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Blue Growth & Marine Spatial Planning Scheme

Marine Foresight Study

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Executive Summary

Ireland is experiencing a period of major change in terms of the legal and policy framework for marine decision-making, the political and socio-economic context for marine activities, the influence of technological change on marine activities and resultant societal impacts. Furthermore, increased awareness of the marine environment by the general public, owed to increased education and increased access to resources, as envisaged by the previous Integrated Marine Plan for Ireland, Harnessing Our Ocean Wealth (HOOW), continues to provide increased engagement with marine issues.

Ireland is beginning the process of developing a successor to HOOW, and this foresight study seeks to support that process. The study has reviewed existing information, both in relation to past and current trends and potential future changes, in seeking to identify the key drivers of change across social, technological, economic, environmental and political topics.

The results of the study are captured in an Evidence Database and summary report.

This report was initially prepared while government formation talks were ongoing. It has been updated to reflect the Programme for Government (PfG) (Government of Ireland, 2020) which sets out a new vision for Ireland, incorporating a strategy for recovery and rebuilding in the period during and after the COVID-19 emergency. This includes many elements which relate to marine activities including an increased emphasis on offshore wind energy, particularly off the west coast, as well as commitments to additional protection of biodiversity at sea.

While Ireland's ocean economy has shown a resurgence in recent years following the 2008 economic crisis, the COVID-19 pandemic and Brexit threaten to cause a significant decline in key marine sectors. Brexit is likely to have significant negative implications for Ireland's economy, with the extent of impacts dependent on the final form of any Brexit agreement. There are particular potential risks to the seafood sector, associated with access to UK waters and export tariffs, to maritime transport as a result of import and export tariffs and customs delays, and to electricity imports and exports due to tariffs.

At a political level, measures implemented by national governments to seek to contain the ongoing COVID-19 pandemic threaten to have a major impact on global economic activity, the potential consequences and duration of which for Ireland are currently highly uncertain. Existing measures, such as restrictions on restaurants and limits on tourism activities, are already having a major impact on Ireland's seafood sector and on maritime transport.

Within this challenging context, there remain opportunities for economic growth, particularly in emerging sectors such as offshore renewable energy, aquaculture, marine biotechnology and the bioeconomy. Globally, the OECD estimated that the marine economy could double in size between 2010 and 2030, reaching around USD 3 trillion in 2030 (OECD, 2016). While the COVID-19 pandemic may slow down the rate of growth in the short-term, the longer-term potential for growth remains.

Key areas of technical advance include artificial intelligence, the Internet of Things and big data alongside progress in material science and biotechnology. Research and innovation are fundamental in underpinning these technical developments and Ireland has particular strengths in key areas including ICT, marine survey and aquaculture research, and the wider marine bioeconomy.

Environmental drivers such as the EU Green Deal and the target to achieve 'net zero' by 2050 are supported by an ambitious target to deploy 3.5 GW of offshore wind capacity by 2030, noting that the target has now been raised to 5 GW by the PfG. This will drive significant investment in offshore wind in the coming decade, providing a substantial opportunity for Ireland if national supply chains can establish quickly.

Continuing implementation of EU environmental directives is likely to lead to some further improvement in the quality of Ireland's marine environment although progress may be slow, particularly limited by available resources. The PfG commitments provide added impetus but will need to be supported by funding to achieve meaningful progress.

Key areas where progress is anticipated is completion of the designation of MPAs and implementation of effective management regimes. Further progress in the protection of wider marine biodiversity is also expected through measures to protect OSPAR threatened and/or declining habitats and species and application of marine plan policies. Increasing use of natural capital and ecosystem services evidence to support decision-making will also contribute better environmental decisions. Adoption of concepts such as biodiversity net gain could also be important in halting and reversing the current trend of marine biodiversity decline. Embracing such a policy may be particularly important, given the likely additional reliance to be placed on harnessing marine resources in the future.

This marine foresight study, incorporating the Evidence Database and this report support the advancement of integrated marine policy in Ireland, by identifying the potential direction of travel, and hence opportunities for policy development to support the continued growth and diversification of the blue economy in Ireland. To assist with the consideration of possible future trends within the marine planning process in a manageable way, it may be appropriate to develop this study through a small number of alternative future scenarios that provide coherent narratives about possible future changes encompassing the range of uncertainty associated with these changes.

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1 Introduction

ABPmer and MacCabe Durney Barnes were commissioned by the Marine Institute to produce a marine foresight study to assist the Institute in the ongoing delivery of policy support services outlined in its Strategic Plan, Building Ocean Knowledge, Delivering Ocean Services (Marine Institute, 2018). The purpose of the report is to support processes involved in developing a successor plan to Harnessing Our Ocean Wealth (HOOW) (Government of Ireland, 2012). The development of a successor plan has been identified in 'Our Shared Future' the new Programme for Government (PfG) in Ireland (Government of Ireland, 2020) as a commitment to *"Develop a new integrated marine sustainable development plan, as a successor to Harnessing Our Ocean Wealth, focusing on all aspects of the marine, with a greater focus on sustainability and stakeholder engagement and centrally co-ordinated by the Department of the Taoiseach to be implemented over the life of the Government."*

Foresight studies are designed to present the potential future trends and drivers of topics or sectors to help inform strategic planning and decision-making processes. In the context of the marine economy and environment in Ireland this covers a wide variety of topics and sectors including economic sectors; and social and environmental factors. The study has reviewed existing information, both in relation to past and current trends, and potential future changes in seeking to identify the key drivers of change across social, technological, economic, environmental and political topics relevant to the sustainable development of Ireland's blue economy. The study is supported by and builds upon work undertaken by, among others, the European Marine Board in identifying requirements for future research, policy and activity through sector specific foresight studies.

The Government of Ireland has developed a range of policy or planning documents relating to its marine area, which will influence how activities in Ireland's marine area develop, alongside relevant wider national, EU and international policy. The PfG has identified a number of new commitments going forwards, including increased focus on the development of marine protected areas, offshore SPAs and increased ambition for the development of offshore wind. These drivers will be particularly important in shaping the future of Ireland's marine area.

This study was drafted at a time where the marine economy and environment are the subject of increasing political interest. The PfG, published in June 2020, shows the Government of Ireland commitment to the prioritisation of development of the marine. Emerging government priorities include inter alia the fast track enactment of the Marine Planning and Development Management Bill; the preparation of a successor to HOOW; the negotiation of better outcomes for fisheries under Brexit and the designation of Marine Protected Areas (MPA).

Relevant evidence has been reviewed and incorporated into the separately provided excel database (Marine Foresight Evidence Database), produced as an addendum to this report, and also provided as an appendix. This evidence has been used to create a synthesis of current and potential future change in key topic areas described in Section 3.

1.1 Integrated Marine Policy and Planning in Ireland

1.1.1 Harnessing Our Ocean Wealth (HOOW)

Harnessing Our Ocean Wealth (HOOW) – an Integrated Marine Plan (IMP) is Ireland's first Integrated Marine Plan, published in 2012 during the last economic recession. The preparation of the plan was led by the Inter-Departmental Marine Coordination Group. It sets a vision, high level goals and integrated

actions across policy, governance and business to enable the country's marine potential to be realised. HOOW is founded on a shared vision as follows:

> *'Our ocean wealth will be a key element of our economic recovery and sustainable growth, generating benefits for all our citizens, supported by coherent policy, planning regulation, and managed in an integrated manner.'*

The vision is supported by three high-level goals:

- Goal 1 - A **thriving maritime economy**, whereby Ireland harnesses market opportunities to achieve economic recovery and socially inclusive and sustainable growth.
- Goal 2 – The achievement of **healthy ecosystems** providing monetary and non-monetary goods and services
- Goal 3 – An increased **engagement with the sea** which will strengthen Ireland's maritime identity and increase awareness of the value, opportunities and social benefits of engaging with the sea.

To support the vision and the goals, eight enablers were identified as key conditions for growth and investment. These enablers are supported by 39 actions, which are allocated a timeline and a responsible party. The enablers are as follows:

- Governance;
- Maritime Safety, Security and Surveillance;
- Clean – Green – Marine;
- Business Development, Marketing & Promotion;
- Research, Knowledge, Technology & Innovation;
- Capacity, Education, Training & Awareness;
- Infrastructure; and
- International & North / South Cooperation.

HOOW sets out two key objectives:

- Double the value of our ocean wealth to €2.4 bn of Gross Domestic Product (GDP) by 2030; and
- Increase the turnover from our ocean economy to exceed €6.4bn by 2020.

HOOW highlights the need to develop an integrated marine and coastal planning and licensing system to ensure a maximum return for the marine economy while securing environmental objectives. To that effect, HOOW contains Key Action no.2 which sought to *'develop an appropriate Marine Spatial Planning Framework for Ireland within which the scope and objectives of an overarching national Marine Spatial Plan will be defined'*. At time of drafting this report, a review of HOOW was being undertaken with completion due in 2020.

1.1.2 The Road to the Adoption of a Marine Spatial Plan in Ireland

Marine Spatial Planning (MSP) is the process that brings together the users of the marine environment with a view to make informed decisions on how to use marine resources sustainably (DHPLG, 2018). The process leads to the publication of a marine spatial plan which allocates use of space and sets out a vision, goals and objectives for the marine area.

The MSP Directive (2014/89/EU) established the legislative framework for MSP and was transposed into Irish legislation in 2016 through S.I. No. 352 of 2016. It requires, inter alia, that all coastal Member States (MS) prepare and adopt a marine spatial plan by March 2021. The DHLGH was designated as the competent authority tasked with the plan-making function. The Planning and Development (Amendment) Act 2018 effectively repealed the regulations and transposed the Directive in primary

legislation. Part 5 of the Act set out the process by which Ireland would adopt a marine spatial plan, the review process, the role of the plan as a regulatory tool and gave enforcement powers to the Minister.

In parallel, the Government published in December 2017 *Towards a Marine Spatial Plan in Ireland* which sets the roadmap for the development of Ireland's marine spatial plan, the National Marine Planning Framework (NMPF). The Baseline Report was published in December 2018 and initiated the formal national public consultation process. The draft NMPF was published in November 2019 and, at the time of preparing this marine foresight study, the second phase of public consultation had been completed. It is expected that a plan will be adopted by the Government before the end of 2020 and will be presented to the European Union (EU) ahead of the March 2021 deadline. The NMPF, once adopted, will sit at the top of the hierarchy of plans and sectoral policies for the marine area.

In addition, Ireland transposed the Marine Strategy Framework Directive (2008/58/EC) (MSFD), the implementation of which has been carried out over several phases. MSFD aims to achieve Good Environmental Status (GES) of marine waters by 2020. Progress is assessed against 11 descriptors for GES. The tasks undertaken as part of MSFD are a critical input to the NMPF. The NMPF also has regard to the River Basin Management Plans which have been prepared in accordance with the Water Framework Directive (2000/60/EC) (WFD). The WFD aims to prevent the deterioration of water bodies including transitional and coastal waters and seeks the achievement Good Status in all waters.

Alongside the WFD and MSFD, further work has been undertaken in the implementation of the Birds Directive and Habitats Directive, including progress towards the identification of further designated sites, as discussed in Section 3.2.4 below.

1.1.3 Draft National Marine Planning Framework (NMPF)

Consultation on the draft NMPF was published at the end of 2019 (Government of Ireland, 2019a). It contains the objectives, policies and supporting actions considered necessary by the Government to support the effective management of marine activities and more sustainable use of marine resources.

There are three high-level objectives founded on the pillars of sustainable development, as follows:

- Environmental – Ocean Health,
- Social – Engagement with the Sea; and
- Economic – Thriving Maritime Economy.

The plan includes a description of the situation of existing sectoral developments and activities in Ireland's maritime area, and identifies future opportunities and constraints for each. It is articulated around Overarching Marine Planning Policies (OMPPs) which apply to all sectors. These OMPPs include inter alia coexistence, biodiversity, coastal and island communities and infrastructure. It also includes Sectoral Marine Planning Policies (SMPPs) to guide decision-making when assessing sector specific development proposals. These regard: aquaculture; defence and security; energy (carbon capture and storage, offshore gas storage, transmission, petroleum, offshore renewable energy); fisheries; marine aggregates and mining; ports, harbours and shipping; safety at sea; seaweed harvesting; sport and recreation; telecommunications; tourism; waste water treatment and disposal.

In accordance with the MSP Directive, Ireland entered a consultation process with its European neighbours to ensure a coherent approach to marine spatial plans.

1.1.4 Links to terrestrial planning

The marine planning system in Ireland will parallel the terrestrial planning system with the two high-level national plans, the NMPF and the National Planning Framework (NPF) 2040 having regard to each other. The NPF is the high-level strategic framework for spatial development in Ireland which aims to promote sustainable growth in tandem with planned population growth. The NPF recognises the inherent link between MSP and land use planning, acknowledging that both are interdependent and interlinked. The NPF sits at the top of land use planning hierarchy. It provides the context for each of the three Regional Assemblies and their Regional Spatial and Economic Strategies (RSES). Development Plans are the principal statutory planning policy document at the local level of the planning policy hierarchy.

The NPF 2040 is accompanied by the National Development Plan 2018-2027 which set out investment and development required to achieve the objectives of the NPF 2040. Its next review will coincide with the review of the first NMPF. It underpins the overarching policies of the spatial framework and allocates funding to infrastructure projects. The alignment of the NMPF and NPF will allow for a holistic consideration of where investment is required to achieve both plans with a view to support social, economic and environmental progress.

Three Regional Spatial and Economic Strategies (RSES) were prepared and made between 2019 and 2020. Their role is to detail the policies contained in the NPF 2040 while guiding development at regional level. As a result, all three RSES contain Regional Policy Objectives (RPO) which support the development and implementation of the NMPF and Blue Growth, including but not limited to marine renewable energy, fisheries, aquaculture and the bioeconomy. In turn, Development Plans provide the spatial framework at county or city level. Those include policies and objectives which are reflective of the local context and particularly important when considering development proposals.

The mutual systemic recognition will allow for better integration and therefore consideration of the marine environment and the marine economy. Similar to the NMPF, Development Plans are prepared every six years, making them one of the most dynamic policy documents in the planning hierarchy. This allows for consideration of new issues and monitoring progress made on policies and objectives. It allows for the better consideration of synergies, better space allocations and a more holistic response to arising issues.

The coordination within and between the hierarchies is essential to achieve common objectives, particularly with regard to sustainable growth and climate change and adaptation. As many marine activities have a dependency on land-based facilities, terrestrial plans can impact directly or indirectly on the quality of the marine environment. Interrelations are particularly relevant for offshore energy production requiring grid connection on land and port facilities to support construction and operation, or where wastewater treatment plants discharge to transitional and coastal waters thereby potentially impacting on the achievement of Good Status (under WFD) and Good Environmental Status (GES) under MSFD. Coordination between the two systems is therefore essential and was enacted through the Planning and Development (Amendment) Act 2018.

1.2 Political Support for the Marine Economy

The PfG, prepared by the government coalition of Fianna Fail, Fine Gael and the Green Party, indicates strong support for the marine economy and envisages significant changes to the protection afforded to the marine environment.

The programme was published at a challenging time for Ireland, as the country was slowly coming out of lockdown and faced with substantial challenges on how to rebuild the economy both during and following one of the most severe economic crises in the history of the State. Social cohesion, Brexit and climate action are three of the underlying themes of the programme. Many of the topics touched upon in this report form part of the PfG. The Government sets itself 12 missions to achieve, some of which are more relevant to the marine economy and environment, as follows:

1.2.1 Mission: Reigniting and Renewing the Economy

Tourism:

- Launch a new tourism initiative the Year of the Invitation in 2023 as a symbolic response to the tenth anniversary of the Gathering.
- Develop a National Outdoor Recreation Strategy.
- Further develop the Wild Atlantic Way (WAW), with a view to develop, inter alia, a walking route from Malin Head to Kinsale.
- Create a tourism trail, the Irish Sea Way, from Carlingford Lough to Cobh and a coastal tourist trail on the Northern coast to link the Causeway coastal route with the WAW.
- Develop in a sustainable manner the marine sector utilising existing partnerships.
- Promote Seafest and develop food trails with Fáilte Ireland.
- Work on strengthening identity and developing a tourism strategy for the Gaeltacht area with Údarás na Gaeltachta.

Access:

- Maximise sea services and examine the development of tourism trails linking ferry ports and rail networks.

Ports, Harbours and Shipping:

- Safeguard the supply chains and access for tourists.
- Consider the expansion of passengers and cargo capability.

Brexit:

- Continue negotiations to ensure the viability of UK landbridge.

1.2.2 A New Green Deal:

Climate Governance:

- Achieve net zero by 2050.
- Support research and development in areas of the bioeconomy, marine sequestration, wave technology and floating offshore wind.
- Significantly push to realise the potential of offshore renewables.
- Evaluate and implement plans pertaining to the carbon sink potential of the marine environment based on the introduction of Marine Protected Areas.
- Update the Climate Action Plan annually.

Renewable Energy:

- Hold the first offshore wind Renewable Electricity Support Scheme (RESS) in 2021.
- Draft and enact the Marine Planning and Development Management Bill within nine months.
- Complete the Celtic Interconnector.
- Establish a long-term plan for harnessing the potential of offshore energy along the Atlantic Coast with a potential production capacity of 30GW from floating wind power.

Funding and Engagement:

- Set up a Climate Action Fund and expand the Environment Fund.
- Sustain citizen engagement.

Natural Heritage and Biodiversity:

- Progress the establishment of a Citizens' Assembly on Biodiversity.
- Promote biodiversity initiatives across primary, post primary and third-level sectors, and ensure that schools, colleges and universities across the country play an active role in providing areas to promote biodiversity.
- Review the remit, status and funding of the National Parks and Wildlife Service (NPWS) to ensure that it is playing an effective role in delivering its overall mandate and enforcement role in the protection of wildlife.
- Support biodiversity data collection.
- Review the protection (including enforcement of relevant legislation) of our natural heritage, including hedgerows, native woodland and wetlands.
- Develop a new National Invasive Species Management Plan.
- Continue implementation of the third National Biodiversity Action Plan 2017-2021 and build on the commitments made at the first National Biodiversity Conference.
- Support local nature groups and local authorities to work in partnership on local biodiversity projects.
- Continue to raise awareness of biodiversity through initiatives like the Annual Biodiversity Awards Scheme.

Water:

- Continue investment in infrastructure to provide for safe and secure drinking water and appropriate wastewater treatment.
- Allocate sufficient budget to Irish Water to deliver adequate services.

1.2.3 Balanced Regional Development

Rural, Coastal and Island Communities:

- Publish the Islands' Action Plan in 2020 which seeks, inter alia, to improve connectivity, transport links and jobs.

Agri-food:

- Secure access to priority markets and continue to harness opportunities from existing markets, including Japan and China.

Marine:

- Prioritise the development of the marine, through the protection of marine biodiversity.
- Develop a successor to HOOW.
- Conclude a Fisheries Agreement with the UK to protect the interests of the Irish fishing industry, access to UK waters and quota share being critical.
- Continue investment in coastal communities through the Fisheries Local Area Group (FLAG) programme and investment in harbour infrastructure.
- Sustainably develop aquaculture and continue the implementation of the report of the Independent Aquaculture Licensing Review Group.
- Ensure that annual quotas allocated by the Common Fisheries Policy (CFP) are in line with Maximum Sustainable Yield.

Marine Protected Areas:

- Develop comprehensive legislation for the identification, designation and management of Marine Protected Areas (MPAs) in Irish territorial waters.
- Realise the outstanding target of 10% under the Marine Strategy Framework Directive as soon as is practical and aim for 30% of marine protected areas by 2030.
- Examine the establishment of an offshore maritime area as Ireland's seventh national park.

Marine Planning:

- Prioritise the passage of a balanced and Aarhus Convention compliant Marine and Planning and Development Management Bill through the Oireachtas.
- Publish Ireland's first ever marine spatial planning policy setting out a clear vision for the future development of our marine planning system.
- Bring forward Ireland's first ever National Marine Planning Framework.
- Establish a marine planning oversight delivery board to provide leadership and oversight to the implementation of these policies.

Blue Carbon:

- Task the Marine Institute with a collaborative EU wide research initiative, aimed at investigating the climate change mitigation potential of blue carbon and working towards a means of creating a validated inventory that will in the future assist the EU in meeting our climate change objectives.

1.2.4 Better Opportunities through Education and Research

Research:

- Expand linkages between research and enterprise.

1.2.5 A Shared Island

This mission focuses on the pending outcomes of Brexit with a view to securing cooperation and collaboration with Northern Ireland. Of particular relevance to the foresight study are:

- The adoption of an all-island approach for national planning frameworks.
- Engagement with the UK Government and the EU with a view to secure the UK's continued involvement in the North Seas Countries Offshore Grid so as to maintain Ireland's energy security.
- Support north / south collaboration on research and innovation.
- Ensure environmental marine conservation and pollution control measures remain.

2 Methodology

The outputs of the marine foresight study are the Evidence database (produced as an excel database and included as an addendum to this report) and a Synthesis Report (this document). This report relies on the evidence database to underpin the results presented in Section 3. The evidence database was developed based on literature review and a limited consultation with relevant stakeholders.

2.1 Evidence database

The evidence database (see Appendix A and associated addendum to this report) was developed in MS Excel. It contains information gleaned from a review of available information on each of the following topics:

- Aquaculture
- Environment - Biodiversity
- Environment - MPAs
- Environment - Water Quality
- Environment - Air Quality
- Environment - Climate Change
- Energy – Carbon Capture and Storage
- Energy – Offshore Gas Storage
- Energy – Transmission
- Energy – Petroleum
- Energy – Offshore Renewable Energy
- Brexit
- Cultural and heritage Assets
- Rural Coastal and Island Communities
- Seascape and Landscape
- Social Benefits
- Aquaculture
- Defence and Security
- Fisheries
- Marine Aggregates and Mining
- Ports, Harbours and Shipping
- Safety at Sea
- Seaweed Harvesting
- Sport and Recreation
- Telecommunications
- Tourism
- Waste Water Treatment and Disposal

Relevant evidence was identified from a number of sources, beginning with an initial list developed as part of the bid process and subsequently added to through consultation with both the Marine Institute and external sources in conjunction with sources identified in further literature review.

Each source identified is recorded against one of six tabs, dependent on the key focus of the literature / data:

- Legal / Policy
- Environment
- Social
- Economic

- Technological
- Brexit

Subsequently information specific to the source is recorded as per Table 1. The purpose and (if applicable) potential inputs to each column are recorded within the Recorded Information tab of the evidence database.

Table 1. Structure of the information database

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link

2.2 Consultation methods

The consultation phase of the project was undertaken from 20th March 2020 to 17th April 2020, with a series of key academic, industry and governmental body contacts included. A stakeholder mapping exercise was carried out prior to engaging in the consultation process. Representatives from State agencies and academia were then contacted by email.

The complete list of organisations contacted can be found in Appendix B of this report. It must be emphasised that the consultation was carried out in its entirety during the COVID-19 public health crisis and as a result some consultees were not available for contact. However, there was a significant overlap in responses indicating that most issues of wide spread interest were raised.

3 Literature Synthesis

3.1 Overview of key drivers

3.1.1 Social

The population of Ireland has been increasing in the last sixty years from around 2.8 million in 1960 to 4 million in 2004 to the present day estimate of around 4.9 million[1]. Life expectancy has increased from 70 to around 82 years in the same time period. This reflects the long-term trend of economic growth and improved quality of life. Notwithstanding these advances, the Organisation for Economic Co-operation and Development (OECD) estimates that around 9% of the population live in relative income poverty. People in Ireland report higher levels of life satisfaction and social support compared to the OECD average (OECD, 2020).

HOOW was published in 2012 during the last recession, which was severe, giving rise to a substantial increase in unemployment and paycuts for those who remained employed. Since 2012, employment has substantially recovered presenting a total cumulated growth for traditional and emerging marine sectors of c. 34% (SEMRU, 2019). Our Ocean Economy 2019 shows that, although, employment growth can be attributed to traditional maritime sectors of the likes of shipping, tourism, fisheries, etc., it is the emerging markets (advanced marine technology, MRE, etc.) which have grown the fastest between 2012 and 2018, presenting a growth rate well over 70%. At €27,500, the average salary in the Irish Blue Economy was higher than the European average of €26,400 in 2017 (EC, 2019). This nonetheless, represents a decrease of 2% compared to 2009, suggesting that historic levels were never achieved since. This may be due to the need to keep costs and therefore salaries low to remain competitive.

As another of its three objectives HOOW sought to achieve greater engagement with the sea through a strengthened maritime identity and increased understanding if its value.

Since HOOW was published, a number of initiatives have been developed or expanded indicating greater engagement with the sea and a move towards more local stewardship. These include formal and informal beach clean events around the Irish coast, some of them through through An Taisce's Clean Coasts programme or Coastwatch among others. These are volunteer-led with the number of Coast Care groups increasing every year. Increased environmental awareness is accompanied by greater national and international information campaigns on marine litter and attempts at reducing the use of plastic goods.

There is growing participation in marine and coastal decision-making, whereby citizens are increasingly involved and organised. This is seen in the cases of the Corrib Gas Pipeline, the Galway Bay Marine and Renewable Test Site and the Bantry Bay mechanical seaweed harvesting project which encountered substantial local opposition and national coverage. Such movements have been influenced by increased access to information via social media which allows citizens to organise themselves outside of formal structures. It is also influenced by increased access and effort in environmental education, particularly marine environmental education.

There has been an increased focus on marine education and outreach programmes for schools, such as the Explorers Education Programme, which is used in over 50 schools around the country. Annual events

[1] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_and_population_change_statistics#Population_change_at_a_national_level

around the coast (e.g. SeaFest) have allowed for greater public understanding of and engagement with the marine.

Linked to greater engagement in the marine is the wider association between the oceans and human health. Understanding of this association is an area that is likely to develop further, and this increased understanding may vary approaches to the marine environment in the future. The SOPHIE2020 research agenda identifies a number of potential interactions between the oceans and human health and seeks to encourage future research in these areas, particularly developing the evidence base for 'blue health', understanding the activities which may promote human health in the marine economy, and how to optimise ocean and human health interactions to obtain physical and mental health and wellbeing benefits (H2020 Sophie Consortium, 2020).

The launch of the Wild Atlantic Way (WAW) in 2014, a large-scale tourism initiative, sought to build on the appeal, both internationally and domestically, of the west coast as a destination and an experience. It is another move toward local stewardship. The initiative has become a key driver for the development of tourism in the west of Ireland and is incorporated into planning policy at all levels of the hierarchy to maximize its impact. Data collated by Fáilte Ireland shows that it supported over 80,000 jobs in 2016 and business creation particularly in recreation and accommodation segments of the tourism industry. Areas such as the Cliffs of Moher have particularly grown in popularity, raising concerns for traffic and litter resulting from increased visitor numbers. The east coast is not excluded from the development of coastal tourism. While the Ancient East is yet to meet the same global and domestic recognition as the WAW, local initiatives are being developed including but not limited to, the Howth Prawn Festival, the Kilmore Quay Seafood Festival and the Dalkey Lobster Festival, showing growing potential and interest for maritime related events. While these developments have evident economic potential, they also show growing engagement with sea and local stewardship.

Other established industries, including but not limited to, maritime transport and aquaculture have seen growth in Full Time Employment (FTE). While shipping and maritime transport have grown moderately since HOOW, marine aquaculture has shown the highest growth, with a recorded increase in direct employment of 87% between 2016 and 2018. Growth in the sector is attributed in part to a strong international demand for shellfish, particularly from China. The location of shellfish aquaculture activity is principally based in counties Donegal, Galway (Connemara), Cork (West Cork), Waterford, Wexford, and Louth (Carlingford Lough) and a significant source of income for coastal communities. Growth in the sector has also been driven by the clearing of the backlog of aquaculture licences since 2017 which allowed for the development, expansion and diversification of the industry, therefore creating employment opportunities, both directly and indirectly. The political push at European level towards a circular economy and addressing climate change is influencing the slow but steady development of the bioeconomy. The bioeconomy, particularly in relation to organic waste from fish discards present potential for entrepreneurship and job creation over the longer term. The National Policy Statement on the Bioeconomy 2018 sets out the Government's policy in relation to the development of the bioeconomy. Similar to the NPF 2040, the statement considers the potential the bioeconomy can bring to rural and coastal communities, particularly as an engine of economic growth, employment and sustainable society. The influence and funding of the European Commission in developing the sector is considerable with research and development programmes set up (Horizon 2020, Bio-based Industries Joint Undertaking). The sector can offer significant potential in offsetting the impacts of Brexit through diversification and reduce risk for the agri-food and marine sectors.

This report notes the ongoing COVID-19 pandemic. In addition to the evident mental and physical health and wellbeing impacts the crisis has on coastal and island communities, it has had severe social impacts as well. COVID-19 has wide ranging impacts on all maritime sectors, either traditional or emerging. Restriction on Irish seafood exports and temporary preferences for tinned, frozen and processed fish rather than fresh is a significant concern for the fishing industry (OECD, 2020). The Irish

seafood market is heavily reliant on exports. Therefore, current levels of demands do not cover fleet and staff costs leading in some instances to grounding of the fleet and therefore unemployment, with reports of up to 75% of Irish fishing boats being tied up due to market closure (Donegal Daily, 2020). The EU recognises the severity of the crisis on aquaculture and fisheries and the lack of flexibility of the European Maritime and Fisheries Fund (EMFF) in addressing the issues. As a result, it adopted on 17th April 2020 *Specific Measures to Mitigate the Impact of the COVID-19 Outbreak in the Fishery and Aquaculture Sectors* (European Commission, 2020). Measures include a more flexible use of EMFF and will be applicable to 31st December 2020. The Government of Ireland announced a series of measures throughout the month of March to cushion income (Temporary Wage Subsidy) and to support those unemployed as a result of the crisis. The Economic and Social Research Institute (ESRI) *Quarterly Economic Commentary – Spring 2020* forecasts that as a result of the crisis, unemployment could rise from 5% in 2019 to 12.6% in 2020, assuming restrictions start to be lifted after 12 weeks. It is otherwise unclear how the crisis will impact on the longer term. Deprivation as a result of lack of economic activity will be dependent in part on the recovery of trade and exports with other nations. This is particularly relevant for aquaculture and fisheries. Recovery in coastal tourism will be in the first instance domestic-led as the ban on domestic travel is lifted. It is unclear how long travel restrictions will be applied and the potential impact on overseas visitor numbers. It is also unclear how cruise tourism will recover. ESRI forecasts that the traded sector (Import / Export) could be impacted over a quarter of the year, suggesting that unemployment in the shipping industry would be temporary and could revert to normal levels in the future.

3.1.2 Technological

The pace of technological development continues to accelerate particularly in areas of artificial intelligence (AI), the Internet of Things and big data (Dobbs et al, 2015) as part of what has been termed the Fourth Industrial Revolution. Alongside advances in material science, these developments offer significant benefits to the maritime sector in terms of facilitating new economic opportunities and increasing the efficiency of existing ones. All marine sectors are likely to benefit from technological development over the coming decades, in some cases substantially.

Such technological development is both a driver in its own right – in creating new opportunities – but also an enabler in responding to other key drivers such as economic drivers for resources and efficiency and environmental drivers such as net zero and The European Green Deal (European Commission, 2019).

For example, the need to reduce emissions will be a major driver of technological development and innovation, affecting the design and powertrain of ships, driving the use of data analytics to improve efficiency, and influencing the technological solutions adopted by the seabed mining industry (Government Office for Science, 2017a). Continuing decarbonisation of the energy grid coupled with cost reduction also offers ongoing opportunities in offshore wind, wave and tidal power.

Government Office for Science (2017a) identifies that technology will continue to evolve rapidly including in the following areas:

- Reducing shipping emissions to support global climate ambitions;
- Increasing demand for specialised shipbuilding;
- Alternative marine fuels and the ocean as a place for energy generation;
- Remote controlled shipping;
- Affordability, security and autonomy in shipping;
- Autonomy and data processing in surveying;
- Linking satellites and marine autonomous systems;
- Increasing demand for satellite bandwidth;
- Emergence of deep-sea mining;
- Growth of the oil and gas decommissioning industry;

- Energy Development and integration of offshore wind power.

Lloyds Register (2018) documents the rapid progress that is being made in autonomous technologies and highlights development in five key areas of technology that will facilitate autonomy in commercial shipping, defence and ocean sensors: artificial intelligence; sensors and situational awareness; connectivity; cyber security; energy management and sustainability. These themes are also emphasised within the UK's Maritime 2050 – Navigating the Future (Department for Transport, 2019).

Marine genetic resources are identified as a potentially valuable future resource (Government Office for Science, 2017a; Lloyds Register, 2015). This includes both genetic material and chemical substances that may be of use in pharmaceutical, cosmetic and other industries. The sector is expected to grow by about 10% per annum in the coming years (Lloyds Register, 2015) with a key focus on the large-scale use of algae.

Ireland's National Statement on the Bioeconomy (Government of Ireland, 2018) highlights the potential for technological advances to facilitate greater sustainable use of renewable biological resources including from the marine environment in value added products such as food and bioenergy. There are key research opportunities identified within the Strategic Research Agenda published by the European Marine Board (H2020 Sophie Consortium, 2020) and funded programmes to support the marine bioeconomy, including a focus on seaweed cultivation to support marine biodiversity and climate change mitigation (BiOrbic, undated). To support the development of the bioeconomy there are multiple routes to funding through national and European initiatives, identified by the Irish Bioeconomy Foundation (IBF) (IBF, undated), which was established to promote the conversion of Ireland's natural land & sea resources to high value products for the development of a sustainable bioeconomy.

3.1.3 Environmental

International and European environmental policy is a very important driver in shaping the regulation of human activities in the marine environment and efforts to maintain and improve the health of Ireland's seas.

The UN Sustainable Development Goals (SDG), including SDG14 which aims to encourage nations to *"Conserve and sustainably use the oceans, seas and marine resources for sustainable development"* seek to provide international impetus to promote the sustainable management of the marine environment, and progress towards the achievement of this goal underlies much of the more detailed drivers at a European and national scale. Achievement of the SDGs will support both the marine environment and the marine economy in developing a sustainable balance. These goals will continue to be significant drivers in the development of policy in blue economy.

Many of the International and European environmental directives are well established; for example, the Convention on Biodiversity, the Birds Directive, the Habitats Directive, Marine Strategy Framework Directive, Water Framework Directive and Bathing Waters Directive; and will continue to drive improvements in environmental quality. The recent EU Green Deal, which includes a focus on achieving 'Net Zero', is also likely to be fundamental in driving the expansion of offshore wind and other renewable energy technologies in Ireland's seas.

The EU Biodiversity Strategy contains specific commitments and actions to be delivered by 2030, including:

- Establishing a larger EU-wide network of protected areas on land and at sea, building upon existing Natura 2000 areas, with strict protection for areas of very high biodiversity and climate value; and

- An EU Nature Restoration Plan - a series of concrete commitments and actions to restore degraded ecosystems across the EU by 2030, and manage them sustainably, addressing the key drivers of biodiversity loss.

The Commission is to provide further detail and guidance in regard to such protected areas later this year. The Strategy is at an early stage of consideration by the Council and will also go to Parliament.

Progress towards environmental objectives in Ireland, as in many other Member States has been slow (discussed below under Biodiversity), and this trend is likely to continue, although this will also be influenced by political factors including future public spending and funding allocations. PfG commitments may help to accelerate the pace of progress. Climate change is likely to increasingly affect the marine environment in the longer-term as a result of sea level rise (affecting coastal habitats), rising sea temperatures (affecting habitat and species distributions) and ocean acidification (affecting calcifying organisms). Climate change will also be a significant threat to coastal infrastructure and cause accelerated erosion around the coast. The Climate Change Advisory Council (2019a) predicted that mean sea level would increase, adding and magnifying the impacts of storm surge and wave pattern in coastal areas. This will be particularly challenging for coastal and some critical infrastructure, namely ports and harbours. The railway network will also be threatened and require investment, particularly the Dublin to Wexford and the Dublin to Belfast lines which directly abut the coastline.

It is expected that progress will be made towards protecting larger areas of the coastal and marine environment through the implementation of MSFD measures and commitments in the PfG. These include the completion of designation processes and effective management of Special Protection Areas and Special Areas of Conservation under the Birds Directive and Habitats Directive and formal designation and management of marine Natural Heritage Areas and other Marine Protected Areas (MPAs). Wider measures to protect OSPAR threatened and/or declining habitats and species are also likely to be put in place.

There may be challenges to the pace of change in the protection and management of the marine environment in Ireland. These could include both social and civic society pressure to accelerate the pace of progress but also economic factors which may reduce focus and spending on the marine environment, particularly following the COVID-19 pandemic.

Since the publication of HOOW, there has been a significant strengthening of climate change policies with a requirement for reducing emissions to Net Zero by 2050. This is likely to be a major environmental driver in the short, medium and long term, instigating significant changes across multiple topics including driving requirements for adaptation across multiple sectors (Government of Ireland, 2017) and increasing demand for offshore renewable energy (Government of Ireland, 2019b) and Carbon Capture and Storage (CCS) technology (Climate Change Advisory Committee, 2019). Shifts in habitat and species distributions may potentially require changes to MPA boundaries (NPWS, 2019). Climate change policies have already significantly influenced the future shape of the Oil and Gas sector in Ireland, with a moratorium on oil prospecting as it is not considered to be compatible with meeting Ireland's obligations to reduce emissions.

Since HOOW, there has also been an increasing recognition of the importance of integrating natural capital and ecosystem services concepts into environmental decision-making. This is likely to be an important focus in the coming decades. For example, the draft NMPF (DHPLG, 2019) includes policies that require decision makers to consider impacts on ecosystem services. There is also a growing focus internationally on the concept of 'net gain', where development projects are required to achieve an overall improvement in the quality of the environment. As a first step, Ireland's National Biodiversity Action Plan (DCHG, 2017) includes policies encouraging no net loss of biodiversity. This is likely to become more widely applied, with development projects in the marine environment potentially being

required to demonstrate net gain as a part of the permitting process. Marine planning may also play a part in influencing development taking into account the protection of the marine environment. For example, the development of sectoral marine plans will be required to consider their impact on the environment as part of the SEA Directive.

3.1.4 Economic

The EU Blue Growth Strategy encourages sustainable development in European seas (European Commission, 2012). HOOW established targets to double the value of Ireland's ocean wealth to 2.4% of GDP by 2030 and to increase the turnover from its ocean economy to exceed €6.4bn by 2020.

Globally, the OECD estimated that the marine economy could double in size between 2010 and 2030, reaching around USD 3 trillion in 2030 (OECD, 2016) with potentially rapid growth in marine aquaculture, capture fisheries, fish processing, offshore wind, and port activities combined with expectations of moderate growth in already large industries like maritime and coastal tourism, offshore oil and gas, shipbuilding and maritime equipment. Technological progress, particularly in the areas of artificial intelligence, materials design, the Internet of Things and big data, has been, and will continue to be, important in driving much of this growth, (Lloyds Register, 2015). This growth provides opportunities both in the direct economy, but also in wider linked shore-based industry (engineering, construction, biotechnology).

Many aspects of Ireland's maritime economy are intricately linked to global supply chains. In particular, maritime transport and the seafood sector have strong international dimensions. For example, of the €651 million worth of exported seafood in 2019, €381 million was to the EU, €93million to Asia and €86 million to the UK; whilst simultaneously €330 million worth of seafood was imported, €219 million of which was from the UK (BIM, 2020). They are therefore subject to influences on international supply and demand. Since 2013, exports towards Asian markets have grown very strongly, with 2018, alone, presenting a year-on-year increase of 23% in value, although there was a slight contraction in 2019. Shellfish, including crab and prawns are some of the most exported species (BIM, 2019a).

A 2019 survey by the Marine Institute and PwC indicated that 88% of leading voices in the marine industry were confident about future growth. Marine energy including offshore wind and ocean energy (87%) was identified as the most significant opportunity for the maritime industry, whilst other opportunities include: marine tourism and leisure (50%); Aquaculture, sea-fisheries and processing (47%), marine biotechnology (38%) and shipping and maritime transport (25%) (Marine Institute and PwC, 2019).

Ireland's marine economy grew 13% from 2016 to €6.2 billion (GVA €2.2 billion) in 2018 (SEMRU, 2019), although it contracted in 2019 to €5.8 billion (Ahearne and Hynes, 2020). This contributed 34,132 FTE jobs in 2018 (31,000 in 2019) in the Irish economy and when considered with indirect effects represented 2% of GDP in 2018 (SEMRU, 2019). In 2018, SEMRU estimated that established marine industries made up the majority of this figure (93% of turnover, 94% of GVA), with Oil and Gas and International Cruise showing significant increases from 2016 to 2018. There was a decline in turnover of Ireland's ocean economy, which was down 7 per cent between 2018 and 2019. Similarly, GVA declined by 5% and employment saw a minor decline of 1 per cent. The decline is attributed to a decline in shipping and maritime transport, marine tourism and leisure and the seafood sector. The drop in natural gas prices also contributed to the reduction.

As an emerging marine industry, offshore renewables experienced a contraction over 2016 to 2018, although the sector is expected to expand rapidly in the coming decades, initially aiming to achieve 5 GW installed capacity by 2030 (Government of Ireland, 2020). This was estimated to have the potential

to contribute up to €6 billion to the Irish economy and to create significant numbers of jobs - up to 20,000 FTE - by 2040 (KPMG, 2018).

Currently, the largest marine sectors are shipping and maritime transport - generating an estimated combined direct annual turnover of c. €2.2 bn (Ahearne and Hynes, 2020); and tourism and leisure in marine (€1.2 bn) and coastal area - generating a combined direct and indirect annual GVA of c. €1.2 bn. Both of these sectors grew significantly between 2016 and 2018 and declined in 2019. Both are currently experiencing uncertainty, with marine transport and shipping particularly threatened by Brexit which may introduce tariffs or necessitate increased direct travel to the continent, with associated increased travel times. The impact of the COVID-19 pandemic on tourism and leisure is also highly uncertain, although it can be concluded with some certainty that it will be significant in the short term. The broader geopolitical context, i.e. trade conflicts between China and the US is also in part responsible for the decline in trade.

Sea fisheries – direct and indirect GVA of €226 million – and fish processing – direct and indirect GVA of €364 million – are also significant contributors to the marine economy and both have shown overall growth since 2010, albeit with some fluctuations (SEMRU, 2019). However, as discussed below, the two industries (alongside many others) are both facing both short and long term challenges through COVID-19 and Brexit.

Measures that have been put in place by national governments to manage health risks due to the COVID-19 pandemic are currently having major negative impacts on national economies. ESRI (2020) estimates that the measures could shrink the Irish economy by 7.1% in 2020, assuming that restriction measures are only in place for around 12 weeks and that the Irish and global economies recover thereafter. The report recognises that impacts could be even more severe if restriction measures need to be prolonged further. The lockdown measures implemented by national governments to seek to control the pandemic are having a major impact on seafood businesses which are heavily dependent on exports which contribute to over 50% of the total seafood industry GDP (BIM, 2019a). Many international markets have collapsed meaning that fishers are unable to sell their catch and fleets are moored up. Similarly, on the back of COVID-19, a contraction in the international cruise sector may also be expected, although the exact nature of this change is uncertain both in magnitude and duration.

Both the short-term (2020) and long-term (decadal) impacts of COVID-19 measures are currently very uncertain, as are the policies likely to be enacted during recovery. Once the pandemic is controlled, it would be expected that economic activity might start to recover but there may be long-lasting changes to global patterns of economic activity.

Brexit is also forecast to negatively affect the Irish economy. Ireland is uniquely exposed to Brexit due to very high trade intensity with the UK. Approximately 15 per cent of Irish goods and services exports are destined to the UK (Copenhagen Economics, 2018). In certain sectors, the UK is an especially important market, such as the agri-food sector where around 40 per cent of exports are destined for the UK. In addition, two-thirds of Irish exporters make use of the UK landbridge to access continental markets. Under four different scenarios which took account of possible future trading arrangements, Brexit was estimated to have an impact on GDP of between -2.8% and -7% by 2030 compared to Business As Usual scenario (Copenhagen Economics, 2018). Brexit could also affect the £:€ exchange rate positively or negatively which could also affect trade.

Future Jobs Ireland 2019 (Government of Ireland, 2019c) recognises the significant threats arising from the fallout of Brexit with the potential to change the economy. Owing to its edge in IT and technology development, Ireland can build on its existing capabilities with regard to artificial intelligence, augmented reality, data analytics and work toward developing solutions in a number of sectors including but not limited to MarineTech and agrifood tech. The digital transition has become a major

influence in the Irish economy and is likely to continue to do so. The July Job Stimulus 2020 (GoI) announced the preparation of a National Economic Plan which will work toward the decarbonisation of the economy and continue effort toward the digital transformation. The stimulus also announced investment in communities and jobs, with funding allocations made to sectors including tourism, fisheries and toward attracting foreign direct investment.

3.1.5 Political

The Political Guidelines for the Next European Commission 2019 – 2024 (von der Leyen, 2019) identify six key priorities:

- A European Green Deal;
- An economy that works for people;
- A Europe fit for the digital age;
- Protecting our European way of life;
- A stronger Europe in the world;
- A new push for European democracy.

The European Green Deal and associated Action Plans and Strategies; including measures to support Net Zero; greater use of natural capital and ecosystem services information in decision making; designation of additional MPAs; a new Biodiversity Strategy; and promotion of a sustainable blue economy will be important political drivers for the marine environment over the next five years and beyond. The drive towards Net Zero is likely to result in rapid expansion of offshore renewables in Irish waters over the coming decades. The Deal also includes a new Industrial Strategy, a strategy for green financing, a Sustainable Europe Investment Plan and a new Circular Economy Action Plan. These may also help to drive blue growth. Economic measures to support SMEs and the development of an SME Strategy may also facilitate blue growth.

The Blue Growth Strategy (see Section 3.1.4 above) will also continue to be an important political driver of marine activity in blue growth sectors, innovation and research and maritime surveillance and co-operation.

The UK's exit from the EU creates a number of significant political challenges for Ireland relevant to the marine environment. The UK is committed to negotiating a new comprehensive trade agreement with the EU by the end of 2020 which may satisfactorily resolve some of these challenges. Key issues include fisheries access and tariffs on fish exports, impact on physical trade flows caused by customs checks, and possible tariffs on electricity transfers. The PfG has reiterated Irish commitment to maintaining the viability of the UK landbridge to protect Irish trade. These issues are discussed further in the relevant subsection below.

The COVID-19 pandemic also poses major political challenges with significant economic and social impacts in the marine environment. The lockdown measures that national governments have been implementing to slow the spread of COVID-19 have significantly affected economic activity. In relation to the marine environment, the measures have particularly affected exports of seafood from Ireland as well as domestic demand from restaurants and hotels. While a raft of financial support measures have been rolled out to support businesses and employees alike, the time period for which lockdown measures may need to be in place and the pace and extent of any subsequent recovery is unknown. It is likely that a sustained major political response involving economic stimulus will be required to support economic recovery. This may alter national spending priorities which may benefit or hinder recovery of marine businesses.

