



Sustainable Blue  
Economy Partnership

**Report:**

# **Blue Economy for the North Sea**

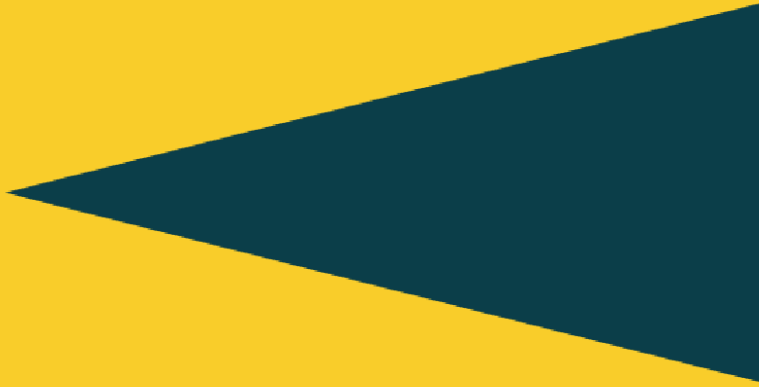
**Sustainable Blue Economy Partnership  
Partnership Regional Workshop**

3<sup>rd</sup> Mission Arena, BlueMissionBANOS  
Amsterdam, The Netherlands  
27 November 2024



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EUROPEAN PARTNERSHIP



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## 1.0 WORKSHOP OUTLINE

### 1.1 SUMMARY

On 27 November 2024, the Sustainable Blue Economy Partnership hosted the ‘**Blue Economy for the North Sea**’ workshop in Amsterdam.

This event was part of a broader series of regional workshops aimed at addressing the unique challenges and opportunities of the blue economy across the European sea basins. Organised in conjunction with the **Blue Mission BANOS Arena 3** event, the workshop also explored synergies between the Partnership and the Mission Ocean.

The workshop brought together senior officials and experts from policy, research, and business communities involved in the blue economy of the North Sea to share contributions and best practices. These discussions are set to inform the Partnership’s Strategic Research and Innovation Agenda and activities, driving forward its efforts to support a sustainable and resilient blue economy.



Figure 1 Group picture of the workshop

This workshop not only showcased the North Sea region’s contributions to the blue economy but also emphasised the critical role of cooperation in advancing the blue economy as a cornerstone of Europe’s sustainable future.

Key takeaways from the presentations, interactive discussion and World Café session included:

- *With the key integrated EU ocean policy, i.e. the European Ocean Pact<sup>1</sup>, in the making, there is a need to build a cohesive and overarching European policy to address the fragmented nature of the blue economy. With diverse policies, stakeholders, financial instruments, and regional needs, a unified framework is essential to accelerate research and innovation and impactful outcomes.*
- *Enhancing stakeholder connections and cooperation was also highlighted as a priority, namely between research organisations and national policymakers as well as businesses. Increased collaboration will help integrate the blue economy into the framework of the European Green Deal and the reinforced emphasis on European competitiveness, supporting key objectives such as the EU's climate and renewable energy targets, and the economic vitality of coastal communities.*
- *As the ocean forms some of Europe's main borders, their role in security and defence is growing. It will therefore be important to position the blue economy at the heart of these conversations, aligning with the new European Commission's focus on defence and security.*







Figure 2 John Bell, Director Healthy Planet, Directorate-General for Research & Innovation


<sup>1</sup> [https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14474-The-European-Oceans-Pact\\_en](https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14474-The-European-Oceans-Pact_en)





Figure 3 World Café discussion

## 1.2 AGENDA

08:45		ARRIVAL AND REGISTRATION	
09:15		<p><b>WELCOMING</b></p> <p>Moderator: Angiolo Boncompagni, Italian Ministry of Universities and Research</p>	<p><b><i>Setting the scene: The role of the Sustainable Blue Economy Partnership in complementarity to the EU Mission Ocean and Waters</i></b></p> <p>Opening statements:</p> <ul style="list-style-type: none"> <li>• Peter Grönwoldt, German Federal Ministry for Education and Research</li> <li>• Elisabetta Balzi, European Commission, Directorate-General for Research &amp; Innovation</li> <li>• Frode Dal Fjeldavli, Research Council Norway, EU Sustainable Blue Economy Partnership</li> </ul>
09:35		<p><b>SESSION 1</b></p> <p>Moderator: Ann-Katrien Lescrauwaet, Flanders Marine Institute</p>	<p><b><i>Multi-use for blue economy sectors in the North Sea</i></b></p> <p>Introduction to the intervention area Statement</p> <ul style="list-style-type: none"> <li>• Olivier Dufourneaud, French Secretary of State for Sea and Biodiversity, Working Track on Multi-use of the Greater North Sea Basin Initiative</li> </ul> <p>Panel Discussion</p> <ul style="list-style-type: none"> <li>• <i>“Large North Sea nature programme”</i> Luca van Duren, Deltares, The Netherlands</li> <li>• <i>“Sustainable decommissioning: Needs towards the reuse and recycling of offshore wind turbines”</i>, Rebecca Verhaeghe, POM West-Vlaanderen, Belgium</li> <li>• <i>“Marine infrastructure security and geopolitics: Promoting strategic governance of the blue economy”</i>, Torsten Linders, University of Gothenburg, Sweden</li> <li>• <i>«Nature Inclusive Design on Sea Basin Level»</i> Timothy Vanagt, ORG, Belgium</li> </ul> <p>Q&amp;A with the audience</p>
10:30		<p><b>SESSION 2</b></p> <p>Moderator: Matthias Sandra, VLIZ</p>	<p><b><i>Blue bioresources for circular economies</i></b></p> <p>Introduction to the intervention area Pitch:</p> <ul style="list-style-type: none"> <li>• <i>“AQUA-UP - Aquafeed Upgraded: Enhancing Immune Function with Seaweed-modified Functional Compounds»</i> Abirami Ramu Ganesan, Norwegian Institute of Bioeconomy Research, Norway</li> </ul> <p>Panel discussion:</p> <ul style="list-style-type: none"> <li>• <i>“Developing smart specialization for circular aquaculture”</i></li> </ul>

	<p>David Bassett, European Aquaculture Technology and Innovation Platform</p> <ul style="list-style-type: none"> <li>• <i>“Research needs for sustainable fishing in offshore wind farms”</i></li> </ul> <p>Andrew G. Gill, British Centre for Environment, Fisheries and Aquaculture Science, United Kingdom</p> <p>Q&amp;A with the audience</p>
<p>11:00</p>	<p>COFFEE BREAK TOGETHER WITH THE MISSION ARENA</p> 
<p>11:15</p> <p>▶ <b>SESSION 3</b></p> <p>Fien De Raedemaeker, Flanders Marine Institute</p>	<p><b><i>Digital twins for sustainable blue economies</i></b></p> <p>Introduction to the intervention area</p> <p>Pitch:</p> <ul style="list-style-type: none"> <li>• <i>“Digital Twins at sub-basin scale in support of ecosystem-based development of offshore activities: the example of animal tracking in the North Sea with DTO-Track (Partnership co-funded project)”</i> Diego del Villar, Loughs Agency, Ireland &amp; Lotte Pohl, VLIZ, Belgium</li> <li>• <i>“Digital Twin of Copenhagen harbour: enabling autonomous monitoring and surveillance of maritime critical infrastructures”</i> Patrizio Mariani, National Institute of Aquatic Resources, Denmark</li> </ul> <p>Panel discussion:</p> <ul style="list-style-type: none"> <li>• <i>“Future uses of the EU Digital Twin of the Ocean for the private sector in support of a sustainable blue economy in the North Sea”</i> Zoi Konstantinou, DG MARE</li> <li>• <i>“Empowering coastal communities through synergies with the digital twin of European coastal marine systems, the case of JERICO-RI”</i> Laurent Delauney, IFREMER, France</li> </ul> <p>Q&amp;A with the audience</p>
<p>12:10</p> <p>▶ <b>SESSION 4</b></p> <p>Moderator:</p> <p>Carine van der Boog – Dutch Ministry of Infrastructure and Water Management</p>	<p><b><i>Managing sea uses for a thriving North Sea</i></b></p> <p>Introduction to the intervention area</p> <p>Panel discussion:</p> <ul style="list-style-type: none"> <li>• <i>“Science agendas for marine conservation and sustainable use of the North Sea”</i> Lisette Enserink, Dutch Ministry of Infrastructure and Water Management/Rijkswaterstaat, representing the OSPAR Commission</li> <li>• <i>“Monitoring and evaluation of Maritime Spatial Plans for sustainable development in the North Sea”</i></li> </ul>

