

Ecological sensitivity analysis to inform future MPA designation in the western Irish Sea

Prof. Tasman Crowe, UCD
Chair, MPA Advisory Group

<https://www.gov.ie/en/publication/e00ec-marine-protected-areas/>

Team

Advisory group

Tasman Crowe (UCD)

Louise Allcock (UOG)

Mark Johnson (UOG)

Tom Doyle (UCC)

Cormac Nolan (MI)

Ollie Tully (MI)

Researchers

Caoimhe Morris (UCD)

Elgar Kamjou (UCD)

Danielle Orrell (UCC)

Damien Haberlin (UCC)

Domonique Gillen (UOG)

Patricia Breen (MI)

Andrew Conway (MI)

Kellie Heney (MI)

Denise O'Sullivan (MI)

DHLGH staff

Oliver Ó Cadhla

Richard Cronin

Tim O'Higgins

Macdara Molloy (UCD)

Context

- General Scheme of the Marine Protected Area Bill published 16 Dec 2022
- Maritime Area Planning Act already in force
- Policy and pressure in relation to Offshore Renewable Energy (ORE)
- Ecological sensitivity analysis proposed as a basis for informing potential designation of MPAs
- Also need to consider key uses by maritime sectors
- Tight time frame due to urgency in relation to energy; project initiated in Dec 2022, report due end April 2023



Key aspects of objectives

- Comprehensive scientific **screening exercise for possible future MPAs** in a defined marine region off the east and south-east of Ireland.
- Open and constructive **engagement with key Government and non-Government stakeholders** that have extensive maritime interests in the Irish Sea
- Facilitate possible future **identification by the Government of viable “go-to-areas” for offshore energy projects in the Irish Sea**, in view of any biodiversity/ environmental/ cultural constraints that are concluded via the project.

Note

- This was **NOT** a process of MPA selection. It will inform MPA selection that will be undertaken under the new legislation, properly applying the processes that will be established in law.
- Nevertheless, we adhered where possible to the principles expected to underpin selection and designation
- Not covering species/habitats listed under EU Birds or Habitats Directives
- Not covering species individually managed under Common Fisheries Policy
- Used best available evidence; explicit about uncertainty
- Processes and conclusions transparent and objectively defensible

EXISTING SITES

Natura 2000 sites
SACs
SPAs

Some also designated as:

**Ramsar sites
with marine area**

**Nationally designated
sites with marine area**

- SNRs
- Refuges for Fauna

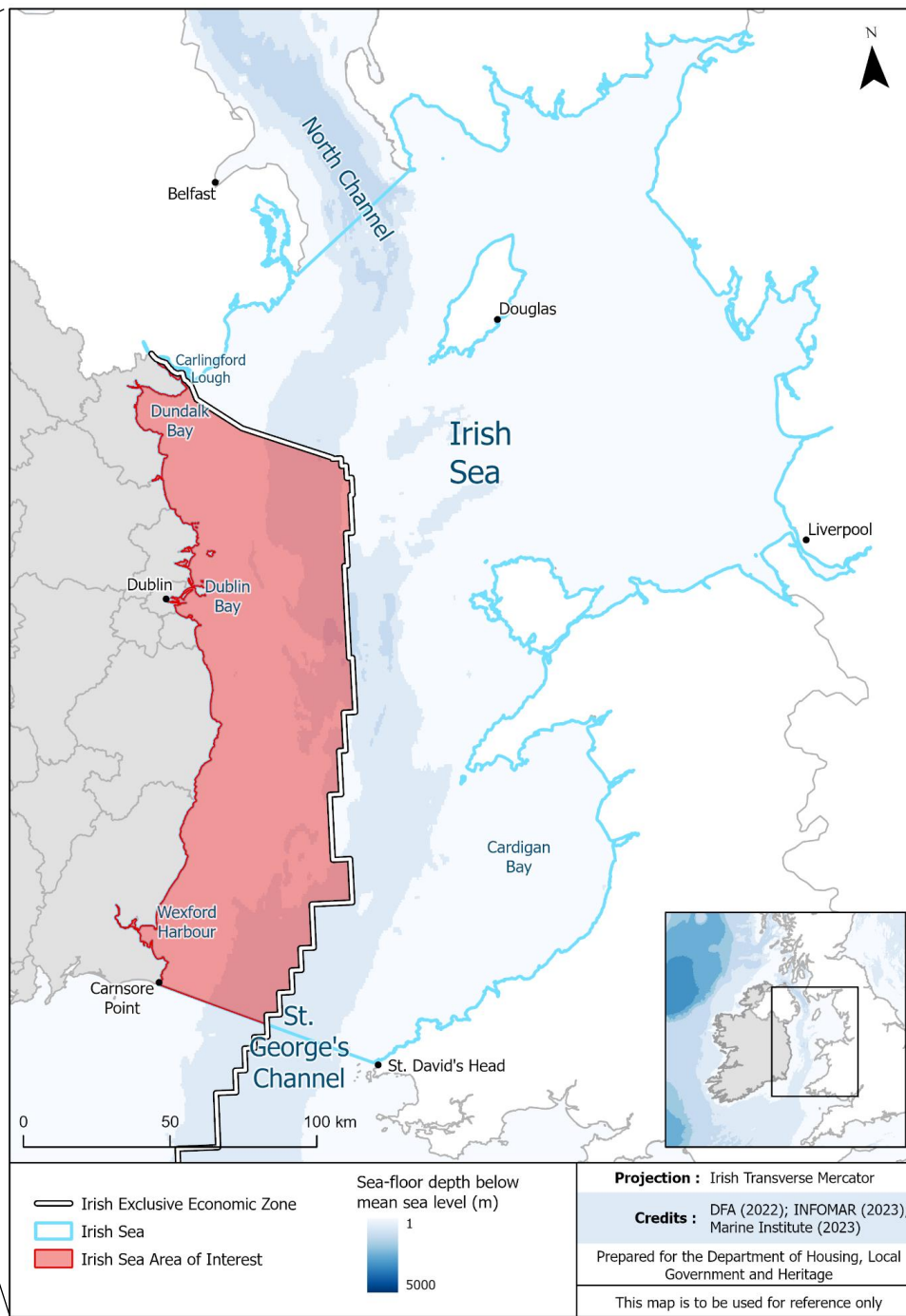
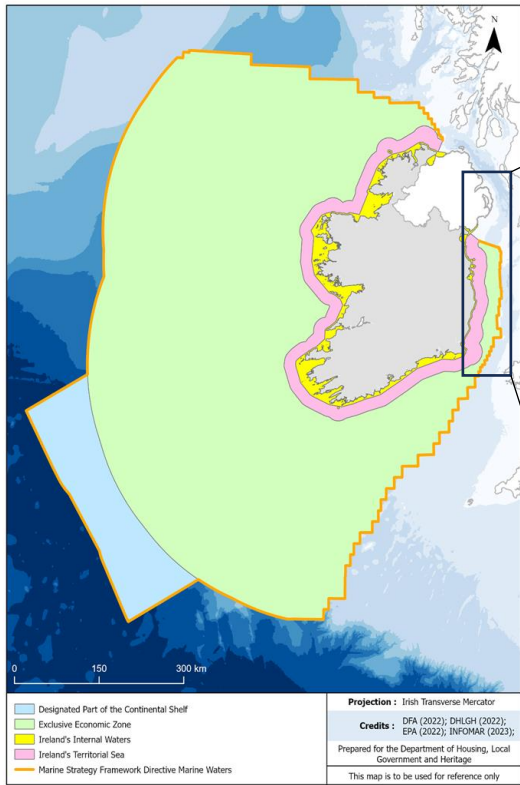
IRELAND'S MPA NETWORK

