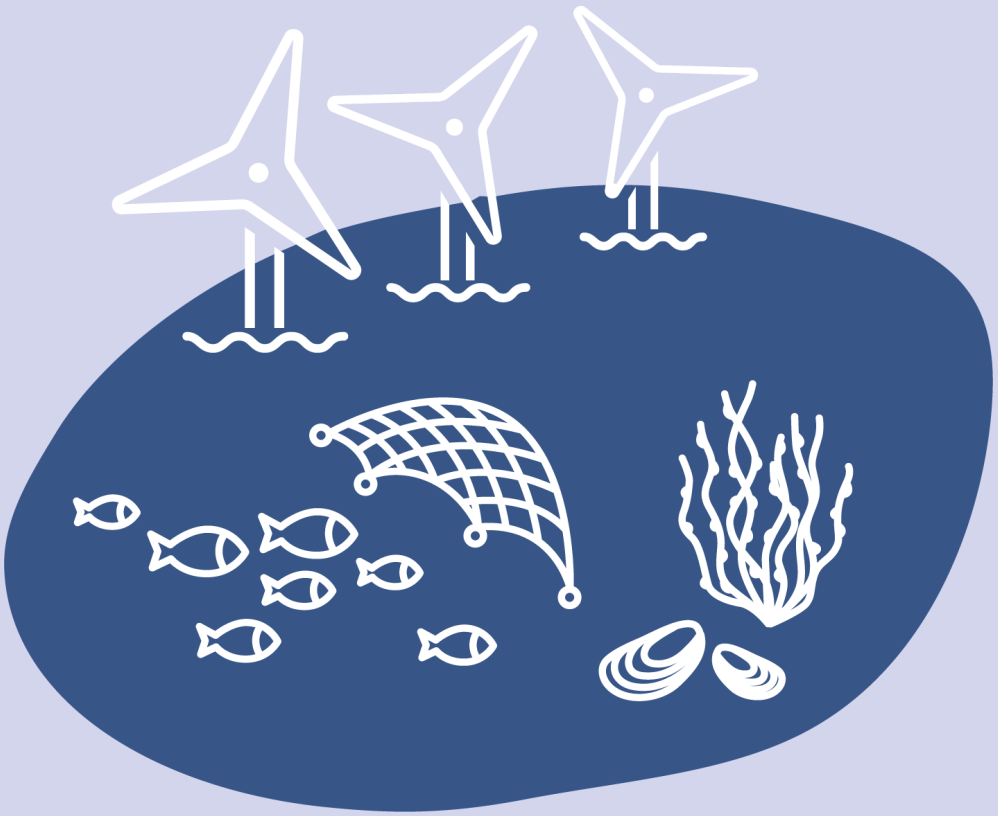
Nordic Council of Ministers

Nordic conference on co-location of marine industries



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Summary

The Nordic Conference on Co-location of Marine Industries was held from September 25 to September 26 2024 at Sankt Gertrud Konferens in Malmö. The conference aimed to bring Nordic stakeholders together and facilitate an exchange of ideas as a part of Sweden's presidency in the Nordic Council of Ministers. The main focus of the conference was offshore renewable energy, fishing, and aquaculture, aiming to highlight opportunities and challenges with increasing demand for sea space and promoting nature-positive solutions for co-location.

Keynote speaker Alexandra Leeper highlighted the importance of collaborative innovation for sustainable growth in marine industries. Leeper concluded with a vision for sustainable growth in Nordic marine industries through innovation and mutual value creation, encapsulated in her quotes: "Create more with less" and "To create trust you need to understand each other."

Jonas Bjärnstedt from Sweden's Agency for Marine and Water Management discussed the need for a national guide to clarify regulations for co-location, emphasizing the importance of risk assessments and insurance solutions. Kari Grundvig from The Norwegian Directorate of Fisheries pointed out the necessity of effective marine spatial planning and ongoing Strategic Environmental Assessments to balance wind development and marine sustainability.

Sigrid Eskeland Schütz from Bergen University stressed the need for a robust legal framework for marine multi-use, while Christian Schell from RISE highlighted risk management strategies for sustainable fishing near wind farms.

Kerstin Bly Joyce from Nordregio, Jessica Hjerpe Olausson from RISE and Karina Barquet from SEI emphasized the need for integrated ocean governance to tackle challenges in marine industries. They advocate for a holistic approach that aligns sustainable development goals, stakeholder engagement, and adaptive management to enhance ocean governance.

Turid Øygard from Offshore Norway and Hanna Bauge from Fiskebåt addressed the need for collaboration between Norway's offshore wind industry and fisheries. They stressed early dialogue and systematic planning to align with the government's goal of developing 30 GW of offshore wind capacity by 2040 while minimizing conflicts with fishing activities.

Innovators Sonja Andrén and Karl Strømsem advocated for incorporating aquaculture into offshore wind strategies to enhance economic resilience and food self-sufficiency through stakeholder collaboration.

Conclusion and suggestions

The discussions surrounding the co-location of fisheries, aquaculture, and offshore wind farms illuminate the intricate dynamics of marine resource management. A central theme emerges: the necessity for collaborative frameworks that harmoniously integrate various marine activities while promoting sustainability. The insights drawn from the presentations underscore that while co-location presents inherent challenges, it also offers significant opportunities for innovation and value creation in the blue economy.

