**4,261.85**	**4,647.77**	**4,974.26**	**5,712.49**	**-2%**	**23%**

Table 8: Direct GVA by sector (Euro Millions), 2008-2016

	Direct GVA (€ millions)									% Change	
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2012 -2014	2014 -2016
Established Markets											
Shipping and Maritime Transport	542.17	271.79	416.25	433.97	374.59	467.31	488.50	522.70	533.15	30%	9%
Marine Tourism and Leisure	384.77	326.29	289.52	316.06	329.92	357.49	396.53	434.47	489.65	20%	23%
International Cruise Industry	…	…	6.25	7.84	8.86	10.32	9.79	10.14	9.76	10%	0%
Marine Retail Services	…	…	33.91	…	34.56	33.37	60.05	62.39	63.89	74%	6%
Sea Fisheries	128.70	60.70	65.00	105.10	142.60	134.70	168.10	114.00	187.00	18%	11%
Aquaculture	27.70	33.20	46.20	53.30	60.60	31.19	49.16	81.85	71.53	-19%	46%
Seafood Processing	92.90	109.15	121.36	140.23	126.71	127.86	135.21	143.32	140.46	7%	4%
Oil and Gas Exploration and Production	42.00	33.90	25.80	24.89	27.89	26.18	23.96	22.33	71.67	-14%	199%
Marine Manufacturing Construction and Engineering	…	…	44.00	…	32.83	46.72	64.96	69.06	70.99	98%	9%
Established Markets Sub-Total	1,218.24	835.03	1,048.28	1,081.39	1,138.57	1,235.12	1,396.26	1,460.25	1,638.10	23%	17%
Emerging Markets											
Advance Marine Products & Services			20.81		38.61	43.55	36.11	38.11	60.63	-6%	68%
Marine Commerce			31.81		49.17	49.91	42.17	41.63	41.76	-14%	-1%
Marine Biotechnology and Bio-products			12.99		18.76	19.67	4.63	13.91	16.99	-75%	267%
Marine Renewable Energy			3.65		8.65	11.95	15.40	18.68	38.10	78%	147%
Emerging Markets Sub-Total			69.26		115.18	125.07	98.30	112.33	157.48	-15%	60%
Total			**1,117.53**		**1,253.75**	**1,360.19**	**1,494.56**	**1,572.58**	**1,795.59**	**19%**	**20%**

Table 9: Direct Employment by sector, 2008-2016

	Direct Employment (FTEs)									% Change	
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2012 -2014	2014 -2016
Established Markets											
Shipping and Maritime Transport	5,238	4,434	4,092	3,684	3,933	4,336	4,375	4,492	4,666	11%	7%
Marine Tourism and Leisure	14,969	13,146	12,562	12,753	13,003	13,439	13,865	13,946	14,891	7%	7%
International Cruise Industry	…	…	…	…	…	…	…	…	…	…	…
Marine Retail Services	…	…	252	…	590	613	743	781	790	26%	6%
Sea Fisheries	3,404	3,692	3,479	2,688	2,709	2,717	2,395	2,522	2,536	-12%	6%
Aquaculture	1,287	976	952	958	956	956	941	988	1,030	-2%	9%
Seafood Processing	1,855	1,892	1,975	2,013	2,174	2,226	2,360	2,976	3,029	9%	28%
Oil and Gas Exploration and Production	99	74	57	64	84	83	85	90	265	1%	212%
Marine Manufacturing Construction and Engineering	…	…	726	…	875	953	906	971	1,023	4%	13%
Established Markets Sub-Total			24,094	22,160	24,324	25,323	25,670	26,766	28,231	6%	10%
Emerging Markets											
Advance Marine Products & Services			391		420	437	561	574	695	33%	24%
Marine Commerce			110		161	165	322	339	342	100%	6%
Marine Biotechnology and Bio-products			304		373	406	436	482	453	17%	4%
Marine Renewable Energy			216		245	276	401	432	454	64%	13%
Emerging Markets Sub-Total			1,021		1,199	1,284	1,720	1,827	1,945	44%	13%
Total			**25,115**		**25,523**	**26,607**	**27,391**	**28,594**	**30,176**	**7%**	**10%**

Figures 1 and 2 show the general trend in direct turnover, GVA and employment respectively for established and emerging marine industries in the 2008-2016 period. Overall the established sectors experienced a fall in activity between 2009 and 2012, reflecting the economic downturn. Between 2013 and 2016, there has been a general increase in economic activity, which in some sectors has been quite significant. Sectoral details on these trends are shown in the following sections of the report.

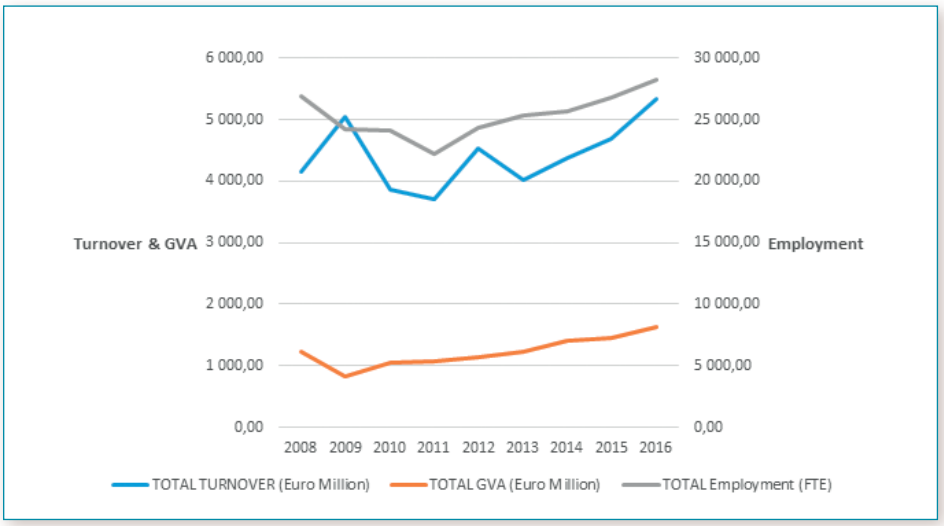


Figure 1: Direct Turnover, GVA and Employment; Established Marine Industries, 2008-2016

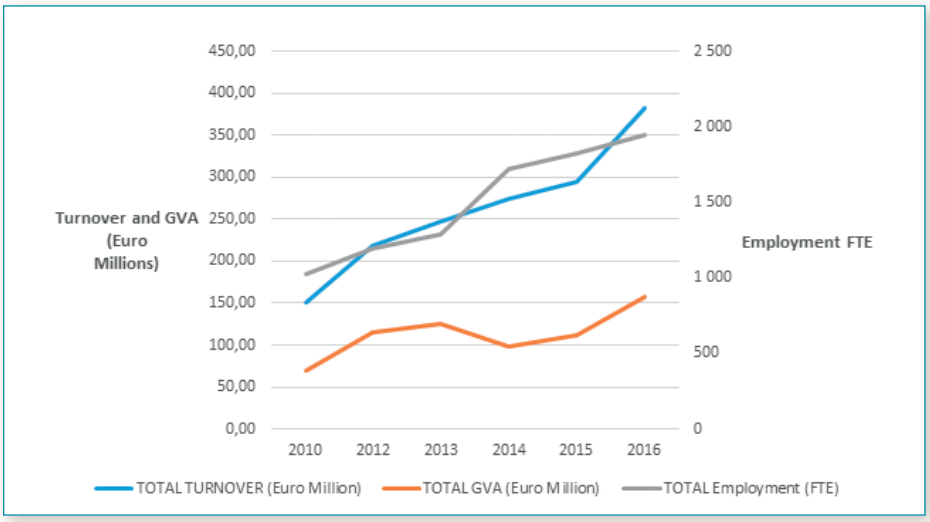


Figure 2: Direct Turnover, GVA and Employment; Emerging Marine Industries, 2010, 2012-2016

The general trend in direct turnover, GVA and employment in emerging marine industries for the period 2008-2016 is upwards, in particular in terms of turnover and employment. GVA experienced a slight decline in 2014, which rapidly recovered in the 2014-2016 period. Overall, emerging marine industries exhibited considerable resilience to the economic downturn, with relatively steady growth rates in turnover between 2010 and 2016. Similarly, employment within the emerging marine sectors has maintained relatively stable growth from 2010 to 2016.

Established Marine Industries

Established Marine Industries

Established marine industries refer to the traditional sectors that are usually associated with marine activity. Established marine industries had a turnover of €4.3 billion in 2014 and provided employment of 25,670 FTEs, representing 94% of the turnover and employment in Ireland's ocean economy. In 2016 the Established Marine Industries had an estimated turnover of €5.3 billion and provided estimated employment to 28,230 FTEs. The established industries include shipping and maritime transport, tourism and leisure in marine and coastal areas, international cruise, sea fisheries, marine aquaculture, seafood processing, oil and gas exploration and production, marine manufacturing, construction and engineering and marine retail services. The relative contribution of each of these sectors to the overall turnover, employment and GVA of the established marine industries are shown in Figure 3.

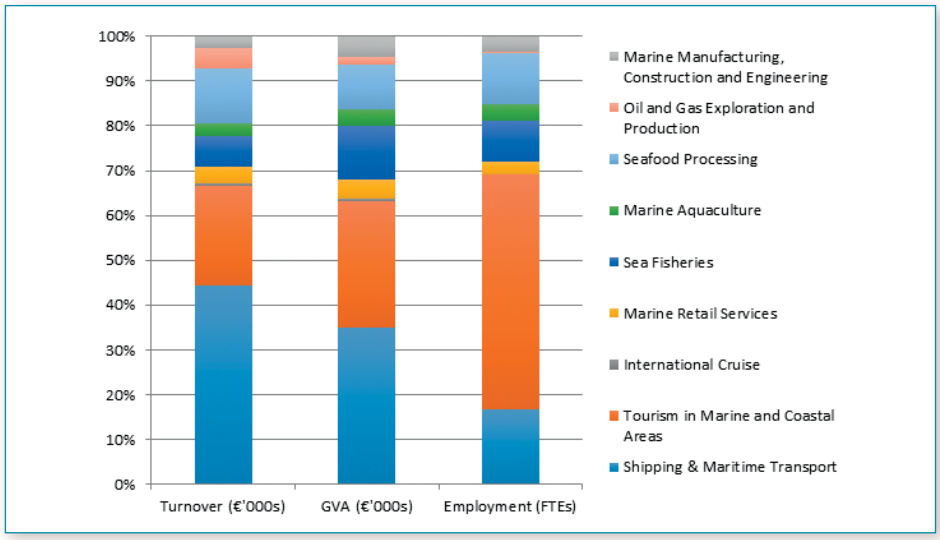


Figure 3: Relative contribution (%) of each subsector within the Established Irish Marine Industries to turnover, GVA and employment, 2014

The shipping and maritime transport sector was the largest contributor to established marine industries in terms of turnover, followed by tourism and leisure in marine and coastal areas, seafood processing, sea fisheries and oil and gas exploration and production, respectively.

Tourism and leisure in marine and coastal areas was the largest contributor to employment in the established marine industries, followed by shipping and maritime transport, seafood processing and sea fisheries, respectively.

In terms of GVA, again shipping and maritime transport is the largest contributor to Ireland's established marine industries, followed by tourism and leisure in marine and coastal areas, sea fisheries and seafood processing, respectively.

Figure 4 shows the rate of change in turnover, GVA and employment for the established industries in the 2014-2016 period. Oil and Gas exploration and production has experienced the largest increase in all three indicators, turnover, GVA and employment. This is due to the start of production in the Corrib gas field in December 2015, which has resulted in a large increase in the performance of this sector in 2016. Marine aquaculture and tourism and leisure in marine and coastal areas also show significant increases in economic activity in the 2014-2016 period. In contrast, Sea Fisheries shows a slight decline in turnover, which can be explained by the changes in quota for some of the key pelagic stocks. Details on economic trends by sector are presented in the following sections, as well as the economic projections out to 2016.

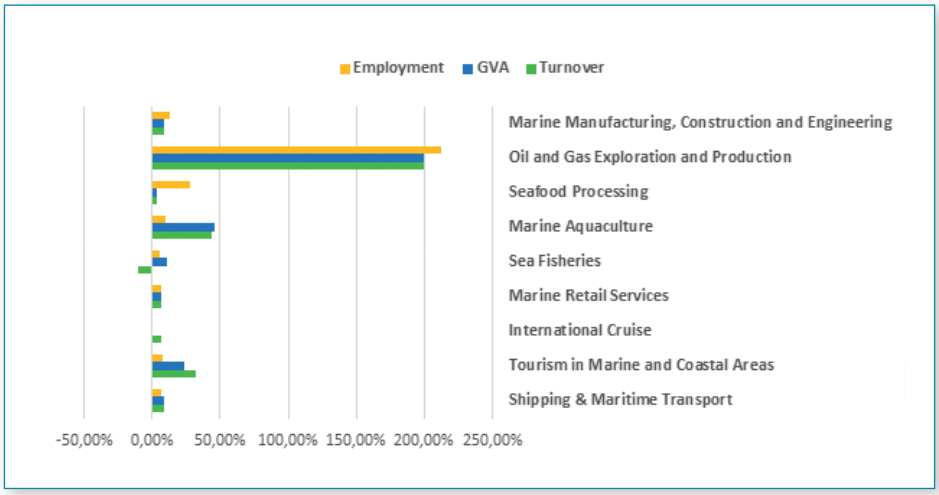


Figure 4: Rates of change (%) in turnover, GVA and employment. Established Industries, 2014-2016

Shipping and Maritime Transport

Sea-based transport accounts for 85% of the total volume and 56% of the total value[9] of the goods traded in Ireland in 2016[10]. The shipping and maritime transport sector has historically been the largest contributor to Ireland's ocean economy in terms of turnover and GVA. The sector comprises Irish sea-based transport operations for freight and passenger transport, as well as associated services, including those related to ship leasing.

As an island nation, shipping and maritime transport represents an essential part of the strategic infrastructure that allows the Irish economy to connect with the global market place. Table 10 shows the turnover, GVA, and employment for 2012, 2014 and 2016 as well as the % change between 2012 and 2014 and between 2014 and 2016. Figure 5 shows the trends for both turnover and employment between 2008 and 2016.