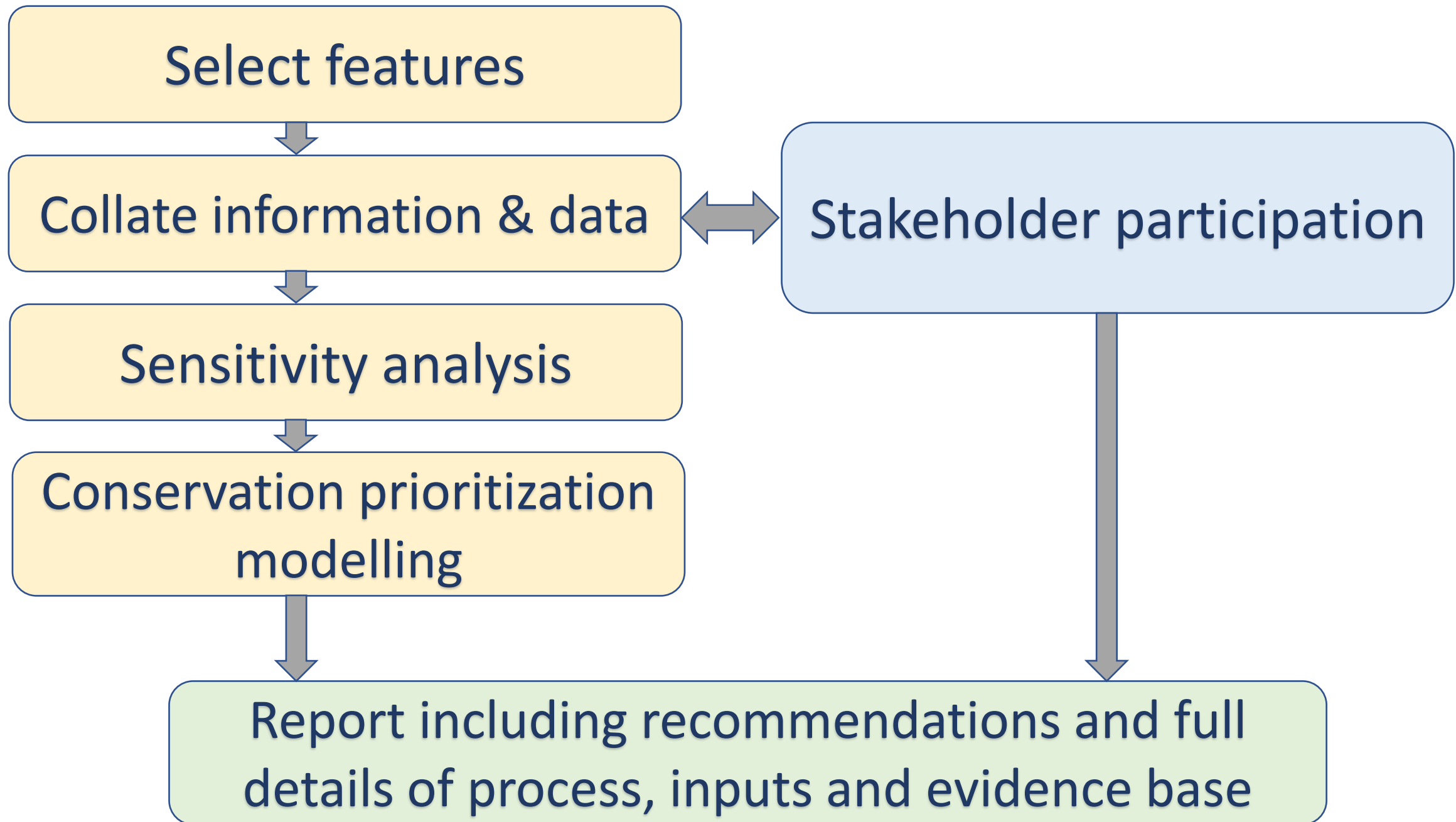
FUTURE SITES

**New MPAs under new
national legislation**

**Additional sites declared
under existing EU or
national legislation**

**Other area-based
measures
eg. OECMs**





Select features

Collate information & data

Sensitivity analysis

Conservation prioritization
modelling

Report including recommendations and full
details of process, inputs and evidence base

Stakeholder participation

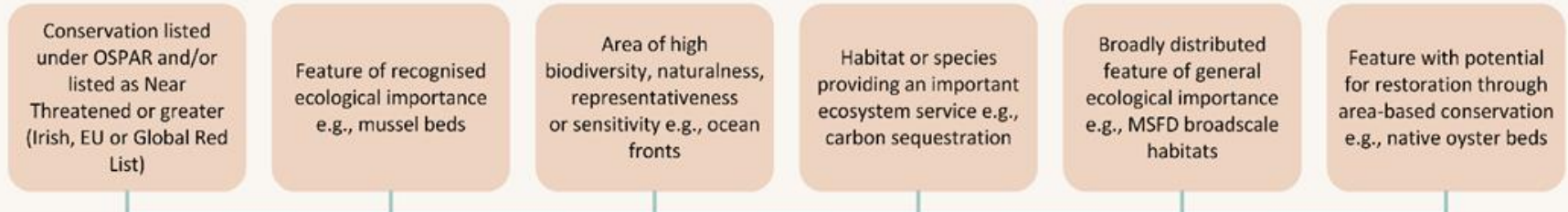
Select features

Species, habitats or other features to be conserved or restored such as areas providing ecosystem services