In conclusion, while co-location of fisheries, aquaculture, and offshore wind farms faces numerous challenges, there is a strong foundation for collaborative innovation and governance. By harnessing the collective expertise and addressing mutual concerns, stakeholders can pave the way for sustainable marine management practices that enhance resource sharing while preserving ecological integrity. As nations move forward with ambitious renewable energy goals, careful consideration of stakeholder dynamics, regulatory frameworks, and collaborative strategies will be critical in ensuring that both marine ecosystems and economies flourish in tandem.

Ten Suggestions for Future Work Towards Increased Coexistence and Co-location of Marine Industries

1. Establish a National Framework for Co-location:

Develop a comprehensive national guide outlining the regulatory landscape and best practices for co-location. This framework should provide clear guidelines and support for harmonizing offshore wind, aquaculture, and fisheries operations while ensuring environmental sustainability.

2. Enhance Stakeholder Engagement:

Foster early and ongoing dialogue among all stakeholders, including fishermen, aquaculture operators, wind farm developers, and regulatory bodies. Establish regular forums and workshops to facilitate communication, address concerns, and collaboratively develop solutions.

3. Conduct Strategic Environmental Assessments (SEAs):

Implement comprehensive SEAs before establishing new marine projects to evaluate environmental impacts and identify potential conflicts. This will help ensure informed decision-making and promote eco-friendly practices across all marine industries.

4. Develop Shared Insurance Mechanisms:

Create insurance solutions tailored for stakeholders operating within overlapping marine spaces. These could cover risks associated with fishing near offshore wind farms and support financial stability during transitions to co-located operations.

5. Encourage Multi-use Pilot Projects:

Fund pilot projects that explore innovative multi-use scenarios, like integrating aquaculture in offshore wind farms. These projects can serve as proof-of-concept examples and provide valuable insights into practical implementation strategies.

6. Prioritize Research and Development:

Invest in R&D initiatives focused on co-location technologies and sustainable practices. Knowledge-sharing platforms should be established to disseminate findings and innovations across marine sectors, fostering a culture of continuous improvement.

7. Implement Adaptive Marine Spatial Planning (MSP):

Integrate adaptive MSP that considers marine activities' cumulative impacts and promotes flexible management strategies. This approach will allow for responding to changes in marine ecosystems and industry needs over time.

8. Utilize Technology for Monitoring and Management:

Leverage advanced technologies, such as AI, drones, and satellite monitoring, to enhance management and monitoring of marine resources. These tools can help assess environmental impact, monitor compliance, and facilitate data sharing among stakeholders.

9. Promote Economic Incentives for Co-location:

Develop financial incentives to encourage stakeholders to adopt co-location practices, such as grants, loans, or tax breaks. This could also include compensation mechanisms for sectors adversely affected by marine space allocation.

10. Cultivate a Culture of Collaboration:

Foster a mindset of mutual respect and collaboration among marine industries by highlighting successful co-location stories. Initiatives that celebrate cross-sector partnerships can inspire stakeholders and shift perceptions towards more cooperative practices.

These suggestions aim to create a systematic approach for fostering coexistence and optimizing the use of marine resources, ultimately contributing to a resilient, sustainable blue economy in the Nordic region.

Opening statements

If the Nordics are to succeed with the green transition, we must boost the resilience of the ocean while harnessing more of its benefits. Consequently, the demand for marine spaces is continually rising, highlighting the need for a more efficient utilization of marine spaces, while simultaneously maximizing environmental, social and economic benefits of marine activities.

In order to bring Nordic stakeholders together and facilitate an exchange of ideas as a part of Swedens presidency in the Nordic Council of Ministers the Swedish Board of Agriculture received funding to arrange the Nordic conference on co-location of marine industries in collaboration with Nordic Innovation and the Swedish Rural Network. Focusing on offshore renewable energy, fisheries and aquaculture, the conference aimed to highlight the opportunities and challenges that arise from the increasing demand for ocean space and how to enhance nature-positive solutions for co-location.

The participants engaged in discussions about the necessary conditions for enhancing co-location of various marine industries at sea. Invited experts shared insights from different Nordic perspectives based on current knowledge with the aim of contributing to tomorrow's solutions and sparking innovation.

The conference was opened with a speech by the Swedish Minister of Agriculture Peter Kullgren as well as The Secretary General of the Nordic Council of Ministers Karen Elleman.

The Minister (recorded speech) states that the Nordic countries must be at the forefront of solutions, with food security being essential, and the fishing sector is important for livelihoods. We must ensure that the conditions are in place for this. However, we also need to achieve our energy goals, and here we must collaborate from a Nordic perspective to find balance. We need to consider the synergies between different industries as this will also contribute to rural development.

The Secretary General for the Nordic Council of Ministers recognized that the core team members are present at the conference. She highlighted significant need for climate-smart solutions, much of which must come from the sea and offshore wind. At the same time, we must secure areas for the environment, conservation, and food production. As the sea has no boundaries it is a common management issue, and co-location is critical. The recommendations that come from these days are very significant and will feed into the Nordic Council of Ministers' continued work.

Keynote message

Speaker: Alexandra Leeper, CEO Iceland Ocean Cluster

The Iceland Ocean Cluster[1] was formed to help solve some of the biggest challenges in the blue economy by bring startups, industry and researchers together to make good ideas happen. Alexandra Leeper's presentation focused on the importance of collaborative innovation to meet these challenges.