Profile

- Sea and coastal passenger water transport
- Sea and coastal freight water transport
- Services incidental to water transport
- Cargo handling
- Renting and leasing of water transport equipment
- Other transportation support activities

Table 10: Shipping and Maritime Transport turnover, GVA, employment, 2012, 2014 and 2016

Shipping and Maritime Transport	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	2,247,403	1,945,455	2,123,270	-13.4%	9.1%
GVA €000's	374,594	488,502	533,151	30.4%	9.1%
Employment FTEs	3,933	4,375	4,666	11.2%	6.7%
Location of activity	TThe majority of shipping and maritime operations and services occur around commercial ports along the coast of Ireland: Cork, Drogheda, Dublin, Waterford, Dundalk, Dun Laoghaire, Galway, New Ross, Shannon Foynes and Wicklow				

Source: CSO – Annual Services Inquiry (ASI), NACE Four-Digit Codes: 50.10, 50.20, 52.22, 52.24, 52.29, 77.34; IMDO iShip Index; CSO Quarterly National Household Survey 2015, 2016; Figures for 2015 and 2016 are estimates[11]

The turnover generated by shipping and maritime transport operations and services in 2014 was €1.94 million. Total GVA generated was €488.5 million. Turnover decreased between 2012 and 2014 by 13%, with a 30% increase in GVA in the same period. These figures reflect a significant increase in productivity in this sector, which may be due to increases in efficiency and market power as a result of the process of consolidation experienced in the container market over the last few years. Employment in shipping and maritime services was 4,375 FTEs in 2014, which shows an increase of 11.2% with respect to the previous reported period.

Estimates suggest that the turnover generated by the sector in 2016 was €2.1 million, representing an increase in activity of over 9% between 2014 and 2016. Total GVA also increased by 9% at €533.1 million in the same period, as well as employment with an increase of 6.7% to 4,666 FTEs.

9 44 million tonnes and €68 billion
10 CSO Trade Statistics – INTRASTAT, 2017
11 See Appendix for details on the methodology.

While still below 2009 activity levels, the sector in gradually recovering in terms of turnover and employment. Figure 5 shows the trends for both turnover and employment between 2008 and 2016.

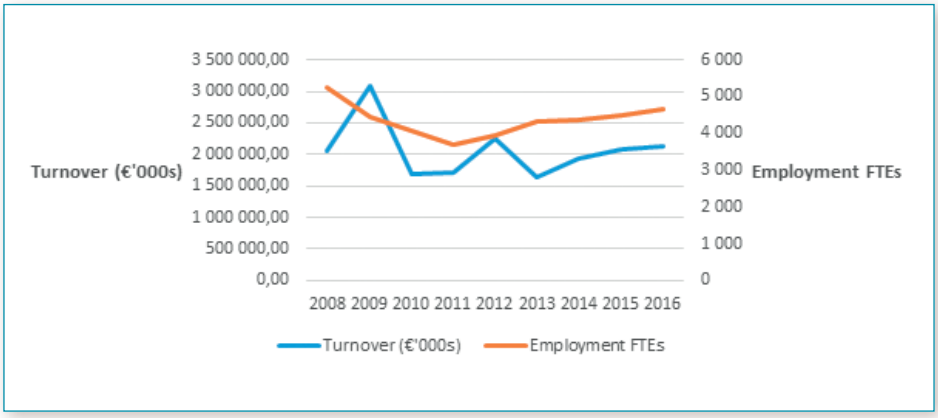


Figure 5: Shipping and Maritime Transport turnover and employment trends, 2008 – 2016

Source: CSO – Annual Services Inquiry (ASI), NACE Four-Digit Codes: 50.10, 50.20, 52.22, 52.24, 52.29, 77.34; IMDO iShip Index; CSO Quarterly National Household Survey 2015, 2016; Figures for 2015 and 2016 are estimates[12]

Overall fluctuations in the level of economic activity in the sector are mainly triggered by variations the services component associated with shipping and maritime transport operations. Figure 6 shows turnover and GVA trends by shipping and maritime transport operations and services in the 2008-2014 period

12 See Appendix 1 for details on the methodology.

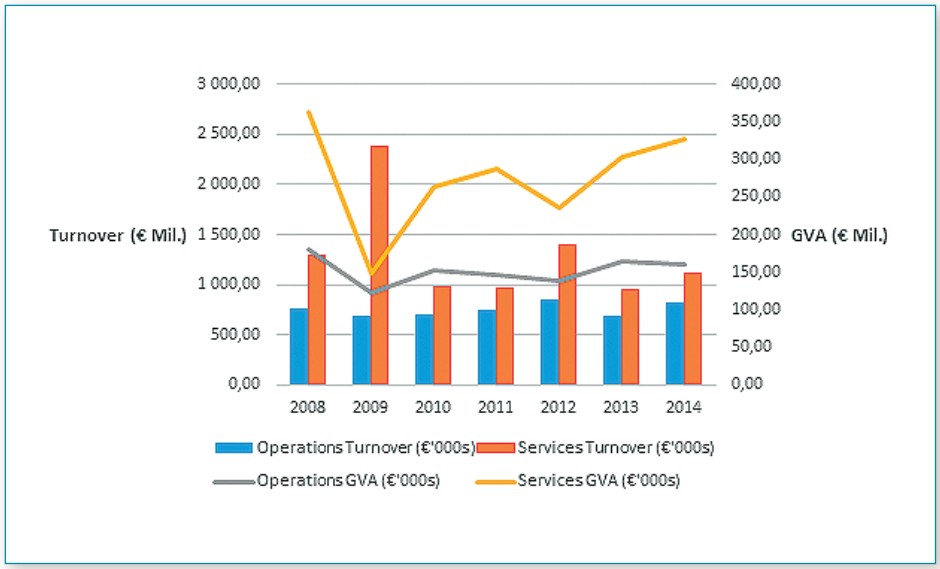


Figure 6: Shipping and Maritime Transport Operations and Services turnover and GVA trends, 2008 – 2014

According to the Irish Maritime Development Office (IMDO), total port traffic increased by 2% in 2016, its highest level since 2007. While this is undoubtedly a positive outcome and a reflection of the healthy economic environment that Ireland is experiencing, concerns have been raised about the impact of Brexit on the maritime industry. The possibility of the re-introduction of border and customs controls brings uncertainty regarding the operational consequences of increased transit times and potential delays at Irish ports, for both freight and passenger transport. This could be particularly relevant in the case of the UK landbridge route, which is currently the most reliable and frequently used route for freight traffic between Ireland and continental Europe.

Tourism and Leisure in Marine and Coastal Areas

Tourism and leisure in marine and coastal areas[13] is a large contributor to Ireland's ocean economy and has historically been an important sector for the Irish coastal economy. The sector is the largest sector by employment and by enterprise in the ocean economy and is also comprised of the largest number of separate NACE coded industry classifications. The tourism industry contributed an estimated €7.5 billion in 2015 to the Irish economy and overseas tourist visits to Ireland in 2015 grew by 13.1% (8 million visitors) relative to 2014[14]. Tourism and travel data from the CSO indicated that there were 9.6 million overseas visitors to Ireland in 2016 - an increase of 11% on 2015[15]. Excluding coastal accommodation, an estimated 260 enterprises are also involved in the delivery of marine leisure activities around the coast of Ireland.

Demand for marine-based leisure comes from both domestic and overseas visitors. An estimated 127,000 people go sea angling every year along Ireland's 5,600 kilometres of coastline and recent research has demonstrated that sea anglers in Ireland derive considerable utility from this recreational activity[16]. Adventure tourism, which includes marine activities such as surfing, windsurfing, kite surfing, sailing and sea kayaking, also has a strong domestic market. Coastal attractions, such as the Cliffs of Moher and Dun Aengus fort on the Aran Islands also receive high numbers of international visitors. Indeed, the Cliffs of Moher Visitor Experience, was ranked the second most popular tourist attraction in the country in 2016, recording 1.4m visitors and a 14pc increase on the previous year's figures. Table 11 shows the turnover, GVA, and employment for 2012, 2014 and 2016 as well as the % change between 2012 and 2014 and between 2014 and 2016. Figure 7 shows the trends for both turnover and employment between 2008 and 2016.

Profile

Watersports

- Sailing at sea
- Boating at sea
- Water skiing / Jet skiing
- Surfing, sail boarding
- Sea kayaking
- Scuba diving / snorkelling
- Other sea sports

Seaside / Resort Trips

- Swimming in the sea
- Bird watching in coastal areas
- Whale/dolphin watching
- Visiting coastal natural reserves
- Other trips to the beach seaside and islands
- Coastal accommodation

Angling

- Sea angling from boats
- Sea angling from the shore

Table 11: Tourism and Leisure in Marine and Coastal Areas; turnover, GVA, employment, 2012, 2014 and 2016

Tourism	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €'000	775,745.40	984,580.28	1,304,287.92	26%	32%
GVA €000's	329,923.77	396,528.85	489,645.64	20%	23%
Employment FTEs	13,003	13,865	14,891	7%	7%
Location of activity	Tourism and leisure in marine and coastal areas are offered all along the coast of Ireland				

Source: Source: CSO – Annual Service Inquiry (ASI); NACE Four-Digit Code: 5510, 5520, 5530, 9312, 9319, 9321, 9329; Fáilte Ireland statistics.

13 For the purpose of this study, tourism is defined as tourism in coastal areas. Coastal areas are defined as municipalities (LAU-2) that either border on the sea or have 50% of their surface within a distance of 10 km from the sea).

14 Fáilte Ireland Tourism Facts, 2015

15 CSO Overseas Travel. Available at http://pdf.cso.ie/www/pdf/20170525082428_Overseas_Travel_February__April_2017_full.pdf

16 Hynes, S., Gaeven, R. and O'Reilly, P. (2017). Estimating a Total Demand Function for Sea Angling Pursuits. Ecological Economics, 134, 73–81.

The turnover generated by tourism and leisure in marine and coastal areas in 2016 is estimated to be €1304 million and the total GVA generated was €490 million. Following the decrease in GVA in the sector from 2008 through to 2010 there has been a steady increase in both GVA and turnover since 2011. The decrease in activity in the 2008 to 2010 period reflected the general downturn in the global economy following the financial crisis. The 51% increase in turnover between 2011 and 2016 reflects an improvement in the state of the global economy but also the success of such Fáilte Ireland initiatives such as the Wild Atlantic Way and the Gathering Initiatives; the latter aimed at attracting the diaspora to visit Ireland in 2013. Employment in marine tourism and leisure was 5,195 FTEs in 2014, which shows an increase of 6.6% with respect to 2012.

The turnover generated by the sector in 2014 was €984 million, representing an increase in activity of 11% between 2012 and 2014. Estimated GVA increased to €286 million in the same period, while employment also increased to 5,952 FTEs, an increase of 15%.

Overall, the turnover and employment trends shown in Figure 7 indicates a turning point in marine tourism activity in 2012, with a clear recovery in years 2013-2016.

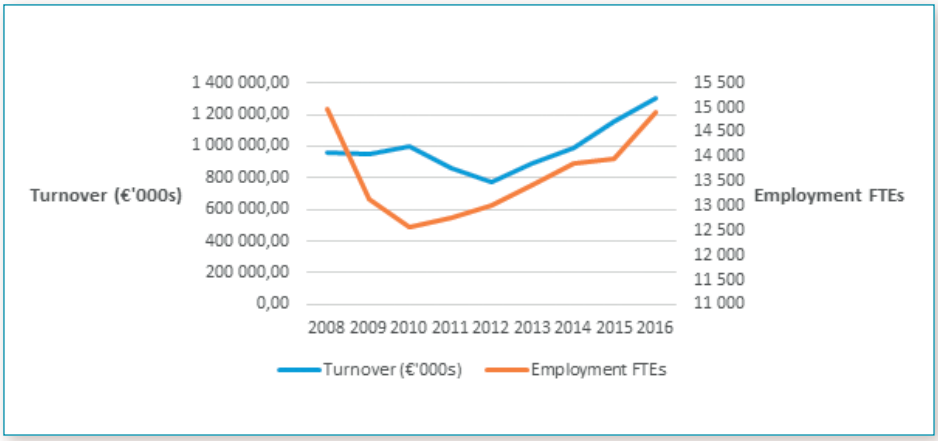


Figure 7: Tourism and Leisure in Marine and Coastal Areas; turnover and employment trends, 2008 – 2016

Source: CSO – Census of Industrial Production (CIP) NACE Four-Digit Code: 5510, 5520, 5530, 9312, 9319, 9321, 9329. Fáilte Ireland statistics.

According to the CSO, in the period November 2016 – January 2017, the total number of trips to Ireland increased by 7.2% to 1,871,100 - an overall increase of 126,400 compared to the same period twelve months earlier[17]. Tourism Ireland has reported that industry sentiment within Ireland and among overseas trade partners is 'cautiously positive overall' for the 2017 season[18]. Tourism Ireland does warn however that a decline in air access to Ireland for the summer of 2017 from Britain of 4% and the decline in sterling (which continues with political and Brexit uncertainty) has made trips to Ireland more expensive for British visitors to Ireland; and economic uncertainty is making British travellers more cautious about discretionary spending. This is a concern given that British visitors to Ireland are the second most frequent following visitors from mainland Europe.

17 CSO Statistical Release, February 2017: Overseas Travel, November 2016– January 2017
18 Tourism Ireland, Situation and Outlook Analysis Report, May 2017

International Cruise Industry

In 2015, cruise industry direct expenditures grew by 1.5% from 2014 to €16.89 billion[19] . Growth of the industry over the past decade has increased demand for additional destinations for cruise line operators, and Ireland continues to capitalise on this with its strong tourist product in close proximity to its main ports of call. Table 12 shows the total expenditure by disembarking cruise passengers at Irish ports and GVA for 2012, 2014 and 2016 as well as the percentage change in the 2012-2014 and 2012-2014 periods. Figure 8 shows the number of passenger and cruise ship visits to Irish ports from 2009 to 2014.

Profile

The main ports of call for cruise liners include:

- Dublin
- Cork
- Waterford
- Dun Laoghaire

Table 12: International Cruise passengers, calls, expenditure, GVA, 2012, 2014 and 2016

International Cruise Industry	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Average passengers per port call	1,357	1,525	1,614	12%	6%
Number of calls Irish ports	229	200	274	-12%	4%
Total expenditure by disembarking cruise passengers €000's	20,829	24,296	25,937	17%	7%
Estimated Gross Value Added €000's	8,859	9,785	9,765	10%	0%

Source: IMDO - The Irish Maritime Transport Economist

There was a total of 274 visits by liners at Irish ports in 2016, which represents an increase of 6% on 2014 figures. The total expenditure by disembarking cruise passenger was €25.94 million in 2016, representing a 7% increase with respect to 2014.