		<p>Ulrich Scheffler, German Federal Maritime and Hydrographic Agency</p> <ul style="list-style-type: none"> <li>• “Enhancing the EU leadership on sustainable dredging for waterborne transport and energy infrastructures”</li> </ul> <p>Paris Sansoglou, European Dredging Association</p> <p>Q&amp;A with the audience</p>
13:00		<p>LUNCH BREAK TOGETHER WITH THE MISSION ARENA</p> 
14:00	<p>▶ <b>SESSION 5</b></p> <p>Moderator: Julie Olivier, Jülich Research Center;</p> <p>Facilitators: Inne Withouck (VLIZ, Early Career Ocean Professional), Ine Moulaert, (VLIZ), Gabrielle Aubert (JPI Oceans);</p> <p>Rapporteurs: Inderjit Singh Marjara (RCN), Frode dal Fjeldavli (RCN), Margherita Zorgno (MUR)</p>	<p><b>Enhancing the resilience of coastal communities and businesses</b></p> <p>Introduction to the intervention area</p> <p>Pitches:</p> <ul style="list-style-type: none"> <li>• “Nature-based coastal management measures - examples from Belgium and the EU project Dunefront”, Ine Moulaert, VLIZ</li> <li>• 3ST Interreg Project “Skills for a sustainable transition of tourism in the North Sea”, Harm Ijben, Impuls Zeeland</li> </ul> <p>World café discussing North Sea cases and needs on:</p> <ul style="list-style-type: none"> <li>• Resilient coastal infrastructures and nature-based solutions</li> <li>• Resilient coastal tourism and diversification of business</li> <li>• Low-impact, regenerative coastal tourism and businesses</li> </ul> <p>Sharing key messages for strategic alignment</p>
15:00	<p>▶ <b>CONCLUSIONS</b></p>	<ul style="list-style-type: none"> <li>• Alain Lagrange, Directorate General for Research and Innovation, Ministry of Higher Education, Research, and Innovation, France</li> <li>• Valérie Dehaut, Ministry of Higher Education, Research, and Innovation, France</li> <li>• Margherita Cappelletto, Italian Ministry of Universities and Research (MUR), Coordinator of the Partnership</li> </ul>
15:30		<p>END &amp; CLOSING SESSION OF THE MISSION ARENA</p> 

### 1.3 REGISTERED PARTICIPANTS

Total number of participants insite and online: 73, from the following nationalities:

Belgium	17
Netherlands	11
Germany	7
Denmark	6
Italy	5
France	4
Norway	4
Poland	4
United Kingdom	4
Sweden	3
Tunisia	2
Bulgaria	1
Finland	1
Indonesia	1
Portugal	1
Spain	1
Tanzania	1

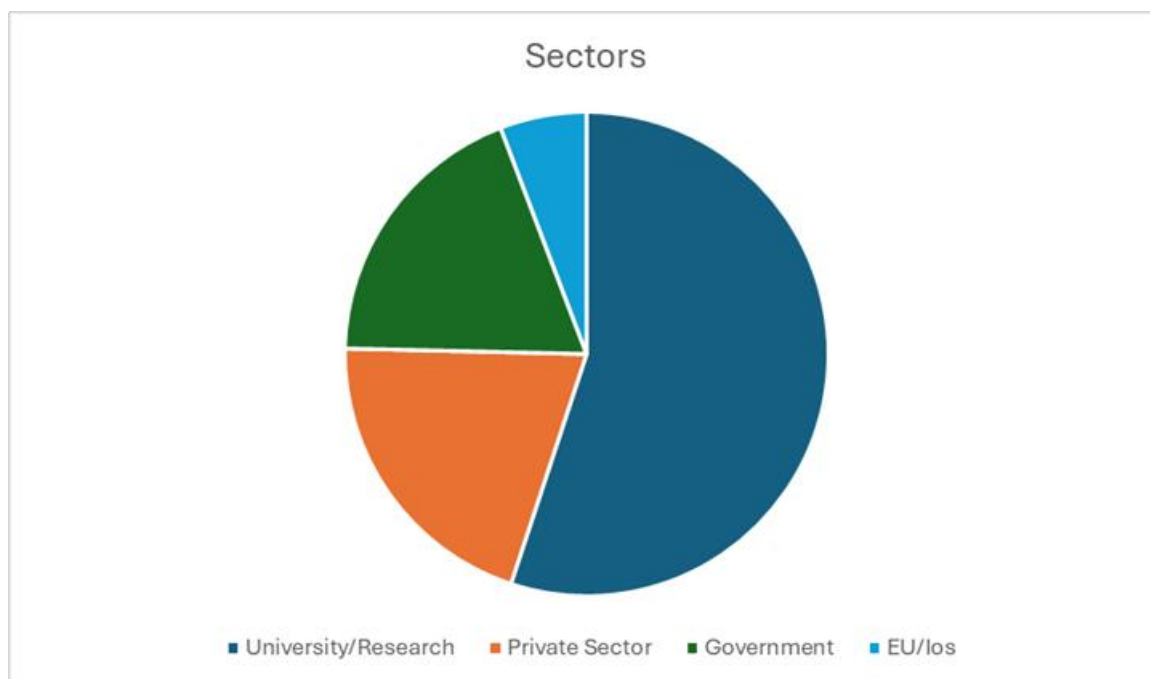


Figure 4: Representation of sectors amongst workshop participants

## 2.0 OUTCOMES

### 2.1 Setting the scene: The role of the Sustainable Blue Economy Partnership in complementarity to the EU Mission Ocean and Waters

Key discussions included environmental initiatives addressing rising sea levels in Europe, the need for collaboration with ministries, and innovative strategies for resilience in human settlements. The importance of partnerships was highlighted, showcasing achievements in the solar economy and the urgency of addressing climate change impacts. The North Sea Greater Initiative was presented as a collaborative effort to preserve marine ecosystems and promote economic resilience. The workshop was deemed a significant milestone for regional cooperation, with plans for future events in March. The partnership's focus on sustainable innovation and alignment with regional agendas was discussed, along with ongoing activities related to research infrastructure and thematic project development.

**Lisette Enserink**, from the **Dutch Ministry of Infrastructure and Water Management/Rijkswaterstaat** on behalf of the Sustainable Blue Economy Partnership (hereafter the Partnership) North Sea Nodes, welcomed all the participants. She highlighted that, starting from the existing Partnership networks with scientific and government institutions as well as with industry and NGOs both of the Netherlands and Belgium, this interaction with the attendees is

useful to understand science and innovational needs to be included in the SBEP Intervention Areas, on which all the sessions this workshop is focusing.

**Peter Grönwoldt, German Federal Ministry of Education and Research**, stressed the vital role of the North Sea for Europe. The North Sea encompasses a unique blend of ecological value, economic activity, geopolitical complexity, and cultural heritage and stands strong as a macrocosm of the global challenge of achieving a sustainable blue economy. The North Sea is also home of the most biodiverse and ecologically significant habitats in the world, including the Wadden Sea, a UNESCO World Heritage Site, which is a testament to the interconnectedness of nature and humanity. Shared by the Netherlands, Germany and Denmark, the Wadden Sea supports millions of migratory birds, marine species, and delicate ecosystems that rely on its shallow waters and nutrient-rich sediments. Since 1978, the governments of Denmark, Germany and the Netherlands have joined forces for the protection of this unique marine ecosystem and formed the **Trilateral Wadden Sea Cooperation** – a best practice example of cross-border cooperation at the scale of the North Sea. In addition to its importance for the shipping industry, the North Sea is vital for fisheries and coastal tourism, and has emerged as a leader in renewable energy, thus driving Europe's green transition. With rising sea levels now threatening these accomplishments, “we must think critically about how to bolster coastal resilience and protect both human settlements and habitats, biodiversity and the ecosystem services.” Nature-based solutions may hold some appropriate keys. **To support coherent policy dialogue on ocean matters, Germany has established an interministerial coordination group** under the leadership of the Federal Ministries for the Environment and for Research - this so-called co-leadership to cooperate more intensively mutually reinforces and complements the **EU Mission “Restore our Ocean and Waters by 2030”**. Finally, across sea basins and across sectors, the Partnership provides a framework for cooperation among Member States by jointly promoting research and innovation from advances in marine renewable energies, multiuse and digital twinning to the development of a sustainable blue bioeconomy. As a test bed for the blue economy, the North Sea provides ground where science, policy and innovation converge to secure a prosperous and ecologically balanced future.

**Elisabetta Balzi, European Commission**, Directorate General for Research and Innovation, acknowledged the commitment of various partners from different countries, emphasising the importance of their achievements in the context of the Partnership, which reflects the collaborative efforts across nations in addressing shared challenges. She congratulated the Partnership for organising this highly relevant regional workshop towards the North Sea and greeted the Netherlands, the German and Norway ministries representatives presented at this opening, for their public political support to the Partnership. She stressed that a new European Commission is about to take office in a crucial moment for the future of our planet, and the urgency to act informs all our Commission's priorities for the new mandate and highlighted that political guidelines of President von der Leyen have also announced key initiatives linked to the workshop and the Mission's work, such as a European Ocean R&I Strategy and a European Water Resilience Strategy and a European Ocean Pact.

For Ms Balzi, the **new European Ocean Pact will support resilient and healthy oceans and coastal areas**, promote the blue economy, manage the use of our seas and oceans coherently and

developing a comprehensive agenda for marine knowledge, innovation, and investment. Also, maritime spatial planning to optimise the different uses of the sea and the ocean's economic potential will be strengthened. For the first time we have a **Commissioner-designate for Startups, Research and Innovation**, Ekaterina Zaharieva, that has clearly stated that Europe's competitiveness and its position in the race to a clean and digital economy will require research and innovation, science and technology at the centre of our economy. Mrs Zaharieva stressed the importance of EU research and the need for the EU Member States to cooperate more closely. Over 90% of Europe's R&I budget comes from the national budgets, the many individual research strategies lead to fragmentation and reduces the effectiveness of the research conducted in Europe. It is then paramount for all EU Member States and the European Commission to enhance their cooperation and seize the opportunities of international cooperation.