The PfG proposes a strategy for recovery and rebuilding from financial and societal impacts caused by the COVID-19 emergency. Those elements of the document which relate to marine activities include a New Green Deal, with an emphasis on offshore wind energy, particularly off the west coast, in addition to protection of biodiversity at sea. Promotion of offshore wind energy along the western coast is likely to result in associated requirements for grid connections and related infrastructure. In relation to reigniting the economy, there is an emphasis on capital investment in infrastructure and the development of sectoral responses through a national economic plan. This provides opportunities for the maritime sector, which can assist in unlocking economic potential of the marine area. A further key plank of the draft document is the promotion of research, development and innovation. Ireland has the potential to further develop expertise in certain technologies with the assistance of government funding. This coalition government policy framework is likely to be developed further with the involvement of other political parties which may require more specific measures.

3.2 Topic specific detail

3.2.1 Aquaculture

Current trends

Aquaculture has grown particularly strongly over the last four years in Ireland. When published in 2012, HOOW set a target of €1 bn annual sales value to be achieved by 2020 for seafood and seaweed. SEMRU's Our Ocean Economy 2019 report shows that the direct turnover of marine aquaculture has grown by 35% since 2012 to 2018, although growth was not consistent throughout the years (SEMRU, 2019). However, it was the source of substantial job creation, with the number of jobs more than doubling in the space of eight years, albeit from a relatively low base. Aquaculture recorded a slight decline of 3% in 2019 to a value of €172 m (BIM, 2020).

Growth in employment (direct FTE) was particularly significant in the year 2017 as a result of the backlog of aquaculture licences being granted following a review of the licensing process as recommended by the National Strategic Plan for Sustainable Aquaculture Development 2015. The resolution of the backlog can also be attributed to measures to ensure compliance with environmental requirements, with particular reference to a European Court of Justice judgement. Aquaculture licensing in most bays must be carried out in line with very specific requirements under the Birds Directive and Habitats Directive. A large element of the judgment concerned a failure by the State to put in place adequate assessment of aquaculture licence applications in 'Natura 2000' areas. The changes also led to a strong growth in Gross Value Added (GVA). This is clearly evidenced in the above mentioned SEMRU report which shows a year-on-year growth of less than a percent in direct employment between 2017 and 2018 compared to a growth of 86% between 2016 and 2017. It is therefore unlikely that levels experienced in recent years would continue to increase but may instead revert back to employment growth levels observed between 2014 and 2016. Although difficulties were noted for 2019 due to trade disputes, weakened confidence as a result of Brexit and the impacts of climate change, confidence in the sector remains strong, particularly as domestic consumption has risen by 2% in 2019 compared to 2018, showing the potentially growing interest and therefore demands of Irish consumers.

The market is principally divided between the finfish (salmon, trout and perch), shellfish (oyster, mussels, etc.) and seaweed subsectors. Aquaculture is particularly sensitive to environmental factors (epidemic) and economic factors (market prices) resulting in fluctuating stocks and turnover over the years. Certain species, and therefore market segments, were affected by diseases, leading to a decrease in turnover (e.g. salmon). Nonetheless, salmon remains the most produced and highest value species. Increased public environmental awareness has also led to increased public opposition in parts of the country such as the north west, delaying the aquaculture licensing process.

Changes since HOOW

The Bord Iascaigh Mhara (BIM) Annual Aquaculture Survey 2019 considers that although economic performance (income v. cost) of Irish aquaculture is improving, it remains challenged due to high costs, including salary. Production has not grown constantly throughout all segments of aquaculture. Rope mussel production has remained relatively static, whereas other species such as oyster and salmon have substantially increased. Interestingly, mussel production costs are and have remained relatively low. On the other hand costs associated with oyster and salmon farming appear to be the highest. Salmon production is now 100% certified organic under the EU Organic regulations owing to favourable competitive conditions. The achievement of a more sustainable aquaculture industry is particularly supported by the BIM Statement of Strategy 2018-2020 which considers the need to showcase Irish seafood as a '*reasonable and sustainable catching, farming and processing sector, with environmental management systems embedded in its operations*' (BIM, 2018).

In 2015, the EU adopted a €239m investment package for Irish fisheries and aquaculture under the European Maritime and Fisheries Fund (EMFF). €14.9m in funding was allocated to aquaculture to specifically support innovation through productive investment and a reduction in administrative burden with a view to improve competitiveness. It also entailed a significant amount allocated to directly support local development initiatives and coastal communities toward diversification and sustainable extension of the sector.

Potential future developments

Aquaculture continues to be a significant growth area as demand for sustainably grown animals continues to rise. The National Marine Research and Innovation Strategy 2017-2021 (MI, 2017) considers that culturing marine species for food will continue and be expanded to include culturing species for use in areas other than food. The production of biomass by culturing macro – and micro-algae and other micro-organisms provides an additional source of raw materials for use in a variety of market areas, including the bioeconomy. Technology development will be particularly important for Irish aquaculture as the production is largely driven by SMEs. Technology which reduces costs will help drive Irish competitiveness on international markets. BIM, Údarás na Gaeltachta and MI have together and individually worked to develop a competitive aquaculture industry. Public and private projects have been funded with a view to develop an environmentally resilient and innovative industry, for example, Recirculating Aquaculture Systems (RAS) which increase productivity and reduce diseases (e.g. sea lice) through a reduction of the time spent at sea. Technology which reduces environmental impacts and drives cost down, particularly energy costs will help increase productivity and social acceptance, the latter becoming an increasingly prevalent issue for the industry. However, technology development will allow for push further offshore, theoretically decreasing public opinion concerns (Black & Hughes, 2017).

Marine bioresources including seaweed have increasingly become the focus of Research & Development (R&D) projects owing to the potential offered. Seaweed is becoming the focus of food developments and agriculture products such as fertiliser and is increasingly used in pharmaceutical and cosmetic products. Enterprise Ireland and BIM recognise the substantial potential offered by seaweed, particularly as an input to the bioeconomy. Enterprise Ireland in particular considers seaweed as an underutilised natural resource offering a wide range of applications across many industry sectors, constituting largely untapped potential.

Aquaculture is not without environmental impacts and can negatively affect landscape / seascape, water quality or lead to the proliferation of invasive species, and activities must be undertaken with regard to the issues discussed in Section 3.2.3 below. Impacts of aquaculture are therefore potential constraints, when sites are within or adjacent to designated sites, and further development of the MPA network discussed in Section 3.2.4 may change the development of the sector. The application of

environmentally friendly practices and the achievement of higher environmental standards are an increasing focus of marine aquaculture. It is expected that the sustainable development of aquaculture, including shellfish aquaculture, will remain a key focus of government and relevant agencies' initiatives as evidenced in the PfG. Department of Agriculture, Food and the Marine (DAFM), BIM and MI have driven the achievement of sustainability in the seafood sector through the achievement of organic certification, the development of Origin Green and supporting increased recycling of equipment such as barrels. The role of Co-ordinated Local Aquaculture Management Systems (CLAMS) should also be noted. These groups established around the coast help the development of a more resilient aquaculture through the deployment of a variety of projects seeking, inter alia, to increase productivity while reducing environmental impacts.

3.2.2 Defence and Security

Current trends

Ireland currently maintains a naval fleet comprising one Helicopter Patrol Vessel (HPV), four Offshore Patrol Vessels (OPV), two Large Patrol Vessels (LPV) and two Coastal Patrol Vessels (CPV). Within the Irish marine area the Naval Service and the Air Corps are responsible for patrolling the entire Irish Exclusive Economic Zone, monitoring Ireland's interests at sea including:

- Fisheries;
- Combatting illegal, unreported and unregulated fishing;
- Installations for the production of renewable energy;
- National conservation sites;
- Petroleum infrastructure;
- Marine transport routes; and
- Submarine cables and pipeline routes.

Changes since HOOW

Since HOOW there has been significant investment in naval assets, with four new Naval Service ships commissioned between 2014 and 2019. The publishing of the Government White Paper on Defence in 2015 also provided for replacement of Maritime Patrol Aircraft. A contract was awarded to Airbus in December 2019 for the Air Corps to acquire two C295 Maritime Patrol Aircraft. Delivery of the two aircraft is expected in 2023.

More widely the development of autonomous underwater, surface and air vehicles both within and outwith the wider/international military sector has continued at pace, with the capabilities offered by such technology potentially providing significant reductions in risk to personnel and changes to the rhythm of engagement.

Potential future developments

Over time, it is expected that there will be significant technological advances in the defence sphere with the development of Artificial Intelligence (AI), whereupon repetitive (but nonetheless important) tasks can be done by AI (Sheehan, 2019). Other technological developments are likely to include advancements in technology, big data analytics, changes to Human Computer Interfaces (HCI), energy management and human augmentation (Lloyds Register, 2015). Changes to the nature of engagement may also be experienced, with increases in cyber warfare, and some commentators identifying the importance of managing and protecting subsea cables in Irish waters (Mulcahy, 2019), especially considering Ireland's position as a leader in Information Technology reliant on such infrastructure.

As set out in the White Paper on Defence (2015), the primary focus of the Department of Defence and the Defence Forces is the protection of Defence networks. The Defence Forces provide a support role to the Department of Climate Action, Communications Networks and Transport who lead on Ireland's National Cyber Security Strategy. This includes the Defence Forces playing a central role in facilitating the operations of the National Cyber Security Centre.

As a small military, the Irish Defence Forces may face difficulties in expanding into the cyber sphere and adapting to rapid changes that are expected to develop in the short and medium term (such as those expected in Artificial Intelligence) (Sheehan, 2019). However, there is some potential that progress may be supported through the EU Declaration on Cooperation on Artificial Intelligence, signed in 2018. Similarly, the EU common defence and security policy, Permanent Structured Cooperation and the European Defence Fund may support EU states in filling capability gaps through enhanced defence cooperation and pooling of funding to invest in defence technologies (Fiott, 2019).

Brexit introduces some additional uncertainty in the development of the Defence and Security relationship between Ireland and the UK, the nature of which will depend on any deal between the UK and Europe in the future. In terms of defence cooperation between the UK and Ireland, while there will be changes at EU-level, bilateral Ireland/UK cooperation on certain areas of defence takes place under the 2015 UK-Ireland Memorandum of Understanding (MoU). This MoU is a voluntary, non-binding arrangement which placed already existing cooperation arrangements in the Defence area, between Ireland and the UK, on a more formal and transparent footing. The MoU will continue to facilitate cooperation between Ireland and the UK in the agreed areas into the future.

3.2.3 Environmental – Biodiversity

Current trends

The National Parks and Wildlife Service (NPWS, 2019) reports the status of EU protected habitats and species for the six year time periods to 2007, 2013 and 2019 in accordance with the requirements of Article 17 of the Habitats Directive. Of 18 marine or marine influenced habitats, only four were assessed as being in favourable condition, with 10 assessed as unfavourable–inadequate and four as unfavourable-bad. Around half of the habitats assessed were reported to be in a declining condition. Of 24 species that have a dependency on the marine environment, 17 were assessed as being in favourable condition, with two assessed as unfavourable-inadequate and five as unfavourable-bad. Three species were assessed as showing a declining condition. Additional measures will be required to halt and reverse this continuing biodiversity loss.

NPWS also reports on the status of birds protected under the Birds Directive. The report covering the time period to 2019 is expected.

Progress towards achieving conservation objectives and actions to support their achievement are documented in Prioritised Action Framework (PAF) reports (e.g. NPWS, 2014a). A further PAF is currently in preparation covering the period 2021-2027.

The Water Framework Directive (2000/60/EC) establishes quality objectives for surface waters and groundwaters including for transitional and coastal waters. EPA (2019) reports progress towards achieving good status in the period 2007 – 2018 (see Figure 1 and Figure 2, below). While there has been some improvement in coastal water bodies, there has been limited improvement in the quality of transitional water bodies.

The Marine Strategy Framework Directive (MSFD) was adopted in 2008 with the aim to achieve Good Environmental Status (GES) in the marine environment by 2020. Ireland has formally submitted targets

to achieve GES and progress has been made in the implementation of measures regarding invasive non-native species (INNS), marine litter, underwater noise and water quality. Ireland's draft Article 17 Report (Government of Ireland, 2019d) indicates that it considers that current status for 6 descriptors is compatible with GES. For biodiversity, commercial fish and shellfish, seafloor integrity and marine litter, some elements were considered to be compatible with GES. For food webs, compatibility with GES was stated as not known. Ireland's Article 18 Report (Government of Ireland, 2019e) notes that of the 203 individual measures in its Programmes of Measures, 177 have already been fully implemented and the remaining 26 measures are in the process of being implemented.

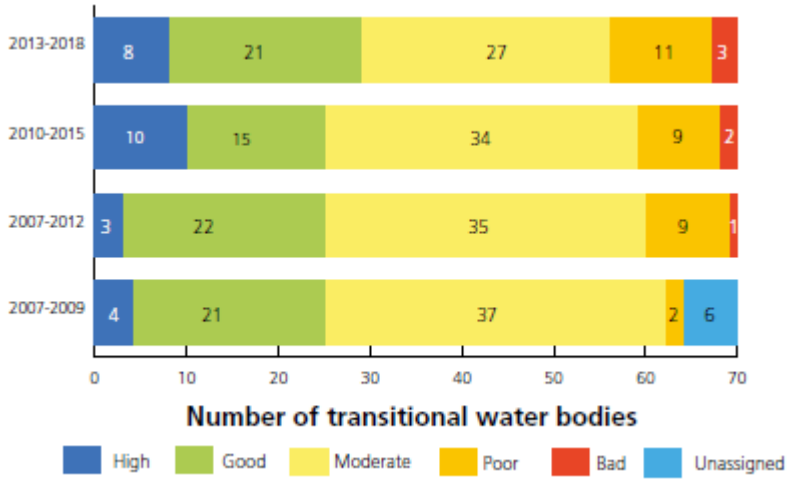


Figure 1. Trend in quality status of transitional water bodies (from EPA, 2019)

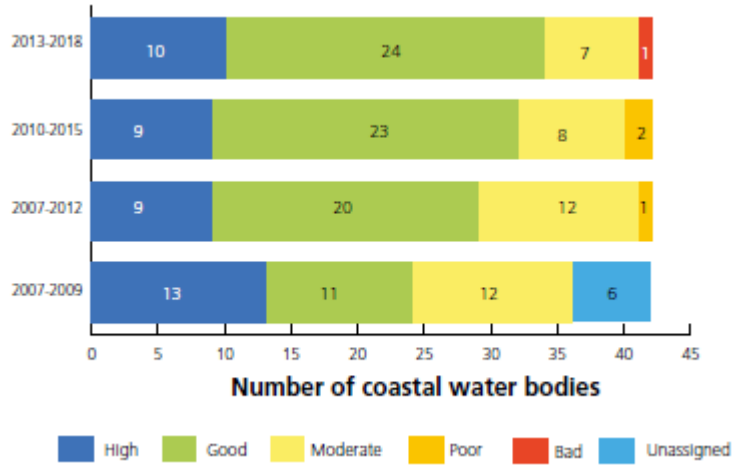


Figure 2. Trend in quality status of coastal water bodies (from EPA, 2019)

Currently, there are no strict regulations on the production of underwater noise in the marine environment. NPWS has published guidance on managing risks to marine mammals from man-made sounds (NPWS, 2014a). The MSFD has implemented actions to increase data collection on sources of underwater noise and its impact on marine species (OSPAR Commission, 2012). Preliminary data on underwater noise has led to the OSPAR Monitoring Strategy for Under Water Noise (OSPAR Commission, 2015) and guidelines for the monitoring of impulsive sounds (OSPAR Commission, 2017). Ireland contributes to OSPAR regional assessments with a register of marine noise, which started in 2015/2016, to monitor seismic surveys and site surveys. Progress is also being made with reducing underwater noise generated by ships (IMO, 2014).

Changes since HOOW

As described above, since HOOW there have been a number of changes to the management and status of biodiversity in Ireland. This has included a continued decline in some aspects of biodiversity, despite implementation of further measures to support achievement of WFD and MSFD objectives and actions taken under the PAF. Potential risks to biodiversity, particularly climate change, INNS, plastic pollution and underwater noise have received more recognition and, associated with greater recognition of these risks, a better acceptance of the value of natural capital and ecosystem services has influenced their use as part of the assessments contributing to decision making.
Since the publication of HOOW, funding has been provided under Ireland's EMFF Operational Programme through the Marine Biodiversity Scheme, aimed at a reduction of the impact of fisheries and aquaculture on the marine environment, including the avoidance and reduction, as far as possible, of unwanted catch and the protection and restoration of aquatic biodiversity and ecosystems.

INNS has received greater recognition and is now recognised as one of the greatest threats to biodiversity and the risk they impose may be increasing due to increasing global trade, transport and climate change (CBD, 2016, 2018). The monitoring and management of INNS is recognised as key to reducing the impact on native biodiversity and the economy and achieve GES (European Commission, 2017). Actions undertaken by Ireland to achieve MSFD targets include the implementation of the National Parks and Wildlife Services' Non-Native Species Risk Assessment, Invasive Alien Species Action Plans and an Industry Code of Practice for the aquaculture industry (Dublin City Council, 2016, DHPLG, 2019). Implementation of the Ballast Water Management Convention (IMO, 2017) into Irish law has started, requiring the recording of INNS in ballast water and the potential of installation of on-board treatment systems, potentially leading to a reduction of INNS introductions in the long-term.

Marine litter, specifically plastic, and its impact on the marine environment has received increasing attention in the research and public sector over the last 10 years. Plastic pollution can be harmful to wildlife, human well-being and to the economy. There is extensive evidence that entanglement in, or ingestion of, plastics can cause injury and death to a wide range of marine organisms, including commercially important fish and shellfish. Plastic pollution is also hazardous for mariners and reduces the amenity value of coastlines necessitating costly ongoing clean-up operations. The effects of small particles of micro and nano-sized plastic debris are not fully known. It is estimated that plastic pollution in oceans will treble between 2015 and 2025 (Thompson, 2017).

A number of legislative changes have been made to reduce plastic waste in Ireland including The Microbeads (Prohibition) Act 2019 and the EU prohibition of sale of single-use plastics which will come into force in 2021. Ongoing measures in Ireland to address marine litter include the National Waste Prevention Programme (NWPP, 2018) which aims to promote alternatives to single-use plastics and improve recycling infrastructure, and the OSPAR Regional Action Plan (OSPAR Commission, 2014) to reduce marine litter where Ireland are co-lead on a number of actions. Ireland will continue to move towards implementation of EU directives and OSPAR actions. The European Strategy for Plastics in a Circular Economy (European Commission, 2018) details a number of proposals for reducing plastic waste which has led to an increase in the number of projects funded by the EU including topics such as innovation into durable plastics and plastic alternatives, technology for tracing plastics and recycling infrastructure.

The PfG provides many significant commitments to improving the marine environment, including:

- A new integrated marine sustainable development plan, as a successor to HOOW;
- Measures to increase the sustainability of commercial fisheries;
- Designation and management of additional MPAs (see Section 3.2.4 below);

- Publication of Ireland's National Marine Spatial Plan and National Marine Planning Framework as part of Project Ireland Marine 2040, a long-term overarching strategy to manage Ireland's seas for the benefit of all its people; and
- Investigating the role of coastal blue carbon in supporting climate change mitigation.

Potential future developments

In the future, the pace of progress towards WFD objectives is likely to continue to be slow unless spending priorities are altered and there are higher levels of investment in tackling issues in transitional and coastal waters.

Similarly, progress in tackling some of the issues in the marine environment under the MSFD is also likely to be slow. For example, based on experiences in other Member States, some of the measures currently in progress such as consideration of additional requirements to protect OSPAR threatened and declining habitats and species, designation of additional MPAs and improved management of existing MPAs, may take some years to implement. Recovery of marine habitats and species thereafter may also be prolonged and likely to be measured on decadal time scales.

The ongoing target set by the National Biodiversity Action Plan 2017 - 2021; "*Harmful invasive alien species are controlled and there is reduced risk of introduction and/or spread of new species*", will continue to drive implementation of actions in Ireland alongside a new National Invasive Species Management Plan, proposed in the PfG. Together with more effective international controls on ballast water and antifouling substances this should limit, but not entirely halt, the number of new INNS being found in Irish waters. Rising sea temperatures, as a result of climate change, may exacerbate issues with existing and new INNS where this favours their spread.

It is possible that additional targeted measures may be required to manage underwater noise in the future. Noise mitigation technologies have been developed in line with MSFD targets, such as bubble curtains, hydro sound dampers and vibro-piling, however, new technologies are being developed which will continue to drive this sector forward in the short to medium-term (OSPAR Commission, 2014). As a result of technological developments and implementation of International Maritime Organisation (IMO) guidelines, underwater noise from shipping is also anticipated to reduce over decadal time scales, reflecting the relatively long asset life of existing ships.

Some new and emerging policies may also help to halt and reverse marine biodiversity decline including:

- PfG commitments;
- PAF actions for 2021-2027;
- EU Biodiversity Strategy 2030;
- National Biodiversity Plan (to be published in 2022);
- Biodiversity policies in the NMPF;
- Uptake and implementation of natural capital and ecosystem services assessments and valuation (Austen et al, 2019);
- Adoption of new policy approaches to reversing biodiversity decline such as 'net gain' (CIEEM et al, 2016)
- As awareness of marine litter increases across public and scientific sectors, it is likely that further European regulations will be placed on plastic products and other waste streams.

The COVID-19 pandemic is likely to significantly affect marine businesses and thus reduce marine activity pressures in the short-term, particularly from commercial fishing. The extent to which efforts are made to address continuing marine biodiversity decline and the extent to which they are successful will depend on social and civic societal pressure for change and government spending priorities in the wake of the COVID-19 pandemic.

In the longer-term (beyond 20 years), the effects of climate change on marine biodiversity may start to increase. This will include both effects of sea level rise on coastal habitats as well as effects associated with rising sea temperatures (species shifts) and ocean acidification (implications for calcifying organisms (e.g. molluscs, maerl) (Sharman *et al*, 2019)). There are also potential risks associated with decreasing oxygen concentrations in the water column (IUCN, 2019).

3.2.4 Environmental – Marine Protected Areas (MPAs)

Current trends

There are currently 159 Special Areas of Conservation (SACs) containing marine features protected under the Habitats Directive and 89 Special Protection Areas (SPAs) with a marine element classified under the Birds Directive (DHPLG, 2018). There are also a number of proposed Natural Heritage Areas (pNHA) which include areas of the marine environment. These were published on a non-statutory basis in 1995, but have not since been statutorily proposed or designated.

Changes since HOOW

As noted in Section 3.1.3 above, the PAF and Article 12 and 17 reports document the status of birds, protected habitats and species in Ireland together with proposed actions. These reports identify limited progress in the management of habitats and species with many still in decline, although recognising that a proportion of these will not be within MPA sites, and therefore conclude that there is a need for further progress to be made to halt and reverse marine biodiversity loss.

Significant progress has been made since the publication of HOOW in the following areas:

- Designation of SACs for harbour porpoise and bottle nosed dolphin;
- Designation of the Codling Fault Zone SAC;
- Monitoring of cetacean by-catch in fisheries as part of the Data Collection Framework; and
- Completion of appropriate assessments for aquaculture activities.

Under the Birds & Habitats Directives and MSFD, Ireland is implementing a number of measures to improve spatial protection of marine biodiversity. These measures include:

- Continue to apply the Natura Directives (Birds Directive (2009/147/EC) and Habitats Directive (92/43/EEC)) and associated national regulations as laid down in S.I. No. 477/2011 – European Communities (Birds and Natural Habitats) Regulations 2011;
- Continue the protection of wild bird species through the designation of Ireland's network of Special Protection Areas under the Birds Directive (2009/147/EC);
- Continued implementation of OSPAR recommendations for Threatened and/or Declining habitats and species;
- Continue to ensure coherence of Ireland's network of marine protected areas by setting up increased protection areas using tools such as habitat protection orders, no-take zones etc.;
- Continuing to consider whether sites justify selection as Marine Protected Areas;
- Develop a national strategy to create and manage Ireland's network of Marine Protected Areas;
- Manage the risk posed by sea fisheries to protected cetaceans in accordance with the Risk Assessment for Special Areas of Conservation;
- Complete the designation process for proposed Special Areas of Conservation for harbour porpoise and bottle nosed dolphin in Irish waters;
- Develop and implement fishery management measures for Marine Protected Areas (MPAs) at national level where sites are within the 6 nautical mile limit and at regional EU level for MPAs outside the 6 nautical mile limit;

- Continue to manage the impacts of sea-fisheries and aquaculture in Special Areas of Conservation and Special Protection Areas.

The PfG supports the principles and ambition of the EU Biodiversity Strategy and provides a clear commitment to develop comprehensive legislation for the identification, designation and management of Marine Protected Areas (MPAs) in Irish territorial waters. It commits to achieving the protection of 10% of Ireland's marine area under the Marine Strategy Framework Directive as soon as is practical and aims for 30% protected within MPAs by 2030. It also includes a commitment to establish an offshore maritime area as Ireland's seventh national park.

Potential future developments

Some of the measures discussed above have been completed, such as the designation of SACs for harbour porpoise and bottlenose dolphin while others are still ongoing (completion of SPA network, implementation of PfG commitments). Work is also in progress to designate two additional SACs for offshore reef by 2024. There is an identified potential lag between implementation of management measures and realised changes (NPWS, 2019). It is therefore expected that the realisation of implemented management measures will result in gradual improvements in the status of protected habitats and species within the managed areas in the medium term, although this will be dependent on political will and funding being made available to deliver change. The PfG commitments are important in this regard.

Further progress in the status of MPA features is also expected to occur as a result of implementation of measures under other policies. This would include measures designed to meet targets under the Water Framework Directive.

Ireland has thus far protected a relatively small proportion of its sea area (2.33% (O'Sullivan, 2018)). This percentage is likely to increase, with pressure on Ireland from both Europe (Oceana, 2020) and internationally (such as Aichi Target 11 of the Convention on Biodiversity (CBD) to achieve 10% of coastal and marine areas to be protected by 2020) and to progress towards 30% of coastal and marine areas protected by 2030 (Oceana, 2020). The PfG commitment should provide strong support towards achieving these objectives.

Increases in designated areas, and associated management measures may have implications for other sectors which operate in the marine area, potentially increasing requirements on assessment for proposed developments under the Birds Directive and Habitats Directive and national legislation.

3.2.5 Environmental – Air quality

Current trends

The Ambient Air Quality Directive and Clean Air for Europe Programme have set legally binding limits for a range of air pollutants such as nitrogen oxide, sulphur dioxide, carbon monoxide and particulate matter. Whilst Ireland's levels of pollutions have fallen below these, there are indications that nitrogen oxide levels will exceed EU limits in the near future, forcing measures to be taken to regulate these levels (Environmental Protection Agency, 2019).

Standards on managing vehicle emissions, such as the EURO standards implemented by the European Union have also led to improvements in the average emissions, with the latest standard (EURO6) requiring significant reductions in carbon monoxide, nitrogen oxides, hydrocarbons and particulate matter emissions. Whilst implementation has reduced the impact of a single vehicle per km travelled

this does not necessarily correlate with reductions in overall emissions as changes in the scale of usage has offset some of the benefits (Crippa *et al.*, 2016).

Changes since HOOW

Air quality around ports has been recognised as the highest priority by the European port sector (ESPO, 2016). European ports have adopted 'green' strategies to reduce sulphur dioxide and nitric oxide emissions such as onshore power supply, liquefied natural gas bunkering facilities and using low emission fuels or technologies in vessels and port vehicles. Whilst these strategies are voluntary, it is likely the implementation of 'green' strategies will increase in ports in line with European Directives in the medium term.

Potential future developments

The National Clean Air Strategy, set up in 2017, awaits publication; however, it is expected to bring specific actions and timelines to reduce health and environmental impacts of air pollution in the medium to long-term (DCCAE, 2017).

In a marine specific context, the EU Sulphur Directive (2016/802) and MARPOL Convention are the current and future drivers in the change of pollutants from shipping. By 2020, vessels must use fuels with less than 0.5% sulphur in all EU waters. MARPOL Emission Control Areas (ECA) for sulphur in Europe (Baltic Sea, North Sea and English Channel) have come into force, restricting vessels with fuels containing more than 0.1% sulphur content from entering. Similarly, by 2021, nitrogen oxide ECA will be implemented in the Baltic and North Sea. The shipping sector will continue to reduce the pollution from fuels in line with these measures and it is likely that further restrictions and ECA will be designated. There is likely to be increasing use of electric vehicles on port estates and adoption of shore-side power systems in larger ports.

The International Energy Agency (2019) compared two scenarios for future electric car use based on different assumptions about government policy support, technological development and costs. The study indicated that by 2030 electric vehicles could comprise between 15-30% of the total fleet. The growth in uptake of electric vehicle use is likely to significantly reduce air quality issues (nitrous oxides and particulates) over decadal time scales, including in the vicinity of ports.

3.2.6 Environmental – Climate change

Current trends

It is accepted that some degree of climate change is unavoidable (Global Commission on Adaptation, 2019), with some impacts already likely being realised, including increases in storm intensity, sea level rise, changes in rainfall patterns etc. (EPA, 2008). The trends currently being observed, recorded and reported are likely (with high confidence) to continue in the short to medium term.

Changes since HOOW

Since HOOW there have been numerous changes both in the global understanding of climate change, and policies / agreements designed to mitigate it. At an international level the most significant document is the Paris Accord, which detailed the measures and reductions in emissions required to achieve no more than 2 degrees Celsius temperature rises (global average) within the next decade. Subsequent to the Paris Accord 2016, set out as part of the European Green Deal, and detailed in the Irish Climate Action Plan 2019 to Tackle Climate Breakdown, Ireland aims to limit net emissions to zero – 'Net Zero' - by 2050. The plan sets out a practical pathway of measures to 2030 and policy

requirements to achieve Net Zero, with a number of these impacting the Marine Economy (discussed against specific sectors below, such as anticipated increases in development of Offshore Renewable Energy to reduce reliance on oil and gas for energy generation).

The publication of the National Adaptation Framework (2018), which requires sectors to produce specific adaptation plans to adapt to climate change has recognised that many elements of the marine economy will need to adapt in the face of a changing climate, and a number of sectors have published adaptation plans, including:

- Gas and Electricity Adaptation Plan;
- Biodiversity Adaptation Plan;
- Agriculture, Forestry and Seafood Sector Adaptation Plans;
- Built and Archaeological Heritage Sector Adaptation Plan; and
- Draft Water Sectors Adaptation Plans.

The PfG includes commitments to:

- Introduce a Climate Action (Amendment) Bill 2020 into the Dáil within 100 days which will, *inter alia*:
    - Set a target to decarbonise the economy by 2050 at the latest;
    - Make the adoption of five-year carbon budgets, setting maximum emissions by sector, a legal requirement;
- Progress a national policy on coastal erosion and flooding.

Potential future developments

Climate change is expected to continue, with current international emissions commitments unlikely to meet targets set out in the Paris Accord (UNEP, 2018). In addition there is uncertainty as to the political will towards reducing climate change worldwide, although there appears to be significant social movement, triggering protests such as those seen organised by extinction rebellion in 2019, across many countries aimed at encouraging political engagement and progress towards emissions targets.

Climate change itself in all scenarios will remain a key driver against a number of sectors, either as part of measures required to limit the extent of climate change, or as a result of required developments in climate resilience. However, the extent to which global climate goals are achieved will likely affect the changes observed in the long term. Of particular note, sea level rise has the potential to have significant impacts on coastal infrastructure, potentially requiring additional investment (costs to the economy) to ensure resilience of ports, harbours and coastal defences. Ocean acidification has the potential to have impacts on biodiversity receptors in Irish seas, which subsequently have the potential to impact on marine economic sectors. For example, ocean acidification may cause reduced yields of shellfish species, with one study estimating significant direct losses of up to 28% to shell fishery sectors and similar impacts on aquaculture, as a result (Mange *et al.*, 2018).

There is potential for the development of the bioeconomy to link into both climate change mitigation and resilience, such as through projects focussed on the use of macro-algae to reduce coastal erosion alongside projects on the climate impact of seaweed cultivation through the sequestering of carbon (although it is recognised that the degree of carbon sequestered is highly uncertain). There are thus opportunities for Ireland to lead innovation in this area.

Whilst the drivers of climate change will likely remain the same (global emissions), it will drive requirements for adaptation to a changing climate throughout the marine economy and it is anticipated that the adaptation plans will provide the framework for these. The National Adaptation Framework identifies, for example, increases in severe storm regularity and intensity as likely to have future impacts on coastal industry, and it is anticipated that investment will be required in the short, medium and long

terms to improve resilience of coastal infrastructure and coastal and island communities, recognising this may have to be balanced against environmental objectives, and consideration of ecosystem services as set out in the Maritime Spatial Planning Directive. The PfG commitments will help to drive implementation of climate mitigation and adaptation policies in the marine environment.

3.2.7 Environment – Water Quality

Current trends

The Water Framework Directive (WFD) continues to drive the implementation of measures to protect the water quality of land surface, coastal waters and groundwater in EU Member States to achieve GES. Ireland has implemented the River Basin Management Plan (RBMP) to protect waters until 2021.

Changes since HOOW

Across the EU, the majority of surface and ground waters remained unchanged between the first and second RBMP (2009-2015 and 2015-2021, respectively) and the European Commission stated that significant progress is needed in the third RBMP to meet targets set in the Directive (European Commission, 2019). Some progress has been made, as discussed in Section 3.2.3 above, however further improvements are required in order to meet the targets and objectives of the Directive. Bathing water quality remains high in Ireland meeting the Bathing Waters Directive's minimum criteria of 'sufficient', and an increase since 2013 of waters classified as 'excellent'.

There is a greater understanding of the risks of persistent organic pollutants, with additional chemicals added to the Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention, 2017). These compounds have the potential to cause adverse human health effects and are known to bioaccumulate in seafood products. They remain a cause for concern (Government Office for Science, 2017a).

Potential future developments

Ireland will continue to address actions in the WFD and RBMP, however, progress is uncertain in the short-term. Movement towards improving water quality in areas classified as 'poor' is currently being made, particularly through individual funded projects and research is being funded to further understand how to protect bathing water quality (DHPLG, 2019). The draft NMPF seeks to promote proposals which demonstrate the avoidance and mitigation of significant adverse effects on water quality.

3.2.8 Energy – Carbon capture and storage

Current trends

Carbon capture and storage (CCS) has historically been identified as a potential solution to reducing emissions from industries or sectors which cannot easily transfer to renewable or low emission solutions. The carbon (generally in the form of carbon dioxide) is captured and injected into an underground store (often an exploited gas field or saline aquifer) for long term storage. It has not yet been implemented in Ireland, with a handful of projects worldwide, but may form a strand of the required measures to reduce net emissions.

Changes since HOOW

The National Mitigation Plan (NMP) (2017) identifies CCS as part of the current plan to retain natural gas electricity generation as a key back-up to renewable sources in the medium term, stating: *"carbon capture and storage (CCS) technology, driven by appropriate carbon price signals of a reformed emissions trading system, will be in place to ensure that emissions from back-up gas generation are captured."* To achieve this, the NMP places actions on the Department of Communications, Climate Action and Environment (DCCAE), now the Department of Climate Action, Communication Networks and Transport (DCACNT) to explore the feasibility of CCS in the period through to 2022. Reports produced to date at a high level identify some potential, with the Kinsale depleted gas field, the most likely site (SEAI, 2008).

The PfG includes a commitment to investigate the role of coastal blue carbon in supporting climate change mitigation.

Potential future developments

In order to reconcile the expected continued reliance on Natural Gas in Ireland with Net Zero ambitions, the development and deployment of CCS has been recognised as a short to mid term future requirement (Climate Change Advisory Committee, 2019).

It is therefore possible that CCS may form part of the measures required to reduce emissions in the medium term, however the feasibility and scale of such projects in Ireland is currently uncertain. In addition, as outlined in the National Planning Framework (NPF), a new legal framework would be required in order for CCS to be developed in Ireland as current statute does not allow geological storage of CO_2 in Ireland (S.I. No. 575/2011).

3.2.9 Energy – Offshore gas storage

Current trends

There is currently no offshore gas storage in Ireland and at this point there are no clear plans to progress any developments.

Changes since HOOW

Historically offshore gas storage formed part of the energy network with storage in the Southwest Kinsale gas field. However, following the closure of this facility in 2017 offshore gas storage is no longer used.

Potential future developments

The use of offshore gas storage in the future is dependent on the requirement for increased energy security and / or the differential between summer and winter gas prices which make the costs of storing the gas a worthwhile expenditure.

It is considered that significant expansion of offshore gas storage in Ireland is unlikely due to a number of factors including the security of pipeline supply from a number of sources (Russia, Algeria, Norway, UK).

However, should the security of supply become less certain for example due to future geopolitical uncertainty, and following the withdrawal of the proposed Shannon Liquefied Natural Gas (LNG)

terminal from the list of European projects of common interest under the PfG, there may be a greater requirement for the re-establishment of the industry.

3.2.10 Energy – Transmission

Current trends

Transmission in Ireland's marine area is broken down to include electricity transmission and gas transmission. Electricity transmission principally considers the potential for development of interconnectors between Ireland and other states. The development of such interconnectors is driven primarily due to requirements for security of electricity supply, whereupon any shortage in either country could be supplemented by trading of electricity through an interconnector.

Gas transmission is principally from the UK via two interconnector pipelines. These pipelines are predicted to continue to provide a significant proportion of Irish natural gas, peaking at 84% in 2024 / 2025 (DHPLG, 2019), although reliance on this source has the potential to increase or decrease due to the actions identified within the PfG such as an increased focus on renewable energy, future research on 'green hydrogen' and withdrawal of the Shannon LNG project.

Changes since HOOW

As the nearest neighbour, electricity interconnection with the UK is generally the most reviewed option, and the East-West interconnector between Ireland and the UK was commissioned in 2012. Since HOOW an additional project has also been progressed between Ireland and the UK which is currently in the consenting phase (Greenlink, 2020). Technological development such as the advent of High-Voltage Direct Current (HVDC) cables is increasingly facilitating the development of marine interconnectors and distribution networks.

In addition, the 'Celtic Interconnector' between Ireland and France is also being progressed and received funding in December 2019 to the tune of €530 million (Celtic Interconnector, 2019).

Potential future developments

Progression of both interconnectors is expected, although following Brexit, there is uncertainty as to the potential for future trade agreements, and in order for Ireland to partake fully in the European Energy Union the Celtic Interconnector may become more prominent as a link to mainland Europe.

Whilst gas will remain an integral part of the energy network in Ireland (discussed in Section 3.2.11 below), there is not expected to be an expansion in the gas transmission network going forwards (DHPLG, 2019), based on sufficient current infrastructure combined with the gradual reduction in gas import requirements as overall reliance on oil and gas reduces.

3.2.11 Energy – Petroleum

Current trends

Oil and gas exploration and production in Irish waters is limited to gas production from a small number of offshore fields (Kinsale and Corrib) and production from these are expected to cease by 2021 and the late 2020s respectively (Government of Ireland, 2019). The sector had a turnover of €396 million (GVA of €52 Million) employing 154 FTE in 2019 (Ahearne and Hynes, 2020). This represented an increase from 2016, an upwards trajectory which may continue in the short term with some potential for continued gas exploration.

Changes since HOOW

Since HOOW the production of natural gas has varied significantly with the coming online of the Corrib gas field significantly increasing production volumes such that reliance on imported energy fell from 90% of energy needs to 70% in 2015. However, whilst in 2018 approximately 60% of gas needs were met by indigenous sources the dominant supply point is now once again expected to be the UK – Ireland interconnector.

Following the conclusion of the Climate Change Advisory Council that exploitation of oil reserves is not compatible with a low carbon future (Climate Change Advisory Council, 2019b), the Irish Government released a policy statement on petroleum exploration and production activities which excludes future prospecting for oil reserves (DCCAE, 2019).

Potential future developments

The mid to long term future of the industry represents an expected significant decline, following the Irish Government announcement in September 2019 that no further licences will be issued for oil exploration (Irish Times, 2019) and expectations that production of natural gas from currently identified reserves will continue to decrease.

On the other hand, natural gas exploration has not yet been excluded (although a commitment to this has been included in the PfG) and Ireland's energy needs are expected to continue to be reliant on natural gas for the foreseeable future. As a result there remains potential for discoveries of natural gas to buoy the industry in Ireland either sustaining or potentially increasing the sector contribution in the marine economy, although development would be very challenging due to poor public perception, as experienced by Shell in the Corrib gas field. However, the Climate Change Advisory Council notes that continued exploitation and use of natural gas in energy production in Ireland must be accompanied by development of CCS technologies (Climate Change Advisory Council, 2019b) (discussed above).

In addition, there is potential for non-exploration activity in the sector, such as the development of a LNG facility (Shannon LNG, 2020) although this is more uncertain following a proposed withdrawal of the project from the list of European projects of common interest.

3.2.12 Energy – Offshore renewable energy

Current trends

Ireland has identified short term growth in Offshore Wind as a key goal in the Climate Action Plan 2019. The PfG builds on this goal, and has set a target of 5 GW installed capacity by 2030 from the current installed capacity of 25 MW at a single demonstration facility.

Changes since HOOW

Offshore renewable energy across Europe has grown significantly since HOOW was published, principally with increases in installed capacity of offshore wind, although significant numbers of projects are ongoing with the goal of scaling up tidal and wave technologies to a commercial level.

Although HOOW recognised it was as an emerging area (together with other marine renewable energy technology), the industry has experienced limited progress in Ireland since 2012. This is in part due to the suspension of commercial licensing in 2015 by the DHLGH. SSE are now proposing to develop the Arklow Bank Wind Park, and have a consented capacity of 520 MW. Review of site investigation licence applications made to DHLGH shows rapidly growing interest from the industry to develop offshore wind

off the east coast since 2019, with a noted acceleration in the first and second quarter of 2020, as a result of impending legislative changes. To support the development of a blueprint for Offshore Wind, the EirWind project reported its findings in July 2020 (MaREI, 2020).

In addition, Ireland has established a number of test areas to support the development of marine renewables (Lir National Ocean Test Facility, Galway Bay Marine Renewable Energy test site and the Atlantic Marine Energy Test Site) and projects further afield are seeking to commercialise tidal stream energy (Morlais Tidal Energy project (Wales), Meygen (Pentland Firth, Scotland)).

Potential future developments

Significant increases in offshore wind are likely in the short and medium term (the PfG includes a commitment to 5GW by 2030 whilst the IWEA Carbon Trust report identifies a current pipeline of over 12GW (Carbon Trust, 2020)), with the principal driver being the aim to reduce carbon emissions to Net Zero by 2050. Initial projects will be focused on fixed foundation technology. Technological advancements have significantly reduced the costs of constructing and operating offshore wind farms and costs are likely to reduce further over time, although the sector still faces challenges in overcoming environmental constraints linked to increasing protection and designations identified in 3.2.4 above.

In the short and medium terms there is less certainty with regard to the development of floating wind, tidal and wave energy sectors, which are less technologically developed than fixed foundation offshore wind and therefore less commercially viable at this time.

However, in the longer term, growth across all offshore renewable sectors is anticipated. The Offshore Renewable Energy Development Plan (Department of Communications, Energy and Natural Resources, 2014), identifies the required steps to reduce or remove obstacles to future development. This includes the development of a single consenting regime for offshore renewable projects which, once implemented, will better support prospective ventures. Development of marine spatial planning in Ireland also has the potential to support future development through use of marine zones and provision of data to support decision making (MRIA, 2018). This may include the development of Sectoral Marine Plans which are provided for within the draft NMPF and, through a mechanism developed within Appendix D of the NMPF, can be developed and automatically incorporated into the NMPF.

Technological advances in the development of floating offshore wind worldwide will be important in demonstrating the engineering and economic argument for deployment in Ireland, with the approved full scale project off County Mayo providing a demonstration of its potential in Irish waters (AFLOWT, 2019) and the PfG identifying floating wind as important in exploiting the available offshore energy on the Atlantic Coast. Similarly the continued investment in testing for wave and tidal energy projects in Ireland through support of the Lir National Ocean Test Facility, Galway Bay Marine Renewable Energy test site and the Atlantic Marine Energy Test Site should support these industries in transferring from a technologically feasible prospect to commercial scale development.

Development of offshore renewables in Ireland also goes hand in hand with the development of transmission infrastructure, discussed above, which will allow energy produced by renewables projects to be traded between Ireland, the UK and mainland Europe. In addition, the PfG identifies that the development of renewable energy has the potential to lead to oversupply of energy which could be used to generate 'green' hydrogen which would then either act as an energy reserve or could be used in other applications such as automotive fuel.

The development of renewable energy offers further opportunities for the development of the marine economy, both within the supply chain, if these can be established to support development, and within the operational and maintenance phase of developments. The IWEA estimates that up to 2,500 jobs

could be created during development with 700 long term jobs during operation and maintenance (IWEA, 2020) This has the potential to lead to investment and growth across the Ports and Harbours sector, in addition to shore based industries, including engineering and fabrication.

3.2.13 Fisheries

Current trends

Fisheries, along with aquaculture and seafood processing, together had a 2020 annual target turnover of €1 bn (HOOW, 2012). Ireland's Ocean Economy 2019, which uses BIM data, estimated that sea fisheries amount to a direct GVA of €173,000,000 and indirect GVA of €53,630,000 in 2018. Direct turnover increased by 17% between 2012 and 2018 (SEMRU, 2019; incorporating BIM data). However, data from BIM in 2020 shows a subsequent decrease of 14.3% in turnover in 2019, resulting in a decrease of €39m in direct GVA and the loss of 273 jobs (Ahearne and Hynes, 2020). Growth in the sector was not consistent throughout the years, with a sharp decrease in 2015, a year after the reform of the Common Fisheries Policy (CFP). Between 2012 and 2018, direct GVA increased by 21%. These growth rates have not translated in the creation of additional employment opportunities which have slightly decreased suggesting that catch value has increased. This is largely influenced by international markets. The sector is particularly sensitive to external influences, namely climate change and health. Domestic fisheries have faced growing competition from foreign vessels with evidence from the CSO that the number of these has doubled between 2009 and 2018.

This report touched upon seafood processing under the aquaculture section, above. BIM data shows that seafood processing has shown some growth in 2019, compared to the previous year (Ahearne and Hynes, 2020), with an increase in a number of seafood processing businesses and jobs.

Changes since HOOW

Overall pelagic volumes exported decreased by 12% between 2017 and 2018. Decreases in volume were particularly significant for mackerel and blue whiting (-20% each) (BIM, 2019a), although the value of the catch subsequently overall increased by 8% in 2019 (BIM, 2020). Sea fisheries remain one of the five largest employers of the ocean economy, ahead of marine aquaculture (SEMRU, 2019). Economic prospects for sea fisheries are largely driven by quota shares negotiated under the CFP, which aims at sustainable catch under the CFP Reform from 2014. This, in turn, drives prices up or down based on the species availability. The highest level of landings by Irish vessels in Ireland was in 2012 when 249,205 tonnes were landed. Recorded fish landings have seen 'seesaw' figures since 2012. While 2012 was the year with the highest number recorded, it was followed by a sharp decrease in 2013, and again a strong increase in 2014 and sharp decrease in 2015. Since then, landings have consistently increased but never returned to levels previously observed. Irish vessels are increasingly landing more in foreign ports but this may be partially offset as a result of policy aimed at attracting foreign landings to Irish ports.

