

WIND LAB 4

MARITIME SUSTAINABLE PLANNING FOR OFFSHORE WIND & ENERGY INFRASTRUCTURE

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ABOUT JUSTWIND4ALL

JustWind4All is a research project that supports the acceleration of on- and offshore wind energy, including emerging wind technologies like airborne and floating, through just and effective governance.

By integrating insights from different academic disciplines and societal perspectives, we support synergies and exchange among people and organisations to coordinate and participate in actions around wind energy

ENERGY READ: MARITIME SUSTAINABLE PLANNING FOR OFFSHORE WIND & ENERGY INFRASTRUCTURE

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ABOUT

Wind Lab 4 explored how Maritime Sustainable Planning acts as an enabler for nature-friendly and people-inclusive offshore wind and grid deployment in the North Sea. Maritime Sustainable Planning encompasses processes which take place during Maritime Spatial Planning and offshore wind and grid project planning.

KEY TOPICS

- Going beyond environmental impact minimisation towards nature enhancement and restoration
- Understanding reasons for opposition and conflicts with other sectors, and creating synergies and benefits
- Addressing the need for holistic energy modelling and system planning
- Enabling inclusive and participatory planning processes

GUIDELINES

Conduct detailed Socio-Economic Assessments at both Maritime Spatial Planning and project planning levels to identify risks, compensation mechanisms, and benefits for affected sectors.

Ensure inclusive stakeholder engagement throughout the project lifecycle to address diverse and conflicting sectoral perspectives.

Leverage Maritime Spatial Planning to guide societal transitions, enabling governments to lead structured dialogues on the future of marine and coastal economies.

Accelerate permitting by standardising procedures and creating a 'one-stop shop' without compromising environmental scrutiny.

Support nature-inclusive design, aligning offshore wind deployment with biodiversity enhancement and restoration goals.

Promote community ownership through enabling policies and financial frameworks, fostering local support and energy justice.

Pilot multi-use concepts strategically, using co-location to free up space for marine restoration.

Adapt modelling tools to reflect the complexity of marine environments and integrate environmental and social considerations.

Adopt transboundary and cross-sectoral approaches, recognising that effective marine governance must extend beyond national borders.

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Abbreviations

EIA – Environmental Impact Assessment

EU – European Union

GNSBI – Greater North Sea Basin Initiative

JW4A – JustWind4All

MSP – Maritime Spatial Planning

NGO – Non-governmental organisation

NID – Nature-inclusive design

NSEC – North Sea Energy Cooperation

NRL – Nature Restoration Law

OCEaN – Offshore Coalition for Energy and Nature

ONDP – Offshore Network Development Plan

OSPAR – Oslo-Paris Convention

OWF – Offshore wind farm

SEA – Strategic Environmental Assessment

TSO – Transmission System Operator

Executive summary

For centuries, the North Sea has been a hub of economic activity, supporting sectors such as shipping, fishing, energy production, tourism, and recreation. However, its ecological health is in sharp decline, demanding urgent action not only for conservation but as a critical step in addressing climate change. Healthy marine ecosystems play an essential role in climate regulation, making their protection and restoration imperative.

Amid the drive for rapid decarbonisation, offshore wind energy has emerged as a central pillar in the climate strategies of North Sea countries. However, the expansion of offshore infrastructure poses new risks to already stressed marine environments. This dual challenge, advancing clean energy while safeguarding marine ecosystems, calls for integrated, just, and inclusive governance approaches.

[The JustWind4All \(JW4A\) project](#), funded under Horizon Europe, responds to this need by exploring how energy justice can guide a fair and sustainable energy transition. One of its key approaches is the Wind Forum, a network bringing together stakeholders from the local, regional, national, and the European Union (EU) levels across policy, community, markets, and third sectors to meet, collaborate, and exchange knowledge. The Wind Forum has five regional Wind Labs, which serve as testing grounds for innovative approaches and technologies in real-world contexts.

This Energy Read summarises the findings from the Wind Lab 4, focused on advancing Maritime Sustainable Planning as a tool to align environmental, social, technical, spatial, and governance considerations. Maritime Sustainable Planning encompasses processes which take place during Maritime Spatial Planning (MSP) and offshore wind and grid project planning.

Wind Lab 4 conducted seven co-production activities across diverse stakeholder groups, producing actionable insights and guiding principles for just and nature-inclusive offshore wind and grid development. During each co-production activity, key insights and reflections emerged through carefully facilitated exchanges that encouraged open dialogue, compromise, and mutual learning.

KEY RECOMMENDATIONS INCLUDE:

1. **Conduct Socio-Economic Assessments** at both planning levels to identify risks, compensation mechanisms, and benefits for affected sectors.
2. **Ensure inclusive stakeholder engagement** throughout the project lifecycle to address diverse and conflicting sectoral perspectives.
3. **Leverage MSP¹ to guide societal transitions**, enabling governments to lead structured dialogues on the future of marine and coastal economies.
4. **Accelerate permitting** by standardising procedures and creating a 'one-stop shop' without compromising environmental scrutiny.
5. **Support nature-inclusive design**, aligning offshore wind deployment with biodiversity enhancement and restoration goals.
6. **Promote community ownership** through enabling policies and financial frameworks, fostering local support and energy justice.
7. **Pilot multi-use concepts strategically**, using co-location to free up space for marine restoration.
8. **Adapt modelling tools** to reflect the complexity of marine environments and integrate environmental and social considerations.
9. **Adopt transboundary and cross-sectoral approaches**, recognising that effective marine governance must extend beyond national borders.

Wind Lab 4's work demonstrated that sustainable offshore energy development is only possible through collaborative, participatory, and adaptive governance. The co-produced principles presented in this report serve as a blueprint for policymakers, offshore wind developers, and other stakeholders aiming to harmonise energy and environmental goals.

While the insights are grounded in the North Sea context, they offer valuable lessons for other EU sea basins such as the Mediterranean and the Black Sea, where opportunities for cross-sector cooperation exist.

Ultimately, the JW4A project underscores that the energy transition must be both effective and just. Offshore wind can become a People- and Nature-Positive industry, a sector that delivers clean energy while enhancing marine biodiversity and supporting coastal communities. Working together through efforts like [the Offshore Coalition for Energy and Nature](#) and [the Global Initiative for Nature, Grids and Renewables](#) will be key to making this vision a reality.

¹ Throughout this report, 'MSP' will be used exclusively as the abbreviation for **Maritime Spatial Planning** to avoid confusion with **Maritime Sustainable Planning**.