The core idea is to create added value within the blue economy by maximizing the utilization of byproducts. There is significant potential to extract substantial value from a single fish. This concept of doing more with less requires a shift in perspective, encompassing everything from policy changes to a new mindset among fishermen.

Leeper advocates for leveraging existing knowledge and making incremental process changes to identify "low-hanging fruit" opportunities for mutually beneficial collaboration. She provides examples of valuation processes and highlights the importance of sharing success stories to build momentum and inspire further innovation. With the most notable success story being Iceland´s first unicorn – Kerecis that created a new cross-sectoral partnership to use cod skin as skin grafts for burns and sores. A big win for both sectors and the 100% fish movement aiming to use the whole fish and produce no waste, where such a success story is transforming the narrative of seafood – and why there is no such thing as waste.

The presentation emphasized the need for increased partnerships between research, industry, and innovation. The Iceland Ocean Cluster's model demonstrates the value of such collaborations. Building trust and understanding among stakeholders with often-conflicting interests is crucial. Leeper suggests starting by identifying a shared challenge and then working together to find mutually beneficial solutions.

The presentation concludes with the assertion that initiatives driven by policymakers, such as those in Iceland, can be effectively implemented through bottom-up solutions involving producers and researchers.

Leeper's presentation offers a compelling vision for the future of the marine industries in the Nordic Ocean space, emphasizing the potential for sustainable growth and innovation through collaboration and a focus on mutual value creation.

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1. Heim - Íslenski sjávarklasinn

Key takeaways:

- "Create more with less" and "Tell the story widely and loudly."
- "To create trust, you need to understand each other."
- Innovation and collaboration: The need for collaborative innovation to address challenges in the fishing industry.
- Value creation: Maximizing value from marine resources, particularly by-products.
- Incremental change: The importance of identifying and capitalizing on "low-hanging fruit" opportunities.
- Partnerships: The role of partnerships between research, industry, and innovation.
- Trust and understanding: The importance of building trust and understanding among stakeholders.
- Bottom-up solutions: The effectiveness of bottom-up approaches driven by producers and researchers.

Co-location of offshore wind, aquaculture, commercial fishing

Speakers: Jonas Bjärnstedt, Swedish Agency for Marine and Water Management & Kari Grundvig, Norwegian Directorate of Fisheries

Jonas Bjärnstedt, from the Swedish Agency for Marine and Water Management, delved into the complexities of marine spatial planning with a focus on planning for potential coexistence of offshore wind power with commercial fishing, aquaculture, and nature conservation in Sweden.[2] A central theme of his presentation was the concept of "co-location," which he described as the fundamental starting point for the marine spatial planning process.

Bjärnstedt emphasized that while co-location is a guiding principle, it presents unique challenges. He highlighted that "pelagic fishing is not possible to co-locate with offshore wind," due to the nature of both activities. This incompatibility, coupled with increased economic risks and a lack of affordable insurance options, underscores the need for careful planning and management.

Sweden's current "open door system" for offshore wind was identified as a significant hurdle to effective coordination. Bjärnstedt explained that this system, a system abandoned by neighbouring countries, creates a complex regulatory environment that hinders the development of clear guidelines for coexistence. He called for a more structured approach, suggesting the development of a "national guide" that would provide regional and local guidance on how to balance competing interests.

Bjärnstedt also discussed the challenges of coexisting with the fishing industry, noting that outdated knowledge, economic uncertainties, and navigational risks pose significant obstacles. He emphasized the need for quantitative analysis of these risks and for insurance solutions that cover both the fishing and wind energy sectors.

Regarding aquaculture, Bjärnstedt highlighted the potential for coexistence but emphasized the need for addressing technical, operational, and safety challenges. He pointed to the Netherlands as a country that has made progress in this area and suggested that Sweden could learn from their experiences.

2. Samexistens mellan havsbaserad vindkraft, yrkesfiske, vattenbruk och naturvård - Publikationer - Data, kartor och rapporter - Havs- och vattenmyndigheten

In conclusion, Bjärnstedt stressed the importance of dialogue, regulation, and a more holistic approach to marine management. He emphasized the need for a national guide that provides clear guidelines for co-location, and he called for increased collaboration between all stakeholders.

Key takeaways:

- Bjärnstedt emphasized the need for quantitative analysis of risks and insurance solutions for both fishing and wind energy sectors.
- There is potential for coexistence between offshore wind and aquaculture, with significant challenges to overcome.
- A more holistic approach to marine management is necessary, involving all stakeholders.
- A national guide providing clear guidelines for co-location is crucial.

Kari Grundvig, Senior Adviser at the Directorate of Fisheries in Norway, discussed the balance between offshore wind development and sustainable management of marine resources. She emphasized the need for careful planning to protect fishing interests while advancing renewable energy initiatives. The Directorate of Fisheries promotes profitable economic activity while ensuring sustainable management of marine resources.

With Norway's population of 5.3 million and extensive coastlines, the seafood industry is vital to its economy, significantly contributing to exports. Offshore wind development is viewed positively by the fisheries sector but requires careful consideration to avoid conflicts with commercial fishing areas. The Norwegian view is that no kind of fishing is possible in offshore wind farms due to the structure of the Norwegian fleet and the type of gear used. Grundvig emphasized that a safety zone between fishing activity and offshore windfarms is difficult to set due to the ever-shifting conditions at sea. Questions about stakeholder involvement and their perceptions of safety aspects have been investigated, and it was noted that transition corridors are needed. There is also consideration of establishing attention zones for a pragmatic approach, and it is essential to have fishing space areas at certain distances from offshore areas, which need regulation.

