DTU Aqua
National Institute of Aquatic Resources

Offshore Wind Energy Infrastructure in Danish Waters: Coexistence, environmental impacts, knowledge gaps and directions for impactful funding.

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Preface

This report documents the work carried out in the project "*Offshore Wind Energy Infrastructure in Danish Waters: Coexistence, environmental impacts, knowledge gaps and directions for impactful funding*", also known as *Coexistence*, which was funded by Denmark's *Havnaturfonden*, of the *miljø- og ligestillingsministeriet* (J.nr: 2024 – 99619). The project period was from June 2025 to February 2026.

This report includes original research, often in summarised forms, where more details are provided as annexes or are in preparation for submission to be published in academic journals.

We thank all of the colleagues and diverse working group members who provided discussion and advice that ultimately improved the quality of this work.

DTU Aqua Kgs. Lyngby, January 2026

Elliot J. Brown

Researcher and Project Leader

Content

Summary

Denmark's planned expansion of offshore wind energy is central to achieving climate and energy security objectives, but it will also fundamentally reshape large areas of marine space and the ecosystems and human activities that depend on them. Policymakers and funders therefore face three interlinked needs: a clearer and shared understanding of what "coexistence" between offshore wind and marine nature actually entails, a robust synthesis of evidence on environmental impacts and risks, including where knowledge is still lacking; and a strategic view of how national funding can best complement and leverage existing Danish and European programmes. This report addresses these needs through three main strands of work: conceptual, empirical, and strategic-programmatic.

The first strand develops a working definition of coexistence that can be used consistently across policy, management, and funding decisions. Drawing on a systematic review of the international literature and a pilot survey of researchers and engaged stakeholders, the report identifies six families of coexistence definitions, ranging from narrow interpretations focused on spatial compatibility or impact minimisation, to broader, systems-level conceptions that treat offshore wind as one element of a socio-ecological-technical system. The survey reveals a strong preference for the holistic, ecosystem-based definition, even though the respondent group is intentionally small and skewed towards academics. This definition explicitly integrates ecological, spatial, and societal perspectives and is compatible with existing Danish policy practice, where coexistence is already implicitly pursued through separate lenses of ecological, spatial, and societal balance. At the same time, our findings show that coexistence is value-laden: different actors prioritise conservation, energy, fisheries, or other uses differently. The proposed definition is therefore presented as a well-informed starting point rather than a prescriptive end-point and comes with the clear recommendation that any operational use of "coexistence" must be explicit about which priorities are being balanced in a given context and why. This conceptual clarity is a prerequisite for transparent trade-offs in marine spatial planning, impact assessment, and restoration planning in and around offshore wind developments.

The second strand synthesises existing knowledge on environmental impacts of offshore wind activities and uses expert elicitation to assess risks where empirical evidence is sparse. Building on and updating an existing global database of empirical studies, the report compiles 162 peer-reviewed articles and 244 distinct "cases" linking specific activities and pressures to ecosystem components. A meta-analytic framework combining direction of effect with an entropy-based certainty metric allows us to distinguish interactions where the literature is both abundant and consistent from those where evidence is limited, conflicting, or absent. To address the many gaps in the empirical record, we undertook a structured expert elicitation with 14 specialists. The resulting risk scores, expressed in the same directional and certainty terms as the literature synthesis, show strong agreement with empirical patterns where both exist. This concordance provides a sound basis for using expert-derived scores to fill empirical gaps in a transparent way. It also highlights interactions that warrant particular attention from Danish authorities and funders, such as impacts from chemical pollutants and sediment resuspension, which experts consistently judge to have negative ecosystem-wide effects, despite minimal

empirical documentation. The strongest and most certain negative impacts documented concern noise from foundation installation on cetaceans, and displacement and collision risks to seabirds from the operation of above-water components. In contrast, the creation of novel hard substrate around foundations and scour protection frequently appears as a positive effect for many benthic and benthopelagic organisms, although these are still anthropogenic perturbations. Dependent on context and conservation objectives, cases of "positive impact" may contribute a form of "pseudo-restoration"; e.g., foundations and scour protection in locations where stone reefs were historically extracted. Overall, the report concludes that future research and monitoring should focus on high-risk, low-certainty interactions and on cumulative assessments that synthesise all activities and their pressures together, especially if offshore wind areas are ever to be credibly considered as Other Effective Conservation Measures.

The third strand of the report examines how Havnaturfonden can best position its funding in a crowded and evolving landscape of national and European programmes. By translating the political agreement underpinning the foundation into generic "programme language" familiar from EU research and innovation initiatives, the report clarifies the fund's motivation, expected impacts, intervention areas and implementation logic. A broad mapping exercise identifies 58 relevant funding programmes spanning Danish public instruments, private philanthropies, European partnerships, and EU missions and framework programmes. Many of these already support research, restoration, data platforms, and coordination activities that are highly relevant to coexistence between offshore wind and marine nature. The report argues that this overlap should be treated not primarily as a duplication risk, but as a strategic resource that can enable stacked funding, complementary calls, and stronger knowledge synthesis—provided that the foundation has a clear scope and an up-to-date overview of who is doing what. To that end, it recommends that the foundation adopt a recurring, lightweight process for mapping Danish and selected international projects and funding streams, link this overview to structured tools such as PESTEL analyses and theories of change, and actively engage with platforms such as the Sustainable Blue Economy Partnership, JPI Oceans, Mission Ocean funders forums, and relevant German and Nordic initiatives. At the same time, it cautions that collaboration carries transaction costs and that co-funded or tightly aligned calls should only be pursued where expected gains in leverage and impact clearly outweigh reductions in flexibility.

Taken together, these three strands address the core motivations behind the report. The proposed working definition of coexistence provides a shared conceptual starting point for aligning environmental, spatial, and societal objectives around the rapid expansion of offshore wind. The synthesis of empirical and expert knowledge offers a structured, transparent basis for identifying where environmental risks are well understood and can be managed through established tools, and where targeted research, monitoring, or precaution are still required. The funding landscape analysis and roadmap translate these conceptual and empirical insights into strategic guidance for Havnaturfonden and relevant authorities, indicating how limited national resources can be invested in ways that both address Danish priorities and connect to broader European and international efforts. Together, they support a governance approach in which offshore wind development, marine nature protection, and restoration are not treated as separate agendas, but as interdependent components of a coherent, long-term strategy for sustainable use of Denmark's marine space.

Danish Summary

Danmarks planlagte udbygning af havvind er afgørende for at nå nationale klima- og forsyningssikkerhedsmål, men den vil samtidig fundamentalt ændre store dele af havområderne og de økosystemer og menneskelige aktiviteter, der er afhængige af dem. Beslutningstagere og fonde står derfor over for tre sammenhængende behov: en klarere og fælles forståelse af, hvad "sameksistens" mellem havvind og marinnatur indebærer; en solid syntese af viden om miljøpåvirkninger og risici, herunder hvor der fortsat er væsentlige videnshuller; og et strategisk overblik over, hvordan nationale midler bedst kan supplere og udnytte eksisterende danske og europæiske programmer. Denne rapport imødekommer disse behov gennem tre hovedspor: et konceptuelt, et empirisk og et strategisk-programmatisk.

Det første spor udvikler en operationel definition af sameksistens, som kan anvendes konsekvent på tværs af politik, forvaltning og finansiering. Med udgangspunkt i en systematisk gennemgang af international litteratur og en pilotsurvey blandt forskere og engagerede interessenter identificerer rapporten seks hovedtyper af definitioner. Disse spænder fra snævre forståelser med fokus på rumlig kompatibilitet eller minimering af påvirkninger til bredere, systemorienterede opfattelser, hvor havvind ses som ét element i et større socio-økologisk-teknisk system. Surveyen viser en tydelig præference for den holistiske, økosystembaserede definition, selvom respondentgruppen bevidst er lille og overrepræsenterer forskningsmiljøer. Definitionen integrerer eksplicit økologiske, rumlige og samfundsmæssige perspektiver og er i tråd med gældende dansk forvaltningspraksis, hvor sameksistens allerede forfølges implicit gennem adskilte hensyn til natur, arealanvendelse og samfundsmæssige behov. Samtidig viser analysen, at sameksistens er værdiladet: forskellige aktører prioriterer naturbeskyttelse, energiudbygning, fiskeri eller andre hensyn forskelligt. Den foreslåede definition skal derfor forstås som et velunderbygget udgangspunkt frem for en endelig norm, og rapporten anbefaler klart, at enhver operationel brug af begrebet gør eksplicit rede for, hvilke prioriteringer der balanceres, og hvorfor. Denne begrebsmæssige tydelighed er en forudsætning for transparente og legitime afvejninger i havplanlægning, miljøvurderinger og restaureringsplanlægning i og omkring havvindområder.

Det andet spor samler eksisterende viden om havvinds miljøpåvirkninger og bruger ekspertvurderinger til at belyse risici, hvor den empiriske dokumentation er begrænset. Med udgangspunkt i en opdateret global database samler rapporten 162 fagfællebedømte studier og 244 konkrete "cases", der kobler bestemte aktiviteter og påvirkninger til specifikke økosystemkomponenter. En meta-analytisk tilgang, der kombinerer påvirkningsretning med en entropibaseret sikkerhedsmetrik, gør det muligt at skelne mellem interaktioner, hvor litteraturen er omfattende og konsistent, og dem, hvor viden er sparsom eller modstridende. For at adressere de betydelige videnshuller gennemførte vi en struktureret ekspertevaluering med 14 specialister. De resulterende risikoscorer, udtrykt i samme termer som litteratursyntesen, viser markant overensstemmelse med de empiriske mønstre, hvor begge typer viden foreligger. Denne overensstemmelse giver et solidt grundlag for at anvende ekspertvurderinger til at udfylde empiriske huller på en gennemsigtig måde. Samtidig fremhæver den interaktioner, som danske myndigheder og fonde bør have særlig opmærksomhed på – fx påvirkninger fra kemiske forurenende stoffer og sediment resuspension – som eksperter vurderer som bredt

negative på tværs af økosystemer, selvom empirisk dokumentation er begrænset. De mest veldokumenterede negative effekter omfatter støj fra fundamentinstallation på havpattedyr samt fortrængning og kollisionsrisiko for havfugle fra turbiner og andre overfladekomponenter. Omvendt peger mange studier på positive effekter af nye hårde substrater omkring fundamenter og scour-beskyttelse for visse bundlevende arter, selv om disse fortsat er menneskeskabte forstyrrelser. Afhængigt af kontekst og lokale naturmål kan sådanne "positive" effekter i særlige tilfælde fungere som en form for pseudo-restaurering, f.eks. i områder, hvor stenrev historisk er blevet fjernet. Rapporten konkluderer samlet, at fremtidig forskning og overvågning bør fokusere på interaktioner med høj risiko og lav sikkerhed samt på kumulative vurderinger, der integrerer alle aktiviteter og påvirkninger – især hvis havvindområder på sigt skal kunne vurderes som potentielle OECM-områder.

Det tredje spor undersøger, hvordan Havnaturfonden bedst kan placere sine indsatser i et tæt og hurtigt udviklende landskab af danske og europæiske finansieringsprogrammer. Ved at oversætte det politiske aftalegrundlag til et generisk "programsprog", der ligner EU's forsknings- og innovationslogikker, tydeliggør rapporten fondens motivation, forventede effekter, indsatsområder og implementeringslogik. En bred kortlægning identificerer 58 relevante finansieringsprogrammer på tværs af nationale ordninger, private fonde, europæiske partnerskaber samt EU-missioner og rammeprogrammer. Mange af disse understøtter allerede forskning, restaurering, datainfrastruktur og koordination, som er direkte relevante for sameksistens mellem havvind og marinnatur. Rapporten argumenterer for, at dette overlap ikke primært bør ses som en risiko for dobbeltfinansiering, men som en strategisk ressource, der kan muliggøre samfinansiering, komplementære opslag og stærkere videnssynteser – forudsat at fonden har en tydelig afgrænsning og et løbende overblik over øvrige aktørers aktiviteter. Derfor anbefales det, at fonden etablerer en tilbagevendende, let proces for kortlægning af danske og udvalgte internationale projekter og finansieringsstrømme, kobler dette overblik til strukturerede værktøjer som PESTEL-analyser og teorier om forandring, og engagerer sig aktivt i platforme som Sustainable Blue Economy Partnership, JPI Oceans, Mission Ocean-forums for fonde samt relevante tyske og nordiske initiativer. Samtidig understreger rapporten, at samarbejde medfører transaktionsomkostninger, og at samfinansierede eller tæt koordinerede opslag kun bør forfølges, hvor gevinsterne klart overstiger tabet af fleksibilitet.

Set samlet adresserer disse tre spor rapportens grundlæggende formål. Den foreslåede arbejdende definition af sameksistens tilbyder et fælles begrebsligt udgangspunkt for at afstemme miljømæssige, rumlige og samfundsmæssige hensyn i takt med den accelererende havvindsudbygning. Syntesen af empirisk og ekspertbaseret viden giver et struktureret og gennemsigtigt grundlag for at identificere, hvor miljømæssige risici er tilstrækkeligt belyst og kan håndteres med kendte værktøjer, og hvor der fortsat er behov for målrettet forskning, overvågning eller forsigtighed. Analysen af finansieringslandskabet og den foreslåede strategiske ramme omsætter disse indsigter til praktisk vejledning for Havnaturfonden og relevante myndigheder og viser, hvordan begrænsede nationale ressourcer kan investeres på en måde, der både adresserer danske behov og skaber koblinger til bredere europæiske og internationale indsatser. Tilsammen understøtter de en styringsmæssig tilgang, hvor havvindsudbygning, naturbeskyttelse og restaurering ikke behandles som adskilte spor, men som indbyrdes forbundne elementer i en langsigtet strategi for bæredygtig anvendelse af Danmarks havområder.

Background and motivation

The intention of this report is to position offshore wind energy activities in the context of other human activities, to document available knowledge on the risks these activities and their pressures pose to various components of the environment, and to outline a roadmap for future funding to improve our understanding of the impacts of offshore wind energy installations.

The report is delivered across three chapters to address the three aforementioned aims:

First, we will investigate definitions of coexistence in the context of wind energy production and the environment, and subsequently propose one that can be suitably applied to offshore wind energy production and the marine environment.

Second, we will provide an up-to-date systematic review of existing knowledge of environmental impacts from offshore wind industry activities and assess potential risks by combining the knowledge extracted from these empirical research articles with an expert elicitation workshop and joint meta-analyses.

Third, we will provide a review of existing national and European research funding that considers the role of offshore wind energy industry in marine management, and use this review as a basis for proposing a roadmap for Danish funding to both complement, supplement and enhance research on this topic, while ensuring its continued relevance for the Danish context.

1. Definition of coexistence

As introduced above, the term *coexistence*, or *“sameksistance”* in Danish, can be used in many different contexts, both within the realm of the accelerating offshore wind industry and more broadly across many domains. To try and facilitate communication and debate on this subject in the realm of wind industry’s interactions in marine space, we sought to establish a working definition. If adopted and used consistently, such working definitions can ensure diverse stakeholders, knowledge holders and knowledge consumers start from a common understanding in exchanges of ideas and debates. This reduces the risk of miscommunication, and overcomes superficial or semantic barriers to reaching shared understanding.

Before attempting to make this definition we should reflect upon the various uses of the term coexistence, in extant policy, management and advocacy contexts and jurisdictions. One common interpretation, is that coexistence pertains to multi-sector governance, i.e., the shared use of space and resources by different industries, which was the primary focus of a recent policy brief from a Nordic Council of Ministers funded project (Chilvers, Bly Joyce, and Eriksson 2025). Conversely, this same term has been taken to mean that side-by-side development, “spatial coexistence”, or coordinated multi-use of marine space is primarily about minimising spatial conflicts in the use of marine space, through Marine Spatial Planning (MSP) by the European Commission (European Commission 2020, 2023). Others, especially, Environmental Non-Governmental Organisations (eNGOs) take coexistence to mean the integration of new offshore wind development with nature restoration and biodiversity action plans (Offshore Coalition for Energy and Nature (OCEaN) 2024, Madias *et al.* 2025).

In a Danish context, coexistence is most often implied, rather than explicitly defined. Publications from the department of energy (*Energistyrelsen*) place an emphasis on ecological compatibility; with a framework for assessment of offshore wind energy plans that considers species sensitivity and spatial overlap in a classic environmental risk approach (Danish Energy Agency 2022, 2025). Less well defined but still explicitly noted is the importance of concurrence between societal goals and other human activities, for example balancing energy security, food security, and fisheries’ economic and cultural roles (Danish Energy Agency 2022, 2026). These approaches can be considered in terms of ecological coexistence, spatial coexistence, and societal coexistence. Across the various stated Danish objectives, these are all considered, but often considered in isolation from one another.

The aim of this section is to recommend a working definition of *coexistence*. To achieve this aim, we undertook to review definitions of *coexistence*, from academic literature on the topic of wind energy interactions with the environment, and to synthesise these into a shortlist of potential definitions with varying scope and emphasis. We then surveyed (in a limited, pilot survey) experts for their opinions on the short list of definitions in order to identify which is most appropriate and which may already be widely accepted.

1.1 Literature review

1.1.1 Methods

A systematic literature review was conducted using the PRISMA approach (O'Dea *et al.* 2021), and following a standard search, screen, extract process (Figure 2-1). Search terms were built around requiring terms from the realms of wind energy production, concepts of coexistence, and either nature conservation or environmental process contexts (Figure 2-2). Pre-defined exclusion criteria were used to screen titles and abstracts of the records retained from the search. One exclusion criterion, the need for the study to be based on an *offshore* wind energy deployment, was relaxed to increase the number of studies and to increase the diversity of contexts in which "coexistence" was considered. Finally, the full text articles of those records that were not excluded during screening were accessed, and were again screened against the exclusion criteria with the details of the full text available before data were extracted into the pre-defined data extraction schematic, focussing on categorising the sentiment / context of the use of coexistence, and retaining excerpts that are either definitions, or implicitly define the relevant concepts being addressed in the paper. The categories of sentiments / contexts which articles' contributions were recorded against (i.e., on article can contribute to more than one category) were:

- Align OWE impacts and Conservation Objectives.
- Spatially selective.
- Trade-off Energy demands (CO2) and conservation objectives.
- Impact Assessments to Minimize Impact (view OWE expansion as inevitable so just try to mitigate risks)
- Holistic Approach. Not decoupled from Social system. Socio-ecological systems only.

The patterns of contributions to these categories, and a manual textual analysis of the relevant excerpts, were used to create a series of new definitions, that both delineated these sentiments but encapsulated the diversity of the definitions..

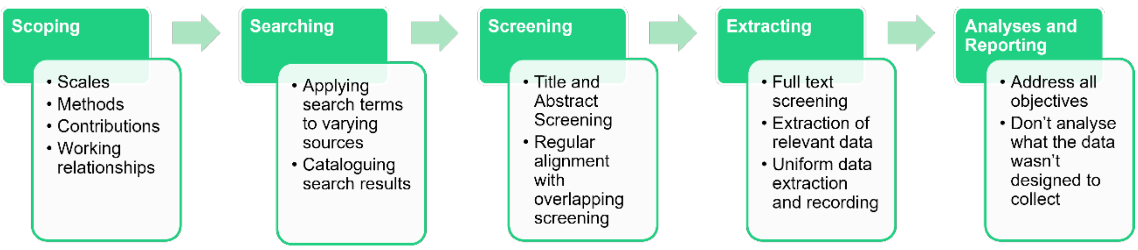

Figure 2-1. Generalised process for a systematic review. Note that search terms, screening criteria, the data extraction schematic, and analytical questions are all predefined in the scoping phase.

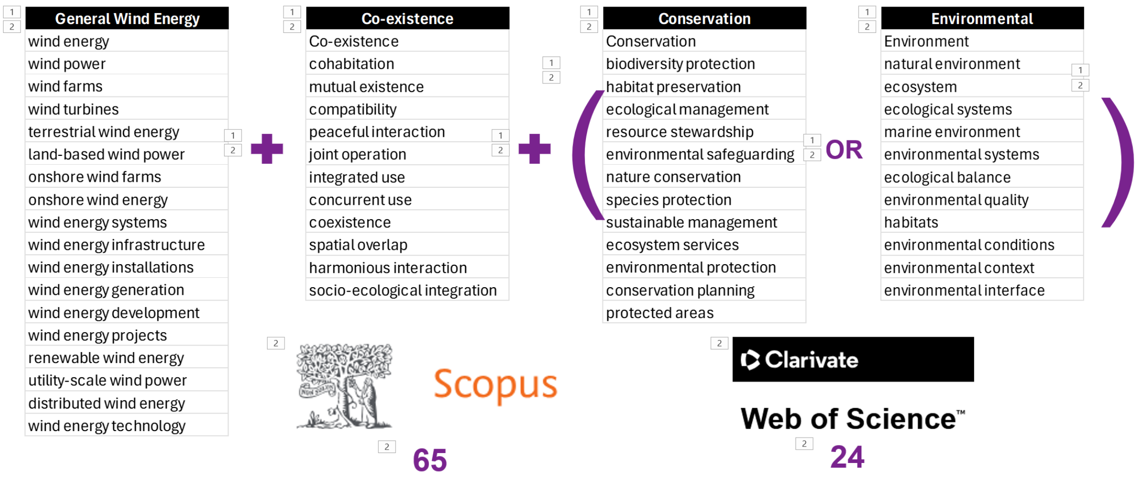

Figure 2-2. Search terms translated into Scopus and Web of Science search queries (Boolean operators are represented as: "+" = AND, and rows or "OR" = an OR), and the resultant numbers of records per source (de-duplicated).

Table 2-1. Exclusion criteria used to reject records identified in the search, based on information in first the title and abstract, and subsequently the full text. Exclusion criterion A was removed from this list to include definitions from terrestrial case studies and broaden the scope of definitions.

