

Second Nordic Forum on Climate Change in Fisheries and Aquaculture



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This publication is also available online in a web-accessible version at:

<https://pub.norden.org/temanord2024-530>



NORDIC MARINE THINK TANK



Vestland
fylkeskommune



Nordic Council
of Ministers



ICES
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Executive summary

The Nordic Marine Think Tank re-joined ICES for a second collaboration to host the Nordic Forum on Climate Change in Fisheries and Aquaculture. The forum was held in Bergen, Norway, 30 November 2023.

The primary aim of this forum was to serve as a platform for stakeholders encompassing the fisheries, aquaculture, scientific, and policymaking realms to engage in substantive dialogues about their role in climate change and the co-existence with offshore wind. Its overarching goal was to foster the exchange of ideas and insights towards active mitigation of the impact of these critical sectors on climate change. Recognizing climate change as a pervasive global challenge necessitating concerted efforts across the maritime industry, the forum endeavors to galvanize actionable solutions that promote harmonious co-existence of sustainable offshore activities across diverse sectors.

Key outcomes of the workshop encompassed a thorough examination of primary concerns regarding offshore wind initiatives from the fishing industry's perspective. Discussions ranged from wind park design considerations to exploring avenues for fishing representatives and practitioners to participate in Marine Spatial Planning. Moreover, critical research inquiries delved into methodologies for assessing the impact of offshore wind farms, alongside strategies for collaborative engagement with governmental energy, fishing, and environmental agencies to establish regulatory frameworks and foster cross-sectoral cooperation in addressing knowledge gaps. Additionally, the workshop deliberations encompassed the ethical dimensions, deep-sea technology applications, and the utility of digital twins in advancing sustainable, transdisciplinary offshore development, in collaboration with other maritime sectors.

Emerging priorities for future endeavors include fostering enhanced industry-research dialogues on wind park design and data acquisition, as well as forging new consortia to spearhead future proposals for EU and Research Council of Norway funding. These initiatives aim to drive pragmatic and strategic co-existence initiatives between offshore wind entities and fishing stakeholders. The Nordic Marine Think Tank and ICES reaffirm their steadfast commitment as collaborative partners in advancing public discourse on offshore marine spatial planning and conducting research to bolster sustainable exploitation of resources from our Ocean.

Expert group information

Expert group name	Workshop of the Second Nordic Climate Change Forum for Fisheries and Aquaculture (WKNCCFFA2)
Expert group cycle	NA
Year cycle started	2023
Reporting year in cycle	1/1
Chair(s)	Dorothy J. Dankel, Norway Lisa Pfeiffer, USA/Denmark
Meeting venue(s) and dates	30 November 2023, Vestlandssalen, Bergen, Vestland County, Norway (70 participants, including 5 online participants)

1. Setting the Scene

The Nordic Marine Think Tank and the International Council for the Exploration of the Sea (ICES) hosted the second Nordic Climate Change Forum for Fisheries and Aquaculture in Bergen 30 November 2023. The theme of the session was "Dealing with maritime space and user conflicts in a new era of offshore wind". The workshop was moderated by NMTT Chair Dorothy Dankel assisted by ICES representative Lisa Pfeifer. The workshop was made possible by financing from the Nordic Council of Ministers and was generously aided by facilities made available from the regional authorities of Vestland County Council in Bergen.

The event opened with a welcome from the Vestland fylkeskommune Deputy County Mayor Stian Jean Opedal Davies, who used the building, Vestlandshuset, as an example of how things can be done differently – it is built using sustainable methods and materials, and the roof is covered in solar panels. The Chair of the Nordic Marine Think Tank, Dorothy Dankel, the NOAA Fisheries and ICES Offshore Wind liaison, Lisa Pfeiffer, and the Chair of the ICES Science Committee, Jörn Schmidt, welcomed everybody and gave a brief history of the event^[1] and the hosting institutions.



Figure 2: Deputy County Mayor of Vestland County, Stian Jean Opedal Davis, welcomes the workshop participants in "Vestlandssalen." Photo by Andrea Magugliani.



Figure 3: Participants in the newly opened Vestlandssalen in downtown Bergen (not shown: online participants). Photo by Andrea Magugliani.

1. Report of the Inaugural Joint ICES-NMTT Workshop launching the Nordic Climate Change Forum for Fisheries and Aquaculture (WKNCCFFA) found here: https://ices-library.figshare.com/articles/report/Joint_ICES-NMTT_Workshop_launching_the_Nordic_Climate_Change_Forum_for_Fisheries_and_Aquaculture_WKNCCFFA/19248953

1.1 Overview of offshore wind technology and the political ambitions for offshore wind in the EU and Norway

Finn Gunnar Nielsen, Professor Emeritus University of Bergen, Bergen Offshore Wind Center

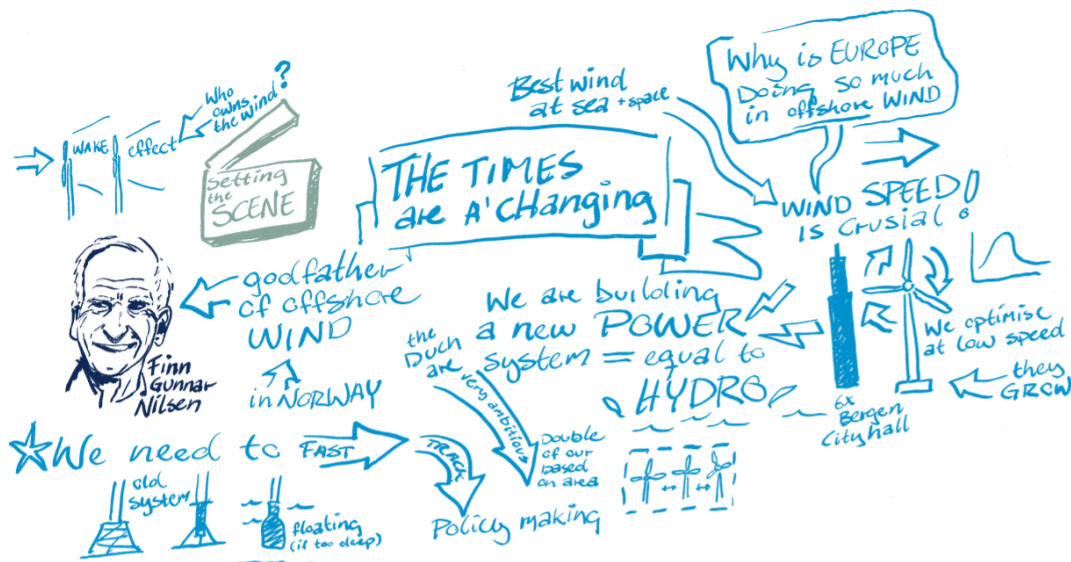


Figure 4: Graphical summary of Finn Gunnar Nielsen's talk. Illustration by Håvard Legreid.

To kick-off the workshop and to introduce the participants to the workshop theme of offshore wind energy, Finn Gunnar Nielsen provided an overview of the changing times, focusing on the European Union (EU) Green Deal's efforts to promote renewable energy structures for enhanced energy security. According to the International Energy Agency's 2019 prediction, offshore wind is projected to become the primary contributor to power supply in the EU by 2040 in line with the Green Deal objectives. Europe boasts numerous regions characterized by high wind speeds, positioning it to potentially lead in wind farm development. The resources for nearshore and offshore wind in the EU significantly exceed current demand.