A strategic environmental assessment (SEA) is underway to evaluate potential offshore wind sites, focusing on their impact on fisheries and marine biodiversity. Key issues include the displacement of fishing grounds, safe distances from turbines, and compensation for loss of catch.

Open ocean aquaculture is also being explored as a viable option outside traditional production areas, with regulatory frameworks established since 2017. The timeline for open ocean aquaculture includes assessments leading up to expected license allocations in 2025. In Norway aquaculture dominates in relation to the fisheries industry and Norwegian aquaculture is the second-largest in the world after China. Co-existence with many different interests is critical. Both open ocean aquaculture and co-location are new areas to develop. Questions about the impact on the ecosystem of open ocean aquaculture have been raised, and it was noted that there is no experience yet, but research is ongoing.

Key takeaways:

- Grundvig highlighted the importance of balancing offshore wind development with sustainable management of marine resources.
- Strategic Environmental Assessments (SEA) are underway to evaluate potential offshore wind sites in Norway.
- There are different views regarding the feasibility of fishing within offshore wind farms, which may be related to differences in fleet structures etc.
- Stakeholder involvement and perceptions of safety aspects are critical in planning.
- Marine plans and legal frameworks are essential for establishing prerequisites for multiuse and co-existence.

Legal requirements and safety aspects for co-location

Speakers: Sigrid Eskeland Schütz, University of Bergen & Christian Schell, RISE

Schütz highlighted that in Norway there is no clear definition of multi-use and therefore no clear legal framework. A legal framework necessary for promoting marine multi-use should emphasize the importance of integrating multiple activities in marine spatial planning to enhance resource sharing and coexistence. Without the initial inclusion of multi-use principles in marine plans, effective implementation is unlikely. The concept of marine multi-use is defined as the joint use of resources by single or multiple users in close geographic proximity. It can involve 'hard' multi- use, which includes physical structures hosting multiple activities, and 'soft' multi- use, where different activities share sea space.

Schütz explained that modes of multi- use include adding new activities to existing ones and developing joint activities from the outset. Strategic marine planning must incorporate social, economic and environmental stability principles to facilitate efficient use of space and coexistence among industries. Various reports and policies related to marine area usage highlight the importance of multiple uses while safeguarding marine nature. Key statistics on offshore wind farms across several countries illustrate current developments in renewable energy infrastructure. It is important to consider questions about exclusive rights versus shared use under existing laws governing ocean energy and seabed minerals, suggesting a need for clearer regulations to support innovation and collaboration among different sectors.

Schütz pointed out that we do not know the multi-use needs of tomorrow, thirty years from now. Permits are time-bound, and there is a need for a business plan for the Norwegian seas that integrates principles for marine areas. Currently, there is a missing statement about co-location in the Ocean Energy Act, which needs to be addressed to ensure a coherent legal framework that fosters multi-use and sustainability in marine management.

Key takeaways:

- Legal Framework for Multi-Use: Emphasizes the need for integrating multi-use principles in maritime spatial planning to enhance resource sharing and coexistence.
- Modes of Multi-Use: Defines 'hard' and 'soft' multi-use and highlights the importance of incorporating social, economic and environmental stability.
- Future Multi-Use Needs: Recognizes the importance of forward-thinking planning and clear regulations to support innovation and collaboration among different sectors.
- Marine Spatial Planning: Stresses the significance of marine plans and legal frameworks for establishing prerequisites for multi-use and co-existence.

Christian Schell examines the coexistence of fishing activities and offshore wind farms, highlighting the risks and necessary precautions to ensure both industries can operate without conflict. The importance of collaboration among stakeholders is emphasized to address potential hazards and develop effective strategies for sustainable practices in these overlapping sectors.

The SSPA Maritime Centre has been involved in research regarding the coexistence of fishing and offshore wind energy, focusing on risk management associated with various fishing methodologies near wind farms. Key points include advisory services provided by RISE Research Institutes, which encompass nautical risk analysis, environmental assessments, and feasibility studies related to offshore wind projects. The study[3] identifies different types of foundations used for wind turbines – fixed and floating – and their implications for fishing operations.

Fishing methodologies in Sweden are diverse, with pelagic trawlers being significant players; however, bottom trawling is predominant along the Swedish west coast. The report outlines specific risks such as gear entanglement with submarine cables and potential collisions between fishing vessels and turbine foundations. Recommendations include establishing a government policy for fishing within wind farms, early consultations with fishermen, proper cable burial

3. SSPA. (2022). Sjösäkerhetsanalys - fiske i havsbaserade vindkraftparker. Energimyndigheten diarienummer: 2022-008944

techniques, and training programs for safe operations in these areas. Stakeholder input indicates that demersal fishing should be permitted within designated buffer zones around turbine foundations while maintaining safety protocols.

Managing risks associated with fishing activities near offshore wind farms requires thorough stakeholder collaboration and strategic planning to mitigate potential conflicts. The main thesis revolves around ensuring sustainable coexistence through comprehensive risk assessments and proactive measures tailored to both industries' needs.