Exclusion Code	**Exclusion Rule**	**Exclusion Explanation**
R	Retain	No other reason to exclude
~~**A**~~	~~Not offshore~~	~~Used to determine whether to restrict to offshore or include all definitions considering interaction between wind energy production and the environment (i.e. land, sea, lake).~~
B	Not interaction with wind energy infrastructure	Comparing co-existence with other human activities, not wind energy production.
C	Not response of natural environment to wind energy infrastructure	Comparing co-existence between wind energy production and other human activities (i.e. multi-use)

D	No definition attempted	A study of wind energy - environmental interactions but no attempt to define "co-existence" or a similar term.
E	Definition considers only multi-use	Definition of co-existence is too focussed on other human activities, or the effect of reducing carbon emissions outside the area of installation.
F	Not english, nor scandinavian language	Language limitations
G	Repeated article in different medium	Repeating definitions across different media based on the same original article.
H	Focus only on individual environmental component	Not concerned with coexistence with ecosystem writ-large, only the impacts on an individual species or small taxonomic group

1.1.2 Results

The search of primary literature found 89 records across Scopus and Web of Science. After deduplication, 71 unique articles were text and abstract screened, from which 29 records were retained for full text analyses. Two of these full texts were rejected for not being in English nor a Scandinavian language, while a further two were excluded based on other subject-matter relevant exclusion criteria. Finally, 25 articles are retained for data extraction (Figure 2-3).

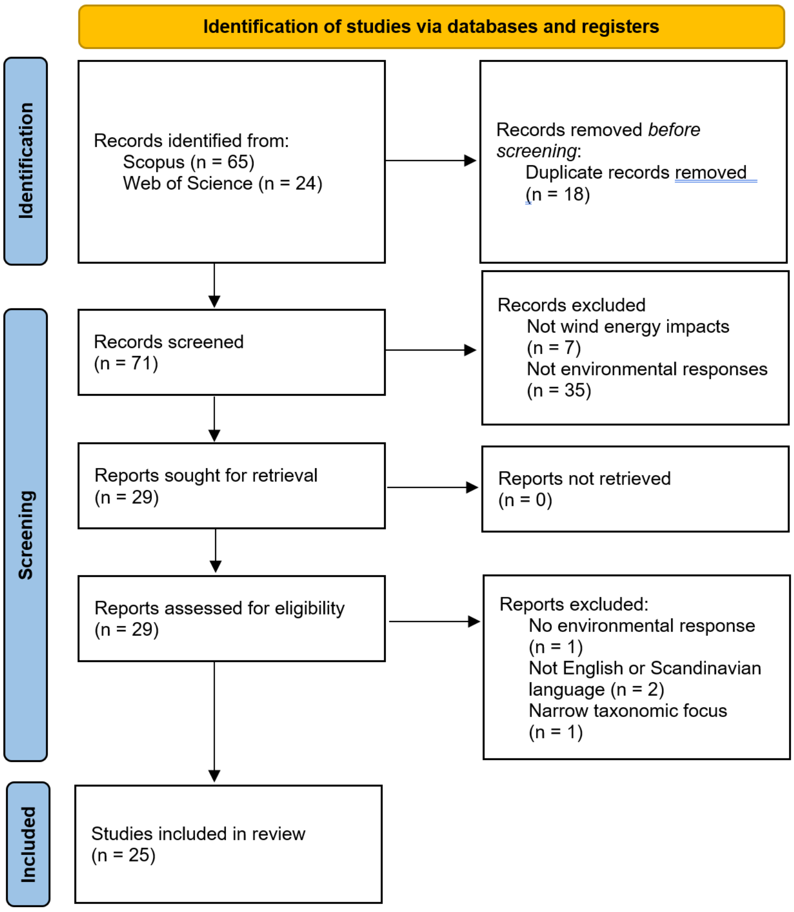

Figure 2-3. PRISMA flow chart documenting the fate of records throughout the systematic literature review.

From these 25 articles and their various implicit and explicit definitions of coexistence of offshore wind energy and the environment, we derived six working definitions of coexistence (Table 2-1). These definitions roughly increase in the scope and complexity of coexistence from the avoidance of ecologically sensitive areas, through to a systems-level balance of ecological, social, and technical factors. As some articles provided alternate definitions, or built up their definitions from simple into more complex and integrated ones, some articles are considered examples in more than one category of definition.

Table 2-2. Categorical definitions of "Coexistence" in the context of offshore wind energy activities and the environment, derived from a systematic review. Source articles are identified by IDs which link to the articles in the appendices.

Definition Type	Core Concept	Key Features	Representative Sources	Strengths	Limitations	Definitions
Spatial Compatibility-Based	Avoidance of sensitive ecological areas	Strategic siting, exclusion zones, legal feasibility	AW004, AW060, AW014, AW026, AW053	Clear regulatory alignment; minimizes direct harm	May limit available space for development; reactive rather than proactive	Coexistence is the strategic siting of offshore wind farms to avoid ecologically sensitive areas, such as MPAs, SACs, SPAs, and habitats protected under international conventions. It emphasizes minimizing spatial conflict through exclusion zones and regulatory buffers.
Impact-Minimization	Technical and operational mitigation	EIA, monitoring, adaptive design, ecological thresholds	AW012, AW019, AW058, AW045	Allows development in more areas; flexible	Requires robust data and enforcement; may not address cumulative impacts	Coexistence is achieved when offshore wind infrastructure is designed and operated to minimize ecological harm, using tools like Environmental Impact Assessments (EIA), monitoring regimes, and technical mitigation measures (e.g., cable trenching, noise reduction).
Impact-conservation objective alignment	Capitalise on impacts where they are beneficial	NbS, habitat creation, biodiversity support	AW004, AW019, AW023, AW026, AW067, AW069	Mutuality in energy production and conservation goals	Limited number of contexts where impacts align with conservation goals.	Coexistence is achieved by aligning known impacts of offshore wind related activities with local conservation objectives, while also avoiding those impacts that conflict with local conservation objectives. In this way wind energy infrastructure isn't just avoiding conflict with conservation objectives but is also contributing to achieving them.

Nature-Positive Integration	Ecological enhancement within wind farm footprint	NbS, habitat creation, mariculture, biodiversity support	AW023, AW025, AW067, AW069	Potential for mutual benefit; aligns with conservation goals	Requires early planning and interdisciplinary design; benefits may be site-specific	Coexistence involves the intentional integration of nature-based solutions (NbS) or ecological enhancements within wind farm footprints (such as kelp farming, artificial reefs, or mariculture) to support biodiversity and ecosystem services. It does not include integration of activities that do not contribute to conservation goals.
Multi-Use & Stakeholder-Compatible	Co-location of human activities with conservation	MSP, stakeholder engagement, conflict mitigation	AW004, AW045, AW039, AW060	Promotes efficient use of space; inclusive governance	Complex coordination; risk of diluted conservation outcomes	Coexistence is the complementary placement (including co-location) of multiple human activities (such as wind energy, fisheries, aquaculture) while striving to achieve conservation goals across a marine territory or region, enabled by marine spatial planning (MSP).
Holistic Ecosystem-Based	Systems-level balance of ecological, social, and technical factors	EBM, CIA, resilience, governance, SETS frameworks	AW051, AW053, AW067, AW069	Comprehensive and adaptive; supports long-term sustainability	Requires high data integration and institutional capacity; may be difficult to implement uniformly	Coexistence is a systems-level approach that balances offshore wind development with ecosystem resilience, cumulative impact assessment, and adaptive governance, treating social, ecological, and technical dimensions as interdependent.

1.2 Survey

To gather feedback on the definitions elicited from the literature review, we undertook a limited survey of relevant experts The intention with this survey was to canvass opinions on which scope or type of definition is most appropriate for the concept of coexistence in offshore wind, and to gather feedback on the proposed definitions.

1.2.1 Methods

A simple online questionnaire was established using Microsoft Forms, in the DTU Aqua office365 environment. The survey consisted of three parts, the first gathered information about the respondents' institutional role, the second asked respondents to rank the definitions from the review, and the third asked for open-ended feedback on the reasons for their rankings and the wording of the definitions (see Appendix B).

The survey was online and open to anyone with the url/hyperlink. A restricted selection of researchers active in offshore wind interactions with the environment from Denmark were the primary group invited to respond. Additionally, we invited known experts from Sweden, the United Kingdom, and Spain based on recent publications and working knowledge of their research interests. Finally, the invitation was extended to the members of the advisory board for the Danish marine nature fund (*havnaturfonden*), to garner feedback from an engaged and directly related group of stakeholders.

Respondents were invited to rank the pre-determined definitions (Table 2-1) with only minimal introduction to the project's goals. Subsequently, open feedback on the given definitions was solicited from respondents before some background information on the desire to integrate the various definitions of "coexistence" with explicit environmental considerations. A second round of ranking was undertaken, before respondents were offered the opportunity to provide their own definition.

Due to the nature of this project, this survey was undertaken at a limited scale, to pilot the proposed potential definitions. As this project was not of a substantial enough scale to engage in a proper stakeholder process over its whole lifetime, efforts were not made to gather responses from a broader or more representative group of stakeholders. This was to prevent our request from contributing to stakeholder fatigue and to prevent a larger bias in the types of stakeholder reach.

The rankings were scored according to the cumulative ranking given by them across all respondents using the Borda scale (Black 1958). This approach awards points to each option based on each individual ranking, such that the top ranked option gets n-1 points, the second n-2 all the way to the bottom ranked option getting 0 points (where n = the number of options to be ranked). Finally these points are summed across all scored responses, so that each option has a total score, upon which their final ranking is based. Mathematically, for item I in a ranking of n items:

$$Score(i) = \sum_{\{j=1\}}^{\{m\}} (n - r_{\{ij\}})$$

Which computes the total Borda score for item i using:

- m: Number of ranked lists (or voters).
- n: Total number of items the list to be ranked.
- r_{ij}: Rank of item $i$in list j.

1.2.2 Results

The survey received 21 responses, with a large proportion of respondents coming from academia (Figure 2-4).

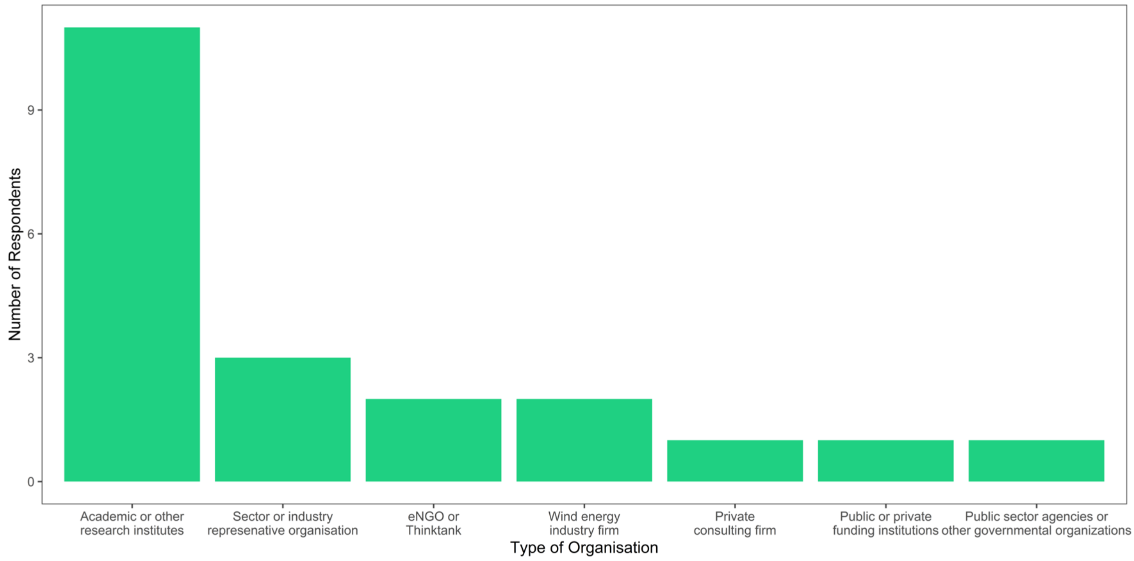

Figure 2-4. Numbers of respondents to survey about definitions of "coexistence in the context of Offshore Wind and Environment", by self-identified institutional affiliation.

The top three ranked definitions did not shift ranks between the “naïve“ ranking and the second ranking, after respondents were provided more detailed information on the project’s goals (Table 2-2).

Table 2-3. Survey based rankings of definitions elicited from systematic literature review. Codes correspond to those in Table 2-1. Scores are based on the Borda scale, and ranks are according to two different opportunities to rank, described in the main text methods.

Code	Definition	Short Description	Core Concept(s)	Incorporating Features	Score 1	Score 2	Rank 1	Rank 2
F	Coexistence is a systems-level approach that balances offshore wind development with ecosystem resilience, cumulative impact assessment, and adaptive governance, treating social, ecological, and technical dimensions as interdependent.	Holistic Ecosystem-Based	Systems-level balance of ecological, social, and technical factors	EBM, CIA, resilience, governance, SETS frameworks	84	**88**	1	1
B	Coexistence is achieved when offshore wind infrastructure is designed and operated to minimize ecological harm, using tools like Environmental Impact Assessments (EIA), monitoring regimes, and technical mitigation measures (e.g., cable trenching, noise reduction).	Impact-Minimization	Technical and operational mitigation	EIA, monitoring, adaptive design, ecological thresholds	78	**77**	2	2
E	Coexistence is the complimentary placement (including co-location) of multiple human activities (such as wind energy, fisheries, aquaculture) while striving to achieve conservation goals across a marine territory or region, enabled by marine spatial planning (MSP).	Multi-Use & Stakeholder-Compatible	Co-location of human activities with conservation	MSP, stakeholder engagement, conflict mitigation	78	**76**	2	3

A	Coexistence is the strategic siting of offshore wind farms to avoid ecologically sensitive areas, such as MPAs, SACs, SPAs, and habitats protected under international conventions. It emphasizes minimizing spatial conflict through exclusion zones and regulatory buffers.	Spatial Compatibility-Based	Avoidance of sensitive ecological areas	Strategic siting, exclusion zones, legal feasibility	63	**74**	6	4
D	Coexistence involves the intentional integration of nature-based solutions (NbS) or ecological enhancements within wind farm footprints (such as kelp farming, artificial reefs, or mariculture) to support biodiversity and ecosystem services. It does not include integration of activities that do not contribute to conservation goals.	Nature-Positive Integration	Ecological enhancement within wind farm footprint	NbS, habitat creation, mariculture, biodiversity support	66	**64**	5	5
C	Coexistence is achieved by aligning known impacts of offshore wind related activities with local conservation objectives, while also avoiding those impacts that conflict with local conservation objectives. In this way wind energy infrastructure isn't just avoiding conflict with conservation objectives but is also contributing to achieving them.	Impact-conservation objective alignment	Capitalise on impacts where they are beneficial	NbS, habitat creation, biodiversity support	72	**62**	4	6

The open-ended feedback primarily reflected the respondent’s institutional affiliations. For example, industry representatives responded that consideration for other users of marine space is most important. Similarly, eNGOs and think-tank representatives responded with direct reference to existing policies or proposed policies, while academics often critiqued the methodology or the underlying premise (Box 1). Other direct feedback we received included some suggestions for wording and semantics. Once presented at the Danish marine researcher conference (*Havforskermødet* 2026), we received more direct feedback and suggestions about the exchange of some wording, which we incorporated (Table 2-3).

Table 2-4. Original and modified versions of the highest ranked (from pilot survey) definitions (from literature review). Modifications are based on feedback recieved in the open, free-text responses of the survey and from verbal feedback of the audience at the Danish *Havforskermødet* 2026

Original Survey Definition	Feedback-tuned Definition
Coexistence is a systems-level approach that balances offshore wind development with ecosystem resilience, cumulative impact assessment, and adaptive governance, treating social, ecological, and technical dimensions as interdependent.	Coexistence is a systems-level approach that balances offshore wind development with ecosystem resilience, addresses cumulative impacts through adaptive governance, and treats social, ecological, and technical dimensions as interdependent.

Box 1. Select quotes from open-ended feedback solicited from survey respondents on the series of definitions provided, after "naive" ranking. Some spelling and grammar edits have been made for ease of reading.

> *“Humans are part of the ecosystem and all human activities have to be weighed into a system-level approach that include risk assessment.”*
>
> *“To me coexistence implies the harmonization of several human maritime activities, whereas purely considering/minimizing ecological impact when placing windfarms is more "classic" nature conservation”*
>
> *“My answers are aligned with the mitigation hierarchy, as far as possible.”*
>
> *“Windfarms should be placed in areas where they impact marine habitats and other known activities, like fisheries, the least. The windfarms should allow fishing, so human impacts on habitats in total is as small as possible.”*
>
> *“*[I] *find that the first* [definition] *encompass*[es] *most of the needed respect for the sensitive species, ecology and environment. Presently, EIAs are not even close to achieve that and additional monitoring and research are needed to assess cumulative impact”*
>
> *“I believe that coexistence is only defined by the alignment* [of human activities] *and does not include any nature concerns. I believe that if nature concerns are included it will muddle the definition and then it won’t go anywhere. So for me Coexistence is the joint exploitation of an area from multiple stakeholders.”*
>
> *“Many of the definitions are already part of considerations and assessments in EIAs and MSPs. The definition chosen as first seems to add more focus on coexistence.”*

The responses to our pilot survey illustrated some of this diversity, however, one definition was consistently, and by a large margin, the highest ranked. This highest ranked definition represents an holistic approach to socio-ecological systems (Table 2-2). This selection mirrors commonly accepted views that management of individual activities or industries is insufficient. In fisheries management, the long-held view of the importance of ecosystem based approaches are taking hold in operational advice and beginning to influence management, in spite of persistent institutional barriers (Rindorf et al., submitted). The opportunities and pathways for this cross-sectoral approach have also been mapped for the European arctic (Skern-Mauritzen, Olsen, and Huse 2018), EU temperate waters (Albrecht, Belinskij, and Heikkilä 2025), and have specific EU guidelines in the context of marine spatial planning (Piet *et al.* 2021).

1.3 Conclusions and recommended definitions

We categorised six types of definitions for coexistence with respect to wind energy generation and the environment. These six types of definitions varied both in the complexity of the system they address and in the fundamental domains in which they focus. They span a range from considering the coexistence of wind with one or more other human activities, with only implicit consideration for the environment, up to considering wind energy activities as only one industry in complex socio-ecological systems. The breadth of these categories reflect the diversity of inferred definitions used in policy documents and opinion pieces addressing offshore wind policies, as reviewed in the introduction to this section.

Based on the survey responses, there is a clear preference for the definition that follows an holistic, ecosystem-based approach when considering coexistence. This preference likely reflects the bias towards academics in the small pilot survey, however, the definition itself does not contradict nor exclude the other definitions. Precisely because it is holistic, it concerns itself with the different priorities of various stakeholders and holds these differing priorities as valid. While this holistic view is inclusive, it also leads to complex operational challenges. However, with other maritime sectors/activities (e.g. fisheries, transport, and conservation) clearly moving in the same direction, the opportunities and methods for coherent, integrated management are increasing.

Coexistence is a systems-level approach that balances offshore wind development with ecosystem resilience, addresses cumulative impacts through adaptive governance, and treats social, ecological, and technical dimensions as inter-dependent.

The proposed definition is grounded in a review of use in primary literature and evaluated by a deliberately small, expert-biased pilot survey, designed to avoid stakeholder fatigue rather than to be statistically representative. It should therefore be regarded as a well-informed starting point for wider stakeholder processes, not as a definitive or democratically endorsed definition.

The survey responses also highlight that notions of coexistence are value-laden and stakeholder-specific: industry representatives tended to emphasise coexistence among human maritime activities, eNGOs often anchored their interpretations in existing or proposed conservation policies, and academic respondents focussed on methodological rigour and ecosystem-based frameworks. Any operational use of “coexistence” should therefore be explicit about which combinations of priorities are presently in focus.

In a Danish context, our review shows that coexistence is implicitly approached through three largely separate lenses: ecological coexistence (compatibility with sensitive species and habitats), spatial coexistence (minimising spatial conflict through MSP), and societal coexistence (balancing energy security, food security, and cultural and economic roles of fisheries). Our recommended systems-level definition provides an overarching frame that explicitly integrates, rather than replaces, these three perspectives. However, as illustrated by open-ended survey responses, notions of coexistence remain value-laden and stakeholder specific. Thus, any operational use of “coexistence” should be explicit about which combinations of priorities are presently in focus.

2. Existing knowledge of environmental impacts of offshore wind activities

As a developing industry, studies of and evidence from real-world deployments of offshore wind farms have only relatively recently started to become available, with reviews of environmental impacts starting in 2022 (Galparsoro *et al.* 2022), and continuing in 2025 (Thomassen JAC *et al.* 2025). Each of these reviews highlighted that while knowledge is beginning to accumulate, and some general trends can be found, there continues to be large gaps in our understanding of the different impacts that are derived from offshore wind activities, especially those associated with end-of-life and decommissioning as well as those dealing with multiple and cumulative impacts.

In this section we describe and synthesise the knowledge that does exist from empirical studies of offshore wind interactions with the environment, by updating an earlier systematic review and meta-analyses. Via this review we also re-iterate the extant knowledge gaps that persist, and we utilise expert elicitation to fill these gaps with the best available knowledge. These two steps result in a mapping of risks, which can inform decision making around offshore wind technological developments (i.e. priorities for nature based designs) and the planning of new installations.

2.1 Literature review

2.1.1 Methods

The systematic literature review was an updated version of that undertaken in (Thomassen JAC *et al.* 2025), and built out the database they produced (Thomassen JA and Brown 2025). The review itself follows the same methodology as used in section 2.1, namely using the PRISMA approach (O'Dea *et al.* 2021), and following a standard search, screen, extract process (Figure 2-1). Search terms were assembled based on synonyms for the marine domain (e.g. coastal, marine, ocean), wind energy industry, ecosystem components, and ecosystem processes (Appendix A). Pre-defined exclusion criteria were used to reject non-relevant records, that were retained from the more inclusive search Table 3-1. One exclusion criterion, the geographic scope being limited to Europe, was relaxed, which maintained the global domain of the search from Thomassen *et al.* (2025). Screening with the exclusion criteria was undertaken in two steps, in the first, only titles and abstracts were compared against the exclusion criteria, in the second, those records still retained from the first round were downloaded and the full text was screened against the exclusion criteria. The final list of retained papers, after both rounds of screening were used in data extraction. The data to be extracted from each paper was the same as for Thomassen et al. (2025), except, in some fields the possible categories of were expanded. For example, in the category "Ecosystem component", the level Benthic fauna, was expanded to three possible levels: Benthic infauna, Mobile benthic epifauna, and Sessile benthic epifauna.

Table 3-1. Exclusion criteria applied to literature review of environmental impacts from offshore wind energy activities. The geographic exclusion criteria initially specified in Thomassen *et al*. (2025), were relaxed in that review to make the context global, and this was continued in this update.