The CFP exerts critical influence on the health and wealth of Irish fisheries. In order to allow for a sustainable and orderly transition toward achieving maximum sustainable yield, ending overfishing while simultaneously mitigating impacts on the small coastal and islands communities, the EMFF was put in place to support affected fishing communities. Depleted stocks like cod have seen great improvements since the reform was passed, showing the positive contribution of the CFP to marine wildlife. However, Ireland has received quotas in excess of scientific advice in relation to certain species, so it is unclear whether maximum sustainable yields will be achieved consistently (NEF, 2017). Transition to better fishing practices and support to coastal and island communities through the EMFF has mitigated some of the economic impacts.

Potential future developments

It is expected that in the short term, the COVID-19 crisis will impact very severely on Irish exports to Asia and severely on the domestic market. However, in the medium to long term both could recover. A trend towards 'Buy Local' or 'Buy Irish' may emerge from the current crisis as consumers may be minded to support domestic economic recovery. It is unclear however, how exports to other continents such as Africa will fare in the medium to long term.

The European Union is continuing support to the fishing industry, previously identified through the EMFF, through the European Maritime Fisheries and Aquaculture Fund (EMFAF), and this may drive innovation and research in the fisheries sector, with priorities for the fishing industry in Ireland identified by the Producers Organisations. These priorities seek to support the fishing industry through establishment of emergency funds, data collection and opportunities for innovation, such as through the circular gear economy; innovation in vessel and engine design; and research on alternative species (Irish Production Organisations, undated).

Brexit presents a significant threat to the sustainable development of Irish fisheries, as the UK will be able to set its own quotas and the extent of access to its marine waters to EU vessels through its own fisheries policy. On average, 34% of the Irish landings are taken from UK waters. Ireland lands at least some of all its commercial quotas (40 plus stocks) from UK waters and for some stocks over 60% of landings are taken from the UK zone (DAFM, 2018). Access to UK marine waters will be determined through the negotiation process. The outcome of these negotiations will have a very significant impact upon the future of Irish commercial fishing and the livelihood of coastal communities depending on it (discussed in Section 3.2.20). The coalition government expressed its support of Irish fisheries and commitment to secure the interests of the Irish fishing industry. It intends to secure a Fisheries Agreement with the UK that would be tailored to support the needs of the sector. The sector is in a particularly difficult position whereby it could see its access to UK waters and quota shares diminished and have to compete more with foreign vessels within its own waters as a result of displacement of the EU fleet into Irish territorial waters.

Seafood processing businesses are generally established in more rural areas and constitute a significant contributor to local coastal economies. The sector handles, packs and transforms products from fisheries. Its wastes, such as discards, can be utilised in other processes and are particularly valuable for businesses operating in the bioeconomy. BIM has been particularly active in supporting the establishment and expansion of those businesses and helping them move toward more sustainable practices through its Seafood Processing Innovation Scheme. The sector is principally located in counties Donegal, Galway, Cork, Kerry and around the South East. Both the NPF 2040 and the draft NMPF are supportive of the seafood processing sectors owing to its evident economic benefits to communities. It is therefore appropriate that the PfG proposed to invest in harbour infrastructure which will attract increased landings with a view to driving the development of the seafood processing sector. The expansion of the bioeconomy could provide valuable opportunities for the seafood processing industry and to coastal communities.

It is noted that the future development of the fishing industry is likely to be linked, at least partially, to the future of the marine environment. Potential fluctuations in stock levels as a result of environmental changes, including as a result of climate change, will impact on Irish fisheries. In addition, fisheries themselves have potential environmental impacts, and there may be some fisheries management required as a result of expansion of the MPA network, as discussed in Section 3.2.4.

3.2.14 Marine aggregates and mining

Current trends

The IMAGIN study (UCC, 2008) identified a number of areas with the potential to support marine aggregates extraction within the Irish Sea. Marine aggregates could provide a sustainable source of materials in Ireland and allow less reliance on exported materials, particularly from non-EU countries. Currently, the construction industry in Ireland relies principally on terrestrial aggregates and imported materials. The principal use of marine aggregate is for beach nourishment, coastal protection, reclamation and landfill (DHPLG, 2018).

Changes since HOOW

Notwithstanding the work undertaken by the IMAGIN project, there has been no significant progress in developing marine aggregates as a source of supply for construction projects and there continues to be limited marine aggregate usage, focused around beach nourishment and coastal protection.

Potential future developments

The EU through its Raw Materials Initiative is pushing towards securing a sustainable supply of minerals to respond to different challenges such as energy supply and green technologies. Through Horizon 2020, it has initiated several pan-European projects examining barriers and challenges to expanding the mineral extraction industry in Europe. In addition, the EU maintains a list of Critical Raw Materials (CRM) which is, or will become, essential to European industries, particularly with a view to securing electricity decarbonisation and lower GHG emissions. The list is reviewed every few years as technology development progresses and as resources are exploited. To date, no CRM have been identified in Ireland.

It is currently unknown whether Ireland's Exclusive Economic Zone (EEZ) contains mineral deposits of sufficient value and density to attract commercial seabed mining operations. Most current interest has been in deep sea ocean ridge locations in international waters (Government Office for Science, 2017a).

3.2.15 Ports, harbours and shipping

Current trends

The maritime sector is essential to the continued supply of goods in and out of the country, accounting for 90% of Ireland's international trade in volume terms and approximately 3 million or 10% of passengers in and out of the country. Shipping and maritime transport is by far the most important segment of Ireland's Ocean Economy, generating a combined direct and indirect GVA of c. €1.7 bn (SEMRU, 2019). It is the industry which generates the most indirect GVA, contributing to almost half of the indirect GVA generated by the Irish maritime economy. However, it represents less than a fifth of all employment in the ocean economy as of 2018. The industry is the most productive industry of the ocean economy. The Irish economy was in recession in 2009 and continued to contract with GDP falling by 7% and Gross National Product (GNP) by 11% (IMDO, 2010). While it is estimated that turnover is still below the highest level recorded in 2009, the industry has experienced steady recovery since and the report highlights that recent Irish Maritime Development Office (IMDO) figures show that port volumes reached record levels in 2018, exceeding the 2008 figures, although subsequently contracted in 2019 to 2017 levels (CSO, 2020). The SEMRU report notes that employment in shipping and maritime transport decreased until 2013 before recovering to pre-financial crisis levels by 2018.

It is unclear how these will be impacted in light of the COVID-19 pandemic in the longer term. COVID 19 has delivered an unprecedented shock to the whole of the Irish economy. The ESRI in its quarterly economic commentary (ESRI, May 2020) state that the Irish economy is set to experience the largest annual decline in its history. All aspects of the economy will be considerably affected with significant declines in consumption, investment and exports of goods and services. This is borne out by feedback provided by the IMDO which over the course of April and May show a complete collapse in passenger numbers travelling by sea with declines of 98% on some routes. Freight has been significantly affected with declines in freight of up to 40% on some routes with the Southern and Continental corridors more significantly affected than the central corridor. Notwithstanding this, DTTAS believe that the fundamentals of the sector remain such that it can recover, albeit on a slow trajectory as the economy recovers and restrictions are lifted.

Changes since HOOW

Since HOOW, Shannon Foynes Port Company (SFPC) has been included on the Trans-European Transport Network (TEN-T) North Mediterranean Corridor map with the associated benefits that brings for funding opportunities. In addition, another important development is the proposal to include Ireland from 2021 on a second TEN-T Corridor, the Atlantic Corridor, to improve Ireland's connectivity to the continent post Brexit.

The publication of the National Ports Policy 2013 setting out the hierarchy for ports and harbours around the Irish coast is the key change since 2012. On foot of its publication, a number of ports and harbours, in particular Tier 3 Ports of Regional Significance saw their ownership transferred to local authorities. In addition, the decision of the UK to leave the EU has introduced significant uncertainty into the markets, potential implications of which are discussed below.

Potential future developments

Technological development in vessel design and materials handling is causing rapid changes in the ports and shipping sectors and will continue to do so over the coming decades as advances in automation and AI are introduced.

Ports are required to become more sustainable for a number of reasons. Many of them are located in dense urban areas. Ports are land-hungry with large scale infrastructure. Their activities can conflict with urban areas, owing to the noise or traffic they generate. They can be sensitive to increases in trade owing to lack of space or difficulty in managing their landbanks. Increasing ship sizes with deeper berth requirements result in demands for new larger port facilities and associated dredging. Ports are often located adjacent to designated European Sites and expansion can be very challenging. They are also energy hungry and constitute pollution risk and risks to marine wildlife such as harbour porpoises. The potential designations of Marine Protected Areas may overlap with existing shipping routes or channels and will be challenging. However, increased deployment of ICT will allow ports to transit to greener, more sustainable practices, availing of better more up-to-date data. Technology development may also lead to an increasing number of autonomous ships (Lloyd's Register, 2015). However, it is not expected that the transition to greener ships will substantially decrease the use of heavy fuels over the next ten years (DBEI, 2018).

A significant threat to continued growth in maritime transport and shipping is Brexit. Ireland is particularly reliant on the landbridge which connects Ireland to the EU continental markets via the UK. The landbridge consists of the movement of Irish imports and exports via the UK roads and ports networks. It allows for a connection in less than 20 hours compared to up to 40 hours via roll-on/roll-off (RoRo) services and of up to 60 hours with Load-on/Load-off (LoLo) services (IMDO, 2018). Approximately 38% of all unitised exports travel using the landbridge to the Continent and it is

particularly favoured for the agri-food industry which requires faster travel times. The UK acceded to the Common Transit Convention which ensures that traders only have to make custom declarations and pay import duties when they arrive at their final destination, with a view to mitigate the impact of Brexit on trade. In response to the potential introduction of tariffs for the use of the landbridge, Irish ports and the shipping industry have started to prepare themselves ahead of the UK withdrawal from the EU. A number of shipping companies are increasing capacity on direct links to the continent and several port companies have prepared or are preparing masterplans and adapted their infrastructure with a view to welcome more direct traffic from Europe and therefore to provide for more capacity. The full impact on maritime transport and shipping will be dependent on the nature of Brexit agreements.

The final customs arrangements both North/South and East/West and Sanitary and Phytosanitary (SPS) checks yet to be agreed as part of Brexit may yet influence the trading patterns and shipping routes on and off the island of Ireland. The full impact of these and whether there will be a shift to more direct sailings or shifts of trade between ports North and South of the border will not be seen until post Brexit. This may result also in direct impacts on both Roll-on, Roll-off (RoRo) from Dublin and Rosslare Ports and/or opportunities for other ports (e.g. the Port of Cork have applied to DAFM seeking the designation of the Port of Cork as a Border Control Post).

Associated with Brexit is the UK proposal to designate some ports as Free Ports. A designation of Belfast as such a port could also result in an impact to trade at Dublin Port, Drogheda or Greenore. Any designation of UK ports including Northern Irish ports could have negative impacts in terms of a level playing field for all ports in Ireland.

As a result of climate change, there may be opportunities to use polar shipping routes, but this will be dependent on whether these are cost effective as they require the use of specialised vessels. The use of longer routes may prove to be more cost efficient based on the cost of fuel, but less environmentally and/or politically acceptable.

There is ongoing regeneration of major Irish Ports, such as Dublin, Shannon, Cork or Waterford. These projects will provide for greater capacity and have the ability to cater for larger vessels. It is expected that with the announcement by Iarnród Éireann of a €25m investment plan for Rosslare Europort to upgrade customer facilities and port infrastructure this port will grow over the next 5 – 10 years. The continued infrastructure investment and development of the ports should form a significant part of the future developments in Ireland.

It must be noted that the deployment of large-scale offshore wind will likely become a factor of redevelopment of ports and harbours, in the first instance on the east and south east coast. Irish ports and harbours, such as Arklow and Wicklow, may seek to compete to provide some of the required services, particularly as they already offer some of these services to the existing wind farm on Arklow Bank. Other ports and harbours including Rosslare, Waterford, Drogheda, and Greenore could also support offshore renewables development and benefit from these projects on the east coast. Galway, Shannon-Foynes and Port of Cork could serve developments on the south and west coast, while smaller fishing harbours such as Killybegs could also play a role. A number of ports and harbours are pursuing new development to cater for these opportunities. This will require investment co-financing and / or long-term financial guarantees from individual project promoters. As with all other sectors or customers of the ports this will have to be market led and driven by the wind or wave energy sector itself.

There may be synergies to be harnessed between existing ports and harbours and centres of excellence such as MaREI in Cork with a view to secure employment opportunities on the east coast. This will be particularly important as Irish ports will be competing with already established and experienced ports in Wales and England. The Environmental Protection Agency and MI funded in 2019, the Sustainable and Holistic management of Irish Ports (SHIP) project which investigates port sustainability.

The longer term consequences of the COVID-19 emergency on the shipping industry are yet to be assessed. The effect of COVID-19 on the passenger market and international travel has exposed the vulnerability of the ROPAX operating model and, given its reliance on passengers as well as freight to underpin the sustainability of the routes, demonstrated Ireland's reliance on ROPAX services to provide resilience in its maritime connections. It has also brought into focus the risks of limited national supply chains and routes. The impacts of COVID-19, and indeed Brexit, may be longer term than originally envisaged.

The publication of the Port Capacity Study is imminent. It is anticipated that following the completion of the study, a review of National Ports Policy will commence with a new ports policy to be formulated in 2021. The completion of the Port Capacity Study will provide a valuable contribution towards the formulation of a new ports policy and the future direction of port development in Ireland for the next decade. The issues discussed above will influence the strategic direction of the next National Ports Policy in order to ensure alternatives and competition in the sector and contribute to better growth of the regions.

3.2.16 Safety at sea

Current trends

Technology deployment on ships has increased safety at sea. The uptake of ICT onboard and data analytics for performance improvements and of intelligence awareness of ships have allowed for reduced accidents and collisions, particularly for larger ships. Data gathered by the European Maritime Safety Agency shows that there has been a continuous decrease in serious marine casualties, particularly cargo ships. Fishing vessels are the most at risk category owing to the high costs of deploying on-board technology; however Irish statistics as published by the MCIB show a positive decrease in fishing vessel casualties over recent years (MCIB, 2020). In addition, the continuous uptake of technology requires staff training and upskilling which incurs more costs for the industry. As shipping and maritime transport has generated higher turnover and operated larger ships, technological uptake has been more consistent.

Changes since HOOW

The Maritime Safety Strategy was published in 2015 and seeks to eliminate the number of casualties in the maritime sector. The strategy includes actions which seek to improve information and communication; improve search and rescue operational management; update the standards applied; reconsider enforcement; and set evaluation frameworks through data collection. There is a strong focus on personal responsibility in the strategy, owing to the large share (49%) of all casualties associated with recreational craft (DTTAS, 2015).

Potential Future Development

It is expected that casualties will continue to reduce for cargo shipping owing to continuous uptake of technology onboard. However, unless technology becomes more affordable, it is somewhat unlikely that the number of casualties in the fishing industry would reduce greatly as the costs of onboard deployment can be too high for smaller vessels. In addition, it should be noted that the efficacy of on-board technology is dependent on navigational technology infrastructure.

The increase in new sectors at sea, namely marine renewables, and expansion of existing sectors or designations (aquaculture, marine conservation) will make coastal areas increasingly complex with continued reduction in space available for shipping. This is combined with an ongoing shortage of

seafarers which is leading to higher levels of responsibility with less practical experience and hence a greater reliance of the mariner on technology to support navigation. This may bring cybersecurity threats and mis-use/human-factors risks at the human/technology interface.

A safe, reliable, efficient and technology-enabled aids to navigation network which meets international standards, and is aligned to the wider suite of maritime safety services, is critical to the economy. However, such a network is likely to be integrated with a range of additional maritime services available to both shipping and shore stakeholders. The Maritime Connectivity Platform Consortium (MCP) is overseeing and facilitating the development of these services. The core elements of the MCP are a Maritime Identity Registry, a Maritime Service Registry and a Maritime Messaging Service. Maritime safety requires an integrated approach across all agencies and stakeholders.

These developments may result in the need for more proactive management of vessel traffic in coastal areas further driving the interaction between ships and shore authorities. Management of operational space from a shipping perspective by evolving Vessel Traffic Services (VTS), supported by the capabilities of e-Navigation, and in conjunction with Marine Spatial Planning are seen as candidate combinations on how to deal with the challenges for safe, secure and efficient navigation in clean waters.

Maritime surveillance is carried out across a range of agencies. Irish Lights has cooperated with a number of trials including the use high frequency radar, seismography and acoustics to improve seaward surveillance and have a network of stations suitable for such infrastructure. Advances in drone technology will allow increased surveillance opportunities. Various maritime agencies could cooperate and coordinate efforts to leverage the assets and expertise of all.

With the difficulties encountered by air travel as a result of COVID-19, there is wider recognition of the critical importance of maritime trade, as key contributor to the marine economy and the wider national economy. It will therefore be paramount to continue to invest in an effective and modern maritime safety infrastructure. Maritime safety will continue to support national trade and economic development and will remain a key driver of change and a key enabler for an island economy.

3.2.17 Seaweed harvesting

Current trends

Seaweed harvesting is an integral part of Irish rural coastal communities, whether harvested mechanically or by hand. It is often used as a sourced of nutrient for agriculture and its potential for the bioeconomy is increasingly recognised. The NMPF Baseline Report notes that seaweed is increasingly used as an ingredient for high value products across a range of industries such as pharmaceutical, cosmetic and artisan food. The draft NMPF reports that some 25,000 to 40,000 tonnes of wild seaweed are harvested every year, 95% of which is grown naturally. There are between 150 and 300 harvesters in Ireland (DHPLG, 2018). Data from the Food and Agriculture Organisation showed that Ireland was the third largest producer of seaweed in Europe, behind Norway and France, contributing 12% of the European production in 2012. Ascophyllum nodosum is the main wild species harvested in Ireland to the tune of 25,000 tonnes per year. Ireland exports its seaweed to 30 countries in Europe, South America and Asia.

Changes since HOOW

The development of the bioeconomy places greater emphasis on seaweed as an input into production chains. There has been growing interest for the large scale and mechanical seaweed harvesting, particularly on the west and south coasts which has raised concerns of existing rights holders and of

local communities. The publication of the *Bioeconomy – National Policy Statement* in 2018 shows the national interest in developing bio-based products, which may include the use of seaweed.

Potential future developments

The seaweed harvesting industry is often aggregated with other more developed industries particularly seafood, which have already been discussed in the aquaculture and fisheries sections above. Seaweed presents strong potential for the development of the bioeconomy and BIM has financed and supported projects which look at potential increased value from seaweed products, as it recognises its significant economic potential. Seaweed aquaculture has the potential to facilitate the bioeconomy if production costs can be reduced through technological advancement. The development of the bioeconomy associated with seaweed harvesting is likely to continue to expand with evident benefits for rural employments and economic development.

3.2.18 Social – Access

Current trends

The draft NMPF recognises that *'marine sports and leisure occupy an important position in Irish coastal communities, offering opportunities for physical activity, facilitating social cohesion and integration through volunteering and social participation'*. It notes that membership numbers and affiliated clubs in sailing totals over 19,000 members in 60 clubs. Ireland is also a world-class destination for surfing with well-established surf schools along the west coast. The east coast has seen the development of coastal recreation infrastructure with several planning applications for sea baths being made in the Dublin Region and the development of coastal cycle lanes around the coast.

Changes since HOOW

Fingal, Waterford and Dublin have made particularly good progress in the development of recreational infrastructure since HOOW was published in 2012. The Department of Transport, Tourism and Sport (DTTAS) has also shown increasing commitment to developing coastal recreation infrastructure with funding allocated to the development of Dún Laoghaire National Watersport Centre in 2019 which will facilitate sailing, kayaking, rowing and windsurfing.

Growing public participation is displayed through an increasing number of local beach clean groups around the Irish coast. There have also been a number of seafood or maritime themed festivals created around the coast with growing popularity. SeaFest, the largest maritime festival, attracts over 100,000 visitors per year. It was held for a period of three years in Galway and is planned to take place in Cork between 2019 and 2021. Increased engagement with the sea is also the result of successful environmental awareness and educational campaigns, by proponents such as MI and An Taisce.

The development of the WAW can be credited as one of the key drivers of diversification and intensification of recreational activities on the west coast. The Fáilte Ireland national initiative has aimed at increasing the number of overseas and domestic tourists in the west of Ireland. The National Tourism Agency noted the number of recreation businesses offering an 'experience' had grown since the initiative was launched in 2014.

Potential future developments

There is increasing appreciation of the value of the coast and marine environment by recreational users, including the benefits to health and wellbeing (H2020 SOPHIE Consortium, 2020), which in turn is likely to increase recreational usage of the coastal and marine environment. Impacts on tourism, discussed

below in Section 3.2.25 and sport and recreation (Section 3.2.23) will be significant in impacting investment in infrastructure to improve access, which is inherently linked to potential benefits from increased visitor numbers.

With development of Information Technology expected to continue, there are likely to be opportunities, such as virtual or augmented reality, as discussed by Skarlatos *et al*. (2016), for increased digital access to Ireland's coastal and marine areas, encouraging engagement across the population with the marine environment.

3.2.19 Social – Cultural and heritage assets

Current trends

As an island nation, Ireland has a large number of shipwrecks around its coast, which is estimated to be in the region of 18,000 (National Monuments Service, undated). Underwater heritage is particularly at risk from climate change and extreme weather events. The National Monuments Service (NMS) and the Underwater Archaeology Unit (UAU) are responsible for the quantification, recording, research, survey, excavation and regulation of underwater finds, contributing to the protection of cultural and heritage assets. Irish Lights also holds the National Maritime Archive which constitutes a comprehensive archive of records.

Focussed maritime tourism and heritage initiatives can help address the ever-increasing societal issue of rural divide, ageing population and rebuilding coastal communities by stimulating local economies to help sustain livelihoods in remote parts of Ireland. Irish Lights has launched the Safe Seas – Connected Coast Strategies 2018-2023 (Irish Lights, 2018) which seeks to promote the Irish maritime heritage and culture.

Changes since HOOW

Coastal local authorities have increasingly sought to harness the potential of their maritime heritage through the organisation of festivals, exhibitions and the development of museums. This was in part enabled by the transfer of ownership of Tier 3 Ports 'Ports of Regional Significance' to Local Authorities (DTTAS, 2013) accentuating the need for local authorities to reconsider their relationship with the coast and the sea and related infrastructure and fund the development and regeneration of ports and harbours.

Potential future developments

The integration of natural capital and ecosystem services could lead to significant changes to how natural maritime assets are viewed and valued.

Ireland is part of INTERREG project CHERISH which analyses coastal and island archaeology and heritage sites and how these are affected by climate change, coastal erosion and rising sea levels. It includes a review of Irish sites, the Saltee Islands, Glascarrig Motte, Skellig Michael and the Skerries Islands. The project places a strong emphasis on community involvement. The project which lasts five years began in 2017 and outputs of the works are likely to influence future management of cultural heritage in the marine environment.

In light of the recent COVID-19 pandemic, the diversion of public funds towards other issues may impact on funding allocations to the protection and enhancement of cultural and heritage assets. The onus will

be on the authorities in charge to develop innovative ways to continue to fund ongoing and new endeavours.

3.2.20 Social – Rural coastal and island communities

Current trends

Review of the Pobal Deprivation Index suggests a slight improvement in some coastal Electoral Divisions, particularly along the Kerry coast, between the 2011 and 2016 census. However, there is no evidence the improvement is related to the maritime economy and would require a more thorough granular analysis. Several of the aforementioned sections indirectly touch upon the topic of rural and island communities, including aquaculture and fisheries.

Changes since HOOW

Planning policy, whether on land or at sea, aims for the balance and sustainable development of space. The *NPF 2040* and the *National Development Plan 2018-2027* are particularly clear in that regard. The NPF seeks to harness opportunities strengthening and diversifying rural and coastal economies. The NPF directs investments to ensure the growth and development of coastal and rural communities through safe access by sea through ports and harbours. It also directed funding for development which will enable the achievement of *Food Wise 2025*, through supporting the sustainable development of the agri-food sector. EMFF funding provided through the Fisheries Local Action Groups has also been critical in sustaining coastal and island communities in light of the CFP Reform. Since HOOW was published in 2012, these groups have gained new opportunities resulting from the WAW which links the different villages and towns on the west coast. By providing a cohesive signposted route, the WAW has brought new visitors and expenditure into local coastal communities. Planning policy also now recognises the potential of the bioeconomy with the NPF 2040 and all RSES including policy objectives supporting the development and expansion of the industry to benefit rural areas.

Potential future developments

The future of rural coastal and island communities is likely to be influenced significantly by the developments described in other sections above and below, particularly aquaculture and fisheries although other developments may offer more diverse opportunities.

The *Rural Regeneration and Development Fund* allocated funding to the development of Gteic at An Spideal, Co. Galway for a digital and innovation hub. Údarás na Gaeltachta actively supports the development of rural and coastal Irish speaking communities. It is one of the key promotors with MI and BIM of Páirc na Mara, a marine innovation park. These developments have the potential to diversify and increase economic opportunities for rural coastal and island communities.

Similar objectives to the NPF regarding access and economic growth of coastal and island communities have been proposed in the draft NMPF and the development of offshore renewable energy could provide significant potential to coastal communities, but this will be dependent on a variety of factors.

In addition, as noted in earlier sections of this report, rural coastal and island communities could benefit from development of the bioeconomy, as some businesses utilise waste derived from fish discards. Development and expansion of the sector could be a source of upskilling and job creation in areas not normally the focus of new technology development. The development of offshore renewable energy can also drive significant change for coastal communities. This may in part be largely driven by the use and/or adaptation of ports and harbours to service offshore windfarms.

3.2.21 Social – Seascape and landscape

Current trends

The *National Landscape Strategy for Ireland 2015-2025* has to date been the key policy document relating to landscape. Policy generally aims at the enhancement and protection of the Irish landscape, through management and planning. The Irish landscape and seascape are particularly important to rural and islands economies as it is a key driver of tourism.

Changes since HOOW

The WAW, the national tourism initiative, is now promoting the Irish landscape on the international level as discussed in Section 3.2.24 below. The Irish landscape is a major selling point for the tourism industry, a key economic contributor of rural and coastal economies. The landscape has long formed part of Irish policy and legislation but recognition of its value has somewhat gained greater importance. Both the NPF and the draft NMPF recognise the need to protect landscape and / or seascape as an overarching consideration to decision-making. Importantly consideration for 'sense of place' is now fully considered as part of both.

Potential future developments

Ireland's journey toward electricity decarbonisation has seen the development of wind energy, particularly onshore. It is expected that large offshore wind energy will soon become part of the energy mix. There is evidently a risk of conflict between the need to protect for landscape and seascape and the development of offshore wind. This is recognised by the draft NMPF which will require that proposals for offshore wind will need to carefully consider landscape and seascape impacts. In 2019, MI commissioned a national seascape characterisation which will allow the assessment of proposals in the marine environment. It will be particularly useful to help the assessment of offshore wind.

3.2.22 Social – Social Benefits

Current trends

Social benefits have been considered in a number of other sections of this report, including those relating to coastal and island communities, and employment opportunities arising from the different sectors. Ireland's Ocean Economy 2019 notes that in 2018, the number of jobs in the blue economy was 34,132 FTE or an increase of just under 34% since 2012. Growth in employment particularly accelerated since 2016.

Changes since HOOW

Although the emerging marine sectors only represent 16% of all the blue economy jobs in Ireland, they present very strong growth since 2012, with a growth rate of over 73%. In comparison, established sectors grew by 31.7% but from a much larger base. Other social benefits including those pertaining to health and well-being or enjoyment of the sea are increasingly the focus of social science research. The Marine Social Sciences Network was established in 2018 with a view to bring together a community of researchers, practitioners, policy makers and others to bring a different perspective to marine management and research.

Potential future developments

The draft NMPF recognises the need to balance the development requirements of the various maritime sectors with the social needs of communities. To that effect, it considers the need for development proposals to enhance or promote social benefits, including but not limited to improved health and well-being, enjoyment and access to the sea, cultural identity and sense of place. It is also anticipated that marine developments should be the source of training, upskilling and of employment opportunities.

3.2.23 Sport and recreation

Current trends

The consideration for marine sports and recreation is intrinsic to other topics reviewed in this report, namely access and tourism. Water sports and recreation are wide ranging and include angling, beach activities, biking, boating and sailing, island trips, nature viewing, sea sports, sightseeing, swimming and walking. The Irish Marine Federation indicates that there are in the region of 4,190 coastal marina berths in Ireland (Irish Marine Federation, 2018). Ireland is a world class destination for a number of marine sports, particularly surfing and yachting.

Changes since HOOW

The National Sports Policy 2018-2027 was published by DTTAS in 2018. The policy recognises the role of sports in fostering social cohesion and integration. Several initiatives have been developed and/or enhanced since 2012 with a view to promote greater engagement in sports and recreation, including but not limited to the INTERREG funded project COOL ROUTE, and the #findyourtrail initiative by the National Trails Office.

The draft NMPF also seeks to increase participation in water-based sports and recreation activities to benefit public health and wellbeing. While there is data available on membership and club numbers, there is no specific economic output or employment data. There has been increased government funding allocation made to sports and recreation as a result of the economic recovery observed since 2012, with large sport and recreation infrastructure projects of the likes of the National Watersports Centre in Dún Laoghaire securing capital works funding.

Potential future developments

In light of the current COVID-19 pandemic, it is expected that businesses operating in this industry would be severely impacted in the short term as they are not able to operate, even at minimum service levels. On the medium to long term, funding allocations may also reduce in light of the need to support other government's proposals seeking to address economic recovery.

3.2.24 Telecommunications

Current trends

The development of telecommunications is essential for Ireland, particularly owing to its growing international importance for the global ICT industry. Since 2012, Ireland has emerged as the ICT capital of Europe, becoming the home of numerous IT multinationals, e.g. Google, Facebook, Intel, Apple, Saleforces and many others. Its capabilities are therefore dependent on excellent infrastructure. The development of high-quality telecommunication infrastructure and expansion of Ireland's ICT profile and capacity are supported by the NPF and the draft NMPF. The draft NMPF seeks to facilitate high-speed connectivity between Ireland and other countries. It is also considerate of island communities

which have historically not always received the same access to telecommunications as onshore communities.

A review of foreshore licences application shows that the east coast is preferred for the laying of telecommunication cables, particularly with the UK.

Change since HOOW

Ireland entered a partnership with France with a view to build the Ireland- France Subsea cable, an undersea cable between the two countries. The cable is a 490 km long fibre optic cable to provide high capacity transmission between the two countries. Permitting is currently ongoing. Once developed, the cable would bring additional capacity for the ICT industry.

Potential future developments

Since 2012, Ireland has seen a massive growth in its data centre industry which will not only drive energy demand up, but also will require increased linkages to other nations. Eirgrid, the national grid operator, has forecasted energy demand from data sectors in its All-Island Generation Capacity Statement 2018-2027. It estimated that in a median scenario, data centres could amount to 31% of all energy demand by 2027. This implies increased activity and therefore expansion and upgrade of the telecommunication infrastructure both on land and at sea.

Ireland has long enjoyed a position as the gateway between continental Europe and North America. Brexit could push for enhanced connectivity with France and therefore Continental Europe.

Improved communications infrastructure will also be critical to underpin advances to bring about improved maritime safety, efficiency and environmental protection.

3.2.25 Tourism

Current trends

HOOW sets a target of €1,500m turnover for tourism by 2020. SEMRU estimated that the total direct and indirect GVA was over €1 bn in 2018, making it the second best performing maritime industry in the country. It is by far the largest employer of the maritime economy, generating almost 16,000 FTE jobs, or over three times the number of shipping and maritime jobs in 2018. Direct turnover from tourism has risen by over 60% since 2012. However, this statement should be qualified. 2012 was a particularly bad year for the tourism industry with a turnover of €775,000,000 compared to over €1 bn in 2010 and over €1.25 bn in 2018. The data indicate that the tourism industry has recovered from the last economic recession although the degree to which it has met / exceeded historic levels is uncertain. It is important to note that commentary on employment should be accompanied by commentary on the seasonal nature of tourism-related employment.

Changes since HOOW

The launch of the WAW is possibly the most significant change in the tourism industry since HOOW was first published in 2012. International cruise has significantly expanded over the last eight years, particularly between 2016-2018 (SEMRU, 2019). It is a significant generator of income for coastal towns and cities. Ports have started adapting their infrastructure to welcome deeper and larger cruise ships, namely Cork and Dublin.

Other initiatives include further regional tourism experience brands developed and marketed by Fáilte Ireland, including *Ireland's Ancient East* and *Dublin – Surprising by Nature* which also have important marine and coastal tourism offerings. In addition, Great Lighthouses of Ireland, an all-island tourism project launched by Irish Lights in 2015 has, to date, resulted in the creation of 80 direct jobs or 42 FTE and sustained an estimated 310 indirect jobs (Irish Lights data). The initiative has scope to develop further in collaboration with local authorities, Fáilte Ireland, Tourism NI and Tourism Ireland, and their brand support programmes.

Potential future developments

SEMRU (2019) reported an optimistic view for tourism in Ireland in 2019. Similar observations cannot be made for 2020. The impact of COVID-19 will be extremely severe on the tourism industry. It is likely that economic performance in the tourism industry will be very poor, dependent on the length of the travel ban and restriction on movements. This will affect all aspects of employment within the tourism economy in Ireland. As an example, PricewaterhouseCoopers (PwC) have estimated that since the start of the crisis, 100,000 people in the hospitality sector have been laid off (PwC, 2020). No coastal and island specific data exist but assumptions of high unemployment are likely correct with, according to figures from the Department of Employment Affairs and Social Protection, up to 92% of the sectoral workforce receiving COVID-19 payments. It is expected that tourism will start recovering in 2021 but the pace of recovery will depend on how long social distancing measures are applied, and implications to long-haul travel markets which are important to Ireland. It is unclear how long the cruise industry will take to recover from the health crisis, particularly in light of very poor publicity since the crisis started, and whether this will change the outlook of current trends, such as the move to larger vessels. Brexit is another threat to the tourism industry in the longer term. Its impact has yet to unfold entirely. A key concern for the industry being currency devaluation and how Ireland can remain an attractive location for British holiday makers. Fáilte Ireland has put in place a suite of supports to help Irish tourism adapt to the impacts of Brexit. In particular, it put in place a 'Brexit Readiness Check', a tool which assesses individual business readiness and suggests the supports available in response.

Notwithstanding the above considerations on COVID-19 and Brexit, Dublin Port announced in 2019 the intention to reduce the number of cruise ships it welcomes from 2021 to 2010 levels (approximately 80 per annum) so that it can accommodate increasing cargo throughput volumes which have increased significantly to date and are likely to increase further, when the UK leaves the EU, as discussed in the section relating to Ports and Shipping above. The decision was criticised by tourism operators in the Dublin region owing to the significant losses it would generate. In response, other ports, including Belfast and Cork are gearing themselves up to welcome more cruise ships. Their preparation includes consideration for transporting passengers to Dublin City by bus or by train. The announcement created substantial uncertainty for cruise line companies which are now reluctant to include Ireland in future itineraries.

The future of large scale cruise tourism at Dublin Port is likely to be influenced by the outcome of the consultation undertaken in 2019/20 (Dublin Port, 2019) on the appetite of the community for large scale cruise tourism. The output of the consultation is not yet available, but may influence the likelihood of further development of the proposed berths at North Wall Quay Extension which would be required should the city target increased cruise tourism. This consultation includes discussions regarding air quality, which will be part of considerations when reviewing the objectives for the cruise industry.

3.2.26 Waste water treatment and disposal

Current Trends

Water quality is measured through the relevant monitoring frameworks in place, including WFD and MSFD. The Urban Waste Water Directive aims to support meeting the objectives in the WFD and MSFD. Since 2013, there has been an increase in waste waters receiving secondary or tertiary treatment in Ireland. However, 21 out of 169 monitoring areas failed to meet EU standards (EPA, 2019). The Environmental Protection Agency has recognised key actions are needed, such as upgrading deficient waste water systems, to avoid financial penalties from the EU. The Environmental Protection Agency's (EPA's) *Ireland Environment – An Assessment 2016* noted urban waste water as one of the key contributors to the lack or limited improvement in water quality.

Changes since HOOW

Since 2012, there have been significant changes in the management of waste water in Ireland, with the creation of Irish Water (IW), a national company in charge of the management of the water supply, treatment and disposal.

Potential future developments

The National Development Plan (NDP) will invest via IW in large scale drainage projects with a view to improve water quality in Ireland. Such projects include inter alia the Cork Lower Harbour Main Drainage Project, the Belmullet Sewerage Scheme and the Greater Dublin Drainage Projects. Such projects are assessed having regard to the Environmental Impact Assessment (EIA), the Birds Directive and the Habitats Directive and may require discharge licences from the EPA, which allows for assessing their impact on water quality. Improvement in water quality will be driven in part by improvements to the waste water network. Proposals in the PfG indicate a governmental commitment to the funding of Irish Water which will positively impact on the water quality.

4 Conclusions

Ireland is experiencing a period of major change in terms of the legal and policy framework for marine decision-making, the economic context for marine activities, the influence of technological change on marine activities and resultant societal impacts.

At a political level, measures implemented by national governments to seek to contain the ongoing COVID-19 pandemic threaten to have major impact on global economic activity, the potential consequences of which for Ireland are currently highly uncertain. Existing measures are already having a major impact on Ireland's seafood sector and on maritime transport.

In addition to this, Brexit is likely to have significant negative implications for Ireland's economy, with the extent of impacts dependent on the final form of any Brexit agreement. There are particular potential risks to the seafood sector, associated with access to UK waters and export tariffs, to maritime transport as a result of import and export tariffs and customs delays, and to electricity imports and exports due to tariffs.

This report was initially prepared while government formation talks were ongoing with Fianna Fail and Fine Gael. It has been updated to reflect the PfG put forward by the coalition of Fianna Fail and Fine Gael with the Green Party. The PfG was published at a challenging time for Ireland, as the country was slowly coming out of lockdown and faced with substantial challenges on how to rebuild the economy during and after one of the most severe economic crises in the history of the State. Social cohesion, Brexit and climate action are three of the underlying themes of the programme. It sets out a strategy for recovery and rebuilding after the COVID-19 emergency. This includes many elements which relate to marine activities including an emphasis on offshore wind energy, particularly off the west coast, as well as commitments to additional protection of biodiversity at sea.

While Ireland's ocean economy has shown a resurgence in recent years following the 2008 economic crisis, the COVID-19 pandemic and Brexit threaten to cause a significant decline in key marine sectors.

Within this challenging context, there remain opportunities for economic growth, particularly in emerging sectors such as offshore renewable energy, aquaculture and marine biotechnology in the bioeconomy. Globally, the OECD estimated that the marine economy could double in size between 2010 and 2030, reaching around USD 3 trillion in 2030 (OECD, 2016). While the COVID-19 pandemic may slow down the rate of growth in the short-term, the longer-term potential for growth remains.

Key areas of technical advance include artificial intelligence, the Internet of Things and big data alongside progress in material science and biotechnology. Research and innovation are fundamental in underpinning these technical developments and Ireland has particular strengths in key areas including ICT, marine survey and aquaculture research, and the wider marine bioeconomy.

Environmental drivers such as the EU Green Deal and the target to achieve 'net zero' by 2050 are supported by an ambitious target to deploy 5 GW of offshore wind capacity by 2030. This will drive significant investment in offshore wind in the coming decade, providing a significant opportunity for Ireland if national supply chains can establish quickly.

Continuing implementation of EU environmental directives is likely to lead to some further improvement in the quality of Ireland's marine environment although progress may be slow, particularly limited by available resources. The PfG commitments provide added impetus but will need to be supported by funding to achieve meaningful progress.

Key areas where progress is anticipated are completion of the designation of MPAs and implementation of effective management regimes. Further progress in the protection of wider marine biodiversity is also expected through measures to protect OSPAR threatened and/or declining habitats and species and application of marine plan policies. Increasing use of natural capital and ecosystem services evidence to support decision-making will also contribute better environmental decisions. Adoption of concepts such as biodiversity net gain could also be important in halting and reversing the current trend of marine biodiversity decline. Embracing such a policy may be particularly important, given the likely additional reliance to be placed on harnessing marine resources in the future.

The upcoming adoption of the NMPF, combined with new legislation in the form of the Marine Planning and Development Management Bill (MPDM), will drive development of certain sectors. Importantly the NMPF will bring much needed transparency and therefore confidence to drive investment in maritime sectors. As the NMPF will be aligned with the NPF 2040, Ireland can seize the unique opportunity to consider Blue Growth from an integrated land and sea perspective. This will be particularly enabled by the alignment of planning and investment cycles, with the second iteration of the NMPF in 2026 to coincide with the preparation of the successor to the NDP in 2027.

To assist with the consideration of possible future trends within the marine planning process in a manageable way, it may be appropriate to develop a small number of alternative future scenarios that provide coherent narratives about possible future changes encompassing the range of uncertainty associated with these changes.

5 References

ABPmer. 2000. Climate Change and Coastal Erosion. ABP Marine Environmental Research Ltd, Report No. R.1111.

AFLOWT. 2019. Accelerating market uptake of Floating Offshore Wind Technology. [online] Available at https://www.nweurope.eu/projects/project-search/aflowt-accelerating-market-uptake-of-floating-offshore-wind-technology/

Ahearne, A. and Hynes, S. 2020. Confidential Update to the Department of the Taoiseach and the Marine Institute, incorporating BIM data. The value of Ireland's ocean economy.

Austen M.C., Andersen P., Armstrong C., Döring R., Hynes S., Levrel H., Oinonen S., Ressurreição A. 2019. Valuing Marine Ecosystems - Taking into account the value of ecosystem benefits in the Blue Economy, Coopman, J., Heymans, JJ., Kellett, P., Muñiz Piniella, A., French, V., Alexander, B. [Eds.] Future Science Brief 5 of the European Marine Board, Ostend, Belgium. 32pp. ISBN: 9789492043696 ISSN: 4920-43696 DOI: 10.5281/zenodo.2602732. [online] Available at: https://www.marineboard.eu/publications/valuing-marine-ecosystem-services-%E2%80%93-taking-account-value-ecosystem-benefits-blue

BiOrbic, undated. Funded Research: Beyond Biofuels. [online] Available at: https://biorbic.com/research/funded-projects/

BIM. 2018. Statement of Strategy 2018-2020, Enabling Sustainable Growth. [online] Available at: http://www.bim.ie/media/bim/content/publications/corporate-other-publications/BIM-statement-of-strategy-2018-2020-enabling-sustainable-growth.pdf

BIM. 2019. National Seafood Survey Aquaculture Report 2019, [online] Available at: http://www.bim.ie/media/bim/content/publications/aquaculture/BIM-National-Seafood-Survey-Aquaculture-Report-2019.pdf

BIM. 2019a. The Business of Seafood 2018. A snapshot of Ireland's seafood sector. [online] Available at: http://www.bim.ie/media/bim/content/publications/corporate-other-publications/BIM-Business-of-Seafood-2018.pdf

BIM, 2020. The Business of Seafood 2019. A snapshot of Ireland's seafood sector. [online] Available at: http://www.bim.ie/media/bim/content/publications/corporate-other-publications/BIM-Business-of-Seafood-2019-Spreads.pdf

Carbon Trust, 2020. Harnessing our potential: Investment and jobs in Ireland's offshore wind industry March 2020. [online] Available at: https://www.iwea.com/images/files/final-harnessing-our-potential-report-may-2020.pdf

Celtic Interconnector. 2019. News Article [online] Available at https://www.celticinterconnector.eu/ga/eirgrid-and-rte-sign-e530-million-funding-agreement-for-the-celtic-interconnector/

CIEEM, CIRIA & IEMA. 2016. Biodiversity Net Gain - Good practice principles for development. [online] Available at: https://cieem.net/wp-content/uploads/2019/02/Biodiversity-Net-Gain-Principles.pdf

Climate Change Advisory Council. 2019a. Annual Review 2019, Submitted to Minister for Communications, Climate Action and the Environment on 17 July 2019. [online] Available at: http://www.climatecouncil.ie/media/Climate%20Change%20Advisory%20Council%20Annual%20Review%202019.pdf

Climate Change Advisory Council. 2019b. Re: Advice on future offshore oil and gas exploration and recovery in Ireland. Advice letter to Minister Bruton, Department of Communications, Climate Action & Environment. [online] Available at: http://www.climatecouncil.ie/media/Climate%20Change%20Advisory%20Council%20Response%20on%20Offshore%20Exploration.pdf

Convention on Biological Diversity (CBD). 2016. Invasive alien species: addressing risks associated with trade, experiences in the use of biological control agents, and decision support tools. [online] Available at: https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-13-en.pdf

Convention on Biological Diversity (CBD). 2018. Invasive alien species. [online] Available at: https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-11-en.pdf

Copenhagen Economics, 2018. Ireland & The Impacts of Brexit: Strategic Implications For Ireland Arising From Changing EU-UK Trading Relations. [online] Available at: https://dbei.gov.ie/en/Publications/Publication-files/Ireland-and-the-Impacts-of-Brexit.pdf

Crippa, M., Janssens-Maenhout, G., Dentener, F., Guizzardi, D., Sindelarova, K., et al. 2016. Forty years of improvements in European air quality: regional policy-industry interactions with global impacts. Atmospheric Chemistry and Physics, European Geosciences Union. 16 (6), pp.3825-3841.

CSO, 2020. Statistics: Tonnage (Thousands) of goods handled by Irish Ports. [online] Available at https://statbank.cso.ie/multiquicktables/quickTables.aspx?id=tba07

DAFM. 2015. National Strategic Plan for Sustainable Aquaculture. [online] Available at: https://www.agriculture.gov.ie/seafood/marineagenciesprogrammesdivision/aquaculturepolicy/nationalstrategicplanforsustainableaquaculturedevelopment/

DAHG. 2015. National Landscape Strategy for Ireland 2015-2025. Available at: https://www.chg.gov.ie/app/uploads/2015/07/N-Landscape-Strategy-english-Web.pdf
DCCAE, 2017. National Clean Air Strategy [online]. [Accessed: March 2020]. Available at: https://www.dccae.gov.ie/en-ie/environment/topics/air-quality/national-clean-air-strategy/Pages/default.aspx.