Nielsen also delved into the various types of offshore wind turbines and their evolving sizes, while emphasizing the challenges and opportunities associated with floating offshore wind technology. He raised thought-provoking questions about ownership of wind resources and its implications for wind farm placement, considering factors such as wake effects and wind direction, particularly in the context of multiple companies vying for space.

1.2 Being a trusted facilitator: Positioning fisheries, biodiversity and offshore wind debates in the Northeast coast of USA

Kanae Tokunaga, Gulf of Maine Research Institute



Figure 6: Graphical summary of Kanae Tokunaga's talk. Illustration by Håvard Legreid.

The Gulf of Maine Research Institute (www.gmri.org) plays a leading role in engaging various sectors in offshore wind development across the USA, leveraging its multidisciplinary expertise in marine and fisheries research. The USA has set a target to harness its offshore wind and energy potential by 2030, with a significant portion expected to be derived from floating offshore wind. The northeastern region of the US stands out as one of the most promising areas for wind and energy development.

Tokunaga emphasized the importance of sharing the best available information and enhancing stakeholder engagement capacity in the planning process. This is crucial due to potential conflicts arising from various sectors such as fisheries, shipping, and conservation. The Gulf of Maine Research Institute is actively collaborating with stakeholders to bolster this capacity. Their efforts include engaging fishing community members, organizing port meetings, and providing resources like logistical support for public input. These inputs were factored in when identifying potential areas for wind energy development.

Recognizing the significance of local social dynamics, it's imperative for offshore wind solutions to be integrated with local needs and priorities to effectively address the climate crisis. This underscores the necessity of aligning offshore wind development with both environmental and social considerations.

1.3 Offshore wind in a Social-Ecological-Technical and Ethical system: Preparing for an ethical dialogue in a Nordic context

Rita Vasconcellos L. d'Oliveira Bouman, SINTEF Ocean & FME NorthWind,
Norwegian Research Center on Wind Energy

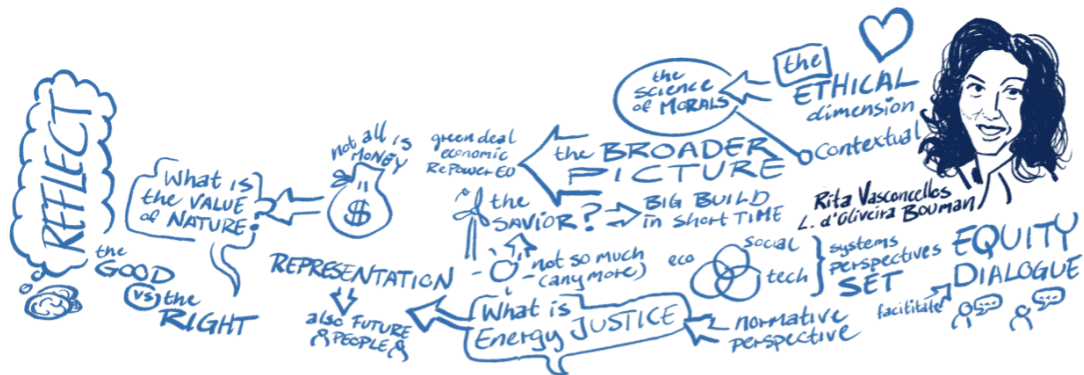


Figure 8: Graphical summary of Rita Bouman's talk. Illustration by Håvard Legreid.

Bouman integrated ethics into the conversation surrounding offshore wind development. The overarching goal is to transition society towards green energy, primarily driven by concerns related to climate change and environmental crises, necessitating a shift away from fossil fuels towards renewable energy sources. Offshore wind is poised for rapid and significant growth within a short timeframe to meet European energy targets and achieve climate objectives.

In Norway, initial planning for offshore wind was progressing well until recently, but there's now a growing apprehension at the societal level regarding the potential for social conflicts that need addressing before further development can proceed.

Offshore wind occupies a central position within the SET framework (social, ecological, and technological systems), which are intricately intertwined, forming a complex system. Utilizing this framework can aid in understanding the emerging social resistance to offshore wind in Norway. It's crucial to map out the effects of offshore wind, considering various expectations and concerns. Understanding the ethical principles and values inherent in the Norwegian offshore debate and how they intersect with concepts of justice and nature is necessary.



Figure 9: Rita Bouman discusses the many ethical dimensions of co-existence in offshore areas.
Photo by Andrea Magugliani.

Currently, there's a lack of fair representation in offshore wind decisions, partly due to the absence of robust process guidelines, impacting both current and future representation in the decision-making process. This issue of mis- or underrepresentation must be acknowledged and rectified. Bouman emphasized the need to question the value of nature and human wellbeing, and the role of money within these contexts. Effective technology should maximize benefits while distributing burdens equitably, incorporating environmental considerations and ensuring the rights and freedoms associated with its usage.

The social dynamics surrounding offshore wind projects are deeply rooted in normative principles, but there's a clash between concepts of nature and justice. For example, who has the moral authority to make decisions about where and how to build new wind parks? How is this authority related to power? Who's views matter? Addressing these normative issues early in the process is crucial for the successful design and implementation of offshore wind projects.

2. Experiences and Expectations of Offshore Co-existence with Fisheries and other Maritime Sectors

The Nordic Marine Think Tank invited governance representatives from Sweden and Norway to present current experiences with offshore co-existence, followed by a debate with other Nordic agencies and fisher organizations.

2.1 Proposal for amended Swedish marine spatial plans

Per Olsson, Unit Director, Marine Spatial Planning, The Swedish Agency for Marine and Water Management



Figure 10: Graphical summary of Per Olsson's talk. Illustration by Håvard Legreid.

In 2022, Sweden finalized its first maritime spatial plans, which designated areas for offshore wind production to meet climate and energy targets. However, updates are necessary to increase energy production, aiming to raise production from 30 to 90 TWh, with an additional 200 TWh needed by 2050 to meet demand.

The task is to identify ways to boost energy production while considering co-existence between wind power and other interests. Currently, 53 areas are proposed, each facing various conflicts. The process to revise the marine spatial plan must be completed by December 2024, involving two consultation processes before presenting the final proposal to the government for approval.

The proposed Swedish marine spatial plan will prioritize marine energy extraction while making adjustments for areas of high natural value and use. The plan involves expanding proposed areas or introducing supplementary areas to accommodate increased energy extraction.

For the Gulf of Bothnia, which is a UNESCO heritage site and supports small-scale fisheries, 11 proposed energy areas and 11 alternatives are being considered. Despite some conflicts, there are ample opportunities for bottom-fixed foundations and grid connections.

In the Baltic Sea, extensive national defense interests, shipping, fishing, and high natural values present challenges. Six proposed energy areas with 18 alternatives are being evaluated, although grid connections and military interests pose uncertainties.

Skagerrak and Kattegat, known for their high natural values for recreation and tourism, face conflicts due to extensive commercial fishing. The impact assessment considers environmental, social, and economic factors, including effects on bird migration routes, marine mammal habitats, fish spawning, and commercial fisheries.

A significant learning from the Swedish maritime spatial planning exercises is the main conflicts with fisheries, particularly regarding new floating structures that hinder fish trawling and vice versa. Efforts are ongoing to address these conflicts with the fishing industries.