1 Introduction

Shipping, fishing, energy production, tourism, and recreation have been integral activities in the North Sea for centuries. However, the ecological health of the North Sea is in a poor and declining state. It is suffering from pollution, nutrient overload, acidification, overfishing, and habitat destruction – all of which have contributed to alarming declines in marine biodiversity (OSPAR, 2023). The urgency to protect and restore marine ecosystems is no longer just a conservation concern, it is also a climate imperative. Healthy oceans play a critical role in regulating the planet's climate, and their preservation is essential in the global effort to address climate change (Weinert et al., 2021).

To mitigate the climate crisis, rapid decarbonisation of energy systems has become a top priority. **Countries bordering the North Sea are advancing their climate objectives through large-scale deployment of renewable energy, particularly offshore wind energy.** However, this transition entails increased human activity in already fragile and depleted marine ecosystems (Offshore Coalition for Energy and Nature, 2024).

Furthermore, the energy transition is not solely an environmental challenge, it carries profound social and economic implications (European Energy Research Alliance, 2023). As we shift from fossil fuels to renewable energy, it is essential to ensure that the transformation does not deepen existing social and economic inequalities. It is not just nature that must be protected, but also the well-being of people affected by these changes. In this context, the framework of energy justice becomes highly relevant (Bacchiocchi et al., 2022; Skjølsvold et al., 2024). Energy justice, ensuring no one is left behind in the transition, enables us to analyse how costs and benefits, but also recognition and participation, are distributed within energy systems.

The Horizon Europe project, [JustWind4All](#) (JW4A), explored this complex landscape through multi- and transdisciplinary perspectives to produce practical guidelines, knowledge, and training activities that support the just and effective acceleration of onshore and offshore wind. Energy justice is the guiding principle of all JustWind4All activities. Energy justice aims to ensure fair access to affordable, reliable, and clean energy for everyone. It focuses on addressing disparities in energy access, environmental impacts, and distribution of costs and benefits (Bacchiocchi et al., 2022; British Academy, 2022; Upham et al., 2022). Energy justice has four dimensions – distributional, procedural, restorative and recognitional (definitions of these are summarised in Figure 1).

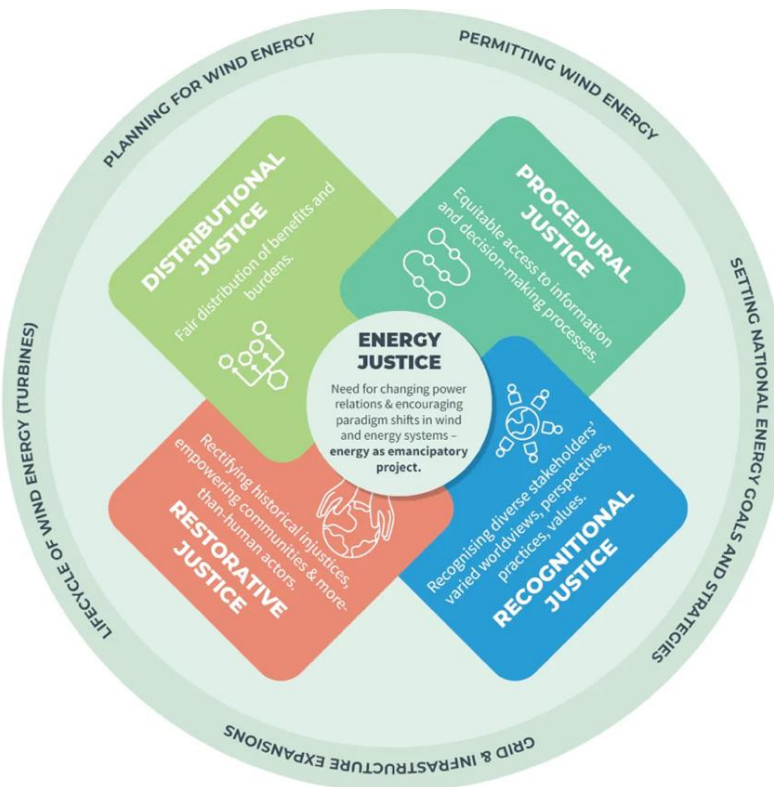


Figure 1: Four main dimensions of energy justice (Source: [JW4A](#))

To promote energy justice in wind development and provide concrete guidelines, JustWind4All employs a range of research methods, including impact assessments, energy systems modelling, multi-criteria mapping, and case study research.

One key approach to developing more just and effective wind energy governance is **the Wind Forum**, a network bringing together stakeholders from the local, regional, national, and the European Union (EU) levels across policy, community, market, and third sectors to meet, collaborate, and exchange knowledge, as shown in Figure 3. The Wind Forum also has five **regional Wind Labs**, which serve as testing grounds for innovative approaches and technologies in real-world contexts, as shown in Figure 2.



Figure 2: The Five Regional Wind Labs of the JustWind4All Wind Forum

This Energy Read on Maritime Sustainable Planning presents the findings generated in Wind Lab 4 and focuses on how just and effective participatory governance acts as an enabler for nature-friendly and people-inclusive offshore wind and grid deployment in the North Sea, with a potential to guide other sea basins in the future. Maritime Sustainable Planning encompasses processes which take place during Maritime Spatial Planning (MSP) and offshore wind and grid project planning.

The North Sea countries are often recognised as forerunners with ambitious offshore wind energy targets to combat climate change (Knill et al., 2012; Lindberg & Wettstad, 2024). This region therefore serves as a co-production “laboratory for learning”, or Wind Lab, as it has the longest history of offshore wind and can provide both lessons learned and guide further improvements. During JustWind4All, we conducted seven diverse co-production activities supporting its trans- and multidisciplinary nature. We gathered feedback from a variety of stakeholders in the North Sea and the EU to assess the current situation and identify areas for enhancement. This Energy Read aims to share the findings related to the socio-economic, environmental, technical, spatial, and governance dimensions generated by our Wind Lab to accelerate just and effective offshore wind and grid infrastructure deployment by integrating Maritime Sustainable Planning.