There is need for coordinated, and systemic actions to preserve freshwater, inland and marine ecosystems, ensuring the resilience of the economies and the prosperity of communities across the North Sea and Europe. In this sense, Ms Balzi stressed the **Greater North Sea Basin Initiative (GNSBI)** as an important collaborative effort (between Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Sweden, the United Kingdom), focusing on climate change, energy, environmental protection, fisheries management, maritime safety, and cross-border cooperation, with the goal of creating a more connected, resilient, and competitive North Sea region. By cooperating with an integrated and transversal approach, in collaboration with the European Commission, the North Sea region countries work towards the transition to a sustainable, resilient, decarbonised and competitive blue economy.

The Sustainable Blue Economy Partnership and the EU Mission Restore our Ocean and Waters by 2030 are two key initiatives that aim to promote this coordinated and systemic effort. While they share common goals and objectives, they complement each other in terms of their global and regional focus, policy and research emphasis, and stakeholder engagement. By coordinating their actions, these initiatives can help achieve a healthy and productive ocean by 2030 and promote sustainable economic growth and development in the blue economy. As an example, the Mission and the Partnership support the development of integrated maritime spatial planning (MSP) frameworks that balance economic activities with environmental protection. This includes creating digital twins of the ocean to simulate and manage marine environments more effectively to guide sustainable development in marine and coastal areas, ensuring that economic growth does not come at the expense of environmental health.

The Partnership, by bringing together 29 countries, with 74 partners and the EC has demonstrated its role as a joint solution and common understanding to strengthen EU and international science-policy interfaces in marine and maritime-related blue economy domains, by aligning national, regional, and EU R&I priorities and bringing together science, industry, policy, and civil society. Given the strong results and impacts the Partnership wants to achieve in society, the aim will be to further enhance the collective ambitions and the working together of all partners. So, this workshop is an important milestone in our pathway to support R&I cooperation in the North Sea and enrich the Blue Economy in a Sustainable North Sea interconnectivity environment.

By discussing the promotion of sustainable practices while fostering regional cooperation, this workshop is therefore, for Ms Balzi, an excellent opportunity for all North Sea stakeholders to get to know the details of the European Partnership, that beyond the implementation of yearly joint transnational calls, develops a wide and important range of additional activities. For the North Sea community, it is important to fully understand the opportunities to develop science-policy interface actions through the portfolio of projects, the potential benefits of supporting the alignment of monitoring and infrastructure programmes, the multiplication effect of synchronised national calls, but also the potential synergies for funding. Ms Balzi emphasised that the Commission's work on the EU Missions and Partnerships is continuing, and we are as energised as ever to demonstrate how EU Partnerships can help meet the targets and objectives we collectively set, notably as part of the European Green Deal.

For **Frode Dal Fjeldavli, Research Council Norway**, and Head of the Brussels Cellule, the Partnership is one element in a big landscape of actors working together with the Mission and others. The Brussels Cellule exists for the specific reason of connecting synergies with other initiatives that includes everything going on at the international level, seeking alignment to learn from the experience. The Partnership Strategic Research and Innovation agenda must be aligned with regional R&I agendas and hearing from needs and wishes to use this input to feed it into the continuous co-design so that these needs will be reflected in the priorities for the coming years.

The annual intervention areas form the basis for annual calls for proposals, with 19 projects already on the way. A third annual call is planned to be launched in September next year. In addition to the calls, additional activities are planned aligning thematic annual programming. In February 2025, a call for sharing of research infrastructures will be launched and we are looking into what role we can play in ocean observation through the Knowledge Hub establishing portfolios projects both based on thematic or regional approach.

## 2.2 SESSION I - Multi-use for blue economy sectors in the North Sea

The moderator **Ann-Katrien Lescrauwaet from VLIZ (Belgium) and contact node of the Partnership for the North Sea** introduced Session I aimed at exploring how to support the transition in the blue economy, discussing decommissioning, solution-oriented integrated approaches and infrastructures in view of climate change with a focus on how to improve coexistence and multiuse of infrastructures.

**Olivier Dufourneaud, French Secretary of State for Sea and Biodiversity** intervened as co-lead of one of the five **working tracks on multi-use of the Greater North Sea Basin Initiative (GNSBI)**, a nine-country driven voluntary action with the European Commission as a strategic partner, exploring how to strengthen cooperation to tackle spatial and ecological challenges according to the conclusions of the Ministerial Meeting of the Initiative. Among its objectives, well aligned with the goals of the Partnership and the Mission, to develop a **sustainable blue economy in the greater North Sea keeping the balance with marine ecosystems**, focusing on future sustainable practices in fisheries and food production. And ultimately, to **develop cross border and cross**

**sectoral collaboration and to create trust among stakeholders.** In this framework, multi-use addresses the increased competition for access to marine space and optimal use in the limited available physical space in the Basin, considering its ecological carrying capacity. **Synergies and co-location** can accommodate an increasing number of activities while ensuring they remain at sustainable level saving space for marine conservation. Currently, **combinations of activities are being tested across the area as pilots**, e.g. offshore wind with existing activities such as fisheries or new ones like aquaculture and nature restoration. **Full commercial scale** is still **hampered by real understanding of the potential of areas, ecological limits and safety constraints.** Sustainability is central to multi-use, e.g. avoiding overexploitation, and R&I and business input is fundamental in this regard. Finally, **regulatory frameworks and licensing processes need to adapt** to this integrated approach.

Following two preparatory years past the launch, the GSBI has been finally confirmed and ready to open the dialogue with stakeholders to explore in detail the potential of multi-use and where such an international collaboration should focus at first. As far as regards the level of ambition, for a voluntary initiative aiming at mainstreaming innovation, the countries will share best practices to foster a coherent approach towards business-friendly environment at regional level.

A comment was made by the European Dredging Association on economic perspective suggesting thinking competitive and extending the activities of already existing national maritime clusters core business to multi-use.

**Timothy Vanagt, ORG Permanent Modernity** (architecture and system design office), **Belgium** presented the 'Nature Inclusive Design for the Belgian Blue Economy' co-creation toolkit, including in support of GSBI as well as the coastal resilience plans. In response to the question on how alignment can be pursued and at which level of ambition considering different ecosystems and national objectives, he recalled the **importance of ecology for multi-use** considering nature infusive design as multi-use offshore infrastructure.

Working for wind farms both in Belgium and in the Netherlands, there are some discrepancies in the tenders on the interest in investing in nature design beside the economic return. Initiatives like the Greater North Sea Base Initiative can support the **creation of a coherent ecological vision for future projects, including on ecology.** Otherwise, we risk a series of missed opportunities in licensing and nature enhancement as in the case of the energy island in the Princess Elisabeth Zone, while the area has not any nature inclusive design, the energy island itself is now a standard.

Looking at the plans for increasing the number of wind farms in the North Sea, **nature restoration and conservation is important along with nature creation.**

**Luca van Duren, Deltares, The Netherlands** on energy, food and nature transition in the climate change scenario presented the 'Large North Sea nature programme', i.e. a €125 million executive programme for nature enhancement and reinforcement in the North Sea managed by the Ministry of Agriculture, including also NGOs in the core team and the Ecosave Consortium, a group of marine contractors. The programme should provide the opportunity to implement cross border nature restoration.

The presence of participants actively involved in nature restoration and inclusive design indicates a collaborative environment for feedback and discussion. This engagement is crucial for assessing the effectiveness of the initiatives discussed.

In terms of regulatory framework, the moderator recalled that beside the Marine Strategy Framework Directive, efforts are directed at national level to overcome the fragmentation, reaffirming the potential role of the GSBI in further support a common vision. The discussion clarified the purpose of the GSBI, emphasising the need for a common vision that integrates ecological and economic considerations. However, the GSBI will not have as prerequisite a common vision and will adopt a building blocks approach with collaboration on specific topic: while a holistic political vision is desirable, starting with specific collaborative projects is essential for progress.

**Rebecca Verhaeghe, POM West-Vlaanderen**, in her intervention on ‘**Sustainable decommissioning**’ and the needs towards the reuse and recycling of offshore wind turbines addressed the following main points: vision for a unified (ideally beyond Belgium) strategy regarding decommissioning and social acceptance. With the first offshore wind turbines to be decommissioned in ten years, multiple factors need to be taken into account from nature to costs, reuse of monopile for alternative energy and materials

The discussion included the planning of a **common vision for decommissioning offshore wind turbines**, which involves engaging with multiple stakeholders and considering various factors such as environmental impact and material reuse or recycle.

In Belgium, the Nature Restoration Regulation mandates that each component has to be removed, including artificial reefs, while this is not the case in other countries. Mobilisation of industry investing in infrastructure to remove such infrastructure is an additional issue. International plans are needed given the challenge ahead.

With common standards far to be defined for decommissioning, international cooperation and knowledge exchange in such a limited North Sea space opens room for a role of the Partnership as facilitator and to direct research efforts.