Criteria Symbols	Exclusion Criteria	Explanation
Retain	NA	No reason defined for excluding the article based on this level of search
A	Not trying to document impact of wind infrastructure	Other energy infrastrucutre such as transmission cables not connecting wind generation OR not actually measuring an effect of wind infrastructure just describing process or advances in wind power generation itself.
B	Environmental impacts outside scope	Environmental impacts measured by equivalent impact from other forms of energy infrastructure (i.e. relative to burnt fossil fuel or relative to oil platform).
C	Social impacts outside scope	Impact on social impacts broader than local coastal communities
~~D~~	~~Outside geographic limits 4~~	~~Study is outside defined geographic scope (Europe).~~
E	Review	Study is a review without introducing any new observations

2.1.2 Results

The database from Thomassen & Brown (2025) contained 129 records or articles. The updated search identified 1,105 new records, of which 232 were immediately removed as duplicates. Of the remaining 873, 787 were excluded during title and abstract screening, and a further 53 were excluded during full-text screening. This resulted in 33 new records being added to the original 129 for a total of 162 records contributing data Figure 3-1. The reason for the ~96% exclusion rate is that the search is designed to be comprehensive, while the screening criteria ensure only relevant, empirical and non-duplicated evidence is retained.

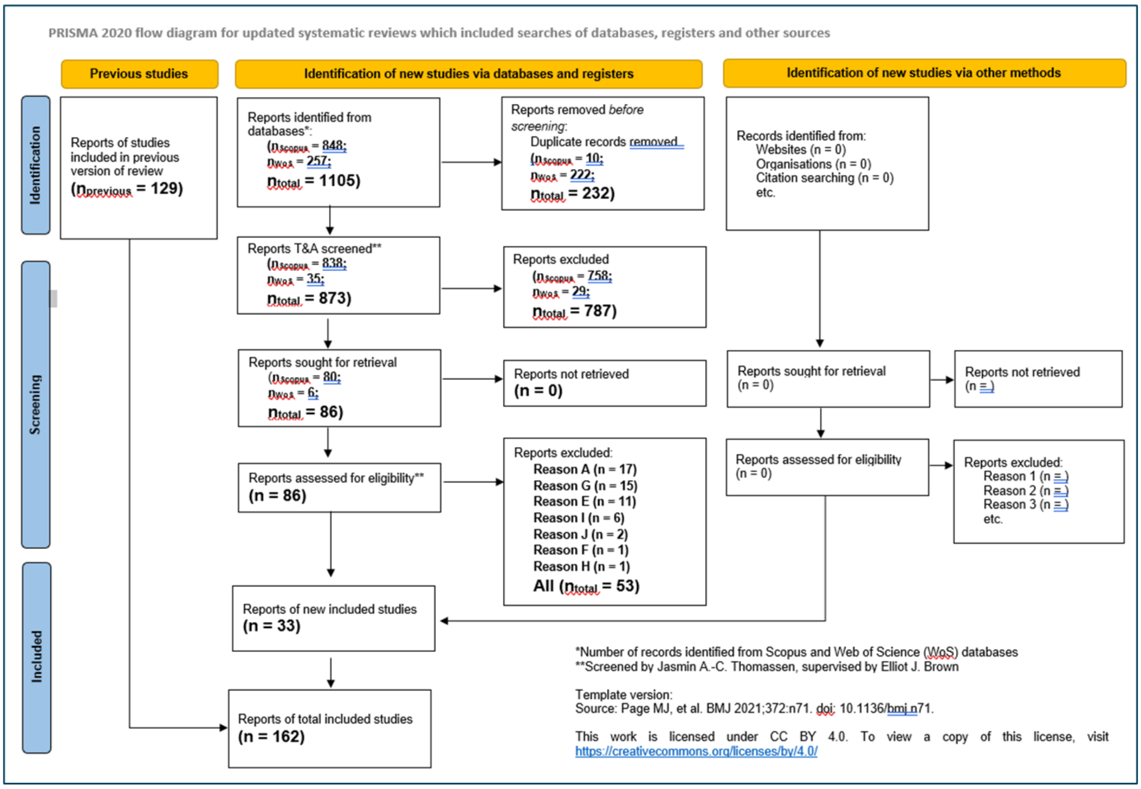

Figure 3-1. Source and fates of records from literature search and screening, presented in the standard PRISMA reporting flow diagram.

From these 162 retained articles, 244 unique “cases” were extracted, where a case is a unique combination of study, activity from offshore wind, a pressure from said activity, and the species/taxonomic group being impacted (Figure 3-2). These cases were geographically biased towards NE-Atlantic, with most evidence coming from coastal states surrounding the North Sea (Figure 3-3). The evidence of impacts from offshore wind energy activities has been steadily increasing, together with the industry’s development, and most evidence comes from recent years (Figure 3-4). Still, only a single study was found to investigate any impacts associated with the end-of-life or decommissioning of offshore wind energy infrastructure. Furthermore, there remains little evidence of interactions between offshore wind energy production and foundational components of the ecosystem, such as phytoplankton, zooplankton, and macrophytes (Figure 3-2). However, there are mounting studies for more charismatic megafauna, such as cetaceans and seabirds, and even for commercially exploited species, such as benthic fish, benthopelagic fish, and mobile benthic epifauna.

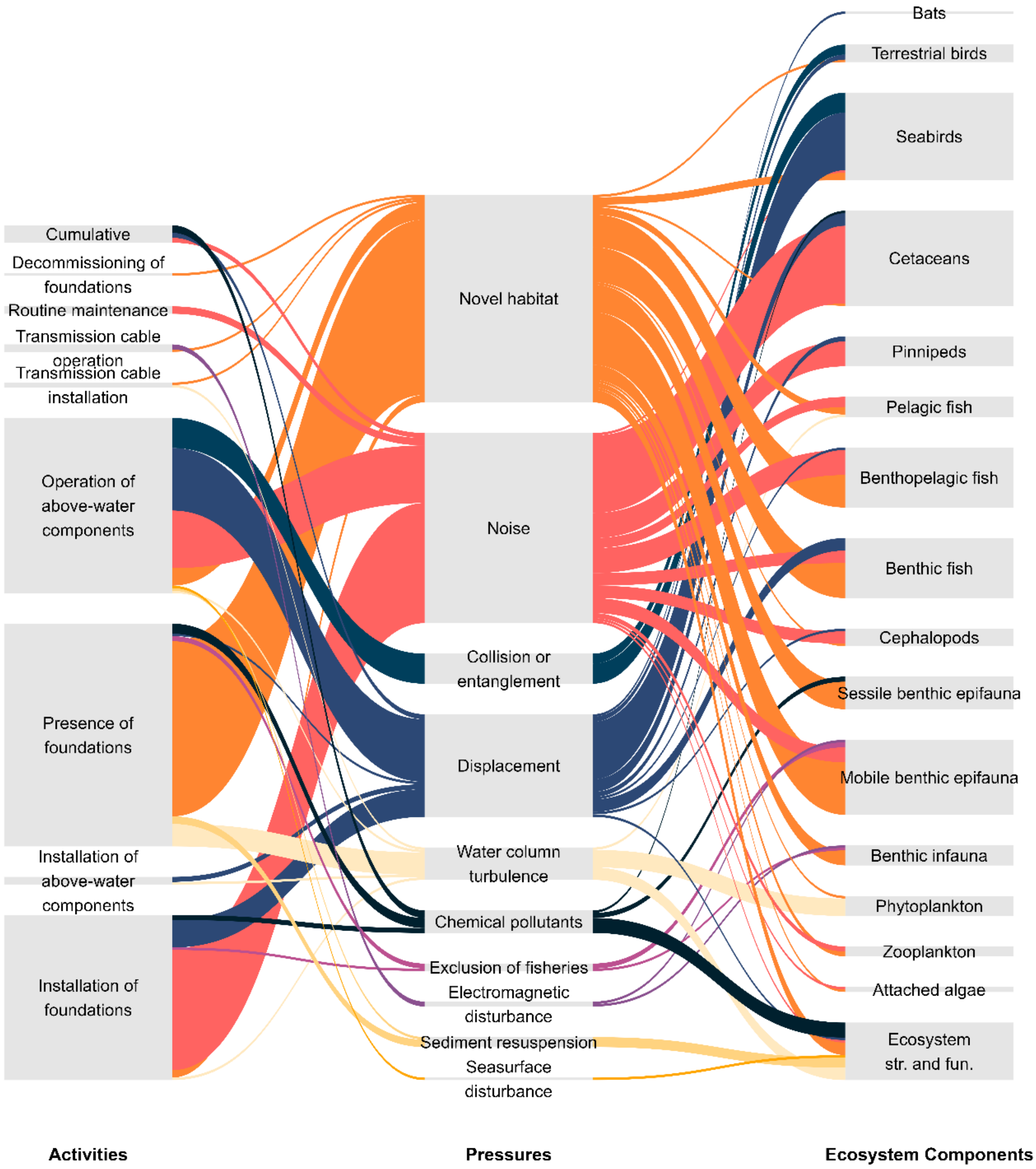

Figure 3-2. Offshore wind energy associated activities (left), the pressures these activities create (middle) and the different ecosystem components that these pressures impact upon (right). The widths of the ribbons represent the number of cases from primary literature (total of 244) linking each of the nodes in this Sankey diagram.

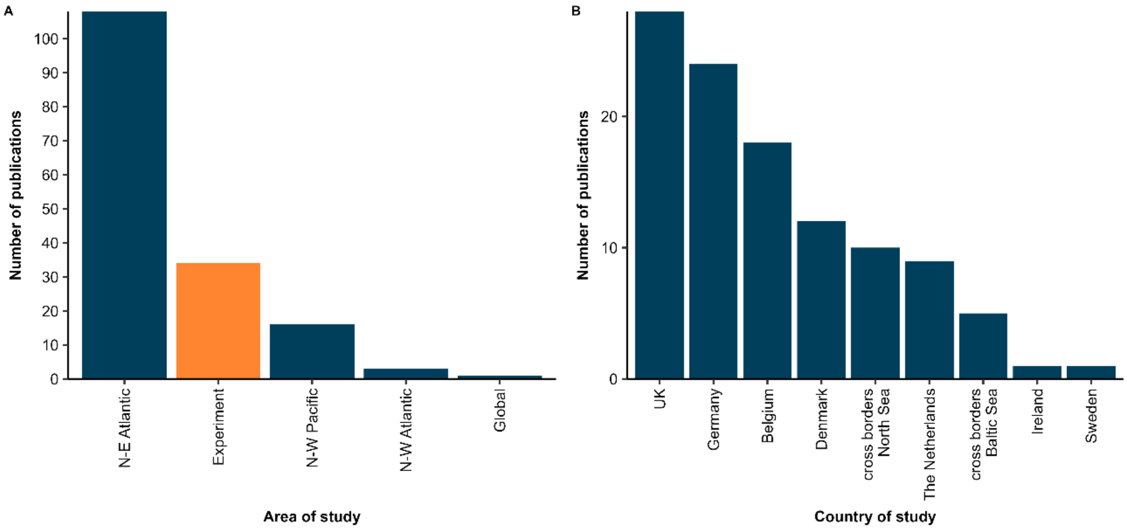

Figure 3-3. Geographic location of retained articles on the topic of offshore wind energy industry related impacts. (A) Number by FAO area, including lab-based experimental studies in their own category (orange bar). (B) Considering only those studies from the NE Atlantic, countries in which the studies took place.

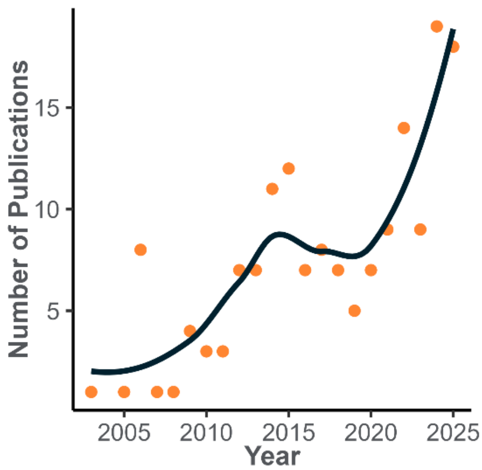

Figure 3-4. Number of relevant, retained studies per year over the whole time period of available evidence. Line is a polynomial smoother, only for visualisation.

The cases considered were not limited to only installation or operation, nor to only the time in which species directly interacted with the infrastructure, thus the reported duration of the various activities and pressures varied as well. We recorded these purported effect durations as either acute, periodic, chronic, or unknown (Figure 3-5). Acute impacts were considered to be relatively short-term, impacting during the specific activity, which only occurs infrequently or even once in the windfarm's life-time (e.g. installation of foundations), and with little to no lasting effects. Periodic effects were considered interactions that were not continuous during operation, but that were relatively frequent over the life-span of the windfarm, for example, routine maintenance activities, or the operation of the windfarm interacting with migratory animals never resident in the area, but routinely migrating past. Cases were considered chronic when they were persistent over prolonged periods of time, for example the persistence of foundations and the effects on soft-bottom species, or the novel habitat they introduce for immigrant species.

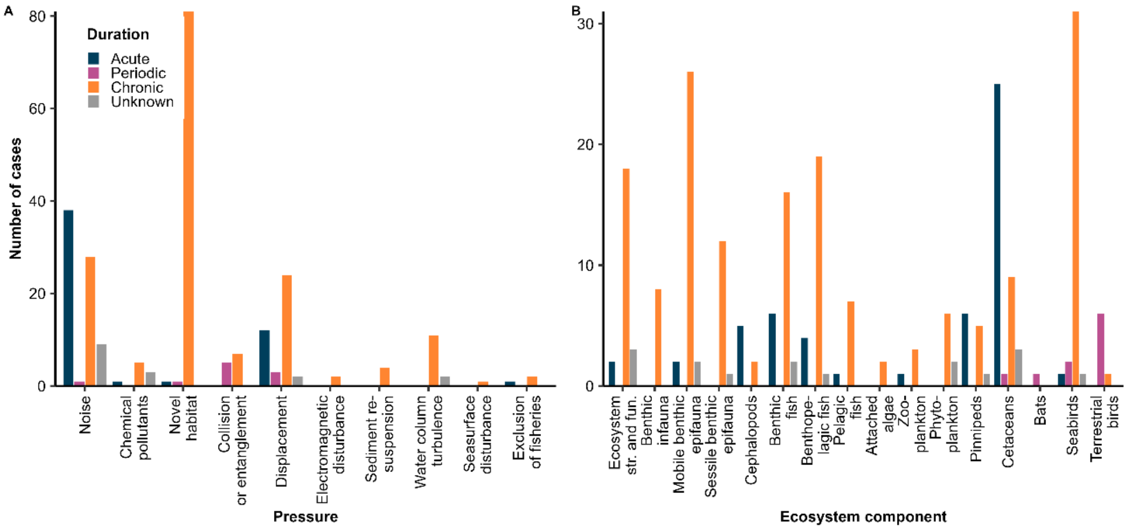

Figure 3-5. Categorical durations of various activities and pressures associated with offshore wind energy infrastructure, and their frequency of occurrence in the reviewed literature.

For each case, using the original authors' own interpretation of the interaction, we also recorded whether the impact upon the component of the ecosystem was positive, negative, polytonic (multi-directional complex response), or undetected. The latter two cases were combined into a (neutral) category that represented the diversity of reported responses, without contributing any evidence of impact existing (Figure 3-6). The neutral category is likely under-represented due to *publication bias* in primary literature (Huntington 2011).

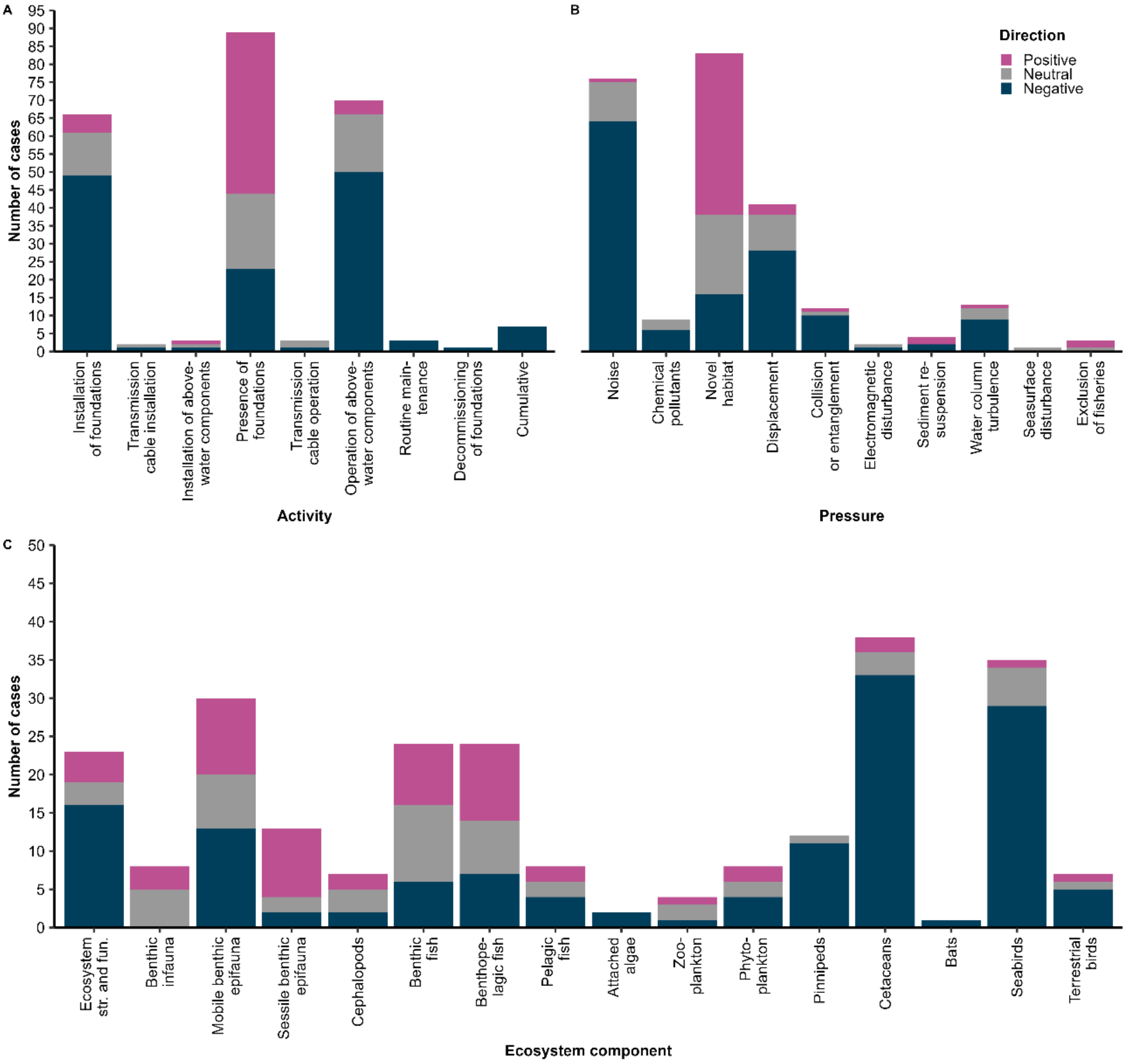

Figure 3-6. Numbers of cases with different directions of impact derived from different offshore wind industry activities (A), the pressures they produce (B), and the components of the ecosystem being impacted (C).

2.2 Knowledge synthesis and gaps

Because of the bias present in what gets published in primary literature, we cannot rely on the amount of evidence generated from a review, alone. We undertook a meta-analysis in which a measure of entropy, or randomness is used to determine how much agreement there is in the literature. The resulting matrices of relative confidence in the existence and directions of impacts, also illustrate where no, or even little evidence exists.

2.2.1 Methods

Using the reported directions of impact, by each combination of activity or pressure and ecosystem composition they were impacting, we calculated a certainty score (see Thomassen et al. 2025, for details), which represents how congruent, or in agreement the literature is about a particular impact. Furthermore, not all studies are optimally designed for the evidence they uncover and report on. Therefore, we gave three quality scores corresponding to how well a study covered the spatial scale, temporal scale and used the appropriate methods of observation and analyses, for each case, and we down-weighted the contribution of evidence with sub-optimal design.

In this analysis if there is a majority of evidence showing a particular direction of impact, with little to no evidence of neutral or opposite effects, then the certainty score will be high (Figure 3-7; left). If there remains a majority of cases showing a particular direction, but there is substantial evidence showing a neutral or opposite effect, then the certainty score will be much lower, for a given number of cases (Figure 3-7; centre). In a case where there is equal evidence across the different outcomes, then there is maximum entropy, no certainty, and the score will be 0 (Figure 3-7; right).