Estimates suggest that the gross value added from cruise tourism expenditure generated by the sector in 2016 was €9.7 million, which represents no change with respect to GVA recorded for 2014. The average number of passengers per port call in the same period rose to 1,614, an increase of 6% on 2014 numbers although slightly down on 2015 figures where the average number of passengers per vessel was a record high of 1,816. This was mainly due to a number of larger international liners visiting Irish ports in that year.

19 CLIA, "The Cruise Industry: Contribution of Cruise Tourism to the Economies of Europe", 2016. Note this direct expenditure figure includes spending for the construction of new cruise ships and the maintenance and refurbishment of existing ships with European shipyards.

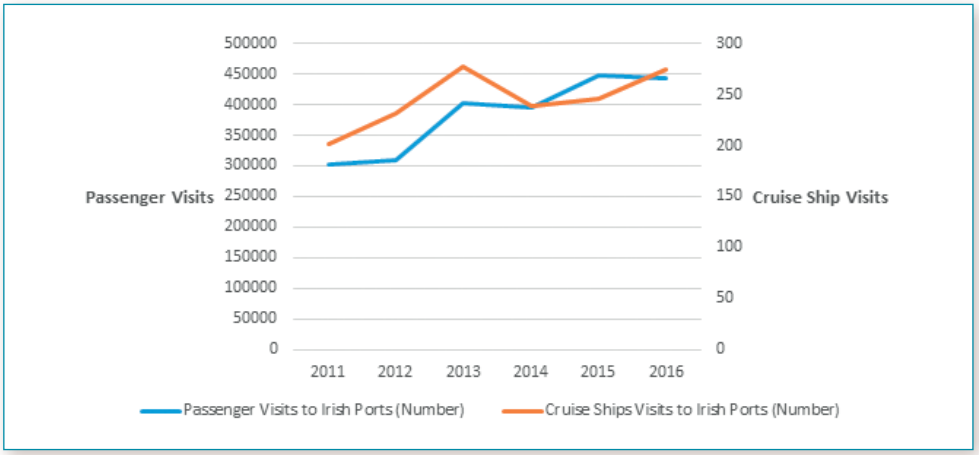


Figure 8: Passenger and Cruise Ship visits to Irish Ports (Number) 2011 – 2016

Source: IMDO

The international cruise industry remains the fastest growing travel sector in the world and strong growth is continuing to be projected for the global cruise industry in the coming years[20]. The Cruise Lines International Association (CLIA) estimate that 25.8 million passengers will partake in a cruise in 2017. With an estimated total (direct and indirect) economic contribution to the EU of €41 billion in 2015, the cruise industry is seen as a driving force for coastal economies in Europe. This figure represents an increase of 2% compared to 2014[21]. Irish ports continued to capitalise on the rise in cruise tourism in the last decade and cruise ship calls to Irish ports rose to 274 in 2016 . As seen in Figure 8 this is the highest number of calls since 2013. This upwards trend is expected to continue in the coming years with ports such as Dublin and Galway planning to expand their capacity to handle increased cruise traffic.

20 Cruise Lines International Association (CLIA), 2017. State of the Cruise Industry Outlook 2017

21 Tourism Review. http://www.tourism-review.com/cruise-tourism-in-europe-recorded-growth-news5215

Marine Retail Services

Marine Retail Services are comprised of small and medium sized enterprises involved in retail activities including the sale of marine equipment, boat sales, chandlery, and the retail of seafood in fishmonger shops. Table 13 shows the turnover, GVA, and employment for 2012, 2014 and 2016 (estimated) as well as the % change for each period. Figure 9 shows the trends for both turnover and employment over the 2008-2016 period.

Profile

- Chandlery
- Boat sales
- Marine equipment sales
- Retail of seafood in fishmonger specialised stores

Table 13: Marine Retail Services turnover, GVA, employment, 2012, 2014 and 2016

Marine Retail Services	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	119,230	152,626	162,384.17	28%	6%
GVA €000's	34,559	60,050	63,889.16	73%	6%
Employment FTEs	590	743	790	26%	6%
Location of activity	Marine Retail Services are located throughout Ireland, both along the coast and inland, (the boat sales and seafood retail categories particularly relates to the latter). The majority of the technology-related marine service companies are located within the larger cities, primarily Galway, Cork and Dublinlin				

Source: SEMRU Company Survey, CSO – Annual Services Inquiry (ASI) NACE Four-Digit Code 47.23; CSO – Retail Services Inquiry; CSO – National Household Survey; Figures for turnover and GVA for 2016 are estimates.

The turnover generated by marine retail services in 2014 was €152 million. Total GVA generated was €60 million. Turnover increased between 2012 and 2014 by 28%, with a 73% increase in GVA in the same period. Employment in marine retail services was 743 FTES in 2014, which shows an increase of 26% with respect to the previous reporting period. Estimates suggest that the turnover generated by the sector in 2016 was €162 million, representing again an increase in activity of 6% between 2014 and 2016. Estimated GVA and employment increased again by approximately 6% to €64 million and 790 FTEs respectively in the same period.

Figure 9 shows the trends in turnover and employment over the 2012-2016 period. After a strong recovery from the low levels of activity experienced in 2010, the sector shows positive trends since 2013, in particular in terms of employment numbers, with strong growth in 2013 with respect to the previous period.

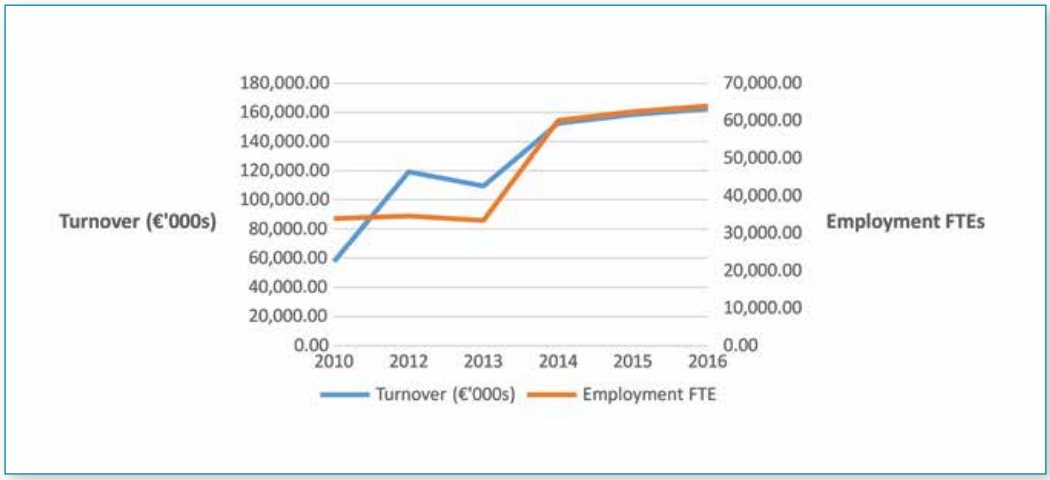


Figure 9: Marine Retail Services turnover and employment trends, 2010 and 2012-2016

Source: SEMRU Company Survey, CSO – Annual Services Inquiry (ASI) NACE Four-Digit Code 47.23; CSO – Retail Services Inquiry; CSO – National Household Survey; Figures for turnover and GVA for 2016 are estimates.

In general the marine retail sector is subject to similar challenges and opportunities as the overall retail sector in Ireland. Following the economic downturn, the retail sector is gradually recovering with an estimated increase in retail sales of 12% between 2014 and 2016[22]. This trend is set to continue in 2017 with key indicators pointing to further improvements in the sector. According to IBEC, disposable income grew by 3% last year as a result of sustained employment and wage growth. This had a positive impact on consumer spending, which grew by 3% in 2016 with respect to the previous period[23].

22 CSO Retail Sales Index, 2014-2016
23 IBEC Quarterly Economic Outlook, Q1 2017.

Sea Fisheries

According to the latest EU economic report on the EU fishing fleet (STECF 16-11), the Irish fishing fleet comprised 2,095 vessels in 2014. This includes an estimated 898 active vessel in the small scale fleet (vessels under 12 metres using passive gears) and an estimated 445 active vessel belonging to the large scale fleet. The fleet had a combined gross tonnage of 59.5 thousand GT, a total power of 182 thousand kW in 2014[24]. The number of vessels increased by 2% (or 44 vessels) between 2013 and 2014, with the total engine power decreasing by a similar margin during the same period. The over 10 metre fishing fleet spent a total of around 54,400 days at sea in 2014. Table 14 shows the turnover, GVA, and employment for 2012, 2014 and 2016 as well as the % change between 2012 and 2014 and between 2014 and 2016. Figure 10 shows the trends for both turnover and employment over the period 2008 to 2016.

Profile

Fishing Segments

- Pelagic
- Polyvalent
- Beam-trawl
- Specific

- Fin Fish
- Mackerel
- Herring
- Horse Mackerel
- Blue Whiting
- Monkfish
- Megrim

- Main Target Species
- Haddock
- Whiting
- Cod
- Sole
- Plaice

- Shellfish
- Lobster
- Dublin Bay prawns
- Mussels
- Scallops
- Razor Clams

Table 14: Sea Fisheries turnover, GVA, employment, 2012, 2014 and 2016

Sea Fisheries	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	268,900	311,900	279,800	15%	-10%
GVA €000's	142,600	168,100	187,000	18%	11%
Employment FTEs	2709	2,395	2,536	-11.50%	6%
Location of activity	Fishing communities are distributed around the coast of Ireland, centred particularly on the fishing harbours of Killybegs (Co. Donegal), Ros an Mhil (Co. Galway), An Daingean (Co. Kerry), Castletownbere (Co. Cork), Dunmore East (Co. Waterford) and Howth (Co. Dublin).				

Source: Bord Iascaigh Mhara (BIM); Scientific, Technical and Economic Committee for Fisheries (STECF) – The Annual Economic Report on the EU Fishing Fleet, 2016

The turnover generated by the sea fisheries sector in 2016 was €280 million. Total GVA generated was €187 million. Turnover increased between 2012 and 2014 by 15%, with an 18% increase in GVA in the same period. Turnover however decreased by 10% over the period 2014 and 2016. This sea sawing in turnover value can mainly be explained by the changes in quota for some of the key pelagic stocks. In particular, Atlantic mackerel quota saw a 13% increase between 2013 and 2014 only to be reduced by 14 thousand tonnes between 2014 and 2015 with a further reduction again in 2016. Decreases in oil prices have allowed for cost saving and thus increased profitability of the Irish national fleet, allowing for an increase in GVA between 2014 and 2016. Employment in the sea fisheries sector was 2,536 FTEs in 2016, which shows an increase of 6% with respect to 2014.

24 The 2016 Annual Economic Report on the EU Fishing Fleet (STECF 16-11)

Estimates suggest that the turnover generated by the sector in 2014 was €311 million, representing an increase in activity of 15% between 2012 and 2014. Estimated GVA increased by 18% to €168 million in the same period, while employment increased to 2,395 FTEs, a decrease of 11.5% (See Table 14).

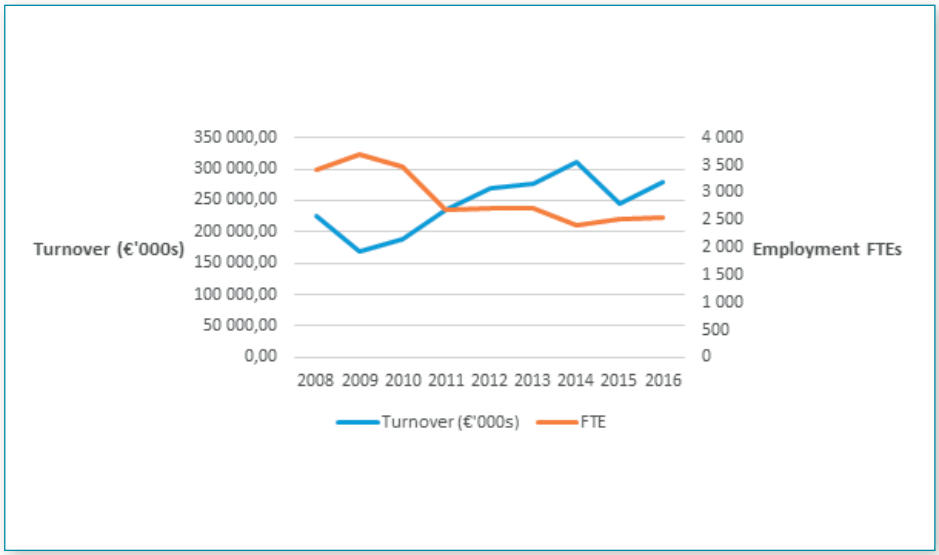


Figure 10: Sea Fisheries turnover and employment trends, 2008 – 2016

Source: Bord Iascaigh Mhara (BIM); Scientific, Technical and Economic Committee for Fisheries (STECF) – The Annual Economic Report on the EU Fishing Fleet, 2016

While a larger allocated quota for 2017 should see further growth in the sector concerns remain in relation to a number of potential obstacles to further development. With 40 stocks shared with Britain and fears in the industry in relation to changes in the shares of quota, trade barriers and access to British fishing grounds (in particular for mackerel and nephrops) after Brexit the impacts on the future economic return from the Irish fishing fleet is uncertain. There are also concerns in relation to how the proposed discard ban, due to come into force for the Irish fleet in early 2019, will be operationalised with the worry being that it could have negative consequences for the ability of the Irish fleet to catch their share of quota and knock on consequences for coastal fishing communities

Marine Aquaculture

Ireland produced 44,000 tonnes of farmed product in total in 2016 with 290 enterprises engaged in the sector, of which the majority are engaged in shellfish aquaculture (mainly gigas oysters and mussels that combined produced 25,800 tonnes of produce in 2016), whilst farmed salmon accounted for 16,300 tonnes of production[25]. Table 15 shows the turnover, GVA, and employment for 2012, 2014 and 2016 as well as the % change between 2012 and 2014 and between 2014 and 2016. Figure 11 shows the trends for both turnover and employment over the 2008-2016 period.