Image: K Hiscock

Step 1. Identifying features for further consideration.
Any qualifier will merit inclusion



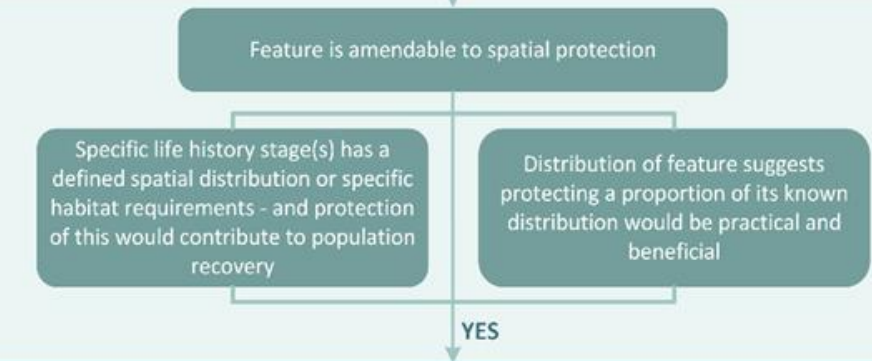
Step 2. Identifying features without existing protection and/or management. Both qualifiers must be met to merit inclusion



Step 3. The western Irish Sea must be a significant part of its past or current range to merit inclusion. As determined by satisfying any of the four criteria



Step 4. Based on current knowledge feature must be amendable to spatial protection. Either qualifier can merit inclusion



End assessment

Feature proceeds to sensitivity analysis

Selected features

40 distinct features met the criteria

- **Listed species**

18 on OSPAR or IUCN Red Lists, including 14 species of fish (9 elasmobranchs)

- **Listed and priority habitats**

All relevant MSFD priority habitats + 2 OSPAR-listed habitats

- **Ecological importance**

Herring spawning grounds, forage/juvenile fish, sub-tidal mussel beds, barrel jelly

- **Ecosystem services**

Carbon sequestration

- **Potential for restoration**

Native oysters



Image: GerardM



Image: E Farrell

Collate information and data

- Ecological
 - Distribution of species and habitats, including feeding, spawning and nursery areas, etc.
- Economic/sectoral
 - Shipping; energy; fisheries & aquaculture
- Cultural
- Legislative
 - Designated areas



Classification of data quality

Table 3.2.1. Data quality categories to assess the datasets provided. Examples are provided in Appendix 7.

Quality/type	Description
High	The ideal dataset for these analyses would be systematically collected without bias, using techniques specific to the feature(s) in question. It would have intensive coverage (e.g., on a 1-3 km grid) and would include repeated observations over several years.
Modelled from good data	<p>Modelled distribution data (based on modelling of systematic design-based observed data). The modelling process enables interpolation to areas not sampled and therefore has high spatial coverage. Uncertainty depends on the predictive power of the model.</p> <p>Examples include survey data used to model the predicted distribution of species, vessel monitoring system (VMS) data, which is extrapolated to a grid, and modelled estimates derived from acoustic data ground-truthed with observed samples.</p>
Modelled from moderate data	<p>Modelled distribution data that may have a spatial bias or provide incomplete information on the potential distribution of the feature.</p> <p>Examples are provided in Appendix 7 and include species distributions from fisheries effort and catch data interpolated or raised to a grid.</p>
Good; observed data	<p>Data acquired systematically which covers a large spatial area, but not the entire area of interest, and preferably with repeated measures over a long time series. These data ideally will provide a good spatial representation of the area but the distance between observations is much larger than the distance between planning units (i.e., grid size). This category also represents data sources which were combined to give a higher spatial coverage of a feature.</p> <p>Examples include observed data acquired from systematic surveys.</p>
Moderate; observed data	<p>Data acquired systematically or <u>opportunistically</u>, but is not modelled and covers only a limited area relative to the potential distribution of the feature.</p> <p>Examples include citizen science data and sea angling data.</p>
Low/ Insufficient for SCP	Data exist <u>in the area of</u> interest but are older than 10 years (for mobile features) or 30 years (for static features) <u>OR</u> are anecdotal <u>OR</u> are spatially imprecise.
N/A	No data available <u>in the area of</u> interest

Stakeholder participation

Inform

- **Aim:** transparency and clarity, inform wide range of stakeholders and provide opportunity for comment, questions and clarification
- **Actions:** Email on 25 Jan



Involve

- **Aim:** involve relevant govt departments and agencies, seek input, request data, hear and acknowledge potential concerns
- **Actions:** Four meetings in Feb and early March – in-person and online



Engage

- **Aim:** engage with key non-govt stakeholders identified by the Delphi method, hear and discuss perspectives and concerns
- **Actions:** Two days of multiple meetings, 23-24 March 2023



Disseminate

- **Aim:** present the outcome of the work, provide a chance for stakeholders to follow up
- **Actions:** Online webinar June/July 2023



With the process on excluded areas... SACs, SPAs, or habitats and species listed in the birds and habitats directive are excluded, we haven't really designated enough SPAs, so it is unclear to me how those two will dovetail?

Transparency and engagement highly valued by stakeholders

"Perhaps there is a belief that we can do everything everywhere, all at once and I think there are trade-offs and I think we have to be honest about what those trade-offs would be."

"I like the kind of structured and systematic scientific approach [you] are actually taking to do this rather than just looking on a map and going: oh, that's kind of nice there, let's protect that!"

Numerous non-government and sectoral stakeholders expressed their willingness to leverage their existing capacities to assist the project team in disseminating the results of this project to a broader audience.