**Torsten Linders, University of Gothenburg, Sweden**, intervened on ‘Marine infrastructure security and geopolitics: Promoting strategic governance of the blue economy’. His take on advocating for an open sustainable and more democratic and participatory blue economy relates to understanding that for the North Sea microcosm the present transformation is the starting point: the offshore domain is a steel and concrete-made landscape opening a **new blue era that will change for ever the relationship between the sea and humankind**. Although cascading effects of multi-use are impossible to assess, the seascape will look more and more terrestrial increasingly challenging policy makers.

The moderator concluded by noting that vulnerability and unexpected events call for enhancing cooperation including in defence and industry for critical infrastructures.

## 2.3 SESSION II - Blue bioresources for circular economies

The 'Blue bioresources' intervention area focuses on research and innovation to support a transition to sustainable production and utilisation of blue bioresources. This includes minimising environmental impacts while meeting the demand for healthy and affordable blue food, feed, and biobased products. Transitioning to a circular blue bioeconomy, which fully utilises biomass from fisheries and aquaculture, presents challenges and opportunities. Current policies can hinder the development of new bio-products from waste, but evidence supports policy reform. Developing high-value products through biorefinery approaches and exploring synergies between aquatic farming and agriculture can enhance the value chain and minimise waste.

The moderator **Mathias Sandra from Flanders Marine Institute**, contact node of the Partnership for the North Sea, introduced the session and the speakers.

**Abirami Ramu Ganesan, from the Norwegian Institute of Bioeconomy Research**, presented through a pitch the Partnership cofunded project **AQUA-UP** – 'Aquafeed Upgraded: Enhancing Immune Function with Seaweed-modified Functional Compounds' addressing how it contributes to a sustainable and circular blue economy. The actual challenges of the aquaculture industry are related to diseases spreading all over the fish farms, increasing the necessity of using chemicals and antibiotics threatening the environment, fish health often compromised by fish meals (soybean and other terrestrial land nutrients) due to the lack of digestibility, bioavailability, and functionality issues. In this framework, seaweed is one of the most significant solutions as a sustainable and renewable nutrient. Aqua-up is tapping into the unexploited potential for the benefit of the fish and seaweed aquaculture in a sustainable way, i.e. taking nutrients from the marine environment without affecting the ecosystem, by developing innovation technique to refine the seaweeds. Through **a zero-waste cascading technology into the food system**, seaweeds are used either as food or feed ingredients, also removing anti-nutritional factors (e.g. heavy metals) to create a more digestible feed for fish. This approach is designed to **enhance the production of seaweed and improve the resilience of fish in aquaculture systems, improving the potential of low trophic organisms in the food value chain**. The project involves as well conducting experiments to assess the effectiveness of seaweed as a novel ingredient in feed systems and fish diets, aiming to reduce reliance on unsustainable fish meal sources.

The anticipated outcomes of the project include environmental benefits through improved carbon conversion by seaweed into potential nutrients, mitigation of ecosystem damage, and socio-economic development through job creation in coastal areas. These results highlight the project's potential impact on both the environment and local communities. In this regard, organisations from three different sea-basins are represented in the Consortium to concur to achievements at the local scale.

Abirami Ramu Ganesan answered to a question from the audience (Flanders Marine Institute - VLIZ) asking whether, under the consideration that fish meal is a very unsustainable food source, seaweeds can feed also carnivores' fish that usually get fat fish meal: Aqua-up will work with omnivore and carnivore fish using seaweeds to minimise the intake of fish oil and soybean, replacing them with substitutes in different percentage. This includes testing different percentages of seaweed to evaluate its impact on gut health in fish.

**David Basset**, General Secretary of the **European Aquaculture Technology and Innovation Platform (EATiP)** addressed the European Union's funding for innovation transfer and its implications for regional development. He introduced the 'thematic smart specialisation platform' (TSSP) for Smart Circular Aquaculture in the framework of the EU cohesion policy investing €380 billion to integrate EU countries and, among other things, encourage industry and innovation transfer from regions with high innovation index to regions with low innovation index. This aligns with the participants' interests in understanding how to leverage these funds for their projects.

The platform works on valorisation of byproducts, energy transition, precision farming and capacity building. He promoted the alignment of regional priorities to develop smart circular aquaculture and explained how his work is relevant to this intervention area. It is important that the intervention area evolves in a clear direction to reach its objectives considering that smart specialisation as a place-based approach plays a role in circular aquaculture. The North Sea region should contribute to the establishment of circular aquaculture.

Answering a question from the audience about innovation needs for the aquaculture industry, David Basset recalled that the function of a European technology platform on aquaculture is to develop a strategic research and innovation agenda for the sector in terms of policy work. Finfish, shellfish, algae, cold and warm waters, R&I across the board: despite the broad variety, guiding issues are **circularity, sustainability, profitability, environmental balance, and impact**.

Valorisation within the sector includes **aquaculture not only for food and feed provision but also for use in other sectors**, e.g., extraction of nutrients, pharmaceuticals, fertilisers, precision farming, use of data sets, monitoring adaptation to climate change, and smarter application across all sectors.

**Andrew G. Gill**, principal scientist from the **British Centre for Environment, Fisheries and Aquaculture Science (CEFAS)**, addressed the research needs for circular economies and sustainable fishing and offshore wind farms (and in general industrialisation of the sea), explaining how his work is related to the intervention area of the Partnership and which evolution he sees. At first sight, fisheries are the industry that enables to extract food and provide jobs. Looking in depth, we need to understand the effects on biodiversity, in particular on mobile species and how they respond to the fishery activities, for instance in relation to the quick and large expansion of wind farms, different construction times or cables roots to shore might have effects on different species.

Data are lacking for an accurate response on how the fisheries resource adapt to offshore wind farms, and whether artificial reef can create fish aggregation. The reason is that traditional ways for collecting data, e.g. fisheries institutes collect data through big vessels, does not fit the wind farms environment. **Being innovative can be an opportunity for entrepreneurs to achieve collecting comparable data to understand changes and where species are, also impactful on displacement of fishing vessels**.

This is challenging also from a regional based approach since the fish don't respect borders: from an ecological perspective, the Southern North Sea is a functional unit for flatfish while different countries are developing wind farm at different stages. Therefore, collecting accurate data to understand adaptation and thus ensure smooth production is fundamental.

Two representatives of the Lough Agency and European Tracking Network, which focuses on collecting data on marine species migration using advanced tracking technologies storing them in a global European database, intervened from the audience. Their activity aims to enhance understanding of marine ecosystems and their interactions with offshore renewable energy developments. During the discussion with the speaker, the need for further tracking and tagging efforts was highlighted, including investments in receivers and multiple approaches (acoustic, sonar, etc.), to improve data collection methods in wind farms and marine environments. **This includes integrating tracking data into digital twin of the ocean to address the challenges of data collection by vessels in specific areas and times.** On compatibility of data, important organisations such as ICES and OSPAR can be involved to incorporate innovative data collection methods in their knowledge. However, a period of transition is needed and be supported by models and the digital twin utilises what we collect outside a windfarm with e.g. autonomous vehicles which can be manoeuvred inside as well as sonar on boats. To pursue the innovation, scientists need to work with statisticians and technicians.

Regarding the regional approach, ICES established a working group on offshore wind development and fisheries, and a roadmap is to be published on offshore renewable energy exploring the expansion and development of renewable energy in different regions. This includes addressing knowledge and data needs and considering fisheries from an ecosystem-based perspective. The speaker touched also upon the importance of collaborations between EU and UK to accomplish the relevant objectives in the North Sea.

## 2.4 SESSION III - Digital twins for sustainable blue economies

The moderator, Fien Fien de Raedemaeker, Flanders Marine Institute (Belgium), introduced the **European Digital Twin of the Ocean (DTO)** that is being developed under the EU Missions programme. It is a digital replica of the real-world ocean, gathering information from underwater sensors, satellite observations, and citizen science. This data is made easily accessible for scientists, decision-makers, industries, and coastal communities. The DTO can simulate the ocean under different environmental scenarios, allowing stakeholders to model and test various sea-use scenarios before making decisions. Applications include addressing plastic pollution, climate change impacts, restoring natural habitats, designing nature-based solutions, and sustainably using ocean resources.

In this session, specific applications for the North Sea were presented, including developed within Partnership-funded projects. The Partnership promotes activities like integrating relevant data into the DTO, developing data-driven AI models, and testing and validating these models, which can significantly impact the sustainable use of ocean resources.

**Diego del Villar, from Loughs Agency, Ireland & Lotte Pohl, VLIZ, Belgium** introduced the Partnership co-funded project on 'Digital Twins at sub-basin scale in support of ecosystem-based development of offshore activities: the example of animal tracking in the North Sea with **DTO-Track**'; about the **European Tracking Network (ETN)** umbrella gathering together also the NorTrack and STRAITS project, he provided an overview of existing tracking infrastructures and

location of arrays with data flow directed to EMODnet and Datalake (EDITO) to predict presence of species, inform industry and policy to make more ecologically informed decisions. Data will be open access and pipelined to existing repositories (ETN database, EMODnet, EDITO).