Profile

Fin Fish

- Salmon
- Seawater Trout
- Arctic Char
- Cod

Shell Fish

- Rope Mussels
- Bottom Mussels
- Gigas Oysters
- Edulis Oysters
- Clams
- Scallops
- Abalone
- Sea Urchins

Table 15: Marine Aquaculture turnover, GVA, employment, 2012, 2014 and 2016

Marine Aquaculture	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's3	130,300	116,299	167,990	-11%	44%
GVA €000's	60,600	49,163	71,533	-19%	45%
Employment FTEs	956	941	1,048	-1.60%	11%
Location of activity	Shellfish aquaculture activities are widely distributed across the coast of Ireland, with particular concentrations in Co. Donegal, Connemara, Co. Galway, West Cork, Co. Waterford, Co. Wexford, and Carlingford Lough, Co. Louth. Finfish aquaculture is mainly restricted to the Western seaboard in counties Donegal, Mayo, Galway, Kerry and Cork.				

Source: Scientific, Technical and Economic Committee for Fisheries (STECF) Economic Report of EU aquaculture sector (STECF-16-19); Bord Iascaigh Mhara (BIM) Aquaculture survey; BIM data on behalf of the JRC (European Joint Research Centre).

The turnover generated by marine aquaculture in 2016 was €130 million. Total GVA generated was €61 million. Turnover increased between 2014 and 2016 by 44%, with a similar 45% increase in GVA in the same period. Employment in the aquaculture sector was 1,048 FTEs in 2016, which shows an increase of 11% with respect to 2014. As can be seen from Table 15, the value of the sector in terms of turnover and GVA fell between 2012 and 2014. While production of aquaculture has increased significantly both in terms of value and volume since 2015, the output of the sector is still well below historical highs for the sector and lags behind international counterparts such as Norway and Scotland.

With this in mind, the National Strategic Plan for Sustainable Aquaculture Development (NSPSAD) has set a target that the volume of aquaculture production be increased to approximately 82,000 tonnes per annum by the year 2023. Recent research examining the potential macroeconomic and employment impacts of an increase in aquaculture output in line with the NSPSAD targets indicated that the planned increase in aquaculture production could increase output by approximately €243 million per annum with the creation of over 1,500 jobs in the wider Irish economy[26].

25 2017, BIM, Annual Aquaculture Survey, available at: http://www.bim.ie/media/bim/content/publications/aquaculture/BIM-Annual-Aquaculture-Survey-2017.pdf

26 Grealis, E., Hynes, S., O'Donoghue, C. Vega, A., van Osch, S. and Towmey, C. (2017). The economic impact of aquaculture expansion: An input-output approach, Marine Policy, 81, 29–36.

If these targets are to be achieved, the aquaculture licencing system, which has proven to be a bottleneck for development of the sector, will need to be reformed. Indeed, an independent review of the aquaculture licence process and associated legal framework carried out on behalf of the Minister for Agriculture, Food and Marine concluded "that a root-and-branch reform of the aquaculture licence application processes is necessary. The reform needs to be comprehensive in scope and focus both on immediate actions which can produce results in the short term as well as initiatives which will bear fruit in the longer term"[27]. Already, the growth in the sector in the 2014-2016 period can in part be attributed to the increased commitment by government to reduce the backlog in licensing applications.

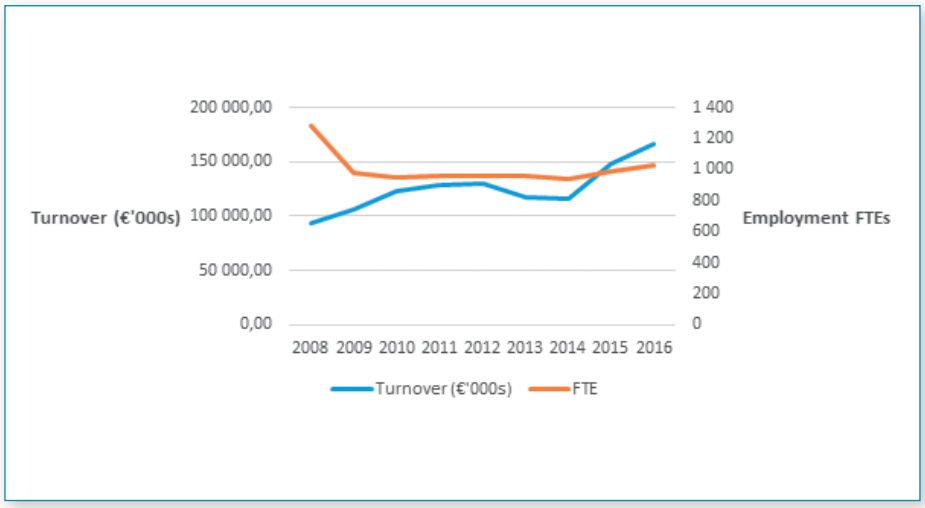


Figure 11: Marine Aquaculture turnover and employment trends, 2008 – 2016

Source: EU Scientific, Technical and Economic Committee for Fisheries (STECF) – The Economic Performance of the EU Aquaculture Sector; Bord Iascaigh Mhara (BIM); Figures for 2016 come from Bord Iascaigh Mhara (BIM) collated on behalf of the JRC (European Joint Research Centre) and from BIM Aquaculture survey

27 Independent Aquaculture Licensing Review Group (2017). Review of the Aquaculture Licensing Process http://www.fishingnet.ie/media/fishingnet/content/ReviewoftheAquacultureLicensingProcess310517.pdf

Seafood Processing

Ireland's seafood industry provides an important source of economic activity across Irish coastal areas. The main export markets are France, Spain, UK, Germany, Italy and Nigeria. The Irish seafood processing industry is comprised of mostly small enterprises with less than 10 employees. There are currently 161 companies engaged in the seafood processing sector in Ireland[28].

The industry is comprised of finfish, shellfish, smoked, pelagic and whitefish operators. Shellfish companies accounted for the largest number of fish processing companies in Ireland. However, many companies specialise in more than one species. Table 16 shows the turnover, GVA, and employment for 2012, 2014 and 2016 (estimated) as well as the % change in the 2012-2014 and 2014-2016 periods. Figure 12 shows the trends for turnover and employment over the 2008-2016 period.

Profile

- Preparation and preservation of fish, crustaceans and molluscs
- Production of fish, crustacean and mollusc products
- Production of fishmeal for human consumption or animal feed
- Production of meals and solubles from fish and other aquatic animals unfit for human consumption
- Activities of vessels engaged only in the processing and preserving of fish
- Processing of seaweed

Table 16: Seafood Processing turnover, GVA, employment, 2012, 2014 and 2016

Seafood Processing	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	535,488	517,050.00	537,111.54	-3%	4%
GVA €000's	126,711	135,211.00	140,457.19	7%	4%
Employment FTEs	2174	2,360	3,029	9%	28%
Location of activity	The sector is concentrated in the coastal regions of Donegal, Mayo, Cork, Kerry, Galway and the South East				

Source: CSO – Census of Industrial Production (CIP) REV 2: NACE Four-Digit Code: 10.20; Bord Bia Export Performance 2017; BIM Business of Seafood, 2017; Figures for 2015 and 2016 are estimates[29]

The turnover generated by seafood processing in 2014 was €517 million. Total GVA generated was €135 million. Turnover decreased between 2012 and 2014 by 3%, with a 7% increase in GVA in the same period. Employment in the seafood processing sector was 2,360 FTEs in 2014, which shows an increase of 9% with respect to the previous reporting period.

Estimates suggest that the turnover generated by the sector in 2016 was €537 million, representing an increase in activity of 4% between 2014 and 2016. Estimated GVA increased by 4% as well to €140.5 million in the same period, while employment increased to 3,029 FTEs, which represents an increase of 28% as shown in Table 16.

28 BIM (2016) The Business of Seafood.
29 See Appendix for details on the methodology

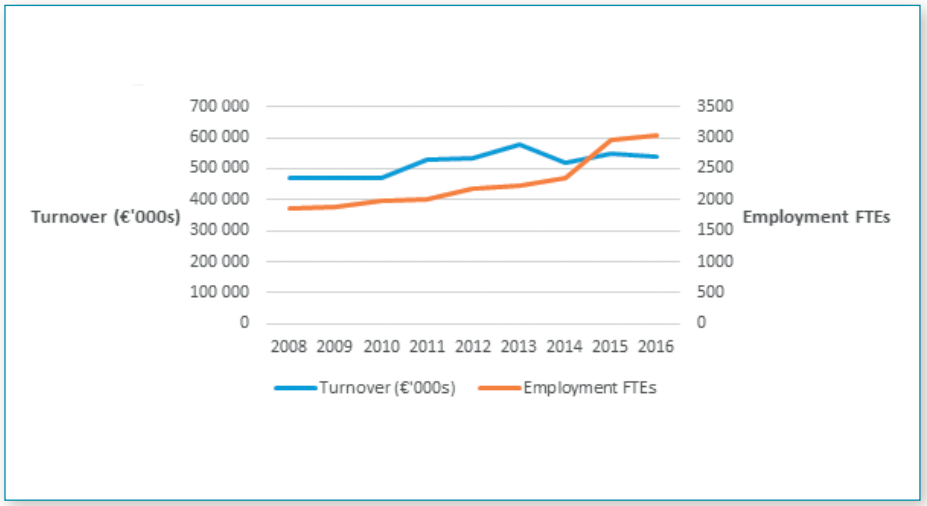


Figure 12: Seafood processing turnover and employment trends, 2008-2016

Source: CSO – Census of Industrial Production (CIP) 2012 – REV 1: NACE Four-Digit Code: 15.02; REV 2: NACE Four-Digit Code: 10.20; Bord Bia Export Performance and Prospects 2014-2015; Figures for 2013 and 2014 are estimates (e)[30]

Recent reports from BIM state that seafood continues experiencing a strong growth out of all proteins in Irish total groceries with a 2.7% increase in value recorded in 2016 with respect to the previous year. EU export markets continue to dominate seafood exports in 2016, accounting for around 65% of total export values. While export values to African markets have experienced a drop of 10% compared to 2015, efforts to develop business in emerging Asian markets (China, Hong Kong, South Korea and Japan) are proving successful in diversifying seafood exports with increases of around 12% in value in 2016

30 See Appendix 1 for details on the methodology.

Oil and Gas Exploration and Production

The offshore oil and gas sector in Ireland continues to have significant potential. There have been four commercial discoveries in Ireland to date and all four of them were gas, including Kinsale (1971); Ballycotton (1989); Seven Heads (1973) and Corrib (1996)[31]. Over the last 40 years, 129 exploration wells have been drilled with limited success making the probability of a commercial discovery in Ireland low[32]. No commercial oil production in Ireland has been achieved to date. Table 17 shows the turnover, GVA, and employment for 2012, 2014 and 2016 (estimated) as well as the % change in each for the 2012-2014 and 2014-2016 periods. Figure 13 shows the trends for both turnover and employment over the 2008-2016 period.

Profile

- Extraction of crude petroleum
- Extraction of natural gas
- Support activities and natural gas extraction, including exploration services

Table 17: Oil and Gas Exploration and Production, GVA, employment, 2012, 2014, and 2016

Oil and Gas Exploration and Production	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	229,882.31	199,644.65	597,281.86	-13%	199%
GVA €000's	27,894.41	23,957.358	71,673.823	-14%	199%
Employment FTEs	85	90	265	1%	212%
Location of activity	The sector is concentrated in the coastal regions of Donegal, Mayo, Cork, Kerry, Galway and the South East				

Source: CSO - Census of Industrial Production REV 2: NACE Four Digit Codes: 06.10, 06.20, 09.10; SEMRU Company Survey; Petroleum Affairs Division, Department of Communications, Energy and Natural Resources; Figures for 2015 and 2016 are estimates[33]

The turnover generated by the oil and gas exploration and production sector in 2014 was €200 million. Total GVA generated was €24 million. Turnover decreased between 2012 and 2014 by 13%, with a further 14% decrease in GVA in the same period. Employment in the sector was 90 FTEs in 2014, which shows an increase of 1% with respect to the previous period.

Following the grant of consent by the Minister for Communications, Energy and Natural Resources to the Corrib partners to operate the Corrib gas pipeline, production of gas commenced from the Corrib gas field at the end of December 2015. This development has had a significant impact on the overall economic value of the oil and gas sector in Ireland as shown in Table 17 and Figure 13. Estimates suggest that the turnover generated by the sector in 2016 was nearly €600 million, representing an increase in activity of 200% between 2014 and 2016[34]. Table17 shows that estimated GVA also increased to €71 million in the same period, while employment increased to 265 FTEs, an increase of 212%. It is estimated that Corrib will have an operating life span of between 15 to 20 years and gas production will meet on average 42% of all island gas demand over the first two years of operation, declining thereafter[35].

31 PwC Report 2013, 'Making the most of our natural resources: Oil and gas exploration in Ireland'
32 Government of Ireland, Inter-Departmental Marine Coordination Group (MCG), "Harnessing Our Ocean Wealth – An Integrated Marine Plan (IMP) for Ireland", July 2012, Briefing Document Part II: Sectoral Briefs
33 See Appendix for details on the methodology
34 Vermilion energy annual report, 2017
35 Department of Communications, Energy and Natural Resources, 2017.

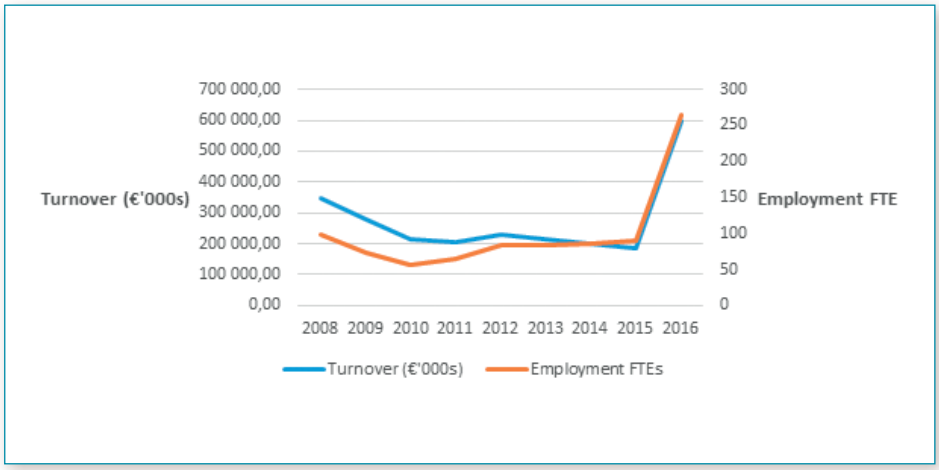


Figure 13: Oil and Gas Exploration and Production turnover and employment trends, 2008-2016

Source: CSO - Census of Industrial Production REV 2: NACE Four Digit Codes: 06.10, 06.20, 09.10; SEMRU Company Survey; Petroleum Affairs Division, Department of Communications, Energy and Natural Resources; Figures for 2015 and 2016 are estimates [36]

36 See Appendix for details on the methodology.

Marine Manufacturing, Construction and Engineering

The majority of Marine Manufacturing, Construction and Engineering companies are small and medium sized enterprises (SME's). Table 18 shows the turnover, GVA, and employment for 2012, 2014 and 2016 (estimated) as well as the % change in each for the 2012-2014 and 2014-2016 periods. Figure 14 shows the trends for both turnover and employment over the 2008-2016 period.