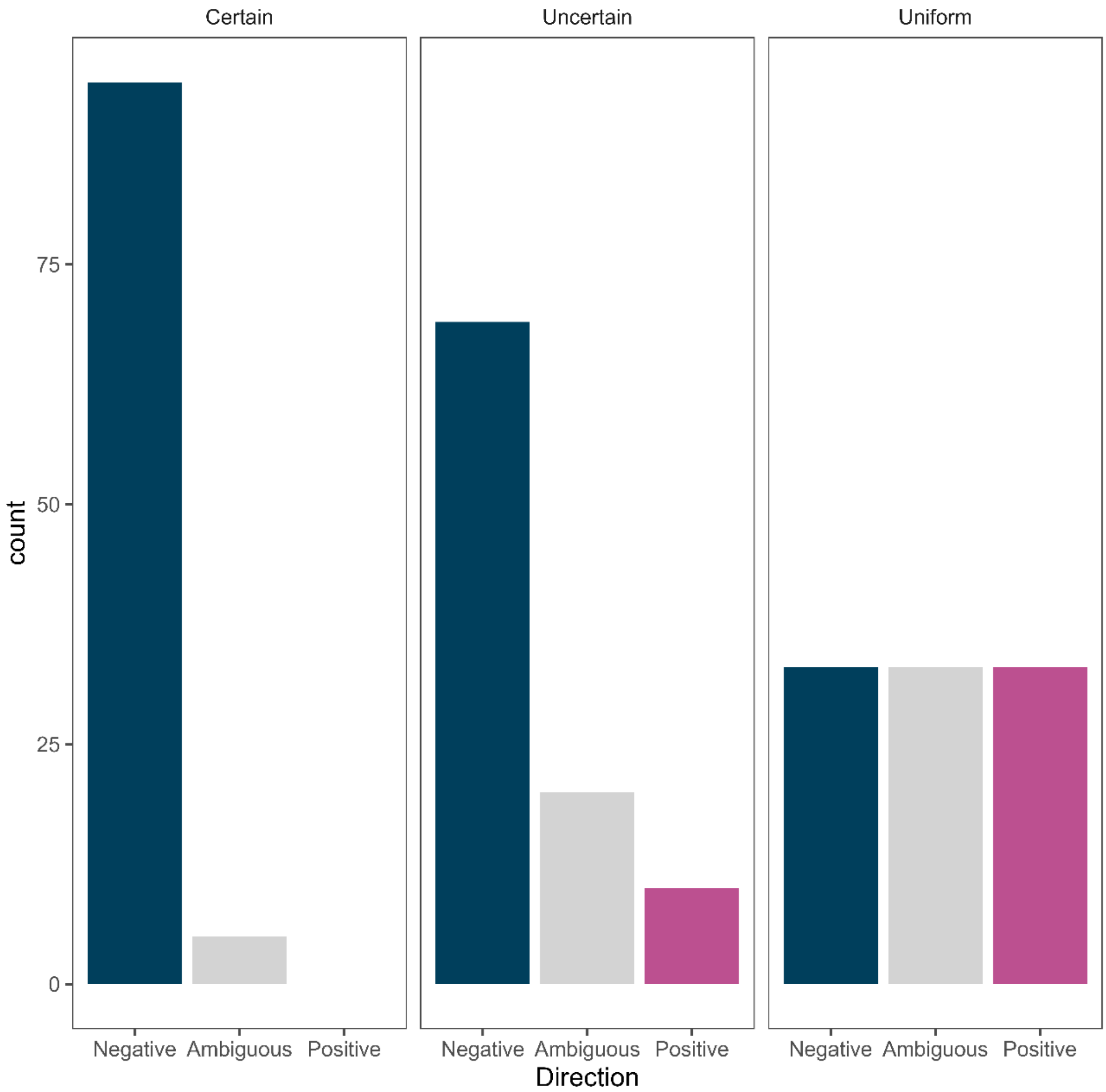

Figure 3-7. Three hypothetical situations for the number of cases for each of three outcomes, and their relative certainty scores under the method adopted from (Thomassen JAC *et al.* 2025). The three scenarios show high certainty (left panel), lower certainty but still strong (middle panel), and no certainty under maximum entropy (right panel).

2.2.2 Results

We found strong agreement that cetaceans are negatively impacted by the installation of foundations and via the pressure of noise produced both during installation and operation. We also found a high degree of evidence that seabirds are negatively impacted by the operation of the above water components and that these negative impacts are primarily caused by both the displacement of birds from the areas of offshore wind energy installations and collisions. Contrastingly, benthopelagic fish and other benthic fauna were positively impacted by the presence of foundations, via the production of novel habitat. For the majority of other interactions studied, there were primarily negative impacts, but often with relatively less evidence. This relatively weaker evidence is derived from either a lower number and/or quality of studies (e.g. Routine maintenance impacts on cetaceans, or the role of novel habitat for attached algae), or from higher discordance in the literature (e.g. the role of chemical pollutants in ecosystem structure and functioning).

There is a near complete absence of knowledge on the impacts derived from the installation and operation of transmission cables, and associated network infrastructure. Equally, for the impacts from routine maintenance activities, and decommissioning. While evidence of impacts from the installation of above water components was studied across three ecosystem components, this evidence was provided by only one study per interaction, meaning that this interaction is also very understudied. These knowledge gaps in impacts from different activities translate into the gaps associated with the impacts from pressures. While there isn’t a one-to-one relationship, studies of activities often focus on the same pressures, for example, majority of studies on the impacts on “mobile benthic epifauna” investigated the role of the “presence of foundations”, but there are also impacts from other activities like the “operation of above water components”. Furthermore, all of the evidence used in the generation of these scores comes from fixed foundation installations, as opposed to floating foundations.

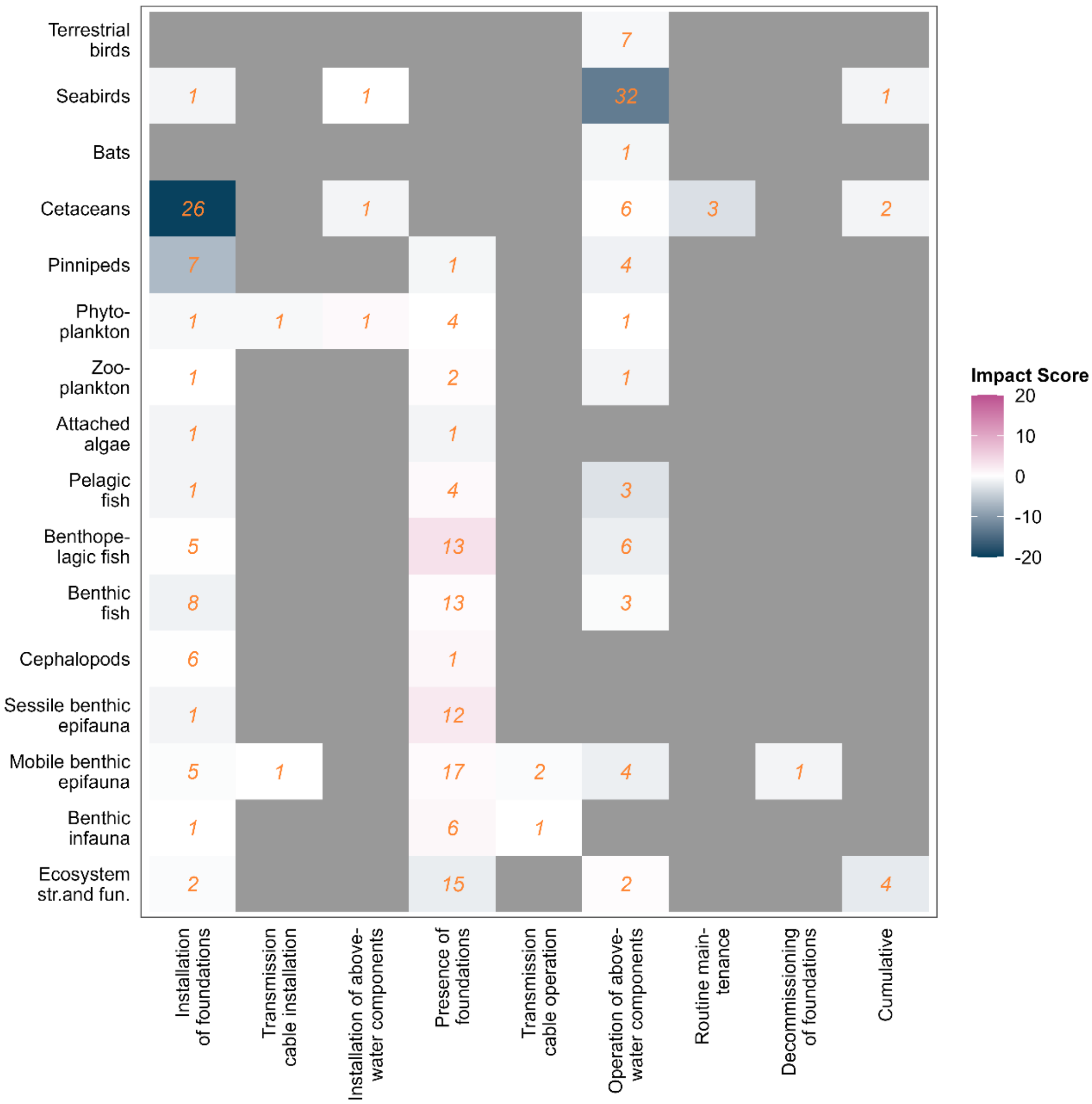

Figure 3-8. Interactions between different offshore wind energy activities (x-axis) and various components of the ecosystem (y-axis), the direction and certainty score (colour) attributed to these interactions, as well as the number of cases (orange numbers) used to derive that score.

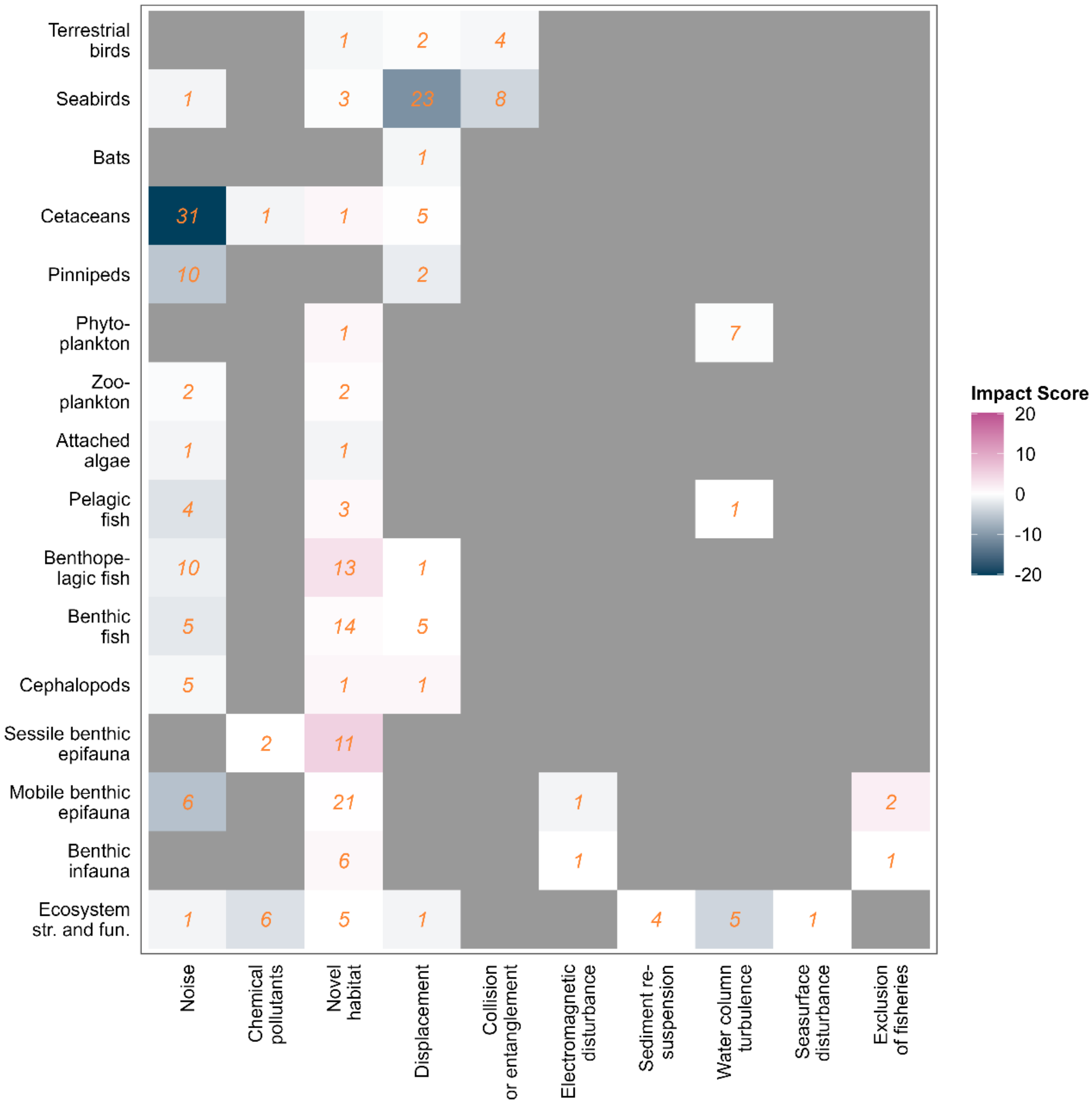

Figure 3-9. Interactions between different pressures derived from offshore wind energy activities (x-axis) and various components of the ecosystem (y-axis), the direction and certainty score (colour) attributed to these interactions, as well as the number of cases (orange numbers) used to derive that score.

2.3 Expert elicitation to assess risks in knowledge gaps

Making decisions in the absence of empirical evidence can still be supported by other forms of knowledge. One example is knowledge from subject matter experts, and eliciting knowledge from experts is common in the realm of ecological risk assessment and environmental management (Choy, O'leary, and Mengersen 2009). To fill in some of the knowledge gaps from the metanalysis of the literature review, we undertook such an expert elicitation activity. Our aim was to elicit expert knowledge in a manner that could be integrated with the literature review.

2.3.1 Methods

We planned our expert elicitation process based on a recent review of methods in this practice (Hanea, Hemming, and Nane 2022), which was useful, because of instead of promoting individual, prescriptive methods this study provided overarching procedural best practices and compared various prescriptive frameworks. We took these best practices and applied them to our specific requirements, namely to provide knowledge in a format that can be used to supplement the empirical knowledge derived from the literature review.

Specifically, we identified individuals researchers known to be involved in the study of the effects of offshore wind energy activities on the environment and who were available to participate in person, or happy to participate online. This resulted in seven senior (Professor, associate professor, or senior researcher), four mid-level researchers (assistant professor, or researcher), and three early career researchers (Post-doctoral researchers and PhD students), for a total of 14 participants.

We prepared participants by sending them an information pack (Appendix C) ahead of the meeting. The meeting followed a specific programme, where we introduced the topic and motivations without discussing specific cases where we were seeking expert input. We then facilitated expert's participation by moving in a specific chronological order through matrices resembling those generated in (Figure 3-9). We selected to elicit knowledge on pressures, rather than activities, as pressures are both one step closer to the impacts than the activities that create them, and pressures are abstracted from activities, and thus can be compared to the same pressures from other activities, future-proofing our results for compatibility with studies of other human activities. Additionally, we elicited knowledge based on a possible numerical range of impacts , and with an explicit qualitative evaluation of the experts' own confidence in their knowledge (see Appendix C).

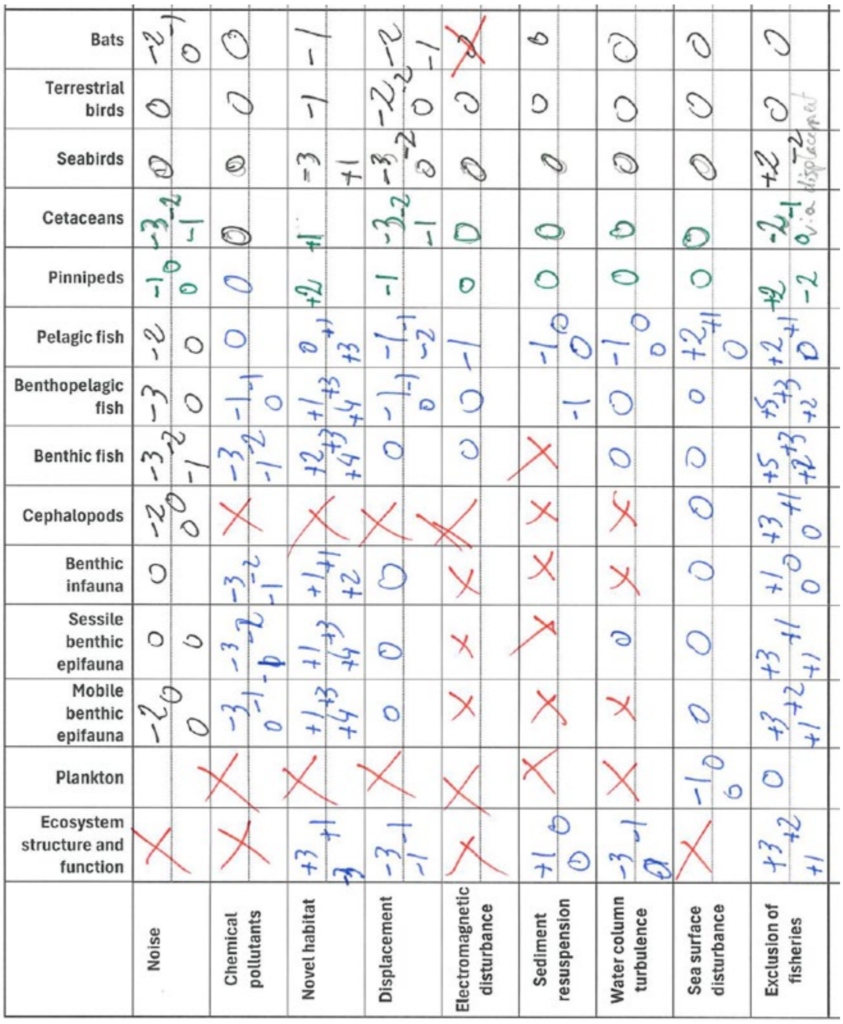

Figure 3-10. Example expert elicitation worksheet showing the resemblance to the meta-analyses' matrices. This illustrates how expected impacts were communicated on a -5 to +5 likert-like scale and the possibility for experts to provide ranges or point scores. Furthermore, the communication of confidence via colours (Red crosses = unable to answer, Green = highly confidence, Blue = medium confidence, Black = low confidence) was facilitated in a chronological order to ensure proper attention was given to the application of this coding method.

The results from the expert elicitation were in a format similar to the data extracted from the literature analyses, with direct comparability between the “quality scores” assigned to different studies and the experts’ self-evaluation of confidence in their response for each interaction. Furthermore, the magnitude of the expert’s interpretation of risk was collapsed down to directional impacts that were coded in the same way as the literature review (positive, negative and ambiguous), and in cases where ranges spanned across positive/negative and zero, these were considered as two potential records (either positive and ambiguous, negative and ambiguous, or positive and negative). These directly analogous data were thus used in the same meta-analytical procedure as the data extracted from the literature search to produce analogous matrices of impact scores.

2.3.2 Results

From the fourteen experts, we received at least one risk evaluation per interaction of ecosystem component and pressure (Figure 3-11). The strongest and most agreed upon impact was that of a negative impact of noise on cetaceans. There was also a high degree of agreement that the exclusion of fisheries from within offshore wind farms would have a positive impact on benthic organisms and a relatively strong agreement that this positive effect would extend across most ecosystem components. However, where a minority of experts felt capable of evaluating impacts of fisheries exclusions on bats and plankton, there was broad agreement that there would be no impact. Novel habitat was also expected to have a positive impact on most ecosystem components. The impacts of water column turbulence and sea surface disturbance were quite variable with low certainty across most ecosystem components, and some positive effects expected for pinnipeds and some benthic or benthic associated ecosystem components.

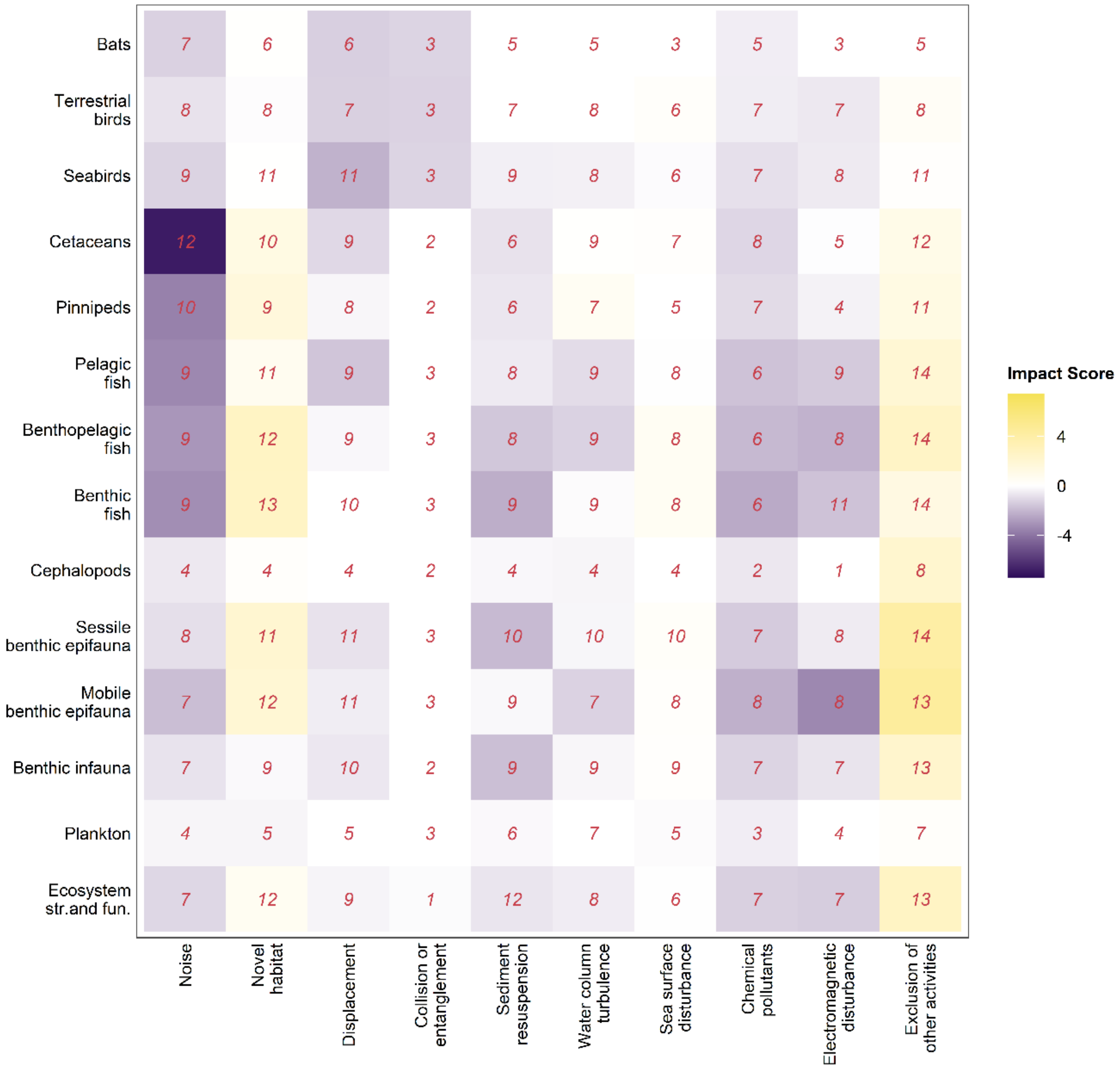

Figure 3-11. Expert knowledge derived direction of relationship (yellow positive, purple negative) between various ecosystem components and pressures derived from offshore wind energy activities. The intensity of the colour scale represents the number of experts and degree of agreement among the experts on the direction of impact. This matrix is analogous to Figure 3-9.