2.2 The Norwegian cross-directorate marine spatial planning experience

Kari Grundvig, Directorate of Fisheries, Norway



Figure 12: Graphical summary of Kari Grundvig's talk. Illustration by Håvard Legreid.

The Directorate of Fisheries holds a shared responsibility for marine life in Norway. After oil and gas, seafood (wild caught and farmed seafood) products are the largest export in Norway and 2023 was a record-breaking year^[2]. Norway's fishing management is dynamic and undergoes constant changes based on market conditions and the health and location of fish stocks.

Within the directorate, there's a specialized group focused on marine spatial planning that spans across different directorates. They pinpoint areas in Norway with low fishing activity and prioritize them for offshore wind development. Although some of these areas still see fishing, they're spacious enough, surpassing the initial 30 GW requirement for offshore wind capacity. This makes offshore wind development viable in these locations.

A Strategic Impact Assessment (SIA) aims to pinpoint five areas to be opened for license bids by 2025, with plans to open others later. However, the potential conflict with open ocean aquaculture arises, with two potential industries overlapping with offshore wind. Decision-making now centers on evaluating the costs and benefits of these overlaps. The weighting of these considerations is a political rather than scientific process, prompting questions on how to consider the trade-offs of priorities among fishing, aquaculture and offshore wind. This decision-making process should incorporate scientific input.

Technical reports will assess the suitability of different areas for various uses, involving trade-off analyses to determine the most favorable outcomes.

2. <https://en.seafood.no/news-and-media/news-archive/record-exports-of-norwegian-seafood-in-2023-due-to-price-growth-and-weak-krone/>

2.3 Stakeholder panel debate

Mia Høgi, Pelagisk Forening, Norway

Niels-Herman Oxholm Johansen, Danmarks Fiskeriforening Producent Organisasjon

Lísa Anne Libungan, Fisheries Iceland

Christopher Harman, Norwegian Offshore Wind Cluster

Antonio Aguera Garcia, Institute of Marine Research, Norway



Figure 14: The stakeholder panel debate. Photo by Andrea Magugliani.

The panel debate opened with an invitation for audience members to engage with the speakers and panelists through questions and comments. Niels-Herman Oxholm Johansen from Denmark raised a question about the experience of Danish fishermen with offshore wind farms, citing concerns about the loss of fishing areas. He noted that about one-third of Danish sea areas have been designated for wind farms since the mid-1990s, primarily in the North Sea. Mia Høgi discussed the process in Norway to identify additional space for wind farms with minimal conflict with fisheries, acknowledging that while it has been more interdisciplinary, there are still shortcomings in stakeholder representation. Lisa Anne Libungan inquired about the outlook for offshore wind in Iceland, expressing concern that fishing representatives' comments are not adequately considered in decision-making processes.

Christopher Harman highlighted the Norwegian offshore wind cluster's support for offshore wind but raised questions about data responsibility and trustworthiness in decision-making processes.

Antonio Aguera Garcia discussed the potential for co-existence between low-trophic aquaculture and offshore wind, emphasizing the need to assess conflicts and plan accordingly.

Questions from the audience touched on topics such as the reef effect of wind farms, the availability of scientific knowledge, and the importance of coordinated research on long-term effects and operation and maintenance. The discussion concluded with reflections on the possibilities and challenges of co-existence between human activities and marine environments, emphasizing the need for caution and consideration of potential environmental impacts.



Figure 16: The first panel debate. Photo by Andrea Magugliani.



Figure 17: During this workshop, artist Håvard Legreid sketched the discussion which the participants could view in real-time on a screen in the front of the room. The result can be seen in the graphical workshop abstract in Figure 1. Photo by Andrea Magugliani.

3. Ecosystem Monitoring of Offshore Wind and Marine Spatial Planning

In this next group of speakers, after the lunch break, we focused on monitoring the offshore sectors and their impact on the marine environment as well as the role of monitoring and the process of Marine Spatial Planning.

3.1 Special guest performance: "Anthropogenic underwater sound and zooplankton"

Emilie Hernes Vereide, PhD candidate, University of Oslo/Institute of Marine Research, Bergen

Winner of the Researcher Grand Prix Bergen scientific public speaking event 2023.

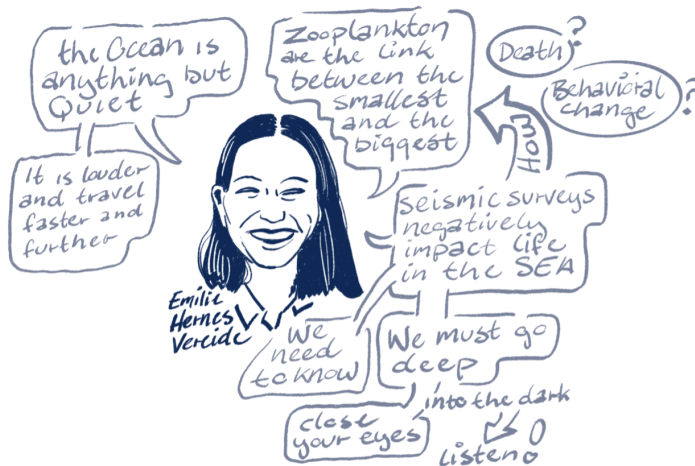


Figure 18: Graphical summary of Emilie Vereide's talk. Illustration by Håvard Legreid.

Emilie Hernes Vereide's research focuses on the impact of anthropogenic sound on marine life, particularly zooplankton, which serve as a crucial link between the smallest organisms and the largest species in the ocean. One prevalent source of underwater noise today is seismic surveys, where seismic air guns are used to penetrate the seabed. While it's well-known that seismic surveys affect fish and marine mammals, the impact on species that cannot swim away remains uncertain due to contradictory research findings. Laboratory studies attempt to replicate seismic noise, while field studies involve conducting seismic surveys at sea. These studies suggest that zooplankton may be affected by sound and seismic surveys, potentially resulting in mortality, particularly at close distances. However, the behavioral and movement patterns of zooplankton change under the influence of sound.

Understanding how sound affects species that passively float in the water is essential to comprehending marine life's experience of their environment. Echolocation, where sound functions as vibrating particles and pressure waves, plays a crucial role in how marine animals perceive and are affected by sound underwater. While most research indicates that seismic surveys may not have a significant lethal impact on zooplankton, there's a need to delve deeper into how these surveys affect marine life, especially over the long term. Since fish and other marine life depend on zooplankton, it's imperative that we understand these consequences before continuing to exploit the ocean's resources. Listening more attentively to the ocean's signals is crucial for better stewardship of marine ecosystems.



Figure 19: Emilie Vereide with an engaging scientific monologue on the impact of anthropogenic (human-induced) underwater sound to the marine environment. Photo by Andrea Magugliani.

3.2 Mapping effects and consequences of the establishment of offshore wind for the Norwegian fishing industry: Insights from Hywind Tampen

Anne Christine Utne Palm, Institute of Marine Research, Bergen



Figure 20: Graphical summary of Anne Christine Utne Palm's talk. Illustration by Håvard Legreid.