Profile

- Boat and Related Equipment Manufacturing
- Boat Manufacturing
- Boat and Ship Repair
- Net manufacturing
- Water Construction
- Marine Industrial Engineering
- Other Marine Manufacturing
- Marine Consultancy

Table 18: Marine Manufacturing, Construction and Engineering turnover, GVA, employment, 2012, 2014 and 2016

Marine Manufacturing	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	199,083	121,000	132,231	-39%	9%
GVA €000's	32,829	64,959	70,989	98%	9%
Employment FTEs	875	906	1,023	4%	13%
Location of activity	Companies involved in marine manufacturing are found throughout Ireland, both along the coast and inland. However there are clusters of particular marine product manufacturing to be found in certain areas, particularly in Co. Donegal (marine industrial engineering), and counties Galway and Cork (boat building). Companies involved in water construction are mainly located in the main urban centres around Ireland.				

Source: CSO – Census of Industrial Production; CSO – Building and Construction Inquiry; REV 2: NACE Four-Digit Codes: 30.11, 30.12, 33.15, 42.91; CSO – Industrial Turnover Index; CSO – National Household Survey; SEMRU Company Survey; Figures for 2015 and 2016 are estimates[37]

The turnover generated by marine manufacturing, construction and engineering in 2014 was €121 million. Total GVA generated was €65 million. Turnover decreased between 2012 and 2014 by 39%, with a 98% increase in GVA in the same period, which is consistent with trends in general marine manufacturing. Employment in the sector was 906 FTEs in 2014, which shows an increase of 4% with respect to the previous reporting period.

Estimates in Table 18 suggest that the turnover generated by the sector in 2016 was €132 million, representing an increase in activity of 9% between 2014 and 2016. Similarly, estimated GVA increased by 9% to €71 million in the same period, while employment increased by 13% to 1,023 FTEs.

37 See Appendix for details on the methodology.

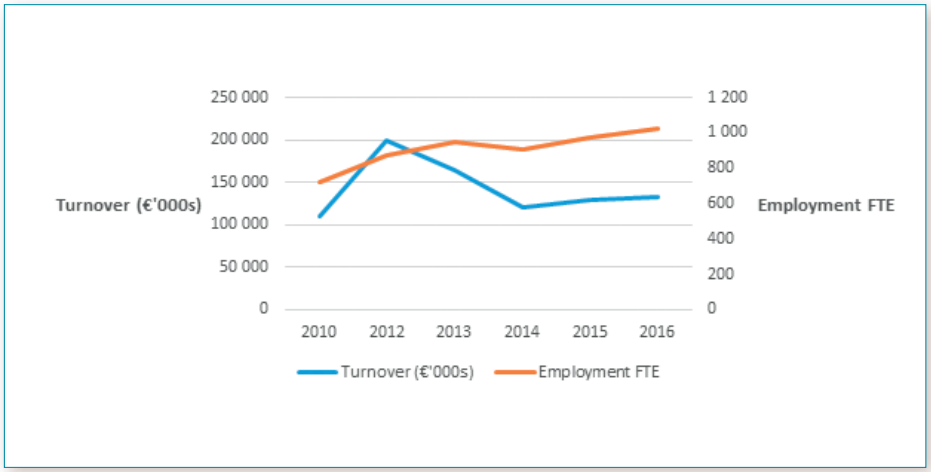


Figure 14: Marine Manufacturing, Construction and Engineering turnover and employment trends, 2008-2016

Source: : CSO – Census of Industrial Production; CSO – Building and Construction Inquiry; REV 2: NACE Four-Digit Codes: 30.11, 30.12, 33.15, 42.91; CSO – Industrial Turnover Index; CSO – National Household Survey; SEMRU Company Survey; Figures for 2015 and 2016 are estimates[38]

According to the SEMRU survey of marine enterprises, the outlook for the sector is generally positive for 2017. The sector has experienced some challenges in 2013 and 2014 as shown in Figure 14, but growth is starting to resume with increases in turnover and GVA in the 2014-2016 period.

38 See Appendix for details on the methodology.

Emerging Marine Industries

Emerging Marine Industries

The Emerging Marine Industries in 2014 had a turnover of €275 million and provided employment to 1,720 FTEs. It represents 6% of the turnover and the employment in Ireland's ocean economy. In 2016 the Emerging Marine Industries had an estimated turnover of €383 million and provided estimated employment to 1,945 FTEs. Emerging industries refer to those that are still at a relatively early stage of development or growth, are R&D intensive and/or use the latest cutting edge technology in their pursuit of economic growth. Ireland's ocean economy includes a number of emerging marine industries with untapped potential.

The Emerging Marine industries have significant potential for growth and development in the future.

Emerging marine sectors identified and profiled below include:

- Marine Commerce
- Advanced Marine Technology Products and Services
- Marine Biotechnology and Bio-products
- Marine Renewable Energy

Figure 15 shows the relative contribution of each of these sectors to the overall turnover, employment and GVA of the emerging marine industries. Amongst the emerging industries, marine commerce was the largest contributor of turnover to the ocean economy in 2014 and 2016, followed by marine advanced technology products and services.

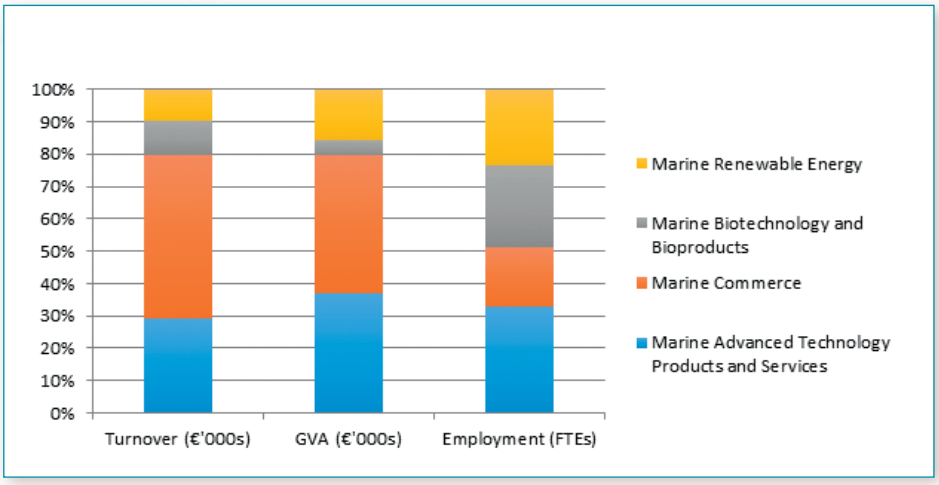


Figure 15: Relative contribution (%) of each sector within emerging marine industries to turnover, GVA and employment, 2014

In terms of GVA, marine commerce was once again the largest contributor in 2014 and 2016 from the emerging industries, followed by the marine advanced technology products and services sector and the marine renewable energy sector, respectively.

The marine advanced technology products and services sector was the largest contributor to employment in the emerging industries in 2014, followed by biotechnology and bio-products and marine renewable energy, respectively.

Figure 16 shows the rate of change in turnover, GVA and employment for the emerging industries in the 2014-2016 period. Marine biotechnology and bio-products shows the largest % increase in GVA, followed by Marine renewable energy, which also experienced the largest % increase in turnover in the same period. Details on economic trends by sector are presented in the following sections for 2010 and from 2012 to 2016

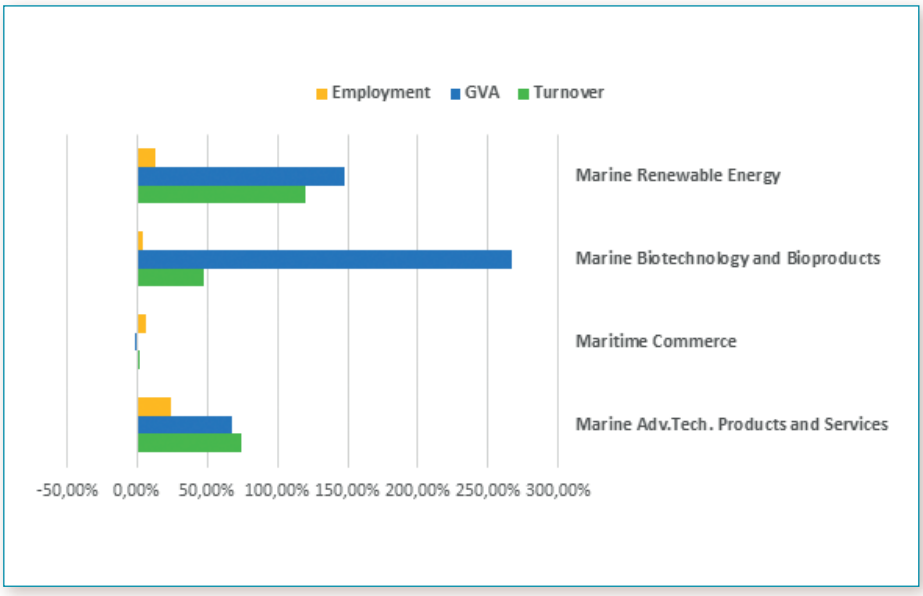


Figure 16: Rates of change (%) in turnover, GVA and employment. Emerging Industries, 2014-2016

Advanced Marine Technology Products and Services

The advanced marine technology products and services sector builds on Ireland's existing marine information and communication technology (ICT), science and engineering base developing new knowledge based products and services for global marine markets. It is an emerging sector consisting of over 150 small and medium sized enterprises (SMEs) and a number of multinational companies (MNCs) with core capabilities in diverse areas such as advanced sensing and communications, data management and informatics, marine robotics and artificial intelligence and materials science. These technologies support activity in a number of marine sectors such as oil and gas, shipping and maritime transport, fisheries and aquaculture and maritime safety, security and surveillance. They also underpin development in emerging sectors such as marine renewable energy, marine environmental monitoring and resource management[39]. Table 19 shows the turnover, GVA and employment in 2012, 2014 and 2016 as well as the % change in each for the 2012-2014 and 2014-2016 periods. Figure 17 shows the trends for both turnover and employment over the 2010-2016 period.

Profile

- Aquaculture Technology
- Marine Instrumentation
- Sensors
- Geo-Informatics Services
- Yacht Design

Table 19: Advanced Marine Technology Products and Services turnover, GVA, employment, 2012, 2014, and 2016

Advanced Marine Technology Products and Services	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	71,276.90	80,067.18	139,680.75	12%	74%
GVA €000's	38,612.42	36,105.77	60,632.18	-6%	68%
Employment FTEs	420	561	695	33%	24%
Location of activity	350	391	420	7%	437
Location of activity	Technology companies are located across Ireland, both on the coast and inland. However, the majority of companies are located within the larger cities, primarily Galway, Cork and Dublin.				

Source: SEMRU Marine Enterprise Survey

The turnover generated by the advanced marine technology products and services in 2014 was €80 million, which represents a 12% increase with respect to the previous reporting period. Total GVA generated in 2014 was €36 million, representing a drop in activity of 6% in the same period.

39 Government of Ireland, Inter-Departmental Marine Coordination Group (MCG), "Harnessing Our Ocean Wealth - An Integrated Marine Plan (IMP) for Ireland," July 2012, Briefing Document Part II: Sectoral Briefs

Employment in the sector was 561 FTEs in 2014, which shows an increase of 33% in the 2012-2014 period.

Table 19 shows that the turnover generated by the sector in 2016 was €140 million, representing an increase in activity of 74% between 2014 and 2016. GVA also increased by 68% to €61 million in the same period, while employment increasing to 695 FTEs, an increase of 24%.

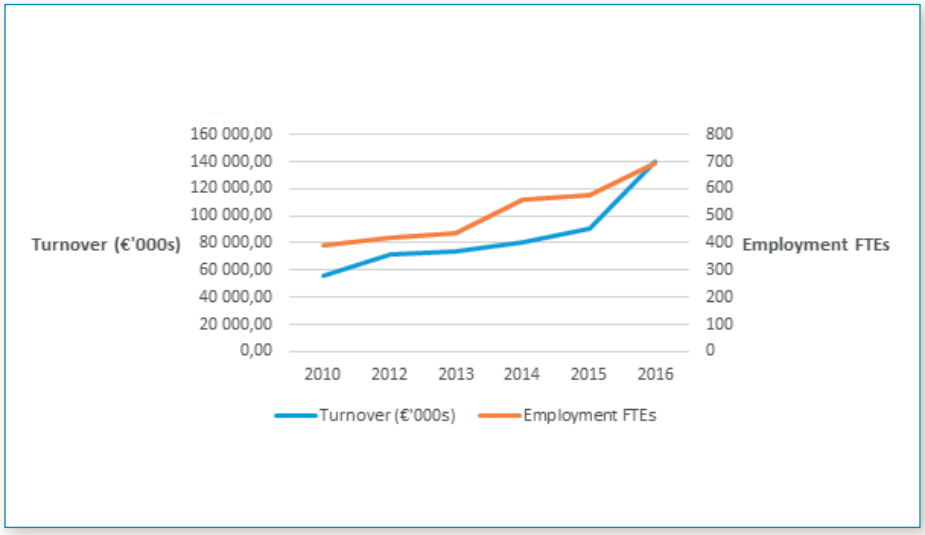


Figure 17: Advanced Marine Technology Products and Services turnover and employment trends, 2010, 2012-2016

Source: SEMRU Marine Enterprise Survey

Figure 17 illustrates the effort that Ireland has made over the last years in infrastructure investment to support the development of this sector into the future. This will continue to enhance Ireland's attractiveness as a location for advanced marine technology research and innovation firms. According to the latest SEMRU Marine Enterprise Survey, the outlook from the sector remains positive for the coming year.