- Input used to help shape the work and report
- Extensive stakeholder participation envisaged under MPA legislation
- Further opportunity for input during MPA process

Sensitivity analysis

- Assessment of sensitivity of features to pressures associated with focal sectoral activities – fishing, ORE, shipping
 - e.g. smothering, underwater noise, extraction of species, electromagnetic charges, changes in water flow – specified in established list
- Used available evidence to categorise resistance and resilience for each feature to each pressure
- Process fully transparent; used MARESA protocol
- Quality, concordance and applicability of evidence also characterized

	Resistance			
Resilience	None	Low	Medium	High
Very low	High	High	Medium	Low
Low	High	High	Medium	Low
Medium	Medium	Medium	Medium	Low
High	Medium	Low	Low	Not sensitive

Summary table of sensitivity to sectors

	ORE construction	ORE operation (cables)	ORE operation (turbines)	Fishing: bottom trawling	Fishing: dredging/ beam trawling	Fishing: pelagic	Fishing: static gear	Shipping
American plaice (long rough dab)	Medium (M)	Medium (M)	Medium (M)	Medium (M)	Medium (M)	Medium (M)	Medium (M)	NEv
Angel shark	Medium (L)	Medium (L)	Medium (L)	High (H)	High (H)	High (H)	High (H)	NEv
Basking shark	Medium (L)	NEv	Medium (L)	High (L)	High (L)	High (L)	High (L)	Medium (L)
Blonde ray	Medium (L)	Medium (L)	Medium (L)	High (H)	High (H)	High (H)	High (H)	NEv
Bull huss	Medium (L)	Medium (L)	Medium (L)	High (L)	High (L)	High (L)	High (L)	NEv
Cuckoo ray	Medium (L)	Low (L)	Low (L)	Medium (M)	Medium (M)	Medium (M)	Medium (M)	NS (L)
Edible sea urchin	High (L)	High (L)	High (L)	High (L)	High (L)	Low (M)	Low (M)	Low (M)
European eel	Low (L)	High (H)	High (H)	High (H)	High (H)	High (H)	High (H)	Low (L)
Icelandic cyprine (ocean quahog)	High (H)	High (H)	High (H)	High (H)	High (H)	High (M)	High (M)	NR
Pink sea fan	High (H)	High (H)	High (H)	High (H)	High (H)	High (L)	High (L)	Medium (M)
Short snouted seahorse	Medium (M)	Medium (L)	Medium (M)	Medium (M)	Medium (M)	Medium (M)	Medium (M)	Medium (L)

Etc...

Case report produced for each feature

- Background
- Rationale for protection in the western Irish Sea
- Summary of sensitivity
- Global and local distribution
- Sources of data and knowledge

Herring Spawning Areas/Grounds/Beds

Irish name: Beitreach sceathraí scaoán



Figure 1. Atlantic Herring, *Clupea harengus* (Linnaeus, 1758). Chile © Gervais et Boulter - Les poissons Gervais, H., Public Domain, <https://commons.wikimedia.org/wiki/Date:18282630>

Background

Herring are a vitally important part of the marine ecosystem, being prey for marine mammals, birds and many predatory fish. They are also a valuable fishery species. Irish Sea herring (CSH) is one of three herring stocks that occurs in Irish waters. The Irish Sea stock encompasses ICES area 7.1a North and has been a key fishery for decades. Northern Ireland holds the vast majority of the yearly allowable catch for this stock. In recent years the biomass of the Irish Sea herring stock has been above all reference points. (Main source: Marine Institute Stockbook 2022; Molloy, 2006)

Unusually for a marine fish, herring eggs are deposited on the seabed in discrete gravel beds or flat stone. The herring are completely reliant on these spawning beds for reproduction and individuals return to their natal spawning ground each year. Nearby spawning gravel beds are generally grouped into "spawning grounds", which may contain one or more beds. Spawning grounds are further grouped into "spawning areas". The spawning areas, grounds and beds for herring around Ireland are well known and are located close to the coast. The Irish Sea herring population spawns in two areas: the Isle of Man and the Mourne (Dundalk bay), with the latter being the only herring spawning area inside the area of interest for the current study (Figure 3). (Main sources: O'Sullivan et al., 2015; Breslin, 1998; Frost and Diele, 2022)

Rationale for spatial protection in the western Irish Sea

Herring is not a species listed by OSPAR or IUCN. Fishing restrictions for herring are in place under the Common Fisheries Policy (2015) but these do not relate to the spawning habitat. The spawning areas/grounds/beds were included in the features list as they are an essential part of the life-cycle for this important forage fish species. The western Irish Sea is a significant part of the range of the Irish Sea herring population and the Mourne is the only spawning ground in the area of interest. Based on the discrete and well documented substrate requirements, herring spawning beds are highly amenable to spatial protection.

Sensitivity assessment

The highest associated sensitivity scoring for herring spawning grounds was in relation to physical loss or disturbance to the seabed. Herring spawning beds are vulnerable to anthropogenic disturbance of the seabed including but not limited to dredging, sand and gravel extraction, dumping of dredge spoil and waste from fish cages (high confidence). The International Council for the Exploration of the Sea advice for herring in the Irish Sea has consistently stated (e.g. ICES, 2021):

"Activities that have a negative impact on the spawning habitat of herring, such as the dumping of dredge spoil, the extraction of marine aggregates (e.g. gravel and sand), and the erection of structures such as wind turbines in the vicinity of spawning grounds are a cause for concern" and advises that:

"Activities that have a negative impact on the spawning of herring should not occur unless the effects of these activities have been assessed and shown not to be detrimental to the productivity of the stock"

Smothering of gravel spawning beds via sediment plumes and noise during works would also cause disruption to herring spawning behaviour (high confidence).

Further research needs

Evidence to identify the potential effect of multiple pressures was insufficient to form an assessment. The potential cumulative effect of multiple ORE installations between herring feeding grounds and spawning grounds (i.e. on the migration route) is poorly understood and could not be assessed. As well as being a possible physical barrier to movement, the effect of underwater noise on herring movement warrants further investigation. Other such pressures included transition elements and organo-metal contamination, hydrocarbon and PAH contamination, synthetic compound contamination and introduction of other substances.



Figure 2. Global geographic distribution of Atlantic herring, *Clupea harengus*, from www.aquamaps.org.