Dorothy Dankel delivered a presentation on behalf of Anne Christine Utne Palm, as SINTEF is a partner on the project presented on fishers' concerns with offshore wind in Norway. The project's objective was to gather existing knowledge, including interviews with fisheries, to examine whether the establishment of offshore wind farms occurs in close collaboration with the fishing industry. Offshore shallow areas contain resources such as oil, wind, and fisheries, with wind occupying more space than oil. The current study areas for wind coincide with bottom trawl fisheries, which are impacted by the presence of wind farms.

Research conducted the past year has shown that fishers have significant concerns about the loss of fishing areas and the lack of alternative locations as a result of new wind farm plans. There is limited understanding of the noise effects from offshore wind farms, and their placement may disrupt migration routes and spawning grounds. Furthermore, there is a scarcity of studies on the cumulative effects on fishing resources. Existing research indicates that wind farms influence local ecosystems, but it remains uncertain whether these local impacts translate to broader ecosystem or population-level effects. Many studies discuss potential effects rather than actual impacts, with few incorporating biological data from fisheries. Interviews conducted as part of the project reveal fisher's perception that their concerns are inadequately addressed, as they feel fisheries are not given due importance.

The planning process for new areas involves fishing organizations and stakeholders directly affected by the development. Ensuring sufficient time and space for cross-sectoral dialogues during the planning process was deemed crucial. However, sustainability considerations such as climate footprint, co-existence, waste management, and nature conservation were excluded from the criteria due to tighter deadlines in the European permitting process.

3.3 ICES Research Roadmap for Offshore Wind

Lisa Pfeiffer, ICES Expert in Residence

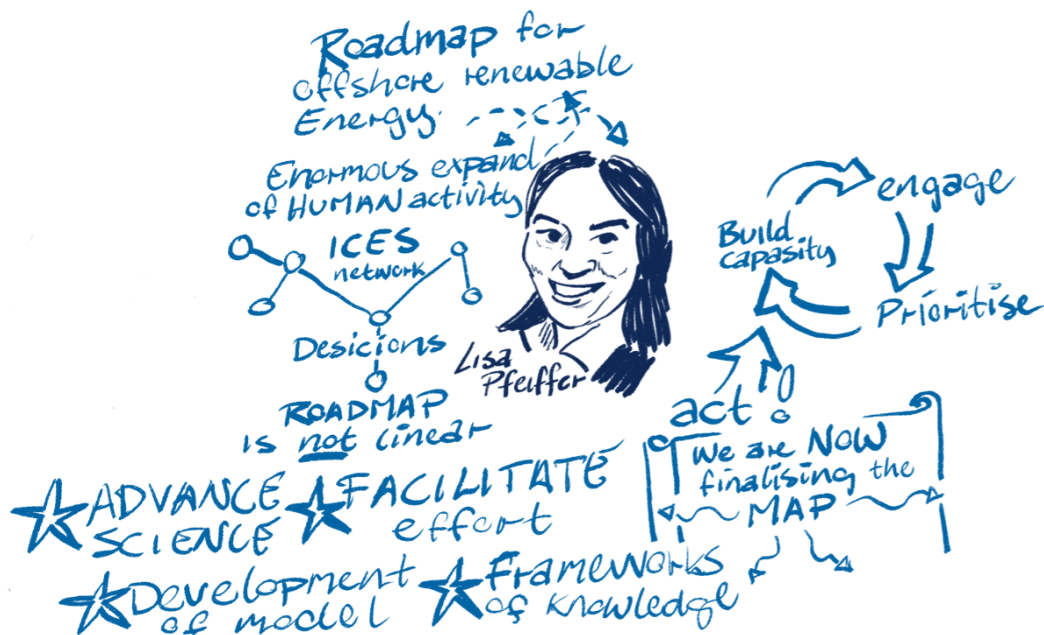


Figure 21: Graphical summary of Lisa Pfeiffer's talk. Illustration by Håvard Legreid.

Offshore renewable energy is growing at unprecedented rates, the largest human change of ocean space, driven by climate change and energy security. Lisa Pfeiffer introduced ICES, the world's oldest and largest marine science network, which operates as an inter-governmental organization with a mission to address societal needs through a network of science, policy, and industry experts. ICES prioritizes various areas, including fisheries and the environment, and recognizes that offshore energy developments will impact all of these scientific domains. Consequently, there arose a need to create a roadmap that integrates offshore energy considerations. The roadmap's development followed a cyclical process, evolving as new knowledge and goals emerged.

Within ICES, three working groups focus specifically on offshore renewable energy. Through the roadmap development process, several goals were identified, primarily revolving around objectives for science, data, and advisory services. The roadmap will outline priority actions aligned with these objectives within a cyclical framework. This framework begins with engagement and priority definition, encompassing tasks such as assessing trade-offs, establishing guidelines for monitoring and assessment, crafting ecosystem-based management advice, and evaluating the impacts of offshore renewable energy on fisheries. The upcoming steps involve finalizing and publishing the roadmap and hosting a workshop, WKWIND^[3] in Copenhagen 29 April –2 May 2024, to address trade-offs and develop terms of reference for other priority areas.

3. <https://www.ices.dk/community/groups/Pages/WKWIND.aspx>

3.4 State-of-the-art offshore monitoring technology

Kai Stoltz, GCE Ocean Technology, Norway

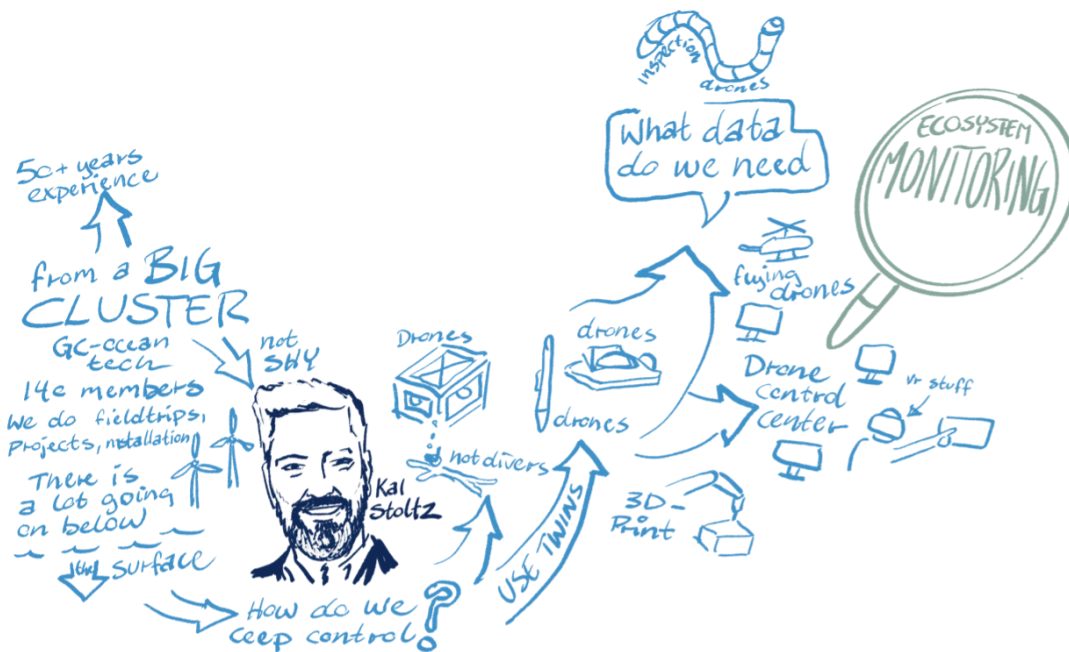


Figure 22: Graphical summary of Kai Stoltz's talk. Illustration by Håvard Legreid.

