



SUBMARINER Progress Report 2025



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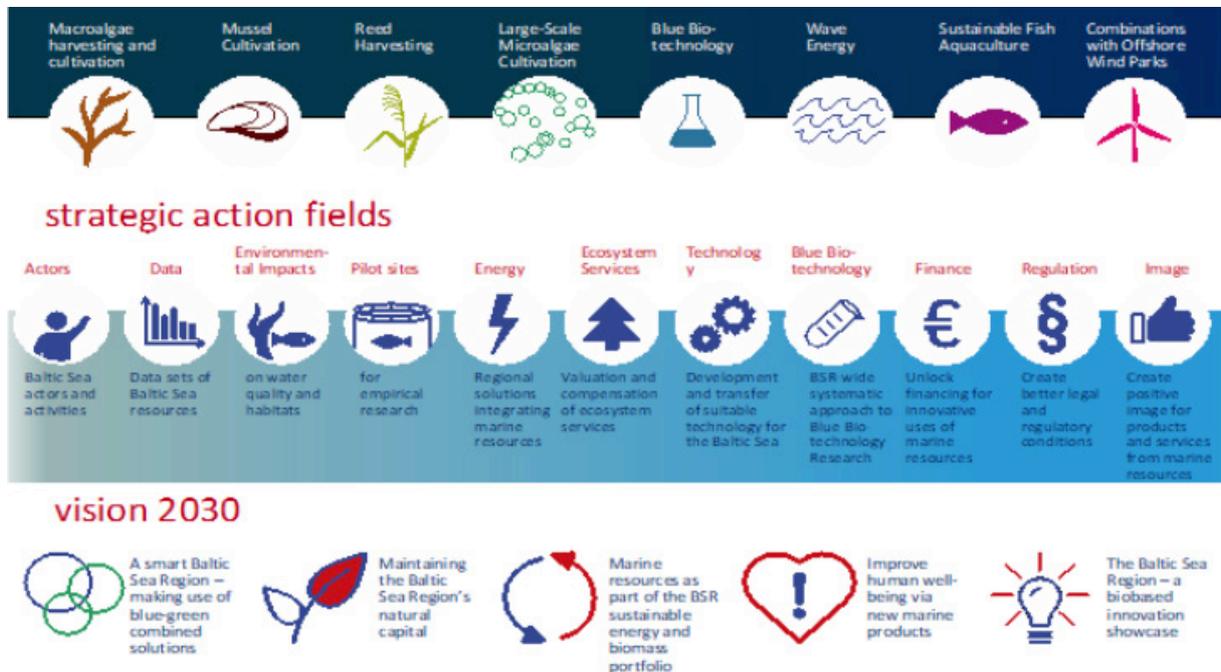
1 ABOUT THE SUBMARINER NETWORK



1.1 SUBMARINER Workstream: A Continuous Evolution

The SUBMARINER Network for Blue Growth EEIG was established in 2013 as a flagship umbrella of the EU Strategy for the Baltic Sea Region. Since then, it has developed into a leading transnational hub for advancing sustainable and innovative uses of marine resources, not only in the Baltic, but also in the North Sea (BANOS) region. For specific topics, SUBMARINER's reach now extends across the European Union, through initiatives like EU4Algae, CBE-JU, and the MPA Community Network.

SUBMARINER's workstreams have evolved in step with changing policy priorities, markets and environmental pressures. The original set of actions guiding the network's work was laid out in the SUBMARINER Roadmap (2013).



In 2020, as part of the INTERREG BSR Blue platform initiative, we conducted a comprehensive review of progress and emerging needs in our areas of action in the Baltic Sea. This resulted in the [SUBMARINER Roadmap Beyond 2021](#) which sharpened and updated the Network's agenda, outlining a set of four Action Areas that continue to steer our ongoing efforts, namely: Get Pilots to the Next Level, Increase Company Involvement, Show the Blue on Land, and Synthesise and Transfer Knowledge in Continuous Working Groups.