Marine Commerce

Marine commerce, as defined here, refers to legal services, financial services, insurance and ship surveying. In this sector companies provide services across a range of marine categories, primarily, shipping and maritime transport, tourism and leisure, fisheries and aquaculture as well as offshore energy. The majority of these companies are large international firms, who have marine-related divisions. Table 20 presents the turnover, GVA and employment for this sector in 2012, 2014 and 2016 as well as the % change in each for the 2012-2014 and 2014-2016 periods. Figure 18 shows the trends for both turnover and employment over the 2010-2016 period

Profile

- Marine Financial Services
- Marine Legal Services
- Marine Insurance
- Ship Surveyors

Table 20: Marine Commerce turnover, GVA, employment, 2012, 2014, and 2016

Marine Commerce	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	86,558.90	138,448.57	140,731.43	60%	2%
GVA €000's	49,166.52	42,165.71	41,762.86	-14%	0%
Employment FTEs	161	322	342	100%	6%
Location of activity	Companies that provide marine commerce services are primarily located in Dublin, Cork and Galway				

Source: SEMRU Marine Enterprise Survey

The turnover generated by the marine commerce sector in 2014 was €138 million. Total GVA generated was €42 million. Turnover increased between 2012 and 2014 by 60%, with a 14% reduction in GVA in the same period. Employment in the sector experienced a twofold increase with respect to the previous reporting period, with 322 FTEs in 2014.

Turnover generated by the sector in 2016 was €141 million, representing a small increase in activity of 2% between 2014 and 2016. Table 20 shows that GVA remained stable at €42 million in the same period, while employment increased by 6% to 342 FTEs.

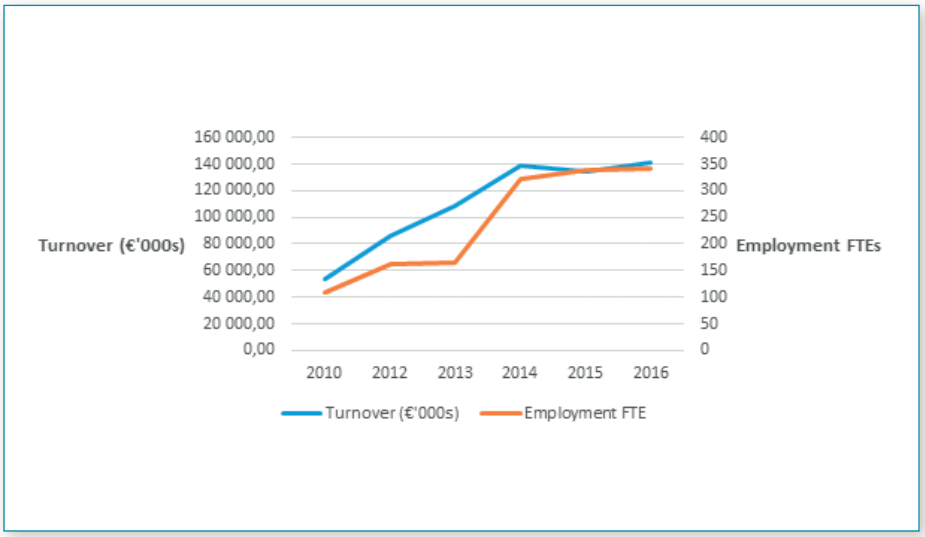


Figure 18: Marine Commerce turnover and employment trends, 2010, 2012-2016

Source: SEMRU Marine Enterprise Survey

The general outlook for the marine commerce sector is positive in spite of the considerable level of uncertainty caused by Brexit. Marine financial services may experience growth over the next few years as opportunities develop with the prospect of relocation of financial institutions from Britain to Ireland after Brexit.

On the other hand, the impact of Brexit on marine legal services is uncertain, in particular in the area of litigation, which has been historically an important area of business for the marine legal services sector in Ireland

Marine Biotechnology and Bioproducts

Marine biotechnology is the use of biological knowledge and analytical and processing techniques to develop new products from marine biological materials. It exploits the diversity of marine organisms in terms of form, structure, physiology and chemistry[40]. The sector also includes seaweed harvesting. The main commercial species harvested in Ireland are Ascophyllum nodosum, Laminaria hyperborea and miscellaneous red seaweeds.

Ireland's emerging marine biotechnology industry is diverse, spanning different industry sectors such as food, pharmaceuticals, medical devices, aquaculture and seaweed and contributes to an array of novel products and processes. Table 21 presents the turnover, GVA and employment for this sector in 2012, 2014 and 2016 as well as the % change in each for the 2012-2014 and 2014-2016 periods. Figure 19 shows the trends for both turnover and employment over the 2010-2016 period.

Profile

- Seaweed Harvesting
- Whole or unprocessed foods and processed foods for consumption
- Industrial texturants, including foods, toothpaste and paints
- Plant fertilisers in agriculture
- Animal feeds in agriculture and fish feeds in aquaculture
- Bioactives for health, medicine and cosmetics
- Energy and biofuels

Table 21: Marine Biotechnology and Bio-products turnover, GVA, employment, 2012, 2014, and 2016

Marine Biotechnology and Bioproducts	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	44,510.22	29,511.62	43,609.94	-33%	48%
GVA €000's	18,755.24	4,833.59	17,123.86	-75%	267%
Exports €000's	373	436	453	17%	4%
Employment FTEs	264	304	373	23%	406
Location of activity	Seaweed harvesting takes place around the coast of Ireland, with particular concentrations in Co. Galway, Co. Donegal, Co. Sligo, Co. Kerry and Co. Cork. Other activities in this sector are not confined to coastal counties and have a wide geographical distribution across the country.				

Source: SEMRU Marine Enterprise Survey

The turnover generated by the marine biotechnology and bio-products sector in 2014 was €29 million. Total GVA generated was €5 million. Turnover and GVA both suffered a drop in 2014 with respect to the previous reporting period, with a reduction of 33% and 75% respectively. Employment in the sector was 436 FTEs in 2014, which shows an increase of 17% with respect to the previous reporting period.

Turnover generated by the sector in 2016 was €44 million, representing an increase in activity of 48% between 2014 and 2016. GVA also increased by an estimated 267% to €17 million in the same period. Employment increased to 453 FTEs in 2016, an increase of 4% as shown in Table 21.

40 Government of Ireland, Inter-Departmental Marine Coordination Group (MCG), "Harnessing Our Ocean Wealth - An Integrated Marine Plan (IMP) for Ireland," July 2012, Briefing Document Part II: Sectoral Briefs

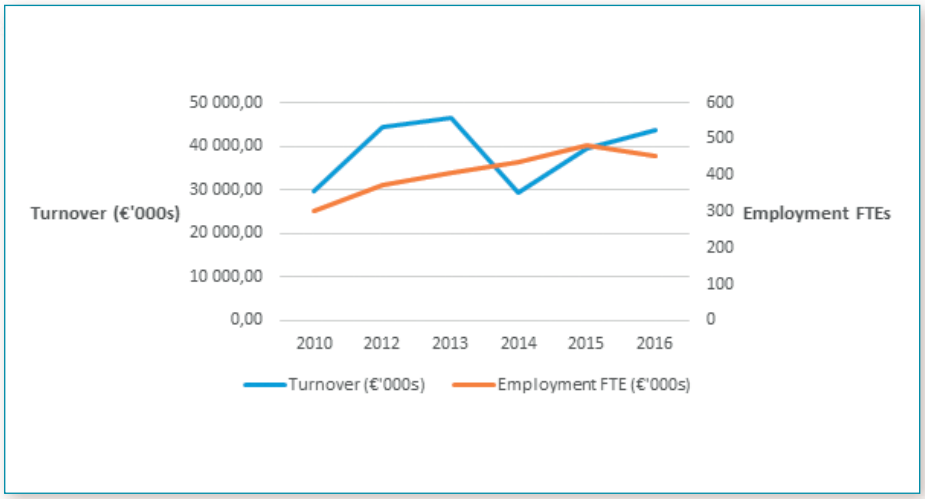


Figure 19: Marine Biotechnology and Bio-products turnover and employment trends, 2010, 2012-2016

Source: SEMRU Marine Enterprise Survey

According to the latest SEMRU Marine Enterprise Survey, the outlook from the sector is positive for the coming year. The future potential for the sector relates to the development of higher value added products such as functional ingredients and foods. The transition through the value chain follows a gradual process of change as the industry moves from materials and products that require minimal processing to more high-value processed products.

Marine Renewable Energy

The marine renewable energy sector in Ireland encompasses the generation of power from offshore wind and the development of technologies and energy devices utilising wave and tidal resources. The wave and tidal sectors are still mainly in the developmental stages globally, while the offshore wind sector is seeing considerable progress taking place at a European and global level[41]. Table 22 presents the turnover, GVA and employment for this sector in 2012, 2014 and 2016 as well as the % change in each for the 2012-2014 and 2014-2016 periods. Figure 20 shows the trends for both turnover and employment over the 2010-2016 period.

Profile

- Offshore Wind Energy Production and Services
- Wave Energy Production and Services (Pre-Commercial)
- Tidal Energy Production and Services (Pre-Commercial)

Table 22: Marine Renewable Energy turnover, GVA, employment, 2012, 2014, and 2016

Marine Renewable Energy	2012	2014	2016	2012-2014 (% change)	2014-2016 (% change)
Turnover €000's	15,826.18	26,892.81	59,002.25	70%	119%
GVA €000's	8,647.17	15,402.50	38,098.60	78%	147%
Employment FTEs	245	401	454	64%	13%
Location of activity	Ireland's location at the western edge of the Atlantic Ocean means that it is ideally located to take advantage of the emerging opportunities to harness power from marine renewable resources.				

Source: SEMRU Marine Enterprise Survey

The turnover generated by the marine renewable energy sector was €27 million in 2014. Total GVA generated was €15 million. Turnover increased between 2012 and 2014 by 70%, with a 78% increase in GVA in the same period. Employment in the sector was 401 FTEs in 2014, which shows an increase of 64% with respect to the previous reporting period.

Table 22 shows that the turnover generated by the sector in 2016 was €59 million, representing an increase in activity of 119% between 2014 and 2016. GVA increased by an estimated 147% to €38 million, while employment increased to 454 FTEs, an increase of 13% in the 2014-2016 period.

41 Government of Ireland, Inter-Departmental Marine Coordination Group (MCG), "Harnessing Our Ocean Wealth - An Integrated Marine Plan (IMP) for Ireland," July 2012, Briefing Document Part II: Sectoral Briefs

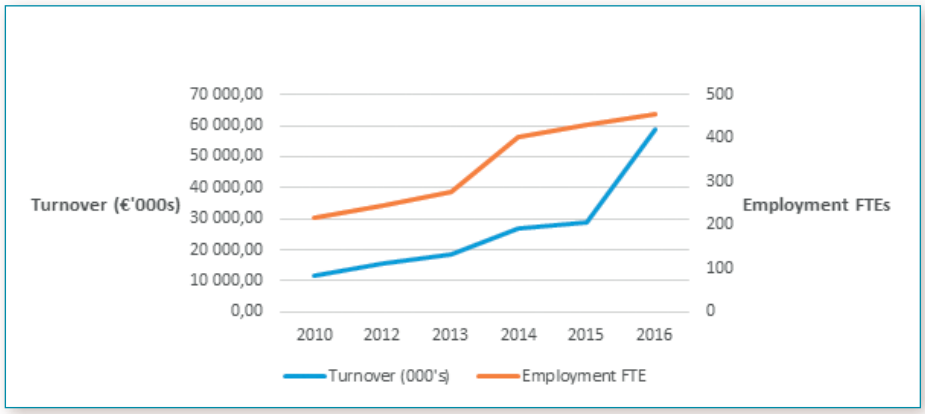


Figure 20: Marine Renewable Energy turnover and employment trends, 2010, 2012-2016

Source: SEMRU Marine Enterprise Surveye

The marine renewable energy sector has been supported by the Irish government with increased policy commitment and exchequer funding to assist the development of the sector in Ireland. Figure 20 shows an increasing trend for both employment and turnover since 2010. According to the latest SEMRU Marine Enterprise Survey, the outlook from the sector is positive for the coming year.

One of the key policy developments in this context is the Offshore Renewable Energy Development Plan (OREDP) published by the Department of Communications, Energy and Natural Resources, with input from the Sustainable Energy Authority of Ireland (SEAI). The plan sets out a vision for development of offshore wind, wave and tidal stream energy in Ireland that sees it contributing to sustainable economic growth and delivering jobs in the green economy for the period to 2030[42].

42 Department of Communications, Energy and Natural Resources (2014) Offshore Renewable Energy Development Plan A Framework for the Sustainable Development of Ireland's Offshore Renewable Energy Resource

A note on Marine Training

The importance of marine training is highlighted in Harnessing Our Ocean Wealth (HOOW). Enabling Education and Training in the marine economy is identified as a key action (Actions 27 and 28) to support the development of the marine industry and the provision of efficient public services in Ireland. The marketing and promotion of Ireland as a marine training and education destination of excellence is another goal. Further recommendations from the Marine Development Task Force to achieve HOOW vision and targets emphasize the need to 'marinise' occupations and qualifications that may not be specific to the marine sector, but for which 'marinising' would bring further opportunities for the marine sector.

Irish based organisations and firms provide a broad range of marine industry-specific training e.g. fishing, seafood, merchant (seafarer) and ocean energy. This training is provided by both public and private organisations. The National Maritime College of Ireland would be one of the largest private providers of marine training although a large number of small and medium sized enterprises (SMEs) provide marine training courses across Ireland. Public organisations providing marine training would include Bord Iascaigh Mhara (BIM) and the Strategic Marine Alliance for Research and Training (SMART). Marine training is defined as any marine related course that results in a National Framework of Qualifications[45] level of 1 to 6.

The value of Ireland's ocean economy reported in these pages does not currently include marine training. Indeed, only a small number of countries[46] incorporate marine training in the valuation of their ocean economies. In order to measure the economic contribution of marine training in a manner that is in line with that used to calculate values in other sectors of Ireland's ocean economy one needs to estimate the total income generated through marine-related training. This data is difficult to obtain as marine training and is not readily available in national accounts or national economic databases. Also, given that marine training is made up of both public and private providers, the data can be commercially sensitive. However, an effort was made by SEMRU to provide an aggregate economic value for marine education and training in Ireland for the 2014 - 2015 period[47].