2.4 Combined empirical and expert knowledge

While the impact scores from the expert elicitation exercise are not directly comparable with those from the literature review meta-analyses, we can directly compare the *certainty* scores. The certainty scores vary only from zero to one and represent only the agreement or concordance (inverse entropy) in the available evidence; and not the amount of evidence, which *is* incorporated into the impact scores. When considering those interactions between ecosystem components and pressures for which there was evidence from both the literature and from the expert elicitation, we see a high degree of agreement on the directions of impact, with some exceptions for the pressure of novel habitat (Figure 3-12). There is some variability in the certainty scores, but this is to be expected, especially where there is only one case from the literature, leading to a high certainty (e.g. the values at -1 or 1 along the x-axis of Figure 3-12).

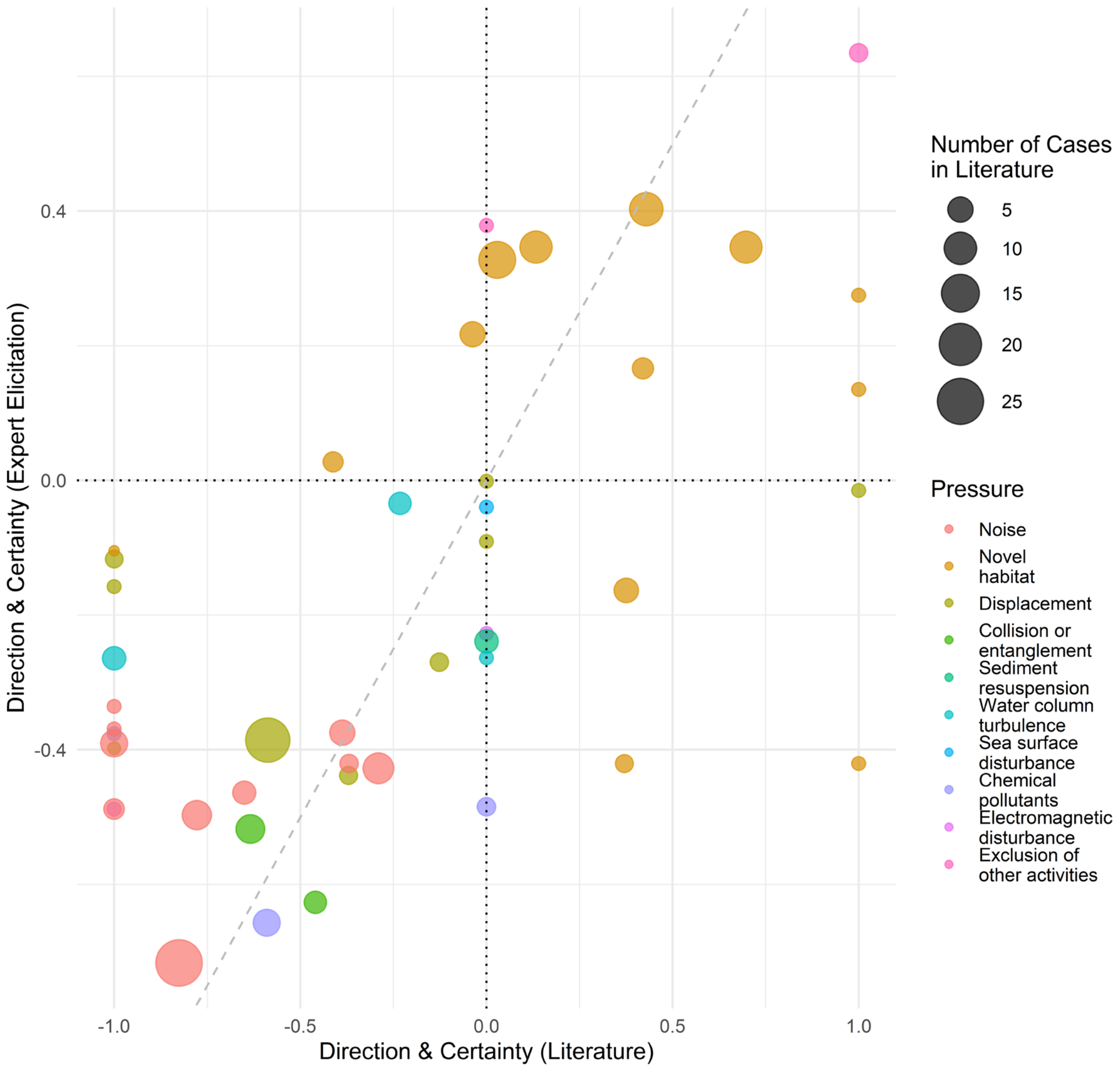

Figure 3-12. Comparison between direction of impact and degree of certainty derived from literature review (x-axis) and expert elicitation (y-axis), where evidence is available for both sources.

This high level of agreement between the two methods means that we can use the expert elicitation results to supplement the impact matrices, where there is no available empirical evidence (i.e.

no peer-reviewed, published literature). In doing so we utilise the best available knowledge to create a more comprehensive overview of risks from offshore wind energy derived pressures over a range of ecosystem components (Figure 3-13). Here we see similar trends as described in Figure 3-9 and Figure 3-11, with one major difference; in cases where the literature review evidence consists of only one source article/case then the directional certainty value is always exactly -1, 0, or 1. This biases these scores to assign more certainty in cases where there is much less evidence, and so no chance for disagreement, contrary to the impact scores of Figure 3-9 and Figure 3-11.

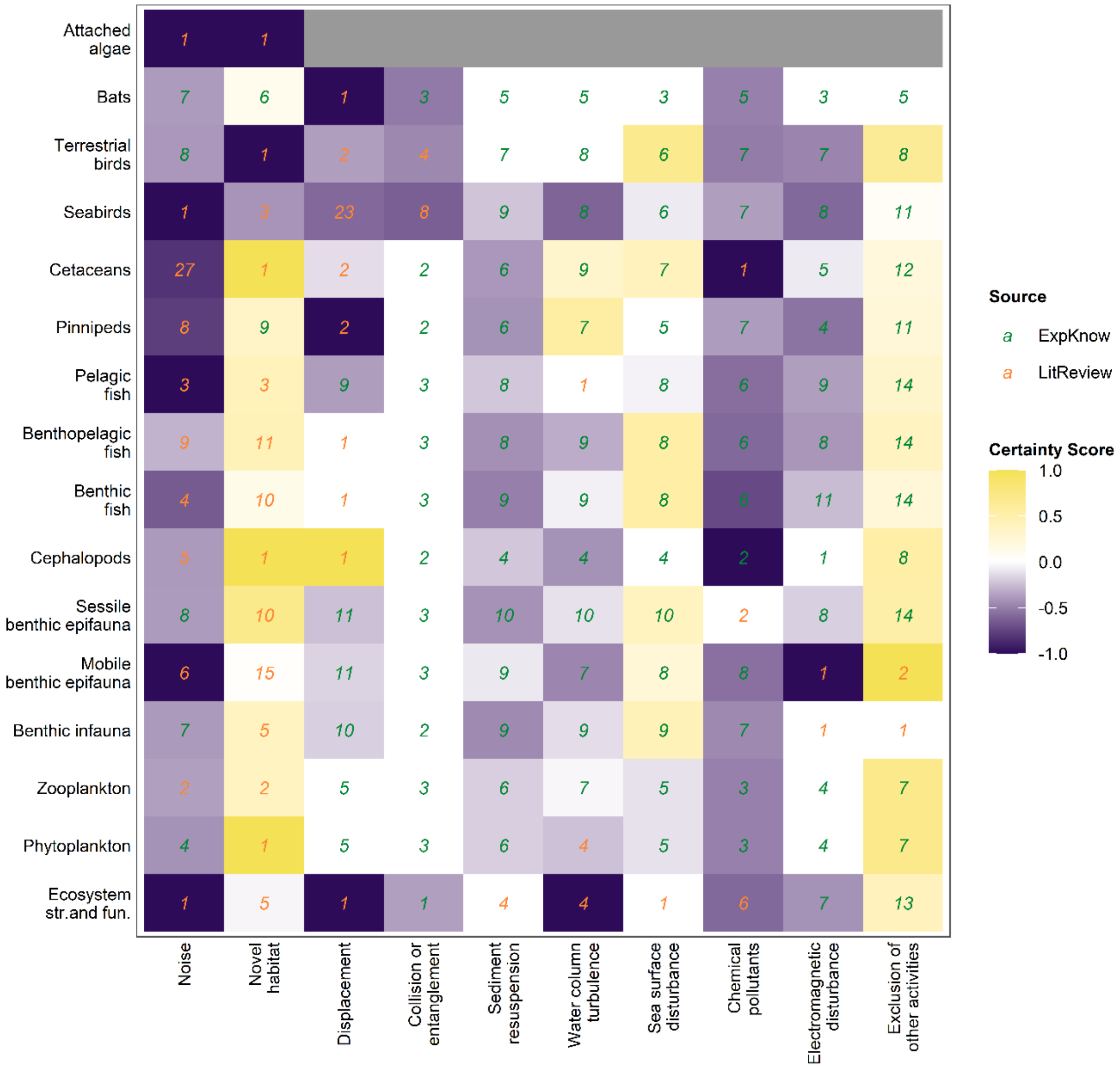

Figure 3-13. Combined matrix of certainty scores showing the direction of impact (fill colour), the level of agreement or certainty in the source of knowledge (fill colour intensity), the source of the knowledge (colour of numeric annotations) and the number of cases or experts that contributed to that score (numeric annotations).

2.5 Interpretation of risks

By combining direction of effect with an entropy-based certainty metric that incorporates study quality, our synthesis distinguishes well-studied, consistent impacts from those where evidence is sparse or contradictory. This allows decision-makers to differentiate between interactions where precautionary limits are strongly justified and those where the priority should be to generate better data.

The greatest evidence for risks from offshore wind energy activities/pressures exists for the impacts of noise from foundation installation on cetaceans. This is partially due to the relative focus on this topic in the literature and is reflected in the expert knowledge. The impacts of noise, whether they be from foundation installation, or other operational activities, have received a lot of attention across different ecosystem components and in nearly all cases the evidence shows a negative impact, although with some ambiguity for organisms, such as zooplankton and seabirds. Contrastingly, for seabirds, there is a relatively large number of studies on the role of the above water components' role in displacement and collision, which is again reflected in the experts' combined knowledge. The pressure of novel habitat, derived from the presence of foundations and scour protections, was found to have a broadly positive effect across ecosystem components. In cases such as this, it should be noted that a positive impact is still a perturbation on the system, an anthropogenic source of disturbance and change to the system that existed before. In narrow cases, for example, the installation of foundations with scour protection in locations where boulder reefs or gravel beds have previously been extracted, then these positive impacts may be interpreted as a form of pseudo-restoration.

Where empirical data and expert elicitation overlapped, we found a high degree of agreement in both the direction and relative certainty of impacts. This concordance justifies using expert-derived risk scores to fill empirical gaps in a structured way, while still transparently distinguishing between evidence types. The evidence from empirical sources (literature) is focussed on the impact of particular activities and their associated pressures, leaving large areas of unknown impacts from various interactions. One good example of this is the role of chemical pollutants, where there are only three ecosystem components represented with few studies in the impact scores from the literature review, but where the expert knowledge identifies consistent agreement of negative impacts across the ecosystem components. Similarly, the disturbance and resuspension of sediments, either from installation or water turbulence at the seafloor, has been deemed by expert to be broadly a negative impact across ecosystem components, but in particular for benthic fish and invertebrates.

Major life-cycle stages and technical elements of offshore wind remain poorly characterised, including the impacts of transmission cables and associated infrastructure, routine operation and maintenance activities, and decommissioning. Moreover, nearly all empirical evidence stems from fixed-foundation installations, leaving the environmental implications of rapidly developing floating technologies largely unresolved.

The exclusion of fisheries, included here in this study as a pressure, is essentially a removal of an activity that may otherwise occur, in areas that are instead utilised for offshore wind energy production. Where a few cases in the literature showed evidence of a positive impact from the exclusion of fisheries, the experts showed a high level of agreement that the exclusion of fisheries in offshore wind energy areas would bring positive change across the vast majority of ecosystem components.   This certainty shown by experts and warrants further investigation of whether this expectation would occur in real-world systems. More explicit considerations of the interactions between different human activities (such as offshore wind energy, fishing, sediment extraction, aquaculture, and shipping) and local conservation objectives, may support the role of offshore wind energy installations as Other Effective Conservation Measures (OECMs). However, until the cumulative effects of different combinations of allowed or excluded activities are evaluated against conservation objectives in an holistic manner, the allocation of OECM status is premature.

In terms of prioritising research, over and above the cumulative impact and risk assessments described above, more fundamental research is required to fill in the gaps in empirical knowledge identified in Figures 3-8 and 3-9. These many gaps can be prioritised by the impact scores determined from expert knowledge, especially those with greater negative values from Figure 3-11 (e.g., chemical pollutants, sediment resuspension, cable-related pressures, and decommissioning). While this new knowledge is being created, the results of this project can help to guide trade-offs between conservation objectives and ecological risks, as well as to help prioritise monitoring efforts toward those interactions with greatest risk.

3. Funding review and roadmap

3.1 Introduction

The structuring of and coordinated execution of large strategic research, innovation and development programmes is an art, which even the largest and most resourceful programmes, such as the EU's Horizon programme or the Novo Nordisk Foundation continuously develop, to stay relevant and ensure maximum impact of investments. To this extent supporting approaches such as PESTEL analyses integrated in theories of change (Hasler-Sheetal *et al.* 2025), and/or foresight analyses (Hoof van *et al.* 2019), are established tools aiming to guide programme committees to develop interventions areas, set programme objectives and develop their implementation plan.

While such efforts likely would be of relevance for the foundation, such analyses go beyond the scope of this report. Instead, this chapter will zoom in on the present funding landscape which the foundation ha to 'navigate in', and the options addressing the foundations objectives efficiently. For simplicity we here take "efficient" to mean:

- The capacity to avoid *unwanted* overlap with parallel project funding, assuming this would reduce the maximum potential impact of the programme
- The capacity to actively exploit synergies with e.g. parallel activities/projects/institutions to e.g. reduce costs of joint activities or enhance impact.

To navigate efficiently, programme committee's therefore benefit from e.g.:

a) Having a general overview of the funding landscape and direction of parallel funding streams aiming to address objectives overlapping with the programme
b) Understand which processes either internally or externally, which can enable the committee to continuously stay up to date on new developments (political, scientific, parallel programme etc.)
c) Identify hich platforms and stakeholders could actively support synergies with present or future activities by the foundation
d) What steps could be relevant to consider in a long-term strategy

This chapter aims to support progress towards all four, by firstly translating the political agreement behind the foundation into a theoretical generalized strategic research and innovation agenda, to illustrate the foundation's thematic focus, proposed implementation modalities etc. Secondly the identified intervention areas are used to map relevant programmes, and their potential for synergies with the foundation's anticipated workstreams. Thirdly, key potential collaborative platforms are described, to illustrate both present and anticipated opportunities for synergies in the coming years. This line of work is already ongoing withinn the foundation e.g. through the collaboration with Den Danske Naturfond, and Dansk Center for Marin Naturgenopretning. Fourthly, a number of general challenges are described and examples provided to illustrate a diversity of perspectives and potential solutions. Finally, the chapter concludes with a theoretical roadmap drafted to illustrate how a long term strategy could be structured to guide potential funding models to maximise impact by complementing existing national, private and EU funding programmes.

3.1.1 Translating the political agreement underpinning the foundation into generalized 'research and innovation programme language'

To better illustrate the role of the foundation in the wider funding landscape, we here propose a translation of it's core objectives, into generalized funding programme terminology and format, often used by e.g. the European Union's programmes such as the The Blue BioCofund, the Sustianable Blue Economy Partnership etc. (Table 4-1). The text regarding the Foundation's objectives are taken from the political agreement ("aftaletekst") from 27. June 2024, and categorized by author.

Based on this categorization, we subsequently define a theoretical research and innovation agenda for the foundation, which align with format often used in an EU programme setting. Here four interventions areas are defined, which are later used to study the overlap with other funding programmes in DK, EU, Europe in general and internationally.

Table 4-1. Translation of the Foundation's politically specified objectives into funding programme terminology.

Political agreement	Prog. terminology
"*Den store udbygning af havvind er nødvendig for at reducere CO2-udledningerne og samtidig øge forsyningssikkerheden med vedvarende energi, men udbygningen vil have en markant effekt på den omkringliggende havnatu*r"	Programme motivation
"*Derfor er der behov for ny og afprøvet viden om sameksistens mellem VE-anlæg og naturhensyn*."	Knowledge gap
"*det overordnede formål at bidrage til beskyttelsen af arter og genoprettelse af robuste økosystemer i havet ved at gennemføre fagligt velfunderede naturgenopretningsprojekter, samt evidensbaseret forskning og afprøvning om sameksistens mellem havvindsudbygningen og havets natur*" "*formålet med en havnaturfond bl.a. kan være at bidrage til viden om miljø og natureffekterne af VE-udbygningen på havet og til omkostningseffektiv genopretning af havnatur og biodiversitet med henblik på at forbedre miljøtilstanden i have*t"	Expected impact
"Det følger også, at der kan ses på muligheden for yderligere finansiering, herunder fra private aktører"	Implementation plan
"fra april 2024 følger, at der afsættes 25 mio. kr. til havnaturfonden i 2024, 100 mio. kr. i 2025 og 75 mio. kr. om året i 2026-2030."	Implementation plan
"Aftaleparterne er enige om, at aftalen om havnaturfonden og dens finansiering skal genbesøges senest i 2028."	Implementation plan
"der skal tilvejebringes et tilstrækkeligt videns-	Implementation plan

grundlag før konkrete naturgenopretningsindsatser påbegyndes" *"På sigt skal Havnaturfondens kortlægnings- og genopretningsindsatser bredes ud til flere områder af det danske hav, som dels skal muliggøre genopretningsprojekter i flere områder, dels gennem afprøvning af konkrete metoder og forsøg skal bidrage med ny viden om naturforbedrende tiltag ved VE-anlæg og muligheder for sameksistens, samt dataindsamling og udstilling via kortlægning og lagring af data fra monitoreringsprogrammerne for VE-anlæg på havet, der bl.a. kan understøtte forundersøgelser til opstilling af VE"*	
"Der vælges marine projekter med størst mulig forventet naturefekt" *"Der igangsættes fortrinsvist projekter i havområder, hvor det vurderes, at der kan opnås en langvarig effekt"* *"Naturgenopretningsindsatser skal som udgangspunkt effektovervåges, så genopretningsindsatser løbende kan bidrage med ny viden til efterfølgende indsatser"* *"Havnaturfondens genopretningsindsatser målrettes i de første år områder med et kendt genopretningsbehov. Disse områder omfatter hhv. 1) Lille-bælt og Sydfynske Øhav, 2) Storebælt, Samsø Bælt og Sejerø Bugt samt 3) Sjællands Nordkyst og Østkyst samt Møn"* *"På sigt skal Havnaturfondens kortlægnings- og genopretningsindsatser bredes ud til flere områder af det danske hav, som dels skal muliggøre genopretningsprojekter i flere områder, dels gennem afprøvning af konkrete metoder og forsøg skal bidrage med ny viden om naturforbedrende tiltag ved VE-anlæg og muligheder for sameksistens, samt dataindsamling og udstilling via kortlægning og lagring af data fra monitoreringsprogrammerne for VE-anlæg på havet, der bl.a. kan understøtte forundersøgelser til opstilling af VE"*	Implementation plan with evaluation criteria for projects focusing on nature restoration
"Aftaleparterne er enige om at afsætte midler til en omfattende kortlægning af områder til naturgenopretning i det danske havareal." "Samtidig afsættes der midler til effektovervågning af naturgenopretningsindsatser." "Aftaleparterne er også enige om at afsætte midler til udarbejdelsen af et virkemiddelkatalog, der skal opsamle seneste viden om marin naturgenopretning og sameksistens"	Implementation plan

”Aftaleparterne er enige om, at der afsættes midler til udvikling af digital infrastruktur til lagring og udstilling af miljødata, samt udvikling af et værktøj til gennemførelse af økosystemanalyser”	
“Initiativet (red. dataplatformen) skal bl.a. muliggøre, at offentlige såvel som private aktører kan bruge mindre tid og færre penge på bl.a. miljøvurderinger, idet data kan genanvendes på tværs af projekter. Samtidig understøttes økosystembaseret havplanlægning, som dels bidrager til, at Havnaturfondens indsatser kan placeres mest hensigtsmæssigt, og der dermed muliggøres omkostningseffektiv og langvarig naturgenopretning, dels bidrager til planlægning af øvrige aktiviteter på havet som fiskeri, råstofindvinding, VE-udbygning m.v. Analyseværktøjet skal også inddrage presfaktorer, kumulative effekter og kunne udarbejde scenarier, der kan understøtte politiske beslutninger”	Expected impact
“Det rådgivende udvalg skal i samarbejde med sekretariatet arbejde målrettet for, at der så vidt muligt sikres medfinansiering til Havnaturfondens opgaver fra fonde, EU-midler, kommuner og andre mulige samarbejdspartnere”	Implementation plan

3.1.2 A proposed research and innovaiton agenda for the foundation

To summarise the general role of the foundation in a wider EU funding landscape, Table 4-2 provides a format which could be shared with other funding programmes, to quickly communicate anticipated topics to cover and preferred intervention modalities.

Table 4-2. Translation of the Foundation's politically specified objectives into generalised EU funding pro-gramme terminology

Programme motivation	The anticipated expansion in offshore renewable energy is necessary to reduce CO2 emissions and simultaneously increase energy security. However, this expansion is anticipated to have a substantial impact on the marine nature. Thus, knowledge gaps in relation to understanding the options for successful coexistence between offshore renewable structures and marine nature should be addressed and communicated to relevant national stakeholders.
Expected impact	Through it’s activities the fund is expected to: 1. Advance the understanding of future options for successful coexistence between offshore renewable structures and marine nature in Danish waters 2. Contribute to the protection of marine species and habitats in Danish waters

	3. Contribute to the direct restoration of selected marine ecosystem habitats in Danish waters
	4. Development of a national marine data platform to support:
	    1. future ecosystem based marine spatial planning
	    2. and reduce public and private resource demand for environmental impact assessments

Intervention areas	1. Direct evidence-informed marine restoration projects with impact monitoring
	2. Pilot coexistence projects
	3. Research and knowledge synthesis on:
	  i. the environmental impacts of offshore energy including aspects of coexistence[1]
	  ii. cost efficient restoration approaches
	4. Compilation, sharing and exploitation of marine environmental data on a dedicated national platform[2]

Implementation plan	In the execution of the foundation's work towards 2030, it has been decided to implement: • Impact monitoring as a part of marine restoration projects (intervention area 1+2) • A funding stream to develop a catalogue of recent knowledge (i.e. synthesis) of marine restoration and co-existence (intervention area 3) • Dedicated funding line to develop a digital infrastructure to store environmental data, enabling wider ecosystem analyses including ecosystem-based marine spatial planning (intervention area 4) • An approach to funding which, to the largest extent possible, ensures co-funding from foundations, EU programmes, municipalities, and other potential collaborators

[1] Bullet points below here could be added when future topics are known, based on e.g. advice is this report's other chapters.

