Northern Ireland Marine Task Force

Proposed Management Measures for Co-Location of Offshore Renewable Energy Developments in the NI MPA Network – Atlantic Region

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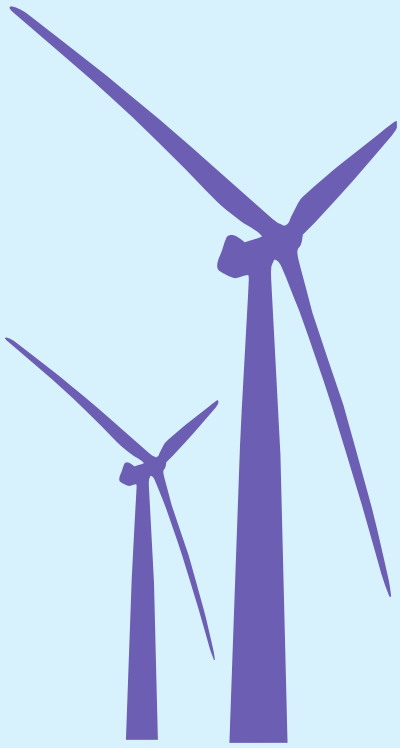

NIMTF Overview

Healthy, productive and resilient seas rely on a core balance to be struck between achieving marine recovery and supporting thriving, sustainable industries. As part of our NIMTF Marine Vision, this report has been compiled as a key piece under “Sustainable Developments at Sea”, “Recovering Biodiversity” and “Climate Action” to address the longstanding interlinked issue of the biodiversity and climate crises which are affecting society on a global basis.

NIMTF advocated in the past for the current NI MPA Network to achieve connectivity and coherence and have advocated for tackling the climate crisis alongside the biodiversity crisis. To fully achieve this, it is important that we move away from continued use of fossil fuels and transition to utilising renewable forms of energy. This is being achieved through implementation of management measures for the NI MPA Network whilst developing the strategy and action plan for delivering offshore renewable energy through the Offshore Renewable Energy Action Plan. This will jointly address the twin biodiversity and climate crises, allowing us to achieve a Just Transition whilst protecting nature and supporting wider sustainable developments at sea.

This report aims to align the developing Offshore Renewable Energy Action Plan with the NI MPA Network to ensure that the coherence of the network to ensure designated features are protected whilst meeting statutory obligations of the Climate Change (Northern Ireland) Act 2022.

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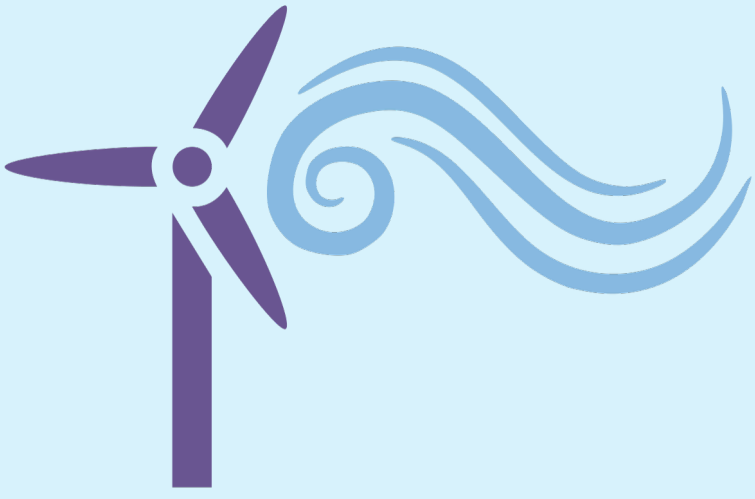
Abstract

Growing pressures on the marine environment demonstrate a need for innovative projects that meet the needs of future targets, such as Northern Ireland's need of 1GW of energy to annually be created through offshore renewable energy (ORE) but aid sustainable management of our natural resources. Research into suitable locations for varying ORE types flows from tidal to floating wind, and even in-combination infrastructures of multiple ORE types, such as fixed wind and solar.

Most notably charismatic in Northern Ireland, the LiftWEC in Strangford Lough. Data from the Offshore Renewable Energy Action Plan (OREAP) II SEA report was utilised to locate potential areas of fixed wind, floating wind and tidal energy specifically in the Atlantic region of Northern Ireland's inshore region.

Through 19 semi-structured, informal stakeholder interviews, broader understanding of perspectives across eight topics involving the co-location of ORE in MPA areas was created. These discussions helped design six recommendations for the potential development of ORE within Northern Ireland's MPA network, with specific regard to the Atlantic region's species, habitats and interactions.

These recommendations are presented in a 'most' to 'least' likely manner, with aiding benefits and limitations to analyse. Noting potential use in aiding policies regarding the future of sustainable development in our waters, whilst allowing current and future maritime users and businesses a fair route of engagement in developing such allowances.



Glossary

Acoustic Deterrent Devices (ADD) = 'Devices used to discourage marine mammals from approaching an area where either anthropogenic noise (e.g. pile or conductor driving, seismic exploration etc.) is likely to cause auditory damage or where animals may interfere with aquaculture/fisheries by predating on fish or damaging nets' (OSC, n.d.).

Area of Special Scientific Interest (ASSI) = 'Protected areas that represent the best of our wildlife and geological sites that make a considerable contribution to the conservation of our most valuable natural places. (DAERA, 2017)'.

Carbon, Capture, Utilisation and Storage (CCUS) = 'A technology aimed at capturing carbon dioxide (CO2) emissions from industrial processes, power plants, and other sources, preventing them from entering the atmosphere and contributing to climate change. The captured CO2 can then be either reused in various industrial applications or stored permanently in geological formations deep underground' (UK Government, 2025, p.1).

Environmental Impact Assessment (EIA) = '"EU environmental assessment" means an assessment carried out— (a) under an obligation to which section 2(1) of the European Communities Act 1972 applies (other than the EIA Directive), or (b) under the law of any part of the United Kingdom implementing an EU obligation other than an obligation arising under the EIA Directive, of the effect of anything on the environment'. (GOV UK, 2017)

Gigawatt (GW) = 'A unit of power equal to one billion watts' (Merriam-Webster, 2026).
Invasive Alien Species (IAS) = 'Animals, plants or other organisms that are introduced by humans, either intentionally or accidentally, into places outside of their natural range, negatively impacting native biodiversity, ecosystem services or human economy and well- being' (IUCN, 2026).

Marine Conservation Area (MCZ) = 'Designated to protect nationally important species, habitats, ecological processes and features of geological/geomorphological importance.' (JNCC, 2023).

Marine Protection Area (MPA) = 'Areas of the ocean set aside for long-term conservation aims – are the only mainstream conservation-focussed, area-based measure to increase the quality and extent of ocean protection. MPAs and their network offer nature-based solutions to support global efforts towards climate change adaptation and mitigation.' (IUCN, 2022) **Northern Ireland (NI)** = 'The northeast part of Ireland that is part of the United Kingdom' (Cambridge Dictionary, 2022).

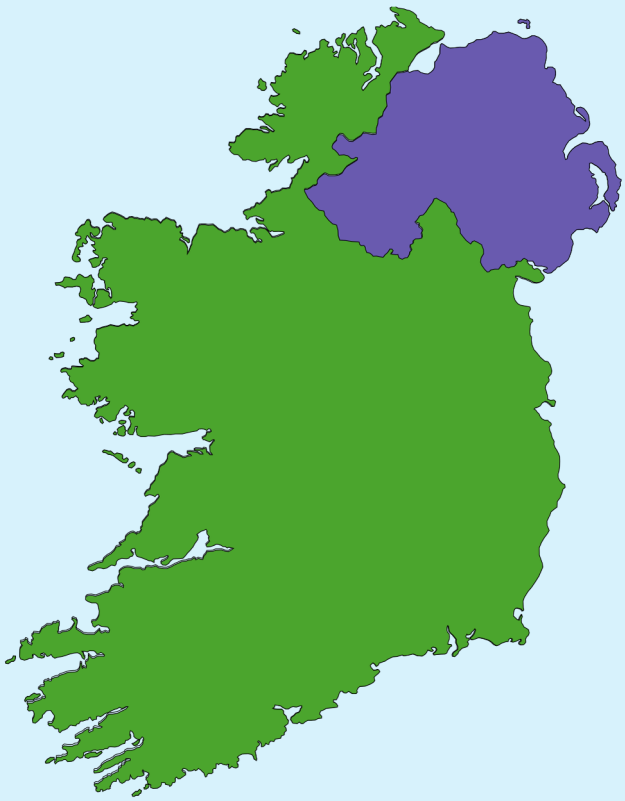
Offshore Renewable Energy (ORE) = 'Offshore renewable energy is the name given to electricity which is generated using ocean-based resources. Captured out at sea (via wind, wave or tidal or thermal energy), offshore renewable energy is transformed into electricity using modern technology and supplied back into the power network back onshore' (Clarksons, 2024, p.1).

Republic of Ireland (RoI) = 'A republic in NW Europe occupying most of Ireland: established as the Irish Free State in 1921 and declared a republic in 1949; joined the European Community (now the European Union) in 1973.' (Collins, 2026)

Special Area of Conservation (SAC) = 'Those which have been given greater protection under The Conservation (Natural Habitats, etc.) Regulations 1995 (Northern Ireland) (as amended). They have been designated because of a possible threat to the special habitats or species which they contain and to provide increased protection to a variety of animals, plants and habitats of importance to biodiversity both on a national and international scale.' (DAERA, 2015b).

Strategic Environmental Assessment (SEA) = 'A statutory process to assess and propose measures to mitigate the likely significant effects on the environment of a plan or programme. SEA also considers reasonable alternatives and inter-relationships with other plans and programmes. SEA provides for transparent decision making requiring public consultations and publication of results of the consultations in decision-making.' (Ministry of Defence, 2019, p.4).

Special Protection Area (SPA) = 'Special Protection Areas (SPAs) are designated under The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended). Post transition the UK is still required to identify internationally important areas for breeding, over- wintering and migrating birds and designate them as Special Protection Areas (SPAs).' (DAERA, 2018b)



Executive Summary

Northern Ireland (NI) has statutory targets to obtain 80% of energy from renewable sources by 2030, with requirements of offshore wind infrastructure to have 1GW capacity alongside (Clarke, 2026; DfE, 2026). Suitable sites for floating wind, fixed wind and tidal energy were identified within the OREAP II SEA report (RPS, 2025), the cumulative Atlantic region from this report is the case-study location for this research. Management proposals are relevant to the marine priority features and characteristics of this specific location in NI's inshore MPA network.

In the context of this research, the definition of co-location as 'development of offshore renewable energy (ORE) within the Marine Protected Area (MPA) network' was utilised. This perspective can follow routes of developing ORE infrastructure in existing MPA's (Ashley, Mangi and Rodwell, 2014; Lloret, 2025), constructing accompanying offshore infrastructure within the same site such as carbon, capture, usage and storage (CCUS) (The Crown Estate, 2025) or the creation of MPA's around ORE infrastructure (Ashley, 2024) - this research will focus only on the first pathway. As the OREAP II SEA is still in finalisation, it is unknown whether the Recommended - which overlaps with some MPAs, such as in the Irish Sea Floating Wind - or Refined Resource Zones will be selected by the Department of Economy.

Whilst this is often recognised as a last-resort option, future threats to marine spatial availability highlights the need for recognition of potential feasibility and relevant management. Acknowledging the uncertainty of the definition agreement is crucial within this research, as a perspective shift may alter management proposals or site identification. Similar phrases of 'co- existence' and 'co-development' are also highlighted within the literature but recognising these may include specific repercussions and are therefore considered in the discussion.

Northern Ireland's Marine Area

Northern Ireland's current MPA designations include Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Areas of Special Scientific Interest (ASSIs), Marine Conservation Zones (MCZs) and Ramsar Sites; these cover 48 sites and 38% of the inshore marine area, as shown in Fig.1 (DAERA, 2015a). MPA across both offshore and inshore waters cover 35.5% of the Northern Irish EEZ.

The current MPA Strategy for the Northern Ireland Inshore Region 2025-30 aims to achieve conservation objectives via a co-delivery approach and implement effective monitoring and adaptive management.

Alongside predefined frameworks of the UK Marine Strategy which aims to achieve and maintain several indicators and corresponding metrics of 'Good Environmental Status' across UK marine waters (DEFRA, 2026b), and the NI Blue Carbon Action Plan 2025-30 which focuses on the protection and restoration of habitats and species which sequester soluble carbon to the seabed in NI (DAERA, 2025b).

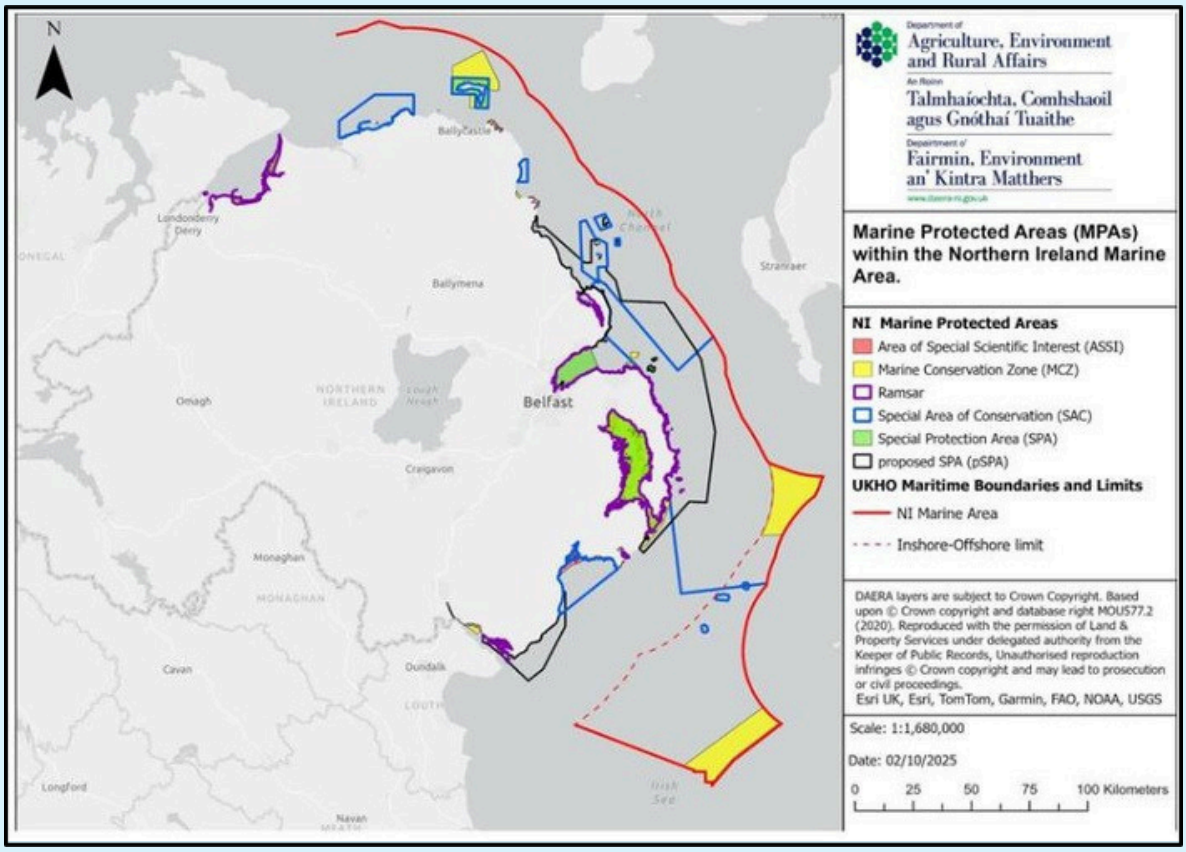


Figure 1: Northern Ireland's Current MPA Designated Sites (DAERA, 2026a)

Key legislation currently in draft, such as the Offshore Renewable Energy Action Plan (OREAP) as referenced previously (DfE, 2022) and the NI Marine Plan (DAERA, 2018a) will also lead to sustainable developments within the marine area.