Estimates from Vega and Corless (2016) suggest that the total turnover generated in marine training, as defined above, was €6.3m in the period 2014-2015. The authors estimated that 82 full time equivalents (FTEs) were involved in the delivery of private training courses but note that this is an underestimate as it does not include employment in the companies providing Irish Sailing Association certification. The private marine training operators accounted for the training of approximately 13,000 students in 2015 and BIM's recent Strategy 2013 - 2017 set a target of 8,000 training places delivered by 2017[48]. While activity in marine related training is difficult to quantify it is important that its progress is not overlooked as the development of the ocean economy is reliant on the availability of a suitable skilled and often specialised workforce.

For full analysis see Vega and Corless. (2016) A Measurement of Third Level Marine Education & Training in Ireland, SEMRU Report Series 16-RS-SEMRU-05, National University of Ireland Galway.

45 The National Framework of Qualifications (NFQ) qualifications framework describe the qualifications of an education and training system and how they interlink. It is a system of ten levels. Each level is based on nationally agreed standards of knowledge, skill and competence.

46 These include China, South Korea, Canada and the UK

47 Vega, A. and Corless, R. (2016). Measuring Marine Education and Training in Ireland. SEMRU Report Series 16-RS-SEMRU-05.

48 Bord Iascaigh Mhara (BIM). (2013). Capturing Ireland's Share of the Global Seafood Opportunity. BIM Strategy 2013 - 2017

Conclusions

As demonstrated throughout this report, the ocean economy, through a wide variety of commercial activities, continues to make a very important contribution to the Irish economy. In 2016 it is estimated that the ocean economy had a turnover of €5.71 billion and contributed €1.8 billion in terms of gross value added to Ireland's GDP, representing approximately 0.9% of GDP. Once the indirect impacts of the sector are factored in, this contribution increases to 1.7% of GDP. The ocean economy directly employs over 30,000 full time equivalent individuals.

The economic reports generated by SEMRU have the continuing aim to facilitate policy making by providing a profile of Ireland's Ocean Economy and sector-by-sector economic projections against which future marine socio-economic data can be compared. The figures generated in this report also provide useful information to support Ireland's implementation of the EU Marine Strategy Framework Directive (MSFD) and Marine Spatial Planning (MSP) in Ireland.

Another key objective of the report is to assist the Irish government in monitoring progress of a number of targets set out in the Integrated Marine Plan for Ireland - Harnessing Our Ocean Wealth (2012). Two key economic targets were set out in the Marine Plan, the first was to double the value of Ireland's ocean wealth to 2.4% of GDP by 2030 and the second was to increase the turnover from Ireland's ocean economy to exceed €6.4bn by 2020. Based on the estimates for 2016 it can be seen that we are moving steadily towards these targets; turnover increased by 23% over the period 2014 to 2016 while the total direct and indirect value of the Irish ocean economy in terms of GVA is estimated to be €3.37 billion which represents 1.7% of total GDP in 2016. The substantial growth in the sector over recent years is a reflection of the recent economic recovery that Ireland has experienced but is also driven by increased activity in shipping, the seafood sector, marine and coastal tourism and leisure industries and the substantial boost to turnover and GVA through the coming on line of the Corrib gas field in December 2015. The GVA associated with firms in the emerging marine industries such as marine commerce, marine renewables and marine advanced technology increased at an even faster pace that the more established industries, recording estimated growth of 60% between 2014 and 2016.

Since SEMRU's first ocean economy report in 2010 the focus has always been on analysing the commercial activities in the Irish ocean economy. However, many public sector activities are tied to the promotion and regulation of marine related activities and marine environmental stewardship. Ireland is also known for its high quality marine related education and research. The surveying of marine relevant government agencies, universities and research institutions, and indeed marine environmental non-government organisations would provide a measure of the public and non-government sector components of Ireland's ocean economy that to date have not been accounted for but which are often included in other maritime countries ocean economy calculations. This represents an area for future research.

The marine and coastal ecosystems around Ireland also provide many other valuable benefits to Irish society not recorded in the ocean economy accounts (See Figure 21). These benefits, generated by nature, are known as 'ecosystem services'. The oceans provide key ecosystem services that underpin many of the identified industries in this report and make coastal life as we know it possible. Knowing what these ecosystem service benefits are and how marine ecosystems' ability to continue to deliver services is impacted by changes in the economic activity taking place in our waters is vital for deciding on the best use of those resources and to ensure blue growth. SEMRU is currently a partner on two EU Horizon 2020 project (ATLAS and MERCES) that are examining how best to quantify marine ecosystem services and it is also finishing up a project funded through the EPA that is focused on the ecosystem service benefits that society receives from Ireland's marine environment, complementing the research presented in this report on the Irish ocean economy.

SEMRU was the lead scientific partner in the MARNET project, an EU transnational co-operation project which contributed to creating a European Atlantic marine socio-economic network and a methodology for the collection of comparable marine socio-economic data across Atlantic regions. Following the success of the EU MARNET project, a new EU transnational co-operation project has just been given the green light that brings together an established network of marine research institutions allied with regional bodies across Portugal, Spain, France, Ireland and the UK. Led by SEMRU the new project. MOSES, will use the MARNET framework to estimate the size and growth of key strategic marine industries at a finer regional scale across the Atlantic Arc. This will facilitate the monitoring of progress in the Atlantic ocean economy since

the implementation of the Atlantic Strategy and the Atlantic Action Plan. The project also aims to examine the potential environmental impact of key strategic marine sectors and propose sustainable blue growth pathways.

While the Irish ocean economy has seen significant growth in recent years and in general the outlook for further growth in the short-term remains positive there are a number of challenges that the sector must face. As with all other sectors in the Irish economy, a key one is the potential impact of Brexit but others include the potential impact of implementation of the discard ban on Irish fishing, the impact of a weaker sterling exchange rate on tourism in Ireland's marine and coastal areas, and ensuring that growth is sustainable such that the marine environment can continue to deliver ecosystem services long into the future.

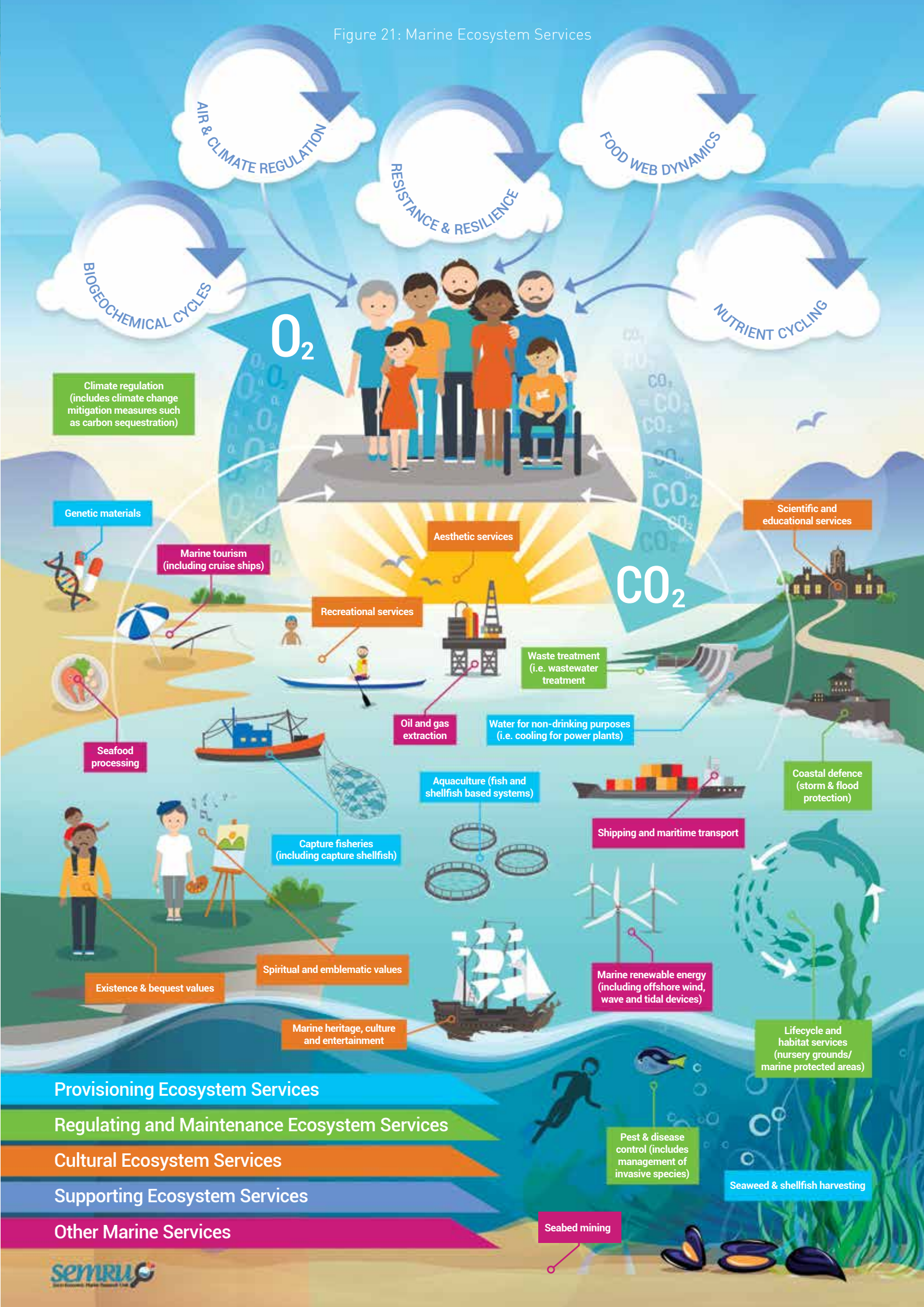
In terms of Brexit the terms of the withdrawal agreement are still far from clear and therefore speculating on the impact on the Irish ocean economy remains difficult[43]. However, weaker sterling is likely to have a negative impact on our competiveness across the ocean economy sector while issues surrounding access to British waters and the sharing of quotas for key stocks are of major concern to the Irish fishing industry on the back of Brexit. The impact on port and shipping activity in Ireland could also be significant but this is to a large extent dependent on final decisions on how agreed customs arrangements between Britain and the EU will impede the freedom of movement in and out of Irish ports.

Brexit may also offer some opportunities to attract marine commerce activity away from London and new routes for shipping from Irish ports to mainland Europe. The recent welcomed review of the licencing arrangements for aquaculture should also result in a more efficient licencing process that can only improve the potential for investment in that sector. Initiatives such as the Wild Atlantic Way and the Ancient East trails should also continue to grow coastal tourism while the continued goal of the Marine Coordination Group chaired by the Minister for Agriculture, Food and the Marine, and the associated Marine Development Task Force, of improving and effectively mobilising a range of state supports and structures in the marine space[44] should continue to encourage the investment required to reach the economic targets set out in Harnessing Our Ocean Wealth.

43 Hynes, S. (2016). Uncharted waters: What would Brexit mean for the Irish ocean economy? SEMRU Policy Brief (as part of the Whitaker Policy Brief Series, May 2016)

44 Our Ocean Wealth - Development Task Force Report to the Marin Coordination Group, 2015.

Figure 21: Marine Ecosystem Services



Appendix

Methodology and Data Source

Methodology

Definitions of marine-based industries within the ocean economy differ across countries. The general approach taken in this report is to:

1. Revise and update the industries from previous reports that are part of the ocean economy
2. Identify the marine sectors for which there is publically available data
3. Estimate the proportion of economic activity that is marine-based using proxies
4. Record levels of turnover, employment and gross value-added for each industry that is in the ocean economy
5. Identify sectors where alternative data collection methods must be developed, i.e. surveys

Certain sectors are clearly identifiable as fully marine, for example shipping and maritime transport or sea fisheries. Data on other marine activity can be more difficult to obtain; for example, marine engineering data cannot be differentiated from general engineering using the data collected by the Central Statistics Office (CSO). Therefore, these sectors require additional work (surveys/proxies) to ensure that they are represented in the ocean economy.

The general approach adopted in this report for assessing Ireland's ocean economy has been concerned with production activity: net output/turnover, input, gross value added, and employment. The Business Demography (BD) and Structural Business Statistics (SBS) Division in the CSO provides data on turnover, GVA, employment, and where available, exports for each sector within the Irish economy. The data are collected across a number of censuses and surveys. The CSO census and surveys used for the collation of the data on Ireland's ocean economy include;

- The Census of Industrial Production (CIP)
- The Annual Services Inquiry (ASI)
- Building and Construction Inquiry (BCI)
- Business Register
- Intrastat

The data relating to marine activity from these censuses and surveys is provided at the NACE four-digit level. The NACE code system is a pan-European classification system that groups enterprises according to their business activities by assigning a unique 2, 3 and 4 digit code to each industry. Where data are not available from CSO sources, a survey developed by SEMRU – the SEMRU Marine Enterprise Survey - is conducted for particular marine sectors. This survey is similar to the surveys carried out by the CSO and contains questions on annual turnover, purchases, operating expenses, employee levels, labour costs, and investment among others. The companies surveyed are compiled using a wide range of database sources, including the Marine Institutes MIDI (Marine Industry Data Inventory) company database. A total of 506 surveys were carried out for this report, with an overall response rate of 27%.

The turnover, GVA and employment figures presented in this report have been revised and updated since the previous report. This was required in order to align our Ireland's ocean economy data with the new revised 2008-2014 CIP, ASI and BCI series released by the CSO in December 2016. This new CSO data series bring coherence between the CSO Business Demography (BD) and Structural Business Statistics (SBS) data series and the National Accounts (Income Method) series for Gross Value Added (GVA). The so-called CSO Coherence Project ran from Q3 2015 to Q4 2016 and it resulted in an update in the definition of what constitutes an active enterprise in the CSO annual series on BD and SBS. These are the main data sources used in the valuation of Ireland's Ocean Economy.

The change in the CSO definition of an active enterprise has implied changes in the treatment of non-responses, which now uses Revenue administrative (tax) data for increased accuracy. The impact of these changes on Ireland's ocean economy overall and sectoral indicators suggests that more enterprise activity is measured, with generally larger overall indicators than previously reported.