[2] Additional information regarding the expected deliverable from the Danish Centre for marine Nature Restoration could be added here as well as under the implementation plan, to highlight how the foundation is already co-funding initiatives with private foundations (i.e. Velux).

3.2 Mapping of funding programmes

As the overall theme of "co-existence, of offshore wind energy activities and conservation objectives" in an academic sense has many potential sub-themes, the mapping was performed as a general mapping of programmes and well-known funding streams covering the marine environment in general, with a primary focus on Danish and European programmes. In practical terms the mapping were performed with information retrieved from online searches, and through consultations with the research supporting staff (i.e. pre-grant offices) at 1) Institute for Biology, University of Copenhagen, 2) Department of Ecoscience, Arhus University, 3) Faculty of Science, University of Southern Denmark, 4) National Institute of Aquatic Resources, Technical University of Denmark.

The result is presented in Appendix D as a table with funding programmes and their role in the landscape, including examples of projects, which align fully or partially with the intervention areas of the foundation. In conclusion the mapping provided 58 examples of funding programmes, of which all have funded work at Danish Universities in recent years. Further programmes may also have been utilized by e.g. Danish NGO's, consultancies etc. not included in the survey.

The provided list of programmes, are very diverse spanning public and private programmes, including both self-sustained legal entities like the Joint Programming Initiative on Oceans and time-limited public EU programmes which has dedicated programme life-cycles, including plans for how to phase out activities at the end of their cycles. The last category include e.g. the present public-public Partnerships co-funded by the Danish Innovation Fund like the Sustainable Blue Economy Partnership and BIODIVERSA + under the umbrella of Horizon Europe.

3.3 Examples of collaboration modalities

Depending on the ambitions of the foundations, it may be relevant to coinsider the level of collaboration modalities desired in future collaborations with other programmes. Thus, to illustrate the diversity of modalities presently in use in the European context, we here outline a few high-level examples, as food for thought.

3.3.1 Intra-programme collaboration to enhance synergies between projects funded by a single programme

Synergies at project levels can be facilitated directly by the funding programme. In an EU context, cofunds such as the BlueBio Cofund, piloted several approaches (Lisbjerg and Korme 2024), which can be thematized in a variety of ways ranging from either mandatory or voluntary data sharing, researcher exchange programmes, alignment of analyses to allow later metanalyses etc. Continuous joint project meetings curated by the programme is e.g. one example of facilitated knowledge sharing, which projects by them self, do not necessarily prioritize otherwise.

3.3.2 Inter-programme collaboration

Synergies across programmes, are a continues topic of discussion across both private and public programmes. One example of a programme facilitating this is the public-public Sustianble Blue Economy Partnership. Here facilitated examples are e.g. use of 1) seals of excellence to highlight unfunded projects qualitative merits, 2) cumulative and combined funding, 3) coverage of up-stream and downstream synergies in e.g. a technology readiness level perspective. For more examples consult e.g. their dashboard (www.aircentre.github.io/SBEP_Synergies_Dashboard/)

Another modality also piloted by the Sustianble Blue Economy Partnership, is the use of thematically aligned calls between public funders, which align on e.g. topics, call texts and selection criteria etc., yet with a strict national focus, enabling post funding synergies between projects in e.g. a joint sea basin, herby mixing intra- and inter-programme collaboration.

3.4 Options and challenges for enhancing synergies between funding programmes

In theory, coordinated collaboration and e.g. co-funding with other programmes, may appear like a shortcut to increasing impact. However, the programme level cost of engaging and if relevant aligning actions, necessarily comes with a cost, which must be evaluated against the potential benefits. The cost of such efforts relative to the impact, has to the best of the author's knowledge, not been assessed directly in a relevant context, but should none the less be considered critically in relation to the foreseen investment. To nuance some of the potential challenges, we here zoom in on some of the challenges the foundation may experience moving forward, both in the short- and long term, as well as options for resolving some of them in practical terms.

Challenge 1: Overlapping intervention areas among funding programmes

The intervention areas of the foundation overlap considerably with several present private philanthropies and European instruments including public-public EU partnerships, as shown in the mapping. At the scientific level this can, on one hand, be perceived as a risk of deploying funding in areas, which are likely to be addressed sufficiently already. On the other hand, it could also be seen as an opportunity to fund parallel projects, with a different approach to increase the diversity of approaches or scale up actions. Funding multiple projects under the same topic, even with relative restrictive call texts, is e.g. often used in the Horizon Europe programmes to ensure this diversity of knowledge, solutions etc.

In all cases, the capacity to anticipate overlaps, to explore synergies for e.g. clustering of projects, co-funding or stacked funding etc. is likely a relevant way to maximize the impact of the foundation's investment, as seen in the already established collaboration with The Danish Nature fund.

From the perspective of joint activities with other funding programmes, overlapping intervention areas are a necessary pre-cursor for collaboration. This is illustrated below, with three European public institutions / platforms, which stood out in the mapping as some of the EU level programmes with large potential for synergies.

1) The German Federal Environmental Foundation, funding topic 11, i.e. 'The marine nature conservation Fund', which so far has been allocated ten million euros per year as of 2025 (DBU 2025), with intervention areas covering:
    - "*Protection and conservation of endangered marine species*…" and "*strengthening and restoration of habitats such as reefs, seagrass beds and the promotion of the continuity of corresponding catchment areas*"

- “*Innovative, environmentally compatible developments in the construction, operation and dismantling of offshore wind turbines…”* “*as well as the reduction of cumulative effects of other existing and future uses (both R&D projects and practical testing and implementation)*”
- “*Development of innovative methods for monitoring, participation and communication in marine nature conservation*”

In addition to the German Federal Environmental Foundation, the Germany Environment Ministry has also in 2024 launched the ‘Action programme’ to detect, retrieve and dispose of unexploded munitions in the German North and Baltic Seas (BMUKN, n.d.), which is anticipated to be continued in the coming years (pers. Communication J.Olivier from Projektträger Jülich, i.e. the federal German science project management organization).

2) The Joint Programme Initiative on Oceans (JPI Oceans) which e.g. presently have a call out co-funded by seven countries including Norway and Germany on “*Effectiveness and scalability of blue carbon restoration and protection measures*” which is expected to develop e.g. “*policy-and management-relevant recommendations, including best practices for restoration and protection of ecosystems*” (JPIO 2025) Additionally in their recent board meeting the JPI Management Board (G. Aubert and T. Kiefer pers. com), discussed potential future actions on topics related to

- “*Environmental Monitoring of Ocean Energy Farms*”
- “*Assessing the ecological impacts of offshore wind energy*”
- “*Man-made infrastructures in support of healthy oceans”*

The exact implementation modality remains to be discussed, as well as participating countries. JPI Oceans, however, have more than a decade of experience in using a variety of tools across the full programming cycle ranging from foresights, to establishing knowledge hubs, co-funded call, infrastructure sharing mechanisms etc.(Riisager-Pedersen and Lisbjerg 2019).
Innovation Fund Denmark has been a partner in JPI Oceans for many years, but decided to step out by the end of 2025, to spent funding in other areas (IFD pers. com). Presently any Danish funding programme could step in, to explore if participation in joint actions could be of value.

3) The Sustainable Blue Economy Partnership (SBEP), will be launching annual calls relevant to the foundation. Their project portfolio already contains multiple projects relevant to the foundation, and with the expected updated work programme of 2026, the intervention area related to MSP and relevance for nature protection is anticipated to be continued and followed up with e.g. calls, co-funded by Innovation Fund Denmark. Options for exploitation could easily include everything from stacked funding, knowledge sharing, thematically aligned calls, etc. Direct participation as a partner could be an option, in both direct or additional activities, where also the Danish Agency for Green Transition and Aquatic Environment is an active partner.

Challenge 2: Lack of project level overview

To keep up with the developments in this area, the diversity of research programmes addressing sub-components is a challenge. Further, Denmark lacks a strategic research council with a supporting analytical capacity similar to several other countries have. Thus, no entity to the authors best knowledge, has the task to keep an overview of the developments in this thematic landscape, and advice the Danish government on the options to align public and private programmes and projects strategically. However, in the short term, project level overviews might be possible to obtain for the foundation. One approach could be to issue annual calls for Danish research institutions, GTS' institutions, consultancies, companies and NGO's to share their present portfolio of projects, expected deliverables etc. This would provide an overview of both scope of present developments, increasing the chance of identifying novel areas, which is not addressed.

As the foundation is a governmental institution, it is also possible to leverage e.g. the national Danish Center for Marine Research (DCMR), which is supported by the Ministry for Education and Research. Here a new working group is expected to be launched in 2026 dedicated to overview and knowledge sharing on marine research and innovation programmes across all DCMR's institutions (RUC, AU, KU, DTU, SDU, GEUS, DMI, Greenland Institute of Natural Resources and Havstovan in the Faroese). The National Ocean Decade Committee also has a working group dedicated to nature-inclusive expansion of offshore energy, which might be able to support parts of this.

Challenge 3: How to support inter-project synergies to maximise programme level impact

Assuming sufficient project level overview can be obtained, the foundation would likely still benefit from considering which activities are relevant to leverage anticipated synergies among projects. Recent EU Co-funds and partnerships could be used as inspiration. For example, did the Blue-Bio Cofund support alignment of projects by hosting joint project Kick-offs to enhance awareness, and followed up with re-occurring thematic online meetings to consistently ensure flow of information and continuous exploration of opportunities for collaboration on e.g. data sharing, infrastructure use, methodological standardization etc. This level of programme facilitated collaboration, can also be further deepened, illustrated by e.g. the Sustainable Blue Economy Partnership which facilitates knowledge sharing among both internally funded projects, under the same theme, but also brings in projects funded through nationally thematically aligned calls as well parallel Horizon calls. This work will continue in the coming years coordinated by FORMAS, i.e. the Swedish research council for sustainable development.

Should such a line of work be chosen, one aspect to consider is the necessity to formalize such expectations with the projects, including necessary budget categories for future projects.

Challenge 4: Planning the long-term role of the foundation in a changing EU programme landscape

The landscape in terms of programme focus, programme structures and scientific progress will develop considerably over ***the next few years***. Firstly, because many large EU projects address many of the aspects related to co-existence, but also because EU policy development and implementation continuously advance. One example is the implementation of the Nature Restoration Law and the formulation of the Ocean Act, which will legally implement the present 'Ocean Pact', which will set the stage for European investments in the follow up to Horizon Europe. However, below these policy developments, are also the forthcoming Ocean Research and Innovation

Agenda and Ocean Observation Strategy, which both should be ready by 3rd quarter of 2026. These strategies are also developments which the foundation could decide to influence directly through e.g. the open consultations expected in spring 2026 to align them with the intervention areas of the foundation.

On the longer term, the European Commission and member states will advance the development of the next Multiannual Financial Framework, set to launch in January 2028, i.e. the follow up to Horizon Europe. This will potentially provide additional new opportunities for the foundation if EU co-funding, is considered relevant. Here close dialogues with e.g. the Agency for Education ad Research's (UFS) Eurocenter and The Danish Innovation Fund's International Office is relevant, as they follow this closely and are in continuous dialogues through UFS' reference group on Horizon Europe with the Danish research community.

Challenge 5: How to efficiently explore opportunities for collaboration at the programme level

Direct contact between programmes could likely be an efficient way to quickly explore options for joint actions. On request from MST, annex 2 provide a list of contact details and relevant staff for organizations mentioned in this report.

A parallel approach, which may also be relevant, could include the participation in the anticipated future funders forums, which will be implemented under the umbrella of the EU Mission Oceans and Waters. These forums will provide new opportunities for both national, sea basin scale and EU collaboration on the programme level, and are inspired by the Danish EU Presidency Mission Ocean & Waters Conference in Nyborg in September 2025.

In practical terms, three levels of potential 'funders forums' are anticipated aiming to align actions behind Mission Ocean and Waters objectives. These include e.g. national round tables facilitated by national Mission Hubs, regional round tables coordinated by the sea basin specific Horizon Europe Mission Ocean coordination and support actions, and EU level facilitated by the European Commission e.g. during the European Commissions annual Ocean Days in Bruxelles. While the exact format and target of these activities remains to be determined, they will without doubt provide several opportunities for the foundation to share ideas for collaboration with public, and private programmes.

3.5 Conclusions and roadmap example

In conclusion, a clearly defined scope of ***what*** the foundation wants to fund, and ***how*** it wants to fund direct or supporting activities is likely the best compass to navigate in a landscape which is constantly changing. Leveraging the collective intelligence, of all Danish institutions through e.g. a systematic annual process, could be a way forward as no single institution have the full overview of all project developments. If such information was integrated into e.g. systematic PESTEL analyses and a theory of change of the programme, this might also enhance the capacity to communicate the background of investment decisions externally. In combination, this should also strengthen the ability to identify and prioritize, when and where investments could either complement or supplement other programmes to maximise impact.

To illustrate the options, the table below provides an example of what a high level 'roadmap' could look like, as requested by MST, taking into consideration the anticipated developments in the EU and national funding landscape. Similarly, appendix F, provide a detailed list of contact persons, which could support the foundation’s future work in assessing the degree to whcih these programmes or platforms are relevant partners for various purposes.

2026

	Examples of activities
1	Make a call for all DK research institutions, NGO’s etc., e.g. with support from Danish Center for Marine Research, to share project portfolio related to offshore wind impacts, and project timeline for future, data sets, models, services, maps etc.
2	Decide topics (informed e.g. by the present report), and implementation modalities for the coming years for all intervention areas – to understand the scope of potential partner intuitions and platforms going forward.
3	Engage the national Mission Ocean Hub, to assess to what extent participation in or scoping of future national, regional and EU funders forums, could be of relevance to the foundation to increase co-funding, stacked funding, thematically aligned calls etc. for all intervention areas.
4	Engage JPI Oceans and the German Federal Environmental Foundation, regarding planned calls and conditions for joint activities
5	Engage Innovation Fund Denmark to clarify the extent to which participation in the Sustianble Blue Economy Partnership could be relevant, for the intervention area which overlaps. This is likely the most straightforward path to direct EU co-funding.
6	Assess to what extent it would be relevant to contribute actively to the shaping of the next generation of EU’s Horizon Programme, including what potential role the foundation potentially could have in future partnership like models.

2027

	Examples of activities
1	Re-issue the call for all DK research institutions, NGO's etc., to share project portfolio related to offshore wind impacts, and project timeline for future, data sets, models, services, maps etc.
2	Continue engagement with the national Mission Ocean Hub, to continosly assess to what extent participation in or scoping of future national, regional and EU funders forums, could be of relevance to the foundation to increase co-funding, stacked funding, thematically aligned calls etc. for all intervention areas.
3	Prepare the potential role in the next EU Horizon Programme, in dialogue with e.g. UFS Eurocenter, Innovation Fund Denmark, and Ministry of Trade, the ladder to understand how DK interprets the competitiveness angle and approach to the next wave of Eu funding.

2028

	Examples of activities
1	Re-issue the call for all DK research institutions, NGO's etc., to share project portfolio related to offshore wind impacts, and project timeline for future, data sets, models, services, maps etc.
2	Consider a national portfolio analyses, inspired by e.g. EC (2023), to update the specific national knowledge gaps, also in support of Dk's capacity through UFS Eurocenter to contribute to the formal consultations on the wanted topics in the new Horizon programme.
3	Other activities will mainly depend on the choices made in the earlier years.

4. Final Conclusions

Across this report, we have examined the concept of coexistence between offshore wind energy and the marine environment, reviewed the current scientific evidence on ecological impacts and risks, and considered how strategic funding can best support a transition toward sustainable offshore wind development in Denmark. Although each chapter addressed these themes from a different analytical perspective, a consistent picture emerges: coexistence is neither a fixed condition nor a singular management goal, but a dynamic, value-laden, and system-level challenge that requires clarity of purpose from broad and early engagement, robust and accessible evidence to support decision making, and coordination across institutions for strategic research funding and maritime policy as well as tactical management decisions.

Our exploration of definitions revealed that coexistence has been employed in different ways across policy, practice, and research. The six categories we identified range from narrow notions centred on specific sectoral interactions to holistic conceptions that consider wind energy within broader socio-ecological systems. The pilot survey favoured the latter approach, reflecting an increasing recognition, which is also evident in other maritime sectors, that sustainable marine governance requires an integrated view of environmental, social, and spatial dimensions. This overarching definition does not displace more focused perspectives such as ecological, spatial, or societal coexistence; instead, it provides a frame that accommodates the diversity of priorities implicitly present in Danish policy and stakeholder discourse. However, this inclusivity comes with operational challenges, as coexistence becomes as much a question of whose values and priorities are in focus at any given moment or decision juncture, as it is a matter of the interactions between species, habitats, and human pressures. As such, any operationalisation of coexistence must be explicit about which priorities are being balanced and why. Our proposed definition comes from a comprehensive systematic review of literature, an ad-hoc review of policies and a pilot survey of experts, therefore, it is a good starting point but requires broader participatory development before being considered a prescriptive definition.

This broader systems perspective is reinforced by the findings from our synthesis of empirical evidence on environmental impacts. By combining direction of effect with an entropy-based certainty metric, we distinguished interactions where knowledge is robust from those where understanding remains shallow or contested. The strongest evidence continues to concern noise impacts on cetaceans during foundation installation and, more generally, the pervasive influence of noise on a wide range of ecosystem components. Similarly, displacement and collision risks to seabirds remain consistently supported by both empirical studies and expert knowledge. Positive responses to novel habitats created by foundations and scour protections appear frequently in the literature, but even such responses constitute anthropogenic disturbances that must be understood within cumulative and long-term ecological contexts. In some cases, these artificial substrates may function as forms of pseudo-restoration, particularly where they replace habitats previously degraded or removed, but their systemic consequences depend on interactions with wider ecosystem processes.

The synthesis of literature and expert knowledge meta-analyses also underlines the depth of existing knowledge gaps and their relevance for Danish decision-making. Entire life-cycle phases of offshore wind installations (i.e., cable infrastructure, maintenance, and decommissioning) remain weakly characterised empirically; while emerging floating technologies are almost entirely unstudied in this region. Foundational components of the marine ecosystem, such as planktonic communities and microbial processes, are also poorly represented despite their central role in ecosystem functioning. Where empirical evidence is limited, expert knowledge provides a structured means of estimating likely risks, as demonstrated by the strong alignment between expert judgements and the empirical evidence that does exist. This alignment supports the use of expert-derived scores to guide prioritisation of research and monitoring, particularly concerning pressures for which experts indicate consistently negative impacts, such as chemical pollution, sediment resuspension, and cable-related disturbance. At the same time, the treatment of fisheries exclusion as a pressure highlights how interactions between human activities can reconfigure ecological dynamics in both synergistic but also antagonistic ways. Whether such interactions might support the designation of offshore wind areas as OECMs depends not on single pressures in isolation but on evaluations of the cumulative effects across activities and direct comparison to conservation objectives; an exercise that is rare in the evaluation of conservation actions.

The funding landscape analysed in Chapter 4 adds a final layer to this picture. The complexity and rapid evolution of Danish, European, and international funding streams means that a clear and consistently communicated programme scope becomes essential for any fund seeking to support coexistence of the rapidly developing offshore wind energy sector with environmental objectives and other maritime sectors. A systematic, recurring process for mapping national activities could help maintain a shared overview among Danish institutions, enabling more deliberate choices about when to complement, supplement, or collaborate with other programmes. Embedding this overview within structured analytical tools, such as PESTEL assessments and theories of change, would strengthen the transparency and strategic grounding of investment decisions while helping to articulate the fund's position within a wider system of knowledge production, innovation, and management. In this sense, the report's roadmap example illustrates not a rigid plan but a mode of thinking: one that embraces the fluidity of the funding landscape and sees strategic coordination as a means of enhancing—not constraining—the impact of limited national resources.

Taken together, the analyses across these chapters point towards a model of offshore wind governance that is both pragmatic and ambitious. Coexistence cannot be reduced to minimising harm, nor can it be achieved by simply co-locating activities. Instead, it calls for an iterative alignment of knowledge, values, and institutional action: an approach that recognises the ecological complexities of marine systems, the legitimate diversity of stakeholder priorities, and the strategic role that funding can play in bridging the gaps between evidence, policy, and practice.