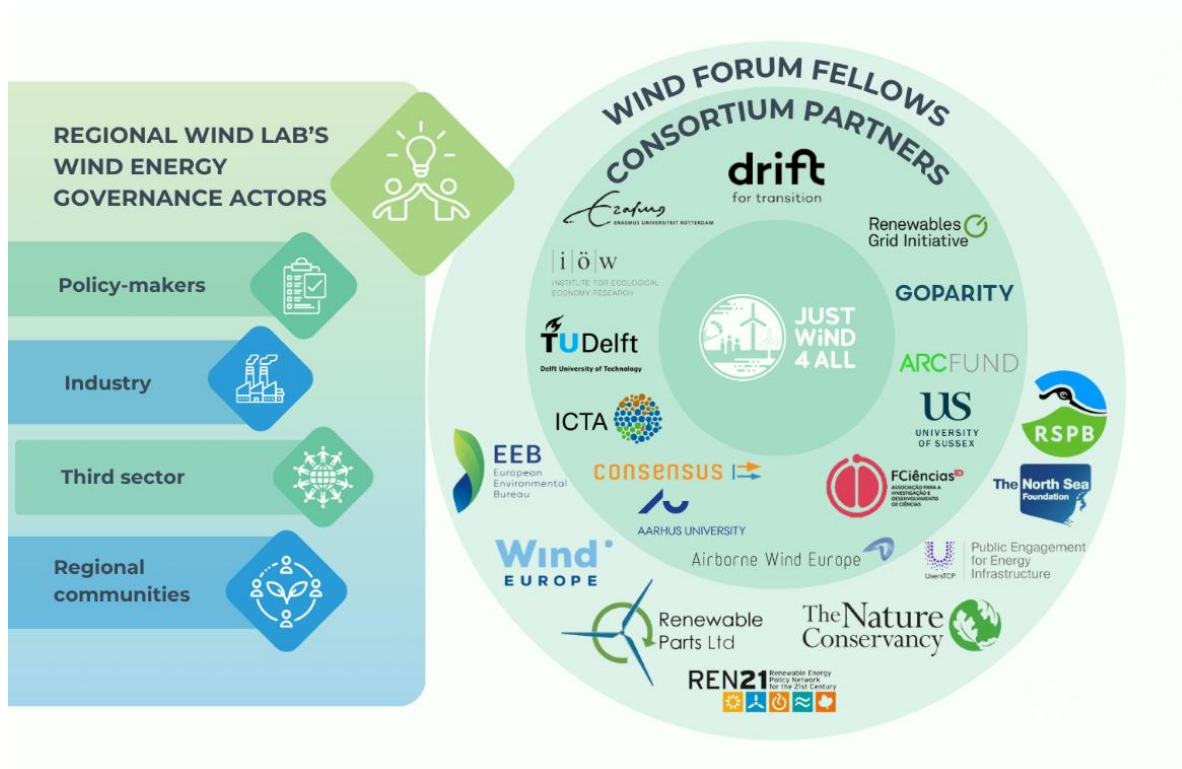


Figure 3: JustWind4All's Wind Forum structure and stakeholder strategy

2 Accelerated wind and grid infrastructure & Maritime Sustainable Planning

In order to achieve climate targets, **the European Union has set a goal of reaching an installed capacity of at least 86-89 GW of offshore wind by 2030 and 355-366 GW by 2050** (European Commission, 2020, 2024). Recently, the countries of the North Sea Energy Cooperation (NSEC) – Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, and Norway – have updated their targets, agreeing to reach at least 260 GW of offshore wind energy in the North Sea by 2050, with an intermediate target of 76 GW by 2030 (Skjølsvold et al., 2024). To highlight the immense scale of the challenge ahead, Europe currently has only 37 GW of offshore wind energy installed across Europe (WindEurope, 2025).

Offshore wind and grid infrastructure are planned at different levels, involving various authorities and a diverse range of stakeholders. One of the first steps in developing offshore wind and grid infrastructure is Maritime Spatial Planning (MSP). This process involves allocating marine space for human activities, including offshore wind, through participatory processes aimed at achieving ecological, social, and economic objectives (Directive 2014/89/EU, 2014; UNESCO-IOC/European Commission, 2021).

Once sites for offshore wind farms are identified during Maritime Spatial Planning, this enables the tendering process to begin for specific locations. After winning a tender, the offshore wind developer can proceed with planning the actual wind farm. At this stage, the details of the wind farm layout are defined, along with concrete avoidance, mitigation, and compensation measures intended to address potential environmental impacts.

During both Maritime Spatial Planning and project planning, there are risks and opportunities that can shape a more just energy transition for both people and nature. If properly addressed, this approach leads to **Maritime Sustainable Planning**. Maritime Sustainable Planning encompasses both the MSP and project planning levels, and what makes it truly sustainable is the deliberate inclusion of environmental, socio-economic, spatial, technical, and governance considerations, going beyond mere impact mitigation to generate broader benefits (see Figure 4).

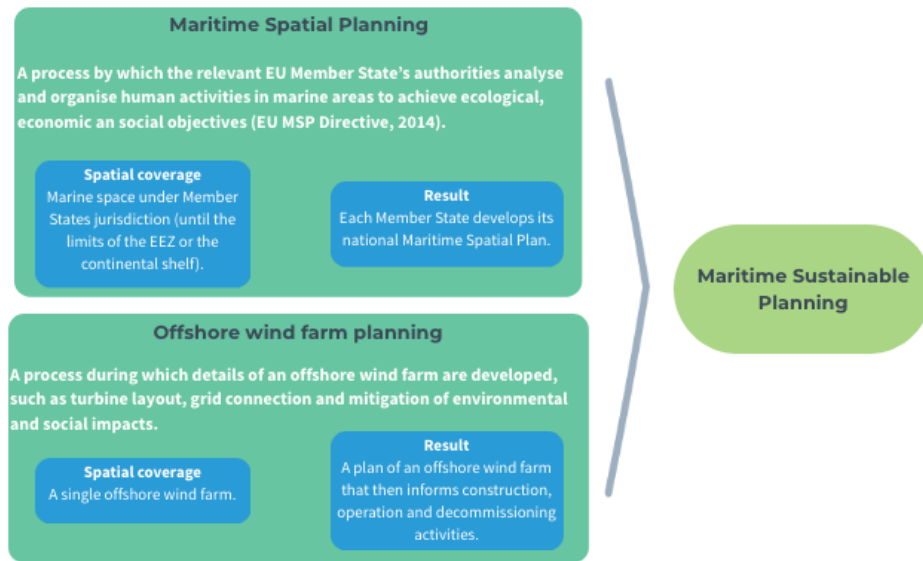


Figure 4: Schematic explanation of Maritime Sustainable Planning

As of May 2025, nearly all EU Member States have their Maritime Spatial Plans in place, and EU bodies are working to create conditions for the accelerated deployment of offshore wind farms and grid infrastructure, though several challenges remain. **Offshore wind and grid installations do not take place in a vacuum.** Their deployment will have tangible environmental, socio-economic, technical, spatial, and governance implications. In this chapter, we provide a brief overview of each of these categories, which we addressed in JustWind4All through our Wind Labs. These implications are also deeply interconnected and there are often significant overlaps and interactions between them. It should be noted that our listed categories are therefore somewhat a simplification of reality. The most relevant implications from each category are also summarised in Figure 5 (below).