The OREAP should establish suitable pathways to reach 2030's aim of 1GW of ORE resources, whilst accounting for economic, environmental and social impacts. However, deployment of the action plan should outline pathways to securing more affordable, localised energy access; diversify the energy mix and increase social acceptance; boost local economies, job opportunities and skill development (DfE, 2025). The NI Marine Plan is expected to improve decision-making within planning across both terrestrial- and marine-based environments and therefore aid efficiency within offshore renewable project development.

Overview

This brief sets out practical management recommendations for site development of ORE within MPAs, supporting socio-economic activities and environmental restoration – within both current and potential future contexts.

Context

Potential ORE within the Atlantic region

The OREAP II SEA report defines a cumulative area within the Atlantic region which is suitable for fixed and floating as well as tidal and wave energy – including potential infrastructure developments alongside one another, for example tidal and floating wind, as represented in Fig.2.

This area interacts with SACs, SPAs and MCZs as well as priority marine features, as represented in Fig.1.

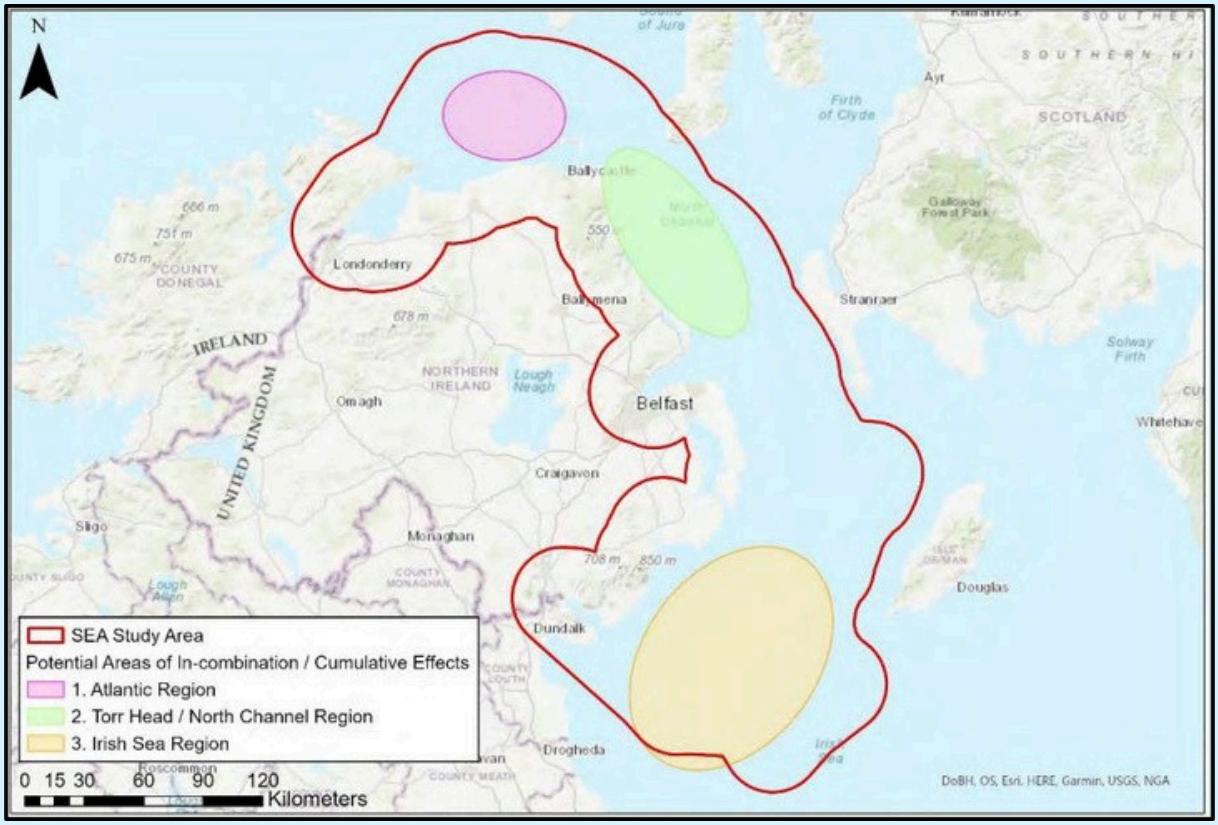


Figure 2: Cumulative effect areas of offshore renewable development in Northern Ireland (DAERA, 2025a, p.306)

Fixed Wind

Fixed wind offshore infrastructure is utilised in shallower waters (up to 60m deep) and has fixed support structures to the seabed. The structure's anchorage type is dependent on metaocean conditions, bathymetry dynamics, geotechnical conditions, installation cost and fatigue threat (Dingle, Gordelier and Pillai, 2023; Empire Engineering, 2023).

Fixed wind anchorage infrastructure may include gravity-based, suction bucket, monopile, pile cap, jacket pile and jacket bucket, as shown in Fig.3; in the UK, the monopile foundation is most widely used due to its cost and simple design (IMarEST, 2024).

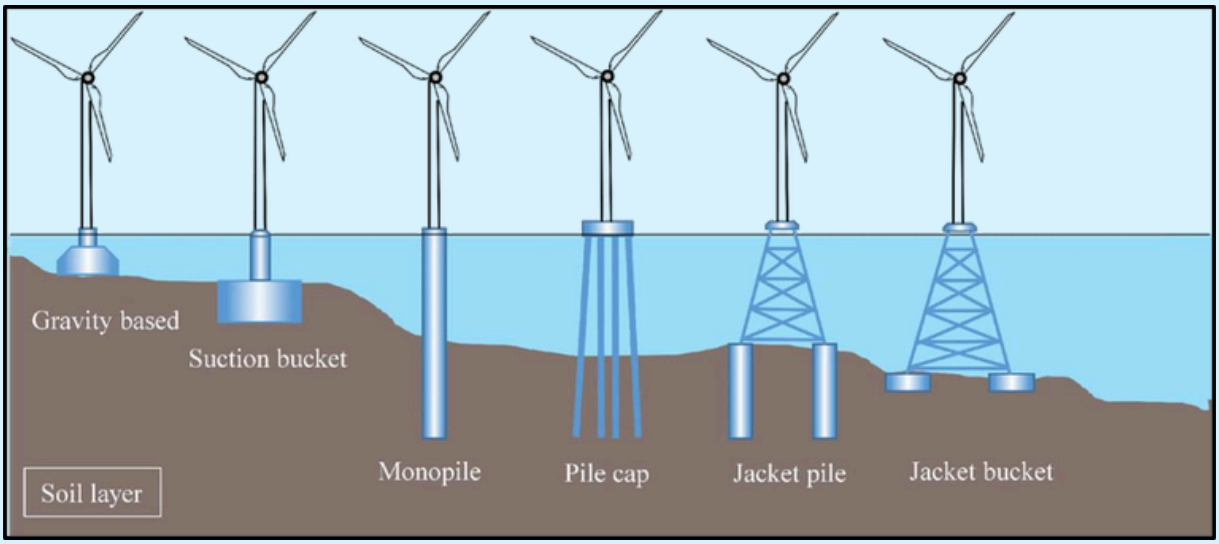


Figure 3: Fixed offshore wind subsea structures (Meng et al., 2025)

Floating Wind

Floating wind infrastructure can be used in deeper waters (>60m), with anchorage and mooring systems connected to the seabed.

There are currently two operational floating projects in the UK: Hywind Scotland and Kincardine. Hywind utilises spar-buoys and suction anchorage (Equinor, 2024), while Kincardine uses semi-submersible foundations (Tethys, 2018). Other floating anchorage includes tension-leg and barge infrastructure, as shown in Fig.4.

Floating wind infrastructure has an impact on a broader variety of marine features and species (as represented later in the 'Data' section and Table.1). This is due to interactions with the entire water column and subsequent species; hydrodynamic alterations and marine trophic mixing; and greater perching opportunities creating further seabird collision risk (Maxwell et al., 2022).

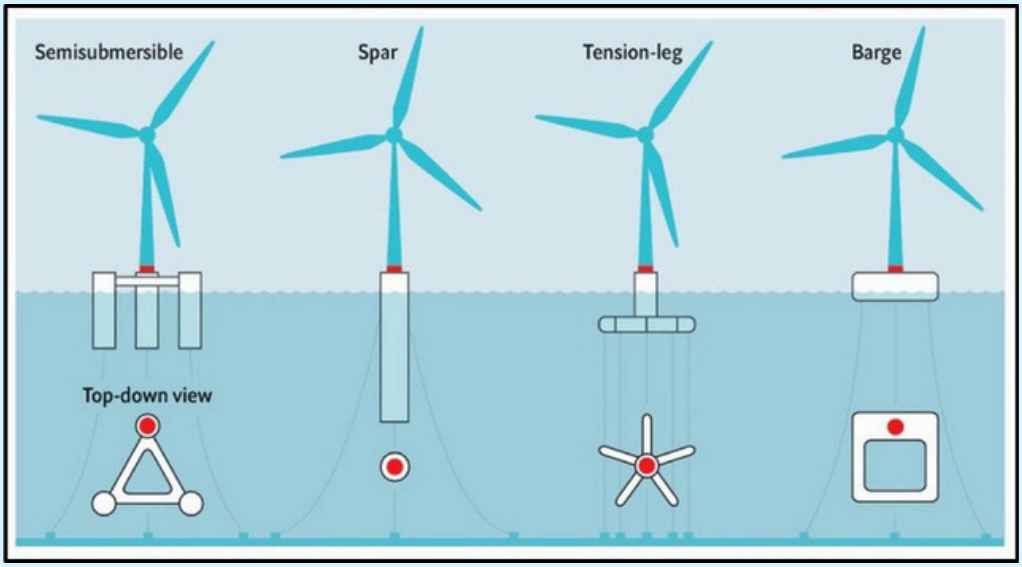


Figure 4: Floating offshore wind subsea structures (Mei and Xiong, 2021)

Tidal

Tidal energy technology is designed either for 'Stream' or 'Range', but 'Stream' being the focus within this study's context due to the research location and harnessing of water currents energy, rather than vertical difference of the water level (Serin, 2023).

Stream tidal energy includes horizontal axis, vertical axis, oscillating hydrofoil (or hydroplanes) and venturi devices (RPS, 2025), as shown in Fig.5. The foundations for these technologies include gravity bases, pile mounted, floating or hydrofoil downforce, as seen in Fig.6.

There have been several tidal projects within the UK, the most relevant being the SeaGen project in Strangford Lough – a twin turbine system reinforced with a pile foundation (Tethys, 2019).

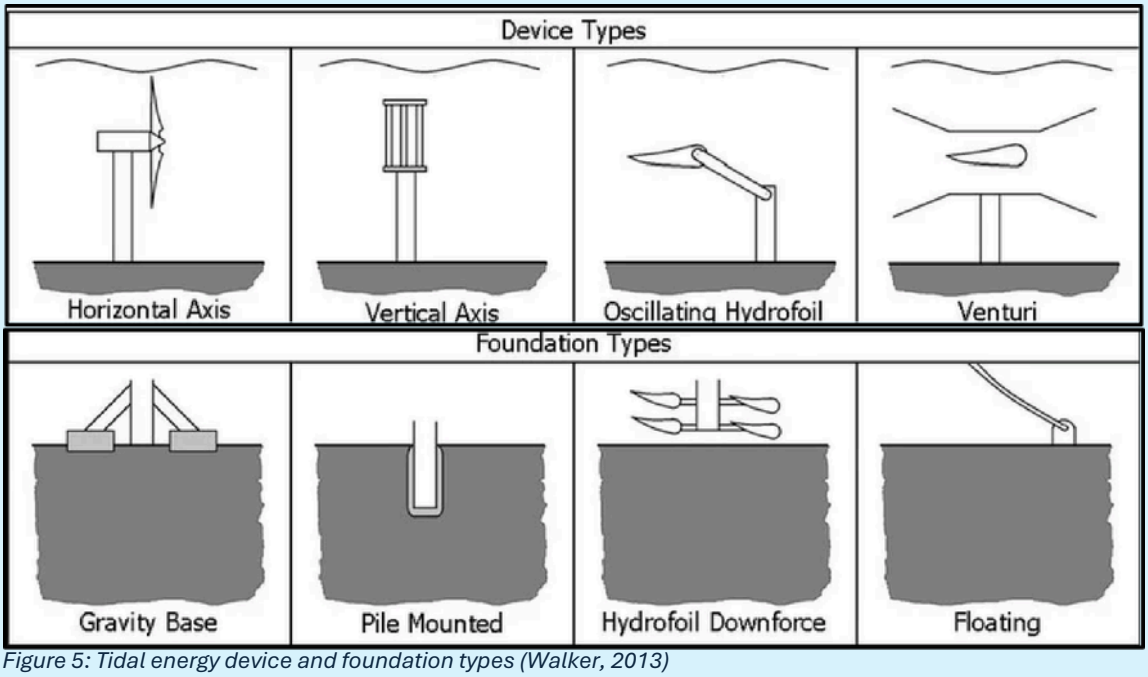


Figure 5: Tidal energy device and foundation types (Walker, 2013)

All ORE types are also reliant on supporting infrastructure including both offshore and onshore substations, cabling and transmission grids; extending reliance on cross-environment planning agreements and supportive stakeholder engagement to ensure management is appropriate for both the natural and civic communities.

Key species and priority marine features

Across the‘Environmental Baseline and Key Issues within theRecommended RZ’ sections specific to ORE potential in the Atlantic region, there was consistency in the species emerging as being impacted through offshore developments.