Kai Stoltz discussed ocean monitoring, focusing on the GCE Ocean Tech cluster, which encompasses the entire value chain in the ocean sector, including academia. Norway draws from over 50 years of experience in offshore development, including oil and gas, as well as operation and monitoring. Offshore wind parks have extensive underwater components, such as cables and structures, necessitating comprehensive monitoring throughout their lifespan. There are over 36 critical elements that require continuous monitoring in an offshore wind park. To effectively manage and monitor these elements, various technologies are employed, including drones and remotely operated vehicles (ROVs)



Figure 23: Kai Stoltz demonstrating next generation underwater technologies for use in the offshore wind industry. Photo by Andrea Magugliani.

3.5 Bringing Marine Spatial Planning processes into a Nordic context: What do we need to know?

Sigrid Eskeland Schütz, Faculty of Law, University of Bergen



Figure 24: Graphical summary of Sigrid Schütz's talk. Illustration by Håvard Legreid.

Sigrid Eskeland Schütz highlighted the significant offshore development underway and emphasized the importance of understanding the legal implications of this development. There's a crucial need to establish consistent regulatory standards both within Exclusive Economic Zones (EEZs) and across borders. From a political standpoint, the Nordic countries share common interests in geopolitics and EU policies, particularly regarding energy security and initiatives like the EU Green Deal. EU policy, notably the taxonomy, emphasizes green investments focusing on nature restoration and nature-inclusive design. The Green Deal aims to streamline permission processes and identify areas suitable for rapid renewable energy development. Additionally, the concept of multi-use, including the establishment of marine industrial sites or energy "islands," is being explored.

While regulatory frameworks in the Baltic Sea are largely harmonized due to EU membership, complexities arise in the North Sea, with some non-EU countries are only members of the European Economic Area (EEA). Even within the EU, full harmonization in marine spatial planning is lacking. Establishing a common regulatory language could facilitate the development of best practices, promote regulatory knowledge innovation and transfer, and enhance trans-border cooperation and planning in the Nordic region.

3.6 Handling complexity, co-existence and collaboration using digital twins: Visual evidence and data driven decisions on dynamic data models

Eirik Solberg and Håvard Legreid, Digital Tvilling



Figure 26: Graphical summary of the talk by Digital Tvilling. Illustration with self portrait by Håvard Legreid.

A digital twin is essentially a digital representation of some aspect of the real world upon which we can build and interact. It typically takes the form of a visual representation, such as a map, with various layered elements. During the presentation, a current digital twin map was showcased by Eirik Solberg and Håvard Legreid, demonstrating features like oil and gas platforms, ships, and production areas. While digital twin technology relies on digital tools, humans are still responsible for their development, which can introduce errors in data input. These digital twin maps contain vast amounts of data and can be utilized for prediction and forecasting purposes.

Digital twinning enables functionalities like flow balance and analytics dashboards, including real-time mapping and control towers. It allows for the integration of different data sources to create a unified and evidence-based understanding for improved decision-making. A critical aspect of digital twins is their ability to attribute properties to both entities and relationships, facilitating the integration of diverse datasets. Moreover, digital twins serve as visual tools for fostering dialogue around cooperation, co-existence, and prediction scenarios. When exploring scenarios, digital twinning aids in evaluating trade-offs and facilitates discussions concerning various options.

3.7 Roundtable discussion and commitments from Nordic leaders

Geir Huse, Research Director, Institute of Marine Research; Norway

Ola Christian Olsen, Olsen Gruppen AS; Norway

Hanne Wigum, Leader Offshore Wind Concepts, Equinor; Norway

Rita Vasconcellos L. d'Oliveira Bouman, Applied Ethicist, SINTEF Ocean; Norway

Sigrid Eskeland Schütz, Faculty of Law, University of Bergen; Norway

Meinhard Eliassen, Energy Consultant, Faroese Environment Agency; Faroe Islands



Figure 28: The Roundtable discussion, moderated by Dorothy Dankel from the Nordic Marine Think Tank (far left). Photo by Andrea Magugliani.

Geir Huse, Research Director at the **Institute of Marine Research** (IMR) in Norway, discussed the collaborative efforts between IMR and ICES in studying offshore wind. He emphasized IMR's role as a knowledge provider covering various aspects of ocean research. Geir highlighted ICES's expertise in ocean wind and marine spatial planning, allowing IMR to tap into this network. He stressed the international impact of offshore wind plans and noted IMR's extensive scientific staff, most of whom actively participate in ICES working groups. Geir said:

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We need to collect data, and we also need to set up a data system with best practices. We need to prioritize what to look at first (the biggest risk) in terms of effects of wind farms in the marine ecosystem.

Ola Christian Olsen, representing the **fishing sector**, emphasized the economic significance of fishing in Norway and its potential parity with offshore wind energy. He debunked the misconception that marine areas are free and stressed the importance of ensuring maps accurately reflect the dynamic nature of fishing activity over time. Ola Christian said that:

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I learned a lot today, and it is very interesting for this conference to open my mind a bit. The development process of offshore wind will not happen overnight, so we need to do it as cleverly as possible. And my industry will participate.

Meinhard Eliassen, an Energy Consultant from the **Faroese Environment Agency**, discussed the challenges and opportunities for offshore wind in the Faroe Islands. He highlighted ongoing exploration for offshore wind farms and the need for alternative energy technologies due to the country's isolated power grid.

Hanne Wigum, Leader of Offshore Wind Concepts at **Equinor**, emphasized the importance of balancing environmental concerns with offshore wind development. She highlighted Equinor's experience in co-existing with nature and society and stressed the importance of international collaboration in offshore wind development. Hanne said:

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Equinor has over 50 years of experience operating in harmony with nature and society. There are many challenges to address, and it's crucial to begin from a solid foundation. The governmental processes in Norway are a good starting point, such as focusing on areas with the fewest conflicts of interest, and continuing to foster good dialogue and data sharing. It's essential to strengthen the capacity for dialogue within Nordic countries. Innovative wind concepts and ideas can drive Nordic leadership in offshore wind development.

Rita Vasconcellos L. d'Oliveira Bouman from **SINTEF Ocean** highlighted the need for ethical considerations and stakeholder engagement in decision-making processes. She emphasized the importance of understanding stakeholders' aspirations and concerns before presenting plans and suggested creating a platform for stakeholders to express their concerns. Rita also connected the theme of power asymmetries among offshore industries with data variability:

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If data is not there or difficult to acquire, then the power dynamic changes. When we talk about people, like fishermen, and using their knowledge, we are taking their knowledge so we need to give something back as well. It has to be a sharing process. There is inherently a power imbalance between quantitative data and qualitative data, because the former is much more available and “easier” to obtain.

Marloes Kraan from **Wageningen University Research** (NL) and co-Chair of ICES expert group WGSOCIAL contributed to the plenary discussion by highlighting the need for a comprehensive understanding of social impact assessments, in addition to ecological and economic assessments. She noted that while there is clarity on what constitutes ecological and economic impact assessments, the same cannot be said for social impact assessments. Marloes emphasized the importance of maintaining a strong fishing industry, particularly in Norway, contrasting it with the Netherlands where economic considerations often outweigh other factors. She raised concerns about the diminishing presence of fisheries in the crowded European space and emphasized the need to address this issue. Marloes also discussed the challenge of incorporating qualitative data into decision-making processes, suggesting that engaging with fishers could provide valuable insights. However, she noted that relying on fishers' input for decision-making could potentially diminish their influence in the political process.