Key takeaways:

- Coexistence of Fishing and Offshore Wind Farms: There are necessary precautions that need to be taken to mitigate risk and ensure sustainable practices in both industries.
- Risk Management: Thorough stakeholder collaboration and strategic planning is key to mitigate potential conflicts.
- Fishing Methodologies: There are different challenges and risks associated with different fishing methods near wind farms, such as gear entanglement and vessel collisions.
- Stakeholder Input: Recommends early consultations with fishermen and proper safety protocols to maintain operations within offshore wind farms.

Governance to facilitate co-location and sustainable coexistence between green and blue sectors in the Nordic region

Speaker: Kerstin Bly Joyce, Nordregio, Jessica Hjerpe Olausson, RISE & Karina Barquet, SEI

Kerstin Bly Joyce, from Nordregio, discussed the need for sustainable coexistence between offshore renewable energy and marine food sectors in the Nordic region, highlighting the conflicts and synergies that arise from their spatial overlaps. She emphasized the importance of collaborative governance and marine spatial planning to address these challenges effectively.

The "Green Meets Blue" project[4] aims to enhance knowledge about sustainable coexistence between offshore renewable energy (wind) and marine food sectors (fisheries, aquaculture) in the Nordic context. The project seeks to provide insights on how Nordic countries can cooperate to tackle potential sea-use conflicts. Key issues include trade-offs made within marine spatial planning frameworks, where both use values and non-use values are considered important.

The marine environment is facing a situation where traditional industries must meet new and upcoming sectors. A key focus of the "Green Meets Blue" project is to explore how governance can address conflicts and find win-win solutions. Incentives, which can be economic or regulatory, must be established, but most crucial are behaviours. There is always a reason behind why different actors behave the way they do, so it is essential to clarify the impacts, drivers and the actual challenges we face, as actors' behaviours are key.

Bly Joyce explained that policy tools can give incentives but "one solution does not fit all." There need to be specific tools designed for each aim. If we want to have an effect on behaviour, we have to target the right problem, much like the problem with micro plastic pollution from clothing stemming from cheap oil creating cheap fibres to manufacture cheap clothes.

The fast-developing energy sector and a strong marine food sector competing for

4. Green Energy Meets Blue Food | Nordregio

the same space creates conflicts. Since we have a three-dimensional space, the problems get even more complex. We are dealing with varying interests and many different values. Practical experience of co-location is rare. We have to create a balance between the actors and not only co-location. For that reason, we need to understand the different interests, and that takes time. We have to move from a passive coexistence to a proactive planning of coexistence and even synergies. Cumulative impacts over time can create new conflicts. How can we handle imbalances between actors of different sizes? One incentive for some actors could be a compensation for the trade-offs.

Nordic challenges include rapidly growing issues such as conflicts over the overlap between wind farms and fishing areas. The three-dimensional space in depth/surface makes it even more complex, multi-faceted, involving the interaction of many varying interests and values. Synergies mainly exist with aquaculture, with a consensus on marine spatial planning that points to co-location. More processes than governance might be needed to make it long-term sustainable.

The project aims to delve deeper into what drives and what hinders collaboration between actors in the green and blue sectors through a series of case studies from the Nordic nations. These case studies will be conducted across varied geographical locations, examining governance practices related to managing the coexistence of offshore wind energy with marine food sectors. There are also a series of workshops planned for 2025 that aims to engage stakeholders from the Baltic Sea, North Sea, and North Atlantic regions, facilitating discussions on governance challenges and solutions for sector coexistence from local to cross-border levels.

Some highlights so far from the project include:

- Policy tools can provide incentives, but one solution does not fit all
- Targeting the right problem is crucial
- Moving from passive coexistence to proactive planning
- Realizing that we cannot have 100% of all there is in the ocean, trade-offs are necessary. Through marine spatial planning (MSP), we can still create win-win situations
- Both use and non-use values are important

A better understanding of these dynamics is essential for fostering collaboration within the Nordic region. Effective governance and collaborative approaches are necessary to manage conflicts arising from overlapping interests between offshore renewable energy and marine food sectors in the Nordic region. While there are significant challenges due to spatial overlaps, there are also opportunities for synergy that can be harnessed through improved marine spatial planning.

Key takeaways:

- The importance of sustainable coexistence between offshore renewable energy and marine food sectors in the Nordic region.
- Need for collaborative governance and marine spatial planning to manage conflicts and find win-win solutions.
- Recognition of the complexity added by the three-dimensional nature of marine space, involving varying interests and values.
- Incentives, both economic and regulatory, are crucial, but understanding actors' behaviors and targeting the right problems are essential for effective governance.
- Moving from passive coexistence to proactive planning is necessary for long-term sustainability.
- Significant challenges exist due to spatial overlaps, but synergies, especially with aquaculture, can be harnessed through marine spatial planning.
- We need an enhanced exchange of experiences within the Nordic region.

Jessica Hjerpe Olausson presented the Mistra C2B2 initiative,[5] which focuses on finding a balance between environmental sustainability, economic growth, and social equity through innovative strategies and collaboration among stakeholders. She also discussed the Nordic BioBuz project,[6] which aims to establish biodiversity credits and multi-use business models for offshore wind farms in Sweden.

Olausson highlighted the current state of ocean governance and the urgent need for a more integrated approach to address the challenges facing various stakeholders in marine industries. She emphasized that improving ocean governance requires a comprehensive strategy that incorporates sustainable development goals, stakeholder engagement, and adaptive management.