Categories of mobile megafauna, elasmobranchs, fish and benthic species had recurring species present, identifying commercial, conservational and environmental sensitivity significance. Spawning or nursery species were also recognised, showing importance to varying species at all stages in their life cycle – the need to understand how and when species use a particular area or habitat is crucial in developing effective management and mitigation plans within ORE proposals.

Co-location in MPA network

Aspreviously mentioned, thisresearch willutilise the co-location definition of: ‘development of offshore renewable energy (ORE) within the Marine Protected Area (MPA) network’. Placing infrastructure in previously designated regions may threaten present activity in the MPAs but may also produce future benefits of the ‘spill-over effect’ or improved quota intake for fishermen; opportunity at reaching energy- related legislation requirements; and diversification in skilled-workers within coastal communities.

Co-existence with other ORE should also be recognised. Potential developments of multiple ORE types alongside another may be beneficial for efficiency and planning of such projects. Previous engagement for development in an MPA can aid future proposals and methods, especially regarding data for analysis of cumulative impacts.

MPA designations

The cumulative areaoverlaps with many MPA sites of SACs, SPAs and MCZs – including those around Rathlin Island and within the Skerries and Causeway marine area. ORE development within these areas should consider the protected features, habitats and species within the boundaries, but must also consider combined and future threatening activity, for example the impact of other ORE sites or climate change altering species activity.

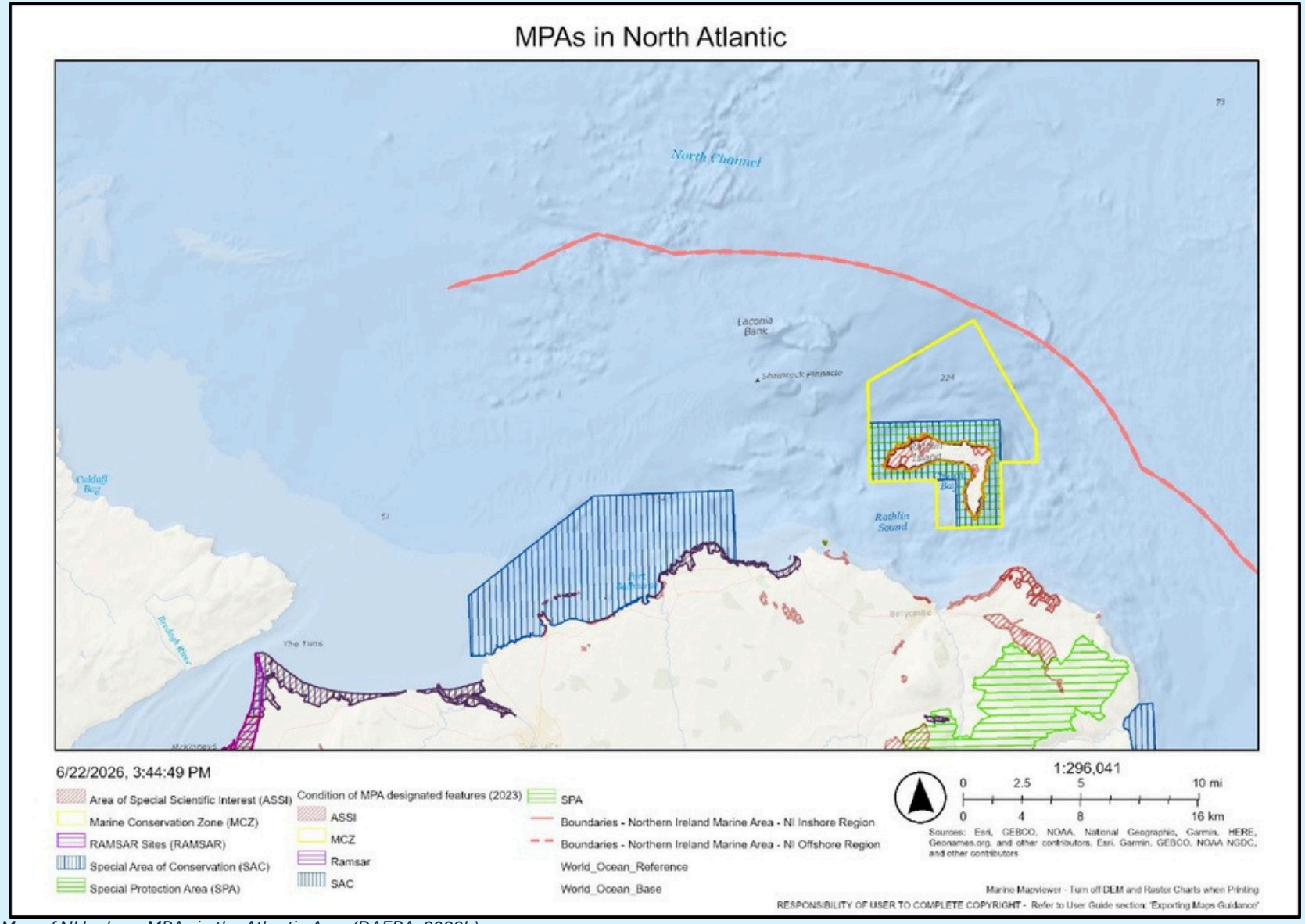


Figure 6: Map of NI Inshore MPAs in the Atlantic Area (DAERA, 2026b)

Co-location

Defining Co-location

Whilstthisprojecthas utilised co-location's meaning of ORE development within the MPA network, there are other definitions present within the field. For example, co-location may consider ORE development alongside other marine structures like aquaculture (Gimpel et al., 2015); or multiple ORE types on the same offshore structures as wind and solar (Liu and Heo, 2026); and the similar term of co- existence, with multiple sectors working separately but within the same marine environment.

We have focused on the interpretation of ORE within MPAs, as it initiates discussion of such development. If projects of this nature were to be created, further developing aquacultures or structures to support multiple ORE types will aid future proposals, however this research's focus highlights the initial opportunity to occur. Given the required need for ORE within the NI marine pace, it is highly anticipated that one such route will be the co-location of multiple structures such as OREs and other marine infrastructure - such as aquaculture, where feasible -within MPAs can be supported through these recommendations and proposals.

Why is co-location exploration important?

NI'smarine space is limited in comparison tootherareas of the UK,in particular comparison to Scotland, making the exploration of co-location opportunities before maritime pressures exacerbate crucial for 'futureproofing' to also coincide with the statutory requirements of conserving the marine environment through our MPA Network. This will require recognition and ambition when tackling the series of known and unknown global governance threats and energy security risks; climate change and marine environmental developments; and energy consumption legislation. There is an increasing need to stabilise energy production in-country and reduce reliance of imports, as represented in 2026's oil crisis (IEA, 2026).

NI has a small marine area to utilise. Efficient developments need to be explored that help manage natural resources whilst also providing maritime resource through fishing and aquaculture, recreational usage through an increasing population alongside marine conservation and protection. Recognising conservationist legislation such as the 30x30 Marine Biodiversity Targets exposes further constraints on ORE development, but it also provides detailed requirements for the future sustainability of our seas and management enforcement.

There are also potential economic benefits of ORE developments, such as the exportation of excess energy. Local energy production may also contribute to more affordable electricity costs for the population, improving upon social constraints of the ongoing Cost of Living Crisis.

Challenges of co-location

Trade-offs in achieving strategies may occur if co-location inside MPAs were going ahead. There is an ongoing debate over whether ORE should be allowed in areas defined as MPAs where pressure from seabed or species interaction are identified as vulnerable to such activity. Whilst NI has 35.5% of the marine area designated, meeting the 30x30 designation requirements, there is concern regarding effective management. ORE and MPA co-location require robust governance, monitoring, management and mitigation measures, inadequate management framework may hinder the balance between ORE development and biodiversity conservation.

Consideration of secondary impacts should also be made. For example, tourists or day-visitors may travel to the Skerries and Causeway or Rathlin Island due to the aesthetic value of the landscape. Changes to the visual character may influence visitor perceptions, with potential implications for communities that rely on the tourism sector (Glasson, Durning and Welch, 2021).

Stakeholder-informed Approach

The following discussion was informed by 19 informal interviews across four weeks with stakeholders from academia, eNGO's, renewable and fishing industry, and governmental. The conversations aimed to cover eight topics, with opportunity for added insight and reflect a wide range of perspectives on the co-location of ORE and MPAs.

The interviews were semi-structured and lasted 40 to 90 minutes, with notes of discussion taken throughout the conversation. They took place predominantly online, with one group interview being in-person. Questions followed the following topics: 'Data and Recording', 'Mitigation of Co-location', 'Species and Identification', 'Climate Change', 'Cable Corridors and EMF', 'ORE Anchorage Type', 'Fisheries Considerations' and 'Meaningful Engagement'. Base questions were created but adapted to the specific stakeholder to gain more relevant information from each interview, based on the stakeholder's knowledge and background. Research into stakeholder's backgrounds came from academic profile reviews, LinkedIn searches and exploring the background of both the industry and organisation of the individual. The interview data was analysed by compiling reoccurring conversations under the relevant topics, reference to case studies were independently researched post-interview and outlying perspectives were also further explored to consider their strength in contradictory arguments. This section aims to cover the key concepts conversed during the meetings, alongside examples or current frameworks relevant.

Data and Recording

Prior to any project development, data gaps acknowledged from previous developments should be addressed and built through scoping for community opinions, clear definitions and environmental impact assessments (EIAs). This scoping should be contributed to by all sectors to ensure balanced opinions. Also, it needs to be acknowledged that the technical language and complexity of EIAs may reduce public understanding and engagement. Finding a balance between the retention of relevant details, whilst reducing the complexity of the document may improve community consultations due to increased understanding and input. DAERA does currently provide some 'easy read' versions for consultations, for example the Draft Environment Strategy for NI. By providing this consistently, it may benefit community comprehension and relevant input to such proposals (DAERA, 2022).

Whilst there is no current full-practice monitoring in NI (due to the lack of operational ORE projects), examples from other UK and European developments will allow a stronger evidence- base for assessing the needs and requirements for successful management and mitigation to be identified. For example, the DPSIR framework utilises adaptive management to investigate driving forces, pressures, states, impacts and responses (Gari, Newton and Icely, 2015).

Mitigation of Co-location

Co-location does cause concern for cumulativeimpacts within protected areas; these alterations must be addressed and mitigated where possible. The mitigation process should be analysed and processed through strategic compensation, although uneven policies and compensation processes make this complicated to complete equitably. Following the mitigation hierarchy, as shown in Fig.7, which outlines avoidance, minimise, mitigation, and compensation (offset), the final stage should be viewed as a last resort. Effective management of sites and avoidance, in the first instance where feasible, should be the adopted process. Where measures cannot be avoided, they should be mitigated and minimised, to reduce their impact and less the need for strategic compensation to be implemented. Strategic compensation is required when certain impacts cannot be fully addressed and therefore must be offset. Adequate planning of such will lessen the requirement of compensation, alongside effective management measures in MPAs.

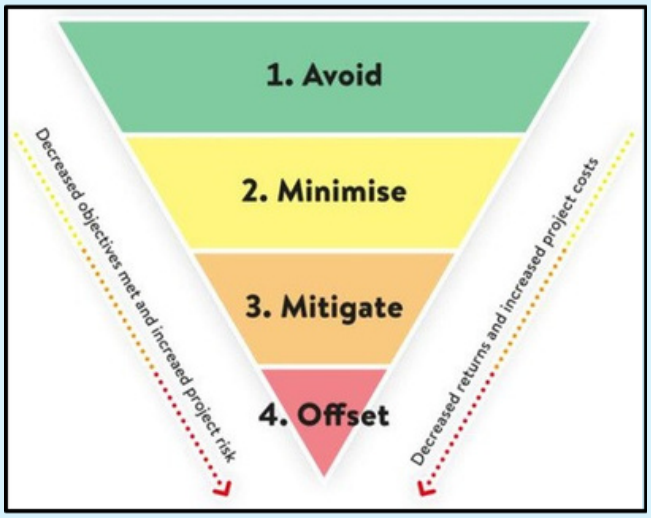


Figure 7: Mitigation hierarchy visual display (Buro Happold,2026)

Policy response opportunities should go beyond traditional pathways of online forms or tangible letters; there should be personal engagement with not only those impacted by potential change but interested society.

DEFRA have an Offshore Wind Environmental Improvement Package (OWEIP) in draft, and this aims to define baselines of impact to improve agreements and understandings related to consultation and planning (DEFRA, 2026a).

Acoustic deterrent devices (ADD) are a topical method in mitigating marine anthropogenic disruption; however, they require licensing to approve usage as they are disturbing species nearby, and their use can be within permanent or temporary thresholds. Such use may interfere with varying timelines of species recovery, requiring further mitigation planning.

ORE infrastructure may also create transboundary concerns and impacts, due to the interaction of non-border conforming species and grid constraints. Recognising cross-border governance requirements is vital; taking example of the agencies which exist for Lough Foyle and Carlingford Lough through the Loughs Agency, but also having political representation at the North-South Ministerial Council may be beneficial in addressing transboundary challenges (Hughes, 2021; NSMC, 2015). This has also been previously addressed at the Ulster Wildlife Blue Horizons event in 2025 (QUB, 2025).

Species and Identification

Considerations for migratoryspeciesin relation to phenological changes being altered through changing climate should be identified and modelled. Planning for post-construction of infrastructure needs to consider timeframes 25+ years into the future, so conditions of the marine environment within varying climate pathways must be calculated to better understand future threats within ORE infrastructure and nearby species or habitats.

However, species and habitats should be considered on a case-by-case basis; considerations that species are mobile; previous designations of the site may alter presence; and cumulative activity impacts should be addressed.

Climate Change

The climate andbiodiversity crisis are entwined and whilst ORE will address the climate crisis through infrastructure development, there are many uncertainties to the work. 'Horizon Scanning' is a method used to develop climate-resilient spatial planning, as it aims to reserve space for unforeseen environmental, technological or policy changes, whilst maintaining mitigative protection (UNDP, 2025; Bengston, Mauno and Hujala, 2024). This will be required for continued assessment, monitoring and adaptive management and will become a beneficial perspective in enhancing the sustainability and active management within the infrastructures' lifespan.

Whilst research would suggest an increased likelihood of interactions in the NI Atlantic region with migratory species, true events are not following – although there has been a recognised increase in prey activity.

Also, ORE is one of many pressures affecting the marine environment and these must be managed accordingly - e.g. shipping activity has incrementally increased annually (DAERA, 2025a). Disturbance from methane emissions, underwater noise, marine litter, invasive alien species, collision threats, water and air pollution are resulting from shipping activity (EEA, 2025). Such considerations should be made when viewing disturbances of ORE development – as it recognises that such threats are already present in the marine environment. Concern for unpredicted threats should require adaptive governance to cover changing responses, mitigation efforts or licensed activity, and whilst such anticipatory governance could be used throughout the ORE development, this relies on rigid governmental structures.