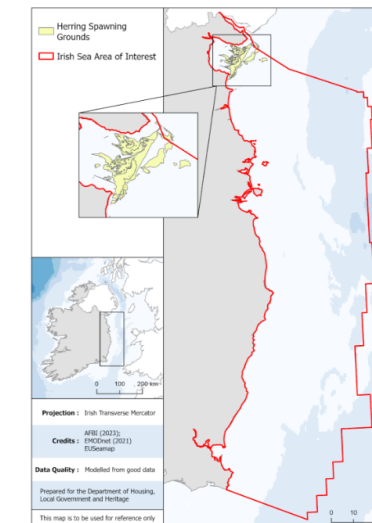


Figure 3. Data available for the coarse gravel substrate constituting the Mourne herring spawning ground in the western Irish Sea.

Data sources and quality

Dataset Name	Data Owning Organisation	Dataset Quality	Metadata URL	Comments
ElSeaMap ENVDnet Benthic Broadscale Habitat Types	ENVDnet	Modelled from good data	ElSeaMap (2021)	AFM advised to select areas with coarse sediment as the benthic habitat in the Dundalk Bay area.

References

Breslin J.J. (1998) The location and extent of the main Herring (*Clupea harengus*) spawning grounds around the Irish coast. Masters Thesis: University College Dublin

ICES (2021). Herring (*Clupea harengus*) in Division 7 a North of 52°30'N (Irish Sea). In Report of the ICES Advisory Committee, 2019. ICES Advice 2019. her.27.mrs. <https://doi.org/10.17896/ices.advice.1774>

Frost, Michelle & Diele, K. (2022). Essential spawning grounds of Scottish herring: current knowledge and future challenges. *Reviews in Fish Biology and Fisheries*, 32, 1-24. [10.1007/s11602-022-09703-5](https://doi.org/10.1007/s11602-022-09703-5)

Marine Institute Stockbook (2022). Available at <https://oas.marine.ie/>

Molloy, J. (2006). The Herring Fisheries of Ireland (1990 – 2005). Biology, Research, Development and Assessment.

O'Sullivan, D., O'Keefe, E., Berry, A., Tully, O. and Clarke, M. (2013). An Inventory of Irish Herring Spawning Grounds. *Irish Fisheries Bulletin*, 42: 2013, 38 pp.

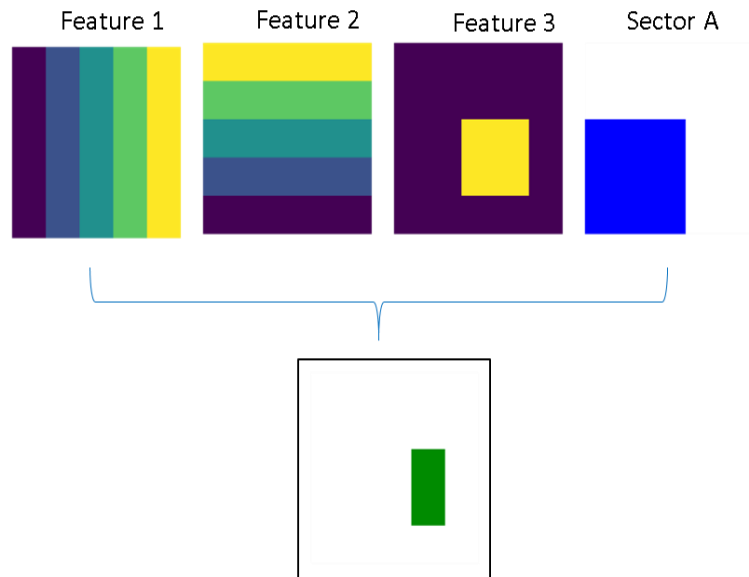
Conservation prioritization modelling

- Uses distribution data to model possible configurations of MPAs to meet network criteria
- Can focus just on ecological considerations or include consideration of sectoral interests and/or take account of sensitivity