To tackle issues within the blue economy, innovative solutions and stronger collaboration among diverse stakeholders are essential. A key component of C2B2 is the development of LivingLabs, set to take place in three regions of Sweden west, east, and north. Two LivingLabs, LivingLab East and LivingLab West, were launched in September. These forums will bring together various marine

5. Mistra Co-Creating Better Blue – For a sustainably blue economy in Sweden.
6. Nordic BioBuz | Nordic Innovation

stakeholders, including fisheries, wind power companies, researchers, and authorities, to discuss challenges, experiment, identify knowledge gaps, and resolve conflicts.

The principal challenges within the blue economy involve environmental degradation, economic and social concerns, governance and policy obstacles, and stakeholder coordination. Effectively addressing these challenges requires a holistic approach that aligns environmental sustainability with economic development and social equity. Enhanced international cooperation, paired with innovative technologies, is vital for fostering a successful blue economy.

Key takeaways:

- Advocates for a holistic approach to ocean governance integrating sustainable development goals, stakeholder engagement, and adaptive management strategies.
- Highlights the importance of innovative solutions and enhanced cooperation among stakeholders to address challenges in the blue economy.
- Stresses the integration of environmental sustainability, economic development, and social equity in ocean governance.

Karina Barquet from The Stockholm Environment Institute presented some current work with reviewing incentives for multifunctionality. The review examines various European countries' approaches to fostering multifunctionality in maritime spaces, highlighting incentives and challenges within different regulatory frameworks. Key research questions include identifying the tools used for multifunctionality, the sectors that utilize these approaches, and which countries lead in this area.

Notably, regulatory challenges are prominent, with inadequate legislation for multifaceted use (MU) and conflicts among sectoral laws being significant barriers. Safety regulations around offshore installations remain insufficient, particularly affecting activities like pescatourism. Additionally, tensions exist between environmental legislation aimed at carbon reduction and the need for renewable energy.

A lack of harmonized policies was identified, revealing discrepancies among countries regarding Maritime Spatial Planning (MSP) maturity. Effective integration of regulations across sectors rather than the existence of MSP itself is essential for promoting MU. Risk management frameworks for multi-use activities are underdeveloped, leading to liabilities that often deter stakeholders.

Public participation in policy processes is often limited, dominating stakeholder influence, which can skew decision-making. There is also a tendency for public procurement processes to favor single sector operations, reducing the encouragement of diversified activities. Furthermore, methods to analyze combined activities' risks are lacking, impeding the potential for impactful MU practices.

The review highlights examples of tools and policies across different countries that promote MU, including:

- Germany: MSP implementation supporting MU projects.
- Belgium: Regulation allowing offshore aquaculture within wind energy zones under specific conditions.
- Norway: Multi-use zoning for sea-based aquaculture.
- UK: Advanced policies incentivizing co-location of energy and fisheries.
- GreeceLegislation facilitating pescatourism.
- Sweden and UK: Safety zones allowing certain activities near offshore wind farms.

The potential benefits of MU include enhanced biodiversity, support for fisheries, aquaculture opportunities, and tourism initiatives that diversify income streams. Economic incentives like governmental subsidies and tax breaks for multifunctional installations serve to drive feasibility and innovation.

Lastly, the review underscores the importance of ongoing research and development, public-private partnerships, and innovative monitoring technologies that facilitate multifunctional use in marine ecosystems.

Examples of multifunctionality:

- Co-use: Utilizing the same facility for various outcomes.
- Co-location: Sharing the value chain.
- Co-existence: Using the same base resource in different locations.
- Governance includes soft measures beyond regulations, with obstacles such as a lack of trust and knowledge about environmental impacts.

Key takeaways:

- Emphasizes balancing environmental sustainability, economic growth, and social equity through innovative solutions and stakeholder collaboration.
- Analyzes leading countries in marine multifunctionality, focusing on resource co-use, co-existence, and value interactions through legislative, economic, and technical measures.
- Identifies major challenges such as the absence of multi-use policies, unclear safety regulations, and social and economic hurdles.

International work: Business perspectives

Speakers: Turid Øygard, Offshore Norway, Hanna Bauge, Fiskebåt, Sonja Andrén, Innovatum & Karl Strømsem Subfarm

Turid Øygard from Offshore Norway and Hanna Bauge from Fiskebåt discussed strategies for fostering collaboration between the offshore wind industry and fisheries in Norway. Emphasizing the importance of early dialogue and systematic planning, they highlight the government's goal of developing a competitive offshore wind sector while minimizing conflicts with existing fishing activities.

Norway aims to allocate space for 30 GW of offshore wind capacity by 2040, with a collaborative forum established by the energy minister to facilitate stakeholder discussions. Offshore Norge represents companies involved in ocean wind park development, while the Fiskebåt advocates for commercial fishing interests. The strategic goals for offshore wind focuses on job creation in Norway related to offshore wind development and reducing CO_2 emissions sustainably while ensuring coexistence between different business interests.

Future challenges include determining acreage loss for fisheries and resolving disputes between industries. Successful coexistence between offshore wind development and fisheries requires systematic planning, early stakeholder engagement, and political commitment to protect fishing interests. Key factors for success include political commitment, genuine influence in decision-making processes, and careful planning of infrastructure like subsea cables to avoid disrupting fishing activities.