Among the needs and challenges to make digital replicas of biological systems and on to adapt a local application for the DTO making it available for the global research community, del Villar highlighted:

- *Models are only as good as the data that populates it, so we need more information*
- *More efforts for instrument platforms and regions that are underrepresented - use existing and harness new infrastructure and multi-use platforms - the scale and dimension of this requires collaboration between science – policy – private sector*
- *ETN offers collaboration, e.g. in private-public setting, in terms of putting sensors and incorporating the platforms in the existing arrays*

**Patrizio Mariani from DTU Aqua (Denmark)** presented the ‘Digital Twin of Copenhagen harbour: enabling autonomous monitoring and surveillance of maritime critical infrastructures’ and explained that through the **Digital Twin**, the **Copenhagen harbour** transitioned from highly polluted to innovative and best practice, including services to the community (year round swimming in clean waters) demonstrating the use of an unmanned surface vehicle, integrated with acoustic and optical sensors, to perform fast and accurate inspections of maritime infrastructures in confined areas. Digital twin allows better operation e.g. in climate change context; automation for improving observations and enhance security and efficient operations; automation by autonomous observations and mapping of underwater and aerial observation (robot by maritime robotics), and of pollutions sources and risk. Collaboration between different stakeholders needed to be established for this typology of application.

Adapting a local application for the DTO and making it available for the global community requires specific steps and resources. The following future steps were put forward:

- *Strengthen public-private partnerships is essential for paving the common path of ecosystem-based management and the ports can play a leading role here*
- *Test solutions at scale for managing ecosystem pressures - promote integrated approaches*
- *Achieve digitalisation and automation of major EU ports and Innovation Hubs*
- *What are the next steps for research and innovation?*
- *System integration and sensor innovation, this is where more research is needed*

**Zoi Konstatinou from DG MARE, European Commission** through the intervention on ‘Future uses of the EU Digital Twin of the Ocean for the private sector in support of a sustainable blue economy in the North Sea’ recognised the role of the Partnership in moving towards a new approach supporting public-private collaboration and dialogue; to leverage on the topics of DTO and ocean observations, better alignment and cooperation is needed, as well as more buy-in from the

private sector. In this regard, more use cases need to be developed to showcase and promote the opportunities of DTO for the private sector. The following aspects were touched upon:

1. **Transition to Sustainability:** We have moved beyond the era of infinite extraction and development. Now, we focus on sustainable and circular growth to maintain prosperity on a finite planet. The Blue Economy, with sectors embracing sustainability and renewables, can lead this transition. Achieving sustainability while maintaining prosperity and jobs requires knowledge, preparedness for climate risks, strategic decision-making, and community involvement. The EU DTO provides the infrastructure and tools to guide us towards solutions.
2. **Importance of comprehensive data:** Building a robust EU DTO for the Blue Economy requires more than marine environmental data. We need data on impacts, human activities, socio-economic factors, proprietary information, and innovation. Collaboration is essential, including agreeing on data standards, engaging in dialogues with industry, and implementing legislative frameworks. The EU DTO can be a testing ground for private investment and community prosperity, but it requires commitment from stakeholders.
3. **Role of new technologies:** Technologies like AI and 3D visualisations offer new opportunities, and the industry is likely to embrace them. However, the success of EU DTO and advanced digital tools depends on knowledge, understanding, responsible decision-making, and continuous review to find the optimal path.

Looking ahead, by 2030 DTO needs to be established as an operational service, and needs to operate and cater for different needs from different sectors, including **data generated by the private sector**. Whether more demonstrations will get more users on board is relevant for example in the case of coastal infrastructures and risks, where most investments are located.

From a research perspective, beside collaboration, impact has to be taken into account.

**Laurent Delauney from IFREMER, France**, in addressing ‘Empowering coastal communities through synergies with the digital twin of European coastal marine systems’, brought the case of **JERICO-RI** and the issue of automation in observing the marine environment on which the Partnership can play a role by helping integrate the systems with early adopters from the private sector.

Ocean observation in coastal areas has improved in terms of platform and sensor integration, interoperability, and data quality, aiding the development of coastal ocean digital twins. For example, the LandSeaLOT project exemplifies efforts to unify various observation initiatives and stakeholders to design a common governance strategy for the land-sea interface. Despite progress, faster advancements in observation capacity for physics, biology, chemistry, and biochemistry are needed to produce long-term data series.

The sustainable blue economy requires informed decisions based on robust scenario simulations and quick decision processes. Sophisticated observation systems, combining long-term autonomous and repeated one-shot observations, demand efficient operation and governance. Collaboration among in-situ, satellite, and modelling communities, including non-scientists and local actors, is essential to **enhance DTO use through co-design processes**.

The Partnership can further support relevant research activities for DTO development and use as well as:

- a) promote synergy among European marine research infrastructures for better utilisation of EU investments, supporting EOOS initiatives.
- b) enable projects with stakeholders as key partners, co-designing and evaluating DTO outcomes to prioritise applications and maximise impact.
- c) accelerate technological developments for understanding complex coastal ecosystems under anthropogenic pressure and reacting swiftly.
- d) focus on greening observation practices, particularly transitioning from TRL6 to TRL9.

Furthermore, to improve ocean ecosystem knowledge and accelerate the production of reliable integrated data for real-time predictive products, technological development that can also accelerate the Mission objectives should focus on:

- **Autonomous monitoring sensors:** Consolidate sensors for long-term unattended deployment in chemistry, biogeochemistry, and biology. Address issues like short autonomy, drift problems, and large data quantities that are difficult to transmit in real time.
- **In Situ auto calibration:** Enhance calibration processes for sensors dedicated to chemistry and biogeochemistry to reduce drift and improve deployment duration. Implement sophisticated biofouling prevention methods for optical sensors.
- **Embedded AI and edge computing:** Reinforce AI and edge computing in ocean in situ measuring systems. Examples like the Coastal-EGIM demonstrate the integration of multiple sensing systems and algorithms for specific scientific explorations, such as detecting algal blooms.
- **Underwater IoT and acoustic communication:** Expand technologies for real-time data transmission in subsea environments. Accelerate development for in situ operations, particularly environmental DNA sampling and processing.

By focusing on these activities, the Partnership can enhance Marine Research Infrastructures' roles as critical contributors to the DTO, bridging the gap between observational data and actionable insights for sustainable marine management and blue economy growth.

Input was raised from the audience about the need to sustain ocean observation to feed with quality data the DTO, including through a directive. According to the EC, ocean observation remains a priority, and the upcoming European Ocean Pact is probably the vehicle to deliver this political layer. Additionally, CEFAS (UK) advocated for focusing and looking at what we need first; Loughs Agency (IR) for speeding up the impact of research that needs to reach sooner the decision makers; and finally, DTU Aqua (DK) suggested to reach out to other partnerships and countries including Argo infrastructures and the US to understand their practices.

## 2.5 SESSION IV – Managing sea uses for a thriving North Sea

The moderator **Lisette Enserink**, from the **Dutch Ministry of Infrastructure and Water Management/Rijkswaterstaat** and representing the **OSPAR Commission**, presented the panel and the speakers. Before giving the floor to the panellist, she introduced OSPAR Commission, explaining the role and function, an instrument for reaching the Good Environmental Status. OSPAR indeed uses data and conduct assessments against 11 descriptions to adjust monitoring systems, identify knowledge gaps, and update the science needs agenda.

The first speaker, **Ulrich Scheffler**, **German Federal Maritime and Hydrographic Agency**, briefly presented the **Marine Spatial Planning programme developed in Germany**. In 2021, under the MSP Directive, all Member States were tasked with developing an MSP plan, which almost all countries successfully achieved, with a requirement to evaluate the plans every 10 years (internally, Germany must do so every 5 years). This approach provides stability by avoiding frequent changes to the plans and supports effective sea management and the promotion of sustainable management of activities, while also regulating interactions between these activities. Although MSP primarily focuses on human activities, it also considers the marine environment. Continuous monitoring is essential to determine if human activities are harming the environment, and MSP can influence ongoing activities by enabling adjustments according to the plan. Additionally, it is important to assess whether the plans are coherent with neighboring plans.

During the panel, he explained the process of how the MSP plan may evolve throughout the years, with new ambitions, projects and targets. During the preparation of the plan, an assessment is conducted, but, indeed, ambitions can evolve over time. For example, while the plan may be developed by 2028, new ambitions like expanding wind farms could arise. Monitoring and assessment are essential before making modifications to the plan, and during implementation, **monitoring can also lead to adjustments**. For instance, during birds migration periods, the plan might require temporary changes, such as closing wind farms. **Ongoing observation informs decision-making effectively**.

The second speaker, **Paris Sansoglou**, from the **European Dredging Association (EDA)** described the work and tasks of the EDA, a lobbying organisation representing the dredging industry that acts as a **facilitator for various activities**, such as the installation of oil and gas infrastructure, the construction of the multipurpose Elisabeth Island, the installation of wind farms, and the removal of contaminated habitats like those found in ports. They also build coastal protection infrastructures following the **‘building with nature’** approach, which is crucial for green taxonomy. Paris Sansoglou emphasised the need for **improvements in governance** in building with nature projects, highlighting the importance of multidisciplinary collaboration during the design phase, and innovation-friendly governance. They advocate for considering the entire life cycle of projects rather than focusing solely on the initial costs, as this approach is more cost-effective in the long term.