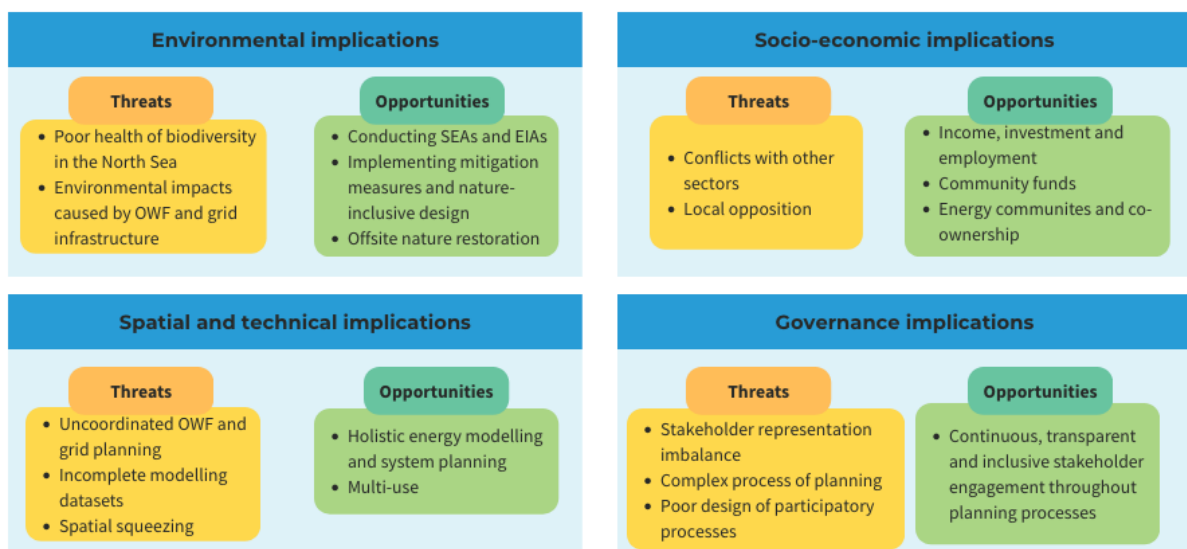


Figure 5: Summary of identified implications connected to offshore wind and grid deployment

1.1 Environmental considerations and implications

To address the dire state of European sea basins, the EU has adopted a first-of-its-kind regulation on nature restoration in 2024. The Nature Restoration Law (NRL) mandates all Member States to restore at least 20% of the EU's land and sea areas by 2030, and all ecosystems in need of restoration by 2050. As part of this target, EU Member States need to develop National Restoration Plans, clearly indicating where areas for nature restoration will be located (Regulation (EU) 2024/1991, 2024).

Healthy marine ecosystems are crucial not only for providing many ecosystem services, such as transport, fishing, tourism, aquaculture, and recreation, but also for regulating the climate. **Therefore, marine biodiversity plays an important role in climate change mitigation alongside large scale decarbonisation of our energy systems.** However, while offshore wind and grid infrastructure are needed to support the energy transition from fossil fuels, these assets pose potential risks to the surrounding environment and ecosystems. Some environmental pressures include habitat disturbance and loss, noise emissions and vibrations produced during infrastructure installation, light emissions disrupting naturally occurring light patterns, and chemical pollution caused by oil or paint spillage.

In order to address impacts coming from these potential pressures, the first step is to conduct a Strategic Environmental Assessment (SEA) during Maritime Spatial Planning, ensuring that the resulting plans do not cause significant long-term environmental harm (Directive 2001/42/EC, 2001). This can be done by using biodiversity sensitivity mapping to ensure sites for future offshore wind farms and grids avoid biodiversity-rich and sensitive areas. Furthermore, as part of the permitting procedure for offshore wind farm (OWF) and grid infrastructure, project developers are obliged to conduct detailed Environmental Impact Assessments (EIAs). A proper and comprehensive EIA outlines a project's anticipated environmental impacts and couples them with concrete measures for their avoidance, minimisation, restoration, and compensation (Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, Amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment). **Therefore, while offshore energy infrastructure is paramount to climate change mitigation, it should not be installed at the expense of nature** (ENTSO-E, 2024; Offshore Coalition for Energy and Nature, 2024).

Furthermore, offshore wind and grid infrastructure developers have the potential to act as frontrunners in addressing the intertwined challenges of climate change and biodiversity loss and make concrete contributions to nature enhancement by using nature-inclusive design (NID) or supporting proactive nature restoration projects (Offshore Coalition for Energy and Nature, 2024).

1.2 Socio-economic considerations and implications

The North Sea has been used by various economic sectors and for recreational activities for centuries. Traditional users, such as fisheries, transport, and tourism, have provided not only jobs and income but also a sense of identity for coastal communities. Offshore wind and grids can therefore be seen as newcomers by sectors which are more established in this sea basin. Traditional users may perceive changing regulations and new requirements related to offshore wind deployment as a threat to their right to access areas historically reserved for their activities. This has been described as “spatial squeezing” (Zaucha et al., 2025). Meanwhile, emerging industries – such as the offshore wind sector – may perceive the current status quo as inequitable if they are not afforded equal consideration in spatial allocation decisions (Gopnik et al., 2012). Consequently, in addition to environmental challenges, considerable attention and resources should be directed toward the economic and social implications of the energy transition.

Two key reasons for the lagging deployment of offshore wind and grid infrastructure is the opposition coming from coastal communities and spatial conflicts with stakeholders from different sectors (Bacchiocchi et al., 2022). Building social acceptance for the energy transition means bringing affected stakeholders and local communities on board and ensuring equitable distribution of socio-economic benefits, thereby building a renewables-based system that improves people’s lives (Le Bihan & Miljanović Rusan, 2024).

Offshore wind projects can bring benefits to coastal communities, such as income, investment, and employment opportunities. These benefits can extend beyond direct jobs in offshore wind and grid sectors, such as indirect perks for the tourism and hospitality industry. Broader benefits may include infrastructure improvements, skill development, and community funds for local projects and education (Bacchiocchi et al., 2022; British Academy, 2022; European MSP Platform, n.d.). Furthermore, research conducted in Norway by Linnerud et al. (2022) shows a preference for locally-owned wind farms over those owned by international consortia, highlighting the interest in energy communities and co-ownership models. However, the costs of offshore wind farm and grid infrastructure deployment are extremely high, posing a significant barrier to local ownership. Nevertheless, the concept of offshore wind energy communities is gaining momentum, with emerging examples from the North Sea.

When addressing a specific sector or a local community, it is important to understand that what counts as a benefit in one place will not necessarily be seen that way in another. **Therefore, comprehensive and inclusive stakeholder engagement during Maritime Spatial Planning and OWF and grid project planning should be mandatory** (Le Bihan & Miljanović Rusan, 2024).

1.3 Spatial and technical considerations and implications

All of the energy produced offshore must be connected to onshore systems and integrated into Europe's broader energy networks – underscoring the critical importance of grid infrastructure (ENTSO-E, 2024). **The harsh marine environment, combined with the scale of offshore energy production, presents specific technical challenges.** To support effective planning and overcome these hurdles, detailed modelling efforts have been developed.