Sigrid Eskeland Schütz from the **University of Bergen** underscored the importance of visualizing impacts and scenarios in offshore development. Sigrid noted: “I need to understand the real world and challenges, and try to disseminate knowledge on fairness across the offshore sectors.” Sigrid also discussed the importance of wind farms to open for early engagement of fishers in offshore wind park development:

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A wind park project is usually initially designed in detail and is very rigid and doesn't allow for a lot of input, so the flexibility of the initial stages in a project development is also very important to lay a foundation for co-existence.

A Professor of Law, Schütz added that adaptation is crucial in addressing the challenges of offshore wind energy development, requiring a reevaluation of methods to expedite processes and reduce costs. Safety emerges as a significant concern in this transition, particularly as offshore wind presents distinct safety challenges compared to other industries. Collaboration with experienced researchers in offshore wind is prioritized to mitigate risks effectively. However, despite efforts, some offshore workers remain hesitant to transition due to safety apprehensions. Meanwhile, there is a recognized need for a deeper understanding of real-world challenges and the aforesaid commitment to disseminate this knowledge to foster fairness in decision-making processes.

Jörn Schmidt from **ICES** discussed ICES's role as a trusted broker for scientific information and emphasized collaboration across disciplines and countries.

The discussion addressed issues of data access, funding for impact assessments, and the incorporation of climate change impacts into marine spatial planning. The panel reflected on the challenges and opportunities presented by offshore wind development, with commitments to further dialogue, engagement, and ethical considerations in future endeavors.

4. Closing of workshop and policy recommendations

In closing the workshop, Dorothy Dankel highlighted the excitement surrounding the phase ahead, emphasizing the convergence of various stakeholders, data, and knowledge. She announced plans to compile the insights gathered during the workshop into a comprehensive report for submission to ICES, with dissemination at the ICES Workshop to develop guidelines on how to approach the ecological, economic, and social trade-offs between offshore renewable energy developments (wind farms) and fisheries (WKWIND) 29 April – 2 May 2024.



Figure 29: Closing of the workshop by (from left) Lisa Pfeiffer, ICES, Dorothy Dankel, NMTT, and Jörn Schmidt, ICES. Photo by Andrea Magugliani.



Figure 30: Participants at the workshop in the Vestlandssalen meeting room November 30, 2023 in the Vestland Fylkeskommune in Bergen, Norway. Photo by Andrea Magugliani.

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Following Dorothy, Lisa Pfeiffer acknowledged the challenges previously encountered and resolved in the marine domain. She stressed the importance of drawing upon collective knowledge and experiences to sustainably manage the development of offshore renewable energy, considering the interplay between new and established sectors.

Jörn Schmidt directed his remarks to Early Career Researchers (ECRs), outlining the multiple avenues available for engagement within ICES, including the strategic initiative tailored for ECRs. He encouraged ECRs to directly reach out to the chairs of relevant groups to explore involvement opportunities. Dorothy concluded by expressing gratitude to NMTT and the hosts, Vestland County Council, for their invaluable contributions to the workshop's success.

Following the results of the workshop, the Chairs and the Board of the Nordic Marine Think Tank offer three recommendations:

1. **Establishment of new Industry-Research Consortia for Offshore Wind social-ecological-technical Innovation:** The policy recommendation would entail creating dedicated novel groups of diverse experts, supported by current and future funding calls from the EU and Research Council of Norway, to drive innovation in offshore wind park design and data acquisition. These consortia would bring together industry stakeholders, research institutions, and relevant government bodies to collaborate on developing and implementing cutting-edge technologies and methodologies. By fostering enhanced industry-research dialogues and providing financial support, these consortia can accelerate the development of sustainable offshore wind solutions.
2. **Continued Facilitation of Industry-Research Dialogues:** A policy recommendation would involve the facilitation and incentivization of regular industry-research dialogues focused on offshore wind park design and data acquisition. Government agencies could organize forums, workshops, and conferences where stakeholders from the offshore wind industry and academic research community can exchange ideas, share best practices, and collaborate on addressing key challenges. By fostering a culture of collaboration and knowledge sharing, these dialogues can drive innovation, improve industry practices, and enhance the overall competitiveness of the offshore wind sector. ICES and the Nordic Marine Think Tank remain committed to this effort.

One of the most crucial issues regarding offshore wind development is the potential impact on marine ecosystems and biodiversity. Offshore wind projects have the potential to disrupt marine habitats, affect migratory patterns of marine species, and alter the distribution of marine life. This can have significant ecological consequences, including the loss of biodiversity, changes in food webs, and disruption of important ecological processes.

3. **Credible Integration of Fishing Stakeholders in Marine Spatial Planning:** This policy recommendation involves integrating fishing stakeholders into the process of marine spatial planning for offshore wind development. Government agencies and industry consortia should actively engage with fishing communities to understand their concerns, priorities, and needs regarding offshore wind projects. By incorporating input from fishing stakeholders into the planning and decision-making process, policymakers can promote pragmatic and strategic co-existence initiatives that minimize conflicts between offshore wind entities and fishing interests. This approach can help ensure the sustainable exploitation of marine resources while supporting the growth of the offshore wind industry.

Annex 1: List of participants

First Name	Last Name	Affiliation/Institute	Country (of institute)
Ola Christian	Olsen	Olsen Gruppen AS	Norway
Mette	Skern-Mauritzen	Head of research, Institute of Marine Research	Norway
Lolita	Troilo	Social Scientist, TotalEnergies	France
Eva Marie	Skulstad	Head Engineer, Institute of Marine Research	Norway
Paul Gustav	Nyland	Senior Adviser, The Norwegian Directorate of Fisheries	Norway
Linn	Vetaas	Senior Adviser, Directorate of Fisheries	Norway
Charlotte	Lem	Senior advisor	Norway
Margrethe	Aanesen	senior researcher, Centre for applied research, Norwegian School of Economics	Norway
Karianne	Thorbjørnsen	Senior adviser, the Ministry of Trade, Industry and Fisheries	Norway
Tove M.	Gabrielsen	Professor, University of Agder	Norway
Liaqat	Zeb	Postdoc	Norway
Bichitra Nanda	Sahoo	Postdoctoral fellow, University of Bergen	Norway
Geir Lasse	Taranger	Havforskningsinstituttet	Norway