Regarding his perspective on the **implementation of ‘building with nature’**, he stressed the importance of the **holistic approach**, considering the entire system and ensuring that proposed solutions are integrated into the broader ecosystem, assessed through for example ecosystem

services. Governance should support innovative approaches rather than defaulting to conventional economic models. Aligning public procurement requirements with green taxonomy could be a viable solution, ensuring that financing demands from bankers align with client expectations for sustainable development.

During the panel discussion, **John Bell**, the **Director Healthy Planet, DG RTD**, took the floor and highlighted the Partnership crucial role, particularly in aligning efforts with the Mission. He reminded the cruciality of this moment for **advancing plans to meet established targets**, with a **new Commissioner** for Research and Innovation in place, and the upcoming **European Ocean Pact**. He also remembered the importance of effectively communicate the value of the Partnership to authorities, ensuring they understand the significance of research and innovation. He congratulated for the achievement done so far and wished a fruitful work ahead.

To the question on how Partnership co-funded projects could support the existing MSP knowledge and activities, Ulrich Scheffler highlighted the need to **improve the understanding of the interaction between various economic activities** at sea and how they can coexist effectively. In Germany, the concept of multiuse is crucial, and there is still a knowledge gap regarding the cumulative impact of multiple human activities on the marine environment. Additionally, monitoring and evaluating the implementation of MSP plans is a challenge since each **EU country applies MSP differently**, leading to diverse outcomes. It is essential to improve the understanding of MSP and develop standardised tools and methodologies for evaluation and monitoring that are widely accepted and recognised.

**Paris Sansoglou** stressed instead the importance of the Partnership in financing pilot projects to bridge the ‘valley of death’ in innovation, supporting the adaptation of management and monitoring systems to ensure precise measurements of key environmental and economic factors. Continued funding for projects and knowledge development is essential to refine methodologies and ensure effective marine spatial planning across Europe.

## 2.6 SESSION V – Resilience of coastal communities and businesses (WORLD CAFE)

The world café engaged the North Sea Community on the new intervention area ‘Enhancing the resilience of coastal communities and businesses’. Alongside the three main thematic key topics (Low-impact and regenerative tourism; Resilient coastal businesses; Resilient coastal infrastructures and nature-based solutions), the discussion aimed at highlighting success stories, opportunities and needs at the North Sea scale, identifying good practices and common challenges across the Partnership’s sea basins in support of the design and implementation of the Joint Transnational Call 2025, and of other relevant Partnership activities.

Reflecting the democratic and co-design processes at stake in the Partnership, the world café format fosters networking, exchange of ideas and good practices between participants, and acquirement of information on aspects not considered before through the involvement of various fields of expertise.

## Which coastal community can you identify with?



*Results of slido pool of the audience*

Based on the project “Skills for a sustainable transition of tourism in the North Sea” ([3ST: Speeding up Sustainability Skills in Tourism 3ST | Interreg North Sea](#)) which brings together the Netherlands, Denmark, France, Sweden, Belgium and Germany in order to strengthen collaboration and disseminate skills and successful approaches needed for a sustainable transition in the tourism sector, **Harm Ijben (Impuls Zeeland)** introduced an agile multi-stakeholder methodology to promote resilient coastal businesses, including low-impact and regenerative tourism.

Based on the Dune-front project ([Project | Dunefront](#)) in Belgium, which aims to enhance coastal protection and safety by optimising solutions that make use of a combination of natural elements (dunes) and manmade hard structures (seawalls), **Ine Moolaert (Flanders Marine Institute)** gave an introduction to the world café on nature-based coastal management measures.

Facilitated by **Inne Withouck (Flanders Marine Institute, Early Career Ocean Professional)** together with **Fien De Raedemaecker (Flanders Marine Institute)**, the world café table dedicated to the key thematic topic ‘**Low-impact, regenerative coastal tourism**’ started with the need for a clear definition of ‘regenerative tourism’. This definition should become clear when defining the details of the IA. According to the participants, it should involve a positive impact, leading to a better place after tourists leave. Different accommodation types were mentioned as an example, with luxurious hotel chains leading to a high ecological impact whereas a local stay with citizens highly reduces the touristic impact.

The discussion addressed challenges and opportunities for innovative solutions and barriers to mitigate the negative environmental impact of mass tourism (e.g. energy and water usage, transportation, governance, ...) at the North Sea basin scale.

Table 1: Challenges and opportunities identified during the World Café discussion

CHALLENGES	OPPORTUNITIES
<ul style="list-style-type: none"> <li>• <i>The market is not always adapted to offering sustainable options.</i></li> <li>• <i>The low-impact offers are not appealing to all tourists that are often attracted to high-impact activities (jet skiing).</i></li> <li>• <i>Lack of financial investments for infrastructure upgrades (e.g. to qualify for a blue flag award).</i></li> <li>• <i>Tendency to have larger tourist boats results in adjustment needs of harbors.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Blue flag awards will help to make places more attractive (e.g. by development of waste disposal instruments in harbors).</i></li> <li>• <i>Match visitors with the communities. Example: cooking demonstrations for visitors in the home of the locals and home staying offers</i></li> <li>• <i>Focus on small and medium enterprises that have a better understanding of the local environment. Money will stay local.</i></li> </ul>
<ul style="list-style-type: none"> <li>• <i>Tourists are not aware of local marine and coastal life. This leads to the discussion whether it is better if tourists don't know the areas of high importance OR warn them about the risks for local life?</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Awareness raising and knowledge building of tourists about local wildlife in an interactive way by offering tours or place informative signs.</i></li> <li>• <i>Restriction of access to vulnerable habitats.</i></li> <li>• <i>Ban certain things that are bad for the environment or stimulate actions that are regenerative (example is collecting litter).</i></li> <li>• <i>Sea rangers</i></li> <li>• <i>Inform tourists about the cultural identity of the area and success stories of nature regeneration. An example is the return of the fint in the Scheldt River when water quality improved. It shows tourists a positive attitude on how important it is to bring certain species back in the environment.</i></li> </ul>
<ul style="list-style-type: none"> <li>• <i>Add better definition of regenerative impact from water and energy use: how/what are the challenges?</i></li> <li>• <i>Do we want to develop the context or apply the concept.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Promotion of local products (example: indicate local vs imported species on the menu in restaurants)</i></li> </ul>

<ul style="list-style-type: none"><li>• <i>More demand for water and energy and the access has now improved for everyone.</i></li><li>• <i>Planification vs people hosting vs housing vs m<sup>2</sup> sand, to understand low impact</i></li></ul>	<ul style="list-style-type: none"><li>• <i>Make local areas more accessible to local communities who are financially limited = promote stay-cation</i></li><li>• <i>Make long-distance flights more expensive.</i></li></ul>
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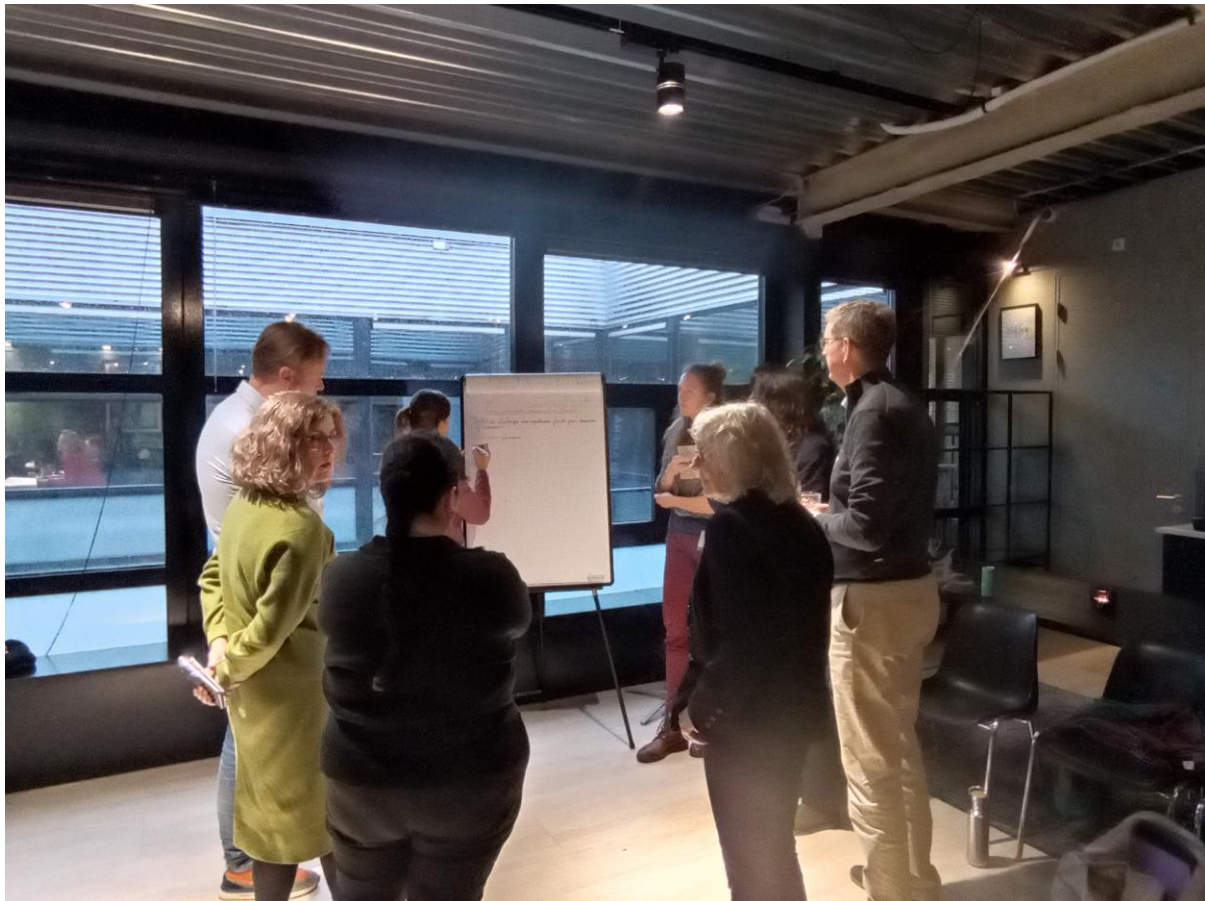