prioritzr results

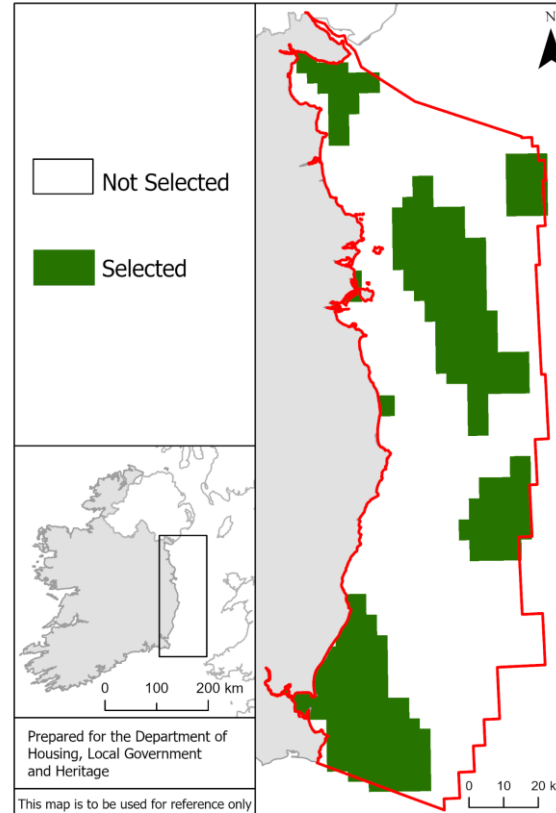
prioritzr

generates network solutions taking account of sectoral trade-offs



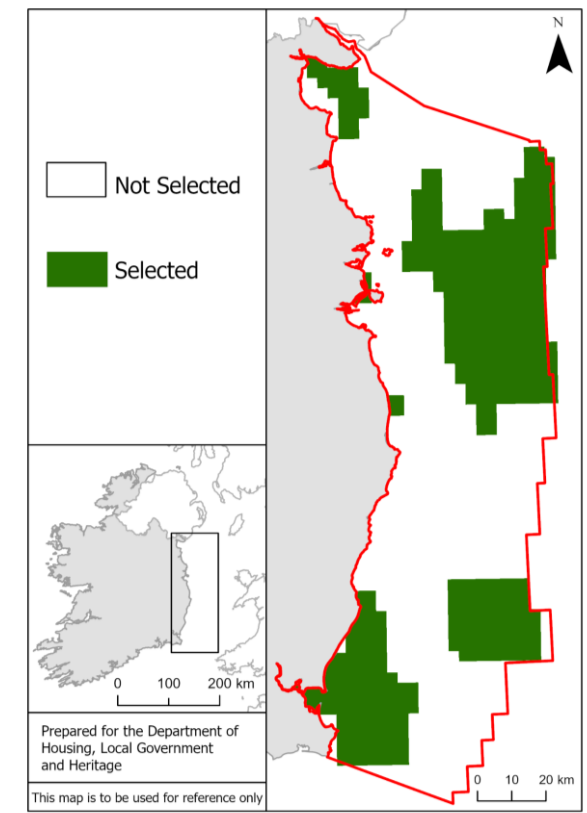
Initial

28%, 60% front; combined sectors



Threatened

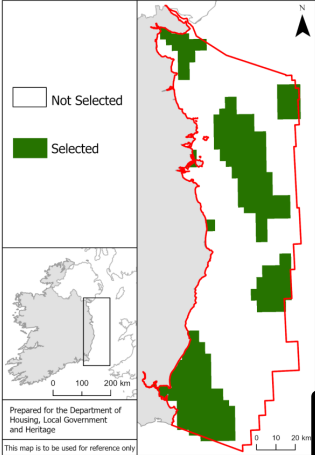
28%, 60% threatened; combined sectors



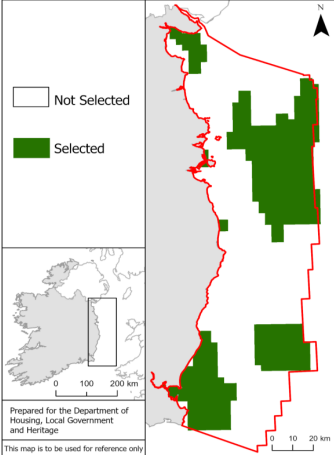
...etc.

Combined *prioritizr* results

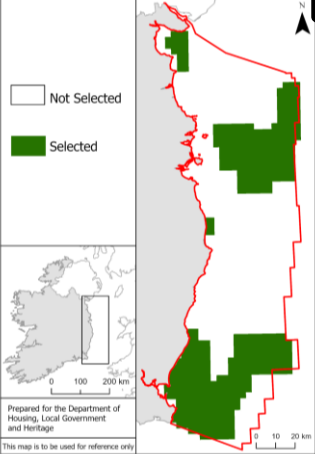
Initial



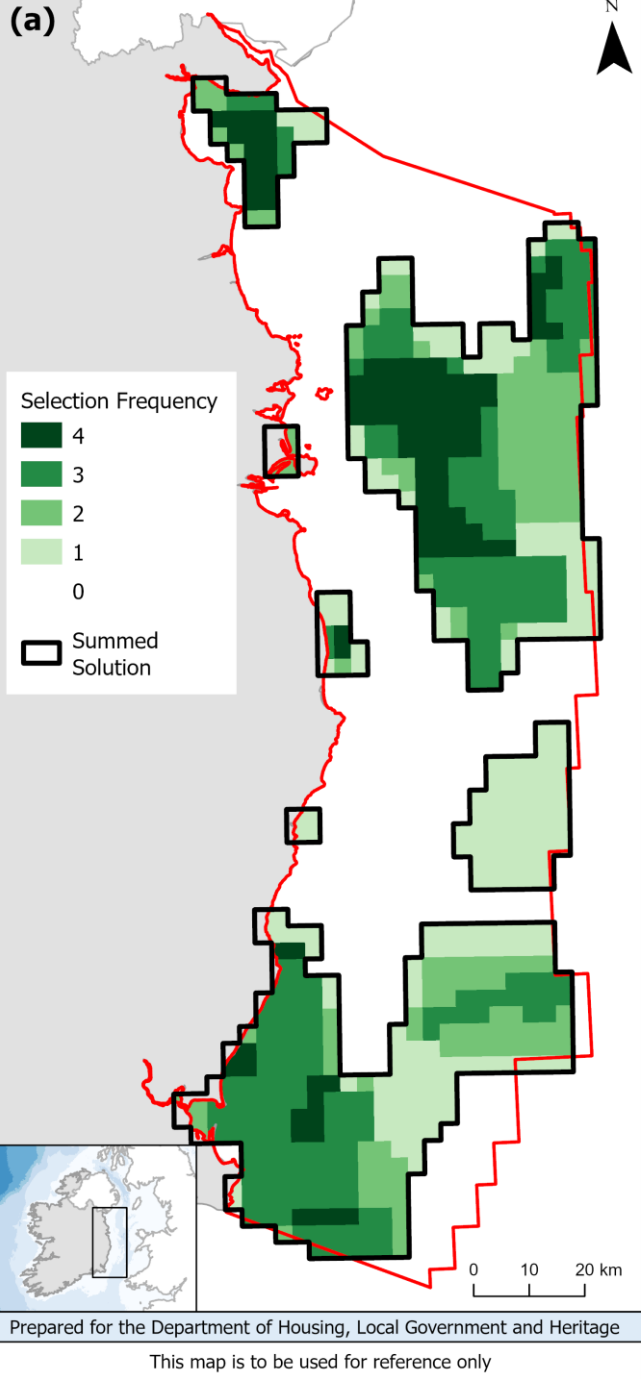
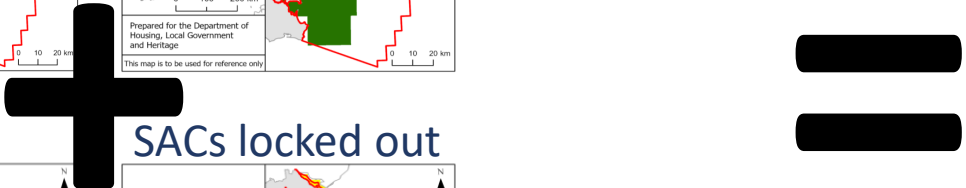
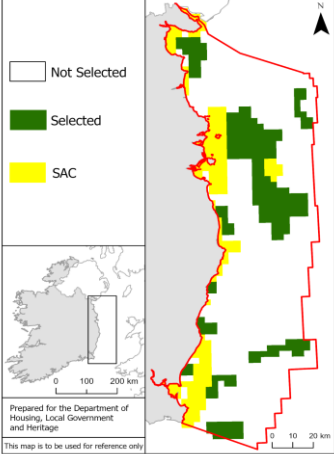
Threatened