Cable Corridors and EMF

Cable corridors require long-term assessments to identify potential benthic habitat and species interaction changes, whether through succession from disturbance or future climatic pressures. This also relates to concern for terrestrial impacts from onshore transmission stations and potential infrastructure or business activity changes during development.

The location of the infrastructure may cause concern for fishing activity as it displaces gear (such as Twin Bottom Otter Trawls, Multi-Rig Bottom Trawls, Otter Trawler Mid, Beam Trawls, Pots and Creels, Seine Nets), which threatens truly sustainable co-existence between ORE and fisheries – regardless of MPA presence (KIS-ORCA, 2026).

In January 2023, the Marine Protected Areas (Prohibited Methods of Fishing) Regulations (Northern Ireland) 2022 came into play, preventing the use of demersal and static gear across 9 out of 48 MPAs (GOVUK, 2022). This legislation prohibits this type of fishing gear and associated activity taking place within these sites, leading to fishing with this type of gear being displaced to other areas of the EEZ. Displacement also occurs for the fishing sector due to a series of socio-economic factors such as crew.

EMF or Electromagnetic Fields are created from subsea power cables, which have expected threat to elasmobranchs, but also unknown alterations to migration or behavioural characteristics (Hermans et al., 2024). Elasmobranchs are particularly affected; they use specialised adaptations to detect changes within electromagnetic spheres around them - benefitting them for hunting or survival. Whilst there are no MPAs which are designated specifically for elasmobranchs, EMF has the potential to affect food web species such as crabs which aggregate towards cables (Lancaster, 2025). Cable corridors are a core component of ORE developments and typically run across the seabed - either embedded within rock armour or submerged within the seabed - to connect to power stations on land.

Queen's University Belfast are currently conducting a research project. Called ELASMO, regarding electric deterrent device impacts on marine species which could explore 'How will offshore energy infrastructure affect elasmobranchs?' (QML, 2026). Whilst it has focus on electrical currents, the knowledge and infrastructure will be useful in comparing EMF impacts to potentially impacted species behaviour.

ORE Anchorage Type

Atsite-level, floating wind isexpected to have the greatest impact on the nearby environment due to a greater footfall, but not at the individual perspective (when compared to fixed wind). When constructing, rock armour or cable protection may be used as artificial reef potential, although the input materials should be suited to the natural environment and species. However, this is challenging for protected benthic habitats and species which are vulnerable to alterations in benthic conditions – which may impact conservation objectives. Co-location development

amplifies the need for such challenges to be addressed, as recognised in this report. Attracting invasive alien species (IAS) is also a concern, due to the alteration of marine features present. The decommissioning process should also be considered within early stages of the project's planning. Whilst the marine license will indicate what future activity is planned; there is questioning whether this may be adaptive due to potential succession around the anchorage. Disapproval of large-scale disruption at both construction and decommissioning phases was present, as it threatens biodiversity, habitat destruction and species disturbance after a 25+ year timeline. If full deconstruction is approved, it questions the sustainability, and genuine mitigation attempts during operation. Exemplar case studies could be through offshore oil and gas rigs, but also from coastal defences such as offshore breakwaters – when attempting to understand succession after the infrastructure's development. Research institutes such as VALMAS are also crucial in understanding the priorities of management across all life-stages of marine structures (VALMAS, 2026).

Fisheries Consideration

Fishermen are displaced at all stages of ORE development, amplifying the need for appropriate communication and compensation with the sector. Concern for fishermen being treated as a scapegoat for the unsustainable usage of the marine environment was revealed, but if everyone is working towards the same goal, this effort to undermine another sector could be used to collaborate and understand the next steps in sustainability utilising our marine resources. Understanding the need to protect the industry, cultural values and social relations is crucial; examples of previous traditional job losses in the UK such as coal mining may foreshadow community impacts if fishing efforts were forced to reduce due to non-local, large-scale corporations. For example, in the 1980's displacement, approximately 200,000 workers or 90% of the workforce lost their jobs (Rud et al., 2024); in 2019, approximately 5.7million people lived around the coalfield areas, and 42% of these communities are amongst the 30% least deprived of the British population (Beatty, Fothergill and Gore, 2019). Thus, proving the unknown impacts and level of compensation required for traditional job loss, such as fishing, due to displacement via future marine developments. Mentions of co-locating aquaculture and ORE circulated, but concern of technological constraints, marine species impact and suitable workers threaten feasibility.

Meaningful Engagement

Key takeaways regarding the creation of meaningful engagement with the stakeholders and impacted communities for such development projects, was to start early and the use of multi- sector stakeholder forum (such as Co-Fish). This could be further strengthened through a unitary organisation for transboundary projects and concerns – such as the outcomes of the Transformative Research Actions for Resilient Coastal Communities (TRACC) project by Queen's University Belfast for Lough Foyle (PML, 2025). Another example is the Carlingford

Lough Citizen Jury, which was the first cross-border democratic lottery process on the island of Ireland which developed principles and recommendations for the future of the lough's sustainability (reference) within their final report (Involve, 2026).

Public consultation should be efficient with respect to gaining a holistic understanding of the local communities' perspectives on a potential development, and what it means for social, economic and environmental impacts as a result. Accessing community 'gatekeepers' early within the project is a crucial way of gaining trust and a platform converse, as well as improving understanding of the community you are collaborating with and how to best access certain groups. Developing 'buy-ins' and understanding areas of disapproval from the local communities is crucial for gaining stakeholder engagement, for example, understanding local perspectives is beneficial to improve areas to address, such as Not-In-My-Back-Yard (NIMBY) perspectives, or management / mitigation plans if communities are amenable.

Use of methods such as 'backcasting' may also be helpful, as it visualises multiple pathways or scenarios and relevant outcomes; by communicating with stakeholders on their preference, plans acknowledge local needs thus reducing the requirements for strict regulation / prohibition due to higher compliance. Use of the Republic of Ireland's (ROI) 'Good Practice Guide' to develop successful examples of methods of engagement will increase efficiency within initial stages of the project (Basford, 2021).

Cross-disciplinary stakeholder groups with in-person meetings are invaluable at building rapport and hearing perspectives from a level playing-field; the ongoing Co-Fish forum provides example of governmental, industry, science and eNGO collaboration that aims to share knowledge and create fair, evidence-based management proposals. This engagement can help public members feed into conversations gatekeepers have with those who typically impose top-down change.

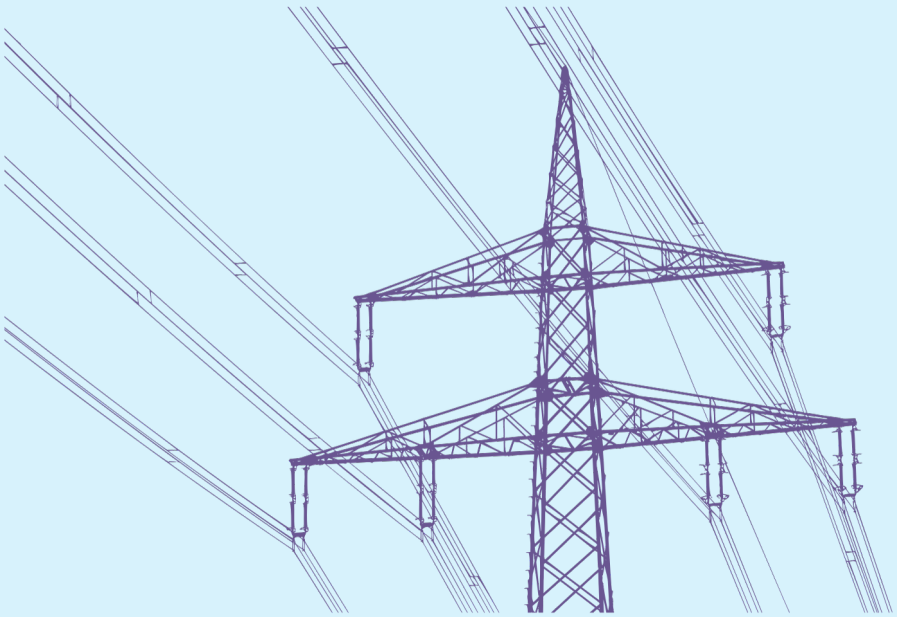
Stakeholder's Inputs

Thedraft MarinePlan will provide guidance and support recommendations for future maritime use to all sectoral users, but delayed publishing has backlogged assistance.

Citizen science and engagement can be crucial to the success of such marine developments, as not only does it support decision making, but it identifies local, cultural knowledge that can be significant to the future protection and management. For example, along the Antrim Coast, local community realisation of the significance of the seagrass meadows led to governmental designation and protection, as well as production of a local wildlife information booklet (Ulster Wildlife, 2019).

Considerations to cross-border or transboundary threats should be made, due to the cumulative impacts of the ORE development, but also for onshore infrastructure requirements such as transmission stations or the currently constrained electric grid. This feeds into terrestrial impacts of ORE that must be acknowledged, such as tourism fluctuations related to visual impacts, or the risk to coastal birds and bats.

Decision-making and modelling relies on high-resolution technocratic tools, standardisation of such technology is hard to define, but it also highlights questions of why communities lived experience, and knowledge may not be implemented into this data. Due to the qualitative nature of such knowledge, capturing such depth of context is difficult to achieve in quantitative models. There was also conversation regarding why ORE should potentially be considered in MPA networks, as the areas and included features are protected for a reason, so allowance of development undermines designation and management of such area.



Data

OREAP II SEA

Within the OREAP II Strategic Environmental Assessment (SEA) document, areas suited for the resource zone and such zones overlaid with combined constraints were produced for fixed wind, floating wind and tidal. It also examines the difference in theoretical energy potential at Stage 1, 2 and 3.

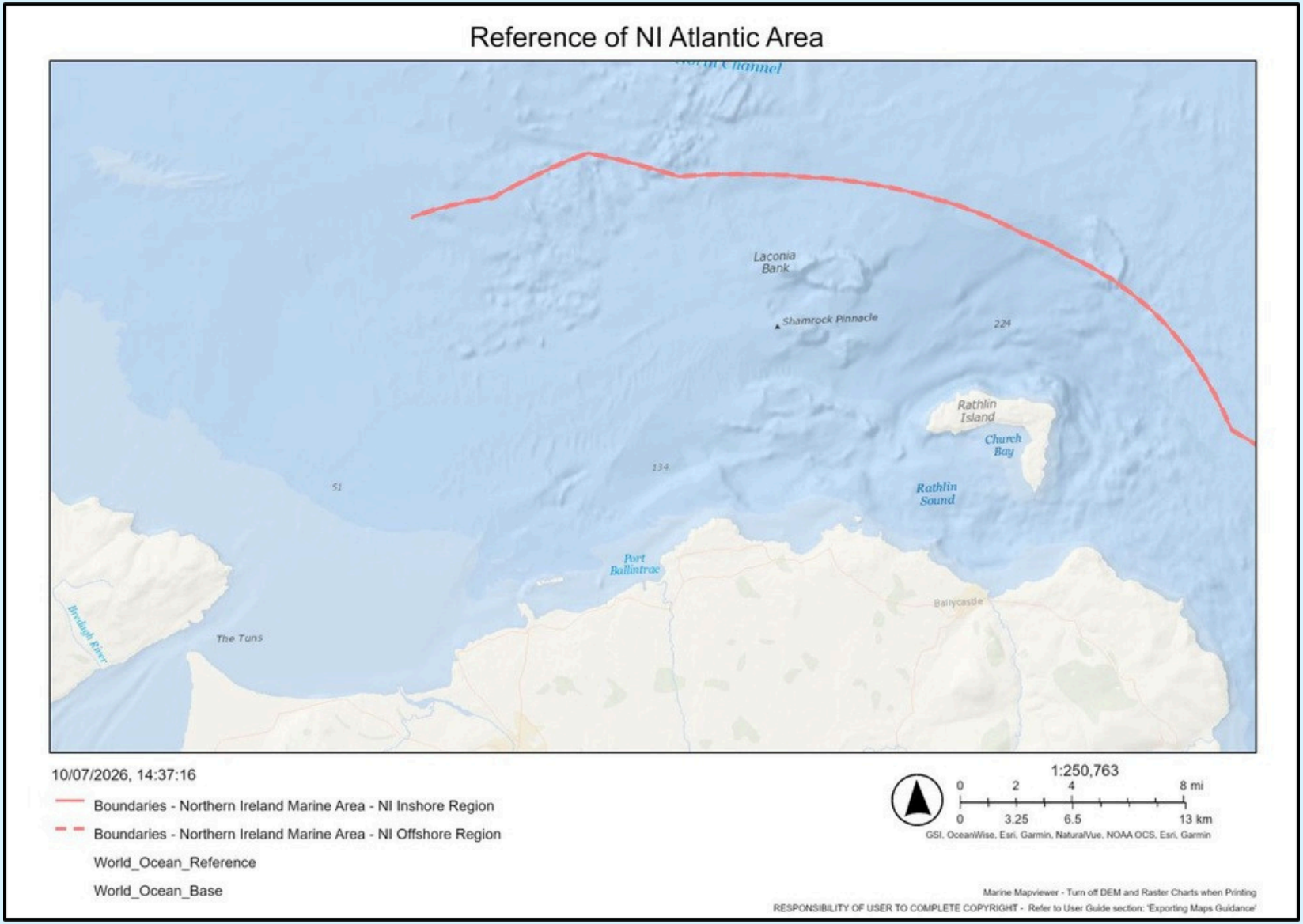


Figure 8: Reference Map for ORE Developments in the NI Atlantic Region (DAERA, 2025b)

Fixed Wind Resource Zone – Atlantic

Initially, the theoretical energy potential for fixed wind is 1.10GW, after Stage 2 it falls to 0.42GW and after Stage 3 recommendations it is 0.26GW.