Energy modelling and system planning have traditionally followed a techno-economic optimisation paradigm, favouring the most cost-efficient solutions, technologies, and infrastructure layout. Acknowledging the environmental and socio-economic considerations and implications described in previous sub-chapters makes it clear that modelling, planning, designing, and deployment of offshore infrastructure should be adapted in a way which integrates these aspects too. This includes improved tools and methodologies which can reflect the complex, interdependent nature of marine ecosystems.

A promising example of this is the Offshore Network Development Plan (ONDP) Modellers' Exchange workshop: *Turning the tide – Optimising Europe's Offshore Energy Future with Holistic Planning and Engagement*. Bringing technical and environmental modellers together to co-develop holistic approaches to optimise offshore energy planning, the workshop's outputs offer an integrated approach to balance ambitious offshore energy targets with ecosystem protection and social acceptability within MSP and offshore infrastructure planning.

In addition, the new infrastructure will inevitably occupy space, both offshore and along the coasts, which can potentially create further complications and spatial squeezing with other sectors. However, these challenges can in some cases be mitigated through the application of coexistence and multi-use concepts, allowing different activities and sectors to share marine space more effectively (European MSP Platform, n.d.). According to Schupp et al. (2019), 4 main types of ocean multi-use can be defined, varying on the level of connectivity of uses and users of the space:

- **Repurposing** signifies that activities take place in the same marine space one after another (*lowest level of connectivity*).
- **Co-existence** or **co-location** refer to simultaneous, independent use of marine space.
- **Symbiotic use** is characterised by activities which not only happen simultaneously and in the same place, but also some parts of this infrastructure or services are shared.

- **Multi-purpose use** occurs when different sectors share core infrastructures and services within the same area at the same time (*highest level of connectivity*).

These participatory approaches, supported by integrated modelling and spatial planning, as supported by the ONDP Modellers' Exchange Workshop, are essential for optimising just and effective spatial planning which supports the offshore energy transition and marine ecosystem resilience.

1.4 Governance considerations and implications

Taking into account all the aspects described above, planning offshore wind and grid infrastructure is inherently a complex and multifaceted process. **Planning, be it on a policy or on a project level, can organise human activities in ways which minimise environmental impacts, finds synergies, and resolve conflicts between different users.** Furthermore, planning involves a wide array of stakeholders, as the decisions made can have far-reaching consequences, particularly for coastal communities (Le Bihan & Miljanović Rusan, 2024).

However, how the planning process is organised, who takes ownership of it, who gets to be involved, and to what level each participant can influence final decision-making differs between Member States and offshore wind and grid developers. Nevertheless, a key issue is the imbalance in stakeholder representation. While Maritime Spatial Planning is intended to involve a wide range of actors, powerful stakeholders are often overrepresented, creating an uneven playing field (Luhtala et al., 2021). Additionally, the large scale and complexity of Maritime Spatial Planning make it difficult to effectively address specific community benefits (Zaucha et al., 2025). Furthermore, on a project planning level, conflicts between offshore wind developers and other sectors, such as fishing, tourism, and nature protection, persist due to poor timing of participatory processes and their limited impact in the design process for offshore wind farms (Skjølsvold et al., 2024).

Maritime Sustainable Planning should not be framed as a top-down process where government policies are imposed. Instead, it should be seen as an iterative process which mediates various forms of knowledge and experience. One of the ways this can be done is by doing continuous, transparent, participatory, and inclusive stakeholder engagement throughout planning processes.

3 How our Wind Lab works: Co-production in the North Sea for Maritime Sustainable Planning

The Wind Lab 4 process was deliberately designed around co-production principles to foster inclusive, context-aware dialogue on MSP and Maritime Sustainable Planning. By engaging a diverse set of actors, from environmental non-governmental organisations (NGOs) to grid operators and sea-basin governance experts, our Wind Lab aimed to pluralise perspectives while acknowledging existing power dynamics. Rather than extract knowledge, the Wind Lab 4 built trust and ownership among participants, supporting a process that was both reflective and oriented toward real-world impact on planning practices and policies.

As part of the Wind Lab 4 activities, we engaged with a broad range of stakeholders representing key users of the North Sea and greater EU policy context. Our goal was to co-produce a set of actionable principles to improve the Maritime Sustainable Planning processes. This Wind Lab built upon the foundational work of [the Offshore Coalition for Energy and Nature \(OCEaN\)](#), convened and moderated by the [Renewables Grid Initiative](#), and extended its efforts further.

The Wind Lab 4 involved seven distinct co-production activities, conducted both in-person and online from September 2023 to April 2025. Given the geographical scope of our initiative, we focused on stakeholders from EU countries bordering the North Sea with significant offshore wind development targets – specifically, the Netherlands, Belgium, Denmark, and Germany. We aimed not only to ensure a multi- and transdisciplinary approach but also to bring together a diverse group of stakeholders to collaboratively discuss Maritime Sustainable Planning. As a result, participants included EU and national decision-makers (e.g., Directorate-General for Maritime Affairs and Fisheries (DG MARE), Dutch Ministry of Agriculture, Fisheries, Food Security and Nature), representatives from the offshore wind and grid industries (e.g., WindEurope, TenneT), environmental and climate NGOs (e.g., BirdLife, the North Sea Foundation, WWF), as well as academic institutions (e.g., TU Delft, TU Berlin).

Maritime sustainable planning Co-production Timeline



Figure 6: Maritime Sustainable Planning Co-production timeline

In addition, the innovative impact assessment and energy modelling tools developed within the JW4A project were presented and tested with these stakeholders to ensure their relevance and practical applicability, contributing to the work carried out in [Work Package 1 and 2 of the project](#).

The co-production activities took various forms, ranging from interactive workshops to high-level panel discussions. To reinforce the participatory nature of these sessions, we employed methods such as brainstorming, World Café, dot-voting, and futuring.