Pragmatic

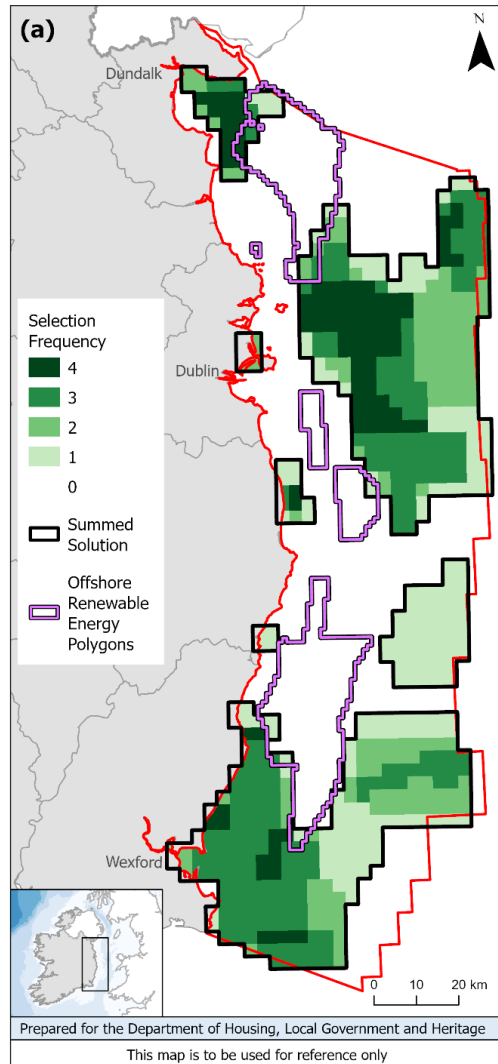


SACs locked out

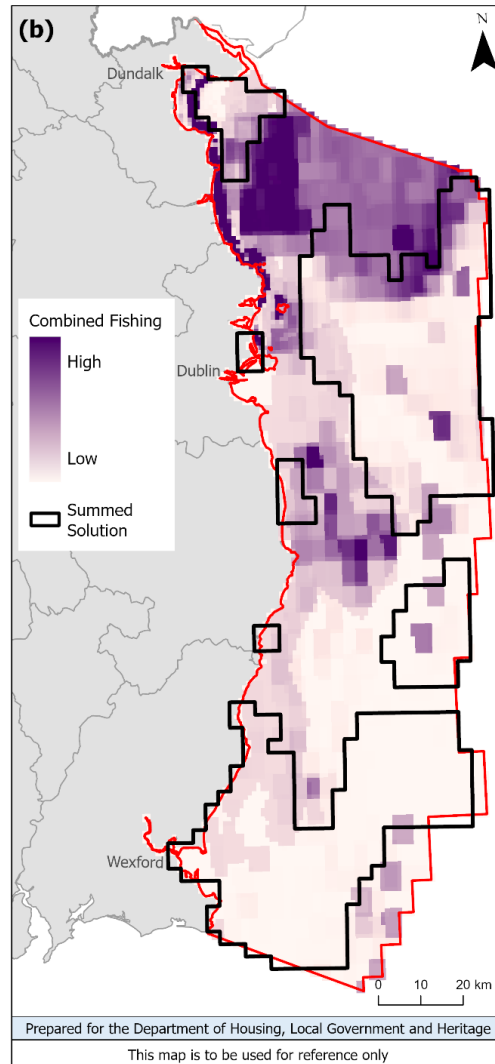


Limited overlap with sectoral activities

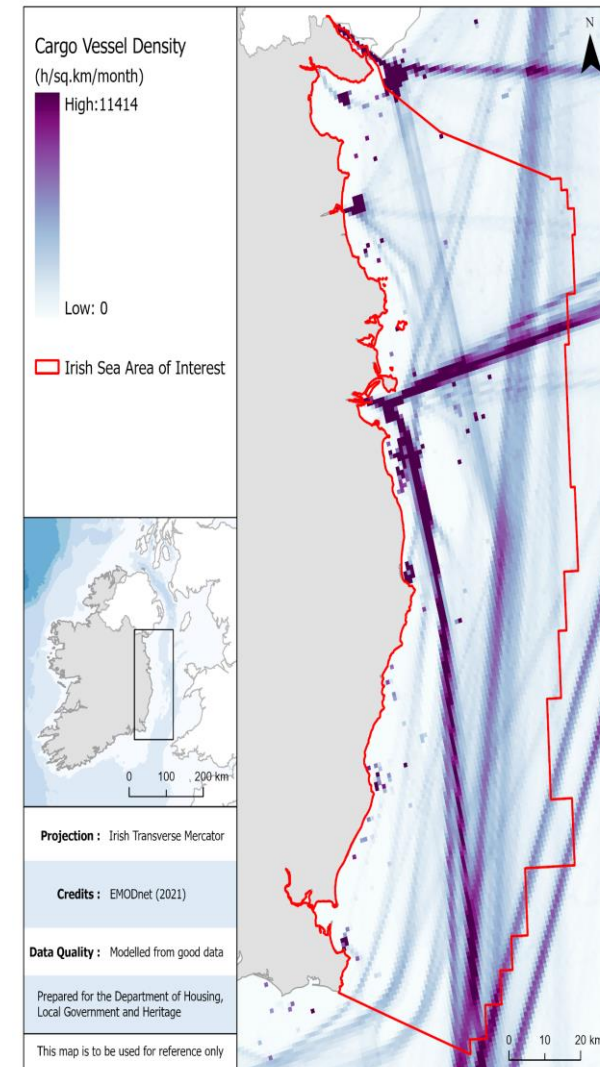
Proposed ORE



Combined fishing



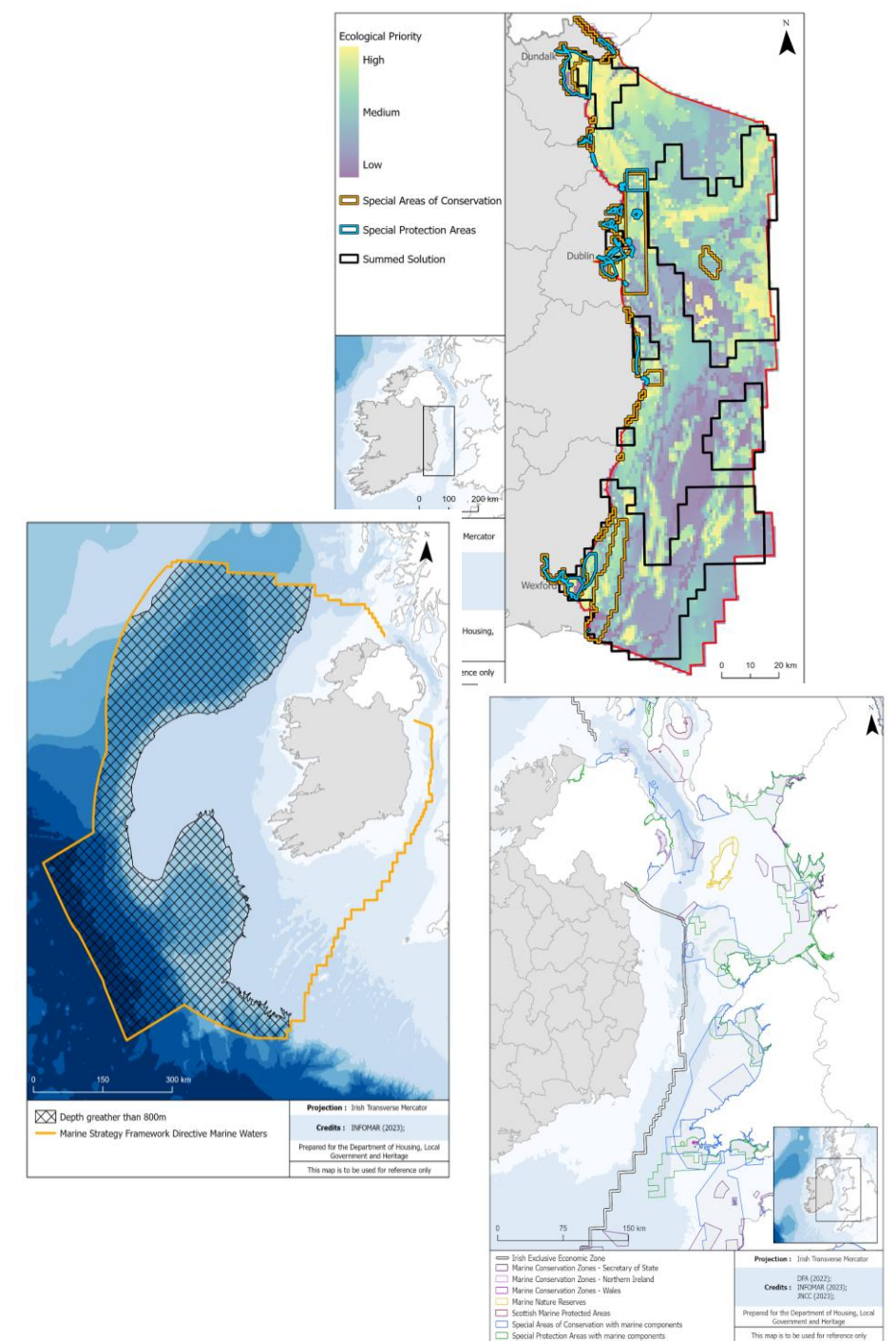
Shipping



More complex:
Few features
sensitive to vessels;
Most sensitivity
is to port activity

Other considerations

- Uncertainty
- Data gaps and research needs
- Natura 2000 network sites
- Wider Irish Maritime Area
- Transboundary considerations



Key outcomes

- Suitable areas have been identified from within which an effective network of MPAs could be selected for the species, habitats and other features included in these analyses.
- Note that the full extent of these suitable areas would not be required for an effective network of MPAs in the western Irish Sea, and that not all activities would need to be restricted within them.
- In identifying these suitable areas, the extent of overlap is limited with areas proposed for Offshore Renewable Energy (ORE) development and areas that are of importance for existing fishing effort.
- Further work under the forthcoming MPA legislation will enable potential MPA network solutions to be refined on the basis of national policy, analyses involving new additional evidence and the participation and input of stakeholders.
- It is envisaged that sectoral overlaps would be further reduced during this process, while establishing a coherent effective network for the conservation of the selected species, habitats and other features.

Thank you