DCCAE. 2019. Policy Statement - Petroleum Exploration and Production Activities as part of Ireland's Transition to a Low Carbon Economy [online] Available at: https://www.dccae.gov.ie/en-ie/natural-resources/publications/Documents/62/Policy%20Statement%20Petroleum%20Exploration%20and%20Production%20Activities.pdf

Department for Transport. 2019. Maritime 2050 – Navigating the Future. January 2019. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/872194/Maritime_2050_Report.pdf

Department of Communications, Energy and Natural Resources. 2014. Offshore Renewable Energy Development Plan – A framework for sustainable development of Ireland's offshore renewable energy

resource. [online] Available at: https://www.dccae.gov.ie/documents/20140204%20DCENR%20-%20Offshore%20Renewable%20Energy%20Development%20Plan.pdf

Department of Culture, Heritage and the Gaeltacht. National Biodiversity Action Plan 2017-2021.
Department of Housing, Planning and Local Government (DHPLG). 2019. Interim Report. [online] Available at:
https://www.housing.gov.ie/sites/default/files/publications/files/2019_10_01_interim_report_-_final.pdf

Department of Housing, Planning and Local Government, 2017, Towards a Marine Spatial Plan for Ireland. [online] Available at: https://www.housing.gov.ie/planning/maritime-spatial-planning/maritime-spatial-planning-directive/maritime-spatial-planning

Dobbs, R., Manyika, J. & Woetzel, J. 2015. The four global forces breaking all the trends, McKinsey Global Institute, April 2015. [online] Available at: www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-four-global-forces-breaking-all-the-trends.

Donegal Daily, 2020. Donegal's fishing ports standing still during lockdown. [online] Available at: https://www.donegaldaily.com/2020/04/04/donegals-fishing-ports-standing-still-during-covid-19-lockdown/

DTTAS. 2013. National Ports Policy. [online] Available at:
https://assets.gov.ie/11557/277d22d364fe4c13be390493282c0557.PDF

Dublin City Council. 2016. Dublin City Alien Species Action Plans. [online] Available at:
https://www.dublincity.ie/sites/default/files/content/RecreationandCulture/DublinCityParks/Biodiversity/Documents/DCCo_IAS_ActionPlan_FINAL%20WEB.pdf.

Dublin Port, 2019. News Article: Public Consultation opens on the future development of cruise tourism in Dublin Port. [online] Available at: https://www.dublinport.ie/public-consultation-opens-future-development-cruise-tourism-dublin-port/

EC. 2020. Specific Measures to Mitigate the impact of the COVID-19 outbreak in the fishery and aquaculture sector. [online] Available at:
https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2020/0059(COD)&l=en

Èirgrid. 2018. All-Island Generation Capacity Statement 2018-2027. [online] Available at:
http://www.eirgridgroup.com/site-files/library/EirGrid/Generation_Capacity_Statement_2018.pdf

Environment Protection Agency. 2013. Coastal Climate Adaptation in Ireland: Assessing current conditions and enhancing the capacity for climate resilience in local coastal management. [online] Available at: https://www.epa.ie/pubs/reports/research/climate/CCRP_28.pdf

Environmental Protection Agency. 2019. Air Quality in Ireland 2018. [online] Available at:
https://www.epa.ie/pubs/reports/air/quality/Air%20Quality%20In%20Ireland%202018.pdf
Environmental Protection Agency, 2019. Water Quality in Ireland 2013-2018. [online] Available at:
http://www.epa.ie/pubs/reports/water/waterqua/Water%20Quality%20in%20Ireland%202013-2018%20(web).pdf

Environment Protection Agency. 2019. Urban Waste Water Treatment in 2018. [online] Available at:
http://www.epa.ie/pubs/reports/water/wastewater/Urban%20Waste%20Water%20Treatment%20in%202018_Web.pdf

ESPO, 2016. EcoPorts Environmental Review April 2016. [online] Available at: https://www.ecoports.com/assets/files/common/publications/ESPO_EcoPorts_Port_Environmnetal_Review_2016_v1.pdf

ESRI. 2020. Quarterly Economic Commentary, Spring 2020. [online] Available at: https://www.esri.ie/publications/quarterly-economic-commentary-spring-2020

European Commission. 2012. The Blue Growth Strategy- Towards more sustainable growth and jobs in the blue economy. [online] Available at: https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en

European Commission. 2017. D2 Non-indigenous species. MSFD Commission Decision (EU) 2017/848. [online] Available at: https://mcc.jrc.ec.europa.eu/main/dev.py?N=20&O=119&titre_page=&titre_chap=D2%20Non-indigenous%20species

European Commission. 2018. A European Strategy for Plastics in a Circular Economy. [online] Available at: https://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf.

European Commission, 2019a. The European Green Deal. Communication from the Commission to the European Parliament, European Council, The Council, The European Economic and Social Committee and the Committee of the Regions. COM(2019)final 640. [online] Available at: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

European Commission, 2019b. European Overview - River Basin Management Plans. Brussels: European Commission. 1-296. [online] Available at: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2019:0030:FIN:EN:PDF.

European Commission, 2020. Specific Measures to Mitigate the Impact of the COVID-19 Outbreak in the Fishery and Aquaculture Sectors. [online] Available at https://www.europarl.europa.eu/doceo/document/TA-9-2020-0052_EN.html

Fáilte Ireland. 2015. Wild Atlantic Way – Operational Programme 2015-2019, [online] Available at: https://www.Fáilteireland.ie/FáilteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/Key%20Projects/Wild-Atlantic-Way-Operational-Programme_1.pdf

Fiott, D. 2019. Pushing the Defence Technology Frontier: A Role for the EU? Contributing Article, Defence Forces Review 2019.

Global Commission on Adaptation. 2019. Adapt Now: A global call for leadership on climate resilience.

Government of Ireland. 2012. Harnessing Our Ocean Wealth (HOOW) – an Integrated Marine Plan. [online] Available at: https://www.ouroceanwealth.ie/publications

Government of Ireland. 2017. National Mitigation Plan. [online] Available at: https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/National-Mitigation-Plan.aspx

Government of Ireland, 2018. Ireland's National Statement on the Bioeconomy, October 2018. [online] Available at: https://assets.gov.ie/2244/241018115730-41d795e366bf4000a6bc0b69a136bda4.pdf

Government of Ireland / DBEI. 2018. Focus on Marine and Maritime. [online] Available at: https://dbei.gov.ie/en/Publications/Publication-files/Focus-on-Marine-and-Maritime.pdf

Government of Ireland and DAFM. 2018. Brexit and the Irish Fishing Industry Factsheet. [online] Available at: https://www.agriculture.gov.ie/media/migration/seafood/sea-fisheriespolicymanagementdivision/brexit/FactSheetJune2018020718.pdf

Government of Ireland. 2019a. National Marine Planning Framework- Consultation Draft. [online] Available at: https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_national_marine_planning_framework_final.pdf

Government of Ireland. 2019b. Climate Action Plan 2019 to Tackle Climate Breakdown. [online] Available at: https://assets.gov.ie/25419/c97cdecddf8c49ab976e773d4e11e515.pdf

Government of Ireland, 2019c. Future Jobs Ireland. Preparing Now for Tomorrow's Economy. [online] Available at: https://dbei.gov.ie/en/Publications/Publication-files/Future-Jobs-Ireland-2019.pdf

Government of Ireland. 2019d. Public Consultation on the Marine Strategy Framework Directive 2008/56/EC Article 17 update of the Assessment (Article 8), Determination of Good Environmental Status (Article 9) and Environmental Targets (Article 10) December 2019. [online] Available at: https://www.housing.gov.ie/water/water-quality/marine-strategy/public-consultation-marine-strategy-framework-directive-200856ec

Government of Ireland. 2019e. Marine Strategy Framework Directive 2008/56/EC Article 18 Interim Progress Report on the Implementation of the Programme of Measures. September, 2019. [online] Available at: https://www.housing.gov.ie/sites/default/files/publications/files/2019_10_01_interim_report_-_final.pdf

Government of Ireland, 2020. Draft Programme for Government. [online] Available at: https://static.rasset.ie/documents/news/2020/06/draft-programme-for-govt.pdf

Government Office for Science. 2017a. Foresight Future of the Sea. A Report from the Government Chief Scientific Advisor. [online] Available at: https://www.gov.uk/government/publications/future-of-the-sea--2

Government Office for Science. 2017b. Foresight, Future of the Sea: Industry perspectives on Emerging Technology. London: GO-Science. [online] Available at: https://www.gov.uk/government/publications/future-of-the-sea-industry-perspectives-on-emerging-technology

Greenlink, 2020. [online] Accessed 12/04/2020 https://www.greenlink.ie/

H2020 SOPHIE Consortium. 2020. A Strategic Research Agenda for Oceans and Human Health in Europe. H2020 SOPHIE Project. Ostend, Belgium. ISBN: 9789492043894 DOI: 10.5281/zenodo.3696561

Irish Bioeconomy Forum, undated. Bioeconomy Funding Opportunities. [online] Available at: https://www.agriculture.gov.ie/media/migration/research/bioeconomy/No4BookletFundingOpportunities2020170420.pdf

Irish Production Organisations, undated. European Maritime Fisheries and Aquaculture Fund 2021 – 2027. A Joint Submission from Irish Fish Producer Organisations, Killybegs Fishermen's Organisation (KFO), Irish Fish Producers Organisation (IFPO), Irish South and West Fish Producers Organisation (IS&WFPO) and Irish South and East Fish Producers Organisation (IS&EFPO)) to the Department of Agriculture, Food and the Marine (DAFM) regarding allocation of EMFAF resources to enable those

Producer Organisations to fulfil their role as required under the terms of the Common Fisheries Policy (CFP). [online] Available at: https://www.agriculture.gov.ie/media/migration/seafood/marineagenciesandprogrammes/emff/sdp2021-27programmedevelopment/submissionsreceived/12JointPOs020720.pdf

IMDO. 2018. IPORES 2018, a Review of Irish Ports Offshore Renewable Energy Services, [online] Available at https://www.imdo.ie/Home/sites/default/files/IMDOFiles/13390%20IMDO%20IPORES%20Report%202018%20FA.PDF

IMO. 2014. IMO MEPC.1/Circ.833: Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life, July 2014. [online] Available at https://www.ascobans.org/en/document/imo-mepc1circ833-guidelines-reduction-underwater-noise-commercial-shipping-address-adverse

Inter-Departmental Marine Coordination Group. 2012. "Harnessing Our Ocean Wealth: An Integrated Marine Plan for Ireland", Inter-Departmental Marine Coordination Group 2012. [online] Available at: https://oar.marine.ie/handle/10793/810

International Energy Agency, 2019. Global EV Outlook 2019 - Scaling-up the transition to electric mobility. [online] Available at: https://webstore.iea.org/download/direct/2807?filename=global_ev_outlook_2019.pdf

International Maritime Organisation. 2017. International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) [online]. Available at: http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx.

Irish Lights. 2018. Irish Lights Strategy 2018-2023. Safe Seas – Connected Coasts. [online] Available at https://www.irishlights.ie/media/51977/safe-seas-connected-coasts-irish-lights-strategy-2018-2023.pdf

Irish Times. 2019. News Article. [online] Accessed 13/04/2020 https://www.irishtimes.com/news/environment/ireland-to-be-among-first-countries-to-phase-out-oil-and-gas-exploration-1.4028136

IUCN. 2019. Issues Brief: Ocean Deoxygenation, December 2019. [online] Available at: https://www.iucn.org/sites/dev/files/ocean_deoxygenation_issues_brief_-_final.pdf

Lloyd's Register, QinetiQ and University of Southampton. 2015. Global Marine Technology Trends 2030. London: Lloyd's Register Group Services Ltd. [online] Available at: https://www.lr.org/en-gb/insights/global-marine-trends-2030/global-marine-technology-trends-2030/

Lloyds Register. 2018. Global Marine Technology Trends 2030 Autonomous Systems. [online] Available at: https://www.lr.org/en-gb/insights/global-marine-trends-2030/technology-trends/

Mangi, S.C., Lee, J., Pinnegar, J.K., Law, R.J., Tyllianakis, E. and Birchenough, S.N., 2018. The economic impacts of ocean acidification on shellfish fisheries and aquaculture in the United Kingdom. Environmental Science & Policy, 86, pp.95-105.

MaREI, 2020. EirWind Project Website. [online] Available at: https://www.marei.ie/project/eirwind/

Marine Institute. 2017. National Marine Research and Innovation Strategy 2017-2021. [online] Available at: https://www.marine.ie/Home/sites/default/files/MIFiles/Docs/ResearchFunding/Print%20Version%20National%20Marine%20Research%20%26%20Innovation%20Strategy%202021.pdf

Marine Institute. 2018. Building ocean knowledge, delivering ocean services. Strategic plan, 2018 – 2022. [online] Available at: https://www.marine.ie/Home/site-area/about-us/corporate-strategy

Marine Institute and PwC. 2019. Marine sector survey 2019. [online] available at https://www.marine.ie/Home/site-area/news-events/press-releases/marine-institute-pwc-survey-marine-sector

MCIB, 2020. Report of Incidents and Investigations, 2019. [online]. Available at: https://www.mcib.ie/_fileupload/MCIB_Incidents_Investigations_Report_2019.pdf

MRIA. 2018. Marine Spatial Planning Needs of Marine Renewables Emerging Technologies - [online] Available at https://www.mria.ie/site/assets/files/1016/marine_spatial_planning_needs_of_marine_renewables_emerging_technologies.pdf

Mulcahy, Lt (NS) Shane. 2019. Patrolling Below the Horizon: Addressing Ireland's Awareness of our Maritime Geospatial Domain. Contributing Article, Defence Forces Review 2019.

National Parks & Wildlife Service. 2014a. A Prioritised Action Framework for Natura 2000. 2014 – 2020 Ireland. [online] Available at: https://www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf

National Parks & Wildlife Service. 2014b. Guidance to Manage the Risk to Marine Mammals from Man made Sound Sources in Irish Waters [online] Available at: https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf

National Parks & Wildlife Service. 2019. The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report. [online] Available at: https://www.npws.ie/publications/article-17-reports/article-17-reports-2019

National Waste Prevention Programme (NWPP. 2018. Preventing waste, driving the circular economy. Annual Report for 2018. [online] Available at: https://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf.

New Economic Foundation. 2017. Landing the Blame: Overfishing in the Atlantic 2017. [online] Available at: https://neweconomics.org/uploads/files/NEF_LTB_ATLANTIC_2017.pdf

O'Sullivan. 2018. Marine Protection: Motion, Seanad Éireann debate - Wednesday, 23 May 2018 Vol. 258 No. 5. [online] Available at: https://www.oireachtas.ie/en/debates/debate/seanad/2018-05-23/14/?highlight%5B0%5D=marine&highlight%5B1%5D=protected&highlight%5B2%5D=areas&highlight%5B5%5D=areas&highlight%5B7%5D=areas&highlight%5B8%5D=areas

Oceana. 2020. Protecting Marine Nature by 2030. [online] Available at https://eu.oceana.org/sites/default/files/oceana_factsheet_2030_mpas_biodiversity.pdf

OECD. 2016. The Ocean Economy to 2030, December 2016. [online] Available at: http://www.oecd.org/sti/inno/the-ocean-economy-in-2030-9789264251724-en.htm

OECD, 2020. OECD Policy Responses to Coronavirus (COVID-19): Fisheries, aquaculture and COVID-19: Issues and policy responses. [online] Available at: http://www.oecd.org/coronavirus/policy-responses/fisheries-aquaculture-and-covid-19-issues-and-policy-responses-a2aa15de/

OSPAR Commission. 2012. MSFD Advice Manual and Background document on Good environmental status - Descriptor 11: Underwater noise. [online] Available at: https://www.ospar.org/documents?d=7292.

OSPAR Commission. 2014. Marine Litter Regional Action Plan. [online] Available at: https://www.ospar.org/documents?v=34422.

OSPAR Commission. 2014. OSPAR inventory of measures to mitigate the emission and environmental impact of underwater noise. [online] Available at: https://www.researchgate.net/publication/308110504_OSPAR_inventory_of_measures_to_mitigate_the_emission_and_environmental_impact_of_underwater_noise.

OSPAR Commission. 2017. CEMP Guidelines for Monitoring and Assessment of loud, low and mid-frequency impulsive sound sources in the OSPAR Maritime Region. [online] Available at: https://www.ospar.org/work-areas/cross-cutting-issues/cemp.

OSPAR Commission. 2015. Underwater Noise [online]. Available at: https://www.ospar.org/work-areas/eiha/noise.

PwC. 2020. Covid-19 and the Irish Hospitality Sector, Impact and Options. [online] Available at: https://www.pwc.ie/publications/2020/hospitality-sector-covid19-impact-and-options.pdf

S.I. No. 575/2011 - European Communities (Geological Storage of Carbon Dioxide) Regulations 2011.

Sarman, Vagh & Neelmani, Ritesh & Chandravanshi, Mahendra & Pal, Mahendra & Sarman, Vyas & Ud, Muniya & Tn,. 2019. Impacts of climate change on marine biodiversity. Journal of Entomology and Zoology Studies 2019; 7(2); 425-430.

SEAI. 2008. Assessment of the Potential for Geological Storage of Carbon Dioxide for the Island of Ireland. [online] Available at: https://www.seai.ie/publications/Assessment-of-the-Potential-for-Geological-Storage-of-CO2-for-the-Island-of-Ireland.pdf

SEMRU. 2019. Ireland's Ocean Economy – June 2019. [online] Available at: https://www.nuigalway.ie/media/researchsites/semru/files/Online_Irelands-Ocean-Economy-Report_for-web_final.pdf

ShannonLNG. 2020. [online] Accessed 16/04/2020 at http://www.shannonlng.ie/

Sheehan, Comdt. K. 2019. What Implications Will Artificial Intelligence Have on The Defence Forces over the Coming Decades, and are they Ready for the Associated Challenges these Developments will Induce? Contributing Article, Defence Forces Review 2019.

Skarlatos, D., Agrafiotis, P., Balogh, T., Bruno, F., Castro, F., Petriaggi, B.D., Demesticha, S., Doulamis, A., Drap, P., Georgopoulos, A. and Kikillos, F. 2016. Project iMARECULTURE: advanced VirtualReality, iMmersive serious games and augmented REality as tools to raise awareness and access to European underwater CULTURal heritagE. In Euro-Mediterranean Conference (pp. 805-813). Springer, Cham.

Stockholm Convention on Persistent Organic Pollutants. 2017. An introduction to the chemicals added to the Stockholm Convention as POPs by the conference of the parties. Geneva. UN. [online] Available at: http://chm.pops.int/TheConvention/Overview/tabid/3351/

Thompson, R.C. 2017. Future of the Sea: Plastic Pollution. Foresight Evidence Review. [online] Avialable at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/634433/Future_of_the_sea_-_plastic_pollution_final.pdf

University College Cork, 2008. IMAGIN: Irish Sea Marine Aggregards Initiative (2005-2007). [online] precis available at: https://www.ucc.ie/en/asu/research/

UNEP. 2018. The Emissions Gap Report 2018. [online] Available at: http://wedocs.unep.org/bitstream/handle/20.500.11822/26895/EGR2018_FullReport_EN.pdf

von der Leyen, U. 2019. Political Guidelines for the next European Commission 2019-2024. [online] Available at: https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf

6 Abbreviations/Acronyms

AFLOWT	Accelerating market uptake of FLoating Offshore Wind Technology
AI	Artificial Intelligence
BIM	Bord Iscaigh Mhara
BWM	International Convention for the Control and Management of Ships' Ballast Water and Sediments
CBD	Convention for Biodiversity
CCMA	County and City Management Association
CCS	Carbon Capture and Storage
CEMP	Construction Environmental Management Plan
CFP	Common Fisheries Policy
CHERISH	Cultural HERitage of fISHing communities in Europe
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CLAMS	Co-oridinated Local Aquaculture Management Systems
CPV	Coastal Patrol Vessels
CRM	Critical Raw Materials
DAFM	Department of Agriculture, Food and the Marine
DAHG	Department of Arts, Heritage and the Gaeltacht
DBEI	Department of Business, Enterprise and Innovation
DCACNT	Department of Climate Action, Communication Network and Transport
DCCAE	Department for Climate Change and the Environment
DCHG	Department of Culture, Heritage and the Gaeltacht
DHLGH	Department of Housing, Local Government and Heritage
DHPLG	Department of Housing, Planning and Local Government
DTTAS	Department of Transport, Tourism and Sports
EC	European Commission
ECA	Emission Control Areas
EEC	European Economic Community
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMFF	European Maritime and Fisheries Fund
EPA	Environmental Protection Agency
ESPO	European Port Sector Organisation
ESRI	Economic and Social Research Institute
EU	European Union
EV	Electric Vehicle
FLAG	Fisheries Local Area Group
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GES	Good Environmental/Ecological Status
GHG	Greenhouse Gas
GNP	Gross National Product
GVA	Gross Value Added
GW	Gigawatt
HCI	Human Computer Interface
HOOW	Harnessing Our Ocean Wealth
HPV	Helicopter Patrol Vessel
HVDC	High-Voltage Direct Current

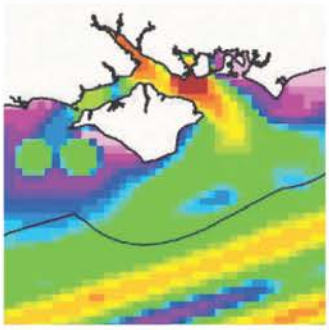
ICT	Information and Communication Technology
IEMA	Institute of Environmental Management and Assessment
IMDO	Irish Maritime Development Office
IMO	International Maritime Organisation
IMP	Integrated Marine Plan
INNS	Invasive Non-Native Species
IPORES	Irish Ports Offshore Renewable Energy Services
IT	Information Technology
IUCN	International Union for Conservation of Nature
IW	Irish Water
LNG	Liquefied Natural Gas
LPV	Large Patrol Vessel
MaREI	Research Centre for Energy, Climate and Marine
MARPOL	Marine Pollution Convention
MCG	Marine Coordination Group
MCP	Maritime Connectivity Platform Consortium
MI	Marine Institute
MPA	Marine Protected Area
MPDM	Marine Planning and Development Management Bill
MRE	Marine Renewable Energy
MRIA	Marine Renewables Industry Association
MS	Member States
MSFD	Marine Strategy Framework Directive
MSP	Marine Spatial Planning
MW	Megawatt
NDP	National Development Plan
NEF	New Economic Foundation
NMP	National Mitigation Plan
NMPF	National Marine Planning Framework
NMS	National Monuments Service
NPF	National Planning Framework
NPWS	National Park and Wildlife Service
NWPP	National Waste Prevention Programme
OECD	Organisation for Economic Co-operation and Development
OPV	Offshore Patrol Vessel
OSPAR	Oslo Paris Commission
PAF	Prioritised Action Framework
PwC	Pricewaterhouse Coopers
RAS	Recirculating Aquaculture Systems
RBMP	River Basin Management Plan
RESS	Renewable Electricity Support Scheme
ROPAX	Passenger and Roll-on Roll-off Vessel
RoRo	Roll-on Roll-off
RPO	Regional Policy Objectives
RSES	Regional Spatial and Economic Strategies
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SEAI	Sustainable Energy Authority Of Ireland
SEMRU	Socio-Economic Marine Research Unit
SFPC	Shannon Foyes Port Company
SHIP	Sustainable and Holistic management of Irish Ports
SME	Small to Medium Enterprise

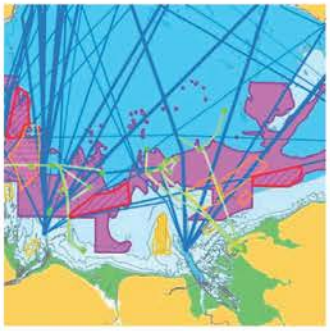
SOPHIE	Seas, Oceans and Public Health in Europe
SPA	Special Protection Area
SPS	Sanitary and Phytosanitary
TEN-T	Trans-European Transport Network
UAU	Underwater Archaeology Unit
UCC	University College Cork
UN	United Nations
UNEP	UN Environment Programme
USD	US Dollar
VTS	Vessel Traffic Services
WAW	Wild Atlantic Way
WFD	Water Framework Directive

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

Appendices




Innovative Thinking - Sustainable Solutions

ABP mer

A Evidence Database

The evidence database is provided below and as a separate, searchable excel database:

For a full description of the database fields, see the 'Recorded Information' page of the database.

20200811_R.3416_Final_Evidence_Database

A.1 Legal / Policy

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Climate Action Plan 2019 to Tackle Climate Breakdown	Climate Change Energy - Offshore Renewable Energy Energy - Transmission	National - Ireland	The action plan aims to set out a pathway to 2030 and policy requirements consistent with achieving a Net Zero economy by 2050.	The roadmap sets out the intent to increase reliance on renewables from 30% to 70% by 2030, incorporating 12 GW of additional renewable energy capacity. This is partly driven by significant offshore wind capacity deployment (1 GW by 2025, 3.5 GW by 2030). The Climate Action Plan anticipates that offshore wind will become the most economical decarbonisation measure at approximately 2025. This also requires reinforcement of the grid, leading to greater investment in interconnector cables, and hence development of this sector in the Irish Marine Area. Further policy development is identified, through the Marine Planning and Development Management Bill, to encourage economic development from offshore renewables, and offshore grid connection policies to line up with Renewable Electricity Support Scheme (RESS) auctions. The plan also identifies the requirement for a new consenting model for offshore wind progression.	Clean - Green - Marine	The introduction of the Net Zero Emissions by 2050 target will influence the emphasis placed on climate change mitigation, and likely continue to place importance on development of offshore wind which has become significantly more commercially viable over the period since HOOW. The first RESS Auction qualification is expected to commence on 9 March 2020 with 'regular' auctions thereafter.	Up to and beyond 2030 the requirement for installed capacity from marine renewables is only likely to increase, driven by pressures to meet climate change / emissions objectives (Net Zero by 2050). Cost reductions in offshore wind are predicted to reduce further, making the technology more economically viable and hence likely to succeed in RESS Auctions, and the development of Floating Offshore Wind will open larger sea areas for development. Future development of marine renewables is ongoing, and is likely to become more viable both technically and economically.	Medium	Government of Ireland. 2019. Climate Action Plan 2019 to Tackle Climate Breakdown https://assets.gov.ie/10206/d042e174c1654c6ca14f39242fb07d22.pdf
Climate Action and Low Carbon Development Act 2015	Climate Change	National - Ireland	Sets out the governmental structure for the transition of Ireland to a low carbon economy.	Establishes a series of advisory councils and requires regular reporting of progress on transition. Requires the establishment of National Mitigation Plans (NMP) and National Adaption Frameworks (NAF).	Governance Clean - Green - Marine	The first NMP was published in July 2017 and first NAF published in January 2018.	Continued reporting under the Act will potentially provide political pressure for progress against the NMP and NAF. The change in government subsequent to the Act (in 2020) may influence how it is implemented.	Low	Government of Ireland. 2015. Climate Action and Low Carbon Development Act 2015. https://www.dccae.gov.ie/en-ie/climate-action/legislation/Documents/3/Climate%20Action%20and%20Low%20Carbon%20Development%20Act
National Mitigation Plan 2017	Climate Change Energy – Offshore Gas Storage Energy – Petroleum Energy – Offshore Renewable Energy Energy – Carbon	National - Ireland	Identifies mitigation measures required to achieve the decarbonisation of Electricity, Built Environment, Transport and Agriculture, Forest and Land Use. Sets out a series of actions required to achieve decarbonisation.	Limited impact on the marine environment, beyond identifying the potential for Marine Renewables to support de-carbonisation of the Energy Sector. In addition, identifies reduction in reliance on oil but continued use of Gas energy generation (potential for development of this sector in the marine economy) and implementation of Carbon Capture and Storage.	Governance Clean - Green - Marine	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW.	Expected continued reporting against actions to drive changes such as increased renewable energy, reduced reliance on oil (petroleum), and continued reliance on gas but with increased Carbon Capture.	Medium	Government of Ireland. 2017. National Mitigation Plan https://www.dccae.gov.ie/documents/National%20Mitigation%20Plan%202017.pdf
National Adaptation Framework 2018	All	National - Ireland	Sets out the guiding principles and framework for Ireland and Irish industry adapting to the now unavoidable changes in climate.	Requires sectoral adaptation plans to be developed for certain Sectors, within the Irish marine economy this includes seafood, biodiversity, built and archaeological heritage, electricity and gas networks, communication networks and Water Quality.	Governance Infrastructure	Increases are being observed in severe storm regularity and strength, impacting on coastal industry.	A more extreme climate will continue to require adaptation from sectors in order to mitigate impacts. Sectoral plans under the framework will be important in supporting future adaptation. This will likely involve investment in coastal infrastructure to increase resilience.	High	Government of Ireland. 2018. National Adaptation Framework https://www.dccae.gov.ie/documents/National%20Adaptation%20Framework.pdf
The Paris Agreement	Climate Change	International	Aims to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius.	The Paris Agreement requires all Parties to put forward their best efforts through nationally determined contributions (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. In the context of Ireland, the goal is a reduction in emissions of 40% by 2030 from 2005 levels.	Governance	Specific requirements are committed to by member states to reduce emissions. The likelihood of achieving such goals are currently considered to be unlikely on a global / EU scale.	Likely to be continued global pressure to reduce emissions, which may continue to drive the low carbon economy, of which the marine environment will likely be a part.	High	
Ireland's Transition to a Low Carbon Future 2015 - 2030	Climate Change Energy – Offshore Gas Storage Energy – Petroleum Energy – Offshore Renewable Energy Energy – Carbon Capture and Storage	National - Ireland	The plan charts the future development of the Irish energy sector, to achieve secure, clean and affordable energy.	The low carbon future is envisaged as involving societal change, increases in energy efficiency, transition to renewable sources for electricity generation, transfer to low emission fuels (gas) and away from peat / coal, use of bioenergy and continued adaption to incorporate new technology. The report sets a target of 80 to 95% reduction in GHG by 2050, which is now replaced by Net Zero. In the short term- there are few impacts for the marine economy, with oil and natural gas remaining significant elements of the energy mix, and marine resources offering enhanced energy security for Ireland. Further development of marine renewables is encouraged but sector specific strategy is referred to the OREDP (above)	Clean - Green - Marine Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure	This strategy was released post HOOW, but does not significantly differ in it's goals for the marine aspects of the energy sector.	However, further progress towards Net Zero by 2050 is likely to increase the importance placed on ORE, whilst reducing incentives to continue to exploit oil and gas reserves in the medium to long term.	High	Government of Ireland, 2015. Ireland's Transition to a Low Carbon Future 2015 - 2030. https://www.dccae.gov.ie/en-ie/energy/publications/Pages/White-Paper-on-Energy-Policy.aspx

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Policy Statement - Petroleum Exploration and Production Activities as part of Ireland's Transition to a Low Carbon Economy	Energy - Petroleum	National - Ireland	Sets out the vision for Ireland's Petroleum Exploration and Production Sector to 2050	The policy statement sets out the Irish Government's position that in order to support transition to lower carbon economy whilst retaining energy security further development of natural gas resources in the Irish offshore marine area is required. It states that future licensing will be for Natural Gas only, and therefore excludes future prospecting for oil reserves.	Governance Clean - Green - Marine Business Development, Marketing & Promotion Infrastructure	The removal from options for exploration of oil fields is a new exclusion since HOOW.	The reliance on oil and gas is expected to reduce within Ireland, however Natural Gas is likely to remain important to the energy security at least until 2050. Development of offshore gas fields will be dependant on the extent of discoveries.	Medium	DCCAE, 2019. Policy Statement - Petroleum Exploration and Production Activities as part of Ireland's Transition to a Low Carbon Economy https://www.dccae.gov.ie/en-ie/natural-resources/publications/Documents/62/Policy%20Statement%20Petroleum%20Exploration%20and%20Production%20Activities.pdf
Marine Research and Innovation Strategy for 2017-2021	All	National - Ireland	The strategy for research and innovation in Ireland based partially on priorities identified in HOOW.	Broken down into 15 themes across three topics - A thriving maritime economy, healthy marine ecosystems and engagement with the sea - the strategy identifies priorities for future research.	Research, Knowledge, Technology & Innovation	The research and innovation strategy builds on HOOW to support knowledge based decision making in achieving the objectives.	The increase in knowledge gained from this strategy, which will likely be superseded from 2022 will continue to support robust decision making in the marine environment.	Medium	Government of Ireland, 2017. Marine Research and Innovation Strategy for 2017-2021 https://www.ouroceanwealth.ie/sites/default/files/sites/default/files/Publications/2017/NationalMarineResearchInnovationStrategy2021.pdf
Maritime Spatial Planning Directive	All	European	Sets a framework for the development of spatial plans by European Member states.	The directive places a requirement on member states to develop marine spatial plans to encourage sustainable growth of marine economies. It requires the use of an ecosystem based approach to ensure that the collective pressure of all activities is kept within levels compatible with achieving GES under the MSFD (below). It encourages the use of adaptive management to allow for adaptation and refinement as knowledge of both the marine environment and the potential impact of activities increase. Member states are required to have designated competent authorities by 2016 and established maritime spatial plans by 2021.	Governance Research, Knowledge, Technology & Innovation Clean - Green - Marine Business Development, Marketing & Promotion Infrastructure International & North / South cooperation	The directive was adopted in 2014, and subsequently spatial planning has been developed in Ireland, with projects ongoing to determine the data to support such spatial planning activities. The National Marine Planning Framework was published in draft in 2019.	It is anticipated that the National Marine Planning Framework will be adopted in full in 2020, and will guide development in the Marine environment.	High	Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0089
Marine Strategy Framework Directive	All	European	Sets a framework and targets for monitoring the state of the environment in a consistent manner across Europe.	The directive Determines 11 descriptors, against which environmental status is to be measured. It places requirements on European states to develop measures in order to protect / restore the environment to a point considered 'Good Environmental Status' (GES). Activities likely to prevent achieving this status will be less likely to be developed. However, generally this influences at a policy, rather than at an individual project level.	Governance Research, Knowledge, Technology & Innovation Clean - Green - Marine Business Development, Marketing & Promotion Infrastructure International & North / South cooperation	The MSFD is reported every 6 years, with the first report in 2012. The 2018 reporting is currently under review.	Following publishing of the Irish report from 2018, new measures will be expected to be identified to progress towards GES. However, the nature of these is uncertain.	Low	Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008
European Green Deal	Biodiversity, MPAs, Climate Change	European	Presents an initial roadmap of the key policies and measures needed to achieve the European Green Deal. This includes measures to support the achievement of net zero by 2050, more central recognition of natural capital and ecosystem services in decision-making, additional MPAs with better site management, a new EU Biodiversity Strategy and promoting a sustainable blue economy	Agreed measures are likely to be taken forward through the EU Biodiversity Strategy 2030 and climate-related actions.	Clean - Green - Marine	There is now an even stronger emphasis on climate mitigation and reversing and recovering biodiversity decline	Actions stemming from the Green Deal in relation to climate change and biodiversity are likely to be a key focus in policy and decision-making. While policy interventions have shown some success in tacking greenhouse gas emissions, they have been less successful	**Medium** - climate related actions; **Low** - biodiversity related actions	European Commission, 2020. European Green Deal. https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf
Convention on Biological Diversity	Biodiversity, MPAs	International	In 1992 the CBD was established and Ireland ratified the Convention in 1996. The objectives of the CBD are "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources". Toward this end the CBD has identified in its Strategic Plan five Strategic Goals and 20 Aichi Biodiversity Targets. In addition, the CBD requires each Contracting Party to develop national strategies and action plans for the conservation and sustainable use of biodiversity.	The CBD is an important driver of Ireland's National Biodiversity Action Plan. The Aichi targets include protecting 10% of national seas within MPAs by 2020.	Clean - Green - Marine	Progress towards CBD targets is reported in Ireland's National Biodiversity Action Plan and through Article 17 Reporting under Birds & Habitats Directives	International biodiversity policies have been of limited effectiveness in halting biodiversity decline. Progress is likely to continue to be slow unless stronger, more effective biodiversity policies are brought into effect at European/national level	**Low** - international biodiversity policies have been of limited effectiveness in halting biodiversity decline	https://www.cbd.int/

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Post-2020 Global Biodiversity Framework	Biodiversity, MPAs	International	The CBD meeting in October 2020 will consider stronger targets for protecting marine biodiversity including a possible target of protecting 30% of seas within MPA's by	Depending on discussions the 2020 CBD conference could agree some more specific targets for protecting marine biodiversity.	Clean - Green - Marine	The zero draft of the framework includes some challenging indicative targets	The outcomes of the October 2020 CBD meeting could encourage designation and management of many more MPAs within Irish waters	**Low** - biodiversity policies have been of limited effectiveness in halting biodiversity decline	https://www.cbd.int/doc/c/cf51/57c8/0908ef199af5bfe2e236009e/wg2020-02-03-en.pdf
OSPAR Convention	Biodiversity, MPAs	International	The Convention includes 5 annexes: Annex I on Prevention and elimination of pollution from land-based sources Annex II Prevention and elimination of pollution by dumping or incineration Annex III PreventiThe Convention includes 5 annexes: Annex I on Prevention and elimination of pollution from land-based sources Annex II Prevention and elimination of pollution by dumping or incineration Annex III Prevention and elimination of pollution from off-shore sources Annex IV Assessment of the quality of the marine environment Annex V: on the protection and conservation of the ecosystems and biological diversity of the maritime areaon and elimination of pollution from off-shore sour	The convention has been important in tackling issues associated with land-based and offshore sources of pollution and dumping at sea. Work to establish MPA networks and protected threatened and declining habitats and species is ongoing	Clean - Green - Marine	Further consideration is being given under the National Biodiversity Action Plan to implement OSPAR recommendations for habitats and species	Improved protection for threatened and declining habitats and species outside of MPAs	**Low** - biodiversity policies have been of limited effectiveness in halting biodiversity decline	https://www.ospar.org/convention
Birds & Habitats Directives	Biodiversity MPAs	European	The Directives seek to establish a coherent network of sites to protect habitats and species of European importance - the Natura 2000 network	Well managed MPAs can make an important contribution to protecting marine biodiversity	Clean - Green - Marine	The NBAP is taking forward work to complete designation of SACs and SPAs, particularly coastal and offshore SPAs. There is also a focus on better management of existing MPAs	Additional MPAs will be designated particularly for offshore foraging areas for seabirds. Improved management arrangements will be implemented where required	**Medium** - the directives have been effective in ensuring appropriate areas are designated	https://www.npws.ie/protected-sites
Marine Strategy Framework Directive	Biodiversity MPAs, Marine Litter, INNS, Underwater Noise	European	MSFD aims to achieve or maintain Good Environmental Status (GES) across Europe by 2020. It forms the 'environmental pillar' of the EU's Integrated Maritime Policy. The MSFD requires the maintenance of biodiversity and implementation of the Ecosystem Approach for the management of human activities having an impact on the marine environment.	Implementation of the Directive contributes to maintaining and improving the status of the marine environment	Clean - Green - Marine	The Initial Assessment addressing Article 8 Assessment, Article 9 Determination of Good Environmental Status and Article 10 Environmental Targets for public consultation was published and reported to the European Commission in 2013. This was followed by the development of a monitoring programme in 2015 and a programme of measures in 2016. Consultation on revisions to the Initial Assessment under Articles 8, 9 and 10 of the Directive has recently ended.	Planning for improvements to the marine environment will continue on a 6 yearly cycle.	**Low** - the first MSFD cycle made little progress towards GES	https://www.housing.gov.ie/water/water-quality/marine-strategy/marine-strategy-framework-directive-msfd
Water Framework Directive	Biodiversity MPAs, Water Quality	European	WFD aims to achieve Good Status in surface and groundwaters across Europe by 2015	Implementation of the Directive contributes to maintaining and improving the status of transitional and coastal waters. There have been 2 cycles of river basin management planning to date (2009 - 15; 2015 - 21)	Clean - Green - Marine	The second cycle of river basin management planing (2015 - 21)	Planning for improvements to transitional and coastal waters to achieve Good Status will continue on a 6 yearly cycle with the next cycle 2021-27.	**Low** - the directive has had limitedi mpact in transitional and coastal waters	https://www.epa.ie/water/watmg/wfd/
EU Biodiversity Strategy 2020	Biodiversity MPAs	European	The strategy included six targets: The full implementation of the EU nature legislation; Better protection and restoration of ecosystems and the services they provide, and greater use of green infrastructure; More sustainable agriculture and forestry; Better management of EU fish stocks and more sustainable fisheries; Tighter controls on Invasive Alien Species; and A greater EU contribution to averting global biodiversity loss	The strategy seeks to influence policy and decision-making	Clean - Green- Marine	The strategy has informed preparation of the NBAP 2017-21	A further EU strategy is expected in March 2020 which may seek more specific measures to tackle biodiversity decline. This isl ikely to include a stronger focus on maintaining and enhancing natural capital and ecosystem services as well as stronger site-based protection.	**Low** - previous strategies have been of limited effectiveness in halting biodiversity decline	https://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm

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National Biodiversity Action Plan 2017 - 2021	Biodiversity MPAs	National - Ireland	Addresses the current state of the environment, and sets out Ireland's vision for the future management of biodiversity in Ireland	The NBAP defines a series of actions against 7 overarching objectives: 1. Mainstream biodiversity into decision-making across all sectors 2. Strengthen the knowledge base for conservation, management and sustainable use of biodiversity 3. Increase awareness and appreciation of biodiversity and ecosystems services 4. Conserve and restore biodiversity and ecosystem services in the wider countryside 5. Conserve and restore biodiversity and ecosystem services in the marine environment - Develop and implement a Marine Spatial Plan for Ireland; Implement measures to achieve good ecological and environmental status of marine and coastal habitats as required by the Habitats, Directive, Water Framework Directive and Marine Strategy Framework Directive (MSFD) and in line with the OSPAR Convention (Convention for the protection of the marine environment in the North-East Atlantic); Implement OSPAR recommendations on Habitats and Species Promote the incorporation of ecological engineering features in new and existing structures such as coastal defences. 6. Expand and improve management of protected areas and	Clean - Green- Marine; International & North / South Cooperation	New piece of policy which incoporates some of the elements of HOOW. Increased understanding of ecosystem services provided by biodiversity has increased the importance of protecting it which is recognised through such policies.	The Action Plan describes proposed work going forwards to 2021. A new plan is expected to be developed for the period 2022 to 2026.	**Low** - biodiversity policies have been of limited effectiveness in halting biodiversity decline	Government of Ireland. 2017. National Biodiversity Action Plan https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf
Biodiversity Sector Climate Change Sectoral Adaptation Plan	Biodiversity, MPAs	National - Ireland	The Plan considers terrestrial, freshwater and marine biodiversity and ecosystem services. The goal is to protect biodiversity from the impacts of climate change and to conserve and manage ecosystems so that they deliver services that increase the adaptive capacity of people and biodiversity. This is achieved by identifying adaptation options that will help to protect biodiversity and ecosystem services from the impacts of changing climate.	The Plan seeks to protect biodiversity from the impacts of climate change and to conserve and manage ecosystems so that they deliver services that increase the adaptive capacity of people and biodiversity while also contributing to climate change mitigation.	Clean - Green- Marine	The Plan was published in September 2019	The Plan will better ensure that biodiversity considerations are taken into account in climate change adaptation planning.	**Low** - it is unclear whether the Plan will be effective in supporting biodiversity	https://www.chg.gov.ie/app/uploads/2019/10/doc-7-climate-change-sectoral-adaptation-plan-for-biodiversity.pdf
Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	aquaculture	National - Ireland	Makes reference to reduced shell growth as a result of ocean acidification in commercially important species such as Oysters and Mussels.	It could lead to economic losses, and decreased seafood production. Unknown consequences on top predators (fish, birds and mammals).	Clean - Green - Marine	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW. Since HOOW, the number of coastal bodies classifying as 'high' or 'good' quality has increased, showing improvements in water quality of coastal water bodies (source: EPA).	Increased acidification can significantly reduced the shell size of species such as clams, oysters and mussels and make their production more difficult and will incertaing impacts on marine food chain. Continued reporting on Descriptor 3 under MSFD can allow for corrective measures. More details will be available from MI funded Post-Doctoral research titles **Impacts of Climate Change in Commercial Fish Stocks in Irish Waters** (commenced in 2018)	medium	https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf
Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	fisheries	National - Ireland	Makes reference to risk to fishing fleet, harbour infrastructure due to increased intensity and frequency of storms,	It could result in damage to vessels and infrastructure including gear loss in inshore and coastal sector of fisheries and aquaculture. The plan also notes the need to tie-up fishing fleet for lengthy periods leading to reduced annual effective fishing efforts. Finally, health and safety issues are also noted.	clean - Green - Marine; maritime safety and surveillance	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW. Number of storms and specifically of 'major weather events' recorded appeats to be increased in intensity and frequency since 2013, or a year after the publication of HOOW (source Met Eireann).	A more extreme climate will continue to require adaptation from the aquaculture and fisheries sectors. The sectoral plan will be important to support future adaptation. This will likely involve investment in coastal infrastructure to increase resilience and consideration for compensation, possibly through insurance.	high - evidence points towards increased frequency of major wather events.	https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf

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Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	fisheries	National - Ireland	Makes reference to possible changes to traditional fisheries as the distribution of certain fish stocks moves northward.	As a result, this may impact time spent at sea for the fishing fleet with likely increased fuel consumption. Markets for new fisheries emerging will have to be secured	Clean - Green - Marine	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW.	Data from BIM shows that over a typical 5-6 day trip, 10% is spent in transit to or from fishing ground or trying to avoid bad weather. If distribution of fish changes over time, it is therefore expected that time spent transiting would increase resulting in higher fuel consumption	low	https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf
Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	aquaculture and fisheries	National - Ireland	Notes an increased threat of non-native invasive species.	It could result in loss of native species and biodiversity	Clean - Green - Marine	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW.	Article 17 reporting under the Habitats Directive dated 2019 shows that a number of marine and coastal habitats were poorly scored during the assessment, including estuaries ('Inadequate), tidal mudflats and sandflats ('inadequate and deteriorating') which particularly impacts on marine aquaculture (Pacific Oyster), lagoons ('bad' with a chnaged in status from stable to deteriorating), large shallow inlets and bays ('bad and deteriorating'), reefs ('inadequate and stable'). Continued reporting under article 17 can potentially help leverage either from European level or national level to be more proactive in protecting habitats.	medium	https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf
Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	aquaculture and fisheries	National - Ireland	Considers possible changes in the timing of fish spawning and subsequent changes in the timing of harvesting.	This could cause economic losses and a knock-on effects on the survival and development of fish populations, In addition suitable larva food availability could be reduced as plankton populations move north.	Clean - Green - Marine	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW.	Number of steps have been identified towards resilience including carrying out studies on the distribution of commercial fish stocks in relation to their mangement aeas; continued studies focused on the timing of the start of spawning and continued monitoring of the spatial distributions of fish stocks.		https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf
Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	aquaculture	National - Ireland	The plan notes possible restrictions on shellfish harvesting opportunities.	Potential economic losses and need to provide for additional resourcing to ensure that the monitoring of seafood safety is not compromised.	Clean - Green - Marine	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW.	Smaller period of times when shellfish are non toxic or longer high risk periods for fish kills due to blooms than is currently experienced.		https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf
Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	aquaculture	National - Ireland	The plan notes possible issues relating to aquaculture site suitability, access and general site management.	It could result in loss of stock and infrastructure in aquaculture facilities, particularly in clam parks and oyster trestles due to storms and storm surges.	Infrastructure	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW.			https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf

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Agriculture, Forest and Seafood - Climate Change Adaptation Plan prepared under the National Adaptation Framework	aquaculture	National - Ireland	The plan considers that the existing seafood infrastructure may become obselete or require considerable upgrading.	This would increase maintenance costs over time if the infrastructure is not suitably upgraded to take account of impacts such as extreme storm events, siltation and sea level rise.	Infrastructure	Based on Climate Action and Low Carbon Development Act 2015 - Entirely new legislation since HOOW.			https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/1AgricultureForestandSeafoodClimateChangeSectoralAdaptationPlanEnglishVersion311019.pdf and https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/climatechangesectoraladaptationplan/4SeafoodSectorBackgroundDocument311019.pdf
Communication from the Commisssion to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Developing a Maritime Strategy for the Atlantic Ocean Area	MPAs, Energy - Offshore Renewable Energy; Social benefits; Aquaculture; Defence and security; Fisheries; Marine aggregates and mining; Ports, Harbours and Shipping; Safety at Sea; Tourism.	International	Management of human activites in the Atlantic must deliver a healthy and productive ecosystem. Challenges and opportunities are grouped in 5 themes: a) implementing the ecosystem approach, b) reducing Europe's carbon footprint, c) sustainable exploitation of the Atlantic seafloor's natural resources, d) responding to threats and emegencies and e) socially inclusive growth	Wide ranging impacts are noted under each of the focus areas: a) Atlantic Member States to take up the regionalisation opportunities that are created in the CFP reform. Use of spatial planning as a tool for implementing the ecosystem approach, to strengthen coherence, connectivity and resilience of MPAs. EU to examine a structured approach towards mechanisms to implement the EBA and examine options to support ocean observing system. b) By 2020, the strategy forecast around 20% of the European offshore wind installed capacity could be located in the Atlantic basin. Irish Sea to be included in a Northern Seas offshore grid to be considered as 'energy infrastructure priority'. Planned shift from road transport to shipping. c) Define arrangements between reasearch organisations around the Atlantic. Provide a unique acess point for marine data harmonised over sea basins. d) Maximise data sharing through VMS and AIS to fight cross-border crime. e) Encourage development of clusters between research and industry. Incorporate opportunities for the development of the cruise industry.	Governance; Maritime Safety, Security and Surveillance, Clean - Green - Marine; Business Development, Marketing and Promotion; Research, Knowledge, Technology and Innovation; Capacity, Education, Training and Awareness; Infrastructure; International and North/ South Cooperation.	HOOW is in itself a direct product of the Atlantic Strategy. Many developments described by the Strategy effectively took place with good results. These include but not limited to: H2020, reform of the CFP, adoption and subsequent transposition of MSFD and of MSPD. Progress on the preparation is well underway and will be adopted at the end of 2020.	Adoption of NMPF and upcoming legislation will allow Ireland to progress toward large scale deployment of offshore wind and for other industries to avail of spatial planning tools such as aquaculture. Progress on legislation will allow for identification of MPAs.	High - except for offshore wind and MPAs. Ireland make no contribution to installation of European offshore wind to be achieved by 2020. Ireland's contribution is still a few years away. In addition, there is legislation to legally underpin marine protected areas to fulfill international commitments. Instead a number of marine of candidate SACs have been identified.	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0782&from=EN
Communication from the Commisssion to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Action Plan for a Maritime Strategy in the Atlantic Area - Deliveiring smart, sustainabke and inclusive growth 2013	MPAs, Energy - Offshore Renewable Energy; Social benefits; Aquaculture; Defence and security; Fisheries; Marine aggregates and mining; Ports, Harbours and Shipping; Safety at Sea; Tourism.	International	The plan was devised to meet the challenges identified in the Atlantic Strategy and deliver smart, sustainable and socially inclusive growth and jobs.To that effect, the action plan sets out priorities as follows: 1. promote entrepreneurship and innovation; 2. protect, secure and develop the potential of the Atlantic marine and coastal environment; 3) Improve accessibility and connectivity and 4) Create a socially inclusive and sustainable model of regional development.	The plan was accompanied by funding channels to ensure its implementation and the achievement of the Atlantic Strategy. It also identified opportunities for collaboration between Member States and support mechanisms.	Governance; Maritime Safety, Security and Surveillance, Clean - Green - Marine; Business Development, Marketing and Promotion; Research, Knowledge, Technology and Innovation; Capacity, Education, Training and Awareness; Infrastructure; International and North/ South Cooperation.	HOOW is in itself a direct product of the Atlantic Strategy. Many developments described by the Strategy effectively took place with good results. These include but not limited to: H2020, reform of the CFP, adoption and subsequent transposition of MSFD and of MSPD. Progress on the preparation is well underway and will be adopted at the end of 2020.	Adoption of NMPF and upcoming legislation will allow Ireland to progress toward large scale deployment of offshore wind and for other industries to avail of spatial planning tools such as aquaculture. Progress on legislation will allow for identification of MPAs.	High - except for offshore wind and MPAs. Ireland makes no contribution to installation of European offshore wind to be achieved by 2020. Ireland's contribution is still a few years away. In addition, there is legislation to legally underpin marine protected areas to fulfill international commitments. Instead a number of marine of candidate SACs have been identified.	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0279&from=EN
Marine Planning Policy Statement	All	National - Ireland	Sets out the existing marine planning system, a vision for the future development, overarching policies and high-level priorities. It considers three goals which are aligned with policies / goals previously adopted by other government departments or agencies in their own plan/policy, including 'a thriving economy'; 'healthy ecosystems' and 'engagement with the sea'.	It sets the path for the policy and legislative marine framework in Ireland, paralleling the terrestrial system. The statement clearly spells out the steps necessary to achieve a modern, integrated marine planning system, encompassing forward planning (the NMPF, the Climate Action Plan), modern fit-for-purpose legislation (MPDM Bill and Maritime Jurisdiction Bill) and environmental safeguards and obligations (MSFD, OSPAR, UN SDG)	Governance	Significant progress made on the development of an integrated marine planning system in Ireland. The draft NMPF was published toward the end of 2019 and it is expected that the NMPF would be adopted toward the end of 2020, ahead of the 2021 deadline set out by the MSP Directive.	It is expected that the Marine Planning Policy Statement will drive new legislation which will govern planning and development in the Irish marine environment, in addition to further spatial planning within the Irish Marine Area going forwards, which in turn will support sector specific development.	High	https://www.housing.gov.ie/sites/default/files/publications/files/marine_planning_policy_statement.pdf
National Development 2018 -2027	All	National - Ireland	The plan published in parallel to the NPF 2040 sets out the investment which will underpin the implementation of of the NPF over a period of ten years. It seeks to ensure that public spending is alignned with the ten NSOs and indicates strategic investment priorities.	Proposed investment in island marine infrastructure to maintain and support the growth and development of the maritime economy in coastal communities and on the islands with safe access by sea being a particular focus. Enable sustainable development of agri-food centre in accordance with Food Wide 2025. Funding provided for new research vessel for MI. Provision of a new wastewater treatment plant on the East coast to serve growing	Infrastructure; Capacity, Education Training & Awareness; Clean - Green - Marine	Publication of NDP on foot of the NPF adoption by the Government.	Improved pier infrastructure on Inis Oirr and Inis Meain in the Aran Islands and at Machaire Rabhartaigh. Provision of new passenger ferry vessel for Oilean Thorai. Funding allocated to the delivery of new IW wastewater treatment plant with outfall near Ireland Eye.	High	https://www.gov.ie/pdf/?file=https://assets.gov.ie/831/130718120306-5569359-NDP%20strategy%2020182027_WEB.pdf#page=1

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National Planning Framework 2040	All	National - Ireland ; International & North/South Cooperation	The NPF 2040 sets out the strategy for the spatial development of Ireland to 2040. It is founded on the achievement of 10 National Strategic Objectives supported by National Planning Objectives. Of particular interest are 'Strengthened Rural Economies and Communities' ; 'Strong Economy supported by Enterprise, Innovations and Skills', 'Sustainable Management of Water, Waste and other Environmental Resources', 'Transition to a Low Carbon and Climate Resilient Society' 'Hihg-Qaulity International Connectivity' 'Enhanced Amenities and Heritage'	Much of the impact of the NPF to date can be attrbiuted to either individual projects funded under the NDP or through measurement of progress against the NSO. To date, much development occur under the NSO 'Compact Growth' which is unrelated to the subject study. €13 m invested in the first year of monitoring to projects relating to fisheries, aquaculture and seafood processing. 2018 Fisheries Harbours Programme include projects at Castletown Bere, Dunmore East, Dingle and Killybegs. Several coastal defence schemes are mentioned were noted as due for completion or commencement in 2019. Possibly its most significant impact is a politcal one with governmental commitment to align terrestrial and marine planning systems	Governance; Infrastructure	Funding allocated to nine projects under New Horizons on the Wild Atlantic Way. References made to the National Bioeconomy Strategy and the Climate Action Plan.	Stronger commitment to the martime economy and recognition of the need to align LUP and MSP to better address common challenges including climate change and adaptation and energy production/distribution. Land based plans to include relevant MSP issues	Medium - dependent on planning compliance throughout the planning hierarchy and sustained funding commitments	http://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf
European Communities (Birds and Natural Habitats) Regulations 2011	INNS	National - Ireland European	Details the European regulations for implementation in Ireland of Council Directive 92/43/EEC for habitats and the European Parliament Directive 2009/147/EC the protection flora and fauna. Addresses both the prohibition on introduction and dispersal of certain terrestrial and marine species and the general provisions for the protection of damage to European Sites.	Land owners or managers must prevent the dispersal, establishment or spread of plants or animals which come under the list of prohibited species. INNS can also be removed and destroyed in accordance with good practice. Licenses are required for the breeding, release or selling of these species. A Non-Native Species Risk Assessment was published for Ireland commissioned by the National Parks and Wildlife Service (NPWS). Risk assessments were undertaken by Inland Fisheries Ireland and National Biodiversity Data Centre.	Clean - Green - Marine	Non-Native Species Risk Assessment has been undertaken highlighting species of greatest concern in Ireland	With an increase in the number of introductions, further restrictions will likely be placed on a larger number of INNS. The list of invasive non-indigenous species in the EU Invasive Alien Species Regulations (1143/2014) will likely be reviewed. Efforts to identify species which have not yet been introduced but are likely to be could be considered.	Low	European Communities (Birds and Natural Habitats) Regulations 2011 report http://www.irishstatutebook.ie/eli/2011/si/477/made/en/print
International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) 2017	INNS	International	The Ballast Water Management Convention was set up in 2004 and implemented in 2017 with the aim to prevent the spread of INNS. Addresses the movement of species from one region to another via ship ballast water and sediments.	All ships involved in international traffic are required to manage ballast water and sediments to a particular standard, follow procedures for the recording of ballast water exchange and potentially install on-board ballast treatment systems. Ships are expected to be surveyed and certified for ballast water management.	Governance Clean - Green - Marine	Under the convention, all vessels part of international traffic must be certified for ballast water management.	Regular reviews of the Ballast Water Performance Standard by the organisations are required by the International Maritime Organisation to assess the environmental impact, effectiveness and practicability of the procedures being undertaken. Annual, intermediate and renewal surveys of vessels will be undertaken for certification requirements which will likely be adapted as knowledge of INNS changes.	Medium - there will be continuation of surveys on vessels to assess the effectiveness of the standards	International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) 2017 http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx
EU Regulation (1143/2014) on invasive alien (non-native) species	INNS	European	The aim of the regulation was to prevent or manage the introduction or spread of invasive non-native species across the European Union. The regulation listed 37 species, meeting criteria concerning their invasiveness and ability to establish in several locations, which will be regulated with the EU Invasive Alien Species Regulation (1143/2014).	Surveillance and rapid response mechanisms have been put in place and Member States have developed management action plans for widely spread species. Further restrictions on commercial keeping, trade, transporting and breeding of INNS. The only marine species included is the Chinese mitten crab (Eriocheir sinensis). 12 new species have been added to the Invasive Alien Species of Union Concern list in 2017 and one in 2019. The Invasive Alien Species (Enforcement and Permitting) Order came into force in 2016 and in Northern Ireland, England and Wales in December 2019.	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation	37 key species were identified which require regulating across Europe. The Invasive Alien Species (Enforcement and Permitting) Order came into force in 2016 and in Northern Ireland, England and Wales in December 2019.	With an increase in the number of introductions, further restrictions will likely be placed on a larger number of INNS. The list of invasive non-indigenous species in the EU Invasive Alien Species Regulations (1143/2014) will likely be reviewed. Efforts to identify species which have not yet been introduced but are likely to be could be considered.	Medium	EU Regulation (1143/2014) on invasive alien (non-native) species https://invasivespeciesireland.com/legislation/european-union/ The Invasive Alien Species (Enforcement and Permitting) Order (Northern Ireland) 2019 http://www.legislation.gov.uk/nisr/2019/159/contents/made
Marine Strategy Framework Directive Commission Decision 2017/848 - D2 Non-indigenous species	INNS	European	The report outlines the directive "non-indigenous species are not currently at levels which adversely alter ecosystems". Criteria and methodological standards were set as guidelines to Member States. Criteria and methodological standards for the monitoring and assessment of pressures and impacts on good environmental status of marine waters are included.	Member States should establish threshold values for the number of new introductions through regional or sub regional operations. Invasive species abundance and distributions should be monitored and threshold values for habitats or species groups at risk or are adversely affected should be established to contribute to the monitoring and assessment of INNS.	Green - Clean - Marine International & North / South Cooperation	Guidance for Member States on assessing the introductions of INNS	The numbers of newly introduced species are assessed every 6 years since 2008. It is likely that future assessments will highlight new species which are becoming established and lead to a review of the criteria and strategies undertaken by Member States.	Medium	Marine Strategy Framework Directive Commission Decision 2017/848 https://mcc.jrc.ec.europa.eu/main/dev.py?N=20&O=119&titre_page=&titre_chap=D2%20Non-indigenous%20species
Prohibition of Micro-Plastics Bill 2016	Marine Litter	National - Ireland	A bill for the prohibition of cosmetic products containing microplastics	The selling, advertising or placing on the market of cosmetic products containing microplastics was banned and plastics were either removed from these products or plastic-free alternatives were used. There has also been an increase into research on marine microplastics and the effects on marine life.	Governance Green - Clean - Marine Business Development, Marketing & Promotion	Awareness for plastic pollution and its impacts on marine life is increasing across the general public, scientific community and governments with several individual initiatives to reduce plastic waste on an individual level.	Microbeads use within cosmetics will remain prohibited. Further consumer products with microplastics may have restrictions imposed.	Medium - as research of microplastics increases, regulations on plastic are likely to change	Prohibition of Micro-Plastics Bill 2016 https://data.oireachtas.ie/ie/oireachtas/bill/2016/102/eng/initiated/b10216d.pdf
Microbeads (Prohibition) Bill 2019	Marine Litter	National - Ireland	A bill for the prohibition of cosmetic or cleaning products containing microbeads on the market. The disposal of substances containing microbeads in inland, maritime or high seas areas, or in domestic waste water treatments or down drains is	The manufacturing or placing on the market of cosmetic products containing microplastics was banned and plastics from these products or plastic-free alternatives were used. The banning of disposal of microbeads should lead to less microplastics entering the marine environment. There has also been an increase into research on marine microplastics and the effects on marine life.	Governance Green - Clean - Marine Business Development, Marketing & Promotion	Awareness for plastic pollution and its impacts on marine life is increasing across the general public, scientific community and governments with several individual initiatives to reduce plastic waste on an individual level.	Microbeads use within cosmetics and cleaning products will remain prohibited. Further consumer products with microbeads may have restrictions imposed.	Medium - as research of microplastics increases, regulations on plastic are likely to change	Microbeads (Prohibition) Bill 2019 https://data.oireachtas.ie/ie/oireachtas/bill/2019/41/eng/ver_a/b41a19d.pdf

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National Waste Prevention Programme (NWPP) "Preventing waste, driving the circular economy" Annual Report for 2018	Marine Litter	National - Ireland	Reflecting on the six priority areas (food waste, construction and demolition, plastics, agriculture, resources and raw materials, local waste prevention) for the NWPP and supporting activities	The review highlighted that plastics are a new priority for the NWPP as a reflecting the EU Strategy for Plastics in a Circular Economy. NWPP provided leadership to this area by promoting alternatives to single-use plastics, improving recycling infrastructure and prompt behavioural change. Ireland met the EU Packaging and Waste Packaging Directive targets for recycling of various waste packaging (plastic, paper, wood, metal, glass etc.). NWPP funded the SMILE Resources Exchange project which collaborated on the Circular ocean project to recover and reuse waste fishing gear.	Clean - Green - Marine Infrastructure Capacity, Education, Training & Awareness	Awareness for plastic pollution and its impacts on marine life is increasing across the general public, scientific community and governments. In light of this, local, regional and European wide projects have been set up to combat marine litter on a European scale by working closely with different Governments, sectors and authorities.	Meetings of the National Waste Prevention Committee meet twice a year to review ongoing activities and provide guidance on future priorities. The activities in place aim to reduce food waste and reduce number of single use plastic bottles in Ireland.	Low	National Waste Prevention Programme (NWPP) "Preventing waste, driving the circular economy" Annual Report for 2018 https://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf
Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment	Marine Litter	European	Addresses new legislations for the ban and regulations of certain plastic products in Europe to reduce marine plastic litter, including single-use plastics and fishing gear. The regulations were put in place in 2019 and must be implemented by 2021.	EU has placed restrictions prohibiting certain items being placed on the market which account for 70% of plastic waste in the oceans and on beaches. These include plastic cotton buds, cutlery, straws food/drink containers made of expanded polystyrene. The Directive also coversregulations on the marking requirements, product requirements, consumption reduction and raising awareness of several single-use plastic products. All European Member States will have banned specific single use plastic items by 2021. The Directive also details that from 2025, plastic "PET bottles" needs to contain at least 25% recycled plastic, and increase this to 30% by 2030. Similarly, 77% of single-use plastics on the market should be recyclable, increasing to 90% in 2029. The European Strategy for Plastic aims to ensure that by 2030 all plastic packaging on the market is re-usable or easily recycled. Member States must also report to the Commission data on fishing gear on the market containing plastic and on waste fishing gear collected every year and set a national minimum annual collection rate of waste fishing gear. Producers of single-use plastics and fishing gear containing plastic should cover the costs of the awareness raising	Governance Clean - Green - Marine Business Development, Marketing & Promotion Infrastructure	Awareness for plastic pollution is increasing across the general public and governments with several individual initiatives to reduce plastic waste on an individual level. There has also been an increase into research on marine plastics and the effects on marine life.	Member States will move towards implementing targets in the directive, such as the banning or regulation of specific products over the next decade (particularly by 2021). Potential for further plastic products to be regulated.	Medium	Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0904&from=EN
OSPAR Regional Action Plan for Marine Litter	Marine Litter	International - Northeast Atlantic	The Regional Action Plan (RAP) covers OSPAR's marine litter policies, including 23 nations and 32 actions to address both land and sea base sources of marine litter, including education and outreach and removal actions. The plan is in place between 2014-2021 with a timetable to achieve these actions. The actions include, for example, fisheries related actions, ship and port related waste, land based water management, consideration of product and packaging use and education, outreach and behavioural change.	Progress on each of the 32 actions is reviewed each year at the meeting of Intersessional Correspondence Group on Marine Litter. In 2019, some actions included an analysis of the monitoring guidance for litter and developing new approaches to monitoring. Recent Directives such as the Single Use Plastics Directive need to be captured with in Member State action development. is needed After 2021, OSPAR will review and reflect on the Regional Action Plan. Several projects (e.g. the CleanAtlantic project) have been set up to combat marine litter on a European scale by working closely with different Governments, sectors and authorities.	Clean - Green - Marine Capacity, Education, Training & Awareness	Awareness for plastic pollution is increasing across the general public and governments. In light of this, local, regional and European wide projects have been set up to combat marine litter on a European scale by working closely with different Governments, sectors and authorities.	Member States will move towards implementing OSPAR's marine litter policies with many of them likely to be extended past the 2021 review.	High	OSPAR Regional Action Plan https://www.ospar.org/documents?v=34422 Intersessional Correspondence Group on Marine Litter https://www.ospar.org/meetings/archive/intersessional-correspondence-group-on-marine-litter-778 Clean Atlantic http://www.cleanatlantic.eu/ OceanWise
Waste Management (Environmental Levy) (Plastic Bag) Order 2007 - S.I. No. 62/2007	Marine Litter	National - Ireland	Order and amendment to reduce the use of plastic carrier bags in Ireland	In 2001, Ireland introduced a levy on plastic carrier bags which would charge 15 cents per plastic bag supplied to a customer from a business or supermarket. This was increased to 19 cents in 2002 and 22 cents in 2007. The success of this, along with public pressure, likely to lead to the charges on plastic bags in the UK in 2015. This charge may have also led to the decrease in plastic bag pollution from volunteer beach clean data (Coastwatch Marine Litter Survey Results and Action to Tackle Marine litter for Ireland May 2019)	Governance Clean - Green - Marine	Awareness for plastic pollution is increasing across the general public and governments. Further bans on single-use plastic items have been introduced by the EU for implementation by 2021.	All European Member States will have banned specific single use plastic items by 2021. With growing pressure, further bans or charges may be imposed and an increase in plastic alternatives created.	Medium	Waste Management (Environmental Levy) (Plastic Bag) Regulations, 2001 http://www.irishstatutebook.ie/eli/2001/si/605/made/en/print Waste Management (Environmental Levy) (Plastic Bag) Order, 2007 http://www.irishstatutebook.ie/eli/2007/si/62/made/en/print

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Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters	Underwater Noise	National - Ireland	Addresses the risk characteristics and management of sound on marine mammals and provides best-practice and knowledge-led project / plan specific guidance	The guidance details potential or direct effects on marine mammals (physical harm, changes or interference with natural behaviour) of man-made sound from licensable projects and plans (i.e. dredging, drilling, pile driving, geophysical acoustic surveys, blasting). Measures for managing underwater noise include: "*• avoid – marine mammal observers or passive acoustic monitoring that can stop* *noise generation while sensitive species are present. Not generating impulsive noise* *generating during sensitive periods (such as breeding, rearing, hibernation, migration),* *• minimise – eliminating or controlling noise at source, for example using alternative* *quieter approaches like drilling foundations instead of pilling, and* *• mitigate – soft start piling allowing sensitive species to avoid the area or attenuation* *measures, for example bubble curtains or pile collars* ."	Clean - Green - Marine Research, Knowledge, Technology & Innovation Infrastructure	The issue of anthropogenic sound has received increasing attention from scientific and public bodies	The requirement for managing underwater noise will likely increase with the continued interest in offshore infrastructure and further research into the impact of noise on marine fauna. There may also be technological advances in mitigating these impacts.	High	Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters Report https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf
MSFD Advice Manual and Background document on Good environmental status - Descriptor 11: Underwater noise 2012	Underwater Noise	International - Northeast Atlantic	The report discusses good environmental status of marine waters with regards to underwater noise. Descriptor 11: " Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment". This addresses both the distribution in time and place of low, loud, mid-frequency impulsive sounds and continuous low frequency sound. The report lists different countries and the steps which are being taken to collect more data on underwater noise in the NE Atlantic and investigate noise levels which should be set for different activities/industries.	Evaluation of risk depends on 3 elements - the source of the The report describes that Ireland have been gathering data from shipping and oil and gas industries, whilst developing specialised acoustic modelling tools. Data has been collected measuring and assessing the pressures of noise which has led to the OSPAR Monitoring Strategy for Ambient Underwater Noise (2015) and CEMP Guidelines for Monitoring and Assessment of loud, low and mid-frequency impulsive sound sources in the OSPAR Maritime Region (2017). These will likely aid in collecting data on underwater noise. Maps looking at the distribution of impulsive sounds in the North Sea in 2015 have also been produced showing predominant sources are seismic survey activity, pile driving and naval sonar.	Clean - Green - Marine Research, Knowledge, Technology & Innovation International & North / South Cooperation	Data have started to be collected from EU Member States regarding underwater activities and noise increasing knowledge and understanding of this disturbance in the marine environment.	Future reporting of underwater noise should improve assessments of the associated pressures. Further work is planned to develop more indicators which address the impacts of noise on particular species or taxonomic groups.	Medium	MSFD Advice Manual and Background document on Good environmental status - Descriptor 11: Underwater noise 2012 https://www.ospar.org/documents?d=7292 OSPAR (2015) https://www.ospar.org/work-areas/eiha/noise Distribution of Reported Impulsive Sounds (2017) https://oap-cloudfront.ospar.org/media/filer_public/55/6d/556daf62-ccbe-48e1-b352-1ed918f4a7ee/impulsive_noise.pdf
The Water Framework Directive (2000/60/EC)	Water Quality	European	The Directive recognises the need for action to protect inland surface waters, transitional waters, coastal waters and groundwater. The objectives are to achieve good ecological status by 2015 or at the latest, 2027. In the marine environment, the aim is to eliminate the discharge, emissions or loss of priority hazardous substances and achieve concentrations close to naturally occurring background values. Coastal regions, including estuaries, closed seas or gulfs, are strongly influenced by input from inland waters, thus the protection of river basins will likely provide economic benefit towards the protection of fish. Monitoring of these location should be undertaken regularly.	Member States have implemented a River Basin Management Plan and Flood Risk Management Plan, required by the Water Framework Directive.	Governance Clean - Green - Marine	Member States have implemented a River Basin Management Plan and Flood Risk Management Plan to protect waters until 2021	Movement towards good status will continue in line with this directive.	Medium	The Water Framework Directive (2000/60/EC) https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF River Basin Management Plan 2018-2021 https://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021

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European Union Shellfish Waters Directive (2006/113/EC)	Water Quality	European	The Directive aims to improve the quality of waters to safeguard shellfish populations from harmful consequences resulting from discharge of pollutants into the sea. This requires all Member States to designate waters that need protection to support shellfish populations, set chemical and microbial requirements for these areas and establish pollution reduction programmes.	Ireland designated six areas in need of protection have been characterised, mapped and implemented Pollution Reduction Programmes. As of 2013, the Shellfish Waters Directive was repealed by the Water Framework Directive (which incorporated shellfish water protected areas) but all Member states were required to maintain the same level of protection. As a result, in 2019 it was recognised that half the Member States have changed their standards or have no standards at all.	Clean - Green - Marine Research, Knowledge, Technology & Innovation	Shellfish Waters Directive was repealed and incorporated into the Water Framework Directive	There will likely be continued monitoring of shellfish waters in line with the Water Framework Directive but further regulations may be required to ensure a high level of protection. Shellfish Action Plans from the original Directive will next be reviewed on a priority basis starting in 2021 which is in line with the third River Basin Cycle under the Water Framework Directive.	Medium	European Union Shellfish Waters Directive 2006 https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006L0113:EN:HTML Fitness Check of the Water Framework Directive, Groundwater Directive, Environmental Quality Standards Directive and Floods Directive https://ec.europa.eu/environment/water/fitness_check_of_the_eu_water_legislation/documents/Water%20Fitness%20Check%20-%20SWD(2019)439%20-
Urban Waste Water Treatment Directive (91/271/ECC)	Water Quality	European	Addresses controls on urban waste water to prevent the environment (surface waters, including coastal) being adversely affected by the disposal of insufficiently. This required: "-The collection and treatment of waste water and discharges -A requirement for pre-authorisation of all discharges of urban wastewater, of discharges from the food-processing industry and of industrial discharges into urban wastewater collection systems; -Monitoring of the performance of treatment plants and receiving waters -Controls of sewage sludge disposal and re-use, and treated waste water re-use whenever it is appropriate".	The 9th Commission Report on the implementation of the Urban Waste Water Treatment Directive (2017) stated that significant progress had been made, with a gradual but notable change in water quality around Europe. However, a number of challenges remain, with the waste water sector requiring significant investment to ensure sufficient collection and treatment of urban waste water.	Governance Clean - Green - Marine Infrastructure Research, Knowledge, Technology & Innovation	Regular reports highlight significant progress in waste water treatment around Europe but further investment is still required.	There is likely to be continued monitoring of urban waste water sources with Member States moving towards targets set by the Directive.	Low	Council Directive concerning urban waste water treatment (91/271/EEC) https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:31991L0271&from=EN The 9th Commission Report on the implementation of the Urban Waste Water Treatment Directive (2017) https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0749&from=EN
Bathing Waters Directive 2006/7/EC	Water Quality	European	Addresses improving the quality of bathing waters for the safeguarding of public health and marine coastal and inland environments. This directive aims to monitor and assess the quality of bathing waters through the analysis of Intestinal enterococci and Escherichia coli. Member States must monitor bathing waters every year between May and September with the waters classified by their level of quality (poor, sufficient, good, excellent). Member States had to ensure that by the end of 2015, all bathing waters were at least "sufficient". Waters of "poor" quality must prohibit or advise against bathing and take measures to prevent, reduce or eliminate the cause of pollution.	All Member States monitor water quality and review the potential sites which require monitoring every year. Bathing water quality in the EU is high and the number of bathing waters receiving "poor" quality status has decreased since 2014 across the EU. Detailed information of the bathing water quality around the EU is publicly available.	Clean - Green - Marine Research, Knowledge, Technology & Innovation	EU Member States routinely monitor bathing waters with a high percentage of bathing waters at an "excellent" quality.	Bathing water quality will remain high in the EU with actions to improve water quality in those classified as "poor" implemented.	Low	Bathing Waters Directive 2006/7/EC https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32006L0007&from=EN EEA Report No 3/2019 https://www.eea.europa.eu/publications/european-bathing-water-quality-in-2018
Directive 2016/802 relating to a reduction in the sulphur content of certain liquid fuels	Air Quality	European	Addresses the emissions from land-based application and shipping, with the combustion of marine fuels high in sulphur, which contributes to air pollution contributes to acid deposition which harms human health and the environment	This Directive outlines the maximum permitted sulphur content of heavy fuel oil, gas oil, marine gas oil and marine diesel oil used in the Union. By January 2020 the sulphur content in marine fuels must reduce from 3.5% to 0.5%, A limit of 0.1% is in place for the Baltic Sea, North Sea and English channel (sulphur emissions control areas) since 2015. Measures in this directive are in line with International Maritime Organisation (IMO) revised MARPOL (Marine Pollution) Convention which aims to prevent pollution from	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation Infrastructure International & North / South Cooperation	The EU has given financial support for the uptake of clean ship technologies, including "green" infrastructure on-board ships. Guidance for on-board sampling has been produced to help monitor sulphur emissions.	Member States will continue to monitor and assess the sulphur content of marine fuels and work towards reducing pollution in coastal and territorial seas in line with the Directive	Low	Sulphur Directive (2016/802) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L0802&rid=5 Implementation and compliance with the Sulphur standards for marine fuel https://ec.europa.eu/environment/air/pdf/report_sulphur_directive.pd
International Convention for the Prevention of Pollution from Ships (MARPOL)	Air Quality	International	Addresses regulations aimed at preventing and minimising pollution from ships. By January 2020 the sulphur content in marine fuels must reduce from 3.5% to 0.5%, A limit of 0.1% is in place for the Baltic Sea, North Sea and English channel (sulphur emissions control areas) since 2015.	MARPOL Annex VI introduced emission control areas which significantly limit the emissions of sulphur dioxide in many areas around the globe (0.1% sulphur content in marine fuels). The EU has given financial support for the uptake of clean ship technologies, including "green" infrastructure on-board ships. Guidance for on-board sampling has been produced to help monitor sulphur emissions.	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation Infrastructure International & North / South Cooperation	The EU has given financial support for the uptake of clean ship technologies, including "green" infrastructure on-board ships. Guidance for on-board sampling has been produced to help monitor sulphur emissions.	Continued monitoring and assessment of the sulphur content of marine fuels and work towards reducing pollution in coastal and territorial seas in line with the Convention	Low	MARPOL - Prevention of Air Pollution from Ships http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Air-Pollution.aspx

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Marine Planning and Development Management Bill	Energy - Offshore Renewable Energy	National - Ireland	The bill seeks to amend the Foreshore Act and create new regulatory area for a more comprehensive and holistic approach to managing development in marine space. The development management process will expand to cover Ireland's exclusive economic zone and continental shelf.	The bill will likely streamline the process of approving infrastructure. It will provide flexibility for centralised and decentralised approaches for offshore renewable energy projects. It is intended that a competitive process for the award of financial support will be established.	Governance Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure	The Marine Planning and Development Management Bill was set up.	Support for the development of marine renewable activities technology is fast growing and there will likely be an increase in the number of offshore renewable projects. The bill will likely streamline the process of approving infrastructure.	Medium	Marine Planning Development Management Bill https://www.housing.gov.ie/planning/marine-spatial-planning/foreshore/marine-planning-and-development-management-bill
S.I. No. 575/2011 - European Communities (Geological Storage of Carbon Dioxide) Regulations 2011.	Energy – Carbon Capture and Storage	National - Ireland	The statutory instrument addresses the development of a framework for the development of CCS	The current legislation does not allow the development of industrial scale CCS projects in Ireland, although small scale test projects may be allowable.	Clean - Green - Marine Research, Knowledge, Technology & Innovation	No changes since HOOW	Future changes are dependent on the potential development of CCS more widely, with the current position to wait for other countries to develop the technology before supporting the industry in Ireland.	Low	S.I. No. 575/2011 - European Communities (Geological Storage of Carbon Dioxide) Regulations 2011.
Harnessing Our Ocean Wealth (HOOW) - An Integrated Marine Plan for Ireland	All	National - Ireland	The report outlines three key goals for sustainable development - focus on a thriving maritime economy, achieve healthy ecosystems and increase engagement with the sea. Targets include doubling the value of ocean wealth to 2.4% of GDP by 2030 and increase turnover from the ocean economy to exceed 6.4 billion Euros by 2020. In total, 39 actions are identified with appropriate goals and timelines for delivery under 8 enablers (Governance; Maritime Safety, Security & Surveillance; Clean - Green - Marine; Business Development, Marketing & Promotion; Research, Knowledge, Technology & Innovation; Capacity, Education, Training & Awareness; Infrastructure; International &	A review of progress has been undertaken each year for the HOOW. In 2018, Ireland's Ocean Economy was on course to achieve it's 2020 target, with a turnover of 6.2 Billion Euros (a 13% increase compared to 2016). There had also been a 13% increase in employment and 11% increase in gross added value since 2016. Implementation and progress of several plans to address EU policies (e.g. fisheries Discards Ban, River Basin Management Plan) and investments made into infrastructure for a variety of sectors (ports, waste water treatment, tourism, research and innovation). Progress on projects focussing on climate change and renewable energy were also discussed.	All	Progress reports detail changes which have been made since HOOW detailing an increase in turnover from the ocean economy and progress made towards policy drivers	Ireland will continue to implement and fund a variety of projects to address EU targets and National targets set out in HOOW 2012 and increase it's ocean wealth	Medium - it is likely that current projects will approach future targets	HOOW 2012 ouroceanwealth.ie/sites/default/files/sites/default/files/Publications/2012/HarnessingOurOceanWealthReport.pdf HOOW Report of Progress 2018 https://www.ouroceanwealth.ie/sites/default/files/Publications/harnessing_our_ocean_wealth_-_review_of_progress_2018-web.pdf
Draft National Marine Planning Framework - 2019	All	National - Ireland	The NMPF is a national plan for Ireland's maritime area. The draft NMPF contains objectives, policies and actions to support effective management of the maritime area. The final NMPF will be published in 2020 after consultation and public engagement processes. This report will be key in consideration for decision-makers on all marine consents.	The objectives and policies will guide all future decision-making in relation to marine activities. The NMPF will form a vital tool in identification of Strategic Marine Activity Zones.	All	The NMPF was set up by the government	The final NMPF is to be published in 2020 which will set out a framework to continue moving towards national and EU targets	Low	Draft NMPF https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_national_marine_planning_framework_final.pdf
Marine Spatial Planning Directive	All	International	The Directive is to push the implementation of MSP as an effective management of marine activities and the sustainable use of marine and coastal resources by creating a framework for consistent, transparent, sustainable and evidence-based decision-making. MSP is founded on the application of the ecosystem-based approach to ensure that pressures from human activities are kept within compatible level and with a view to achieve GES.	Ireland has transposed the Directive into legislation through Statutory Instrument in the first instance and now as part of the Planning and Development Act 2018. Upcoming act will complete the legal framework for MSP in Ireland. The Government published the draft NMPF with a view to adopt the final plan by the end of 2020.	Governance	Legislative changes and draft NMPF published.	Legal framework comprising inter alia of the PDA 2018, the MPDM Bill and Maritime Jurisdiction Bill. Policy framework headed by NMPF.	High	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN
White Paper on Defence - Update 2019	Defence and Security	International	The White Paper seeks to ensure that defence policy is up to date and brings certainty and regularity to the process of defence planning and overall preparedness. The Naval Services are involved in numerous activities including but not limited to surveillance, intelligence gathering, humanitarian. Importanly the paper recognises the need to adapt the Naval Service fleet due to more difficult sea condition as a result of climate change.	Delivery of four new offshore patrol vessels to the Naval Service. Pausing of the proposed two Coastal Patrol Vessels. Considers the need to include radar surveillance capability for naval service ships.	Maritime safety, Security and Surveillance	Delivery of four new offshore patrol vessels to the Naval Service	Acquisition of a multi-role vessel to replace the Naval Service LÉ Eithne and mid-life extsnion progromme of the Naval Servoce's two P50 class vessels. Plan upgrade and mdernisation of naval sercie facilities. More Naval Service ships to be fitted with radar surveillance capability. Increase of 100 in the establishment of the naval service reserve.	Medium	https://www.gov.ie/en/publication/a519cf-white-paper-on-defence-update-2019/

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National Ports Policy (DTTAS, 2013)	Ports, harbours and shipping	National - Ireland	The policy seeks to facilitate a competitite and effective market for martime transport services.	Introduced categorisation of all ports in Ireland into 3 tiers: Tier 1 - Port of National significant; Tier 2: Ports of National Significance and Tier 3 Ports of Regional Significance	Governance, Infrastructure	Transfer of ownership of Tier 3 ports of regional significance to Local Authorities to enable better longer management in line with local and regional development needs. Change of ownership enabled through Statutory Instruments	Local authorities have approached differently their new roles in ports management and are now able to have a more proactive approach. It is expected that some Tier 3 ports will take new directions based on emerging opportunities (eg recreation, offshore wind) and may result in	High	https://assets.gov.ie/11557/277d22d364fe4c13be390493282c0557.PDF
National Sports Policy 2018-2027	Sports and recreation	National - Ireland	Recognises the influence and importance of sports in Ireland and defines actions to deliver on its vision by 2027.	The publication of the policy supports applications being made under the Sports Capital Programmes (eg DLR National Watersports Centre)	Infrastructure	The National Watersports Centre is the most significant coastal / marine development since HOOW. Smaller funding allocations made to growing number of sailing, kayaking, canoeing	Increased development of coastal and marine recreation infrastructure to respond to increased engagement with the sea	Medium - depends on government funding allocated	https://assets.gov.ie/15979/04e0f52cee5f47ee9c01003cf559e98d.pdf
National Strategic Plan for Sustainable Aquaculture Development (DAFM, 2015)	aquaculture	National - Ireland	Plan prepared in response to art. 34 of the CFP requiring the preparation of mutli-annual strategic plans for aquaculture.	Aims to grow the production of the aquaculture industry by 45,000 tonnes across all species. Seeks to fosters knowledge and R&D and to promote environmental sustainability. Include a number of action to be achieved to deliver the plan.	Governance; clean- green - marine; Research, Knowledge, Technology and Innovation	The plan was prepared after HOOW and triggered a number of changes / initiatives. Particularly formally allowed for the review of the aquaculture licensing process. (see Mid-Term assessment of National Strategic Plan here: https://www.agriculture.gov.ie/media/migration/seafood/marineagenciesandprogrammes/nspa/MidTermAss20032018.PDF)	Complete implementation of the plan due to need to comply with CFP.	high	https://www.agriculture.gov.ie/media/migration/seafood/marineagenciesandprogrammes/nspa/NationalStrategicPlanSusAquaDevel181215.pdf
Regulation (EU) 2020/560 of the European Parliament and of the Council of 23 April 2020 amending Regulations (EU) No 508/2014 and (EU) No 1379/2013 as regards specific measures to mitigate the impact of the COVID-19 outbreak in the fishery and aquaculture sector PE/9/2020/REV/1	aquaculture; fisheries	International	Addresses the severe impacts of Covid-19 on fishing and aquaculture sectors	It will allow for a more flexible use of EMFF until the 31st December 2020	Governance; Business Development, Marketing and Promotion	Covid -19 is a pandemic and therefore was unforeseen.	Uncertain. It will depend on how long trading on international markets is suspended	Low	https://ec.europa.eu/transparency/regdoc/rep/1/2020/EN/COM-2020-142-F1-EN-MAIN-PART-1.PDF
RSES for the EMRA 2019-203	all	Regional - Eastern and Mi	Set out the spatial framework for develo	Will guide the decision making-process for development and	Governance	The RSES were made in 2019. Since 2012, the governance structure of the Regional Assemblies has chnaged with only 3 RA now	Regional assemblies could be tasked with preparing regional marine spatial plans. They will continue to support the integration between land and sea	High	https://emra.ie/dubh/wp-content/uploads/2020/05/EMRA_RSES_1.4.5web.pdf
RSES for the Northern and Wall		Regional - Northern and W	Set out the spatial framework for develo	Will guide the decision making-process for development and	Governance	The RSES were made in 2020. Since 2012, the governance structure of the Regional Assemblies has changed with only 3 RA now	Regional assemblies could be tasked with preparing regional marine spatial plans. They will continue to support the integration between land and sea	High	https://www.nwra.ie/rses/
RSES for the Southern Regio	all	Regional - Southern	Set out the spatial framework for develo	Will guide the decision making-process for development and	Governance	The RSES were made in 2020. Since 2012, the governance structure of the Regional Assemblies has changed with only 3 RA now.	Regional assemblies could be tasked with preparing regional marine spatial plans. They will continue to support the integration between land and sea.	High	https://www.southernassembly.ie/uploads/general-files/Southern%20Regional%20Assembly%20RSES%202020%20High%20Res pdf
Our Shared Future - Program	All	National	Sets out the coalition government's pro	The porgramme sets out key actiions to be taken by the government. It will drive policy development and investment / funding allocations for the lifetime of the coalition.	Governance	Clear shift on emphasis on climate change with a renewed interest for developing marine renewable. Political commitments to designate MPAs	5 GW of offshore wind target, designation of MPAs, continued support for aquaculture and fisheries. Huge push for recovery in tourism sector.	High	https://static.rasset.ie/documents/news/2020/06/draft-programme-for-govt.pdf

A.2 Environmental

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
WWF Global Futures Technical Report	Biodiversity	Global	Contribution of ecosystem services to global economies under three conservation scenarios: 1. Business as usual 2. Sustainable Pathway 3. Global conservation	The report considers the ecosystem services contributions to World GDP in the future by modelling a variety of factors, of which Coastal protection, Carbon storage and Marine fish provision are applicable to the Marine Environment, against three potential emissions scenarios. Recommends the inclusion of ecosystem services into planning policy globally, which is estimated to (on a global scale) provide an economic gain under scenario 3 but economic losses under scenarios 1 and 2.	Clean - Green - Marine Research, Knowledge, Technology & Innovation International & North / South Cooperation	Increased understanding of the value of natural capital throughout industry and increased international pressure on climate action is increasing.	Natural capital / ecosystem services approaches to economic assessment are likely to become more included within standard practice. There is potential that reports such as this may drive global pressure for consideration of natural capital in policy (including marine policy) and land-use planning. Depending on the scenario closest to reality, potential increases or decreases in the value of ecosystem services on a global scale in the marine environment.	Low	Johnson, J.A., Baldos, U., Hertel, T., Liu, J., Nootenboom, C., Polasky, S., and Roxburgh, T. 2020. Global Futures: modelling the global economic impacts of environmental change to support policy-making. Technical Report, January 2020. https://www.wwf.org.uk/globalfutures
National Biodiversity Action Plan 2017 - 2021	Biodiversity MPAs	National - Ireland	Addresses the current state of the environment, and sets out Ireland's vision for the future management of biodiversity in Ireland	The NBAP defines a series of actions against 7 overarching objectives: 1. Mainstream biodiversity into decision-making across all sectors 2. Strengthen the knowledge base for conservation, management and sustainable use of biodiversity 3. Increase awareness and appreciation of biodiversity and ecosystems services 4. Conserve and restore biodiversity and ecosystem services in the wider countryside 5. Conserve and restore biodiversity and ecosystem services in the marine environment 6. Expand and improve management of protected areas and species 7. Strengthen international governance for	International & North / South Cooperation Clean - Green - Marine	New piece of policy which incorporates some of the elements of HOOW. Increased understanding of ecosystem services provided by biodiversity has increased the importance of protecting it which is recognised through such policies.	The Action Plan describes proposed work going forwards to 2021. A new plan is expected to be developed for the period 2022 to 2026.	Medium	Government of Ireland. 2017. National Biodiversity Action Plan https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf
Draft Biodiversity Climate Change Adaption Report	Climate Change Biodiversity		Addresses the potential adaptations in biodiversity expected as a result of climate change and sets out required actions to support adaptation and mitigate significant impacts.	The report focusses on specific habitats, recognising that in the coastal environment coastal erosion accelerated as a result of climate change poses a challenge, and Invasive Non-Native Species in the marine environment require monitoring as spread is likely to be increased by climate change. There is recognition that connectivity is important in resilience to climate changes.	Clean - Green - Marine	New piece of guidance which develops a series of actions for identifying and managing risks to biodiversity as a result of climate change.	The report identifies a series of projected changes to the climate, as per Desmond *et al.* (2017) below. Impacts as a result of these are: **Phenology** • Changes in the timings of seasonal events; • Disruption of species interactions **Geographical range and species abundance** •Shifts in suitable climate conditions for individual species leading to change in abundance and range; • Loss of species (especially range restricted species) •Increased stress on species from more frequent extreme events (drought, flooding, fire, disease) **Degradation of habitats and changes in ecosystem processes** • Loss or changes in the structure and functionality of the habitats which species occupy; • Changes to the composition of plant and animal communities; • Loss of space due to sea level rise and associated salt water intrusion; •Increased ocean acidification **Invasive species** • Arrival of new species better able to survive the new conditions, some may have negative impacts on the economy (e.g. via impacts on farming); •Existing species change in range as a result of climate change and become problematic	**High** Extent of changes will depend on extent of climate change as described in Desmond *et al.* (2017).	Government of Ireland, 2019. Draft Climate Change Adaptation Report. https://www.npws.ie/sites/default/files/files/32631_NPWS_Climate%20Change%20Report_15Feb(1).pdf
Irish Coastal Protection Strategy Study	Climate Change	National - Ireland	Reviews the current rates of coastal erosion and, based on climate / sea level predictions, makes forecasts as to the likely future impact of coastal erosion or flooding around the Irish Coast	The outputs, based on sea level rises under two scenarios (500mm and 1000mm rise by 2100) include maps which may be used to support decision making in designing coastal development and supporting hazard management.	Maritime Safety, Security & Surveillance Research, Knowledge, Technology & Innovation Capacity, Education, Training & Awareness Infrastructure	The final study was completed in 2013, and therefore changes from HOOW are limited, and the scenarios applied are approximately in accordance with the most recent global predictions from the IPCC (2019) Since HOOW increases in storm intensity may increase the rate of coastal erosion.	Sea level rise is likely to fall between the two scenarios by 2100, although coastal erosion may be increased by significant increases in storm intensity, as seen in the late 2010s.	**Medium** Sea level rise is likely to happen, but the extent remains uncertain and dependant on global climate action.	Government of Ireland, 2019. Irish Coastal Protection Strategy Study (ICPSS). https://www.gov.ie/en/publication/eed0fb-irish-coastal-protection-strategy-study-icpss/
MCCIP Report Card 2020	Climate Change Biodiversity	National - Other	Evidence on the impacts of climate change in the UK	Identifies evidence that warming seas, reduced oxygen, ocean acidification and sea level rise are affecting UK coastlines and seas. This is likely to be a similar picture for Ireland, given the proximity.	Research, Knowledge, Technology & Innovation	Increased evidence of the impact of climate change already present within the oceans.	The report makes predictions for different receptors of the likely impacts of future climate change, recognising that the extent of these will change under different emissions scenarios.	**Medium** Further changes in the environment are expected as a result of Climate Change, however the extent remains uncertain.	MCCIP, 2020. Marine Climate Change Impacts Report Card 2020.