Figure 4 World Café discussion on 'Low-impact, regenerative coastal tourism'

The discussion was guided by a range of questions referring to the intervention area defined with the nodes and the Partnership Work Package on the Strategic Co-design, and especially the first question:

- *What are opportunities for innovative solutions and barriers to mitigate the negative environmental impact of mass tourism (e.g. energy and water usage, transportation, governance, ...) at the North Sea basin scale?*
- *How can tourism be combined with local human activities and cultural heritage?*
- *Which business models and policy frameworks for sustainable tourism in the North Sea and in other sea basins do you know of?*
- *What are research gaps to be able to shift the attitudes and behaviors of tourists?*

- *If you are/were a stakeholder in the coastal or marine tourism sector (hotel, tourism operator, boating, port, restaurant, local authority, inhabitant, ...), to which extent would you be willing to make tradeoffs and pay for environmental measures towards low-impact tourism?*
- *Which innovative digital products and services can be helpful to inform decision-making?*
- *Where do you see opportunities for citizen science and ocean literacy?*

Facilitated by **Gabrielle Aubert (JPI Oceans)** together with **Inderjit Singh Marjara (Research Council of Norway, Sustainable Blue Economy Partnership)**, the world café table dedicated to the key thematic topic ‘**Resilient coastal businesses**’ addressed the achievement of a fair and inclusive transition for coastal communities:

- *Sea level rise*
- *Local societies not involved when developing new areas / businesses*
  - *Local communities should be involved and they need to build their competences*
  - *No job / economy creation at the local level*
  - *Ownership international – impact local*
  - *Give alternative to people*
  - *Denmark*

- *local businesses, also communities need support (economical, structural, capacity building)*
- *empowering the local community*
- *participatory methods (include the locals) both at legislative / policy level and in the planning process*
- *inclusion of scientific advisors*
- *literacy*



Figure 5 World Café discussion on 'Resilient coastal businesses'

The discussion was led by a range of questions referring to the intervention area defined by the nodes and WP2:

- *What are threats for coastal communities and businesses at the North Sea scale (e.g. climate change with ocean warming, sea-level rise, biodiversity loss, flooding, extreme weather events, invasive species, but also beyond e.g. demographics, industrial fishing, migration)?*
- *What is the North Sea experience on strategies and barriers for building and enhancing societal resilience and preparedness of North Sea communities against these threats?*
- *What are research gaps to understand interdependencies between coastal communities and ecosystem health at the land-sea interface (incl. tourism, human well-being, agriculture, ...)?*
- *Which stakeholders should be targeted by the Partnership's Joint Transnational Co-funded Call 2025 for innovative solutions on coastal resilience?*
- *Which economic and human activities support the livelihoods of coastal communities you are familiar with? And to which extent can social innovation\*, business diversification (incl. to emerging blue economy sectors) and policy measures (e.g. for small-scale fisheries) ensure that no one is left behind in these communities?*
- *Which skills should be targeted to achieve a fair transition for coastal communities?*

*\*Social innovations are defined as new ideas that meet social needs, create social relationships and form new collaborations.*

Facilitated by Ine Moolaert, Flanders Marine Institute) together with Margherita Zorgno (Italian Ministry of Universities and Research, Sustainable Blue Economy Partnership), the table dedicated to 'Resilient coastal infrastructures and nature-based solutions (NBS)' addressed challenges and solutions at the land-sea interface for the benefit of both people and nature.



Figure 6 Group discussion on 'Resilient coastal infrastructures and nature-based solutions (NBS)'

First, the need for a clear and commonly understood/used definition of 'Nature-based' solutions was discussed, especially ahead of the upscale of Nature-based Solutions by the private sector. The lack of this could lead to a wrong interpretation and application, and greenwashing practices. Also, regulatory dimensions should be included and adapted to enable and incentivise the implementation of Nature-based Solutions at the land-sea interface. Adaptive management, local knowledge, pilot applications, and local context-specific criteria and needs are essential for the development and application of resilient coastal infrastructures and nature-based solutions. The use of material (for building green infrastructures and Nature-based Solutions) should be very well considered and regulated. However, the source and provenience of material has been discussed as a potential challenge. An example mentioned referred to the use of sand in the Netherlands for the regeneration of dunes and other adaptive coastal measures, which is a good practice, but sand being a limited source, the question verted on where to take it from.

The carrying capacity of the area should be carefully considered when implementing infrastructures (e.g. for tourism), and unsustainable infrastructures and practices should be definitely banned. Additionally, there is a pressing need for increased education and awareness among local communities, particularly regarding the interplay between land and sea. Instead of

resisting change, adaptive measures can be implemented to enhance resilience against climate change and rising sea level.

The discussion was led by posing several guiding questions based on the specific intervention area and defined with the nodes and the Work Package on strategic co-design.

- *Which solutions for protection of (built) marine coastal infrastructures\* are used in the North Sea, from grey infrastructures\*\* to blue-green infrastructures\*\*\*? How effective are they?*
- *What are research gaps and barriers for the scaling-up of nature-based solutions, especially in the context of the EU Biodiversity Strategy and the Nature Restoration Law?*
- *Which observation, monitoring and data capacity (incl. innovative technologies, research infrastructure and integrated models) are needed to inform decision-making in support of resilient coastal communities?*
- *Which common indicators for coastal resilience are needed?*
- *What are opportunities and challenges to enhance coastal resilience through different blue economy sectors incl. aquaculture and dredging?*
- *What can we learn from the North Sea on the use of artificial intelligence in predicting and modelling pressures from human activities on ecosystem services?*

\* Structures developed for aquaculture, tourism, ports, energy devices, urbanisation, housing and coastal protection.

\*\* Hard engineered solutions incl. concrete sea walls, breakwaters, ...

\*\*\* Soft or hybrid infrastructure incl. nature-based solutions such as Marine Protected Areas, fisheries management, low and multi-trophic aquaculture, offshore reefs, multiuse, seagrass meadows, dune-dyke systems, bioblock, vegetated dunes, coastal setback zones, ....

Addressing intervention area 5 '**Resilient coastal infrastructures and nature-based solutions (Nbs)**', the world café aimed at building the North Sea community around the common challenge of enhancing resilience of coastal businesses and communities and also contributed to validate the intervention area ahead of the joint transnational call in 2025. In that regard through limited answers to the guiding questions, the world cafe session showed that the terminology of the intervention area was relatively challenging for the current Partnership's stakeholders to engage with, and therefore highlighted the needs for 1) more precise definitions, 2) further development towards impact, 3) the appropriate targeting of relevant stakeholders potentially interested in accessing to co-funding. These needs can be fulfilled e.g. by providing fit-for-purpose expertise on R&I and policy needs at upcoming regional workshops and by a scoping exercise to adjust the outreach of the Partnership on coastal actors. To conclude, the engagement of the audience in the broader community of the BlueMissionBANOS Arena proved a valuable learning process and played a role in raising awareness on the specific challenges and opportunities tied to coastal resilience.

## 2.7 CONCLUSIONS

**Alain Lagrange from the French Ministry of Higher Education, Research and Innovation**, and member of the Steering Committee of the Partnership, spoke on behalf of the French delegation. Despite the little coastline in the North Sea, France is engaged in exploring scientific issues raising in the regional basin, including being at the crossroad of many EU countries as well as economic and strategic interest. As shown today, the North Sea Basin federated many scientific expectations. Building on the dynamism of the Partnership to which France is committed, two major events are announced as important contribution to the open dialogue with all stakeholders: i) the United Nation Ocean Conference UNOC3 to be held in Nice on 9-13 June jointly organised by the government of France and Costa Rica; this will be anticipated by the One Ocean Science Congress from 4-6 June framed as a symposium dedicated to science and aimed at providing heads of States and society insight of the ocean and future trajectories; ii) the meetings of the Steering Committee and the General Assembly of the Partnership that will be hosted in Paris on 24-25 June. On connection of the EU and global dimension, Lagrange also noted excellent convergence of priority between the G7 Future of the Sea and Ocean Initiative, the Mission Ocean and Waters and the Partnership for instance on sharing of research infrastructures and the DTO, acting in synergy while preserving the specific priorities of each programme.