1 GET PILOTS TO THE NEXT LEVEL

- Regional & national roundtables
- Develop comprehensive regional plans
- Identify & monitor sites based on common parameters
- Establish large-scale demonstration farms & plants
- Encourage cooperative structures
- Cross-cutting assessments and plans for: biodiversity, climate, engineering, ecosystem services

2 INCREASE COMPANY INVOLVEMENT

- Address the need for a company networking platform
- Blue bio-economy product & company catalogue
- Continue and expand company-specific services:
 - Accelerator/match-making
 - Co-creation & ideation
 - Technology development & transfer
 - Ecosystem valuation

3 THE BLUE ON LAND

- Work with regions
- Consumer awareness
- Ocean literacy & citizen science
- Education & skills development
- Waste treatment, marine litter, tourism, food & feed

4 WORKING GROUPS

- Algae & mussels
- Sustainable fish
- Multi-Use
- Ocean literacy, education & skills
- Mentors' forum

To date, our work remains structured around the following **nine 'Blue Economy Solutions,'** which combine environmental goals with innovation and socioeconomic relevance, and provide a practical backbone for project design, stakeholder engagement and impact delivery.



Ocean Governance



Algae Cultivation, Processing, & Products



Bivalve Farming, Processing, & Products



Sustainable Aquaculture & Fisheries



Ocean Multi-Use



Maritime Spatial Planning



Marine Protected Areas



Business Support



Education & Capacity Building

1.2 The SUBMARINER Vision

The SUBMARINER Network is guided by the conviction that innovative and sustainable uses can meaningfully contribute to the Baltic and North Sea regions, and to wider European objectives, including the European Green Deal. Within this framework, SUBMARINER's work directly aligns with the Green Deal's blue dimension, articulated through the EU Ocean Pact, and ultimately also supports the achievement of the UN Sustainable Development Goals.

Already in 2020, SUBMARINER actions aimed to address the following challenges:

Reduce Climate Change	<ul style="list-style-type: none"> » instruments and measures to reduce Greenhouse Gas Emissions » stimulating more local and regional sustainable production; including renewable energy as well as feed, food and materials
Reduce Pollution	<ul style="list-style-type: none"> » new measures for nutrient uptake; including dealing with the internal nutrient load within the Baltic Sea » effective measures to reduce marine litter » sustainable ways of fishery and aquaculture
Increase Biodiversity	<ul style="list-style-type: none"> » offering new ways for ecosystem restoration by ‘building with nature’ » increasing efficiency of use of marine space by promoting the concept of multi-use
Increase Protection	<ul style="list-style-type: none"> » extending the concept to nature protection to noise and the seabed » extending the concept of nature protection towards cultural heritage
Address Demographic Change	<ul style="list-style-type: none"> » opening up towards new feed, food and material resources derived from the sea; which can be explored sustainably and address important health issues
Foster Competitiveness	<ul style="list-style-type: none"> » opening new economic activities not only in metropolitan areas, but also in rural, coastal regions offering additional income sources for societal groups, which lose jobs in traditional marine sectors

As can be seen below, these ambitions are almost synonymous with the three guiding objectives of the EU Mission ‘Restore our Oceans and Waters.’ Since 2023, the SUBMARINER Network, together with many of its members, has acted as the lead partner to BlueMissionBANOS, which coordinates and supports the implementation of the Mission Ocean in the Baltic and North Sea region.

<p>Objective 1 Protect and restore marine and freshwater ecosystems and biodiversity</p>	<p>Objective 2 Prevent and eliminate pollution of our oceans, seas and waters</p>	<p>Objective 3 Make the sustainable blue economy carbon-neutral and circular</p>
<p>Contribute to relevant marine nature restoration targets including degraded seabed habitats and coastal ecosystems</p>	<p>Reduce nutrient losses by 50%</p>	<p>Achieve net zero maritime emissions</p>
<p>Protect at least 30% of the EU’s seas and integrate ecological corridors, as part of true Trans-European Nature Network</p>	<p>Reduce the use and risk of chemical pesticides by 50%</p>	<p>Develop zero-carbon and low-impact aquaculture</p>
<p>Strictly protect at least 10% of the EU’s seas</p>	<p>Reduce plastic litter at sea by 50%</p>	<p>Promote circular, low-carbon multi-purpose use of marine and water space</p>
<p>Restore at least 25.000 km of free/flowing rivers</p>	<p>Reduce by 30% microplastics released into the environment</p>	
<p>Related policy: EU Biodiversity Strategy 2030</p>	<p>Related policy: Action Plan Towards Zero Pollution</p>	<p>Related policy: European Green Deal European Climate Law</p>



1.3 SUBMARINER Network – Members and Statutes

The SUBMARINER Network is a not-for-profit **European Economic Interest Grouping (EEIG)**. Our work is guided by our statutes and a series of roadmaps, all publicly available on our [website](#).