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For expert advice and information: Prof. Andy Wheeler, Dr Brendan McHugh, Dr Colm Lordan, Cliona O'Brien, Dr David Lyons, Dr David Tierney, Prof. Emer Rogan, Dr Eoghan Daly, Dr Evin McGovern, Dr Garvan O'Donnell, Dr Glenn Nolan, Gráinne Devine, Dr Hans Gerritsen, Hannah Hood, Dr Joe McGovern, Jon Rees, Prof. Jonne Kotta, Dr Karl Brady, Katie Gillham, Dr Margot Cronin, Dr Mark Coughlan, Dr Mark Jessopp, Mathieu Lundy, Dr Maurice Clarke, Paul Coleman, Dr Russell Poole, Dr Tomasz Dabrowski, Dr William Roche, Dr Yvonne Leahy, Dr Kathryn Schoenrock. See Appendix 9 for further details.

For participation in stakeholder engagement, representatives of: An Bord Iascaigh Mhara, An Bord Pleanála, An Taisce, Ascophyllum nodosum Processors Group, Coastwatch, Commissioners of Irish Lights, Sea Angling Ireland (SAI), Department of Agriculture, Food and the Marine, Department of the Environment, Climate and Communications, Department of Housing, Local Government and Heritage (including National Parks & Wildlife Service), Department of Transport, Dublin County Council, EirGrid, Environmental Protection Agency, Fair Seas, Federation of Irish Sport, Fingal County Council, Inland Fisheries Ireland, Irish Farmers' Association (IFA Aquaculture), Irish Fish Producers Organisation, Irish Marine Federation, Irish Sailing Association, Irish Seal Sanctuary, Irish South and East Fish Producers Organisation, Irish Whale and Dolphin Group, Irish Wildlife Trust, Killybegs Fishermens' Organisation, Native Oyster Restoration Ireland, Regional Inshore Fisheries Forums – South East, The Heritage Council, Wind Energy Ireland and associated wind energy industry representatives. See Appendix 5c for further details and a list of all stakeholders contacted.