Kasper	Olsen	Nordic Marine Think Tank	Denmark
Emilie	Hernes Vereide	PhD candidate, Institute of Marine Research/UiO	Norway
Nazar	MOHAMED	Faculty of medicine, K1. SEAS post-doc, University of Bergen	Norway
Zoran	Sargac	Postdoc, University of Bergen	Norway
Hanne	Wigum	Equinor	Norway
Johnny	Lokøy	Pelagisk Forening (Pelagic Fishermen's Association)	Norway
Geir	Huse	Institute of Marine Research	Norway
Håvard	Legreid	Digital Tvilling	Norway
Eirik	Solberg	Digital Tvilling	Norway
Kai	Stoltz	GCE Ocean Technology	Norway
Emilie Hernes	Vereide	Institute of Marine Research	Norway
Christopher	Harman	Norwegian Offshore Wind	Norway
Lísa Anne	Libungan	Fisheries Iceland (SFS)	Iceland
Niels-Herman Oxholm	Johansen	Danske Fiskeriforening (Danish Fishermen's Association)	Denmark
Mia	Høgi	Pelagisk Forening (Pelagic Fishermen's Association)	Norway
Kari	Grundvig	Directorate of Fisheries	Norway
Siv Elén	Vedvik	Postdoctoral fellow, Faculty of law, University of Bergen	Norway
Per	Olsson	Swedish Agency for Marine and Water Management	Sweden
Kanae	Tokunaga	Gulf Of Maine Research Institute	USA

Finn Gunnar	Nielsen	University of Bergen	Norway
Jörn	Schmidt	ICES	Denmark
Lisa	Pfeiffer	NOAA Federal	Norway
Dag Rune	Storelid		Norway
Terhi	Minkkinen	Communications Officer, ICES	Denmark
Sissi	Liu	Researcher, University of Bergen	Norway
Elin	Leander	Stockholm Environment Institute	Sweden
Frans	Sjölander	Stockholm Environment Institute	Sweden
Jørgen Brandt	Theodorsen	Norwegian Energy Partners (NORWEP)	Norway
Øivin	Aarnes	Principal Environmental Scientist, DNV	Norway
Monica	Sanden	Researcher, Institute of Marine Research	Norway
Elisa	Ravagnan	Chief Scientist NORCE	Norway
Hans Petter	Klohs	Co-Founder & Director, ADEPTH Minerals	Norway
Ingvar	Henne	Senterleder SFI Smart Ocean, University of Bergen	Norway
Claire	Cardy	CCO, Nortek	Norway
Mike	Woodborne	Director PRM Ocean Mineral Projects	Norway
Jeovah	Lima	VP Business Development - Imenco AS	Norway
Sara	Walstad	Student at University of Bergen	Norway
Agnes	Thunem	Masters in Sustainability student, University of Bergen	Norway

Carl-Christian	Schmidt	Vice Chair, Nordic Marine Think Tank	Norway
Mari	Bjordal	Aquaculture researcher, DNV	Norway
Henry	Boddington	Sales Development Parker	Norway
Hege	Hammersland	Business Development Manager	Norway
Kelvin	Ivankovic	Researcher at HVL	Norway
Sjur	Øyen	Sr. Data Engineer at Halliburton - Sperry Drilling Services - SDL	Norway
Paul	Alabi	Assistant operations manager FC energy	Norway
Terje	Norheim	Founder CEO	Norway
Elyse	Hauser	Freelance Journalist - hosted by the Center for Investigative Journalism (SUJO)	Norway
Petter M	Johannessen	CEO, IFFO - The Marine Ingredients Organisation	Norway
Silje	Vindenes	Adviser, Vestland Fylkeskommune	Norway
Finn	Corus	Masters in Sustainability student at University of Bergen	Norway
Stine	Lines	Masters in Sustainability student at University of Bergen	Norway
Hanne	Hjelle Hatlebrekke	Researcher, SINTEF Ocean	Norway
Stuart	Squires	CEO, Advanced Innovations AS	Norway
Junyong	You	Senior Researcher, NORCE	Norway
Kai	Stoltz	Business Development Manager, GCE Ocean Technology	Norway
Karianne Kojen	Andersen	Innovation Manager GCE Ocean Technology	Norway

Leila	Neimane	post-doctoral researcher, University of Bergen	Norway
Solfrid Sætre	Hjøllo	Senior scientist, Institute of Marine Research	Norway
Anna	Furhovden	Masters in Sustainability student at University of Bergen	Norway
Marloes	Kraan	Researcher Wageningen University Research	Netherlands
Andrea	Magugliani	University of Bergen	Norway
Xiurou	Wu	Postdoc Researcher at SNF of Norwegian School of Economics	Norway
Johan	Blomquist	Researcher, Swedish University of Agricultural Sciences	Sweden
Sonja	Feldthaus	Secretariat, Nordic Marine Think Tank	Denmark
Arvind	Keprate	Associate Professor Oslo Metropolitan University	Norway
Sigrid Eskeland	Schütz	Prof., Faculty of law, University of Bergen	Norway
Staffan	Waldo	Researcher at Agrifood Economic Centre	Sweden
Katrin	Vilhelm Poulsen	Senior adviser, Nordic Council of Ministers	Denmark
Rita	Vasconcellos d'Oliveira Bouman	SINTEF Ocean	Norway
Lars	Clink	Nordic Marine Think Tank Secretariat	Norway
Dorothy	Dankel	Senior Research Scientist, SINTEF Ocean; Chair, Nordic Marine Think Tank	Norway

Annex 2: Workshop booklet



 **NORDIC MARINE
THINK TANK**

 **ICES
CIEM** International Council for
the Exploration of the Sea
Conseil International pour
l'Exploration de la Mer

**Nordic Marine
Think Tank and ICES
Joint Workshop**

Second Nordic Climate Change Forum for Fisheries
and Aquaculture:

Norway
30th of November
2023

Dealing with Maritime Space and User Conflicts in a New Era of Offshore Wind

WELCOME

Second Nordic Marine Think Tank and ICES Forum: Advancing Climate-Resilient Fisheries and Aquaculture

Welcome to the Second Nordic Marine Think Tank (NMTT) and ICES Forum!
We are thrilled to have you join us for this pivotal gathering dedicated to advancing climate-resilient practices within the fisheries and aquaculture sectors in the Nordic region.

BACKGROUND

Building upon the resounding success of the inaugural Nordic Marine Think Tank and ICES "Nordic Climate Change Forum for Fisheries and Aquaculture" (WKNCCFFA), this second edition of the NMTT & ICES Forum continues the crucial dialogue initiated by diverse stakeholders, policymakers, scientists, and industry experts. The aim is to confront the multifaceted challenges posed by climate change within the fisheries and aquaculture sectors.

KEY INSIGHTS FROM THE PREVIOUS FORUM

- **Shift Towards Aquaculture:** Acknowledgement of the inevitable rise of aquaculture as a primary source of future seafood.
- **Standardization of CO2 Measurements:** Recognizing the need for unified protocols to measure CO2 emissions.
- **Research Emphasis:** Highlighting the necessity for further research on value chain dynamics and consumer acceptance of new species.
- **Policy Frameworks:** Stressing the urgency for dedicated climate change policies within the fisheries and aquaculture sectors.

YOUR ROLE AT THE FORUM

As a participant, your valuable insights and expertise will contribute significantly to shaping actionable strategies that address climate challenges in the Nordic fisheries and aquaculture sectors. Engage in dialogue, share experiences, and collaborate to pave the way for a sustainable and adaptive future.

NORDIC MARINE THINK TANK AND ICES JOINT WORKSHOP

JOIN THE DISCUSSION

The Second NMTT Forum promises to be a dynamic platform fostering collaboration, knowledge exchange, and actionable outcomes. Together, let's chart a course toward a resilient and thriving marine ecosystem.

STAY CONNECTED, BE A NMTT MEMBER!