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Appendix A Coexistence Review Database

ID	Title	Year	DOI	Quotation on "Co-existence"	Pg.	Quotation on "Co-existence"	Pg.
AW 002	Assessing the spatial overlap between planned offshore wind farms and wintering waterbirds: A Baltic Sea case study	2025	10.1017/S0959270925000097	“Balancing renewable energy development with biodiversity conservation is inherently complex and challenging. This study highlights the high densities of seabirds in areas designated for OWF development, highlighting the critical need for integrated planning approaches.”	9		
AW 004	A synthesis review of nature positive approaches and coexistence in the offshore wind industry	2025	10.1093/icesjms/fsad191	**Coexistence**: *Placement of multiple activities or uses within the same marine area, including safety zones where applicable* (MMO, 2013).	3	"Although not being nature positive approaches in the strict sense, positive outcomes from coexistence activities (e.g. kelp farming and carbon-storing) should be carefully evaluated. Ideally, colocated businesses could combine efforts to build a mutual implementation of nature positive approaches and strategies to reducing the overall impact on the environment."	11

AW 009	Addressing offshore wind farms compatibilities and conflicts with marine conservation through the application of modelled benchmarking scenarios	2025	10.1016/j.rser.2024.114894	"Prior to the installation of offshore wind farms, a thorough evaluation of the marine ecosystems' status and ongoing activities, particularly fishing, should take precedence. This proactive approach aims to ensure that the future advancement of such marine renewable energy aligns harmoniously with biodiversity conservation efforts."	14		
AW 012	Offshore windfarm construction elevates metabolic rate and increases predation vulnerability of a key marine invertebrate	2024	10.1016/j.envpol.2024.124709	"Considering the clear physiological and antipredator impacts to scallops reported here... we stress the importance of selecting location of both wind farms and pile foundations in context of natural scallop density data... to selectively avoid productive habitats, mitigating disruptions to ecologically-important and abundant scallops, safeguarding one of the most lucrative fisheries in the U.S. and allow nations to meet renewable energy needs."	8		
AW 014	Site selection within the maritime spatial planning: Insights from use-cases on aquaculture, offshore wind energy and aggregates extraction	2024	10.1016/j.ocecoaman.2024.107051	"This section analyses the potential incompatibility of the maritime activity with marine conservation, considering the possibility that the activity may contribute to the achievement of conservation objectives. For example, marine birds conservation is in direct conflict with	3		

				offshore wind energy (OWE) installations... However, OWE parks can act as fishery exclusion zones, thereby contributing to the conservation of biological resources."			
AW 016	De-notified and notified protected area: Kappathagudda Wildlife Sanctuary and its importance for the conservation of mammals in the Deccan Plateau of Karnataka, India	2024	10.18520/cs/v127/i6/746-755				
AW 017	Wind power distribution across subalpine, boreal, and temperate landscapes	2023	10.5751/ES-14452-280418	"In a triad approach, conservation core areas... are recognized in an inner zone... wind power is located outside both zones but strictly not in the inner zone... This approach builds on a focus on planning based on avoiding conflict risks in the inner zone and promoting integration and synergy opportunities in the outer zone."	8		
AW 019	Socio-political acceptability of floating offshore wind farms in France: challenges	2023	10.1016/j.ocecoaman.2023.106513	"This research contributes to better linking basic research to final decision-making... treating social and ecological variables equally in an SES... [and] offers a more	10	"The network perspective in this study stemmed from the need for an integrated approach to understand social-ecological reciprocal interactions that structure the	10

	and perspectives for marine governance towards sustainability			detailed understanding of the social-ecological barriers in terms of the background (impacts) and the design (framing) of the political permitting process."		local marine SES and to inform decision-making towards a sustainable energy transition."	
AW 021	Limitations and Opportunities in PHM for Offshore Wind Farms: A Socio-Technical-Ecological System Perspective	2023	10.36001/phmconf.2023.v15i1.3697	“Integrating ecological considerations into a PHM framework would preserve ecosystem connectivity, promote biodiversity, mitigate potential negative cumulative effects of OWFs on multi-species populations, and ensure the long-term viability of offshore wind energy as a renewable and ecologically friendly power source.”	6	“The integration of ecological assessments in decision-making processes ensures the long-term coexistence of offshore wind farms with marine ecosystems.” “OWFs are often part of larger marine environments, and it is vital to comprehend their interactions with adjacent ecosystems... Its O&M should be compatible with biodiversity protection and conservation objectives.”	4 5

AW 023	A three-step approach for co-locating nature-based solutions within offshore wind farms	2023	10.3389/fevo.2023.690382	“Co-location of marine renewable or structures with conservation initiatives offers the opportunity to support populations of threatened species and contribute to wider ecosystem services and benefits.”	1	Throughout the paper, coexistence is framed as: Mutual benefit: OWFs can provide shelter, substrate, and protection from fishing, while NbS can enhance biodiversity and ecosystem services. Design integration: Coexistence is more successful when NbS are considered from the planning phase of OWFs, not retrofitted post-construction. Risk-aware feasibility: The three-step approach (data synthesis, compatibility analysis, and numerical modelling) is designed to reduce ecological and economic risks and improve project success. Policy and governance alignment: Successful coexistence requires institutional support, stakeholder engagement, and inclusion in licensing and environmental statements.	NA
AW 025	The Potential Compatibility of Designating Offshore Wind Farms within Wider Marine Protected	2022	10.3390/fishes7040195	“Offshore wind farms could be a way to maximize the benefits for different stakeholders and positively impact the marine environment and ecosystem.”	1	“Designating offshore wind farms within MPAs can be a mechanism for minimizing conflicts between fisheries and conservation.”	2

	Areasâ€"Conservation of the Chinese White Dolphin Regarding Fishersâ€™ Perception						
AW 026	Environmental Compatibility of the Parc Tramuntana Offshore Wind Project in Relation to Marine Ecosystems	2022	10.3390/jmse10070898	"In general, the studies carried out allow to anticipate a low impact of the floating offshore wind farm project on marine biodiversity in the area of implementation, which makes it compatible with the conservation of such biodiversity."	24		
AW 031	Introducing offshore wind energy in the sea space: Canary Islands case study developed under Maritime Spatial Planning principles	2021	10.1016/j.rser.2021.111119	“The MSP process needs to find a balance of all five clusters reflecting on EBM components that should be mirrored in the MSP strategy, including options with tradeoffs regarding sectoral growth, conflict prevention and environmental protection & conservation.”	13	“The objective of this study was to introduce a new sector, applying as few tradeoffs as possible with the marine environment and maritime and coastal activities.”	11
AW 037	Landscape-scale wildlife species richness metrics to inform wind and solar energy facility siting: An Arizona case study	2018	10.1016/j.enpol.2018.01.052	“The proactive options that exist are to avoid, minimize, or mitigate potential conflict between wildlife and facility siting.”	6	“Given the presence of high wildlife richness in an area, a planner or developer has the choice to avoid the area, compensate through off-site mitigation, or adopt siting and operational practices that minimize negative impacts to wildlife.”	6

AW 039	Co-locating offshore wind farms and marine protected areas: A United Kingdom perspective	2017	10.4324/9781315666877	"Co-location of energy installations is possible if development is compatible with the conservation objectives of the protected area."	251	"Energy installations have both environmental costs and benefits, but all modify their environments at the local scale." "All energy installations offer some temporary de facto protection to the surrounding area by excluding some activities." "Maximising co-location opportunities within marine planning requires better understanding of environmental impacts at local and network scales." "As offshore energy technologies continue to develop and pose fewer environmental impacts, co-location opportunities will grow."	Various
AW 045	Co-location of activities and designations: A means of solving or creating problems in marine spatial planning?	2014	10.1016/j.marpol.2013.06.002	"Where the objectives of the conservation sites and renewable energy development are coincident, preference should be given to locating windfarms in such areas to reduce the potential spatial conflict with other users."	4		
AW 047	Offshore wind energy development and ecosystem-based marine management in	2013	10.1163/9789004256842_003	"Wind farm development is not prohibited strictu sensu but must undergo 'Appropriate Assessment' under Article 6 of the Habitats Directive to determine the	34	"SEA facilitates ecosystem-based marine management by ensuring that wind energy development is not undertaken in areas where it poses an unacceptable	40

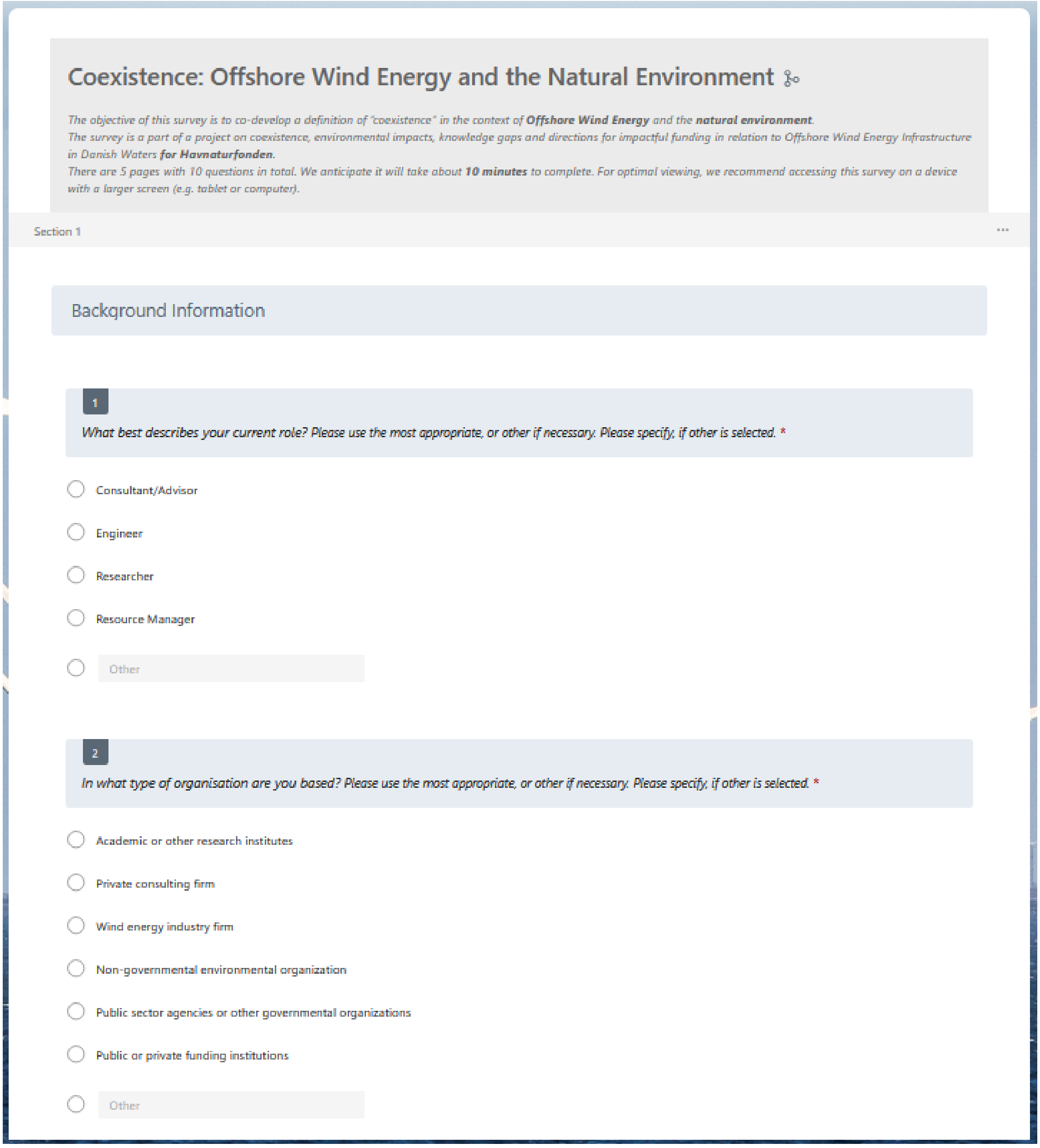
	the eu: Are the regulatory answers really blowing in the wind?			implication of a proposed project or plan on the conservation objectives of a protected area.”		threat to the protection of marine biodiversity…”	
AW 051	Effectiveness of GIS suitability mapping in predicting ecological impacts of proposed wind farm development on Aristazabal Island, BC	2011	10.1007/ s10668-011-9300-1	“Ecological factors were defined as those site characteristics that are important for the proper structure and functioning of the ecosystem, and which could potentially be affected by the proposed wind farm development.”	7	“The trade-off is considered to be worthwhile”	28
AW 053	Wind energy and environmental protection: Using GIS to evaluate the compatibility of Croatian strategies	2011	10.1109/ EEM.2011.5953113	“The analysis will provide a base model for initial evaluation of the compatibility of current Croatian wind energy and environmental protection objectives.”	1		
AW 058	The impact of wind engine constructions on benthic growth patterns in the western Baltic	2006	10.1007/ 978-3-540-34677-7_13	“Even with the use of renewable energy sources, there may still be an impact on the environment and nature; any conflicts of interest must be resolved and technological development must be controlled to ensure it is compatible with the environment and nature.”	242	“The correlation/combination of the protected assets and their specific sensitivity towards the impact factors caused by offshore wind farms not only shows which protected assets can be neglected... Also those correlations of impacts become identifiable which could fulfil the grounds for refusal and should therefore be examined thoroughly.”	314

AW 060	Tilting at offshore windmills: Regulating wind farm development within the renewable energy zone	2006	10.1093/jel/eqi047	“The report concludes that initial development by 2010 is achievable within each strategic area, and impacts on the environment and other users of the coastal sites may be minimised by ensuring that developments are few in number but significant in scale.”	108		
AW 067	Cumulative effects of offshore renewables: From pragmatic policies to holistic marine spatial planning tools	2023	10.1016/j.eiar.2023.107153	“The UK-MPS acknowledges that increasing needs for marine space should be addressed using an ecosystem-based approach, ensuring the coexistence of activities and incorporating terrestrial planning.”	4	“Additionally, the UK-MPS acknowledges that developments may benefit the marine environment by providing opportunities to enhance marine ecology and biodiversity.”	4
AW 068	Marine Renewable Energies and Maritime Spatial Planning: different national proposals for their legal and spatial context reorganization	2023	10.36688/ewtec-2023-325	“The designation and compatibility of MPAs with MRE projects is a significant challenge across the countries.”	5	“This MSP framework not only intends to mitigate possible present spatial conflicts but also contemplates emerging sectors and technological development to ensure future conflicts are prevented or minimised.”	2
AW 069	A new strategic framework to structure Cumulative Impact Assessment (CIA)	2022	10.36688/imej.5.339-347	“In addition to detrimental impacts, MREDs may have positive effects, for example by creating reef effects and the exclusion of fisheries may provide the opportunity for improved functionality of ecosystems...”	2	“This will help to identify potential mitigation and compensatory measures at correct spatio-temporal scales to maximise future ecosystem value and functioning in order to enhance marine spatial planning processes.”	3

AW 072	The role of maritime spatial planning on the advance of blue energy in the European Union	2019	10.1016/j.marpol.2018.10.015	“Integrated and efficient management of maritime space is required to optimise the use of offshore renewable energies. This would make it compatible with other uses, minimise potential conflicts and guarantee the preservation of marine ecosystems.”	1		

Appendix B Survey on Defining Coexistence

Screen shots taken from online questionnaire, in order of sections, which are each seen in this order, chronologically.



Coexistence: Offshore Wind Energy and the Natural Environment

*The objective of this survey is to co-develop a definition of "coexistence" in the context of **Offshore Wind Energy** and the **natural environment**.*
*The survey is a part of a project on coexistence, environmental impacts, knowledge gaps and directions for impactful funding in relation to Offshore Wind Energy Infrastructure in Danish Waters **for Havnaturfonden**.*
*There are 5 pages with 10 questions in total. We anticipate it will take about **10 minutes** to complete. For optimal viewing, we recommend accessing this survey on a device with a larger screen (e.g. tablet or computer).*

Section 1

Background Information

1

What best describes your current role? Please use the most appropriate, or other if necessary. Please specify, if other is selected. *

- Consultant/Advisor
- Engineer
- Researcher
- Resource Manager
- Other

2

In what type of organisation are you based? Please use the most appropriate, or other if necessary. Please specify, if other is selected. *

- Academic or other research institutes
- Private consulting firm
- Wind energy industry firm
- Non-governmental environmental organization
- Public sector agencies or other governmental organizations
- Public or private funding institutions
- Other

Section 2

First Round on Definitions

3

Please rank the following six definitions of coexistence from most aligned (at the top) to least aligned (at the bottom) with your opinion on coexistence between offshore wind energy and the natural environment (drag and drop, or use the arrows that appear on hover at the right hand side of the text). *

- Coexistence is the **strategic siting of offshore wind farms to avoid ecologically sensitive areas**, such as MPAs, SACs, SPAs, and habitats protected under international conventions. It emphasizes minimizing spatial conflict through exclusion zones and regulatory buffers.
- Coexistence is achieved when **offshore wind infrastructure is designed and operated to minimize ecological harm**, using tools like Environmental Impact Assessments (EIA), monitoring regimes, and technical mitigation measures (e.g., cable trenching, noise reduction).
- Coexistence is achieved by **aligning known impacts of offshore wind related activities with local conservation objectives, while also avoiding those impacts that conflict with local conservation objectives**. In this way wind energy infrastructure isn't just avoiding conflict with conservation objectives but is also contributing to achieving them.
- Coexistence involves the **intentional integration of nature-based solutions (NbS) or ecological enhancements within wind farm footprints** (such as kelp farming, artificial reefs, or mariculture) to support biodiversity and ecosystem services. It does not include integration of activities that do not contribute to conservation goals.
- Coexistence is the **complimentary placement (including co-location) of multiple human activities (such as wind energy, fisheries, aquaculture) while striving to achieve conservation goals** across a marine territory or region, enabled by marine spatial planning (MSP).
- Coexistence is a **systems-level approach that balances offshore wind development with ecosystem resilience, cumulative impact assessment, and adaptive governance**, treating social, ecological, and technical dimensions as interdependent.

4

Please comment on the above definitions, e.g. reasons for your choice for most/least aligned definition, or identify those components with which you strongly agree or disagree (optional)

Please enter at most 500 characters

Section 3

Second Round on Definitions

5

The previous six definitions on coexistence are developed based on a systematic literature review, from which key features and sentiments were extracted.

Using the extra information seen in the table below, please rank the definitions again from most aligned (at the top) to least aligned (at the bottom).
*

Definitions	Core Concept	Strengths	Limitations
A:	Avoidance of sensitive ecological areas	Clear regulatory alignment; minimizes direct harm	May limit available space for development; reactive rather than proactive
B:	Technical and operational mitigation	Allows development in more areas; flexible	Requires robust data and enforcement; may not address cumulative impacts
C:	Capitalise on impacts where they are beneficial	Mutuality in energy production and conservation goals	Limited number of contexts where impacts align with conservation goals.
D:	Ecological enhancement within wind farm footprint	Potential for mutual benefit; aligns with conservation goals	Requires early planning and interdisciplinary design; benefits may be site-specific
E:	Co-location of human activities with conservation	Promotes efficient use of space; inclusive governance	Complex coordination; risk of diluted conservation outcomes
F:	Systems-level balance of ecological, social, and technical factors	Comprehensive and adaptive; supports long-term sustainability	Requires high data integration and institutional capacity; may be difficult to implement uniformly

A: Coexistence is the **strategic siting of offshore wind farms to avoid ecologically sensitive areas**, such as MPAs, SACs, SPAs, and habitats protected under international conventions. It emphasizes minimizing spatial conflict through exclusion zones and regulatory buffers.

B: Coexistence is achieved when **offshore wind infrastructure is designed and operated to minimize ecological harm**, using tools like Environmental Impact Assessments (EIA), monitoring regimes, and technical mitigation measures (e.g., cable trenching, noise reduction).

C: Coexistence is achieved by **aligning known impacts of offshore wind related activities with local conservation objectives, while also avoiding those impacts that conflict with local conservation objectives**. In this way wind energy infrastructure isn't just avoiding conflict with conservation objectives but is also contributing to achieving them.

D: Coexistence involves the **intentional integration of nature-based solutions (NbS) or ecological enhancements within wind farm footprints** (such as kelp farming, artificial reefs, or mariculture) to support biodiversity and ecosystem services. It does not include integration of activities that do not contribute to conservation goals.

E: Coexistence is the **complimentary placement (including co-location) of multiple human activities (such as wind energy, fisheries, aquaculture) while striving to achieve conservation goals** across a marine territory or region, enabled by marine spatial planning (MSP).

F: Coexistence is a **systems-level approach that balances offshore wind development with ecosystem resilience, cumulative impact assessment, and adaptive governance**, treating social, ecological, and technical dimensions as interdependent.

6

Please provide your own definition on coexistence between offshore wind energy and the natural environment (optional)

Please enter at most 400 characters

Section 4

Potential Future Collaborations

7

If you are a researcher at a University or other Research Institute, we would like to invite you to a workshop on the topic of co-existence between Offshore Wind Energy and Conservation Objectives. Are you a researcher and would you be interested in attending such a workshop (12:30 - 14:00, 10th of October, online or in person)? *

- Yes
- No

8

If yes, please provide us with preferred name (i.e. the name you would like to be addressed by).

Enter your answer

9

your surname,

Enter your answer

10

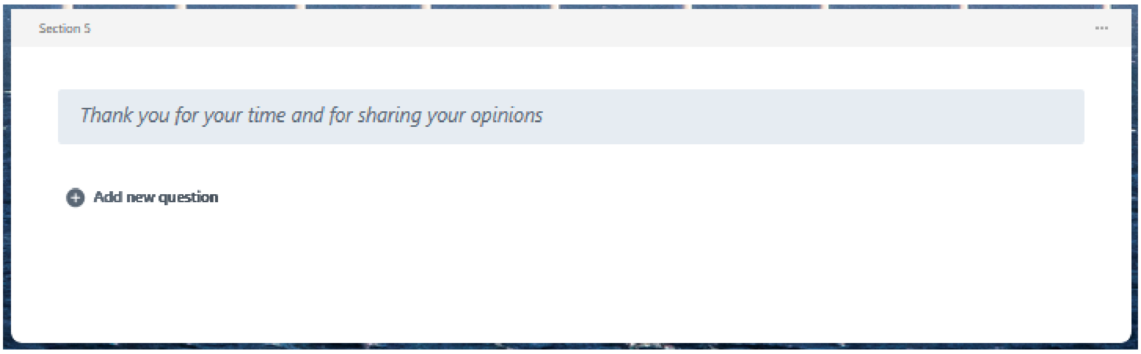
and your email address for correspondence

Please enter an email

11

Would you like to join in person, or online? (No travel funding available, but lunch is available)

- In person, at DTU Aqua in Lyngby, from 12:30.
- In person, at DTU Aqua in Lyngby, and joining for lunch at 11:30.
- Online (Teams)


Section 5
Thank you for your time and for sharing your opinions
Add new question

Appendix C Expert Elicitation Workshop Info Pack

Assessing Environmental Risks from Offshore Wind Energy

Thank you for contributing your expertise to this workshop/activity. The goal of this activity is to gather expert judgments on the perceived environmental risks associated with offshore wind energy. Your input will help identify key pressure-impact pathways, especially where empirical knowledge is lacking.

1. Actors involved in this process:

Table 3. Table identifying the persons involved in this expert elicitation activity.

Role	Role Description	Actor
Decision Maker	Identifies the need of the analysis, contacts analyst(s).	Mikkel Klougart (Havnaturfonden)
Analyst	Designs the elicitation, contacts facilitator(s), analyses results.	Elliot Brown (DTU Aqua)
Facilitator	Facilitates discussion, manages experts and their interaction.	Elliot Brown, Jasmin Thomassen, Christian Riisager-Simonsen (DTU Aqua)
Expert	Provides expert judgement, gives feedback and open-ended extensions where needed.	A collection of invited researchers on the topic of interactions of offshore wind energy and the environment.