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Climate change Implications forIreland's Marine Environmentand Resources	Climate Change Biodiversity	National - Ireland	Reviewed the evidence base(as per 2005 base) and made predictions as to the potential impacts of climate change on the Irish marine area.	The report identifies a number of changes that were being observed (such as warming) and uses predictions as to what is likely to occur to make an assessment of the impact on Irish marine environment and resources. Identifies that increased storm intensities may have implications for coastal infrastructure, which combined with sea level rise may lead to increased coastal flooding.	Research, Knowledge, Technology & Innovation	Increased evidence of the impact of climate change already present within the oceans. Some of the predictions of the report are materialising, and further evidence is available indicating that more accurate predictions are now possible.	Predicted changes include a greater incidence of storm damage and flooding in low-lying coastal areas and various impacts on marine life including modifications in primary production, food chains and geographical ranges of some species.	**Medium**	Boelens, Minchin and O'Sullivan. 2005. Climate change - Implications for Ireland's Marine Environment and Resources. Marine Foresight Series https://oar.marine.ie/bitstream/handle/10793/560/Foresight%20Series%202%20Climate%20Change%20Implications.pdf?sequence=3&isAllowed=y
The Status of EU Protected Habitats and Species in Ireland	Biodiversity, MPAs	National - Ireland	Under Article 17 of the Habitats Directive, Member States are required to report on the condition of SAC features every 6 years	The outcomes of 6 yearly monitoring inform the need for additional management	Clean - Green - Marine	Latest Article 17 report published in 2019. Indicates that sandbanks, submarine structures made by leaking gases and Salicornia were in favourable condition. Features such as estuaries, tidal mudflats and sandflats, reefs, drift lines, vegetated shingle, vegetated sea cliffs, Atlantic salt meadow and Mediterranean salt meadow were also classified as inadequate, while lagoons and large shallow inlets and bays were assessed as bad. Overall there has been a slight further deterioration since 2013. Most marine mammal features are assessed as being in favourable condition (or unknown) with no significant change since 2013. For migratory fish species, twaite shad and sea lamprey are assessed as bad and salmon as inadequate, similar to 2013	Member States are obliged to take measures to achieve favourablecondition	**Medium** - the Habitats Directive has provide somewhat effective in slowing the pace of biodiversity decline but has lacked the resources to progress large scale restoration work	https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol1_Summary_Article17.pdf
MSFD Article 17 update	Biodiversity MPAs, Marine Litter, INNS, Underwater Noise	European	An initial assessment in relation to GES for Ireland's waters was published in 2013. DHPLG consulted on an update to the Article 9 assessment in December 2019	For biodiversity, fish, sea-floor integrity and marine litter, not all elements are currently at GES. The status of food webs is assessed as unknown	Clean - Green - Marine	There has been progress in assessing and reporting the status of the marine environment	Some additional measures may need to be implemented to support achievement of GES.	**Low** - the extent to which additional measures may be implemented and their effectiveness is uncertain.	https://www.housing.gov.ie/sites/default/files/public-consultation/files/msfd_public_consultation_report_december_2019.pdf
River Basin Management Plan 2018 -21	Biodiversity MPAs, Water Quality	European	An assessment of transitional and coastal water bodies was made for the second RBMP cycle 2018 - 2021	There are 195 transitional water bodies and 115 coastal water bodies. For the period 2013-18, around 9% of transitional water bodies were at high and 29% at good status with 38% moderate, 18% poor and 8% bad. For coastal waters around 22% were high and 57% good with 20% moderate and 2% bad	Clean - Green - Marine	There has been progress in assessing and reporting WFD status which has resulted in downgrading of some transitional waterbodies. There has been a slight improvement in coastal waterbodies over time.	It is expected that there will be continued progress towards Good status in transitional and coastal waterbodies but the pace of improvement is likely to be slow.	**Low** - the pace of progress towards achieving Good Status is uncertain	https://www.catchments.ie/data/#/dashboard/waterquality?_k=v10aey
Convention on Biological Diversity (CBD) Guiding Principals for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species	INNS	International	The report recognises that INNS are a primary threat to biodiversity and the risk they impose may be increasing due to increase in global trade, transport and climate change. Target set by CBD: "*By 2020, invasive alien species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment*".	The global register of Introduced and Invasive Species was developed by Global Invasive Alien Species Information Partnership who aim to support parties to the CBD.	Clean - Green - Marine	Guidance for Parties and Governments which recognises the need for collaboration to minimise risks associated with INNS (2018).	With an increase in the number of introductions, further restriction being placed on a larger number of INNS. It is likely that new species will become established over time and further review will be needed to update the guidance for Parties and Governments.	Low	Convention on Biological Diversity (CBD) Guiding Principals for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-11-en pdf
Ireland's MSFD Directive Initial Assessment, GES and Targets and Indicators 2013	INNS	National - Ireland	The majority of primary introductions to Irish waters have occurred via shipping and aquaculture, the majority of recorded INNS occur in ports and harbours, including those which are impacting or have the potential to impact, such as the tunicate *Didemnum vexillum,* slipper limpet *Crepidula fornicata* and seaweed *Sargassum muticum.* There were 79 non-indigenous species in Irish waters. Eight out of the 35 most significant NIS identified by DAISIE have been recorded in Ireland. Knowledge on the distribution of many non-indigenous species is limited but it is suggested the number arriving in Ireland is increasing.	Ireland have introduced Invasive Alien Species Action Plans implemented until at least 2020. An Industry Code of Practice has been developed for the aquaculture industry, completed in 2019. Implementation of the Ballast Water convention into Irish law has started and will be implemented shortly. An updated list of invasive species in Ireland is due to take place.	Clean - Green - Marine	Implementation of the Ballast Water Convention in Ireland and a Code of Practice for aquaculture industry	With an increase in the number of introductions, further restrictions may be placed on a larger number of INNS. It is likely that new species will become established over time and further review will be needed to update the guidance for Parties and Governments. There will be continued work towards action plans and management of non-indigenous species in line with European Directives.	Medium	https://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad%2C34365%2Cen.pdf MSFD Interim Progress Report on the Implementation of the Programme of Measures (Ireland) https://www.housing.gov.ie/sites/default/files/publications/files/2019_10_01_interim_report_-_final.pdf Dublin City Alien Species Action Plans https://www.biodiversityireland.ie/invasive-alien-species-action-plan-dublin-city-2016-2020-

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Coastwatch Marine Litter Survey Results and Action to Tackle Marine Litter for Ireland May 2019	Marine Litter	National - Ireland	Volunteer led beach cleans provide an initial indication of the amount of coastal litter. It has shown the plastic bag levy likely led to a decrease in the number of plastic bags on beaches from 34 to 4 bags/km. 2017 and 2018 saw an increase in landfill materials on the shore compared to 2012-2016. Litter from drinks containers has decreased since 2010 and 2013 with 51 and 30 plastic bottles/500m , respectively but between 13-18 plastic bottles/500m are still recorded each year. Countries with a deposit return scheme record 1-2 per 500m. Marine litter is becoming more widespread (nets ropes, nylon, polypropylene). 72.3% of survey sites had rope and string from discarded fishing in 2017 which increased from 59.1% in 2015. Aquaculture waste has been increasing steadily since 2014 to 16.9% of survey sites. Aquaculture is set to grow	Coastwatch put in place a number of recommendations and potential actions to address different sources of beach litter. They outlined a new structured approach to marine litter clean-ups to efficiently describe shores and litter profiles - Shore Character and Litter Profiles (SCALPS).	Clean - Green -Marine	Plastic bag levy has led to a noticeable decrease in plastics bags on the shore. Plastic bottle decrease on shores likely due to public awareness of plastic pollution.	Reduction in single-use plastics on beaches which are being phased out in EU legislation such as cotton buds and plastic cutlery by 2021.	Medium - it is expected that changes in beach litter will change with regards to single-use plastics across the whole of Europe. Volunteer led surveys have the potential to detect this change.	http://coastwatch.org/europe/wp-content/uploads/2019/07/Report_2018_part2_Marine_Litter.pdf
Ireland's MSFD Directive Initial Assessment, GES and Targets and Indicators 2013	Marine Litter	National - Ireland	The main source of litter on beaches in Ireland are from tourism, sewage, shipping and fishing. Beach litter surveys (on 4 beaches) found plastic to make up at least 90% of items whilst other items includes metals, paper, sanitary items and wood. Between 2008/2009 and 2011, beach litter had decreased from 247 to 181 items/100m. Potential seabed litter hotspots have been identified to the southeast of Ireland. Marine litter poses a direct threat risk to marine animals through entanglement and ingestion, however, there is little evidence of this in Ireland.	Ireland have implemented: - Coast Care, programmes which involve local beach cleans, annual national beach clean and photography competitions. - Environmental education programme Eco-Schools with a module on marine litter (235 schools working on this topic in 2017) - The National Litter Pollution Monitoring System (NLPMS), an annual report on litter in Ireland - Fishing for litter Scheme, in 2019, 95% of fishing vessels signed up to help bring back lost fishing gear for appropriate disposal. Implementation started: - OSPAR Regional Action Plan on Marine Litter, and Ireland co-lead on a number of actions.	Governance Clean - Green - Marine Capacity, Education, Training & Awareness	Several monitoring systems and programmes have been introduced to achieve the actions set out by the MSFD which encompass a variety of different marine litter types and increasing awareness and education.	EU Member States will move towards implementing targets in the Directive, such as the banning or regulation of specific products found on beaches over the next decade (particularly by 2021). Potential for further plastic products to be regulated.	Medium - deadline is likely to be reached in several Member States but a thorough review is likely required to see where further action is needed. No countries have yet to implement a ban on the specific single-use plastics.	Ireland's MSFD Directive Initial Assessment, GES and Targets and Indicators 2013 https://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad%2C34365%2Cen.pdf MSFD Interim Progress Report on the Implementation of the Programme of Measures (Ireland) https://www.housing.gov.ie/sites/default/files/publications/files/2019_10_01_interim_report_-Ireland's MSFD Directive Initial Assessment, GES and Targets and Indicators 2013 https://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad%2C34365%2Cen.pdf MSFD Interim Progress Report on the Implementation of the Programme of Measures (Ireland) https://www.housing.gov.ie/sites/default/files/publications/files/2019_10_01_interim_report_-Distribution of Reported Impulsive Sounds in the Sea https://oap.ospar.org/en/versions/distribution-reported-impulsive-sounds-sea-en-0-0-1/ JOMOPANS project https://www.ospar.org/news/meeting-on-ambient-noise-monitoring-in-the-north-sea?utm_source=osparemail&utm_medium=email&utm_campaign=End%20of%20year%20news%202019
Ireland's MSFD Directive Initial Assessment, GES and Targets and Indicators 2013	Underwater Noise	National - Ireland	Potentially harmful effects in the marine environment are considered to occur within the 10 - 10,000 Hz frequency range. It is thought that less than 1% of the Irish Assessment Area is subjected to impulsive sounds. There is likely to be an increase in underwater noise activity as there is likely to be a steady increase in the number of authorisations.	Ireland have begun to implement a register of marine noise started in 2015/6 to reflect seismic surveys and site surveys. Surveys are uploaded to the ICES Noise Register and supports OSPAR regional assessments.	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation	Data have started to be collected from EU Member States regarding underwater activities and noise increasing knowledge and understanding of this disturbance in the marine environment.	Baseline data of underwater noise are still in need of collection across EU Member states before regulations can be put in place. Further monitoring surveys and studies are likely to be implemented in line with EU targets which are required for a more complete understanding of this disturbance.	Medium	
Distribution of Reported Impulsive Sounds in the Sea	Underwater Noise	International - Northeast Atlantic	The predominant source of noise was seismic survey activity which decreased between 2015 and 2017, however there was an increase in pile driving, explosions and sonar/acoustic deterrent activities. The North Sea reported the most activity (over 1000 pulse block days per year) but the activity declines over the three years. The Arctic, Atlantic, and Celtic Seas had an increases in activity during the period but all were less than 300 pulse block days.	Data has been collected measuring and assessing the pressures of noise which has led to the OSPAR Monitoring Strategy for Ambient Underwater Noise (2015) and CEMP Guidelines for Monitoring and Assessment of loud, low and mid-frequency impulsive sound sources in the OSPAR Maritime Region (2017). A Common Indicator to assess the impact of impulsive noise on sensitive species was submitted to OSPAR's Environmental Impacts of Human Activities Committee 2019. The Joint Monitoring Programme for Ambient Noise North Sea (JOMOPANS) project was set up to develop a framework for a fully operational programme for ambient noise monitoring in the North Sea. The aim is to create tools for managers, planners and stakeholders to incorporate the effects of ambient noise in their environmental assessments.	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation	Data have started to be collected from EU Member States regarding underwater activities and noise increasing knowledge and understanding of this disturbance in the marine environment.	Implementation of standards for monitoring for underwater noise are likely to be made available. Baseline data of underwater noise are still in need of collection across EU Member states before regulations can be put in place. Further monitoring surveys and studies are likely to be implemented in line with EU targets which are required for a more complete understanding of this disturbance.	Medium - steady progress is being made in implementing standard for underwater noise monitoring	

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European Overview - River Basin Management Plans 2019	Water Quality	European	The River Basin Management Plans (RBMPs) aim to protect waters until 2021 under the Water Framework Directive. A review in 2019 described that at an EU level, 90% of surface water bodies and 70% of groundwater bodies remain unchanged since the first RBMPs. The number of water bodies with an unknown chemical status has more than halved since the first RBMP. All Member States use exemptions listed in the Directive extensively (equating to half of Europe's water	A list of recommendations to Member States has been made to improve progress towards the Water Framework Directive.	Governance Clean - Green - Marine	A review on the RBMPs around Europe highlighting progress is needed to meet targets set by the Water Framework Directive.	EU Member States will move towards implementing targets with regards to the RBMP and Water Framework Directive.	Low - thus far, little overall progress has been made	https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2019:0030:FIN:EN:PDF
EEA Report No 3/2019 - Bathing Water Quality	Water Quality	European	Addressing the Bathing Water Quality Directive, in 2018, 95.4% of EU bathing sites met the minimum "sufficient" quality requirement, with 85.1% meeting "excellent" quality standards. Since 2014, the quality of bathing waters has remained stable, but there has been an overall decrease of waters receiving "poor" quality status from 1.9 - 1.3%.	Detailed information of the bathing water quality around the EU is publically available.	Clean - Green - Marine	The number of bathing waters receiving "poor" quality status has decreased since 2014 across the EU.	Bathing water quality will remain high in the EU with actions to improve water quality in those classified as "poor" implemented.	Low	https://www.eea.europa.eu/publications/european-bathing-water-quality-in-2018
Ireland's MSFD Directive Initial Assessment, GES and Targets and Indicators 2013	Water Quality	National - Ireland	Minimum bathing quality has remained high in Ireland since 2010. In 2010 and 2011, 98.4% of Ireland's coastal bathing waters were at least "sufficient" quality, with 84.1% of these being classified as "good" in 2011. The quality of bathing waters is influenced by factors such as the weather, with 2012 showing a reduction in "good" status bathing waters reducing from 127 sites to 84 due to intense rainfall. 65.1% of shellfish waters achieved the standard for *E. coli* in shellfish flesh.	In 2018 94% of bathing waters met the minimum criteria of "sufficient" with over 70% classified as "excellent" and 15% classed as "good" quality. Five bathing waters were classified as poor, an improvement from seven in 2017. The Environmental Protection Agency in Ireland have implemented actions such as improving any bathing waters classified as poor and increase the number of waters classified as good or excellent. An Environmental Code of Practice for Irish aquaculture companies and traders is in place to minimise the impact of operations. The EU SWIM project is developing a system to predict bathing water quality. Further projects, between 2019 - 2023, have been funded to both increase bathing water quality and research to further understand how to protect and improve bathing	Clean - Green - Marine Research, Knowledge, Technology & Innovation	The number of bathing waters classified as excellent is high and projects and research are being undertaken to improve knowledge and overall bathing water quality.	Bathing water quality will remain high in Ireland with actions to improve water quality in those classified as "poor" implemented. Individual funded projects in local areas will increase water quality of target locations.	Medium	Ireland's MSFD Directive Initial Assessment, GES and Targets and Indicators 2013 https://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad%2C34365%2Cen.pdf MSFD Interim Progress Report on the Implementation of the Programme of Measures (Ireland) https://www.housing.gov.ie/sites/default/files/publications/files/2019_10_01_interim_report_-_final.pdf
Urban Waste Water Treatment 2018	Water Quality	National - Ireland	The proportion of urban waste water receiving secondary or tertiary treatment in Ireland has increased since 2013 but is behind in comparison to other EU countries. The European Commission took Ireland to the Court of Justice due to ongoing failure to ensure waste waster was collected and treated in 2016. Overall, there has been a reduction in the number of urban areas releasing raw sewage and a decrease in the urban areas failing to meet EU standards. However, as of 2018 there are still 21 of 169 areas which failed to meet EU standard. These 21 areas produce over half of Ireland's urban waste water. Sewage from 36 towns and villages is still released into the environment without treatment. Improvement is needed to protect	The Environmental Protection Agency has recognised key actions which are required, such as increasing the pace of upgrades to deficient waste water systems to avoid financial penalties. Irish water has been required to provide waste water disinfection systems to protect shellfish waters at two urban areas.	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation Infrastructure	Ireland were taken to EU Court of Justice over failure to ensure appropriate collection and treatment of urban waste water. Small improvements have been made.	Water quality will continue to be monitored and progress made to increase the level of treatment around Ireland in line with the Urban Waste Water Directive.	Low - change has been slow and likely to take several years to implement	Urban Waste Water Treatment in 2018 https://www.epa.ie/pubs/reports/water/wastewater/Urban%20Waste%20Water%20Treatment%20in%202018_Web.pdf Urban Waste Water Treatment in 2016 https://www.epa.ie/pubs/reports/water/wastewater/Urban%20waste%20water%20report%20for%202016%20Final%20Version.pdf Urban Waste Water Treatment Europe https://www.eea.europa.eu/data-and-maps/indicators/urban-waste-water-treatment/urban-
Nitrates Directive - Department of Housing, Planning and Local Government	Water Quality	National - Ireland	The aim of the Nitrates Directive is protect water quality from pollution by agricultural sources and promote good farming practice. All EU Member States must prepare National Nitrates Action Programmes (NAP) that outlines the management and application of livestock manures and other fertilisers.	Ireland's NAP limits the amount of livestock manure applied to land each year, prohibits land spreading at times of increased risk and set capacity levels for storage of manure. Ireland have banned slurry spreading on land between mid-October to mid-January (depending on location). Land spreading is conditional on weather and suitable ground conditions, i.e. no fertilisers can be applied on waterlogged, flooded or frozen land, or if heavy rain is forecasted within 48 hours. As of 2018, Ireland have relaxed rules to allow farmers a higher stocking rate of manure (170kg/ha to 250kg/ha per year), however, they must comply with	Clean - Green - Marine	As of 2018, Ireland have relaxed rules to allow farmers a higher stocking rate of manure (170kg/ha to 250kg/ha per year), however, they must comply to strict rules.	Ireland's NAP will be reviewed at the end of 2021 with reference to water quality, including the derogation of stocking rate. Further changes may be needed to comply with further amendments to the EU (Good Agricultural Practice for Protection of Waters) Amendments.	Low	Nitrates Directive - Department of Housing, Planning and Local Government https://www.housing.gov.ie/water/water-quality/nitrates/nitrates-directive

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Air Quality In Ireland 2018	Air Quality	National - Ireland	Ambient Air quality Directive (2008) and Clean Air for Europe Programme (2013) set legally binding limits and target values for concentrations of, for example, nitrogen dioxide, sulphur dioxide, carbon monoxide, particulate matter. Member States are required to have air quality zones where target values are exceeded. Standard needed to be met by 2015.	Ireland designated 4 zones (Dublin, Cork, other towns and cities, rural Ireland) in 2011 and made amendments in 2013 to reflect population counts and to add addition districts/towns within the zones, no areas were removed. Levels at monitoring sites were below the EU legislative levels for all years monitored, therefore no action plans have been required. Levels are, however, above WHO guideline values for health for particulate matter, ozone and nitrogen dioxide. There are indications that Ireland nitrogen dioxide values will exceed EU limits in the near future. The National Clean Air Strategy was set up in 2017, however, limited progress has been documented. New monitoring stations have been installed and some upgraded. Citizen Science and engagement activities have been set up (GLOBE project, CleanAir@School).	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation	EPA have publically available maps of air quality for Ireland with routine data collection and analysis.	Monitoring of air quality in several locations around Ireland will continue with the aim to reducing pollution below WHO levels. Levels may exceed EU legislative levels in the near future meaning future measures to regulate these levels will need to be taken.	Low	Air Quality in Ireland 2018 https://www.epa.ie/pubs/reports/air/quality/Air%20Quality%20In%20Ireland%202018.pdf National Clean Air Strategy https://www.dccae.gov.ie/en-ie/environment/topics/air-quality/national-clean-air-strategy/Pages/default.aspx
State of Science Report 2016	Biodiversity Underwater Noise Energy - Offshore Renewable Energy	International	The report summarizes the state of science of interactions and effects of marine renewable energy devices on the marine environment. Most evidence of change to benthic habitats from marine renewables is from offshore wind farms where changes are not expected to be widespread. Research suggests that structures on the sea bed may lead to reefing populations of fish and an increase in species diversity and abundance through enhancement of habitats. Underwater noise from marine renewables, such as wind or wave/tidal are not expected to have a negative behavioural or physical effect on marine organisms, however, further research is needed to determine this. It is acknowledged that as the marine renewable energy industry continues to develop, it is important to measure and monitor potential disturbance to marine life.	This review of highlights areas where information and data are lacking which may influence future research and funding	Clean - Green - Marine Research, Knowledge, Technology & Innovation	Renewable energy has had an increase in development and investment. Recent support structures for marine renewables (Renewable Energy Support Scheme, REES) have shown recognition for the use of marine renewables in Ireland to meet 2030 energy targets.	Research and monitoring associated with marine renewables and its effect on the marine environment is likely to increase as development offshore increases to meet renewable energy targets. In particular research into underwater noise during construction.	Medium	State of Science Report - 2016 https://tethys.pnnl.gov/sites/default/files/publications/Annex-IV-2016-State-of-the-Science-Report_LR.pdf
Future of the Sea: Plastic Pollution. Foresight Evidence Review. (2017)	Marine litter	National - other	Around 70 per cent of all the litter in the oceans is made of plastic. Pollution of the environment with plastics is a global environmental problem; with plastic debris contaminating habitats from the poles to the equator and from the shoreline and sea surface to the deep sea.	Plastic pollution can be harmful to wildlife, human well-being and to the economy. There is extensive evidence that entanglement in, or ingestion of, plastics can cause injury and death to a wide range of marine organisms, including commercially important fish and shellfish. Plastic pollution is also hazardous for mariners and reduces the amenity value of coastlines necessitating costly ongoing clean-up operations. In addition, there are emerging concerns of potential negative consequences for human well-being, but currently there is a lack of evidence on which to base firm conclusions here. The effects of small particles of micro and nano-sized plastic debris are not fully known. Estimated that plastic pollution in oceans will treble between 2015 to 2025.	Clean - Green - Marine Research, Knowledge, Technology & Innovation	Greater understanding of the prevalence of marine plastic litter and increasing concern about the environmental impacts	Amounts of plastic litter in the ocean likely to increase in the short-term but may decline in long-term dependent on effectiveness of legislation controlling production and use.	Medium - likely that amounts of plastic litter will increase in the short-term.	Thompson, R.C., 2017. Future of the Sea: Plastic Pollution. Foresight Evidence Review. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/634433/Future_of_the_sea_-_plastic_pollution_final.pdf
The Status of EU Protected Habitats and Species in Ireland 2019	Biodiversity MPAs	National - Ireland	Addresses the current status of protected habitats and species in Ireland as of 2019.	A number of habitats are at bad status and still in decline in the marine environment. The report recognises that in some cases this is due to the lag between implementation of measures and the realisation of their impacts. Continued management will be required in order to manage impacts on these habitats and species, although the most significant pressure is related to water quality which is expected to be addressed through further action under the WFD.	Clean - Green - Marine	The report addresses the progress in status since 2007, which incorporates progress made since HOOW. There are some improvements at species level, however the majority of habitats in the marine environment still require additional work.]	The implementation of management measures and continued improvement against the WFD should lead to improvements in the status of protected habitats and species. Climate change is likely to be a continued pressure on species and habitats, and adaptation will be required in order for successful management. Suggestions include adapting the boundaries of MPA where species distributions change as a result of climate change.	Medium - Likely that management measures will remain in place, however the extent of the impact of climate change is uncertain.	Citation: NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.
Protecting Marine Nature by 2030	Biodiversity MPAs	European	Considers the progress required to achieve sufficient protection of the marine environment through designation and management of MPAs.	Likely to drive pressure on Ireland to designate additional national MPAs to meet proposed targets, including designation of 30% of coastal and marine areas by 2030.	Clean - Green - Marine				Oceana. 2020. Protecting Marine Nature by 2030. https://eu.oceana.org/sites/default/files/oceana_factsheet_2030_mpas_biodiversity.pdf

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Marine Institute 3-Year Strategic Plan	All	National - Ireland	Provide direction and focus for the Board and continue to deliver efficient and effective services to government, industry and public. Stes out five high-level goals for MI including: Service Provider; Research Performer; Research Catalyst and Funder; Infrastructure Provider; Efficient and Effective Organisation.	The MI has been a significant player both in supporting and lead role in promoting Blue Growth and supporting the achievement of objectives set out under various environmental directives including MSFD.	All	MI has successfully secured EMFF funding to undertake the Spatial Data and Evidence Projects to support the development of the NMPF. It has also been involved in a number of European and International projects relating to the marine environment, contributing to Ireland's standing on an international level. Through INFOMAR, MI in collaboration with GSI has contributed to the development of essential data repositories such as EMODNET. It worked in successful collaboration with SEAI in developing testing sites for marine and energy technologies in real life context, including AMETS and the Galway Bay Marine & Renewable Test Site.	Continuation of its services as scientific and technical advisor to Government Departments. Closer relationship with DHPLG, the plan-making authority in charge of preparing the NMPF and to An Bord Pleanála, future competent authority for ORE. Continued support to the development of scientific marine knowledge and continued funding of marine research, development and innovation programmes. Management of the new Marine Atlas.	High	https://www.marine.ie/Home/sites/default/files/MIFiles/Docs/CS/MI%20Strategic%20Business%20Plan%20-%202015%20-%202018.pdf?language=en
National Marine Research & Innovation Strategy 2017-2021	Aquaculture and fisheries;	National - Ireland	Sets out the strategy for research and innovation for the period up to 2021 according to three research themes: a thriving maritime economy; a healthy ecosystem and engagement with the sea	The strategy has allowed MI to secure and distribute relevant funding to achieve goals as driven by national and international policy drivers.	Research, Knowledge, Technology and Innovation	National Infrastructure Access Programme in place. Establishment of the Marine Research Funders Forum and Marine Infrastructure Providers Forum in 2018.€210 million has been awarded to / won by the Irish marine research community; of which €84 million from the EU research budget (H2020 and Interreg).	Continued international collaboration and continued support to the Irish marine research community.	High	https://www.ouroceanwealth.ie/sites/default/files/sites/default/files/Publications/2017/NationalMarineResearchInnovationStrategy2021.pdf
In-depth Q&A: Why Ireland is 'nowhere near' meeting its climate-change goals	Climate Change	National - Ireland	Highlights current issues being encountered by Ireland in meeting emissions targets.	Demonstrates that additional action is likely to be required in order to meet emissions targets - this may include encouragement for de-carbonising the marine economy and / or installing additional marine renewable energy capacity.	Clean - Green - Marine Infrastructure Technology & Innovation	Since HOOW less progress has been made than anticipated.	Likely to be continued global pressure to reduce emissions, which may continue to drive the low carbon economy, of which the marine environment will likely be a part.	High	https://www.carbonbrief.org/in-depth-qa-why-ireland-is-nowhere-near-meeting-its-climate-change-goals
Reflection Paper - Towards a Sustainable Europe by 2030	Climate Change	International	Sets the pathway for Europe up to 2030. It consists of a low-carbon, climate-neutral, resource-efficient and biodiverse economy in compliance with the UN 2030 Agena and the 17 SDGs. The pathway includes policy diections for the EU including inter alia a shift to the circular economy; sustainable from farm to fork; future-proof energy, buildings and mobility; and a socially fair transition. It outlines three scenarios on how to progress the SDGs.	Much of planning policy around Europe now has regard to the SDG	All	Adoption of the SDG was after that of the publication of HOOW.	Projects to be funded in line the UN sustainable development goals, particularly toward SDG 13 Climate Action and 14 Life below Water.	Medium - limited monitoring to track progress, but Governmental commitment in policy	https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf
Landing the Blame: Overfishing in the Atlantic 2017 (NEF, 2017)	fisheries, biodiversity	International	Analysis CFP allocated quotas against scientific advice in realtion to stock	Ireland negotiated a high percentage of total allowable catch (TAC) in excess of the scientific advice	Clean - Green - Marine	Reform of the CFP	Annual revision of TACs	Medium - very politcal topic. It depends on the Government's agenda whether it is looking at economic growth or environmental sustainbility	https://neweconomics.org/uploads/files/NEF_LTB_ATLANTIC_2017.pdf

A.3 Economic

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Offshore Renewable Energy Development Plan (OREDP) (2014)	Energy – Offshore Renewable Energy Energy – Transmission	National - Ireland	Encouraging the development of the offshore renewable energy sector in Ireland. Objectives, next steps and SEA / HRA.	The report sets out 10 next steps required to support the future development of the offshore renewable energy sector. 1. Put in place a robust Governance Structure for the OREDP 2. Increase Exchequer Support for Ocean Research, Development and Demonstration 3. Introduce Initial Market Support Tariff for Ocean Energy 4. Develop Renewable Electricity Export Markets 5. Develop the Supply Chain for the Offshore Renewable Energy Industry in Ireland 6. Communicate that Ireland is Open for Business 7. Explore Potential for International Collaboration 8. Introduce a New Planning and Consent Architecture for Development in the Marine Area 9. Environmental Monitoring 10 Ensure Appropriate Infrastructure Development	Clean - Green - Marine Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure	The introduction of the Net Zero Emissions by 2050 target will influence the emphasis placed on climate change mitigation, and likely continue to place importance on development of offshore wind which has become significantly more commercially viable over the period since HOOW. The first RESS Auction qualification is expected to commence on 9 March 2020 with 'regular' auctions thereafter.	See Row 9 (Offshore Renewable Energy Development Plan (OREDP) – Interim Review May 2018.)	N/A	Department of Communications, Energy and Natural Resources. 2014. Offshore Renewable Energy Development Plan. February 2014. https://www.dccae.gov.ie/documents/20140204%20DCENR%20-%20Offshore%20Renewable%20Energy%20Development%20Plan.pdf
Offshore Renewable Energy Development Plan (OREDP) – Interim Review May 2018.	Energy – Offshore Renewable Energy Energy – Transmission	National - Ireland	Documenting progresses and challenges against the OREDP (2014). Proposing next steps.	Report considers progress and challenges for the 10 next steps considered above, and proposes recommendations to support future progress broken down against the 10 next steps.	Clean - Green - Marine Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure	The introduction of the Net Zero Emissions by 2050 target will influence the emphasis placed on climate change mitigation, and likely continue to place importance on development of offshore wind which has become significantly more commercially viable over the period since HOOW. The first RESS Auction qualification is expected to commence on 9 March 2020 with 'regular' auctions thereafter. Following Brexit, identified need to progress Ireland - France interconnector.	Progress against the recommended steps is anticipated, supporting growth in offshore renewable sectors. Improvements in wind / wave / tidal technology should arise as a result of the test areas either in Ireland (AMETS / WestWave) or abroad (e.g. EMEC).	Medium	RPS and REMTec on behalf of the Government of Ireland. 2018. Offshore Renewable Energy Development Plan (OREDP) Interim Review May 2018. https://www.dccae.gov.ie/documents/OREDP%20Interim%20Review%2020180514.pdf
Future Trends in Celtic Seas	Energy - Petroleum Energy - Offshore Renewable Energy	Other - Celtic Seas	Reviewing the key drivers of change and modelling future scenarios for key sectors in the Marine Environment	The report is wide ranging across multiple topics. Results of models are sector and scenario specific, but show overall likely trends in the development of different sectors in 2017 to 2027.	Research, Knowledge, Technology & Innovation	The report was written before the UK exit from the EU, and as such does not take into account factors influencing the Celtic Seas as a result of this, (see the Brexit tab for more information).	Likely trends include an expected decline in Oil and Gas sectors and increases in Offshore Renewables, with the two potentially linked (i.e. greater focus on renewables = a lower reliance on oil and gas).	Low	ABPmer, (2016). Future Trends in the Celtic Seas, Summary Report, ABPmer Report No. R.2584a. A report produced by ABPmer and ICF International for the Celtic Seas Partnership, August 2016. http://futuretrends.celticseaspartnership.eu/downloads/R2584a%20Future%20Trends_Final%20Summary%20Report_5Aug2016.pdf
ESRI, 2020. Quarterly Economic Commentary, Spring 2020.	All sectors	National - Ireland	Measures imposed by national governments (including in Ireland) to tackle Covid-19 pandemic are having a major negative impact on global economic activity	ESRI estimates that if Covid measures are restricted to a 3 month period and national eocnomies recover thereafter, this will result in a reduction in GDP of 7.1% for 2020, with a short term increase in unemployment of 350,000. The scenario assumes that economic activity both domestically and internationally begins to recover significantly in Q3 and Q4 of 2020. If this does not occur, then the results would be even more adverse for the domestic economy. The disruption the virus causes to the economies of all of Ireland's major trading partners will significantly reduce consumption and business investment in these economies which in turn will result in a large fall in Irish exports. In the current environment, with an immediate and sharp adjustment in aggregate demand from households and firms, and an exceptionally high degree of uncertainty about the future trading landscape, it is likely that companies will pare back investment significantly.	Clean - Green - Marine Business Development, Marketing & Promotion Research	The economic impact of the Covid-19 virus began in March 2020.	The economic impact of the virus is likely to be much greater than the economic downturn caused by the 2008 financial crisis.	There is high confidence that the impacts will be worse than the 2008 crisis wit potential for the impacts to be considerably worse.	https://www.esri.ie/system/files/publications/QECSPRING2020.pdf
Article in Financial Times 30 March 2020	Fisheries	National - Ireland	Measures imposed by national governments to tackle Covid-19 pandemic are having a major negative impact on Irish fish exports	Closure of hotels and restaurants in Ireland and internationally have caused the collapse of many seafood prices. This has particularly affected key export markets to Europe and the Far East.	Clean - Green - Marine Business Development, Marketing & Promotion Research	The economic impact of the Covid-19 virus began in March 2020.	The economic impact on the fisheries sector will depend on how quickly recovery of key markets occurs	Low. Some recovery of markets would be expected over time, depending on the overall economic impact of the virus.	https://www.ft.com/content/2b9fad2b-0457-411a-8c57-ce8c472e7ce8

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Action Plan for Jobs 2018	fisheries	National - Ireland	The agri-food sector is one of Ireland's largest indigenous industries. The plan makes direct reference to HOOW. It is noted that BIM provides funding opportunities for the fishing fleet, aquaculture enterprises, seafood processing and coastal communities through the Fisheries Local Action Groups (FLAGs).	The plan seeks to provide support to food start-ups and to undertake commercial projects proposals, with the involvement of relevant government agencies.	Business Development, Marketing and Promotion - Research, Knowledge & Innovation infrastructure	The highest level of landings by Irish vessels in Ireland was in 2012 when 249,205 tonnes were landed. Recorded fish landings has seen 'seesaw' figures since 2012. While 2012 was the year with the highest number recorded, it was followed by a sharp decrease in 2013, and again a strong increase in 2014 and sharp decrease in 2015. Since, landings have consistently increased but never returned to levels previously observed. , The number has since decreased. Although, Irish vessels are increasingly landing more in foreign ports. BIM recorded a decrease in 15% growth of the aquaculture industry between 2017 and 2018. The government also provided at least €170m in funding to the Irish Seafood industry. Last, the difference between export and import recorded a year on year decrease of 6.5% in 2018. Export recorded a year on year decrease of 4% in 2018	It is unclear how Brexit will affect fishing particularly as the most important catch zone that for Irish fishermen is located in the west of Scotland and Rockall, with Rockall being a contested marine territory between Ireland and the UK. The Irish seafood economy grew by 3.4% between 2017 and 2018 thanks to increased private investment supporting government funding.	**Low -** statistics available shows that the policy is not yet yielding results and include limited action aimed at fisheries. Heavy reliance on BIM and unclear the amount of the support o be provided by other state agencies such as Enterprise Ireland to this particular industry.	https://dbei.gov.ie/en/Publications/Publication-files/Action-Plan-for-Jobs-2018.pdf
Agri-Food Strategy to 2030 - Public Consultation	fisheries	National - Ireland	The agri-food sector is one of the country's most important indigenous industry contributing to 7.7% of modified GNI in 2017). This Strategy will encompasses many of the themes covered by Food Wise 2025 but with a focus on sustainability. It has regards to current issues such as Brexit and the reform of the CAP.	Very uncertain for a number of factors: 1. the document acts as a issues paper for consultation purpose to gather views of stakeholders. It does not set a vision or objectives at this stage.	Clean- Green - Marine	this document is not a fully developed policy	Unclear	n/a	https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/agri-foodstrategyto2030/PublicConsultationDocument301019.pdf
Global Food Consumption Patterns of Interest to the Irish Seafood Sector 2019	fisheries; aquaculture	International	The document reviews global trends of seafood consumption with a view to identify possible future export markets.	Expected growth in export toward South Eastern Asia due to strong economic and population growth. Northern and western Africa also appear to be possible interest markets due to higher average prices for pelagic species. The study also notes Ireland has having one of the highest seafood consumption rates in the world.	Business Development, Marketing and Promotion	Trends reviewed in this document shows trends observed between 1961 and 2013 or a year after the publication of HOOW. Review of other sources shows that seafood export since 2013 have grown very strongly, particularly toward Asian markets with a year-on-year increase of 19% in value in 2018. Crab and prawns having experienced year-on-year growth of c. 25%. However, many other species such as salmon or mussels have experienced strong declines of over 20% at a minimum. Transformed fish products such as flours, meals and pellets have soared, showing very strong potential for export.	It is expected that in the short term, the Covid-19 crisis will impact very severely on Irish export to Asia and severely on the domestic market. However, in the medium to long term both should be recovering. A trend toward 'Buying Local' or 'Buying Irish' may emerge from the current crisis as consumers may be minded to support domestic economic recovery. It is unclear however, how exports to Africa will fare on the medium to long term.	Medium	http://bim.ie/media/bim/content/publications/fisheries/BIM-Global-food-consumption-patterns-of-interest-to-the-Irish-seafood-sector.pdf
National Policy Statement on the Bioeconomy - Project Ireland 2040 (2018)	aquaculture, fisheries, seaweed harvesting, rural coastal and island communities	National - Ireland	The bioeconomy can foster new employment opportunities as inputs are sourced nationally. This is particularly relevant for industries such as agri-food and marine sectors. This can also help support businesses located in rural and coastal areas with a view to combat rural decline. Ireland has a number of natural and comparative advantages for the development of the bioeconomy, specifically an extensive coastline which provide for opportunities for the development of new marine-biobased value chains	The statement envisages a number of actions to support the promotion of the bioeconomy, which regard governance, sectoral cohesion, the application of research into real world cases, possible legislative amendments.	Business Development, Marketing and Promotion	Much of the changes have occurred in the period 2018-2020. Number of funding streams at European levels and filtered through to national level via relevant agencies. Relevant projects have been successful in securing funds. Importantly an Implementation Group has been set up with a view to achieve the objectives of the statement.	The EU has been a strong proponent of the Bioeconomy and given that Ireland has both natural and comparative advantages, it is reasonable to assume that the industry would expand in the medium to long term. Short term expectations are limited as much of the industry is at infant and/or R&D stage and remains widely unknown to the greater public. It is also noted that the bioeconomy is strongly supported by Enterprise Ireland, as a sector to provide for new opportunities.	High	https://assets.gov.ie/2244/241018115730-41d795e366bf4000a6bc0b69a136bda4.pdf

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Blue Growth - Scenarios and Drivers for Sustainable Growth from the Oceans, Seas and Coasts.	shipping; tourism; safety at sea; telecommunication; marine aggregates and mining; aquaculture; fisheries	International	To take advantage if the potential offered by the sea, maritime activities need to be 'smartly' combined to allow for the creation of synergies and to build critical mass through innovation. Blue Growth is one of the pillars of the Europe 2020 Strategy. It can generate further growth. Maritime economic activities are expected to grow to estimated GVA of €590 billion and to 7 million persons employed. This report focuses on 11 activities out of the total 27 maritime economic activities. These 11 activities are forecast to be essential to the European Blue Economy.	The report proposes a series of 8 policy actions to stimulate blue growth as a driver for Europe as follows: Promote maritime Research & Development – in particular for the pre-development maritime economic activities to bridge the gap between research and market uptake;II) Boost access to finance – to foster maritime economic actors in the pre-development stage and to help overcoming the "valley of death"; III)Invest in smart infrastructure – for the mature maritime economic activities to flourish further; IV) Provide maritime cluster support – to have more critical mass of actors, also across EU Member States; V) Anticipate maritime skills needs – and attract skilled workers also in remote and peripheral places; VI) Promote maritime spatial planning – to overcome the increasing complexity of maritime spatial use and to increase public acceptance for pre-development and growth-stage marine economic activities; VII)Foster integrated local development – for a sustainable development of Blue Growth;VIII)Stimulate public engagement – a vital ingredient to fully unleash the Blue Growth potential. If those actions are implemented, they would allow for cohesive blue growth throughout the MS.	Governance; maritime safety, security and surveillance, clean - green - marine; business development, marketing and promotion; research, knowledge, technology and innovation; capacity, education, training and awareness, infrastructure; international and north / south cooperation	At Irish level, there has been good progress made. The Ireland's Ocean Economy (June 2019) provides the clearest data on how Ireland is contributing economically to Blue Growth, estimated that Ireland's Ocean Economy contributed to 2% of the GDP compared to a 1.2% baseline measured in 2007. This translates to a contribution of €4.2 bn GVA. The target contribution is 2.4% by 2030. Between 2016 and 2018, the maritime economy contribution to GVA grew by 11% with an increase in 13% in FTE as well as turnover.	In light of the recent widespread and worldwide economic crisis, it is unlikely that the objectives set out in the SEMRU report for 2020 be achieved. However, given the energy potential and technical capabilities in some Irish sectors, achieving objectives set out for 2030 is possible. It is unlikely that Ireland would not seek to achieve its energy targets and the market potential presented by offshore energy may be appealing. It is unclear in nominal terms, if growth assessed on a baseline of 2007 will be achieved due to 2007 being at the start year of the previous economic recession.	Medium - except for cruise tourism	https://webgate.ec.europa.eu/maritimeforum/system/files/Blue%20Growth%20Final%20Report%2013092012.pdf
DBEI Sectoral Briefs - Focus on Agri-Food and Beverages	fisheries, aquaculture	National - Ireland	The seafood sector contributed to €1.5 billion to the Irish economy in 2017.	The seafood sector is particular exposed to the fallout from Brexit.	Business development, marketing and promotion	The British People voted for Brexit in 2016. This resulted in substantial uncertainties pending trading agreements between the UK and the EU.	Unclear pending trade agreements as a result from Brexit. Negotiations will include inter alia consideration for continued access to the UK and maintaining the current access to fishing grounds in the UK zone of the Irish Sea, the Celtic Sea and north of Donegal, and protection of Ireland's quota share for joint fish stocks.	Low	https://dbei.gov.ie/en/Publications/Publication-files/Focus-on-Agri-food-and-Beverages.pdf
Enterprise 2025 Renewed		National - Ireland	Realise the potential of marine and maritime. This includes harnessing enterprise, innovation and research capabilities in natural capital management such as the marine, bio-	Develop and support the bioeconomy sector as it allows for a more circular economy and is indigenous, requiring less foreign input.	Clean - Green - Marine; Business Development, Marketing and Promotion	The bioeconomy sector is gathering pace and support from the both policy-makers and funders.	Bioeconomy to grow as it is in line with the principle of sustainable development and promotes a circular economy.	High	https://dbei.gov.ie/en/Publications/Publication-files/Enterprise-2025-Renewed.pdf
DBEI Sectoral Briefs - Marine and Maritime	fisheries, tourism, aquaculture, ports, harbours and shipping, social benefits	National - Ireland	Rapid changes in regulations and governance and growing pressure on available resources and space. Changing distribution of resources due to climate change, and environmental issues and climate targets. The brief also notes public perception and acceptance of marine-based development as an issues.	Increased regulations can impact on the short term on the fluidity of activity but as its objective is partially to clarify the use of space and resources, it will allow for the promotion of marine and maritime nationally and internationally.	Clean - Green - Marine; Business Development, Marketing and Promotion; Governance	The Irish marine and maritime sector saw its contribution to the GVA increased by 21.9% between 2015 and 2017. It is one of the fastest growing industry in Ireland, particularly since HOOW.	Growth forecast of the global market from $1.5 trn to $ 3.2 trn by 2030. OECD considers that some sub-segments of the markets will grow faster than others namely marine aquaculture, capture fisheries, fish processing, offshore wind and port activities. Brexit poses considerable challenges nonetheless.		
Food Harvest 2020	fisheries, aquaculture	National - Ireland	Objective is the chart the direction of the agri-food sector between 2010 and 2020. It targets an increase in the value of primary outputs, increasing the value added by €6 bn; achieving an export targets of €12 bn (an increase of 42% from the 2007-2009 average). The policy is very much industry led and not supported by Strategic Environmental Assessment. At time of drafting the sector was assessed as having an estimated sale value of €700 million and employing 11,000 people. The policy notes the then upcoming reform of the CFP as being of critical importance. Other issues noted are the vulnerability of the sector to fuel costs and global trade patterns.	The objective in relation to seafood was to increase revenue to €1 bn and employment to 14,000 persons FTE by 2020 in sea fisheries and aquaculture. Production of wild fish is regulated at EU and national level and the then reform of the CFP could impact on allowable catches, therefore impacting revenue. The policy proposed four recommendations regarding R&D strategies for the seafood sector, a proposed increase in share of catch being processed by Irish companies, to allow for added value in Ireland using both landings from Irish and foreign vessels; the development of innovative consumer seafood products and the development of R&D programmes aimed at marine biotechnology and marine functional foods. Finally, seafood sector is now valued at €850 million so an increase from the €700 million.	Business Development, Marketing and Promotion; research, knowledge, technology and innovation; capacity, education, training and awareness	CFP reform in 2014 which puts quotas on certain types of fish to allow for sustainable fishing. European Maritime and Fisheries Fund has been put in place to provide financial assistance so that relevant communities can continue to fish sustainably and develop new sources of revenue. The CFP also seeking to eliminate discarding which resulted in new landing obligation being put in place. The EMFF help Ireland fulfil its obligations through the intermediary of DAFM and other relevant agencies. The Irish EMFF Operational Programme supports coastal communities and small scale fisheries through the FLAGs. Sea fisheries recorded a drop in direct turnover in the immediate aftermath of the reform, but has strongly recovered since showing incremental increases year on year to reach level higher than pre-reform. Both sectors present increases in employment as well, this is particularly strong in the marine aquaculture sector	The EU has committed to providing further €6.14 bn EMFF funding to progress the implementation of CFP changes between 2021 and 2027. It is expected that there will be continued support to Irish sea fisheries and aquaculture sectors.	High - strong government and relevant support. EMFF commitment to 2027.	https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodharvest2020/2020FoodHarvestEng240810.pdf