The Norwegian government has established a collaborative forum with working groups representing various interests. This structured and transparent process aims to utilize the exception provision effectively, focusing on coexistence rather than co-location. One of the first things to come out of the collaborative forum is the so called "Dreieboka" or "Playbook".[7] The aim of the playbook is for it to function as a recipe to avoid conflict between the industries in the development and operation of offshore wind projects, within areas that the authorities have already opened for such development. The book is intended as a practical handbook and reference book for when and how the industries should have a dialogue, involve each other, discuss and cooperate in various activities related to offshore wind projects. A

7. Principles and manual/guideline for offshore wind and fisheries - Offshore Norge

system for dialogue has been set up, emphasizing early communication. For the fishing industry, this means addressing the inevitable development of wind power.

Key factors for success include:

- Agreement on principles, vital for the fishing industry
- A national objective for development
- Genuine influence in decision-making processes
- Strategic selection of initial areas, avoiding significant spots
- Ensuring areas are adaptable throughout the process
- High standards for area efficiency
- Focus on nature mapping and data collection
- Utilization of best available technology (BAT)
- Extensive use of subsea cables and securing their funding

Norway plans to build offshore wind farms (OWF) producing 30 GW by 2040, with 20 ocean areas designated for OWF. Three have already been auctioned, with the first bid won by Venture, partially owned by IKEA. The remaining 17 areas will be auctioned next year. Government-designated areas, decided through extensive dialogue, reduce conflict levels. Co-existence, not co-location, is the primary goal.

- Importance of early dialogue and systematic planning to promote cooperation between the offshore wind industry and fisheries.
- Goals to develop a competitive offshore wind sector in Norway while minimizing conflicts with existing fishing activities.
- Establishment of a collaborative forum to promote stakeholder dialogue, focusing on coexistence rather than competition.

Bauge from Fiskebåt states that political will ensures the establishment of OWF, advocating for coexistence. Early involvement and real influence are essential, as is selecting the right areas initially. Adaptable zones for future changes and add-ons are also crucial. Success factors include nature mapping, BAT, subsea cables, and decommissioning.

In conclusion, the process is paramount, and leadership is necessary. The collaboration around the handbook has helped the sectors establish a way forward, making it easier now than at the beginning.

- Political will and real influence in decision-making processes are crucial.
- Significance of selecting the right areas initially and making them adaptable for future changes.

- Focus on nature mapping, the use of best available technology (BAT), and extensive use of subsea cables.

Sonja Andrén presented current work at Innovatum Science Park which aims to drive sustainable transformation and regional competitive excellence by supporting innovation investments and fostering collaboration among businesses. Focusing on the blue bioeconomy, the park emphasizes multi-use scenarios in seafood production, highlighting capacity building and stakeholder engagement.

Established in 1997 in Trollhättan, Sweden, Innovatum backs startups and scale-ups, facilitating business development through expert coaching and community access. Key focus areas include sustainable industry, renewable energy, and the blue bioeconomy. With over 3,000 maritime companies employing about 20,000 people in the region, Innovatum aims to enhance local economies through job creation and alternative revenue streams, promoting industrial symbiosis and circularity.

Andrén explains that multi-use scenarios in seafood production drive growth and sustainability in coastal regions. Partnerships with local municipalities like Lysekil and Falkenberg strengthen the blue bioeconomy in Western Sweden.

Co-location of aquaculture with renewable energy has the potential to support sustainable development and increase food self-sufficiency in Sweden. Lysekil and Falkenberg are being studied to identify challenges and opportunities for a common foundation for innovations in food production. Challenges such as socio-economic factors, legal governance issues, technical hurdles, and environmental concerns need addressing for successful implementation.

Andrén also presented the Blue Bio Cluster project.[8] The project will be carried out over three years and focus on enhancing the blue and bio-marine sectors at regional, national, and international levels. Its main goal is to support companies in the blue bioeconomy with innovative tools and methods for business development, fostering sustainable growth and strengthening European coastal communities. Key activities include facilitating connections for startups and SMEs with experts and investors, showcasing integrated circular value chains as models for other coastal regions, and helping companies incorporate ecosystem services into new business models. The initiative will also identify weaknesses in bio-based value chains and promote international collaboration among bio-marine clusters, with Innovatum Science Park in Sweden participating among 12 EU countries.

- Innovatum supports sustainable transformation and regional competitive excellence by fostering innovation and collaboration among businesses.

8. Blue Bio Clusters | Projekt | Innovatum Science Park

- Focus on the blue bioeconomy and multi-use scenarios in seafood production.
- Collaboration with local municipalities to strengthen the blue bioeconomy in Western Sweden.

Karl Strømsem talked about how the OFFWOFF[9] and MARCO[10] projects have begun laying a foundation for investigating whether co-location of floating wind power and fish farming is feasible. However, scaling these concepts requires investment in research and development, as well as pilot projects to test scalability and identify best practices. Strømsem highlights the need for international cooperation, drawing on global expertise to address the technical and environmental challenges inherent in such ambitious undertakings.

Strømsem emphasizes the importance of collaboration among stakeholders, including marine biologists, engineers, policymakers, and the fishing industry, to realize the potential of integrated offshore floating wind farms and submerged aquaculture. The success of this system hinges on meticulous planning, robust regulatory frameworks, and continuous technological advancements.