Methodology by Sector

The reference year for this report is 2014. This is the most recent year that data is available currently from the CSO for the above mentioned surveys. Estimates based on economic projections for the performance of the ocean economy in 2015 and 2016 are also presented in this report. These estimates are the result of a forecasting exercise of the future turnover, GVA and employment in Ireland's ocean economy on a sector-by-sector basis. This methodology is based on published socio-economic data from the CSO, government economic forecasts and information obtained from interviews with marine-related enterprises and relevant government departments and agencies.

Shipping & Maritime Transport

Shipping and maritime transport is one of the marine sectors that can be directly identified in the standard NACE classification. The data for the Shipping and Maritime Transport sector is obtained entirely from the CSO (ASI). The NACE codes under this sector include some activities that are not fully marine such as 'Other transportation support activities' (NACE Rev (2) 52.29) and Cargo Handling (NACE Rev (2) 52.24). Proxies are used to account for the percentage of relevant maritime activity, i.e. trade by sea.

Economic projections for turnover and GVA in 2015 and 2016 are based on the performance of the shipping and maritime transport reported by the Irish Maritime Development Office (IMDO) in their IShip index (Irish Maritime Transport Economist, 2017). Estimates for employment are obtained from the annual growth rate reported by the CSO in their Quarterly National Household Survey (Transport and storage).

Tourism and leisure in marine and coastal areas

The tourism and leisure in marine and coastal areas sector is made up of seven NACE codes as follows: 5510 - Hotels and similar accommodation, 5520 - Holiday and other short stay accommodation, 5530 -Camping grounds, recreational vehicle parks and trailer parks, 9312 - Activities of sports clubs, 9319 - Other sports activities, 9321 - Activities of amusement parks and theme parks, 9329 - Other amusement and recreation activities. Each of these codes will only be partly marine or coastal related as tourism can obviously be unconnected with marine activities or may not even occur in coastal areas.

Based on the Fáilte Ireland Accommodation Occupancy Survey, it is possible to calculate the number of bed nights in Fáilte Ireland Registered/Approved hotels, guesthouses, B&Bs, self-catering accommodation, hostels and Caravan/Camping grounds. This bed night information is broken down between coastal and non-coastal areas where coastal is defined as municipalities (LAU-2) that either border on the sea or have 50% of their surface within a distance of 10 km from the sea. The share of 'Immediate urbanised & Coastal' and 'Thinly populated & Coastal' bed nights out of total bed nights indicates that 27% of all visitor bed nights are spend in coastal areas. The category 'Densely populated & Coastal' is not included in the calculation of coastal bed nights as this generally reflects visit to Ireland larger coastal cities which in the majority of cases are not in any way marine related whereas visitors to areas outside cities do so in order to get closer to the natural environment. We therefore take 27% of the total value for turnover, GVA and employment from the accommodation NACE categories' 5510, 5520 and 5530, as a fair estimate of the contribution from tourism in marine and coastal areas.

Based on the share of marine related leisure enterprises (information on marine enterprise numbers comes from the Initial Assessment for the Marine Strategy Framework Directive Assessment for Ireland) in the total number of enterprises recorded for the leisure sector NACE categories (9312, 9319, 9321, 9329) from the CSO Business Registry we estimate a 9.8% share of marine enterprises across the leisure sector industries. We therefore take 10% of the total value for turnover, GVA and employment from these NACE categories as a fair estimate of the contribution from marine leisure activities.

Adding the estimates for the tourism in marine and coastal areas based on the share of bed nights described above and the estimate of the contribution from marine leisure based on share of marine leisure enterprises provides the total values for turnover, GVA and employment for the sector tourism and leisure in marine and coastal areas.

Economic projections for turnover and GVA in 2015 and 2016 are based on estimates provided by Fáilte Ireland and the CSO in terms of international and domestic tourism numbers. Estimates for employment are obtained from the annual growth rate reported by the CSO in their Quarterly National Household Survey (Accommodation and food service activities).

International Cruise Industry

International cruise data differs from other sectors as it captures passenger expenditure rather than cruise ship turnover. For this report, cruise data on the total number of passengers provided by the Irish Maritime Development Office (IMDO) is used in conjunction with the average expenditure by port by disembarking passenger previously reported by Fáilte Ireland. Expenditure levels are adjusted by inflation accordingly.

Marine Retail Services

An online survey was designed by SEMRU and administered to the companies conducting boat sales, chandlery services and marine equipment engineering in April 2016. The response rate was 41%. Additional data from for seafood retail establishments is obtained from the CSO – Annual Services Inquiry.

Economic projections for turnover and GVA in 2015 and 2016 are based on reported data from the Retail Sales Inquiry, published by the CSO. Estimates for employment are obtained from the annual growth rate reported by the CSO in their Quarterly National Household Survey (Wholesale and retail trade).

Sea Fisheries

Figures for turnover, GVA and employment are provided by Bord Iascaigh Mhara's (BIM).

Marine Aquaculture

Figures for turnover, GVA and employment are provided by Bord Iascaigh Mhara's (BIM). Economic projections for GVA in 2016 are obtained from the annual growth rate reported by BIM (Aquaculture survey)/STECF in the 2008-2015 period.

Seafood Processing

Seafood Processing can be directly identified in the standard NACE classification provided by the CSO. The data was collected under the NACE code 10.20 'Seafood Processing' from the Census of Industrial Production (CIP).

Economic projections for turnover and GVA in 2015 and 2016 are estimated as a function of the level of seafood exports reported by Bord Bia in those years. Employment figures for 2015 and 2016 are provided by Bord Iascaigh Mhara's (BIM).

Oil & Gas

Oil & Gas can be directly identified in the standard NACE classification. The data for the Oil & Gas sector was obtained in part from the CSO, CIP - NACE 06.10, 06.20, 09.10. The data is confidential due to the small number of companies operating under the three Oil & Gas NACE codes. As a result, a survey was administered to the sector to complement the CSO data and to include oil and gas exploration activities.

Economic projections for turnover and GVA in 2015 and 2016 are estimated on the basis of historic trends in the sector and growth rates in exploration licenses, licensing options and seismic acquisitions, as well as the number of wells spudded and drilled offshore. Information was provided by the Department of Communications, Energy and Natural Resources to complement our estimates. Shareholder annual financial information from the newly operational Corrib Gas field was used to estimate turnover, GVA and employment in 2016.

Marine Manufacturing, Engineering & Construction

The marine manufacturing sector data was collected primarily from the Census of Industrial Production and the Building and Construction Inquiry, CSO. The data reported also include marine engineering activities. A survey was administered to marine engineering companies in April 2016, as it is not possible to identify specifically marine engineering in the main engineering NACE codes. The response rate was 37%.

Economic projections for turnover, GVA and employment in 2015 and 2016 are estimated on the basis of historic trends in the sector as measured by SEMRU previous surveys and overall trends in general manufacturing from the CSO. This was complemented by company interviews where the economic performance in the current scenario was discussed.

Advanced Marine Technology Products and Services

The SEMRU Marine Enterprise Survey was administered to relevant companies in April 2016.

Marine Commerce

The SEMRU Marine Enterprise Survey was administered to relevant companies in April 2016.

Biotechnology – Seaweed

The SEMRU Marine Enterprise Survey was administered to relevant companies in April 2016.

Marine Renewable Energy

The SEMRU Marine Enterprise Survey was administered to relevant companies in April 2016.

Data Sources

Shipping and Maritime Transportation Logistics

- Annual Services Inquiry, CSO
- IShip Index, IMDO
- Quarterly National Household Survey (Transport and storage), CSO

Tourism and Leisure in Marine and Coastal Areas

- Domestic and overseas visitors 2015-2016, Fáilte Ireland
- Quarterly National Household Survey (Accommodation and food service activities) 2015; 2016, CSO

Sea Fisheries

- The Business of Seafood, 2017, BIM

Marine Aquaculture

- The Business of Seafood, 2017, BIM

Marine Biotechnology & Bioproducts

- SEMRU Company Survey.

Seafood Processing

- Census of Industrial Production, CSO
- Seafood exports 2015; 2016, Bord Bia
- The Business of Seafood, 2017, BIM

International Cruise

- Irish Maritime Transport Economist, IMDO
- Maritime Statistics, CSO

Oil and Gas Activity

- Census of Industrial Production, CSO
- SEMRU company survey.

Renewable Energy

- SEMRU Company Survey.

Water Construction

- Buildings and Construction Inquiry, CSO

Marine Engineering

- SEMRU Company Survey.
- Quarterly National Household Survey (Industry), CSO
- Industrial Turnover Index, CSO

Boat Building

- Census of Industrial Production, CSO
- Industrial Turnover Index, CSO

High Tech Marine Services

- SEMRU Company Survey.

Marine Commerce

- SEMRU Company Survey.

Marine Retail Services

- SEMRU Company Survey.
- Annual Survey Inquiry, CSO
- Quarterly National Household Survey (Wholesale and retail trade), CSO
- Retail Sales Inquiry, CSO

Marine Biotechnology & Bio-products

- SEMRU Company Survey.

Tables

Table 1: Sectoral Targets set out in the Integrated Marine Plan 4

Table 2: The Irish Ocean Economy key figures and trends, 2012, 2014 and 2016 6

Table 3: GVA Multipliers for Marine Sectors from Bio-Economy Input-Output Model 7

Table 4: Direct and Indirect GVA, 2016 8

Table 5: International Comparisons 9

Table 6: Direct Turnover, GVA and Employment by sector, 2014 12

Table 7: Direct Turnover by sector (Euro Million), 2008-2016 13

Table 8: Direct GVA by sector (Euro Millions), 2008-2016 14

Table 9: Direct Employment by sector, 2008-2016 15

Table 10: Shipping and Maritime Transport turnover, GVA, employment, 2012, 2014 and 2016 21

Table 11: Tourism and Leisure in Marine and Coastal Areas; turnover, GVA, employment, 2012, 2014 and 2016 24

Table 12: International Cruise passengers, calls, expenditure, GVA, 2012, 2014 and 2016 26

Table 13: Marine Retail Services turnover, GVA, employment, 2012, 2014 and 2016 28

Table 14: Sea Fisheries turnover, GVA, employment, 2012, 2014 and 2016 30

Table 15: Marine Aquaculture turnover, GVA, employment, 2012, 2014 and 2016 32

Table 16: Seafood Processing turnover, GVA, employment, 2012, 2014 and 2016 34

Table 17: Oil and Gas Exploration and Production, GVA, employment, 2012, 2014, and 2016 36

Table 18: Marine Manufacturing, Construction and Engineering turnover, GVA, employment, 2012, 2014 and 2016 38

Table 19: Advanced Marine Technology Products and Services turnover, GVA, employment, 2012, 2014, and 2016 43

Table 20: Marine Commerce turnover, GVA, employment, 2012, 2014, and 2016 45

Table 21: Marine Biotechnology and Bio-products turnover, GVA, employment, 2012, 2014, and 2016 47

Table 22: Marine Renewable Energy turnover, GVA, employment, 2012, 2014, and 2016 49

Figures

Figure 1: Direct Turnover, GVA and Employment; Established Marine Industries, 2008-2016 16

Figure 2: Direct Turnover, GVA and Employment; Emerging Marine Industries, 2010, 2012-2016 16

Figure 3: Relative contribution (%) of each subsector within the Established Irish Marine Industries to turnover, GVA and employment, 2014 19

Figure 4: Rates of change (%) in turnover, GVA and employment. Established Industries, 2014-2016 20

Figure 5: Shipping and Maritime Transport turnover and employment trends, 2008 – 2016 22

Figure 6: Shipping and Maritime Transport Operations and Services turnover and GVA trends, 2008 – 2014 23

Figure 7: Tourism and Leisure in Marine and Coastal Areas; turnover and employment trends, 2008 – 2016 25

Figure 8: Passenger and Cruise Ship visits to Irish Ports (Number) 2011 – 2016 27

Figure 9: Marine Retail Services turnover and employment trends, 2010 and 2012-2016 29

Figure 10: Sea Fisheries turnover and employment trends, 2008 – 2016 31

Figure 11: Marine Aquaculture turnover and employment trends, 2008 – 2016 33

Figure 12: Seafood processing turnover and employment trends, 2008-2016 35

Figure 13: Oil and Gas Exploration and Production turnover and employment trends, 2008-2016 37

Figure 14: Marine Manufacturing, Construction and Engineering turnover and employment trends, 2008-2016 39

Figure 15: Relative contribution (%) of each sector within emerging marine industries to turnover, GVA and employment, 2014 42

Figure 16: Rates of change (%) in turnover, GVA and employment. Emerging Industries, 2014-2016 42

Figure 17: Advanced Marine Technology Products and Services turnover and employment trends, 2010, 2012-2016 44

Figure 18: Marine Commerce turnover and employment trends, 2010, 2012-2016 46

Figure 19: Marine Biotechnology and Bio-products turnover and employment trends, 2010, 2012-2016 48

Figure 20: Marine Renewable Energy turnover and employment trends, 2010, 2012-2016 50

Figure 21: Marice Ecosystems Services 54

Glossary of Acronyms/Terms

AMETS	Atlantic Marine Energy Test Site
ASI	The Annual Services Inquiry
BCI	Building and Construction Inquiry
BIM	Bord Iascaigh Mhara
CFP	Common Fisheries Policy
CIP	Census of Industrial Production
CRO	Company Registration Office
CSO	Central Statistics Office
DCENR	Department of Communication, Energy & Natural Resources
EDs	Electoral Districts
FDI	Foreign Direct Investment
FI	Fáilte Ireland
FTEs	Full Time Equivalents
GDP	Gross Domestic Product
GVA	Gross Value Added
HOOW	Harnessing Our Ocean Wealth
ICT	Information & Communication Technology
IMDO	Irish Maritime Development Office
IMP	Integrated Marine Plan
LAU	Local Administrative Unit
MIDI	Marine Industry Data Inventory
MSFD	Marine Strategy Framework Directive
NACE	Statistical classification of economic activities in the European Community
PAD	Petroleum Affairs Division
R&D	Research and Development
REV 2	Revision 2 of the NACE code system (post 2007)
SEMRU	Socio Economic Marine Research Unit
SME	Small or Medium Sized Enterprises
STECF	Scientific, Technical and Economic Committee for Fisheries

Notes:

ISSN 2009-6933

Socio-Economic Marine Research Unit
National University of Ireland, Galway
Tel: +353 (0)91 495679
Fax: +353 (0)91 524130

Email: amaya.vega@nuigalway.ie
Web: http://www.nuigalway.ie/semru/

NUI Galway
OÉ Gaillimh

semru
Socio-Economic Marine Research Unit