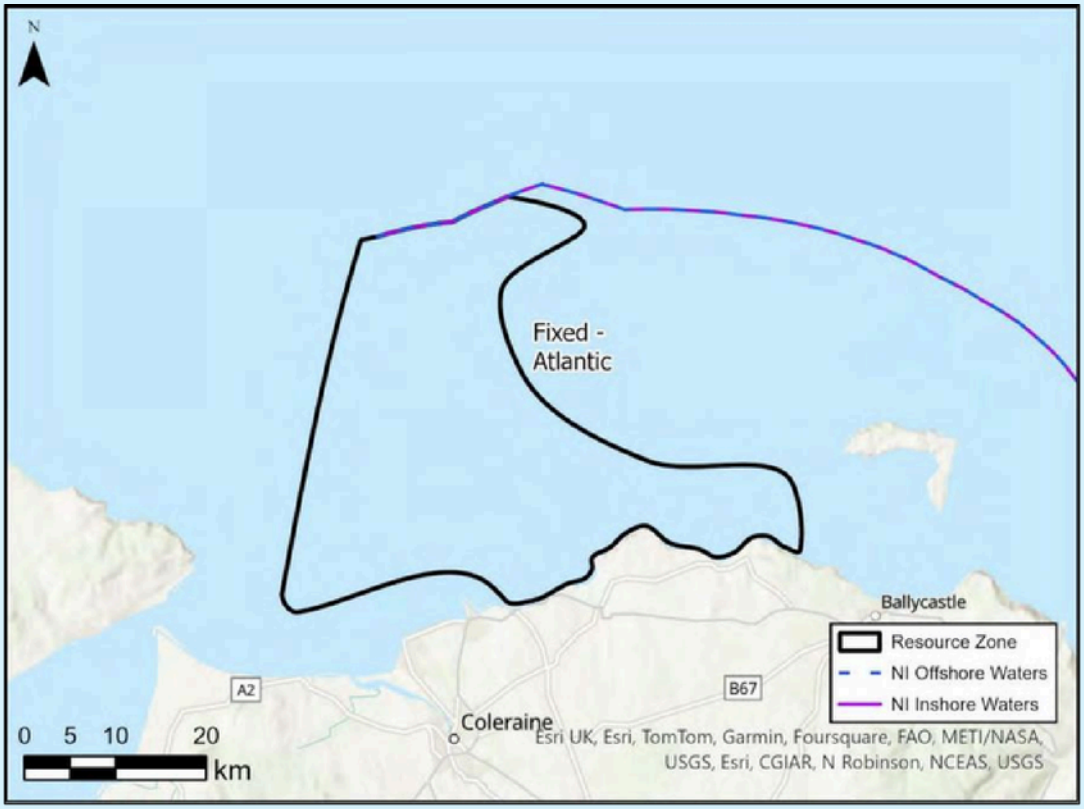


Figure 9: Initial Fixed Wind Resource Area (DAERA, 2022, p.178)

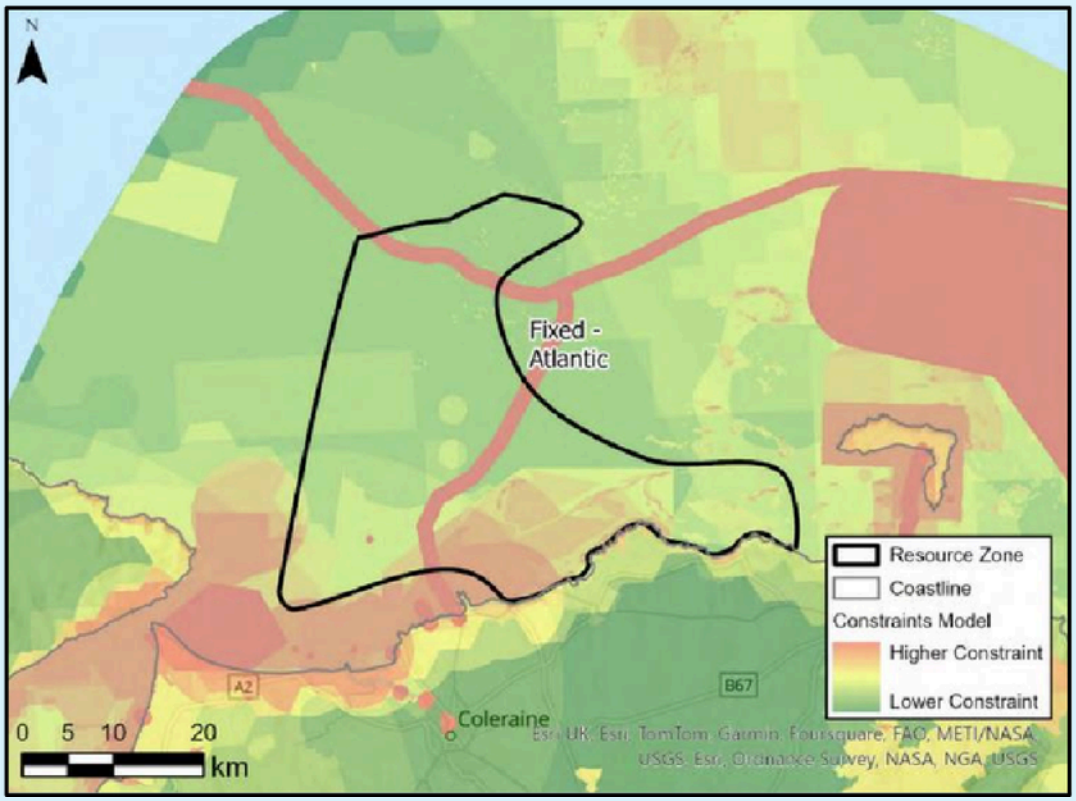


Figure 10: Fixed Wind Resource Zone with Constraints Model (DAERA, 2022, p.179)

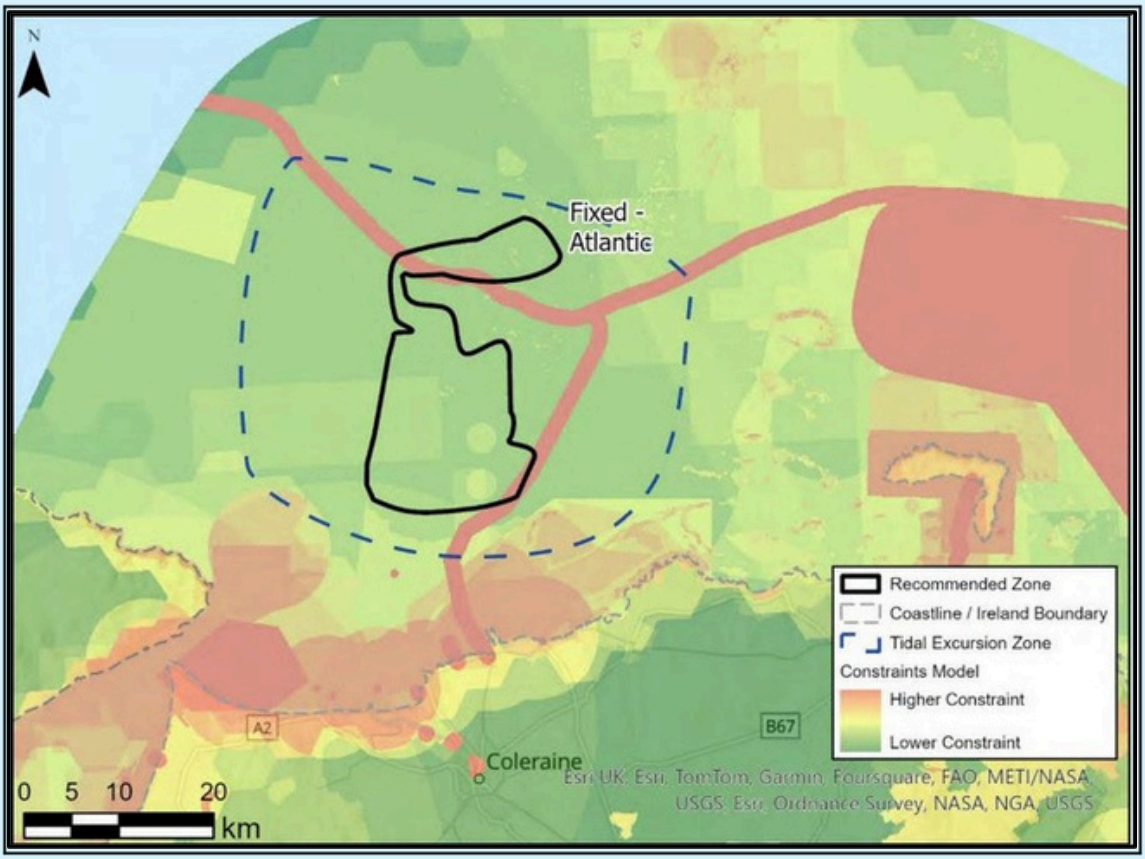


Figure 11: Recommended Fixed Wind Resource Zone with Constraints Model (DAERA, 2022, p.180)

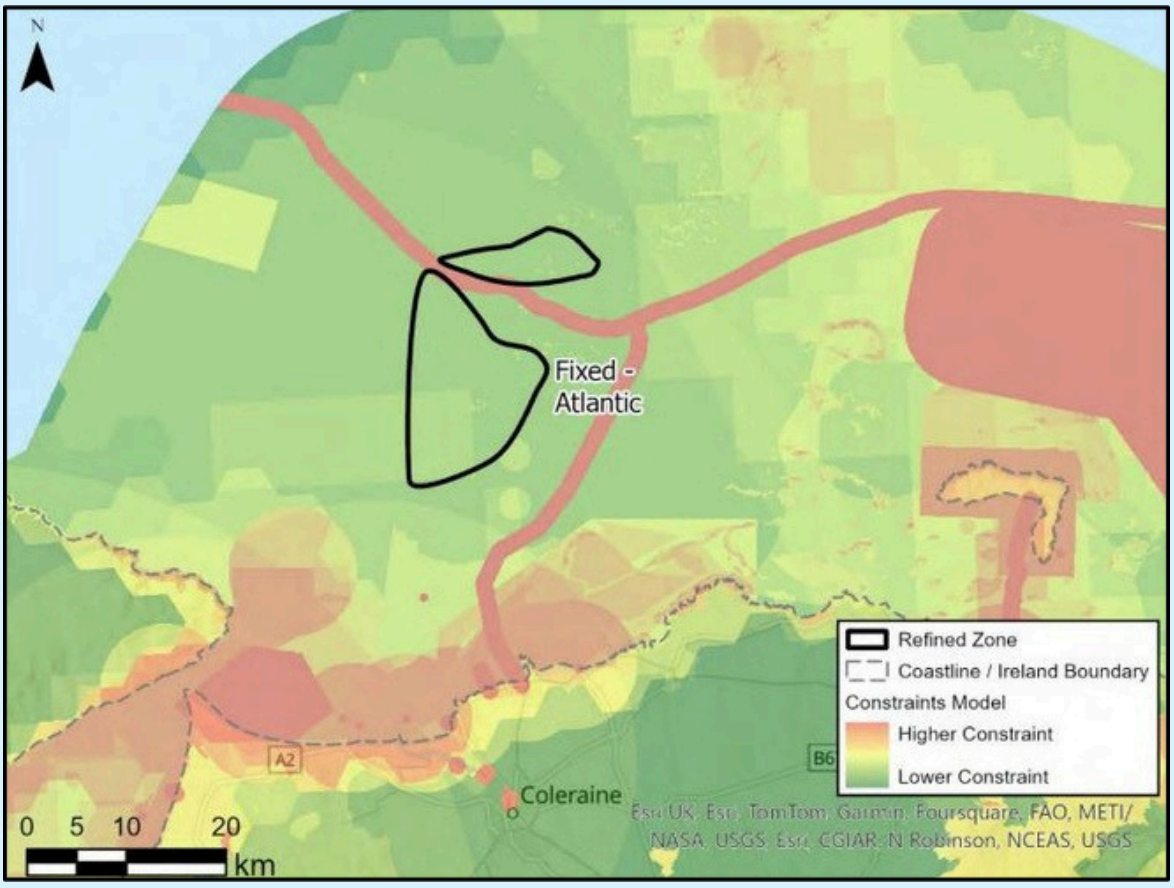


Figure 12: Refined Fixed Wind Resource Zone with Constraints Model (DAERA, 2022, p.187)

Floating Wind Resource Zone – Atlantic

Initially, the theoretical energy potential for floating wind is 3.34GW, after Stage 2 it falls to 2.22GW and after Stage 3 recommendations it is 1.06GW.

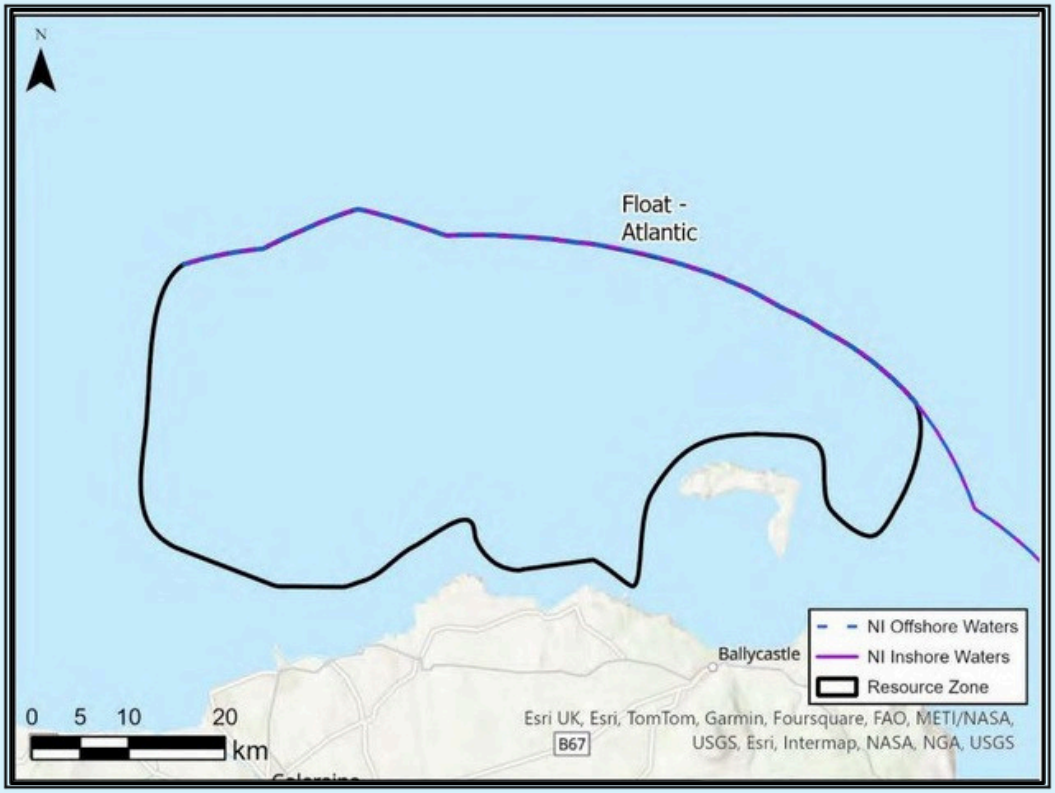


Figure 13: Initial Floating Wind Resource Zone (DAERA, 2022, p.228)