Figure 7: World Café at the ‘Energy & Space’ workshop



Figure 8: Futuring during ‘How Can We Achieve a Just Energy Transition at North Sea Basin by 2030?’ workshop

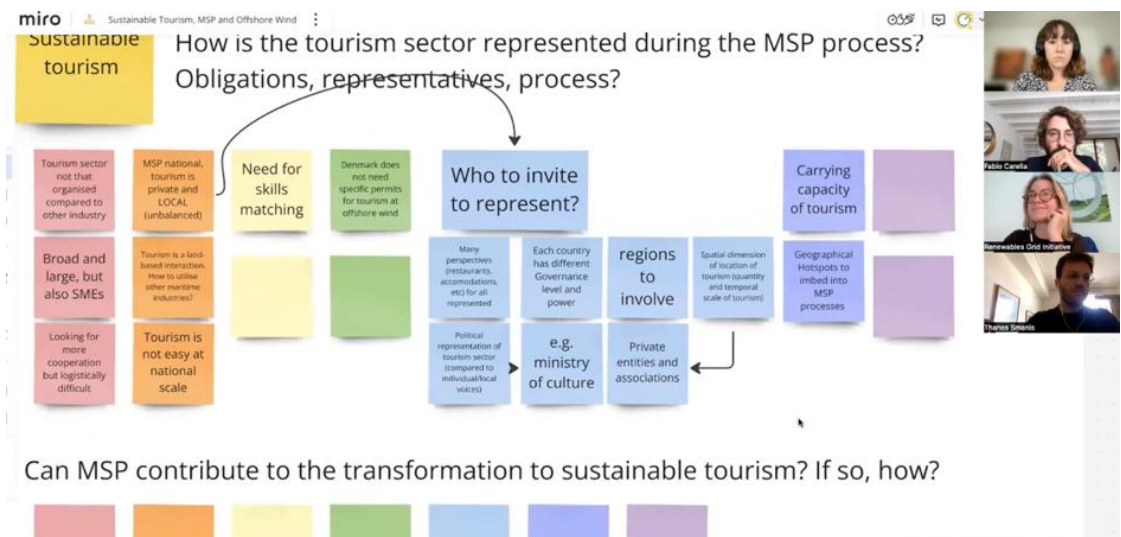


Figure 9: Dot-voting during ‘Sustainable Tourism, MSP and Offshore Wind’ expert roundtable

Table 1 provides an overview of the co-production activities conducted through this Wind Lab, detailing the stakeholders involved, key issues addressed, and the main findings from each engagement.

Table 1: Overview of co-production activities organised as part of JW4A Wind Labs on Maritime Sustainable Planning together with key insights

EVENT	FORMAT	TYPE OF STAKEHOLDERS ATTENDING	ADDRESSED IMPLICATIONS	KEY STAKEHOLDER INSIGHTS AND REFLECTIONS
Energy & Space Workshop: Overcoming the challenge of limited water and space to achieve a decarbonised energy system	Dedicated break out session on holistic energy planning offshore	Experts in the modelling community, environmental NGOs, industry representatives, and informed public	<i>Spatial and technical</i>	- Grid connection is critical for system decarbonisation and must be a central part of planning discussions.
			<i>Governance</i>	- MSP reflects political priorities; therefore, a just energy transition and nature-friendly offshore development should be at the top of EU political agenda. - Achieving a just energy transition requires addressing complex issues during stakeholder engagement. Consequently, the language and format of stakeholder engagement need to be adjusted to allow for meaningful participation. - Stakeholder engagement must be fast and initiated early to be effective. This is important during both MSP and offshore wind farm planning. - Importance of avoiding working in technical/governance silos when planning complex systems, whether onshore or offshore.
Turbines and Tides: Expanding EU Offshore Wind in a Nature-friendly Way	Technical session on accommodating the needs of diverse ocean players	EU and national decision-making bodies, offshore wind developers, environmental NGOs, research	<i>Environmental and Governance</i>	- The blue economy cannot exist without healthy marine ecosystems; therefore, marine restoration is crucial. - Offshore wind and grid developers are invited to test and implement nature-inclusive designs. However, these must be based on best available science. This can be encouraged by including environmental non-price criteria in future offshore wind tenders.

	for a sustainable blue economy	institutes, and academia	<i>Spatial and technical</i>	- The energy transition at sea does not happen in a vacuum; it is part of the larger blue economy. Therefore, different sectors of the blue economy need to interact and explore whether co-location of human activities is an option. One possibility is multi-use, which requires serious commitment from all sectors involved and still faces significant knowledge gaps.
			<i>Socio-economic</i>	- The energy transition must bring benefits to coastal communities, for instance through employment opportunities.
Modellers' Exchange workshop : Turning the tide – Optimising Europe's Offshore Energy Future with Holistic Planning and Engagement	Full day in-person workshop on energy modelling challenges and needs	EU decision-making bodies, TSOs, offshore wind industry, academia	<i>Spatial and technical</i>	- Incorporating iterative planning steps through open exchanges and the alignment of modelling methodologies requires a high level of coordination. - The lack of local data and underrepresentation of societal and environmental aspects pose challenges for large-scale energy system optimisation models. - For future offshore infrastructure planning, including the 2026 ONDP, clearer guidance and improved coordination is needed by the EU and Member States to ensure that Maritime Spatial Plans have consistent formats, map resolution, and denominations across national and regional levels. - Visualisation tools, such as Geographic Information Systems (GIS) or interactive maps, can aid the MSP process in identifying suitable locations for offshore infrastructure projects. - Holistic, optimised infrastructure planning is essential to address marine environmental and social contexts, reduce conflicts, and promote collaboration across sectors.

Offshore Coalition for Energy and Nature – Mitigation Task Force	Online meeting with Members of OCEaN to discuss the work of JW4A on holistic impact assessment	Offshore wind developers, TSOs, environmental NGOs, academia	<i>Technical and environmental</i>	- The marine environment is complex and still largely uncharted; therefore, simple transposition of onshore tools to marine environments is not possible. Furthermore, it is not feasible to generalise indicators and parameters across the entire sea basin, even when only slight differences exist within the North Sea. As a result, everything should be approached case by case and site specifically. - Future offshore wind and grid infrastructure should be developed through careful and comprehensive planning, integrating the best available practices in avoidance and minimisation measures.
			<i>Governance</i>	- Although the countries bordering the North Sea are connected by the sea, each has its own unique national regulations. Better coordination between them could help resolve the understanding of environmental impacts and their mitigation.
Roundtable: Sustainable Tourism, Maritime Spatial Planning (MSP), and Offshore Wind in the North Sea	Expert roundtable (online) focused on the conflicts and opportunities between	Academia, industry representatives	<i>Socio-economic</i>	- Key conflicts between offshore wind and tourism include concerns over degraded ocean views, impacts on recreational activities, and community disruption. Solutions to conflicts may include multi-use (e.g., tourist visits to offshore wind farms) and cooperative ownership models to increase community support. - Socio-economic impact assessments should be conducted when siting offshore wind farms to understand effects on tourism, providing a fuller picture than environmental impact assessments (EIA) alone.