Tabel modified from Hanea, Hemming, & Nane (2021), DOI: 10.1111/risa.13718

2. Overview of the Task

You will be asked to score the perceived risk of environmental impacts between:

- Pre-defined pressures (linked to offshore wind activities)
- Pre-defined ecosystem components

These scores will be entered into a blank matrix where each cell represents a pressure–ecosystem interaction.

3. Scoring Scale

Use a Likert-like scale from -5 to +5 to indicate the direction and magnitude of risk (Table 2):

- **Negative values (-1 to -5):** Indicate a harmful or negative impact of increasing certainty and magnitude.
- **Zero (0):** Negligible probability of occurring and/or no known mechanism of impact.
- **Positive values (1 to 5):** Indicate an impact beneficial to that ecosystem component, of increasing certainty and magnitude.

There are two cells per interaction. If you believe different sub-categories of the ecosystem component experience **different levels or directions of impact**, write the **lower and upper ranges** in each of the cells **and your best point estimate** on the line between them.

If you think of an ecosystem component, or a pressure that does not fit into the provided categories, please write them in manually and for those in person, share it with the group.

4. Tips for Completing the Matrix

- Be consistent with your use of colours and symbols.
- Use two cells for an interaction if needed to reflect a range of, or divergent, impacts on sub-categories.
    - If unsure between two scores, use the range and a best estimate for point-value overall. There are three cells available for each interaction for low, best estimate, high from left to right.
- If you're online or remote, please save a copy with your name and institute appended as "_JohnDoe_Insistute.xlsx", and email it to elbr@aqua.dtu.dk.

5. Step-by-Step Instructions

Each step uses a different colour to indicate your level of expertise or confidence. Please follow the sequence below:

6. Timing Guidance

- If you are attending the facilitated workshop, the facilitator will guide you through each step and indicate when to move on.
- If you are undertaking this process independently, please follow the steps in the order listed below, completing each one before moving to the next.

7. Step 1: Core Expertise *(**Green**)*

Score interactions you are **directly experienced** with.

These are areas where you have hands-on knowledge or in which you have participated in research.

8. Step 2: Some Experience (**Black**)

Score interactions you are **familiar with** through colleagues, literature, or related work.

You have some confidence in your judgment, though it may not be first-hand.

9. Step 3: Outside Domain (**Red Slash**)

Place a red slash (\) or capital "x" (X) in cells where you **do not have sufficient knowledge (direct or background)** to provide a score.

This helps distinguish gaps in expertise from low-risk perceptions.

10. Step 4: Educated Estimation (**Blue**)

Score remaining interactions where you feel comfortable offering your **best professional judgement**.

These are areas where you can reasonably infer risk based on your broader understanding.

11. Likert-like Scale

Table 4. Explanation and examples for scores.

Score	Risk Level Description	Example (to be added)
-5	Very high risk	High probability of occurrence and high consequence (e.g., almost certain, severe degradation).
-4	High risk	Either high probability or high consequence; the other is moderate (e.g., likely but moderate impact, or uncertain but potentially severe).
-3	Moderate risk	Moderate probability and moderate consequence, or one high and one low (e.g., probable but not severe).
-2	Low risk	Low probability or low consequence, with the other being moderate (e.g., unlikely but could cause some harm).
-1	Very low risk	Low probability and low consequence (e.g., rare and minor impact).
0	No anticipated impact	Either no known mechanism for impact, or negligible probability and consequence.
1	Very low benefit	Low probability and low positive consequence (e.g., minor improvement, unlikely to matter ecologically).
2	Low benefit	Low to moderate probability or low consequence, with the other being moderate (e.g., small gains, possibly occurring).
3	Moderate benefit	Moderate probability and moderate consequence, or one high and one low (e.g., plausible benefit with moderate ecological value).

4	High benefit	Either high probability or high consequence; the other is moderate (e.g., likely improvement or potentially large gain).
5	Very high benefit	High probability of occurrence and high positive consequence (e.g., to be expected, substantial ecological benefit).

12. Anticipated Analyses

Coupled to empirical knowledge

Where knowledge gaps from the systematic review exist, then the scores provided here will be utilised in the same way as conclusions from the reviewed papers. Expert agreement and discordance will form the basis of an analysis of entropy, that will generate scores on the same scale as those produced by the meta-analysis of the literature.

Contribution to a Bayesian Belief Network

Depending on resourcing and future project funding, these responses may be used to inform prior probability distributions of the links between pressures and ecosystem components in a Bayesian belief network, based on an acyclic diagram similar to the Sankey diagram presented.

Ultimate use of results

The primary use of these results is to inform a funding agency's strategy on where knowledge gaps exist and where risk is highest, to aid in prioritising future research.

13. Thank You

Your insights are invaluable. This structured approach helps us capture not only your judgments but also the confidence and source of your knowledge, which is critical for interpreting the results.

Appendix D Overview of funding Programme

Overview of funding programmes identifed in the mapping, and categorised based on their primary focus deifned as a) research and innovation projects; b) restoration and/or monitoring; c) development of databases or related platforms; d) crosscutting activities including coordination and knowledge sharing. As the mapping is performed on all marine related funding programmes, those with intervention areas most aligned with the foundation's intervention areas have been highlited in bold.

	Role	R/I	Rest. + Monit.	Datab.	Cross	Examples of projects or activities	Collaboration options	Expertise, and potential roles
Danish public programmes								
Den Danske Naturfond	Funds direct restoration actions		X			First co-financed call in progress	Co-funding	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities - Expertise on national implementation of restoration projects, including stakeholder engagement - Provide the first experience on co-funded call execution

Innova-tionsfonden	Funds R/I at various TRL levels both with the public and private sector. Has e.g. 1) industry researcher programme; 2) grand solutions	X			X	"Observing ocean-river interaction with satellite altimetry…" (2025-27) in the industry researcher programme. "LTA BOOST" (2023-27)	Co-funding Know. Sharing	- Expertise in how to formally participate as a programme in co-funded EU partnerships - Expertise in joint public-private industry programmes - Support coordination of DK presence in FP10 programmes - Experience in industry related green missions such i.e. the 'innomissions'
Danmarks Frie Forsknings-fond	Funds basic research with thematic calls related to sustainability	X				"The contribution of cultural ecosystem services to trade-offs between human well-being and biodiversity conservation"	Co-funding	- Potential for thematic calls - Expertise in excellence research evaluation process
Grund-forsknings-fonden	Funds basic research	X				"Center for Hadal researcg" som undersøger dybhavsøkologi (2022-27)	Know. sharing	- Expertise in excellence research evaluation process
EUDP	Applied R & I in energy	X				"250 MW bølgekraft i den danske nordsø før 2030" (2022-2025)	*Unlikely, due to more energy tech focus*	- Expertise in applied energy-related R&D funding landscape
GUDP	Applied R & I in relation to env. tech.	x			x	"Industriel udplantning af ålegræs" (2024-)	Co-funding	- Will soon enter the EU co-funded partnership "FutureFoods", as the Danish representative and will get

MUDP	Focus on high TRL supporting healthy environments	X			x	"Såmaskine og plantemaskine til reetablering af ålegræsenge”	Co-funding	- Role similar to EUDP - The scope covers e.g. reduction of pollution and biodiversity, joint calls could be an option to reduce e.g. pollution from wind farms
Danmarks erhvervsfremme bestyrelse	Focus on SME funding				x	“Opsamling af ålegræs”	Co-funding if focus on SME	- Deep understanding of the role of funding SME’s in the green transition
Plantefonden	Applied R & I in relation to plant/algae based production	X				“TANGO – Tang på tallerkenen i offentlige køkkener” (2025-27)	*Less obvious except for e.g. aquaculture related topics*	- Role similar to EUDP, MUDP, GUDP
Fiskeristyrelsen	Applied R & I and calls in relation to e.g. co-existence	X			X	“PreMAH - Passive nature restoration of marine habitats” (2025-2036)	Co-funding Know. sharing	- Occasionally launch long term projects on e.g. environmental monitoring of protected areas
Energinet	Dvelops tenders related to e.g. environmental impact studies for offshore wind			X	X	Planning transmission cables to future wind farms in general	Know. sharing	- Could be a recipient of knowledge created by the foundation’s programmes

Energistyrelsen	Develops env. biodiv. monitoring standards. Key player in delivering maps for marine spatial planning including info on biodiv.			(X)	X	"Screening og miljøkortlægning af havvindspotentialet i Danmark" (2023-25)	Co-funding Know. sharing	- Planning of follow up research to e.g. environmental screenings, test of monitoring technologies, indicators etc.
SGAV + MST	Operates and develop national marine monitoring programmes	X	X	X	X	"IMM" Integrated marine monitoring programme	Co-funding Know. Sharing	- Planning of research to follow up on e.g. new monitoring technologies, sampling approaches etc. - Alignment of offshore energy specific approaches with general marine monitoring programmes. - Experience in participating in EU co-funded partnerships like Sustainable Blue Economy Partnership
Danmarks Miljøportal	Coordinates the programme on delivering better marine env. data for e.g. impact assesments			X	X	In the EU project "SUSTAINOW" they are a partner	Know. Sharing	- Expertise in actively participating in e.g. Horizon projects, to co-fund development in the DK marine area. - Already considered to some extent in the foundations work
Geodata-styrelsen	Funds and performs ocean mapping				X		Know. sharing	- Expertise in ocean mapping, but not research and conservation related calls them self. They do however them self participate as partner in Horizon projects.
Dansk Center for Havforskning	Formal coordination role in Danish marine research with a board representing	(X)	(x)		X	"Wind@Sea" supported in 2025	Know. sharing	- Formal coordination role in marine research with - Expertise in research evaluation process with regard to infrastructure access - Could by chance end up funding research cruise time, on projects funded by the foundation

	all marine research institutions							
Public EU programmes implemented nationally								
LIFE	Funds direct nature restoration in Europe				x	"COASTal LIFE" (2022-2028) Restoration of coastal habitat zones in the Limfjord	Co-funding	– Will likely be phased out in the coming years with FP10. So any considerations of co-funding should like go ahead now.
EMFAF	Calls relevant to e.g. co-existence	X			X			- Co-existence with fisheries is likely the main overlapping topic
Private Danish philantropies								
VELUX Humanistisk praksis*	Main focus in on practioners and the use of methodologies based in the humanities	x			x	"Biodiversitetsindsatser i havvindenergi: Forening af en økosystembaseret og virksomhedsdreven tilgang på tværs af skalaer (2026-2028"	Know. Sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities
VELUX Hav i balance*	Marine science and restoration for sustainable development	x	x	x	x	"Center for Marine Nature Restoration (2022-2026)"	Co-funding	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities - Collaboration already present through e.g. Center for Marine Nature Restoration

Villum Fonden	Basic research	X				"Challenging the fish growth paradigm in a changing climate" (2024-2029)	Know. Sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities
SEABREAK	Marine science, restoration and communication	X			x	"Now or never? Urgent need for research on the critically endangered lumpsucker (2026-2029)"	Know. Sharing Stacked or co-funding	- New foundation with limited geographic scope
Fjord fonden	Aims to fund restoration projects in Danish fjords		X			"Etablering af stenrev I Odense fjord"	Know. Sharing Stacked funding Co-funding	- New foundation with first six projects funded
Aage V. Jensen naturfond	Funds both research and restoration projects, but not necessarily projects with a marine focus each year	X			X	"Integrated ecological and oceanographic analysis for planning marine habitat protection (2024-2027)"	Co-funding	- Occasionally have thematic calls focused on marine ecosystems
15. Juni fonden	Funds projects on biodiversity but necessarily research	X	X		X	None directly marine	Co-funding knowledge sharing	- Little focus on marine systems

Carlsberg	Funds basic research and communication	X			X	"Unravelling the impact of artificial structures on marine metapopulations using network theory(2025-2027)	Co-funding knowledge sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities
Lundbeck Fonden	Funds ue.g. research conferences				x	"International Conference on Bioacoustics in Kerteminde, Denmark"	Co-funding knowledge sharing	- Could co-fund knowledge sharing activities with a research dimension
Companies funding marine research in DK waters								
Examples include Ørsted, Total Energies, Vattenfall etc.	A non uniform group of companies which to date have funded relevant research and restoration in Danish waters	x	x	x	x	"BIOREEF (2022-2027)" aiming to restore biogenic reefs "Offshore Wind Environmental Survey Optimization for Monitoring impacts on Ecosystems (2025-2028)"	Co-funding knowledge sharing	- Most companies fund direct research/innovation/restoration related projects, of which some are in collaboration with universities, NGO's etc. - Joint industry programmes as seen in the UK (INSITE), could be an option to explore in the future
European public programmes								
NORDFORSK	Nordic projects with topics on fisheries and aquaculture	(X)			(X)		Co-funding knowledge sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities. However, the focus in the present research areas are not strong

Nordisk Ministerråds havprogram	Nordic marine sectors including energy and fisheries	X	?	?	X	Projects on the way, based on recent tender.	Co funding Know. sharing	- Have recently had a tender out on marine resilience and resilience (EU Supply portal 2026). The tender format chosen, is not attractive for many academic institutions, but could be for private enterprises.
Det Færøeske Forskningsråd	Basic and apllied research	X	?	?	X	-	Know. sharing	- Limited geographic overlap
Norges forskningsråd	Have multiple programmes both basic and applied	X	x	x	X	"VisAviS (2022-2026)" focusing on the consequences of large-scale offshore and coastal wind energy development on bird migration and marine life	Co funding Know. sharing	- A very active player in both nordic and EU programmes including JPI Oceans and SBEP, which they chair.
FORMAS	Funding Swedish research and innovation, has open calls, national research programmes, strategic innovation programmes	x			x	"ClimePlan: Ecological risk analyses climate-proofing impact assessments for ecosystem-based marine spatial planning (2025-2027)"	Co funding Know. sharin	- Is Sweeden's research council for sustainable development. Already engaged in EU platforms including SBEP

VINNOVA	Innovation for sustainable solutions	x			x	-	Maybe not the most relevant actor	- Has a role resembling Innovation Fund Denmark to some degree.
JPI Oceans (all europe)	Formal European platform supporting public member institutions to co-programme and fund calls, knowledge synthesis etc.	X	X	X	X	In prep.	A – co funding Stacked funding Know. Sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities - Experience in facilitating international collaboration , definition and launching of joint calls - Unique platform for European coordination and collaboration e.g. between environmental ministries and funding programmes - No Danish partners as of 1. January 2026 - Close ties to EU policy landscape, and explicitly mentioned as tool to implement the Ocean Pact. - Also partner in SBEP
German Marine Nature Conservation Fund	In format it resembles Havnaturfonden		X			-	A – co funding	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities
German action programme	Has e.g. a focus removin gmunitions form the Baltic and North Sea		X			-	A – co-funding	- If the negative environmental impact of decaying munitions on DK waters was included in the scope of the foundation, this programme could be a relevant partner
INSITE	UK based joint public/private industry programme related the ecological role of offshore structures in the North Sea	X			X	"VaiMAS" which will study how marine artificial structures shape ecosystems by applying natural capital approaches to reveal their value and impact	Knowledge sharing Co-funding	- Expertise in joint public-private programme development and execution - Options for direct knowledge exchange - Options for co-funding synergistic projects in DK waters

European Private philanthropies								
European Cli-mate foundation					x	"Offshore Coalition for Energy and Nature"	?	- Little public information
Baltic Waters		X	X		X	"Re-Cod – release of small cod inthe Baltix Sea" (2020-20230)	?	- A small foundation, with a clear geographic de-liniation of activites
The endangered landscape and sescape pro-gramme		x	x			"Sejerø Sescape (2025-2030"	Co-funding	- Already active in Denmark, but also internation-ally
European Union								
European Re-search Council	Basic research for all career stages, with focus on aca-demic excellence	X				"RECLESS (2024-2030)	Co-funding	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of addi-tional national activities
Horizon Europe Cluster 5 & 6 general	Particular the 'Oceans' sub pro-gramme in cluster six, represent the largest EU strategic policy aligned re-search programme	X	X	X	X	"Obama Next" (2022-2026) which aims to advance marine eco-system and biodiver-sity monitoring	Co funding Stacked funding Knowledge sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of addi-tional national activities - Gaps in the foundations funding capacity could be raised as potential topics to be covered by Horizon raised through Eurocenter in the Minis-try for Education and Research, e.g. by partici-pating in the reference group.

	on the topic. But also Cluster 5 on climate has relevant projects					"SUSTAINOW" which aims to establish and shared data platform and tools for the planning and environmental assessment of offshore wind (2025-2028)		
Horizon Europe - Mission Ocean and Waters	Aims on one hand to support R/I through calls e.g. related to nature inclusive wind farms and co-existence, and on the other to support national, sea-basin specific and EU level collaboration through platforms such ad Mission hubs, funders forums etc.	X	X	X	X	"Nid4Ocean" nature inclusive designs for reconciling offshore renewables with ocean protection (2024-2027) "Ultfarms" Circular low trophic aquaculture in wind farms and restoration of marine space (2023-2026) "BlueActionBANOS (2025-2029" smaller cascade calls for e.g. local marine restoration actions	Stacked funding Know. sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities - Expertise among leading institutions in the Mission to facilitate multi-stakeholder alignment and participation in the Mission - The collective expertise of the Mission is it's capacity to break down sectoral, disciplinary and national silos. - Leading institutions, pave the way for national engagement - Gaps in the foundations funding capacity could be raised as potential topics to be covered by Horizon raised through Eurocenter in the Agency for Education and Research, e.g. by participating in the reference group.

Sustainable Blue Economy Partnership (SBEP)	Deploys direct co-funded calls e.g. in relation to offshore structures and co-existence and further coordinates alignment of national R&I programmes, support ministerial collaboration etc.	X	X	X	X	"MSP4MORE" creating tools for integrating multiple sustainability objectives under expansion of Offshore Renewable Energy	Co-funding Stacked funding Knowledge sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities - Expertise in implementing formal public partnership with e.g. DK participation from SGAV, Innovationsfonden and DTU. - Expertise on implementing EU scale activites across implementing agencies like SGAV with EC Co-funding - Expertise on developing and implementing national thematic calls across Europe in parallel to maximize alignment of funding to increase impact of EU R & I - Gaps in the foundations funding capacity could be raised as potential topics to be covered by Horizon raised through Eurocenter in the Agency for Education and Research, who sits in the steering committee
BIODIVERSA	Deploys direct co-funded calls e.g. in relation to NbS, biodiversity etc. but often with little focus on marine issue	X	X		X	"B-Usefull" which will provide interactive maps of multiple marine biodiversity indicators and risks for both marine fish and benthic invertebrates, as well as evaluations of management actions e.g. in relation to offshore wind (2022-2026)	Co-funding Stacked funding Knowledge sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities - Formal public platform with e.g. DK participation from SGAV, Innovationfund DK and University of Copenhagen through IPBES Dk - Gaps in the foundations funding capacity could be raised as potential topics to be covered by Horizon raised through Eurocenter in the Agency for Education and Research, who sits in the steering committee
LIFE	Deploys projects with co-funding from e.g. public bodies to		X		X	"BlueREEF" project which restored the	Co-funding Stacked funding	- Positively reviewed restoration projects by the foundation could use, funds to co-finance LIFE project proposals

	implement e.g. nature restoration					boulder reefs at Læsø Trinddel (2006-13)		- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities - MST should already be experienced in collaboration with the programme.
Fisheries local action groups (FLAG)	Are small scale community-led partnerships in the EU				x	-	Knowledge sharing	- Local small scale community-led actions could benefit from the foundations work or indirectly through Center for Marine Nature Restoration
INTERREG	Has subprogrammes related to e.g. Øresund-Kattegat-Skagerrak	x	x		x	"BlueBioClimate (2023-2026)" which develops tools for climate-adapted management of marine biodiversity	Co-funding Stacked funding Knowledge sharing	- Positively evaluated projects could be explored for e.g. stacked funding or co-funding of additional national activities
WATER KIC	Will become active in 2027	(x)			X	No projects yet	Know. sharing	- Expertise is expected to be build up in the coming years, with a focus on supporting water-related innovation within the private sector, with a paid membership structure for e.g. universities, companies etc. across Europe. I.e. not a classic research or nature conservation funding programme.
Global								
National Philantrophic Trust	Supports and advice a large diversity of				x	"Offshore Coalition for Energy and Nature"	?	- Experience in supporting international work related to the offshore nature nexus

	philantropies reach their goals							
Velux founda-tions*	The part of the foun-dation covering more international issues and projects				x	"Global initiative to boost climate resili-ence in MPAs" to-gether with IOC UNESCO	Knowledge sharing	- Experience in collaboration with international in-stitutions
Novo Nordic Foundation	Generally do not cover marine topics	x			x	"Center for Glaicial Rock Flour" which ex-plore impact on e.g. marine ecosystems of rock flour	Co-funding Stacked funding	- While experienced in covering sustainability is-sues, the marine domain has historically been out of scope. This may change, e.g. in relation to their in involvement with the Green tripartite, through donations to Den Danske Naturfond
Moore charitable foundation	Healthy oceans as theme	X				Donationer til fx "Cen-tre for Ocean life cen-ter" ved DTU	Stacked funding	- US based philantropy focusing on a protecting species and habitats
Simons founda-tion	Basic research	X				Donationer til fx "Cen-tre for Ocean life cen-ter" ved DTU	Stacked funding	- US based philantropy
Schmidt Family Foundation in-cluding Schimdt marine technol-ogy partners	Working for clean re-newable energy, healthy food sys-tems, healthy oceans	X			X	?	?	- US based foundation covering e.g. ocean ob-servation, and technology development

US Department of Defence	Works on a variety of aspects related to understanding marine environments with a dual use approach	x			x	"How Odontocetes mine an Underwater Soundscape (2022-2025)	Knowledge Sharing	- Historically Dk partners have e.g. received funding in relation to acoustics and marine mammal research
Belmont Forum Foundation	Transdisciplinary, transnational research to help understand, mitigate, and adapt to global environmental change	x			x	"Negotiating Ocean Conflicts among RIvals for Sustainable and Equitable Solutions (2020-2022")	Co-funding	- Co-fund calls with global partners including the European Commission which has a seat in the steering committe. Previoues calls have had e.g. the Norwegian Research Council and the Swedish FORMAS as partners.