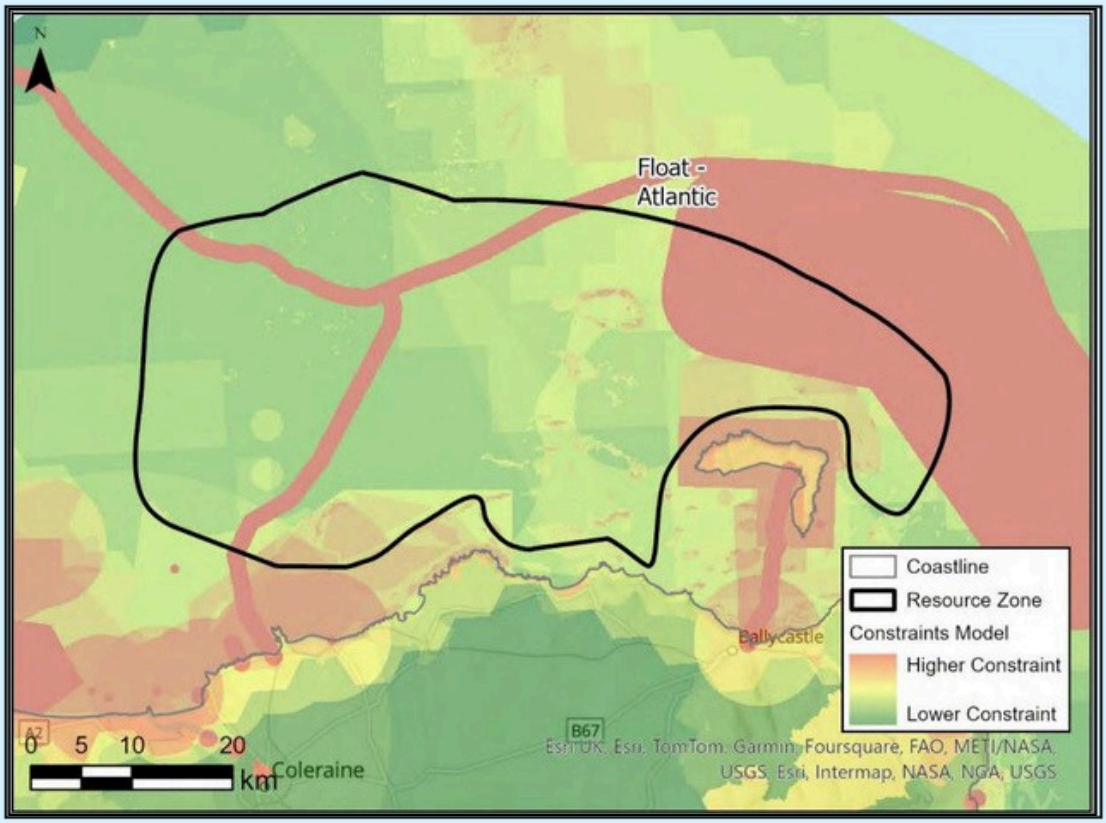


Figure 14: Floating Wind Resource Zone with Constraints Model (DAERA, 2022, p.229)

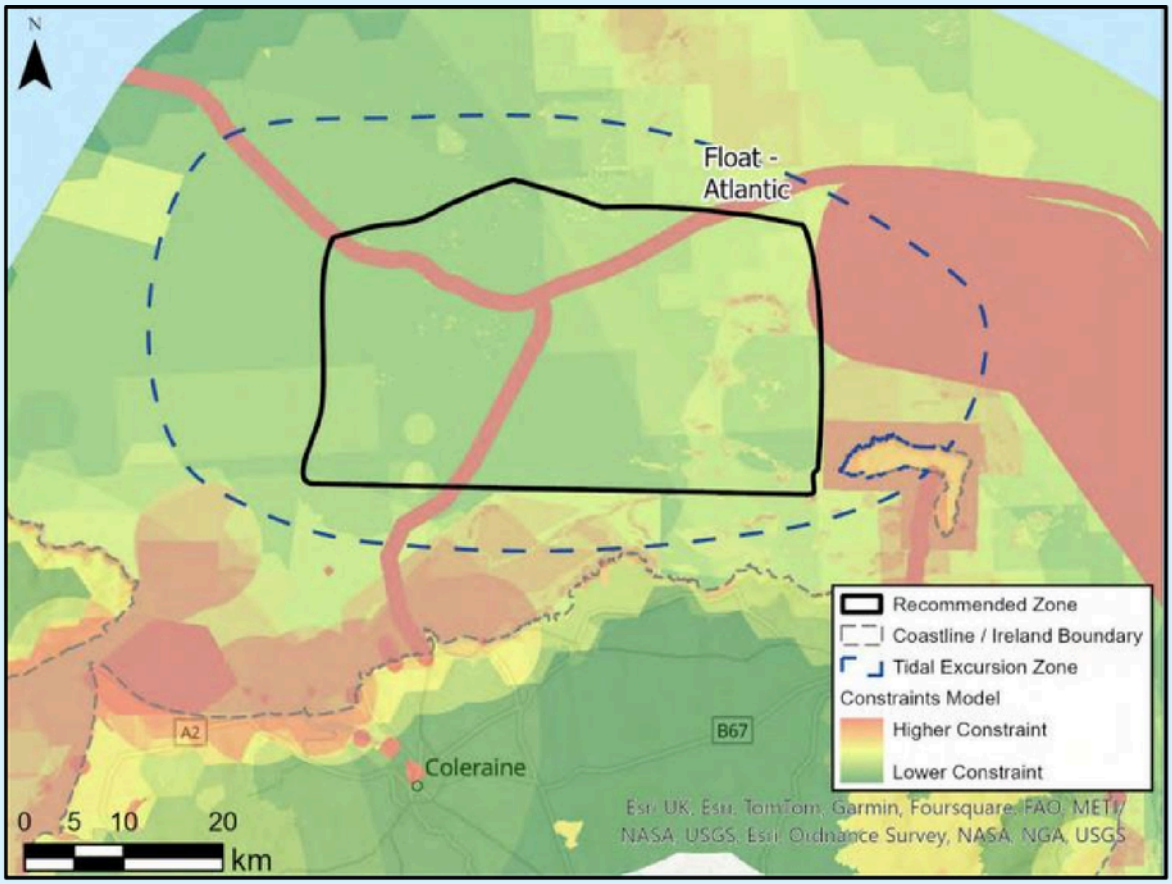


Figure 15: Recommended Floating Resource Zone with Constraints Model (DAERA, 2022, p.230)

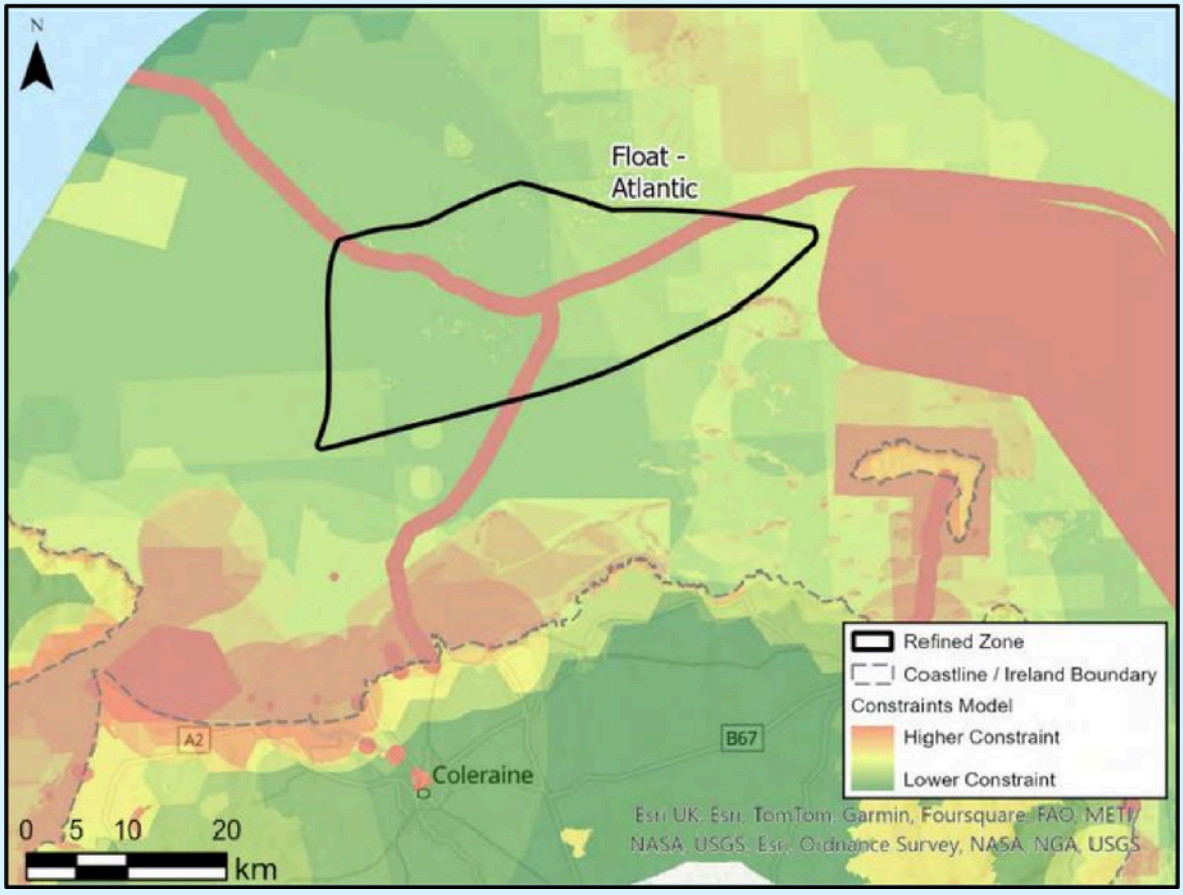


Figure 16: Refined Floating Resource Zone with Constraint Model (DAERA, 2022, p.238)

Tidal Resource Zone – Atlantic

Initially, the theoretical energy potential for tidal is 1.62GW, at Stage 2 it remains at 1.62GW and after Stage 3 recommendations it is 0.99GW.

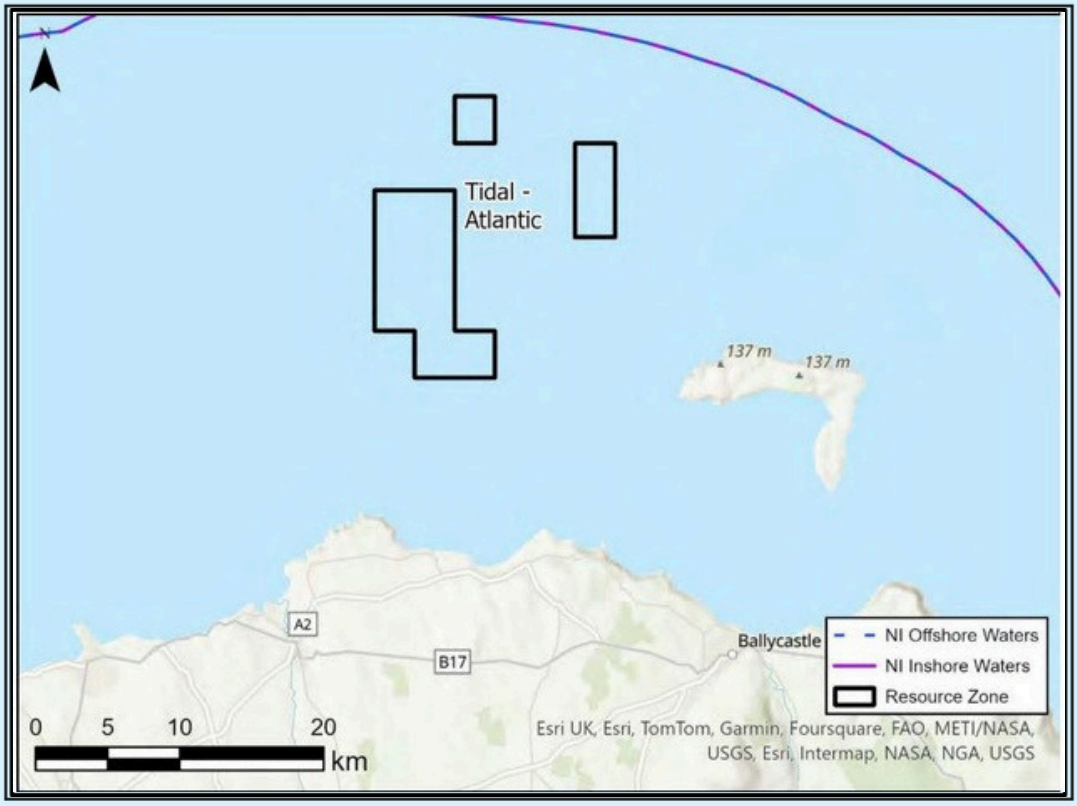


Figure 17: Initial Tidal Resource Zone (DAERA, 2022, p.284)

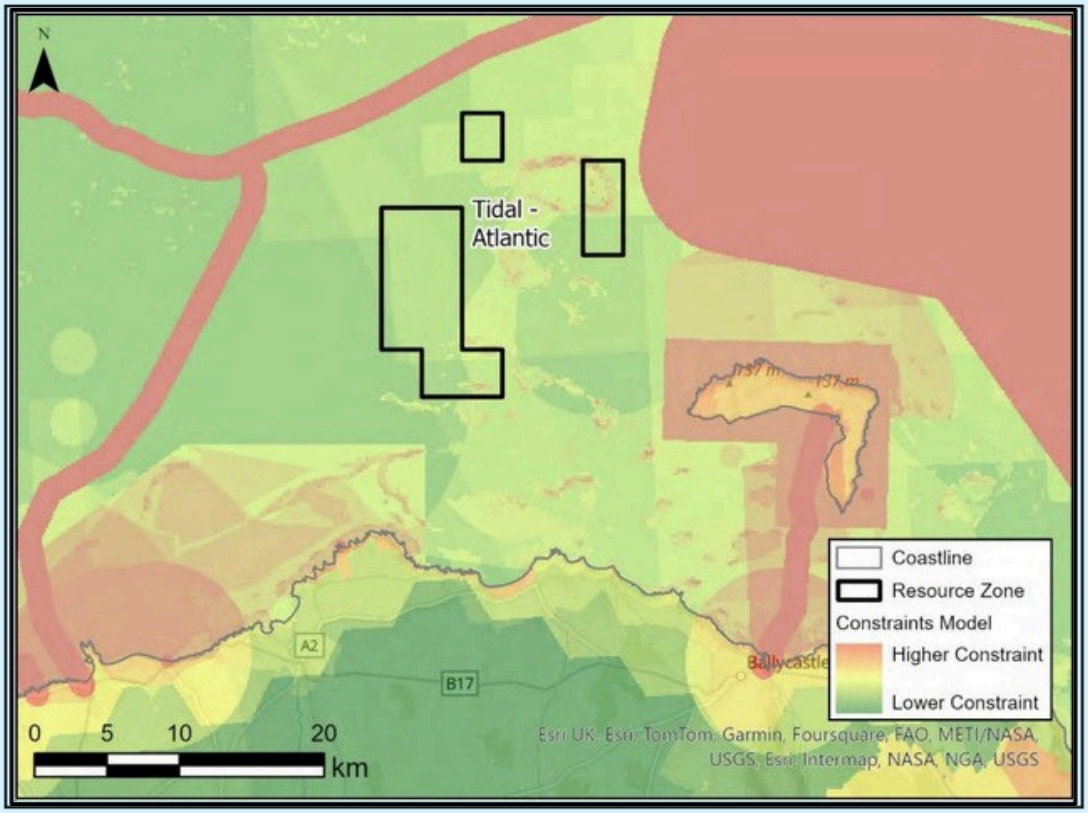


Figure 18: Tidal Resource Zone and Constraints Model (DAERA, 2022, p.285)