	offshore wind and tourism		<i>Governance</i>	- Tourism's complexity makes engagement in MSP difficult; tourism sector includes diverse, fragmented stakeholders, making it hard to find the right representatives. Furthermore, tourism small and medium enterprises often lack the resources and capacity to meaningfully participate in MSP. - MSP should consider not only spatial limits but also the carrying capacity of both the land and sea. Current MSPs often focus too much on technological solutions; a broader social transformation is needed, questioning mass tourism and mass shipping models. - Sector prioritisation in MSP is often politically driven, limiting MSP's transformative potential; MSP should act as a strategic instrument shaping sectoral policies.
Offshore Coalition for Energy and Nature – Fishery Task Force	Online meeting with Members of OCEaN and an expert discussing the coexistence of offshore wind and coastal fisheries	Offshore wind developers, TSOs, environmental NGOs, consultant	<i>Socio-economic</i>	- Spatial squeezing from offshore wind farm expansion is a major concern for the fishing industry. - Currently, fish stocks are declining due to both overfishing and climate change. - Co-location is being explored in more countries (e.g., Belgium, Netherlands), favouring passive fishing gear over destructive active gear. - OWFs as no-take zones may boost fish populations through the spill-over effect, but future rules could allow fishing inside. - Financial compensation for fishers is difficult to manage due to data transparency issues. Employment in OWF operations can act as an alternative but remains controversial.
How Can We Achieve a Just Energy Transition	Workshop (in-person) co-organised together with	Offshore wind developers, TSOs, environmental	<i>Socio-economic</i>	- Learning from best practices and disputes (e.g., Belgium-France case) highlights the need for flexible timelines, fair benefit sharing, and stronger alliances between environmental groups and energy cooperatives.

at the North Sea Basin by 2030?	a JW4A partner to test the decision-making tool developed as part of the project	NGOs, energy cooperatives, national, and EU decision-making bodies	<i>Governance</i>	- Inclusive stakeholder engagement is crucial but can delay decision-making; meaningful citizen and environmental representation remains limited in MSP. - Cooperative participation in offshore wind is heavily restricted by current financial frameworks; stronger governmental support and democratised ownership models are needed. - Permitting acceleration focuses too much on formal processes, overlooking critical pre-permitting activities like environmental surveys and early stakeholder engagement. - Standardisation and centralisation are crucial for permitting acceleration, which can be done by creating one-stop-shops. These already exist in the Netherlands and Denmark. - Cross-sectoral and international cooperation (e.g., through NSEC, Oslo-Paris Convention (OSPAR), Greater North Sea Basin Initiative (GNSBI)) is essential for a fair, nature-friendly energy transition, but real-world implementation is challenging.
			<i>Environmental and Governance</i>	- Offshore wind's environmental impact was rated as potentially significant but could be reduced with scaled-up nature enhancement projects and better multi-use strategies, though legal and practical barriers persist. - Offshore wind and grid developers are willing to test nature-inclusive design (NID) innovations/solutions, but current permitting regulations often limit the possibility to do so. For instance, grid developers are only allowed to integrate NIDs directly on their infrastructure, but not in the surrounding area.
			<i>Spatial and technical</i>	- Different forms of multi-use, ranging from basic co-existence to fully integrated, multi-purpose approaches, are currently being explored. However, developing a viable business case has proven to be more difficult than anticipated.

During each co-production activity, key insights and reflections emerged through carefully facilitated exchanges which encouraged open dialogue, disagreement, and mutual learning. These insights were then analysed to identify the most pressing concerns, clearly articulated needs, and potential methods or solutions to address them in the context of improving Maritime Sustainable Planning.

Priority was given to concerns shared by multiple stakeholders and to tools or approaches supported by diverse, sometimes even opposing, groups. **This approach aimed to develop co-produced principles and actions that can be adopted by relevant stakeholders, such as policymakers, offshore wind developers, and grid operators, depending on their respective areas of responsibility.**

It also became evident that some of the identified concerns and solutions were overlapping. For example, a solution addressing governance challenges might also help resolve socio-economic issues. As a result, the recommended principles and actions are complementary and synergistic, reinforcing the earlier observation that our selection of implication categories (see Figure 5 for summary) was, to some extent, arbitrary and overlapping. **To support the uptake of these principles and actions by relevant actors, such as policymakers and offshore wind and grid developers, we have also developed an accompanying factsheet (in Annex) that summarises the actions and principles explained in more detail in the following chapter.**

4 Principles & Actions for Maritime Sustainable Planning

1. CONDUCT DETAILED SOCIO-ECONOMIC ASSESSMENTS AT BOTH MARITIME SPATIAL PLANNING AND PROJECT PLANNING LEVELS

While EU regulations for environmental assessments already exist at both levels, there is a need for an additional layer of assessment – one which focuses more specifically on the risks posed to other economic sectors by the deployment of offshore wind and grid infrastructure. This process could also identify concrete compensation mechanisms and benefits tailored to the specific concerns and needs of affected sectors. It could run in parallel with SEA and EIA, with some overlapping steps to enhance coherence.

2. ENSURE PARTICIPATORY, INCLUSIVE, AND TIMELY STAKEHOLDER ENGAGEMENT

Although stakeholder engagement is a formal requirement in both MSP and project planning, its implementation remains insufficient. It is essential to recognise that no sector is monolithic and cannot be adequately represented by a single individual. Particularly in the sectors experiencing stronger conflicts with offshore wind development, ongoing engagement throughout the entire lifecycle of offshore wind farms would be highly beneficial.

3. USE MARITIME SPATIAL PLANNING AS A PLATFORM TO ADDRESS BROADER SOCIETAL TRANSFORMATIONS

Current debates around spatial squeezing underscore the need to critically reconsider whether exponential growth of the blue economy is realistic – even with improvements in sectoral efficiency or multi-use approaches, which have shown implementation challenges. MSP presents a unique opportunity for governments to lead a structured dialogue with economic sectors and local communities about the kind of future society they envision and how best to achieve it.

4. ACCELERATE PERMITTING BY STANDARDISING REQUIREMENTS AND ESTABLISHING A ONE-STOP SHOP

Instead of reducing stakeholder engagement or environmental scrutiny to speed up permitting, focus should be on streamlining the process, such as creating a one-stop shop to act as a central authority for coordinating and collecting relevant permitting information. Predictability is key: establishing clear expectations for crucial steps,

required surveys, and minimum developer requirements would greatly reduce delays. While site-specific adjustments will always be necessary, the overall permitting framework should follow a standardised template.

5. SUPPORT, RATHER THAN COMPLICATE, NATURE-INCLUSIVE DESIGN AND OTHER NATURE ENHANCEMENT PROJECTS, BOTH ONSITE AND OFFSITE

Offshore wind and grid developers have a valuable opportunity to lead by example and contribute to biodiversity restoration goals. Initiatives like [the Rich North Sea program](#) are already demonstrating what is possible. However, current regulations often hinder rather than help, sometimes presenting contradictory requirements. Greater policy support is needed, both through more flexible permitting and by incorporating Nature-inclusive Design into non-price auctioning criteria. Additionally, developers should be encouraged and supported in conducting offsite restoration in collaboration with local communities, NGOs, and academia, helping the industry shift toward a Nature-Positive approach.