Finally, the Coordinator of the Partnership **Margherita Cappelletto from the Italian Ministry of Universities and Research**, connected on-line, recalled that the gathering aimed to co-design strategies by connecting locally to achieve impact. Objectives included active dialogue with regional communities, international cooperation, mutual awareness of relevant projects, and enhancing innovation in blue economy sectors. Thanks to all parties involved, the event successfully achieved these goals, valuing the specificities of each sea-basin. Topics mirrored the Partnership's intervention areas, with contributions from various stakeholders. Now that the second cycle of the Partnership is fully approved and starting, involving 75 partners from 30 countries, focusing on launching R&I joint calls for proposals and additional activities, the North Sea blue economy community is encouraged to participate actively.

## 3.0 NEXT STEPS/ RECOMMENDATIONS IN THE LIGHT OF EVOLVING INTERVENTION AREAS

Session	Identification of needs....	...feeding into:
Setting the scene	<ul style="list-style-type: none"> <li>- <i>Developing offshore farms in the light of rising sea levels and coastal resilience to protect human settlements.</i></li> <li>- <i>Consider habitats and</i></li> </ul>	<p>WP2 (Strategic Co-design)</p> <p>WP6 – Task 6.2 Collaboration with EU initiatives</p> <p>WP1 – Exchange of practices at national level</p>

	<p><i>biodiversity are key words of the real economy.</i></p> <ul style="list-style-type: none"> <li>- <i>Connect the national (Germany established an inter ministerial coordination group) and the EU dimension: EU Mission/SBEP and MS collaboration</i></li> <li>- <i>upcoming EU Ocean Pact to support resilient and healthy oceans and coastal areas, promote the blue economy, manage the use of our seas and oceans coherently and developing a comprehensive agenda for marine knowledge, innovation, and investment</i></li> <li>- <i>commissioner-designate for Startups, Research and Innovation, Europe’s competitiveness based on research and innovation, science and technology</i></li> <li>- <i>develop science-policy interface actions through the portfolio of projects</i></li> </ul>	<p>WP1 – Steering Committee – sharing practice on cross-ministerial coordination in the context of the European Ocean Pact</p> <p>WP 4 – Portfolio of projects</p>
<p><b>IA1 (Session III)</b></p>	<p>a)</p> <ul style="list-style-type: none"> <li>- <i>More efforts for instrument platforms and regions that are underrepresented</i></li> <li>- <i>Use cases to showcase and promote the opportunities of DTO for the private sector</i></li> <li>- <i>Strengthen public-private partnerships</i></li> <li>- <i>Test solutions at scale for managing ecosystem pressures - promote integrated approaches</i></li> <li>- <i>Achieve digitalisation and automation of major EU ports</i></li> <li>- <i>System integration and sensor innovation</i></li> </ul>	<p>a) &amp; b): WP2 (Strategic Co-design)</p> <p style="text-align: center;">***</p> <p>b): Task 6.2 – Collaboration with EU initiative, in particular Mission Oceans</p> <p style="text-align: center;">***</p> <p>c): Task 8.4 – Sharing research infrastructures</p> <p style="text-align: center;">***</p> <p>a) &amp; d): Task 8.5 – Action to support EOOS</p>

	<ul style="list-style-type: none"> <li>- <i>DTO established as operational services, and needs to operate and cater for different needs from different sectors, including data generated by the private sector</i></li> <li>b) <i>accelerate technological developments, in particular on:</i> <ul style="list-style-type: none"> <li>○ <i>autonomous monitoring sensors:</i></li> <li>○ <i>in situ auto calibration:</i></li> <li>○ <i>embedded AI and edge computing:</i></li> <li>○ <i>Underwater IoT and acoustic communication</i></li> </ul> </li> <li>c) <i>enhance Marine Research Infrastructures' roles as critical contributors to the DTO</i></li> <li>d) <i>reach out to other partnerships and countries including Argo infrastructures and the US to understand their practices</i></li> </ul>	
<p><b>IA2 (Session I)</b></p>	<ul style="list-style-type: none"> <li>a) <i>Synergies and co-location to accommodate increasing number of activities ensuring sustainability</i></li> <li>b) <i>Full commercial scale of colocation hampered by real understanding of the potential of areas, ecological limits and safety constraints.</i></li> <li>c) <i>Regulatory frameworks and licensing processes need to be adapted.</i></li> <li>d) <i>SBEP can support the GSBI also in terms of mobilising the community of stakeholders to provide input</i></li> <li>e) <i>Nature restoration and</i></li> </ul>	<ul style="list-style-type: none"> <li>a), b), c), e), f), g), h): WP2 (Strategic Co-design) WP3</li> <li>b) – c): Task 7.4 market uptake</li> <li>d), f): WP6 – CoP</li> <li>e): IA5</li> </ul>

	<p><i>conservation is important along with nature creation</i></p> <p><i>f) Lack of a common vision for decommissioning offshore wind turbines</i></p> <p><i>g) Democracy of the blue economy: the seascape will look more and more terrestrial increasingly challenging policy makers.</i></p> <p><i>h) Vulnerability and unexpected events call for enhancing cooperation including in defence and industry, e.g. for surveying critical infrastructures.</i></p>	
<p><b>IA3 (Session IV)</b></p>	<p><i>a) Improve MSP monitoring to quickly adapt to new ambitions and changes.</i></p> <p><i>b) Improve understanding of cumulative impacts on marine environment to apply of MSP planning</i></p> <p><i>c) Standardise MSP evaluation tools across EU countries.</i></p> <p><i>d) Foster innovation-friendly governance in building with nature projects.</i></p> <p><i>e) Importance of funding pilots projects to bridge the valley of death in innovation and adapt management systems for accurate environmental and economic measurements.</i></p> <p><i>f) Achieve digitalisation and automation of major EU ports</i></p>	<p>WP2 (Strategic Co-design) WP3, R&amp;I calls WP8 - 8.4 WP7 - 7.4</p>
<p><b>IA4 (Session II)</b></p>	<p><i>a) Challenges: diseases' spreading, increasing the necessity of using chemicals and antibiotics, and fish health compromised by fish meals</i></p> <p><i>b) Opportunities from this sea plant</i></p>	<p>a) &amp; e) - i): WP2 (Strategic Co-design) b): Task 1.3 Widening and Task 6.3 international cooperation c): Task 6.1 Regional activities and Task 7.4 market uptake</p>

	<p><i>source entail seaweeds farming for industry and the environment: carbon conversion by seaweed into potential nutrients, mitigation of ecosystem damage, and socio-economic development through job creation in coastal areas.</i></p> <p><i>c) Establishing innovative aquaculture along the guiding principles of circularity, sustainability, profitability, environmental balance, and impact. Aquaculture beyond food and feed production to be used in other sectors, e.g., extraction of nutrients, pharmaceuticals, fertilisers, precision farming, use of data sets, monitoring adaptation to climate change, and smarter application across all sectors.</i></p> <p><i>d) EU – UK collaboration</i></p> <p><i>e) European Union's funding for innovation transfer (e.g. the 'thematic smart specialisation platform' (TSSP)) has implications for regional development.</i></p> <p><i>f) Smart specialisation as a place-based approach plays a role in circular aquaculture</i></p> <p><i>g) Innovative Data Collection for Wind Farms</i></p> <p><i>h) Integrating tracking data into digital twin of the ocean</i></p> <p><i>i) Data compatibility needs the support of important organisations such as ICES and OSPAR to incorporate innovative data collection methods in their knowledge.</i></p>	<p>d): Task 8.1 Synergy of funding streams</p> <p>e) &amp; h): Task 8.5 EOOS Knowledge Hub and Task 7.4 on market uptake</p> <p>i): Task 7.6 Enhancing human capacity</p>
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	<p><i>j) Investments in receivers and multiple approaches (acoustic, sonar, autonomous vehicles etc.) complemented by models and the digital twin.</i></p>	
	<p><i>k) Scientists need to work with statisticians and technicians</i></p>	
<p><b>World café / IA5</b></p>	<p><i>a) Need to enhance regulatory framework for the upscale of Nature-based Solutions to avoid green-washing, incl. certification;</i></p> <p><i>b) Needs for clear definitions (“regenerative”, “nature-based solutions”, “low impact”, “regenerative impact from water and energy use”)</i></p> <p><i>c) Role of airborne transport for sustainable tourism</i></p> <p><i>d) Need to target local SMEs and the local communities;</i></p> <p><i>e) Coastal observation and common indicators on coastal resilience;</i></p> <p><i>f) Need for more expert input.</i></p>	<p><i>a. WP6 (cross-partnership cooperation), WP7 (Impact); WP2</i></p> <p><i>b. WP3 (Joint Calls), WP2 (Strategic Co-design and Expert group)</i></p> <p><i>c. WP2, WP3, WP6</i></p> <p><i>d. Scoping exercise to expand Partnership’s outreach (CoP) in a fit-for-purpose way (WP5?)</i></p> <p><i>e. WP8</i></p> <p><i>f. Upcoming regional workshops</i></p>

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