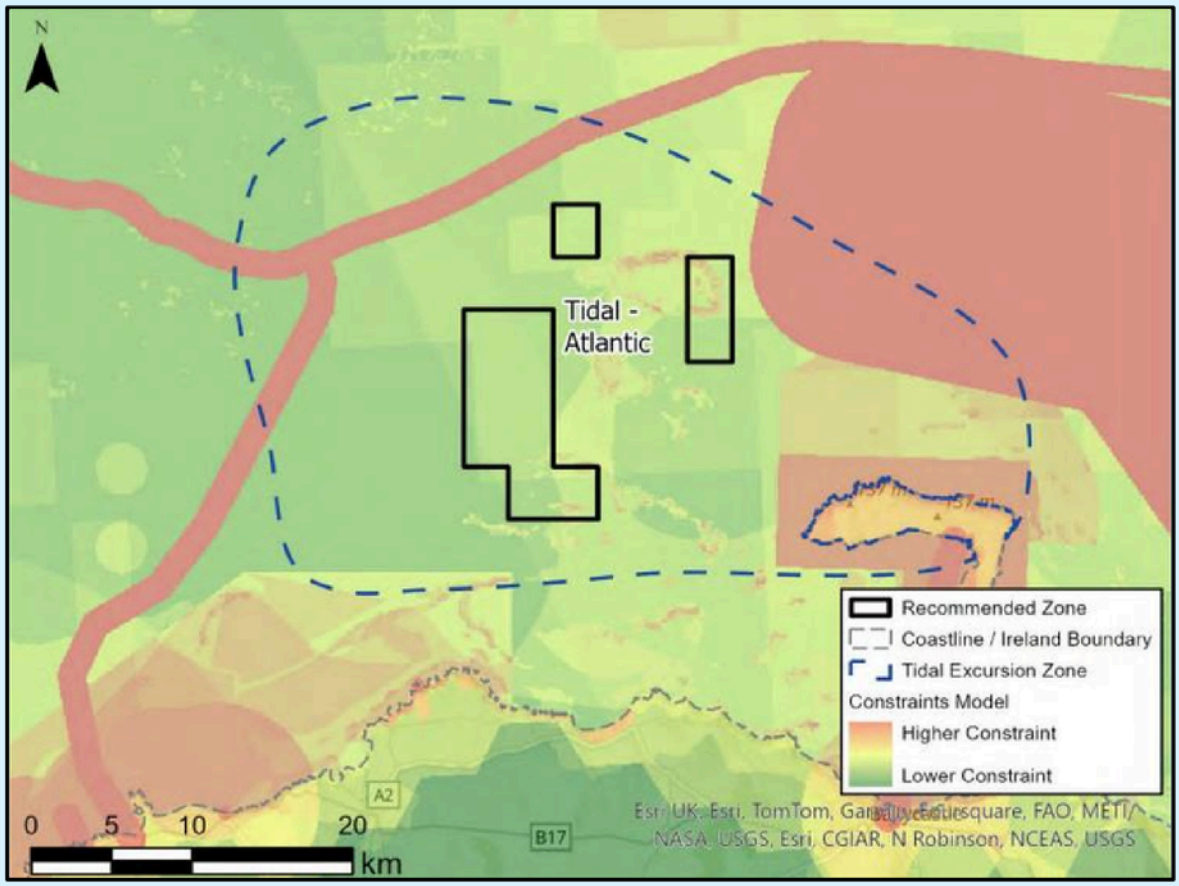


Figure 19: Recommended Tidal Resource Zone and Constraints Model (DAERA, 2022, p.286)

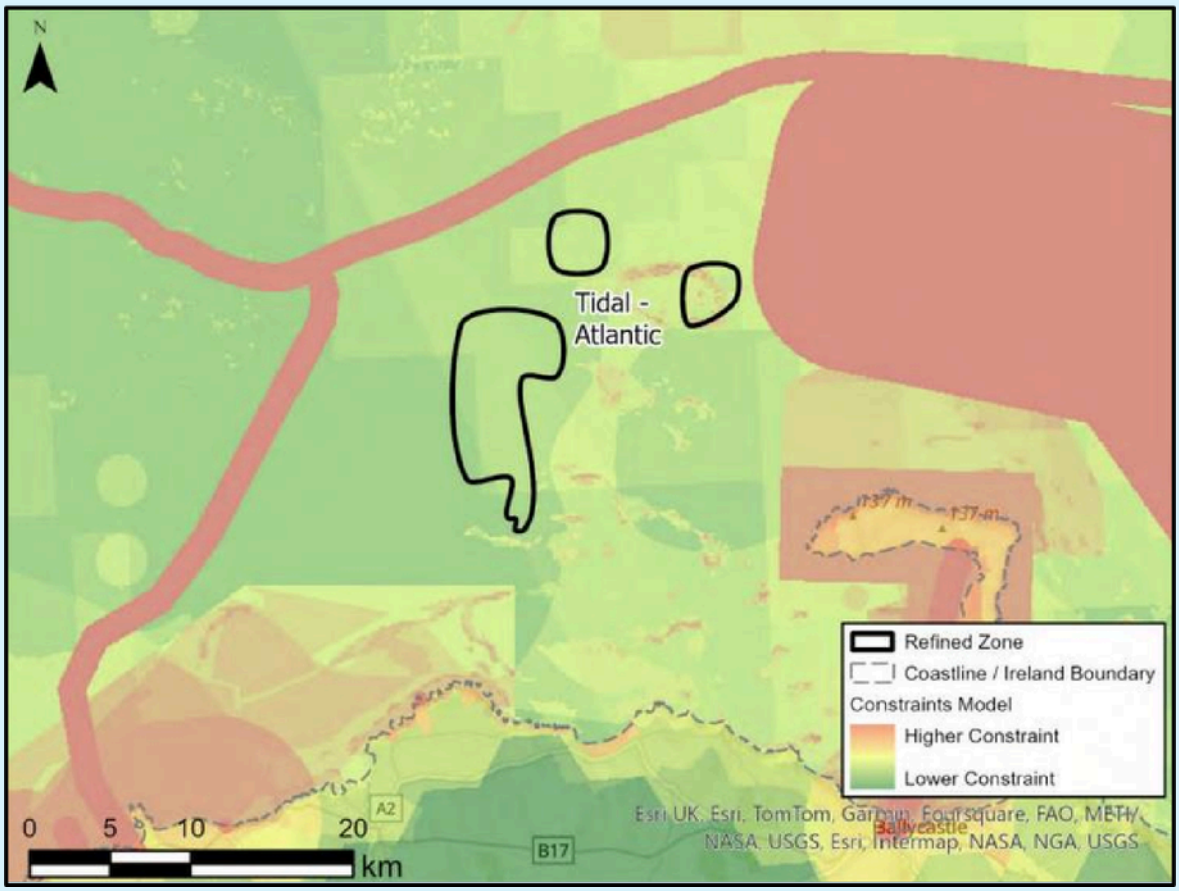


Figure 20: Refined Tidal Resource Zone and Constraints Model (DAERA, 2022, p.293)

MPA network

Fig. 6in the 'Context' section displays the MPA network in the Atlantic region and will be used in reference to the proximity of designated areas and included features.

Key species and priority marine features

Within the selected Atlanticsites across fixed wind, floatingwind andtidal, reference to the key species and marine features should be accounted for. Tables 1, 2, 3 and 4 iterate those of potential impact if development was successful. Recognising that the health of the seabed and subsequent habitats is crucial to species presence, for example preserving the Annex I Reef habitat, as identified in the OREAP II SEA document.

Table 1: Protected, NI Priority, OSPAR and SCANs Species Potentially Impacted by Fixed Wind, Floating Wind and Tidal Energy Proposals in the Atlantic region

Technology	Protected Species (WO)	NI Priority Species	OSPAR	SCANs
Fixed Wind	- Fan mussel - Harbour porpoise - Minke whale - Short-beaked common dolphin - Basking shark	- Fan mussel - Harbour porpoise - Minke whale - Short-beaked common dolphin - Basking shark - Purple sunstar - Horse mussel - Ocean quahog - Sea squirt (Pyura microcosmus) - Spiny dogfish	- Harbour porpoise - Ocean quahog - Spotted ray - Thornback ray - Spiny dogfish - Basking shark - Annex I Reef	90th percentile - White-beaked dolphin - Pilot whale -Bottlenose dolphin 70th percentile - Fin whale - Pilot whale -Bottlenose dolphin
Floating Wind	- Fan mussel -Harbour porpoise -Short-beaked common dolphin - Minke whale - Basking shark -Bottlenose dolphin - Common skate -Common goldeneye	- Fan mussel - Harbour porpoise - Short-beaked common dolphin - Minke whale - Basking shark - Bottlenose dolphin - Purple sunstar - Horse mussel - Ocean quahog - Sea squirt (Pyura microcosmus) - Spiny dogfish - Goose foot starfish - Sand sea star - Variegated scallop - Porbeagle - Cod - Whiting - Hake - Circular crab - Rugose squat lobster	-Spiny dogfish -Harbour porpoise -Spotted ray -Thornback ray -Common skate -Basking shark -Black-legged kittiwake -Cod -Ocean quahog -Porbeagle -Annex I Reef	-White-beaked dolphin - Pilot whale -Bottlenose dolphin - Fin whale

Tidal	Tidal	Tidal	Tidal	Tidal

Table 2: Protected Marine Features Potentially Impacted by Fixed Wind, Floating Wind and Tidal Energy Proposals in theAtlantic region

Marine Features (PMF Species)		
Fixed Womd	Floating Wind	Tidal
- Red cushion star - Purple sunstar - Great scallop - Queen scallop - Ocean quahog - Fan mussel - Sea slug - Embletonia pulchra - Harbour porpoise -Short-beaked common dolphin - Cuckoo ray - Spotted ray - Sole - Anglerfish - Thornback ray - Small-spotted catshark - Plaice - Spiny dogfish	- Red cushion star	n/a

Table 3: Spawning or Nursery Grounds Potentially Impacted by Fixed Wind, Floating Wind and Tidal Energy Proposals inthe Atlantic region

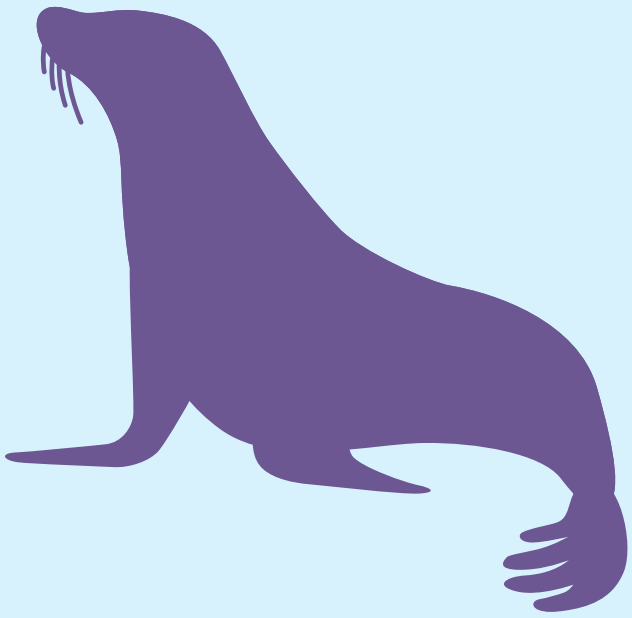
Spawning or Nursery Grounds		
Fixed	Floating	Tidal
- Sprat - Herring - Nephrops - Cod - Spurdog - Anglerfish - Blue whiting - Common skate - Hake - Herring - Mackerel - Queen scallops - Whiting - Ling	- Sprat	- Sprat

Table 4: INNS Potentially Impacted by Fixed Wind, Floating Wind and Tidal Energy Proposals in the Atlantic region

INNS		
Fixed	Floating	Tidal
- Polychaete (Goniadella gracilis) - Bryozoan (Bugula stolonifera)	- Polychaete (Goniadella gracilis)	n/a

Other species from MU data (including impact from all ORE types):

- White-sided dolphin
- White-beaked dolphin
- Risso's dolphin
- Minke whale
- Harbour porpoise
- Common dolphin
- Bottlenose dolphin
- Grey seal
- Harbour seal



Recommendations

The following recommendations outline management and / or mitigation actions if ORE were to be co-located in the MPA network across the Atlantic region of NI waters.

Each proposal is colour-coded to indicate feasibility, based on implementation likelihood; resourcing and stakeholder engagement consensus; supported by independent research and personal analysis. The benefits and limitations (tables) of each recommendation further inform its overall viability.

Legend for Recommendation Possibility:

Possible

Potentially Feasible

Aspirational

Recommendation 1

Enhancing the SEA to account for adaptive management framework for NI waters

As previously mentioned, EIAs are extensive documents required for licensing approval, project development and understanding required mitigation, but they also may be difficult for community members to understand when they want to be involved within the consultation process.

By altering the SEA requirements, for example by accounting for adaptive management frameworks, it would extend the dynamics of the project as well as alleviating marine licensing level of detail by putting greater focus on the overall requirements under the SEA rather than project-specific requirements which require repetition on a case-by-case basis. Revising requirements of what evidence is required and how monitoring will change over time allows the inclusion of an adaptive framework to support the environmental adaptation to ORE on a long-term, higher resolution. It can also account for future uncertainties, extend stakeholder involvement and present thresholds per scenario. Due to the infancy of co-location within this context having pre-designed adaptative capacity supports the evolution and potential of similar projects.

SEAs are typically static documents, whilst they do providethorough mitigation responses and future-planning, the variable marine environment requiresadapted monitoring efforts to ensure true sustainability in approving such marine construction.

Table 5: Benefits and Limitations of Recommendation 1

Benefits	Limitations
• Adaptive Frameworks: Adopt an adaptive, active management approach is adopted • Utilise Existing Frameworks: DIPSIR notes existing pressures to develop prioritisation and weighting for mitigation measures • Overarching Governance: Strengthen SEA approach to common principles and required measures, lessening EIA detail	• Holistic Approach: Ensure balanced governance between sectors • Sector Expertise: Ensure value and experience of each sector is considered

Recommendation 2

Align existing and future policies with the mitigation hierarchy and precautionary principle to set environmental standards

Aligning both existing and future policies would provide consistency across projects and developments, as it creates accountability requiring active engagement from developers involved. This should include long-term, full-practice monitoring to set such standards, for example, taking inspiration from the structure of the MONI-project.