6. STRENGTHEN POLITICAL SUPPORT FOR COMMUNITY OWNERSHIP OF OFFSHORE WIND INFRASTRUCTURE TO PROMOTE LOCAL INVOLVEMENT

Current financial and regulatory frameworks significantly limit cooperative participation in offshore wind. More robust governmental backing and democratised ownership models are necessary. Other North Sea countries are encouraged to follow Belgium's lead by including citizen participation as a non-price tendering criterion for future offshore wind projects. This would not only promote energy justice but also foster greater local support for offshore wind development.

7. PILOT MULTI-USE CONCEPTS CAREFULLY – ACKNOWLEDGING THEY ARE NOT A SILVER BULLET FOR SPATIAL SQUEEZING

Various types of multi-use, from simple co-existence to fully integrated multi-purpose use, are currently under exploration. However, the business case has proven to be more challenging than expected. When co-locating activities, it's essential to do so with the strategic goal of freeing up other marine areas for nature restoration. This could create the necessary space for passive restoration in line with the Nature Restoration Law. Therefore, multi-use can help address the problem of limited space, but due to its complex implementation and the magnitude of the nature and climate crises, we will need other proactive and ambitious measures for nature restoration.

8. ADAPT ENERGY AND ENVIRONMENTAL MODELLING TO THE COMPLEXITY OF THE OFFSHORE ENVIRONMENT

Robust energy system and environmental modelling are vital for integrated planning, but technical aspects currently dominate at the expense of environmental and social considerations. Making modelling processes more participatory and ensuring a greater integration of different tools would help address this imbalance. Additionally, onshore models cannot simply be transferred to offshore contexts due to the higher complexity and site-specific nature of marine ecosystems. Offshore modelling must be flexible and detailed enough to reflect these realities in order to be effective.

9. ADOPT A TRANSBOUNDARY, SEA BASIN-WIDE, AND CROSS-SECTORAL APPROACH – BECAUSE SEAS KNOW NO BORDERS

Meeting climate and biodiversity goals requires strong collaboration among EU Member States. Large-scale nature restoration, particularly in areas like the North Sea, is only feasible through transboundary planning. Such cooperation would also ensure the efficient use of offshore energy production. Furthermore, since the energy transition does not occur in isolation, cross-sectoral coordination is essential to achieving a truly just transition.

5 Conclusion & Outlook

The Wind Lab 4 was established to develop principles and actions aimed at improving current practices in Maritime Sustainable Planning. Since MSP and project planning involve a broad range of stakeholders, we aimed for our principles to be relevant to most of them, from EU and national decision-makers to offshore wind and grid developers to non-governmental organisations.

For instance, following the completion of the first editions of national Maritime Spatial Plans, it has become evident that there is room for improvement. EU regulatory bodies could facilitate progress by establishing requirements for sea-basin-wide or, at minimum, cross-border Maritime Spatial Plans. Similarly, while national authorities are under pressure to accelerate permitting processes for offshore wind farms, our recommendations emphasise that such acceleration should not compromise environmental integrity. Instead, improvements should be achieved by streamlining procedures in a way that upholds environmental standards.

Furthermore, through our co-production activities, we discovered opportunities for new alliances which could enhance advocacy efforts and mutual support. For instance, partnerships between energy cooperatives and environmental NGOs could align their goals to amplify their influence. Moreover, offshore wind and grid developers share a critical objective alongside environmental NGOs: ensuring healthy oceans while advancing the energy transition. The recommendations emerging from this work aim to help these stakeholders identify areas for collaboration, such as the implementation of Nature-inclusive Designs and careful piloting of multi-use projects.

While this document outlines the key findings of the Wind Lab on Maritime Sustainable Planning, the insights gathered through co-production will also inform other components of the JustWind4All project. Notably, they will contribute to tools like the decision-making compass for wind energy governance (see [Wind Lab 5](#)), which supports regional policy development.

Although this Wind Lab focused primarily on countries bordering the North Sea, many of its insights offer valuable lessons for other EU sea basins. **We encourage countries and other relevant actors in these regions to consider which principles might apply to their own context and goal to achieve a just and effective energy transition.** For example, they can be useful to foster dialogue and cooperation between coastal communities, environmental NGOs, and offshore wind developers in the Black Sea, as JustWind4All's [Wind Lab 1](#) based in Bulgaria illustrated.

The work toward a sustainable, just, and effective offshore energy transition will continue beyond the conclusion of JustWind4All. As highlighted throughout this document, the offshore wind and grid deployment sector has the potential to lead as a People- and Nature-Positive industry – delivering benefits to society while actively contributing to ecological restoration. This vision will be further pursued through initiatives such as [the Offshore Coalition for Energy and Nature](#) and [the Global Initiative for Nature, Grids and Renewables](#).

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7 Annex



9

PRINCIPLES & ACTIONS FOR MARITIME SUSTAINABLE PLANNING

Maritime sustainable planning is more than mapping—it's about making offshore space work for nature and people through just and effective decision-making

- 

01. Assess socio-economic impacts beyond standard EIAs

Conduct detailed socio-economic assessments **in parallel with SEA/EIA** to identify risks to other marine sectors and **design tailored compensation** and benefit-sharing mechanisms
- Position MSP as a democratic space for **co-developing visions** of the sea's future with affected sectors and communities—not just as a technical coordination tool



02. Recognise MSP as a governance tool—not just a spatial one
- 

03. Ensure early, inclusive, ongoing stakeholder engagement

Include **local authorities** and **communities** from the outset and **formalise** stakeholder mapping
- Introduce a **one-stop shop** to coordinate permitting steps, define minimum survey and consultation requirements, and establish a clear permitting framework template



04. Accelerate permitting through streamlining, not dilution
- 

05. Support, not stifle, nature-inclusive design approaches

Reform permitting and auctioning rules to reward **nature-inclusive approaches**; create **flexible frameworks** to support collaborative restoration with NGOs and communities (e.g. The Rich North Sea)
- Integrate community participation into **non-price auctioning criteria**. Provide supportive regulation to enable cooperative investment in offshore wind



06. Democratise offshore energy through community ownership
- 

07. Pilot multi-use with strategic intent, not as a silver bullet

Support pilots that prioritise **ecological space-saving** (e.g. zones for restoration), while acknowledging limitations in the current business case for co-location
- Avoid **one-size-fits-all models** derived from onshore contexts. Develop **offshore-specific models** for dynamic marine conditions that include **social** and **ecological** parameters to incorporate local and sectoral knowledge



08. Adapt energy and environmental modelling to reflect offshore complexity
- 

09. Adopt a Sea Basin-wide and cross-sectoral approach for a just offshore energy transition

Large-scale nature restoration is only feasible through **transboundary planning**, efficient **cooperation** and **cross-sectoral coordination** with offshore energy projects



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