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Renewable Electricity Support Scheme (RESS)	Energy – Offshore Renewable Energy	National - Ireland	The RESS will provide support for renewable electricity projects with a focus on cost effectiveness. A range of auctions will be held to encourage the development of projects to support the countries ambition of supplying 70% of electricity through renewables in Ireland by 2030. It will deliver on a range on policy objectives including increasing technology diversity.	The first auction aims to deliver up to a 3,000GWh increase in renewable electricity generation by the end of 2022.	Clean - Green - Marine Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure	RESS has been set up with the aim to increase renewable energy in Ireland, up to 70% by 2030 which was set out in the draft National Energy and Climate Plan.	The first auction will encourage development of renewable energy in Ireland.	Low - with no previous auctions to base confidence on, the uncertainty is high.	Renewable Electricity Support Scheme (RESS) https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/electricity/renewable-electricity-supports/ress/Pages/default.aspx
EirGrid Group Strategy 2020-2025	Energy – Offshore Renewable Energy Climate Change	National - Ireland	EirGrid aim to lead the electricity sector on sustainability and decarbonisation in line with the Climate Action Plan 2019. This will be done by actions such as accommodating more renewable energy, new infrastructure and upgrading the power system to make it more robust to prepare for renewable energy. Currently the grid can operate with 65% renewable power, but ideally want to increase this to 95% by 2030.	Increase the capacity for renewable energy in Ireland energy. It is estimated to cost 2 billion Euros.	Clean - Green - Marine Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure	The Climate Action Plan set targets for the increase of renewable energy in Ireland	Technology, infrastructure development and partnerships will transform the electricity grid by 2030 with renewable energy accounting for 70% of electricity in Ireland	Low - relies on policy makers and regulators to approve investments and similar ambitions from partnerships	EirGrid Group Strategy 2025 http://www.eirgridgroup.com/about/strategy-2025/EirGrid-Group-Strategy-2025-DOWNLOAD.pdf EirGrid Newsroom 26 September 2019 http://www.eirgridgroup.com/newsroom/eirgrid-group-strategy-20/
Report on the Blue Growth Strategy - European Commission 2017	Biodiversity Energy - Offshore Renewable Energy Aquaculture Marine Aggregates and Mining Ports, Harbours and Shipping Tourism	European	In 2012, the Blue Growth Strategy was formed to harness the potential of European waters for sustainable growth and jobs. The strategy aimed to provide long-term support. The Blue Economy represents 5.4 million jobs and generates 500 billion Euros per year.	Since 2012, the European Commission has undertaken a series of actions, such as launching initiatives in policy related areas and facilitating cooperation between different sectors and stakeholders. For example, funds have been set up such as the European Regional Development Fund and the European Maritime and Fisheries Fund which aim to help towards policy related projects. The Horizon 2020 research programme to promote collaboration between countries and between scientists and different sectors.	Governance Clean - Green - Marine Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure International & North / South Cooperation	The Commission has launched initiatives in many policy related areas	There is likely to be future funding in line with a variety of policy drivers. Collaboration between different sectors will may increase.	Low	Report on the Blue Growth Strategy https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/swd-2017-128_en.pdf Blue Growth – Opportunities for marine and maritime sustainable growth, COM(2012)494 https://www.eea.europa.eu/policy-documents/com-2012-494-final-blue
Food Wise 2025 (incl. Implementation Plan)	fisheries, aquaculture	national	Develop greater processing scale to capitalise on expanded supply of raw material available to Irish processors from the increased output from aquaculture and from lands into Ireland from foreign vessels. Decrease the amount of seafood exported from its current 70% level. Seeks to develop advantage in the marine biotechnology field.	Expected impact include the expansion of the raw material base, enhancement of the industry's structure and skills and the optimisation of the product added value, as well as export markets and environmental sustainability.	Business Development, Marketing and Promotion; research, knowledge, technology and innovation; capacity, education, training and awareness	This policy is the replacement of Food Harvest 2020, so much has been covered under that header.	Potential amendments to aquaculture licensing as a result of an independent review of the system seeking to identify its shortcomings. Development of a number of strategies which regard: the expansion of shellfish and aquaculture production; the increase of seafood added value across all main species groups and food ingredients with a view or reduce the level of produce sold in commodity form from 70% to 50%. Improved environmental sustainability of the sectors renewed interest in R&D, with a particular focus on food ingredients, product development and functional foods.	High- Food Harvest 2020 was a very successful policy document, although it did overestimate the levels to be achieved by the seafood sector. This gives confidence in the potential success of Food Wise 2025.	https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/report/FoodWise2025.pdf

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Future Trends in the Celtic Seas	Fisheries; Energy - Offshore Renewable Energy; Ports, Harbours and Shipping; tourism; MPAs	International	Sets out three scenarios which review the economic, social and environmental impacts under the influence of a series of drivers in the Celtic Seas over a period of 20 years. Some of the drivers identified include the Atlantic Action Plan which is forecast as potentially increasing level of economic activity; MSFD and the CFP which aim for adequate protection of the marine environment. The analysis report notes that while these drivers promote the application of the EBA it will be challenging due to the complex nature of marine systems. The 3 scenarios for consideration are: 'business as usual'; 'nature at work' and 'local stewardship'. The scenarios report identifies three 'sectors' which would trigger the highest magnitude of direct negative interactions as being hard coastal defence and commercial fisheries as they interact with nature conservation and the interaction between offshore wind with commercial fisheries.	The analysis establishes that levels of economic activities would increase in all three scenarios i.e. presenting an increase ranging from 31%/1.4% per annum (under the Business as Usual scenario) to 47% / 2% per annum (under the Nature at work scenarios). It considers that ports and shipping would grow from contributing to 51% of the total maritime GVA to contributing to up to 60% (Business as Usual), to 53% (Nature at Work) but would fall to a 45% contribution under the Local Stewardship scenario by 2036. Tourism is unlikely to be a key driver over the next 20 years with very low growth rates. It would perform better under the Local Stewardship scenario. Commercial fisheries are predicted to grow annually by 0.6 to 0.8%. Marine aggregates are expected to grow by 1.1% and 0.8% annually respectively under the Business as Usual and Nature at work scenarios but would more than double in size under the Local Stewardship scenario. The introduction of new actors or the increase of level of economic activity in certain sectors will put pressure on marine space, including but not limited to competition for space. This will likely be particularly prevalent for fisheries which will be negatively impacted by the designation of MPAs and will see access restricted or their activities displaced as a result of the deployment of wind energy.	Clean - Green - Marine; Governance; Infrastructure; International & North / South Cooperation	Progress has been made on the preparation of the NMPF which will rationalise the use of space. The draft NMPF as it stands give precedence to ORE which should allow theoretically it to grow to its anticipated potential. This statement precludes considerations for MPAs, of which the designation has not progressed since HOOW, owing to the lack to legal footing. The lack of MPA could eventually turn out to be significant obstacles as consent for ORE will be particularly open to legal challenge. In addition, precedence of ORE would have an impact on the expansion of marine aggregates as activities are unmovable.	It is expected that offshore wind will see a significant expansion within the Irish territorial waters over the next 20 years once a marine plan and new legislation is adopted by the Government. This will undoubtedly put pressure on commercial fisheries, which are already under pressure from the CFP reform. Marine aggregates will also suffer from the expansion of offshore wind as such resources are unmovable and not given precedence in the draft NMPF. However, the EU has carried significant works on its EU Raw materials programme. It has been actively looking at diminishing its reliance on imported minerals and may incentivise a more regional production of certain critical raw materials and a renewed interest for marine aggregates and deep sea mining. It is noted that mining and extraction are supported at government level but have been dropped from regional planning policy denoting a lack of political interest. At time of drafting this report, it is highly unclear how Covid 19 will impact on tourism and how the sector will recover in the aftermath of the sector.	High	https://dbei.gov.ie/en/Publications/Publication-files/Future-Jobs-Ireland-2019.pdf
The EU Blue Economy RepoAll		International	The report analyses the size of the Blue conomy in the EU MS wiith a view to provide evidence for future polic-making. In relation to Ireland, it uses data collected and analysed by SEMRU. It notes in particular that the most singificant expansion of the Blue Economy between 2007 and 2017 is in Ireland, with employment growing by 20%. Ireland's average annual salary in 2017 in the EU blue economy was higher than the EU average annual of €26,400. It considers that the Blue Economy in general is influenced by macroeconomic developments, specifically the 2008-2009 global financial crisis. While all sectors present increased contribution to GVA, extraction of non-living resources such as oil and gas has significantly decreased. This is inputted to the high cost of extraction operations. Maritime transport is also observed as decreasing but on a much lower level with a decrease of 3% over the review period. Coastal tourism, port activities are	This reports consist of an aggregation of data and evidence collected at national level by MS. It refers to increased contribution over the review period by offshrore, wind, ocean energy and blue bio economy and biotechnology, marine minerals and desalination with futher potential for growth and jobs.	Clean- Green - Marine	Increased in Blue Economy employment (2.2% of total national employment in 2017 compared to 2.1% in 2012). Blue Economy GVA has increased by 47% over the same period, but its share in the national economy remained the same for established blue economy sector.	Continued growth of established sectors. As offshore wind is developed in Ireland, it will contirbue to both jobs and the GVA.	high	https://op.europa.eu/en/publication-detail/-/publication/676bbd4a-7dd9-11e9-9f05-01aa75ed71a1/language-en/
BIM - Statement of Strategy 2018-2020	aquaculture, fisheries, seaweed harvesting, rural coastal and island communities	National - Ireland	Support and enable an increase in value creatioon of a sustainable Irish seafood sector across the supply chain from catch to consumer	BIM promotes the Irish seafood sector as 'sustainable' and 'responsible'. To that effect, it develops programmes which seeks to drive sustainability in seafood.	Clean - Green - Marine; Business Development, Marketing and Promotion	Development of Origin Green and achievement of 100% organic salmon. Launch of Fishing for Litter initiative	Continued number of trawlers to sign up to the Fishing for Litter initiatives. Continued development of green and sustaianble programmes to move toward sustainability in seafood indsutry.	high	http://www.bim.ie/media/bim/content/publications/corporate-other-publications/BIM-statement-of-strategy-2018-2020-enabling-sustainable-growth.pdf
The Business of Seafood 2016 (BIM, 2016)	aquaculture, fisheries	National - Ireland	Presents a snapshop of Ireland's seafood sector in 2016.	None,as not the purpose of the report. Dissemination of economic data	Business Development, Marketing and promotion	Shows an expansion of the fleet involved in aquaculture, beamer and pelagic but decrease of the polyvalent fleet. Shows a continuous increase in aquaculture production (volume and value) between	Continued increase in aqucaculture response to quota	high	http://www.bim.ie/media/bim/content/publications/corporate-other-publications/BIM-the-business-of-seafood-2016-1.pdf
The Business of Seafood 2018 (BIM, 2018)	aquaculture, fisheries	National - Ireland	Presents a snapshop of Ireland's seafood sector in 201.	None,as not the purpose of the report. Dissemination of economic data	Business Development, Marketing and promotion	Shows strong growth in domestic consumption ad private investment since 2017 and no growth in governmental investment	Unlikley to see growth in government investment for the foreseeable future in light of public health crisis	high	http://www.bim.ie/media/bim/content/publications/corporate-other-publications/BIM-Business-of-Seafood-2018.pdf
Covid-19 and the Irish Hospitality Sector (PwC, 2020)	Tourism	National - Ireland	Presents the impact of Covid-19 on the Irish hospitality sector and options for recovery	None. Analysis of the ongoing public health crisis.	Business Development, Marketing and promotion	Covid-19 is a pandemic and therefore unforeseen.	Recovery will depend on the duration of the application of social distancing measures	low	https://www.pwc.ie/publications/2020/hospitality-sector-covid19-impact-and-options.pdf

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Ireland's Ocean Economy June 2019 (SEMRU 2019)	all	National - Ireland	Provides a yearly snapshot of established and emerging maritime sectors in Ireland.	Provides a snapshot of the Irish Blue Economy with a view to monitor progress. Fed into the ongoing process of the NMPF.	All	See other sections	Uncertain due to Covid-19 and Brexit. But strong potential displayed in energing sectors which will keep progressing.	Medium	https://www.nuigalway.ie/media/researchsites/semru/files/Online_Irelands-Ocean-Economy-Report_for-web final pdf
BIM National Seafood Survey - Aquaculture Report 2019	aquaculture	National - Ireland	Provides a yearly snapshot of the aquaculture industry in Ireland	Provides a snapshot of the Irish aquaculture with a view to monitor progress. Fed into the ongoing process of the NMPF. Also gforms evidence-baseed policy by DAFM	Business Development, Marketing and promotion; Research Knowledge, Technology and Innovation	Strong growth in the aquaculture indsutry. Achievement of 100% organic salmon prodcution	Aquaculture to continue to strenghen in response to demand for sustainably farmed food.	Medium - largely export driven	http://www.bim.ie/media/bim/content/publications/aquaculture/BIM-National-Seafood-Survey-Aquaculture-Report-2019.pdf
Joint Sub-Committee on Fisheries - Report of Promoting Suatainable Rural Coasatl and Island Communities (Oireachtas,	fisheries; aquaculture; rural coastal and island communities; seaweed harvesting	National - Ireland	Seeks to identify how rural coastal communities could be supported in a more holistic and sustainable manner, Includes a number of recommendations.	Review of policy and licencing regimes was recommended and brought forward. It also recommended that a socio-economic profile of rural coastal and island communities be prepared in asscoaition with the CSO and BIM. Recommended that strategies for rural and isalnd communities be developed.	All - except maritime surveillance and safety	Review of policy and licencing regimes was recommended and brought forward.	Development of the socio-economic profile is likely in the near future as it would better inform the achievement of the objectives and goals of the NMPF.	Medium - partial implementation to date	https://webarchive.oireachtas.ie/parliament/media/draft-3-final-report-on-promoting-sustainable-rural-coastal-and-island-communities.pdf
Wild Atlantic Way - Opeational Programme 2015 -2019	tourism	National - Ireland	Sets out the steps for the development and implementation of WAW along the Atlantic Coast. It is accompanied by funding to enable a cohesive initiative	WAW is a national tourism initiative seeking to showcse the West of Ireland on an international scale. It has been coupled with substantial investment to allow for the establishment of a cohesive image along the coast.	Business Development, Marketing and promotion;	WAW is now part of all levels of planning policies ensuring its implementation and impact	It showed strong potential since its layunch but there is currently limited data specifically measuring its impacts. It is expected that progress will be measured in the coming years.	Medium - depends on recovery from Covid -19 and Brexit	https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/Key%20Projects/Wild-Atlantic-Way-Operational-
Irish Lights Strategy 2018-2023 'Safe Seas - Connected Coasts'	Safety at Sea Ports, Harbours and Shipping Tourism Cultural and Heritage Assets Rural, Coastal and Island Communities	National - Ireland National - Other (UK)	5-year strategy for Irish Lights as a statutory maritime safety organisation delivering 24/7 safety and navigation services around the coast of Ireland (North and South) 365 days a year. Maps vision for the delivery of next generation maritime services to protect lives, property, trade and the environment.	Commits Irish Lights to implementing a combination of new and existing navigation technology, engineering and data management solutions to facilitate Safe Navigation at Sea for commercial shipping, fishing, leisure craft and passenger vessels. Sets six outcomes in delivering navigation, safety and allied maritime services and supporting the growth of the maritime economy: For the Safety of All; International Maritime Leadership; Technological Innovation; Collaboration and Partnership; Contributing to the Wider Maritime Economy; Safeguarding the Past for the Future.	Governance; Maritime Safety, Security and Surveillance; Clean - Green - Marine; Business Development; Marketing and Promotion; Research, Knowledge, Technology and Innovation; Infrastructure; International and North/South Cooperation.	Irish Lights has implemented a major programme of change coinciding with the timeframe of HOOW, delivered against a backdrop of significant financial and operational challenges. It has resulted in the cost effective provision of a suite of diverse, high quality, technologically enabled, navigation and allied commercial, value added services. It has created a leaner, more agile organisation which provides a solid platform for the future as the next phase of development progresses, driven by the current Strategy to 2023. In addition, *Great Lighthouses of Irleand* - a new innovative all island lighthouse tourism initiative - was successfully launched internationally, protecting and developing unique maritime heritage assets for the public good.	Given the need for international standardisation to serve a global industry, Irish Lights intends to exercise a broader leadership role and influence on delivery of next-generation navigation and safety services, including Aids to Navigation as a Critical National Infrastructure. By proactive engagement with international bodies (IALA, IMO, IHO, ITU), it will seek early influence on policy, regulation and standards Irish Lights will also strengthen the contribution that it makes to the wider maritime economy by targeting its expertise, asset base and proven technological capabilities to deliver maximum value and public-good services in the interests of stakeholders, coastal communities and the wider economy. It will continue to provide active input to the development of the NMPF and provision of advice and support services to ensure that safe and efficient navigation is fully considered in the Maritime Spatial Planning process	High	https://www.irishlights.ie/media/51977/safe-seas-connected-coasts-irish-lights strategy-2018-2023.pdf
Irish Lights Strategy 2018-2023 'Safe Seas - Connected Coasts'	Safety at Sea Ports, Harbours and Shipping Tourism Cultural and Heritage Assets Rural, Coastal and Island Communities	National - Ireland National - Other (UK)	5-year strategy for Irish Lights as a statutory maritime safety organisation delivering 24/7 safety and navigation services around the coast of Ireland (North and South) 365 days a year. Maps vision for the delivery of next generation maritime services to protect lives, property, trade and the environment.	Commits Irish Lights to implementing a combination of new and existing navigation technology, engineering and data management solutions to facilitate Safe Navigation at Sea for commercial shipping, fishing, leisure craft and passenger vessels. Sets six outcomes in delivering navigation, safety and allied maritime services and supporting the growth of the maritime economy: For the Safety of All; International Maritime Leadership; Technological Innovation; Collaboration and Partnership; Contributing to the Wider Maritime Economy; Safeguarding the Past for the Future.	Governance; Maritime Safety, Security and Surveillance; Clean - Green - Marine; Business Development; Marketing and Promotion; Research, Knowledge, Technology and Innovation; Infrastructure; International and North/South Cooperation.	Irish Lights has implemented a major programme of change coinciding with the timeframe of HOOW, delivered against a backdrop of significant financial and operational challenges. It has resulted in the cost effective provision of a suite of diverse, high quality, technologically enabled, navigation and allied commercial, value added services. It has created a leaner, more agile organisation which provides a solid platform for the future as the next phase of development progresses, driven by the current Strategy to 2023. In addition, *Great Lighthouses of Irleand* - a new innovative all island lighthouse tourism initiative - was successfully launched internationally, protecting and developing unique maritime heritage assets for the public good.	Given the need for international standardisation to serve a global industry, Irish Lights intends to exercise a broader leadership role and influence on delivery of next-generation navigation and safety services, including Aids to Navigation as a Critical National Infrastructure. By proactive engagement with international bodies (IALA, IMO, IHO, ITU), it will seek early influence on policy, regulation and standards Irish Lights will also strengthen the contribution that it makes to the wider maritime economy by targeting its expertise, asset base and proven technological capabilities to deliver maximum value and public-good services in the interests of stakeholders, coastal communities and the wider economy. It will continue to provide active input to the development of the NMPF and provision of advice and support services to ensure that safe and efficient navigation is fully considered in the Maritime Spatial Planning process	High	https://www.irishlights.ie/media/51977/safe-seas-connected-coasts-irish-lights strategy-2018-2023.pdf

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The Business of Seafood 2018 (BIM, 2019)	aquaculture, fisheries	National - Ireland	Presents a snapshop of Ireland's seafood sector in 2018.	None,as not the purpose of the report. Dissemination of economic data	Business Development, Marketing and promotion	Shows strong growth in domestic consumption, with small decline in value of aquaculture but strong growth in value of Irish seafood. Notes a strong growth in landings value by Irish and foreign vessels	Unlikley to see growth in government investment for the foreseeable future in light of public health crisis	high	http://www.bim.ie/media/bim/content/publications/corporate-other-publications/BIM-Business-of-Seafood-2019-Spreads.pdf
IPORES (IMDO, 2018)	ports and harbour, Energy - Offshore Renewable Energy	National	Review the ports and harbours' capacity around Ireland with a focus on their preparedness to accommodate the needs of the offshore renewable industry.	The report is widely regarded in the industry. Arklow was selected by SSE as its base.	Business development	This is the second iteration of IPORES. Some developments have planned / and being implemented by a number of ports with a ciew to potentially accommodate ORE	Tier 2 and Tier 3 ports and harbours which are used for offshore renewables will become key generators of local employments. Improved ports and harbour infrastructure.	High	https://www.imdo.ie/Home/sites/default/files/IMDOFiles/13390%20IMDO%20IPORES%20Report%202018%20FA.PDF
Harnessing our potential - Investment and Jobs in Ireland offshore wind industry (IWEA, 2020)	ports and harbour, Energy - Offshore Renewable Energy	national	Reviews the necessary steps to enable the delivery of 3.5 GW of ORE by 2030.	The report was commissioned by an interest group so it therefore expected that it will drive the agenda of requests by the industry. Considers the need to develop offshore wind enterpirse zones.	Business Development, Marketing and promotion; Research Knowledge, Technology and Innovation	Proposed MPDM Bill and draft NMPF.Clear governmental commitment to enact the former to allow for the development of ORE.	Enactment of MPDM Bill, adoption of the NMPF, first round of offshore wind RESS. Potential designation of offshore wind enterprise zones	High	https://www.iwea.com/images/files/final-harnessing-our-potential-report-may-2020.pdf
July Jobs Stimulus Plan (GoI, 2020)	Fisheries; Tourism	National	The document sets out the next phase to stimulate economic recovery in light of Covid-19. It includes allocation of €7.4 bn to help business reopen, get people back to work and promote confidence.	€10m allocated in fishery and on-farm renewable energy investment; €10m allocated to support business engaging in green research, development and innovation. €10m allocated to tourism sector.	Business development, Technology and Innovation	Covid-19 has been the trigger for the stimulus programme. Since 2012, Ireland's economy had largely recovered with full employment levels reached.	Further announcements will be expected as part of the October budget. It is unclear however what sectors will be the subject of further support	Medium	https://www.gov.ie/en/publication/c48ab-july-jobs-stimulus/

A.4 Social

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Future Trends in the Celtic Seas	Fisheries; Energy - Offshore Renewable Energy; Ports, Harbours and Shipping; tourism; MPAs; sports and recreation; rural coastal and island communities	International	Sets out three scenarios which review the economic, social and environmental impacts under the influence of a series of drivers in the Celtic Seas over a period of 20 years. Some of the drivers identified include the Atlantic Action Plan which is forecast as potentially increasing level of economic activity; MSFD and the CFP which aim for adequate protection of the marine environment. The analysis report notes that while these drivers promote the application of the EBA it will be challenging due to the complex nature of marine systems. The 3 scenarios for consideration are: 'business as usual'; 'nature at work' and 'local stewardship'. The scenarios report identifies three 'sectors' which would trigger the highest magnitude of direct negative interactions as being hard coastal defence and commercial fisheries as they interact with nature conservation and the interaction between offshore wind with commercial fisheries.	The study considers that income and employment are the most tangible social benefits of the maritime economy. Under the three scenarios, employment is set to grow with varying and variable stability or within a range between 495,000 and 535,000 jobs by 2036 representing forecast increases ranging between 22% and 32% from 2016 for direct employment only. Shipping and ports as the main key maritime sector would itself see an increase of ranging between 50,000 (Local stewardship) and 110,000 jobs (BAS/NaW). Employment in tourism and recreation would see increases between 0% and 1.8% per annum or up to 45,000 jobs. The study considers challenges associated with the sector which is largely operating on a seasonal basis and which taskforce consists of much low wage workers. Health and well-being benefits are also	Clean - Green - Marine; Business Development, Marketing & Promotion	The blue economy has grown consistently since HOOW and since the Future Trends report was prepared, resulting in the creation of job opportunities and therefore benefits. There has been substantial efforts by the EU and Irish actors to mitigate the impacts of the CFP on smaller rural communities which are reliant on fisheries. In addition, there has been a movement toward Local Stewardship with numerous endeavours such as Beach Clean events.	Available data and experience in other countries such as Belgium point toward an increase of job opportunities relating to the Blue Economy. Compliance with environmental safeguards such as the WFD, MSFD and the BWD will allow for improved water quality and environmental conditions which will in turn provide for health and well-being benefits.	High	http://futuretrends.celticseaspartnership.eu/downloads/R2584e%20Future%20Trends_Final%20Analysis%20Report_5Aug2016%20(1).pdf
National Landscape Strategy for Ireland 2015 - 2025	Seascape and Landscape; social benefits	National - Ireland	Ensure compliance with the European Landscape Convention and establish the principles for protection and enhancment of the landscape to achieve a balance bteween protection, management and planning.	Strategy is to be taken into account in planning decision-making in accordance with the Planning and Development Act 2000, as amended.	Governance	On foot of Action 2 regarding the use of GIS mapping, a number of database platform have been developed including hertitagemaps.ie and the GSI Spatial Resources platform inter alia.	Seascapre character assessment to be completed by the team commissioned by MI in 2019. Seascape and landscape to considered in development management process for ORE. Completion of the natinal character assessment and of the natinal landscape charcacter map.	Medium - no progress on key actions as indicated in the strategy specifically the national landscape character map. Seascape mapping pursued by MI.	https://www.chg.gov.ie/app/uploads/2015/07/N-Landscape-Strategy-english-Web.pdf
Oireachtas Joint Sub-Committee on Fisheries - Report in Promoting Sustainable Rural Coastal and Island Communities	Fisheries; seaweed harvesting	National - Ireland	The report recognises that thee has been instances of over fishing of certain stocks as a result of commercial opportunity. As result sustainable aquaculture is perceived as an option to cater for demand while sustaining the livelihood of coastal communities. The key issue is how compliance with the Natura Directives can be reconciled with aquaculture licensing. Need to diversity and avoid reliance on only a couple of species. Need to develop tourism strategies coupled with capital investment to develop infrastructure. The report also considers the need to review the legislation for seaweed harvesting.	Includes recommendations: a) Promote inter-departmental / agency collaboration to obtain better data (BIM/CSO) with a view to build more complete socio-economic profiles. b) considerations for existing policy and licensing regimes. C) development of strategies for rural and island communities.	Governance; Cacptiy, Education, Training & Awareness	SEMRU has fone considerable work on building a socio-economic profile of rural coastal communities as reported in the yearly Ireland's Ocean Economy reports. Now 7 FLAGs established in Ireland with rolling funding and project evaluations carried out on a quarterly basis.	In short to medium term, rural/coastal communities likely to continue to rely on inshore fishing (up to 12nm) and aquaculture.	High	https://webarchive.oireachtas.ie/parliament/media/draft-3-final-report-on-promoting-sustainable-rural-coastal-and-island-communities.pdf
Socio-Economic Impact Review of the Great Lighthouses of Ireland Initiative - KHSK Economic Consultants	Cultural and Heritage Assets; Rural, Coastal and Island Communities; Social Benefits; Tourism.	National - Ireland	A review of the Great Lighthouses of Ireland initiative and its socioeconomic impact	Support Blue Growth Strategy and local economic development in remote coastal areas and marginalised communities by leveraging Irish Lights' built and maritime cultural heritage assets in the context of community development through social enterprise.	Business Development, Marketing and Promotion; International and North/South Cooperation.	The establishment of the Great Lighthouses of Ireland tourism initiative is a key enabler for coastal tourism and is an important initiative for Ireland's coastal communities. It places an emphasis on supporting coastal communities whilst recognising the strategic value of Irish Light's heritage assets to Ireland. Focussed maritime tourism & heritage initiatives will help address the ever increasing societal issue of rural divide, aging population and rebuilding coastal communities by stimulating local economies to help sustain livelihoods in remote parts of Ireland. In 2018 Great Lighthouses of Ireland partners recorded a combined total of 143,580 visitor sales and accommodation partner reporting occupancy rates of 49.4%.	It is difficult to predict given the current COVID crisis and expected recovery phase. Significant interest in lighthouse tourism which creates wider economic impacts as outlined in this recent independent Economic Impact Assessment commissioned by Irish Lights. The impact of social distancing measures could result in some visitor attractions becoming unviable from an operations and financial point of view. However this should be balanced by an increased domestic market demand which will support a quicker recovery.	High (except for COVID impact)	Socio-Economic Impact Review of the Great Lighthouses of Ireland Initiative - KHSK Economic Consultants - Report to Commissioners of Irish Lights - April 2019

A.5 Technological

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
2018 National Policy Statement on Electricity Interconnection	Energy – Transmission	National - Ireland	Looks to the requirement for increased infrastructure between Ireland and the UK / the EU.	Identifies that increased capacity in the electricity grid transmission to the UK and EU is part of the strategy, recognising that in the light of the UK decision to leave the EU, pursuit of an interconnector to at least one EU country is required in order to function as part of the EU Energy union. The investment in transmission infrastructure is recognised as providing economic and social benefits.	Infrastructure	The Greenlink cable between Ireland and Wales is currently applying for consent. Increase in renewable energy further increase the requirement for an integrated energy grid in the EU.	Likely that as a minimum there will be the development of an interconnector between Ireland and the UK and one between Ireland and France.	High	Government of Ireland, 2018. National Policy Statement, Electricity Interconnection. https://www.dccae.gov.ie/en-ie/energy/publications/Documents/19/National%20Policy%20Statement%20on%20Electricity%20Interconnection.pdf
EU Energy Union Strategy	Energy – Transmission Energy – Offshore Renewable Energy	European	Sets out the european strategy for the development of an Energy Union and aims to develop in five ways: 1. diversification of energy source through cooperation between states 2. enable the flow of energy throughout the EU through adequate infrastructure 3. improve energy efficiency 4. decarbonisation, partially through leading in renewable energy 5. support research, innovation and competitiveness to support breakthroughs in low-carbon and clean energy technologies.	The key impacts for Ireland are likely to be the requirements for the increases in transmission capability, for which the development of transmission infrastructure between Ireland and the EU (most likely France) will be required. In addition, Ireland is well placed to support increased renewable energy, with development of offshore wind and marine renewables expected. In addition, Irelands provision of testing areas for Marine renewables will support the resarch and innovation required to drive a low-carbon economy.	Infrastructure Clean - Green - Marine	The strategy for the Energy Union was published in 2015 and is as such a new strategy, however some of the goals are similar to those already in place before or as part of HOOW. The key change is the UK Exit from the EU and as such from the Energy Union, which will necessitate the development of transmittion infrastructure between Ireland and mainland Europe.	The development of ORE and transmission infrastructure as part of the Energy Union is expected to continue. The proposed celtic interconnector (Ireland - France) is expected to progress to support the Energy Union.	Medium	European Union. 2018. EU Energy Union Strategy. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN
Research Priority Areas 2018 to 2023	Tourism; seascape and landscape; Energy - offshore renewable energy	National - Ireland	Sets out research priorities for a number of sectors in Ireland. ICT holds a very strong position owing to a strong national technical capability. It considers using Irish technological capabilities to realise opportunities in creatingm operating and delivering across digital media through hardware, software and media development. It also notes electricity decarbonisation as a priority.	Digital progress can help showcase the Irish landscape, a key driver of the tourism industry. The documents highlights strong capabilities at Irish level to develop experiential tourism inter alia. Capabilities have been identified as well in developing IT in the energy system and robotics	Clean - Green - Marine ; Infrastructure ; Business development, marketing & promotion	A number of Visitor Expreince Development Plans have been developed for coastal and island attractions, such as the Skellig, the Connemara Coast and Arran Islandm the Burren and Cliffs of Moher. A number of test sites were granted licenses / lease which will allow for testing of technology and ICT with a particular focus on innovative technologies to support real-time information gatehring.	Ireland will continue to support its ICT industry through funding for research and innovation owing to very strong national capabilities.	Medium - it is unclear how much funding would be available in the short term. However, funding opportunities may arise for other sources such as the EU or private R&D programmes.	https://dbei.gov.ie/en/Publications/Publication-files/Research-Priority-Areas-2018-to-2023.pdf
DBEI sectoral Briefs - Transport & Logistics (also applies to economic)	ports, harbours and shipping; safety at sea	National - Ireland	Technology is transforming the trasnport sector through the use of data analytics for performance improvements. Techonological developments in Intelligence Awareness systens can be applied to shipping to enhance safety. Technology can also be trasnformative for ports.	Uptake in technology in port can reduce the need for manpower and can shift the way ports traditionally operate. IT integration in ship can reduce risks of collision and improve safety at sea. Increased use of autonomous technology in shipping, althouhg it is noted that unlilely those will be applied to large cargo ships. On the other hand, technological development and its uptake will require upskilling of exsiting workforce and development new skills	Clean - Green - Marine ; Infrastructure; Research, Knowledge, Technology and Innovation	Ireland is heavily dependent on ports for trade as most imports and exports enter / exit through a ports. There has been a subtsantial increase in freight since the economy recovered as evidenced in roro/lolo data available from various ports authoritiy. For instance, between 2016 and 2017 alone, Irish ports handled 53.3 million tonnes of goods in 2017, or an increase of 5.2% since 2016. Several ferry companies have acquired new vessels which provide new routes connect RORO services directly to European Ports. Sunstantial investment planned in three of the most important Irish Ports (Shannon Foynes, Ringaskiddy and Dublin) toward improved facilities	Uptake of ICT in ports and shipping is likely as it provides for safer and more efficient maritime operations.	Low - At least 11% of Irirsh exports shipped trhough the landbridge (CSO, 2016). Their average value in € [er tonne is over three times higher than that trasnported to the rest of the EU. 40% of Irish export to the EU transit through the landbridge, making the trasnport industry particularly vulnerable, in particular for the agri-food and seafood sectioor due to perishable nature of the goods transported. Customs and borders can have a significant negative impacts. However, in the absence of formal trade deal, the assessment of chnage reamins uncertain.	https://dbei.gov.ie/en/Publications/Publication-files/Focus-on-Transport-and-Logistics.pdf
DBEI Sectoral Briefs - Marine and Maritime	fisheries, tourism, aquaculture, ports, harbours and shipping, social benefits	National - Ireland	Uptake of new technology in Ports and harbour management and shipping such as Smart ports, big data and ICT. Better data collection techniques and tools avaialble.	Can change the way ports and harbours are traditionally operated. Possible increase in the number of autonomous ship. Increased understanding and knowledge of seabed thanks to improve seabed mapping tools	infrastructure; clean - green - marine	Sunstantial progress made by INFOMAR since HOOW.	Projections do not show that a decline for heavy fuel oils shipping by 2030 in a status quo scenarios. The bief forecasts an evolution of shipping rather than a revolution, with progress much slower than	High	https://dbei.gov.ie/en/Publications/Publication-files/Focus-on-Marine-and-Maritime.pdf

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A European Strategy for Plastics in a Circular Economy	Marine Litter	European	Addresses the key challenges with regards to plastic waste and sets out a vision/proposal for a 'circular' plastic economy. Global production of plastics has increase twentyfold since 1960 reaching 322 million tonnes in 2015. This expected to double over the next 20 years. 49 million tonnes of plastic were created in the EU in 2015, 40% of which was for packaging. 59% of plastic waste is made up of packaging and less than 30% is recycled. The vision for Europe's Plastic Economy details a number of proposals, or example, innovation into plastics which are high quality and durable for reuse and recycling, technology for watermarking and tracing plastics.	As a result of "Plastics in a Circular Economy" the EU have funded several projects for example: - POLYMARK - plastic bottle marking, identification and sorting technologies - PolyCE - organisations working together to enhance the use of recycled plastics in electronics applications - CIRC-PACK - production of biodegradable plastics - LIFE AGANFOILS - Building of a innovative new polymer recycling plant by the Dutch waste management company Attero which will aim to recycle difficult-to-treat materials.	Governance Green - Clean - Marine Research, Knowledge, Technology & Innovation	Awareness for plastic pollution and its impacts on marine life is increasing. The EU has funded several projects to enhance re-use and recycling technologies	Technologies will advance recycling and reuse of plastics in the EU.	Low	A European Strategy for Plastics in a Circular Economy https://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf POLYMARK https://ec.europa.eu/research/infocentre/article_en.cfm?artid=50229 PolyCE https://www.polyce-project.eu/ CIRC-PACK https://circpack.eu/home/ LIFE AGANFOILS https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_i
OSPAR inventory of measures to mitigate the emission and environmental impact of underwater noise	Underwater Noise	International - Northeast Atlantic	A summary of noise mitigation technologies related to impulsive noise and their applications. These include bubble curtains, hydro sound damper, vibro-piling. Additional noise mitigation concepts and prototypes are detailed, for example, BLUE Piling Technology by Fistuca.	Will help with achieving Good Environmental Status with regards to impulsive underwater noise. Mitigation measures are implemented into environmental impact assessments.	Green - Clean - Marine Research, Knowledge, Technology & Innovation Infrastructure	Increase in technologies and design which reduce underwater noise	Further advances will be made in reducing underwater noise. Legislation may come into effect which will restrict underwater noise.	Low	OSPAR inventory of measures https://www.researchgate.net/publication/308110504_OSPAR_inventory_of_measures_to_mitigate_the_emission_and_environmental_impact_of_underwater_noise
Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life 2014	Underwater Noise	International	The IMO recognised that commercial ships contribute a significant portion of the underwater noise generated by human activity and these activities may have significant impacts on marine life. The guidelines highlight the sources of underwater noise associated with propellers, hull form, on-board machinery and operational aspects, consider technology and measures which may reduce noise. Standards and references are detailed for the measurement of noise and design of equipment.	Guidelines are internationally used and referred to as best practice. Research and technology has been used to design more efficient ships which reduce sound.	Clean - Green - Marine Research, Knowledge, Technology & Innovation International & North / South Cooperation	Guidelines to reduce noise from commercial ships have been published.	Further consideration will likely be given to reduce the amount of noise from commercial shipping in line with IMO guidelines. Further research will highlight the effects of underwater noise on marine life with potential targets/legislations being put in place. The IMO highlighted in 2018 the need for further research to better understand the impact of underwater noise from shipping compared to other sources.	Medium	Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life 2014 www.imo.org/en/MediaCentre/HotTopics/Documents/833%20Guidance%20on%20reducing%20underwater%20noise%20from%20commercial%20shipping%2C.pdf In Focus - Ship Noise, IMO http://www.imo.org/en/MediaCentre/HotTopics/Pages/Noise.aspx
Hannon et al., 2019. Offshore wind, ready to float? Global and UK trends in the floating offshore wind market	Energy - Offshore Renewable Energy	National - UK International	Floating wind foundations allow wind turbines to be further offshore where water is deeper and there are more stable wind regimes. The floating wind market is growing, expanding from almost zero to 57 MW between 2008 and 2018 and lots of future development expected. The UK is the world leader with 56% of global capacity, the majority of the foundations are made in Norway and Japan.	There is increasing interest and development in the floating offshore wind market. The report suggests further research needed into modelling the potential growth of the market, comparison of countries' investments and deployment and costs.	Clean - Green - Marine Business Development, Marketing & Promotion Research, Knowledge, Technology & Innovation Infrastructure	In 2019, a 31 million Euro project led by the European Marine Energy Centre (EMEC) working in partnership with SEAI, SAIPEM and other organisations in France, Germany, Ireland, the Netherlands, and the UK has been approved to build a full scale floating wind turbine off County Mayo, Ireland for testing.	The world leader for floating wind foundations will change if the UK lose access to European technology demonstration funding post-Brexit. Development and design is being taken up by the US and France which may increase the number of installations. Global capacity could be as high as 4.3 GW by 2030.	Low - further modelling of the market growth is required	Hannon et al., 2019. Offshore wind, ready to float? Global and UK trends in the floating offshore wind market https://strathprints.strath.ac.uk/69501/13/Hannon_etal_2019_Offshore_wind_ready_to_float_global_and_uk_trends_in_the_floating_offshore_wind_market.pdf Floating Wind SEAI https://www.seai.ie/news-and-
Marine Spatial Planning Needs of Marine Renewables Emerging Technologies - MRIA 2018	Energy - Offshore Renewable Energy	National - Ireland	The discussion paper identifies four key issues and offers recommendations for the success of Marine Spatial Planning in Ireland. The recommendations cover marine zones, buffer zones for renewables, Coastal Partnerships, and data availability for decision making. It is noted that Ireland has the highest offshore wind speeds in Europe and thus floating offshore wind energy in Ireland has potential.	The recommendations may be of use to the National Marine Planning Framework.	Governance Clean - Green - Marine Research, Knowledge, Technology & Innovation	Recent support structures for marine renewables (Renewable Energy Support Scheme, REES) have shown recognition for the use of marine renewables in Ireland to meet 2030 energy targets.	Support for the development of marine renewable activities and technology is fast growing and the policy landscape for marine renewables is likely to change.	Low	Marine Spatial Planning Needs of Marine Renewables Emerging Technologies - MRIA 2018 https://www.mria.ie/site/assets/files/1016/marine_spatial_planning_needs_of_marine_renewables_emerging_technologies.pdf

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ESPO Green Guide - 2012	Water Quality Air Quality	European	Air quality around ports is recognised as the top priority by the European port sector. Guidance on how to make ports greener includes the use of Onshore Power Supply (OPS) , using low emission fuels in vessels and port vehicles, and liquefied natural gas (LNG) bunkering facilities. Ports are guided on waste management, by increasing recovery recycling of waste, providing infrastructure for waste collection from ships and monitoring waste aiming to reduce the volume of waste and harmful substances in waste. To increase water quality, recommendations include reducing spillages and establish spill emergency responses, reviewing sewage and ballast discharges from ships and providing infrastructure and monitoring of runoff water.	Regular monitoring by ESPO/EcoPorts found in 2016 that 62% of EU ports which responded to a survey (91 ports, in 20 Member States) offered differentiated port charges (OPS) for cleaner vessels, reducing sulphur dioxide and nitric oxide emissions. 22% had LNG bunkering facilities. In Ireland, 3 ports responded to the survey. 70% of EU ports monitor water quality, an increase of 14% between 2013 and 2016. 65% monitor air quality with an increase of 13% over the three years. Waste was the most monitored environmental issue with 79% of ports. It is likely that the increase in the importance of water quality is due to the implementation of the Water Framework Directive. The implementation of the Sulphur Directive likely has a role to play for air quality being a top priority for ports.	Clean - Green - Marine Business Development, Marketing and Promotion Infrastructure	More ports have adopted cleaner initiatives and technology in line with EU Directives	Ports will continue to implement "green" strategies to increase water and air quality to meet EU Directives	Low - some changes are likely, in line with Directives but many initiatives recommended are voluntary	ESPO Green Guide - 2012 https://www.espo.be/media/espopublications/espo_green%20guide_october%202012_final.pdf EcoPorts Environmental Review - 2016 https://www.ecoports.com/assets/files/common/publications/ESPO_EcoPorts_Port_Environmnetal_Review_2016_v1.pdf
Valuing Marine Ecosystems - Taking into account the value of ecosystem benefits in the Blue Economy (2019)	Biodiversity	European	Natural capital and ecosystem services concepts are not mainstreeamed in marine environmental deicison making, resulting in decisions which don't deliver sustainable development	The report makes vairous recommendations to support uptake andi mplementation of NC and ES concepts in marine decision-making	Clean - Green - Marine	There is greater recognition of the need to incorporate NC and ES concepts in decision-making and to improve the evidence base but progress is slow	There will be greater use of NC and ES evidence to inform decisions in the marine environment over the coming decades, alongside existing tools such as SEA, EIA and SEIA	Medium - the NC and ES evidence basei s increasing and such information is increasingly used to support decision-making.	Austen M.C., Andersen P., Armstrong C., Döring R., Hynes S., Levrel H., Oinonen S., Ressurreição A. (2019) Valuing Marine Ecosystems - Taking into account the value of ecosystem benefits in the Blue Economy, Coopman, J., Heymans, JJ., Kellett, P., Muñiz Piniella, A., French, V., Alexander, B. [Eds.] Future Science Brief 5 of the European Marine Board, Ostend, Belgium. 32pp. ISBN: 9789492043696 ISSN: 4920-43696 DOI: 10.5281/zenodo.2602732 https://www.marineboard.eu/publications/valuing-marine-ecosystem-services-%E2%80%93-taking-account-value-ecosystem-benefits-blue
Navigating the Future V: Marine Science for a Sustainable Future (2019)		European	Society is not achieving sustainable development of our seas and there continues to be biodiversity decline	The Strategy identifies priorities for marine science research, including in relation to extreme events and climate change and the role of changing technologies and ICT in improving ocean observation and forecasting, including: Develop the ocean Internet of Things by developing new technologies for use in the sea, allowing observations to be transferred in real time to satellites or other communication networks through enhanced local data processing including machine learning and artificial intelligence; Develop a virtual reality ocean platform where all information can be uploaded and visible to the	Clean - Green - Marine; Research, Knowledge, Technology and Innovation	Greater recognition of the imperative to achieve sustainable development in our oceans and seas; greater recognition of the role of oceans and seas in mitigating climate change; increasing opportunities afforded by technology to observe and better manage oceans and seas.	Improved ocean observation and modelling driven by technology (remote sensing, betterm odels, artificial intelligence, better engagement with public	Medium - these changes are already happening and will continue. The pace of progress will be driven by technological development and levels of investment.	European Marine Board (2019) Navigating the Future V: Marine Science for a Sustainable Future. Position Paper 24 of the European Marine Board, Ostend, Belgium. ISBN: 9789492043757. ISSN: 0167-9309. DOI: 10.5281/zenodo.2809392 https://www.marineboard.eu/publications/navigating-future-v
A Strategic Research Agenda for Oceans and Human Health in Europe. (2020)	Biodiversity, Tourism, Aquaculture	European	There is a need to co-ordinate marine research to support sustainable development	The SRA focuses on three main target action areas: Sustainable seafood and healthy people; Blue spaces, tourism and well-being; and Marine biodiversity, biotechnology and medicine. It also outlines policy, relevant research needs, public and stakeholder attitudes, and capacity and training requirements in relation to these three areas.	Clean - Green - Marine; Research, Knowledge, Technology and Innovation	Greater recognition of need to collaborate and coordinate marine research priorities across Europe	Better co-ordination of mairne research priorities across Europe	Medium - there are many mechanisms to support co-ordination and co-operaiton in marine research across Europe.	H2020 SOPHIE Consortium (2020) A Strategic Research Agenda for Oceans and Human Health in Europe. H2020 SOPHIE Project. Ostend, Belgium. ISBN: 9789492043894 DOI: 10.5281/zenodo.3696561 https://www.marineboard.eu/sites/marineboard.eu/files/public/publication/SOPHIE%20Strategic%20Research%20Agenda 2020 web 0.pdf