Initial studies on the Mareld Field suggest significant potential for generating both renewable energy (9–12 TWh) and aquaculture production (60,000 tons), leading to substantial job creation. The future of fish farming in Strømsems opinion lies subsea, as subsea farms for salmon avoid the salmon lice problem, which do not live in colder waters. The SUBFARM system, designed for submerged cage placement between wind turbine towers, is well-suited for this integration.

Economic implications of this integrated approach are profound. By utilizing renewable energy sources and sustainable aquaculture, nations can diversify their energy portfolios, enhance food security, and create resilient coastal economies. The dual benefits of energy and food production promise a more balanced utilization of marine resources, fostering a blue economy that is both prosperous and environmentally responsible.

9. OFFWOFF co-location project | Nordic Innovation
10. Marine co-existence scenario building - Prosjektbanken

Key takeaways:

- Importance of collaboration among stakeholders to realize the potential of integrated offshore floating wind farms and submerged aquaculture.
- Highlights the need for detailed plans, robust regulatory frameworks, and continuous technological advancements.
- Economic implications of integrated access to renewable energy and sustainable aquaculture.

Presentation of the Nordic Innovation report "Barriers to Co-Location in Nordic seas"

Speakers: Thordur Reynisson and Emil Gejrot, Nordic Innovation

Advisers Thordur Reynisson and Emil Gejrot gave a presentation about Nordic Innovation, an organization under the Nordic Council of Ministers working to connect, strengthen and support businesses across the Nordic region. In this work, Nordic Innovation also supports the Nordic vision for 2030: that the Nordic region will become the most sustainable and integrated region in the world by that year.

Reynisson described how Nordic Innovation has been working in eight different thematic programs over the past four years. One of these programs is Sustainable Ocean Economy, the aim of which is to make the Nordics the leading region for sustainability in the ocean economy. Following an initial mapping of strongholds, the program was split into three separate work packages on ocean biomass, marine co-location and marine testbeds. Nordic Innovation is currently funding two projects related to ocean biomass, while concrete activities related to marine testbeds are still being developed. The second work package on marine co-location has thus far included a hackathon, funding for two pilot projects (OFFWOFF and Nordic BioBuz, mentioned above in this report) and several events – including this conference.

Gejrot then introduced the most recently completed work: a report on barriers to co-location in Nordic seas.[11] In the report, written by a freelance journalist on commission from Nordic Innovation, stakeholder interviews and literature reviews are used to identify the most pressing obstacles to the realization of marine co-location in the Nordic region. Barriers mentioned include:

- Regulatory hurdles
- Environmental problems
- Technology gaps
- Security concerns

11. Report on Barriers to Co-Location in Nordic Seas

The conclusion is that there needs to be more active support in policy and planning across the Nordic region, but also that the Nordic countries are well-placed to provide that support – perhaps under the auspices of the Nordic Co-operation.

Gejrot and Reynisson concluded by teasing some upcoming activities within the Sustainable Ocean Economy program, including two calls for proposals on future scenarios and testbeds, respectively.

Panel discussion

Participants: Anders Drottja Swedish Ministry of Rural Affairs, Ásmundur Guðjónsson Independent Consultant, Unni Kløvstad Nordic Council of Ministers, Åsa Dyberg Freja Offshore

The conference wrapped up with a panel of Nordic policymakers, researchers, and stakeholders exploring new perspectives on collaboration for co-location. They highlighted successful initiatives like the algae farms in the Faroe Islands, which enhance spawning grounds while minimizing sea conflicts. While co-location has faced some criticism, it presents significant opportunities if effectively managed.

Embracing innovation and fostering dialogue among industries will be crucial for realizing these benefits. Aquaculture, as an emerging sector, can leverage co-location to drive growth and environmental sustainability. It was noted that simply having conflict-free areas is insufficient for meeting our energy production targets.

The panel agreed that the conference served as a valuable learning experience, providing insights and lessons for participants to take back to their respective Member States to reinforce policy development. While there is a prevailing notion that co-location may pose challenges, it can also present opportunities if approached bravely and innovatively. Continuous engagement and dialogue between industries are essential to understanding the benefits of coordination. As the aquaculture sector continues to grow, co-location could play a pivotal role in its development while also benefiting the natural environment.

Upon returning home, participants will focus on fostering inclusive dialogue, co-creation, and equality throughout this process. From the wind industry's perspective, maintaining the momentum of discussions initiated at the conference is paramount. Guðjónsson will present the outcome from the conference to the Faroe Islands authorities once the conference report is finalized. The Nordic Council of Ministers is set to emphasize marine issues in future collaborations and seeks to influence the EU agenda in this area, exploring potential use of grant funding to support these efforts.

Collaboration requires breaking down silos among stakeholders with an interest in the sea, along with the introduction of more incentives for such cooperation. Dyberg from Freja Offshore highlighted the need for neutral facilitators to kickstart these partnerships while emphasizing the importance of regionally tailored solutions. Education and mutual understanding among stakeholders will also be key. Ultimately, while co-location is important, the goal must extend beyond mere physical proximity to achieving broader environmental and social values.

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Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland and Åland.

Nordic co-operation has firm traditions in politics, economics and culture and plays an important role in European and international forums. The Nordic community strives for a strong Nordic Region in a strong Europe.

Nordic co-operation promotes regional interests and values in a global world. The values shared by the Nordic countries help make the region one of the most innovative and competitive in the world.

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