Through a membership in the Nordic Marine Think Tank, and through your participation in the Nordic Forum for Climate Change in Fisheries and Aquaculture, you will connect with fellow participants, access resources, and continue the dialogue beyond the event through our dedicated networking channels.

Membership information is found here:

<https://www.nmtt.org/membership>

We look forward to your active participation and invaluable contributions at the Second Nordic Marine Think Tank Forum, as we collectively strive for a more sustainable and productive future for our marine ecosystems.

On behalf of the NMTT Board,
Dorothy Dankel, Chair
Carl-Christian Schmidt, Vice-Chair

Nordic Marine Think Tank and ICES Joint Workshop

Second Nordic Climate Change Forum for Fisheries and Aquaculture:

Dealing with Maritime Space and User Conflicts in a New Era of Offshore Wind

Agenda is subject to changes

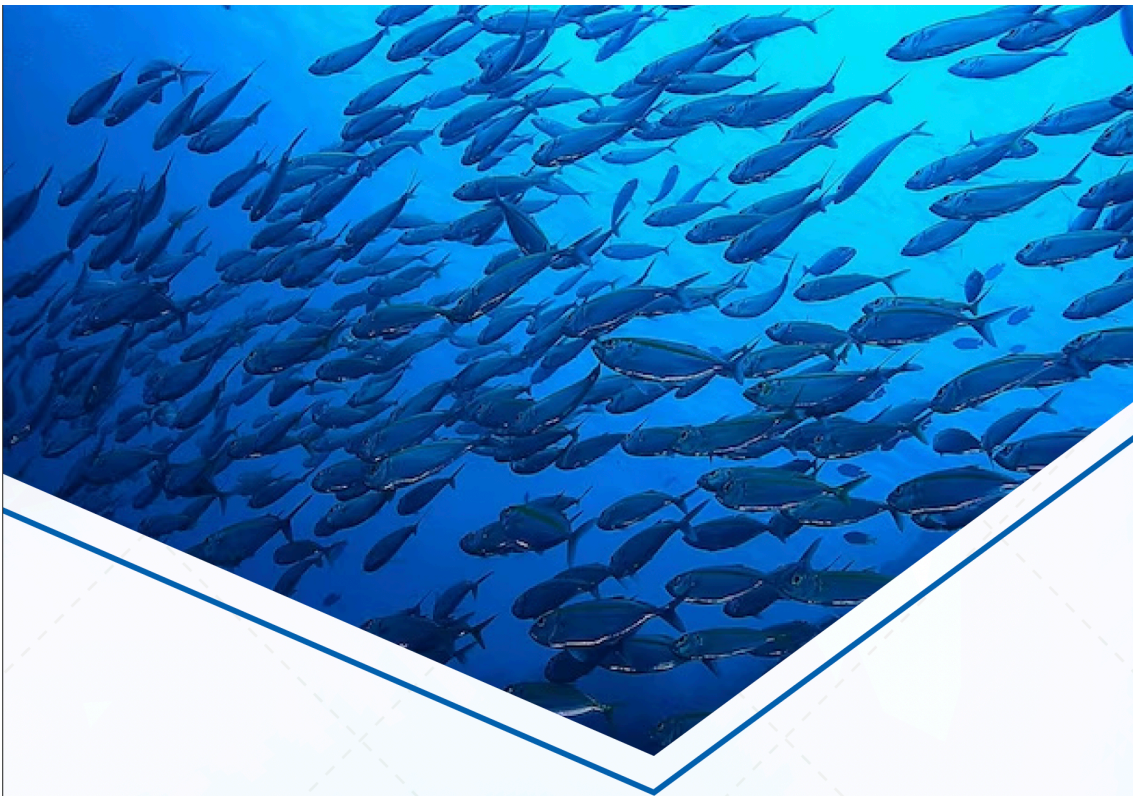
Norway 30th of November 2023

PLACE

Vestlandshuset, Vestlandssalen, Vestre Strømkaien 13, 5008 Bergen

09.30-10.00	Coffee and mingling	
10.00-10.10	Opening and Welcome from Vestland/Fylkeskommune and Bergen Municipality	Fylkesordfører, Bergen Kommune
10.10-10.20	Introduction and overview of NMTT/ICES Joint Workshop objectives and expectations	Dorothy Dankel, Chair, Nordic Marine Think Tank, Lisa Pfeiffer, NOAA Fisheries and ICES Offshore Wind liaison, Jörn Schmidt, Chair, Science Committee, International Council for the Exploration of the Seas
Setting the Scene: Offshore wind outlook		
10.20-10.40	Overview of offshore wind technology and the political ambitions for offshore wind in the EU - and Norway	Finn Gunnar Nielsen, Professor Emeritus Univ. of Bergen, Bergen Offshore Wind Center
10.00-10.10	Being a trusted facilitator: Positioning fisheries, biodiversity and offshore wind debates in the Northeast coast of USA	Kanae Tokunaga, Gulf of Maine Research Institute
10.55-11.15	Offshore wind in a Social-Ecological-Technical and Ethical system: Preparing for an ethical dialogue in a Nordic context	Rita Vasconcellos L. d'Oliveira Bouman, SINTEF Ocean& FME NorthWind, Norwegian Research Center on Wind Energy

		
11.15-11.30	Per Olsson, Unit director, marine spatial planning, Havs- och vattenmyndigheten, Sweden KarlMannbjørn Mortensen, Head of Energy Department, Environment Agency, Faroe Islands	
Ecosystem Monitoring of Offshore Wind		
11.30-11.40	ICES Research Roadmap for Offshore Wind	Lisa Pfeiffer, ICES Expert in Residence
11.40-11.50	Current experiences and research needs for ecosystem monitoring of offshore wind parks	Anne Christine Utne Palm, Institute of Marine Research, Bergen, Norway
11.50-12.00	State-of-the-art offshore monitoring technology	Kai Stoltz, GCE Ocean Technology
12.00-13.00	Lunch, sponsored by the Nordic Council of Ministers	
Expectations of Offshore Co-existence with Fisheries and other Maritime Sectors		
13.00-13.15	The Norwegian cross-Directorate marine spatial planning experience	Paul Oma (TBC), Directorate of Fisheries, Norway
13.15-13.45	Mia Høgl, Pelagisk Forening Niels-Herman Oxholm Johansen, Danmarks Fiskeforening/Producent Organisasjon Christopher Harman, Norwegian Offshore Wind Cluster	
13.45-14.00	Bringing Marine Spatial Planning processes into a Nordic context: What do we need to know?	Sigrd Eskeland Schütz, Faculty of Law, University of Bergen
13.45-14.00	The use of Digital Twins in Marine Spatial Planning: Leveraging ICES data for collaborative scenario planning	Filip Åblom, Digital Tvilling
14.30-14.45	Coffee Break	
14.45-15.20	Roundtable Discussion and Commitments from Nordic Leaders	
	GeirHuse, Research Director, Institute of Marine Research, Jonny Lokøy, PelagiskForening, ++ Pending Invitations to OED, KLD and NFD, ++	
15.20-15.30	Closing of Workshop and Next Steps	Dorothy Dankel, NMTT



Nordic Marine Think Tank and ICES Joint Workshop



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THINK TANK**



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NORDIC MARINE THINK TANK AND ICES JOINT WORKSHOP

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Dorothy Jane Dankel, Carl-Christian Schmidt, Staffan Waldo, Lisa Pfeiffer

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