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Future of the Sea: Trends in Aquaculture. Foresight Evidence Review. 2017	Aquaculture	National - other	There are opportunities to expand fish and shellfish aquaculture to meet internaitonal demand for seafood	There are global and national drivers for aquaculture to develop further, including: increasing demand for seafood for export and a limit to the expansion of capture fisheries, and the development of technology that will reduce the environmental impact and increase the social acceptance of aquaculture. Climate change, energy prices, government policy and social acceptance of aquaculture will shape how aquaculture develops in the next 50 years. There is significant potential for aquaculture to further develop especially in semi-contained recirculating aquaculture systems (RAS) on both land and sea, and in offshore cage aquaculture.	Clean - Green - Marine, Business Development, Marketing & Promotion, Research, Knowledge, Technology & Innovation	Conitinuing development in technology with increasing interest in offshore aquaculture	continuing expansion with increasing development offshore	Medium - expansion will depend on continuing international demand, and development of technologies	Black, K. & Hughes, A., 2017. Future of the Sea: Trends in Aquaculture. Foresight Evidence Review. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/635209/Future_of_the_sea_-_trends_in_aquaculture_FINAL_NEW.pdf
Foresight Future of the Sea. A Report from the Government Chief Scientific Advisor. (2017)		National - other	There is increasing reliance on our oceans and seas as a source of food , energy and minerals, resulting in increasing pressures on the marine environment. Some of these changes will be exacerbated by climate change.	The report makes wide ranges recommendaitons on economy, environment, governance and science	Clean - Green - Marine, Research, Knowledge, Technology & Innovation, Governance	Increasing recognition of the importance of our oceans and seas and the impact of human activity pressures	Increasing use of marine environment for energy generation, food and minerals; increasing pressures from infrastructure, plastic litter,	Medium - increasing use of marine environment is a well established trend.	Government Office for Science, 2017. Foresight Future of the Sea. A Report from the Government Chief Scientific Advisor. https://www.gov.uk/government/publications/future-of-the-sea--2
The Ocean Economy in 2030		International	There is increasing reliance on oceans and seas for food, energy and minerals	The report estimates that the marine/maritime economy could more than between 2010 to 2030 increasing to >USD 3 trillion. Particularly strong growth is expected in marine aquaculture, offshore wind, fish processing, and shipbuilding and repair. Ocean industries also have the potential to make an important contribution to employment growth. In 2030, they are anticipated to employ approximately 40 million full-time equivalent jobs in the business as-usual scenario. The fastest growth in jobs is expected to occur in offshore wind energy, marine aquaculture, fish processing and port activities. In the coming decades, scientific and technological advances are expected to play a crucial role both in addressing many of the ocean-related environmental challenges mentioned above and in the further development of ocean-based economic activities. Innovations in advanced materials, subsea engineering and technology, sensors and imaging, satellite technologies, computerisation and big data analytics, autonomous systems, biotechnology and nanotechnology – every sector of the ocean economy – stands to be affected by these	Clean - Green - Marine, Research, Knowledge, Technology & Innovation	Increasing recognition of the potential economic growth opportunities in the marine environment	Growth in offshore energy and aquaculture	Medium - it is expected that internationally there will be significant growth in the marine economy alongside further technological and scientific development.	https://www.oecd-ilibrary.org/economics/the-ocean-economy-in-2030_9789264251724-en
Government Office for Science (2017) Foresight, Future of the Sea: Industry perspectives on Emerging Technology.	Ports, Harbours and Shipping, Energy-Offshore Renewable Energy, Marine Aggregates and Mining	International	Societal needs for resources and requirements for sustainability are driving tehcnological innovation across marine industries.	The need to reduce emissions will be a major driver of technological development and innovation, affecting the design and powertrain of ships, driving the use of data analytics to improve efficiency, and influencing the technological solutions adopted by the seabed mining industry. Continuing decarbonisation of the energy grid will also offer ongoing opportunities in offshore wind, wave and tidal power. The emergence of autonomous systems, from unmanned ships to smaller vessels for deep sea mining and surveying, will also shape the industry's future. However, the speeds at which such technology will be adopted, and the impact it may have, remain uncertain.	Clean - Green - Marine, Research, Knowledge, Technology & Innovation	Continuing technological development, particularly cost reduciton in offshore wind and emergence of AUVs	Technology will continue to evolve rapidly including in the following areas: Reducing shipping emissions to support global climate ambitions; Increasing demand for specialised shipbuilding; Alternative marine fuels and the ocean as a place for energy generation; Remote controlled shipping; Affordability, security and autonomy in shipping; Autonomy and data processing in surveying; Linking satellites and marine autonomous systems; Increasing demand for satellite bandwidth; Emergence of deep sea mining; Growth of the oil and gas decommissioning industry; Energy Development and integration of offshore	Medium - High. Technology has and will ocntinue to evolve rapidly.	Government Office for Science (2017) Foresight, Future of the Sea: Industry perspectives on Emerging Technology. London: GO Science https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/622635/FutureOfTheSea_Report_V7_final.pdf
Global Marine Technology Trends 2030 - Autonomous Systems	Report requested by SCH 12/4/20								https://www.lr.org/en-gb/insights/global-marine-trends-2030/technology-trends/

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Global Marine Technology Trends 2030	Ports, Harbours and Shipping, Defence and Security, Energy - Carbon Capture & Storage; Energy Offshore Renewable Energy; Marine aggregates and Mining	International	Technological innovation	The study reviewed technological trends across shipping, naval, and ocean space industries. For commercial shipping sector the study evaluated robotics, sensors, big data analytics, propulsion and powering, advanced materials, smart ship, shipbuilding, and communication technologies. For the naval sector, the study considered big data analytics, advanced materials, autonomous systems, advanced manufacturing, energy management, cyber and electronic warfare, human–computer interaction and human augmentation technologies. For the ocean space sector, the study explored big data analytics, advanced materials, autonomous systems, sensors and communication, sustainable energy generation, carbon capture and storage, marine biotechnology and deep ocean mining.	Clean - Green - Marine, Research, Knowledge, Technology & Innovation	Continuing technological development, particularly ship design, big data, materials	Technology is forecast to continue to evolve rpaidly in these areas	Medium - High. Technology has and will continue to evolve rapidly.	Lloyd's Register, 2015. Global Marine Technology Trends 2030. London: Lloyd's Register Group Services Ltd. https://www.lr.org/en-gb/insights/global-marine-trends-2030/global-marine-technology-trends-2030/
Melia, N., Haines, K. and Hawkins E., Implications from Opening Arctic Sea Routes (2017)	Ports, Harbours and Shipping	International	Climate change will open up polar shipping routes, reducing sailing times from the Far East	The Northern Sea Route and Northwest Passages are seasonally open most years, although specialised vessels are currently required. The Arctic shipping season will continue to extend tripling in length by mid-century, coinciding with the opening of the Transpolar Sea Route across the central Arctic Ocean, although there will still be sea ice present in the Arctic winter. Typically by mid-century voyages from East Asia to the UK could save 10–12 days by using trans-Arctic routes instead of the Suez Canal route. These findings suggest that trans-Arctic routes may provide a useful supplement to the traditional canal	Clean - Green - Marine, Business Development, Marketing & Promotion, Research, Knowledge, Technology & Innovation	Increasing certainty that polar routes will be open for significant periods of the year	Increased opportunity to make use of polar routes if cost-effective	Low - unclear whether route will become economically viable	Melia, N., Haines, K. and Hawkins E., Implications from Opening Arctic Sea Routes (2017) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/634437/Future_of_the_sea_-_implications_from_opening_arctic_sea_routes_final.pdf
National Marine Research & Innovation Strategy 2017-21	Aquaculture, Fisheries, Tourism, Energy - Offshore Renewable Energy, Defence and Security, Safety at Sea, Ports, Harbours and Shipping, Biodiversity, Climate Change, Marine Litter,	National - Ireland	Sets out research priorities across different work areas	The Strategy sets out research priorities in key areas	Clean - Green - Marine, Business Development, Marketing & Promotion, Research, Knowledge, Technology & Innovation	Continued tehcnological progress	Technology is forecast to continue to evolve rpaidly in these areas	Medium - High. Technology has and will continue to evolve rapidly.	National Marine Research & Innovation Strategy 2017-21 https://www.marine.ie/Home/site-area/research-funding/national-marine-research-strategy/national-marine-research-innovation
Isles Project	Energy - Offshore Renewable Energy Energy - Trasmission	National - Ireland National - Other	Considers the feasibility and opportunities for the development of an interconnected offshore electricity network to help facilitate the developmen of renewable energy in the offshore areas of Ireland, Northern Ireland and Scotland.	The project confirmed the feasibility of such an interconnected network, to support renewable energy development.		However, it should be noted that no further developments on this topic have been seen, and Brexit may increase the barriers for the development of an interconnected network.	The principles for an incterconnected network remain, however the development including countries now external to the EU is less likely.	Low	Isles Project, 2015. http://www.islesproject.eu/final-reports-published-and-available-to-download/
Ireland's Industry 4.0 Strategy 2020-2025 - Supporting the digital transformation of the manufacturing sector and its supply chain		National - Ireland	The policy seeks to ensure that Ireland remain well placed in the golbal economy. The country's manufacturing employs over 227,000 people and is a significant driver of employment outside of Dublin. It notes the growing importance of ICT technologies.	Digital technologies can allow for increased resources efficiency (energy and materials) therefore contributing to climate action. In addition, progress in sensors, robotics and autonomous systems will allow for increased safety at sea and improved understanding of the marine environment inter alia.	Maitime safety, security and surveillance; Research, Knowledge, Technology & Innovation	Increased levels of process automation using data in real time.	Slow but steady uptake of ICT and automated processed due to deployment costs. Upskilling and training of workforce toward use of ICT.	High	
Mid-Term review of Innovation 2020		National - Ireland	Reviews the progress of I202 which sought to have Ireland has a Global Innovation Leader. As a result the government committed to increase public R&D investment at a rate of 2.5% of the GDP by 2020. Promote innoavtion in agri-food, marine environment, digital society, energy, natural resources and defence.	Increased Gross Expenditure in Research and Development (public and private) by 14.4% between between 2014 and 2017. Incvreased Business Expenditure in R&R by 31.5% over the same period. Increased Government budget allocation for R&D by 1.7%. GNP grew by 43.3% over the same three years. But, it is noted that Irelan'd research intensity declined from contributing to 1.81% of the GNP in 2014 to 1.46% in 2017.	Research, Knowledge, Technology & Innovation; Clean - Green - Marine	National Marine Research and Innovation Strategy (2017-2021) published in 2017. Replace of Celtic Voyager as indicated in the NDP. Progress made on the design and funding of Páirc na Mara. MI has allocated €2m to HEI between 2016 and 2018 for research equipment.	Replacement of Celtic Voyager to be delivered in 2022 to enhance national capacity to support fisheries, oceanographic research and marine data collection and training. Delivery of Páirc na Mara	High	

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IMO Guidelines for the Reduction of Underwater Noise from Commercial Shipping	Ports, Harbours and Shipping Biodiversity Underwater Noise	International	Underwater noise is recognised as having potentially negative impacts on marine biodiversity.	The guidelines recognise that the greatest opportunity for noise reduction is during the design process, and therefore includes recommendations for identifying noise reduction as part of early design. There are additional measures which are identified in order to reduce noise from current vessels, including hull / propellor cleaning, and considering marine life when selecting routes.	Research, Knowledge, Technology & Innovation; Clean - Green - Marine	The recommendations of the working group were released subsequent to the publishing of HOOW.	Future design of vessels is likely to produce vessels which produce less noise, however this may be required to be incorporated into policy, as well as becoming best practice.	Medium	https://www.ascobans.org/en/document/imo-mepc1circ833-guidelines-reduction-underwater-noise-commercial-shipping-address-adverse IMO MEPC.1/Circ.833: Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life, July 2014.
Global EV Outlook 2019	Air Quality	International	Looks at the potential expansion of Electric Vehicles.	Increased usage of electric vehicles is likely to significantly reduce air quality issues over decadal time scales (including in port estates)	Research, Knowledge, Technology & Innovation; Clean - Green - Marine	EV have become significantly more prevalent with increased infrastructure for charging installed.	The study indicates that by 2030 EV could comprise between 15 and 30% of the total fleet.	High	International Energy Agency, 2019. Global EV Outlook 2019 - Scaling-up the transition to electric mobility. Available at: https://webstore.iea.org/download/direct/2807?filename=global_ev_outlook_2019.pdf
Global Marine Technology Trends 2030	Underwater Noise Air Quality Climate Change Energy – Carbon Capture and Storage Energy – Transmission Energy – Petroleum Energy – Offshore Renewable Energy Defence and Security Fisheries Marine Aggregates and Mining Ports, Harbours and Shipping Seaweed Harvesting	International	Considers the likely changes to commercial shipping, naval and ocan space through to 2030.	The changes set out are likely to increase the efficiency of the sectors, although they may take some time for the benefits to become apparent such as due to the long asset life of commercial / naval vessels. Key changes across all sectors are the increase in data analytics, autonomous systems and robotics which will likely cause major changes to the industries over the longer term.	Research, Knowledge, Technology & Innovation;	A number of the technologies discussed within the document have made major enhancements since 2012.	Increased uptake of technology in the marine sector is expected, with changes likely to be driven worldwide by naval sectors.	High	Lloyd's Register, QinetiQ and University of Southampton. 2015. Global Marine Technology Trends 2030. London: Lloyd's Register Group Services Ltd. [online] Available at: https://www.lr.org/en-gb/insights/global-marine-trends-2030/global-marine-technology-trends-2030/
European Defence Fund	Defence and Security	European	Sets out the structure for joint investment in research and development of defence technology.	There are projects ongoing already with implications for the marine defence environment including integration of drones and unmanned submarines into fleet operations and development of the Eurodrone to increase European strategic autonomy in an area where it has a technological and strategic dependancy on non EU partners.	Research, Knowledge, Technology & Innovation;	There have been significant investments made in Defence Naval Assets in Ireland. Further research has, and continues to emerge regarding autonomy in the marine sphere.	It is likely that investment will continue to be focussed upon autonomy and the application of big data in the defence sphere with technology offering opportunities for innovation and investment in Ireland	Medium	https://ec.europa.eu/commission/news/european-defence-fund-2019-mar-19_en
Realising the Opportunities for Enterprise in the Bioeconomy and Circular Economy in Ireland	seaweed; fisheries; aquaculture	National - Ireland	Four areas of opportunities identified: nutraceuticals and functional foods with include food and nutrition supplements, specialist nutrients and infant formula; biotechnology; Biorefinery and Bioconversion and low carbon construction.	Direct reseacrh funding from H2020 could generate up to 130,000 additional jobs and €45bn in added value by 2025. SFI support MaREI to support fundamental research relating to marine and renwable energy applications including bioenegy	Clean - Green - Marine; Research, Knowledge, Technology and Innovation	Private investment in marine biorefinery (BioMarine, a pilot scale marine biorefinery)	Future opportunities to arise from continued private investments and public fundings, likely arising from continued EU influence through R&D funding and policy and particularly due to Ireland's large agri-food based industry.	High	https://dbei.gov.ie/en/Publications/Publication-files/Realising-opportunities-for-enterprise-bioeconomy-and-circular-economy-Ireland.pdf
Report of the Resaerch Prioritisation Steering Group	fisheries, aquacultre, energy - offshire renewable energy	National - Ireland	Sets 14 priority areas for investment in publicly-perfomed research to drive enterprise development, employment and growth and job retention, contributing to improvements in quality of life. These areas include: MRE, food for health, sustainable food production and processing.	Low impact as the report envisaged that 500 MW would be generated from ocean energy and that Ireland would become an important energy / electrcity source for Europe. However it did propose Ireland as an innovation hub for deployment of MRE technologies and services and to create an early stage industry and research cluster which it has achieved through the creation of MAREI and the development of several test sites	Clean - Green - Marine; Research, Knowledge, Technology and Innovation	No commercial MRE produced since HOOW but successful development of test site facilities and research buoys.	Ireland to continue to be a centre for innovation owing to experience and estasblished networks. Progress toward sustainable food production	high	https://dbei.gov.ie/en/Publications/Publication-files/Research-Prioritisation.pdf

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SAFESEANET	Safety at Sea; Ports, Harbours and Shipping	International	Platform for Maritime data exchange between MS maritime authorities to help the prevention of accidents at sea and marine pollution. It involved the development of a community vessel traffic monitroing and information system and incorporate data exchnage requirements.	The platform was transferred to the European Maritime Safety Agency which manages it. Data collected between 2014 and 2019 by EMSA on accident investigation shows a continuous decrease in very serious marine casualty to the exception of the year 2018. Other classes of accidents have generally remained the same across the six years. It does show a decreased number of cargo ships involved in accident and a slgiht increase of fishing vessels invvolved in accidents suggesting variable uptake of technology. Loss of control (30%) and collision (16%) are the most prevalent causes of accidents over the review period. Fishing vessels are the category which has lost the most ships over the review operiod with 90	Safety, Security and Surveillance	Transfer of Safeseanet to EMSA	Unless technology becomes more accessible, it is not expected that there would be more chnages to the number of accidents recorded for fishing vessels. Continued slow decrease on recorded accident for cargo ships paralleling uptake of technology.	High	https://ec.europa.eu/idabc/en/document/2282/5926.html
ADDED JULY 2020									
National Policy Statement on the Bioeconomy	Biodiversity; Climate Change, Aquaculture	National - Ireland	The National Policy Statement on the Bioeconomy sets out a vision, common principles, strategic objectives, and a framework for implementation to deliver on this vision for the bioeconomy in Ireland.	The Policy Statement facilitates identificaiton of opportunities in the marine bioeconomy and collaboration between industry and researchers	Clean - Green - Marine; Research, Knowledge, Technology and Innovation	The Statement was published in 2018	The Policy Statement has the potential to promote investment in and development of the marine bioeconomy in Ireland	Medium	https://www.gov.ie/en/press-release/3d585e-national-policy-statement-on-the-bioeconomy/?referrer=/eng/news/government_press_releases/national_policy_statement_on_the_bioeconomy.html/
Maritime 2050	Safety at Sea; Ports, Harbours and Shipping	National - other	Establishes a long term strategy for the UK maritime sector.	The strategy covers seven high level themes: competitive advantage, environment, infrastructure, people, security, technology and trade. These themes are also relevant to Ireland's maritime sector	Maritime Safety, Security and Surveillance; Clean - Green - Marine; Research, Knowledge, Technology and Innovation	Various tehcnologies discussed within the strategy have progressed significantly since 2012	Trends in thek ey themses are likely to influence the development of Ireland's maritime sector	Medium	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/872194/Maritime_2050_Report.pdf
Seas, Oceans and Public Health in Europe	Social Benefits Aquaculture Seaweed Harvesting Tourism	European	Identifying priority research areas towards establishing an oceans and human health research capacity in Europe	The Strategy sets out research priorities in key areas to link Oceans and Human Health outcomes across three themes: Sustainable seafood and healthy people Blue spaces, tourism and well-being Marine biodiversity, medicine and	Clean - Green - Marine; Research, Knowledge, Technology and Innovation	Since HOOW linkages between Human Health and the Oceans have become clearer and this has emerged as a meta-discipline.	It is likely that further research will develop in line with the strategy	Medium	https://www.marineboard.eu/sites/marineboard.eu/files/public/publication/SOPHIE%20Strategic%20Research%20Agenda_2020_web_0.pdf
General Lighhouse Authority Aids to Navigation Strategy to 2030 - '2030 Navigating the Future'	Ports, Harbours and Shipping; Safety at Sea; Telecommunications.	National - Ireland; National - Other.	UK and Ireland's marine Aids to Navigation (AtoN) strategy.	Marine AtoN are an important strategic resource for the UK and Ireland and will make a significant contribution to delivering e-Navigation services. The Strategy recognises the continuing need to provide: an appropriate mix of visual, radio and e-Navigation services to mariners; wreck/new-danger response and management of AtoNs to international standards. It aims to continuously improve the safety of marine navigation through: improved reliability and cost-effectiveness; harmonised international standards; new services and technological infrastructure.	Maritime Safety, Security and Surveillance; Clean - Green - Marine; Research, Knowledge, Technology and Innovation; Infrastructure; International & North/South Cooperation.	5-year UK and Ireland AtoN review conducted in 2019 (published 2020): a formal review of AtoNs with User Consultation process and analysis of traffic data to ensure that the AtoN provided are appropriate.	Marine risk: Increasingly complex coastal environment with continued reduction in available sea room for shipping due to expanding uses e.g. offshore wind turbines, aquaculture sites, marine conservation area restrictions, marine spatial planning regime etc. Increasing reliance of the mariner on technology to support navigation, with shortage of experienced seafarers leading to higher levels of responsiblity with less practical experience. Consequent need to develop appropriate AtoN to mitigate these evolving risks. Technology development: new opportunities and threats to the maritime sector. e-Navigation brings the potential for improved safety, efficiency and environmental protection. However threats include cybersecurity and mis-use of	Medium	https://irishlights.ie/media/49590/2030-Navigating-the-Future.pdf
Position on the Development of Marine Aids to Navigation Services - The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)	Ports, Harbours and Shipping; Safety at Sea; Telecommunications.	International	Describes the Positions that IALA will take concerning certain critical technical and operational aspects of its work.	Position statements have been developed to give guidance on the technical philosophy on specific topics and IALAs preferred policy direction.	Maritime Safety, Security and Surveillance; Clean - Green - Marine; Research, Knowledge, Technology and Innovation; Infrastructure; International & North/South Cooperation.	IALA is to change status in 2020 to that of an international intergovernmental organisation. The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), which has National members in 82 coastal States around the world, will adopt a new legal framework on its transition from an international non-governmental association to an Intergovernmental Organization (IGO).	Various preferred policy directions have been identified nder the headings of the seven IALA standards: Marine Aids to Navigation (AtoN) Planning and Service Requirements; AtoN Design and Delivery; Radio-Navigation Services; Vessel Traffic Services; Training and Certification; Digital Communications Technologies; Information Services.	Medium	https://www.iala-aism.org/content/uploads/2020/03/IALA-Position-Document-on-the-Development-of-Marine-AtoN-Services-2019.pdf

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Current Drivers and Trends - The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)	Ports, Harbours and Shipping; Safety at Sea; Telecommunications.	International	Current maritime drivers and trends to serve as guidance as to how IALA can reach its strategic goals with a long-term horizon and perspective.	A picture of possible future maritime trends and global developments which are most likely to have an impact on IALA and how these may affect the association's priorities, organization and activities which are aimed at supporting its objectives and strategic goals: "to foster the safe, economic and efficient movement of vessels, through improvement and harmonization of aids to navigate worldwide and other appropriate means, for the benefit of the maritime community and the protection of the environment". Goal 1 Marine Aids to Navigation are developed and harmonized through international cooperation and the provision of standards. Goal 2 All coastal states have contributed to a sustainable and efficient global network of Marine Aids to Navigation through capacity	Maritime Safety, Security and Surveillance; Clean - Green - Marine; Research, Knowledge, Technology and Innovation; Infrastructure; International & North/South Cooperation.	IALA is to change status in 2020 to that of an international intergovernmental organisation. The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), which has National members in 82 coastal States around the world, will adopt a new legal framework on its transition from an international non-governmental association to an Intergovernmental Organization (IGO).	Increased digitalisation; Development of autonomous vessels; Need for increased connectivity and interoperability; Cyber-crime vulnerability and cyber security; Changes in trade patterns due to global economic developments; Large cruise ships going to remote locations like the Arctic; Competing use of the oceans (Marine Spatial Planning); Demand for efficiency in the transport chain.	Medium	https://www.iala-aism.org/content/uploads/2020/04/Important-Drivers-and-Trends-ed1.1-Clean.pdf
European Radio Navigation Plan - European Commission	Defence and Security; Ports, Harbours and Shipping; Safety at Sea; Telecommunications.	European	Captures the characteristics of Europe's radio navigation landscape. Provides an inventory of existing and emerging radio navigation systems, foreseen modernisation plans, details user requirements, lists key stakeholders and gives an overview of the relevant EU legislation concerning radio navigation.	This initiative follows the European Commission's commitment to "release a European radio navigation plan to facilitate the introduction of global navigation satellite system applications in sectoral policies" in line with what was set out in the "Space Strategy for Europe". The overall objective of the ERNP is to inform policy-makers and stakeholders of the potential pathways for various sectors in Europe to take full advantage of Europe's GNSS: Galileo and EGNOS.	Maritime Safety, Security and Surveillance; Research, Knowledge, Technology and Innovation; Infrastructure.	Galileo has increased the robustness and resilience of GNSS and will be the first GNSS system to provide authentication of the signal (making it more resilient against spoofing) .In the coming years, at least four GNSS systems will be operational (GPS, Galileo, GLONASS and BeiDou)	Potential for harmonisation of the suite of radio navigation systems available in Europe. Incentives to streamline investment in terrestrial Positioning, Navigation and Timing (PNT) infrastructure Facilitate the eventual coordinated rationalisation of legacy radio navigation infrastructure across Europe. Reduced European dependency on non-European PNT systems.	Medium	https://ec.europa.eu/docsroom/documents/33024

A.6 Brexit

Title / source	Topic / sector	Geographic scale	Issue	Impact	Relevant HOOW Enabler	Changes since HOOW	Anticipated future change	Confidence in future changes	Reference / Link
Political Declaration setting out the framework for the future relationship between the European Union and the United Kingdom	Fisheries, Ports Harbours & Shipping, Safety at Sea, Energy - Transmission, Energy – Offshore Renewable Energy	European	The political declaration covers a number of issues including pursuit of a free trade agreement, cooperation on maritime safety and security, co-operation on electricity and gas networks, co-operation on fisheries and establishing a new fisheries agreement, and global cooperation on various topics including climate change; sustainable development; cross-border pollution; public health and consumer protection	The extent to which these objectives are achieved will, in part, depend on whether and when a new trade deal can be agreed.	Governance, International & North/South CooperationMaritime Safety, Security & Surveillance	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	The UK's departure from the EU is likely to change its relationship with Ireland. Potential changes relevant to the marine environment include fisheries, electricity markets and water borne transport	**Low** - it is currently unclear whether, and to what extent Brexit will affect these sectors.	HM Government, 2019. Political Declaration setting out the framework for the future relationship between the European Union and the United Kingdom https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/840656/Political_Declaration_setting_out_the_framework_for_the_future_relationship_between_the_European_Union_and_the_United_Kingdom.pdf
Ireland & The Impacts of Brexit: Strategic Implications For Ireland Arising From Changing EU-UK Trading Relations	Fisheries, Ports Harbours and Shipping	National - Ireland	Ireland is uniquely exposed to Brexit due to a very high trade intensity with the UK. Approximately 15 per cent of Irish goods and services exports are destined to the UK. In certain sectors, of the UK is an especially important market, such as the agri-food sector where around 40 per cent of exports are destined for the UK. In addition, two-thirds of Irish exporters make use of the UK landbridge to access continental markets.	Under 4 different scenarios which took account of possible future trading arrangements, Brexit was estimated have an impact on GDP of between -2.8% and -7% by 2030 compared to BAU scenario. Brexit could also affect the £:€ exchange rate positively or negatively which could also affect trade	Governance, Business Development & Marketing, International & North / South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020.	Brexit is likely to have an impact on some marine activities, particularly fish (exports and imports) and possibly also ports & shipping (through reductions in trade) and electricity supply. The scale of the changes will depend on the nature of future trade arrangements yet to be agreed.	**Medium** - based on four different scenarios, the overall impact on GDP by 2030 was assessed as negative for Ireland but the scale of impact remains uncertain depending on the nature of any future trade agreement.	Copenhagen Economics. 2018. Ireland & The Impacts of Brexit: Strategic Implications For Ireland Arising From Changing EU-UK Trading Relations. https://dbei.gov.ie/en/Publications/Publication-files/Ireland-and-the-Impacts-of-Brexit.pdf
Non-Tariff Barriers and Goods Trade: a Brexit Impact Analysis	Fisheries, Ports Harbours and Shipping	National - Ireland	Non-tariff barriers such as customs inspections and documentary compliance could affect export and import of fresh foods including seafood	Based on the impact model applied, it was estimated that there could be approximately a 15% decline in fresh food exports as well as a comparable decline in fresh food imports. It is unclear whether this might be offset with increased trade with the Rest of the World.	Business Development, Marketing & Promotion	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	Brexit may affect exports/imports of seafood between Ireland and the UK affecting both the fisheries sector and shipping/transport sector. The scale of impact is unclear and would depend on the nature of any future trade deal. It is unclear whether any impact might be offset by increased trade with the Rest of the World	**Low** - while it is likely that trade with UK will be affected, it is unclear whether this might be offset by increases in trade with the Rest of the World	Byrne, S. & Rice, J., 2018. Non-Tariff Barriers and Goods Trade: a Brexit Impact Analysis. Research Technical Paper Vol. 2018, No. 7 https://www.centralbank.ie/docs/default-source/publications/research-technical-papers/06rt18-non-tarriff-barriers-and-goods-trade-a-brexit-impact-analysis-(byrne-and-rice).pdf?sfvrsn=4
Brexit and the Irish Fishing Industry Factsheet	Fisheries, Ports Harbours and Shipping	National - Ireland	Once the transition period ends the UK will be an independent coastal state and responsible for setting its own fisheries policy. It will set its own quotas and decide to what extent it will allow access to EU vessels. It will also be able to set the rules on how fishing is carried out in UK waters, and how fisheries are supported. On average, 34% of the Irish landings are taken from UK waters. Ireland lands at least some of all our its commercial quotas (40 plus stocks) from UK waters. For some stocks over 60% of landings are taken from the UK zone. UK vessels land on average 20,000 tonnes into Irish ports each year. Irish vessels land on average 12,000 tonnes of fish (mackerel & herring) into UK	Continued access to fish in UK waters will be dependent on the outcome of negotiations. There are concerns that future access for Irish vessels to UK waters may be more limited than currently affetcing opportunities for the Irish fishing and processing sectors	Governance, Business Development & Marketing, International & North / South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	Brexit may affect access for Irish vessels to UK waters, but this will depend on the outcome of any trade deal.	**Low** - it is currently unclear whether, and to what extent access to UK waters might be affected	DAFM, 2018. Brexit and the Irish Fishing Industry Factsheet https://www.agriculture.gov.ie/media/migration/seafood/sea-fisheriespolicymanagementdivision/brexit/FactSheetJune2018020718.pdf
DAFM Website - Fisheries Fisheries	National - Ireland		Brexit poses a very particular set of potential serious threats to the Irish and EU seafood industry including possible prohibitions on access to fish in the UK zone, large loss of quota share in commercial fisheries, potentially up to 50% for some species, and increase in activity by other EU vessels in the waters around Ireland, risking stock depletion.	On average, 34% (by volume) of Irish landings are taken from UK waters. A worst case scenario is that, in addition to restrictions on access, the UK would seek to increase its current quotas to match the amount of fish currently taken by non UK vessels in the UK zone. This would lead to serious over exploitation of stocks at everyone's expense.	Governance, Business Development & Marketing, International & North / South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	Brexit may affect access for Irish vessels to UK waters, but this will depend on the outcome of any trade deal. There may also be increased fishing pressure from other EU vessels in Irish waters	**Low** - it is currently unclear whether, and to what extent access to UK waters might be affected	https://www.agriculture.gov.ie/brexit/fisheries/

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Commercial Fishing UK No Deal Notes	Fisheries	European	From December 2020 (or when a new trade deal is agreed after December 2020) access arrangements for fisheries will change. Access of Irish fishing vessels to UK ports (and vice versa) may also change. Additional rules will also apply to the import and export of fish.	The new arrangements could affect Irish vessels access to UK waters and vice versa (60% of mackerel and 40% of Nephrops landed into Ireland currently comes from UK waters https://www.irishtimes.com/news/ireland/irish-news/hard-brexit-would-be-unmitigated-disaster-for-irish-fishing-industry-1.4116611. Colud also affect access to ports and changes in ease and cost of fish imports/exports with	Governance, Business Development & Marketing, International & North/South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	Brexit may affect fishing access for Irish vessels to UK waters and vice-versa; it may also affect access to ports and change the rules applying to import and export of fish. The scale of impact is unclear and would depend on the nature of any future trade deal. It is unclear whether any impact might be offset by increased trade with the Rest of the World	**Low** - it is currently unclear whether, and to what extent Brexit may affect fisheries	http://brexitlegal.ie/commercial-fishing-uk-no-deal-notes/
The implications of Brexit on the use of the landbridge	Ports, Harbours and Shipping	European	The UK Landbridge connects Irish importers and exporters to international markets via the UK road and ports network. It is a strategically important means of access to single market that is favoured by traders in high value or time sensitive goods because it offers significantly faster transit times than alternative routes. The estimated volume of goods transported via the landbridge is 3,055,553 tonnes, which consists of 1,031,384 tonnes of imports and 2,024,169 tonnes of exports. The re-introduction of customs or border controls as a consequence of Brexit will increase transit times and place an additional cost burden on Irish importers and exporters that will	The re-introduction of customs or border controls as a consequence of Brexit will increase transit times and place an additional cost burden on Irish importers and exporters that will undermine their competitiveness in accessing international markets.	Governance, Business Development & Marketing, International & North/South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	Additional customs checks for freight transiting the landbridge could affect trade flows, particularly for fresh goods. Some ports may seek to develop additional orutes to mainland Europe for non time-critical goods.	**Low** - the impacts will be mitigated to some extent as a result of UK's accession to the CTC	IMDO, 2018. The implications of Brexit on the use of the landbridge. https://www.imdo.ie/Home/sites/default/files/IMDOFiles/A143219%20IMDO%20Landbridge%20Report-digital-draft1.pdf
UK landbridge transit	Ports, Harbours and Shipping	European	The UK has recently acceded to the Common Transit Convention. The agreement will ensure that traders only have to make customs declarations and pay import duties when they arrive at their final destination.	The CTC will minimise the impactof moving good using the landbridge	Governance, Business Development & Marketing, International & North/South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	The UK's accession to the CTC will mitigate to some extent thei mpacts of additional checks for freight transiting the landbridge	**Low** - it is unclear to what extent additional checks will affect freight flows across the landbridge and thus whether other routes might emerge	http://brexitlegal.ie/the-uk-land-bridge-transit/
Revised Protocol to the Withdrawal Agreement	Energy - Transmission, European Energy – Offshore Renewable Energy		Protocol supports arrangements to maintain Single Eletricity Market in Ireland. This is backed up by legislative provisions that are intended to be implemented in the event of a 'No deal' scenario.	Will help to maintain SEM	Governance, Business Development & Marketing, International & North/South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020. The revised protocol to the Withdrawal Agreement will help to support maintenance of the SEM post-Brexit	It is anticipated that the SEM will continue. This may help to support the development of offshore renewables in Ireland	**Medium** - it is anticipated that the SEM will continue. The impact on offshore renewables development in Ireland is unkonwn.	HM Government, 2019. Revised Protocol to the Withdrawal Agreement https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/840230/Revised_Protocol_to_the_Withdrawal_Agreement.pdf
Discussion Paper on 'The impact of Brexit on the Single Electricity Market (SEM) and the Future of the Internal Energy Market (IEM)'	Energy - Transmission, European Energy – Offshore Renewable Energy		The UK is currently a full member of the Internal Energy Market (IEM). The Government of the United Kingdom that the UK will leave the Single Market and the Europe. Should the UK maintain access to the IEM, then little will change in relation to the UK's relationship with the EU. However, committing to remaining integrated with the IEM would require the UK to comply with current and future EU Energy Market rules as well as integral aspects of environmental legislation.	As it is the current position of the jurisdiction of the European Court of Justice, it is expected that once the UK leaves the EU it will no longer be a full member of the IEM. In addition, the UK has outlined in its technical papers that if there is a 'No Deal' scenario "European energy law EU will no longer apply to the UK and the UK's electricity markets will be decoupled from the Internal Energy Market	Governance, Clean-Green-Marine, Infrastructure	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	A 'No deal' Brexit would result in the UK leaving the IEM. This could affect offshore renewable energy development and interconnector opportunities between Ireland and the UK.	**Low** - the outcomes of trade discussions are uncertain	British/Irish Chamber of Commerce & energy UK, 2019. Discussion Paper on 'The impact of Brexit on the Single Electricity Market (SEM) and the Future of the Internal Energy Market (IEM)' https://www.britishirishchamber.com/wp-content/uploads/2019/06/The-impact-of-Brexit-on-the-Single-Electricity-Market-SEM-and-the-Future-of-the-Internal-Energy-Market-IEM.pdf

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Discussion Paper on 'The impact of Brexit on the Single Electricity Market (SEM) and the Future of the Internal Energy Market (IEM)'	Energy - Transmission, Energy – Offshore Renewable Energy	European	The UK is currently a full member of the Internal Energy Market (IEM). The IEM enables harmonised, tariff-free trading of gas and electricity across Europe. Should the UK maintain access to the IEM, then little will change in relation to the UK's relationship with the EU. However, committing to remaining fully integrated with the IEM would require the UK to comply with current and future EU Energy Market rules as well as integral aspects of EU environmental legislation.	As it is the current position of the Government of the United Kingdom that the UK will leave the single Market and the jurisdiction of the European Court of Justice, it is expected that once the UK leaves the EU it will no longer be a full member of the IEM. In addition, the UK has outlined in its technical papers that if there is a 'No Deal' scenario "European energy law will no longer apply to the UK and the UK's electricity markets will be decoupled from the Internal Energy Market	Governance, Clean-Green-Marine, Infrastructure	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	A 'No deal' Brexit would result in the UK leaving the IEM. This could affect offshore renewable energy development and interconnector opportunities between Ireland and the UK.	**Low** - the outcomes of trade discussions are uncertain	British/Irish Chamber of Commerce & energy UK, 2019. Discussion Paper on 'The impact of Brexit on the Single Electricity Market (SEM) and the Future of the Internal Energy Market (IEM)' https://www.britishirishchamber.com/wp-content/uploads/2019/06/The-im
Preparing for the Withdrawal of the United Kingdom from the European Union - Contingency Action Plan Update (GoI, July 2019)	Fisheries	European	The agri-food sector is very exposed to the fallout from Brexit as the UK accounts for 40% of export value overall. In relation to Fisheries, the action plan cites the measures for fishermen: a) compensation for cessation of fishing activities and amendments of EU regulations to allow access to UK vessels on a reciprocal basis. Ireland will work with the EU and Member States to identify options for fishing industry from 2020 onwards. This will include management of possible displacement into EU waters under the control of Ireland of fleets from other Member	Upon the end of the transition period, if no arrangements are made, Irish fishermen will lose access to UK waters due. All of the important commercial fish stocks are shared with the UK and a third of landings of fish by Irish vessels come from UK waters. This means loss of revenue due to reduced landings (due to potentail reductions in volume or type of catch).	Governance, Business Development & Marketing, International & North/South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	Brexit may affect access for Irish vessels to UK waters, but this will depend on the outcomes of any trade deal.	**Low** - it is currently unclear whether, and to what extent access to UK waters might be affected	https://www.dfa.ie/media/dfa/eu/brexit/keydocuments/Contingency-Action-Plan-Update.-July-2019.pdf
Action Plan for Jobs (DBEI, 2018)		European	Upon withdrawl from the EU, the Irish economy could be impacted on a number of ways including at domestic and international level. The Irish Government seeks to minimise impact on trade and the economy, protect the Northern Ireland Peace Process, maintain the common travel area and influence the future of the European Union. The plan ultimately seeks to create an environment which will support job retentionand creation. It cites a number of initaitives already underway such as the Brexit Loan Scheme for Business, the Brexit Response Loan Scheme, additional capital expenditure allocation towards major infrastructure projects and the 'Br Prepared' grant scheme. Three core actions are proposed as part of the APJ as follows: 1) national preparedness and intensified supports; 2) intensifying and diversifying trade and 3) improving access to finance.	More governmental support will be provided to companies to help be 'Brexit-ready'. The APJ expects changes to excise arrangements, supply chain management and sourcing strategies. Another expected impact relates to increased engagement with relevant enterprise supports agencies such as Enterprise Ireland. Additional support from Enterprise Ireland to stimulate competitiveness. Expected impact imparted to 'Ireland Connected - trading and investing in a dynamic world' noted in AJP of relevance are@ invrease indegenuous exports invluding food by 2020 to reach €26 billion (or 26% increase since 2015) and intensification and diversification with 67% growth in export outside the UK market.	Governance - Business development, marketing and promotion - international and north / south cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	Reinforce trade with other Member States and other countries (Asia particularly mentioned) and possible decrease in trading with UK (but dependent on trade agreements)	**Medium** - It is expected that Ireland will seek to develop / reinforce trade with other EU Member States and with other nations, particularly Asian countries. **Low** - The outcomes of trade discussions with the UK are uncertain.	https://dbei.gov.ie/en/Publications/Publication-files/Action-Plan-for-Jobs-2018.pdf
Assessment of the effects of Brexit on Irish and EU fisheries in the NE Atlantic, The Socio-Economic Marine Research Unit (SEMRU) National University of	Brexit	National - Ireland European	Potential changes in the use of EU waters after Brexit, in particular if the UK takes control of its Exclusive Economic Zone, where currently fishing is allowed by other EU Member States, including Ireland.	Estimated that Ireland would lose out on 87 million Euros worth of landing (93,320 tonnes) from UK waters if fishing in the UK EEZ is prohibited, based on 2014 catch data.	Governance Maritime Safety, Security & Surveillance International & North/South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	The UK's departure from the EU is likely to change its relationship with Ireland. Ireland may have restrictions on fishing within UK waters which would have a detrimental impact on its fishing industry.	**Low** - it is currently unclear whether, and to what extent Brexit will affect these sectors.	Norton, D. and Hynes, S. (2016). Assessment of the effects of Brexit on Irish and EU fisheries in the NE Atlantic. SEMRU Research Note. 16_RN_SEMRU_01 https://www.nuigalway.ie/media/researchsites/semru/files/16_RN_SEMRU_01.pdf
Brexit and Trade Compliance: Guidance for Industry - Sea-Fisheries Protection Authority	Brexit	National - Ireland	Brexit will have Implications for moving goods across the UK Landbridge between Member States, import and export, direct landings by Irish vessels in UK ports and changes to existing arrangements for access to fishing grounds. Regulatory guidance outlines new requirements to trade with the UK post-Brexit.	Several customs, import and export regulations, such as registering with DAFM, and Trade Control and Expert System (TRACES). There are likely to be sanitary and phytosanitary control inspections, veterinary controls of fish landed from the UK. Notification of landing fish will be required.	Governance Business Development & Marketing International & North/South Cooperation	The UK voted to leave the EU in 2016. The Withdrawal Agreement was finalised in November 2019. The UK and EU are in the process of negotiating a new trade agreement which the UK wants to complete by December 2020	The UK's departure from the EU is likely to change its relationship with Ireland. Ireland will have to comply with new regulatory requirements with regards to importing and exporting fish post-Brexit, however, this will depend on any future trade deals.	Medium - it is likely that trade between the UK and Ireland will be affected	Brexit and Trade Compliance: Guidance for Industry - Sea-Fisheries Protection Authority https://www.sfpa.ie/Portals/0/Documents/Brexit/Leaflet/V4%20SFPA%20Brexit%20A5%20Booklet%20November%202019.pdf

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Political Guidelines for the Next European Commission 2019 - 2024	All Topics	European	The guidelines identify six priorities: A European Green Deal; An economy that works for people; A Europe fit for the digital age; Protecting our European way of life; A stronger Europe in the world; A new push for European democracy	The European Green Deal which seeks to achieve net zero by 2050 is likely to be a ky driver of policy in the marine area, particularly in relation to renewable energy. The Deal includes a new Industrial Strategy, a strategy for green financing, a Sustainable Europe Investment Plan, a Biodiversity Strategy and a new Circular Economy Action Plan. Under priority 2, the measures to support SMEs and the development of an SME Strategy may also facilitate blue growth.	Clean - Green - Marine Research, Knowledge, Technology & Innovation	The guidelines and associated initiatives represent important progressions since HOOW.	The Guidelines and supporting initiatives will increase the focus on reducing greenhouse gas emissions and taking further steps to reverse biodiversity decline. They will also provide additional support to SMEs in the blue economy.	**Medium -** these initiatives are likely to deliver significant reductions in greenhouse gas emissions. Progress with halting biodiversity decline may be slower. Significant blue growth will continue to be largely driven by commercial viability but public funding may help to accelerate time to market.	https://ec.europa.eu/info/sites/info/files/political-guidelines-next-commission_en_0.pdf

B List of Organisations Contacted

- Bord Bia
- Bord Iascaigh Mhara
- Commissioners of Irish Lights
- Eastern and Midland Regional Assembly
- Economic and Social Research Institute
- Enterprise Ireland
- Environmental Protection Agency
- Fáilte Ireland
- Irish Farming Association – Aquaculture
- Irish Maritime Development Office
- Irish Offshore Operators' Association
- Irish Wind Energy Association
- Lir National Ocean Test Facility
- Marine Renewable Industry Association
- National Parks and Wildlife Service
- Northern and Western Regional Assembly
- Office of the Planning Regulator
- Queen's University Belfast
- Research Centre for Energy, Climate and Marine (MaREI)
- SmartBay Ireland
- Socio-Economic Marine Research Unit
- Southern Regional Assembly
- Sustainable Energy Authority of Ireland
- Teagasc
- Trinity College Dublin
- Údarás na Gaeltachta
- Ulster University
- University College Cork

Further details available on www.emff.marine.ie

Managing Authority EMFF 2014-2020	Specified Public Beneficiary Body
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Department of Agriculture, Food and the Marine

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Foras na Mara
Marine Institute