Avoid, mitigate, restore, compensate. This hierarchy allows the exploration of mitigating environmental impacts first and then considers what can be minimised and enforced after such alterations are made. This process instils consistency within mitigation planning as well as across sectors, which may provide secondary benefits of reduced conflict for future MPA developments.

Precautionary measures ensure protection is at the forefront of each project. Preventing harm, rather than allowing disturbance, creates pro-active responses; within projects such as the co- location ofORE in MPAs, implementing adaptive yet rigorous standards for acknowledgement allows for future proofing and compl iments later developments of its nature.

Table6: Benefits and Limitations of Recommendation 2

Benefits	Limitations
• Disturbance Thresholds: Acknowledged issues require implementation of recognised permanent or temporary thresholds • Existing Projects: MONI project aims to map entire NI benthic area by 2028 • Timelines for Recovery: Ability to ensure realistic timelines to achieve species and habitat recovery • Addressing Data Gaps: Inclusion of community opinions, EIAs, define and explore within strategies' own literature and definitions • Policy to Action: Traditional policy development opportunities ensuring creation of action • Environmental Standards: DEFRA's already developing Offshore Wind Environmental Standards as an existing template to define and improve baselines and improve joint agreements	• Mitigation Measures: Existing measures such as Acoustic Deterrent Devices (A.D.D.s) not utilised as standard to reduce impacts to marine mammals • Transboundary Concerns: Lack of inclusion of transboundary issues for Lough Foyle and Carlingford Lough areas • Policy Alignment: Existing policies are uneven, complex, especially around compensation • Compensation Scope: Small positive scope, but critical for strategic development and planning • Full Practice Monitoring: Not currently being delivered or monitored. References from UK SNCBs to all fishing vessels being monitored. Take in sector sensitivity – e.g. commercial vessel

Recommendation 3

Drive innovative technology development and adaptive management by applying established findings of EMF on Priority Marine Features

By utilising EMF data from current comparable ORE sites in the UK, operation would allow modelling of the potential impacts of EMF on specific features in the nearby environment for NI. Having updated datasets and monitoring could allow for management to be increasingly relevant to features affected, ensuring protection further meets standards as proposed to the co- location aspect of the project. This extends precautionary measures, as it is a developing field of research, allowing management to adapt and improve as ongoing evidence provides a feedback loop.

This may also provide a systems-approach to management, as it assesses individual feature concerns, as well as communitive features. Management must adhere to extreme thresholds of threat (for example – most and least vulnerable), and must be suitable for what is present, as to not cause further harm.

This knowledge can feed into environmental standards for future ORE developments (Recommendation 2), whether specific to MPA's or specifically areas with priority marine features present, allowing relevant enhancements to the legislation.

For example, QUB's current ELASMO project research the impacts of electrical currents on individual marine species. The technology, infrastructure and dataco uld be reflective of the similar impacts of EMF, allowing new data to feed into proposals.

Table7: Benefits and Limitations of Recommendation 3

Benefits	Limitations
· Long-Term Assessments: Opportunities to build on long-term, existing datasets or utilise existing frameworks to develop required monitoring programmes · Construction Phase Mitigation: Existing examples of mitigation during construction phase well-known which can be applied to other areas of operation (e.g. full life) · Community Engagement: Opportunities to bring public opinion into scoping and opportunities to further develop social acceptance of technologies used · ELASMO Project: Research ongoing and developing into Electric-deterrent devices to assess EMF impacts on marine species to be applied to infrastructure and further knowledge base · Successful Case Studies: Expansive information available on poorly planned, mitigated projects such as Hornsea III alongside successful case studies which can be used	· Terrestrial Link (Cable Corridors): Needs to have greater social acceptance for sections of ORE developments coming onto land and associated EMF · Displacement Impacts:Concerns need to be addressed over displacement of sectors through restrictive access of gears or active areas for other industries · Co-Existence: Further work needed to assess if co-existence between sectors such as fisheries and ORE within and outside of MPAs are sustainable

Recommendation 4

Long-term monitoring to assess impacts to conservation status of priority marine features (and habitats) prior to construction through to decommissioning

The different life stages of the project will affect marine features at varying thresholds, which must be considered within the management of the project development. This creates difficulty for implementation as cumulative impacts of conservation and management proposals should also be recognised. Impacts within the 'in-between' life stages may also go unrecognised, so monitoring and modelling must include these timeframes and processes.

More specifically, the decommissioning process should be informed through active assessments, rather than static policies, as the future state from successive developments and processes is unknown, such as the features present after the operational life of the ORE. However, this does allude to the concern for IAS presence, or the argument that present species may not be suitable to be maintained in the area due to uncertainty whether they would have been present if not for the ORE infrastructure. This should be factored into existing biodiversity action plans and IAS Action Plans.

Examples of species presence and succession could be taken from other offshore infrastructure that is near decommissioning. For example, monitoring oil and gas offshore rigs, or potentially sea defence s tructures such as groynes.

Table8: Benefits and Limitations of Recommendation 4

Benefits	Limitations
· Species-Specific: Monitoring, mitigation and action for cumulative impacts should be species-specific and, on a case-by-case basis · Seasonal Migrations: Mitigation and action should take account of wealth of data associated with seasonal migratory pathways for cumulative impacts	· Full-Life Planning: Requires increased planning and regulation for the full life of infrastructure developments (planning through to decommissioning)

Recommendation 5

Alignment of adaptive managementwith existing conservation, climate and industry management plans, strategies and action plans

Current strategies and action plans alongside those in draft should be designed to include adaptive management potential.

Recently published plans or strategies included the NI Seabird Conservation Strategy 2026 – 2035 (DAERA, 2026c) and the in-draft including the Climate Action Plan 2023 – 2027 (DAERA, 2025c), Fisheries Management Plans (DAERA, 2023) and the Nature Recovery Strategy (DAERA, 2026a). As well, the in-development Underwater Noise Action Plan being developed by DAERA should be published in 2028 as mentioned within the Environmental Improvement Plan and subsequent Annual Progress Report 2025 - 2026 (DAERA, 2024). This alignment stems from the uncertainty of model predications, for example, within the stakeholder discussions it was noted that contemporary research suggests that NI waters would see an increase of interactions with migratory species alongside shifts in current, but reality is not following. The Ulster Wildlife commissioned report with Plymouth Marine Laboratory, entitled 'MPAs in Relation to Climate Change for Northern Ireland (2026)' predicts that 53.3% of NI's benthic will be significantly changed by the end of the century alongside most pelagic waters. Rather there has been an increase in prey activity; changing climates have created warmer sea temperatures increasing metabolic rates, as well as the extent of seasonal upwelling (Ferrari et al., 2015; MERP, 2024). These unexpected findings represent the need for adaptive planning and management, as following predefined actions may exacerbate changing interactions, rather than limit or support.

Table 9: Benefits and Limitations of Recommendation 5

Benefits	Limitations
• Adaptive Governance: Requires a rigid governance structure to work with data and monitoring programmes to ensure effective implementation • Horizon Scanning: Need to account for links to existing policies and strategies to ensure alignment • Existing Literature: There are many case studies and recent examples of latest information on climate change – e.g. UW Report on MPAs in Relation to Climate Change for Northern Ireland (2026)	• Changing variables: Must take account of additional variables such as changing wind activity and sea temperature to provide clearer picture • Cumulative Impacts: Need to take account of potential increase in marine user activities and the subsequent impacts from those because of co-location

Recommendation 6

Development and implementation of prioritisation criteria for low-impact ORE projects within MPAs

For proposed co-located projects, the creation of prioritisation criteria to reduce impacts could be developed and implemented. This would include sensitivity analyses, relevant statutory legislation and associated nature conservation. For example, the MPA Strategy for the Northern Ireland Inshore Region 2025–2030 (DAERA,2026b); Blue Carbon Action Plan 2025 – 2030 (DAERA, 2025b); the Energy Strategy – The Path to Net Zero Energy – Action Plan 2026 (DfE, 2020); and the developing Offshore Renewable Energy Installations (OREI) Bill.

This would be beneficial in selecting locations suited to efficient use of the marine environment, whilst ensuring the least impacts, or includes those most able to be mitigated or managed. This perspective would ensure mitigation was truly consolidated within the planning and processing of the project, which feeds into the sustainability of the marine environment and improvements into renewable energy access.

However, it would also limit the potential energy creation or size of the sites, hindering the efficiency and cost of such ORE infrastructure. Whilst developers and investors acknowledge the cost of mitigation and risk to the natural environment, constructing income- and energy- maximising turbines is the focus. To take a holistic approach, economic advancement should not override natural environmental protection and vice versa.

Table 10: Benefits and Limitations of Recommendation 6

Benefits	Limitations
• Test Sites: Opportunities to assess drag impact from shore within volatile environments • Comparison Sites: Once established, can compare with other offshore infrastructure to assess negative impacts • Coastal Defences: Assess potential for supporting natural habitats and compare to long-term coastal defences	• Double-Habitat Removal: Several individual and cumulative impacts associated with removal of settled benthic species and habitats during decommissioning • Adaptive Decommissioning: Assessment through marine licence on activity does not account for unique habitats forming and then being lost. Must adapt through long-term monitoring and site suitability • Compare ORE Design: Assess where greater footfall through anchorage type at individual and site levels to support prioritisation criteria • Cable Protection: Requires prior assessments to ensure that natural environment is suited to having a cable placement and can recover after placement • Invasive Alien Species: Risks of potential settlement of invasive alien species must be monitored, assessed and managed appropriately for all developments

Management Conclusions

Overall,six management recommendations were proposed. They were presented from 'Most' to 'Least' likely to be implemented, as noted through the 'Benefits' and 'Limitations' analysis. They provide a practical guide for the management of the co-location of ORE within the Atlantic area of Northern Ireland's inshore MPA network. Despite the separated analysis, it must be noted that the interconnectedness would enhance the effectiveness of the MPA's management. Collaborative planning, coordinated action and utilisation of relevant strategic frameworks should develop Northern Ireland's offshore renewable energy potential.

Additional Stakeholder Themes

The following themes were identified but not fully analysed and highlight areas for further research within this topic to gain a more holistic perspective.

- **Other areas across NI's MPA network that may be considered** - this research focused on MPAs that may be impacted across the Atlantic area, nearby Rathlin Island and the Skerries and Causeway, however, does not consider these other MPAs within NI's inshore region - yet recommendations could also be applied across the MPA network.

- **Other cumulative areas across the NI marine area that host opportunity for multiple ORE types at one location** - this research did not consider the other 'cumulative' areas identified in the OREAP II SEA report, including Torr Head / North Channel and the Irish Sea Area, which may require altered management proposals.

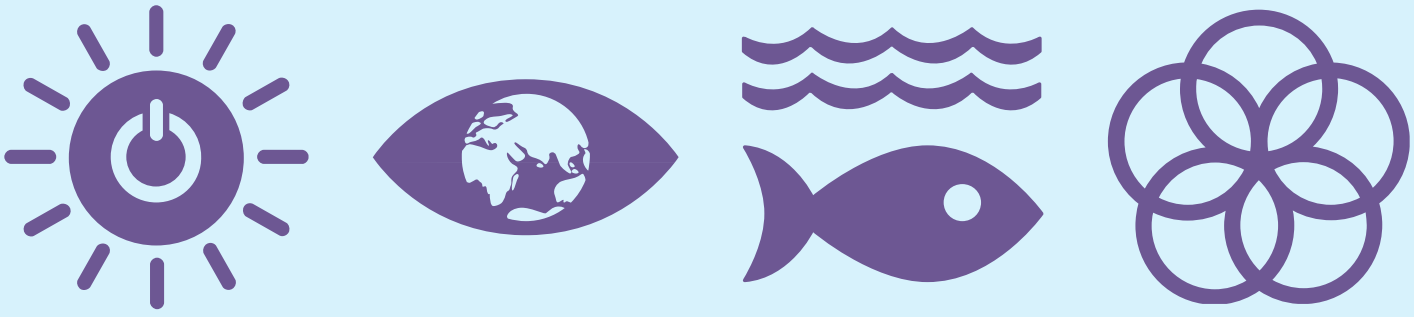
- **Fishing sector economic pressures** - economic compensation has been acknowledged for the fishing sector, however understanding of the true cost of potential loss would need to be studied (inclusion of knock-on effects, but also must consider outliers of future benefits from the potential 'spill-over' effects or future aquaculture opportunities).

- **Specific species at threat** - this research notes species of impact, however, does not go into species-specific management proposals. These concerns should be identified and mitigated where possible on a case-by-case basis through EIAs, for example the impact on Herring spawning grounds due to the in-progress Isle of Man ORE developments (Oriel Windfarm, 2024).

Conclusions

These management proposals have the intention of developing offshore renewable energy sites within Northern Ireland's MPA network. They have been developed in recognition of developed infrastructural constraints on marine features, increasing marine spatial squeeze, and effective management to retain biodiverse natural environments.

Meaningful engagement with the public and impacted sectors allows for holistic input, but complex EIAs, costly consultations and deficits in ocean literacy threaten feasibility. Bridging the public knowledge gap, whilst enhancing policies that ensure sustainability in future marine developments is vital to address future concerns for the offshore renewable potential for Northern Ireland.



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Appendices

StakeholderConversation Questions

DATA AND RECORDING

- How are impacts being currently being recorded in relation to Co-Location?

- What are the known data gaps in impacts from ORE? Why is this (Is there a lack of transparency?)

MITIGATION OF CO-LOCATION

- What mitigation iscurrently being proposed in NI? (Strategic compensation, acoustic deterrent devices, etc)
- Is this different depending on the ORE type?

SPECIES AND IDENTIFICATION

- How does interactions with species and habitats with ORE vary along the North Coast? (why is this)?
- What interactions occur at differentspatial areas in the sea – e.g. interactions at the seabed, surface and pelagic (mid-water)?

CLIMATE CHANGE

- Is there an increasein the likelihood of interactions with migratory species and habitats because of CC?
- What does current modelling suggest about climate-driven shifts in migratory species relevant to NI waters?
- If they answer yes to the above, where, which species (changing migration patterns, where in water column)?

EMF – Cable Corridors

-What impacts need to be considered when considering/establishing a cable corridor?

- What monitoring is currently being done around EMF impacts to migratory species and benthic communities?

ANCHORAGE TYPE

- How does impact vary by anchorage?

- What type of anchorage is likely to be appropriate in NI?

- Impact of decommissioning on benthic communities and established communities on foundational structures?

MY OWN QUESTIONS

- What impacts to fisheries would you think need to be considered – for example, would you suggest importance of artificial reef construction, economic compensation, allow passive gears around ORE infrastructure?

-What are the challenges in evidencing fisheries displacement and socio-economic impacts within the consenting process?

-What would “meaningful engagement” look like to you in future ORE in MPA planning, to ensure all communities’ voices involved are accounted for?