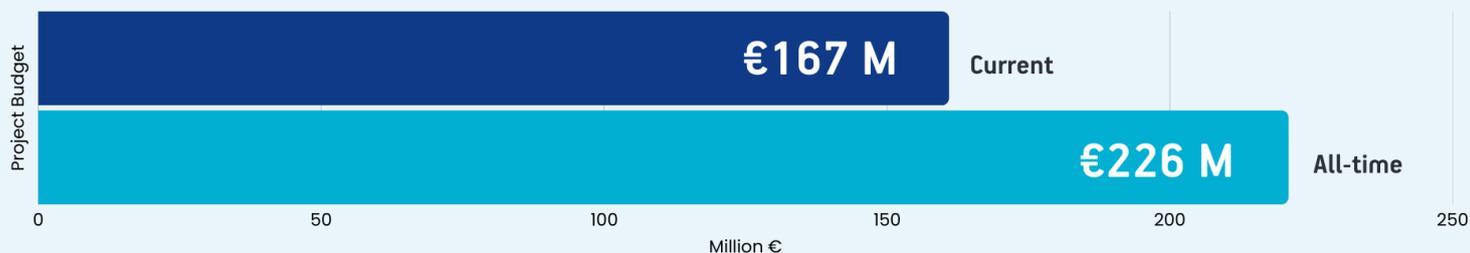
As of 2025, the following institutions form the core of the EEIG as fully registered members: **s.Pro sustainable projects GmbH** (s.Pro; Germany), **BioConValley** (Germany), **Kiel Marine Science Centre (KMS)** (Germany), **University of Southern Denmark (SDU)**, **Gdynia Maritime University (GMU)** (Poland), **Klaipėda University (KU)** (Lithuania), and the **Latvian Institute for Aquatic Ecology (LIAE)**. From 2026, the **Swedish Environmental Research Institute (IVL)** and **Forschungs- und Entwicklungszentrum Fachhochschule Kiel GmbH (FuE)** (Germany) will also join as registered members.

SUBMARINER’s Advisory Board includes the **Royal Institute of Technology (KTH)** (Sweden), the **Finnish Environment Institute (SYKE)**, the **University of Tartu (UTartu)** (Estonia), the **Norwegian Institute for Water Research (NIVA)**, and **Fraunhofer** (Germany). In addition, more than **30 associate members** — including start-ups, SMEs, and business clusters — contribute to the Network and are committed to SUBMARINER’s long-term vision.

At the Members’ Assembly on 6 December 2025, **Fredrik Gröndahl** (Director, Blue Food Seafood Centre at KTH) was confirmed as SUBMARINER’s **President**, and **Angela Schultz-Zehden** as **Managing Director**.

1.4 SUBMARINER: Implementing Actions through Projects

SUBMARINER operationalises its vision primarily through a closely coordinated portfolio of funded projects. To date, the network has been involved in **more than 54 projects**, generating a total volume of **€226 million**. While 20 projects have been completed, 34 projects are ongoing, representing **€167 million** in active implementation.



Beyond funding volume, projects are SUBMARINER’s main vehicle for reaching stakeholders, generating applied knowledge, and building capacity across the blue bioeconomy. Lessons learned, tools, and methods developed through projects are systematically shared within the Network, supporting transfer, replication, and wider uptake across countries and sea basins.



SUBMARINER Project Cloud (2022-2029)

1.5 SUBMARINER: Implementing Actions through Projects

From 2026 onwards, SUBMARINER’s work is yet again entering a new phase. The EU Mission Ocean & Waters is shifting further into the **deployment phase**, where solutions piloted and tested in its initial phase will be mainstreamed. In this context, SUBMARINER is taking on an implementation role as coordinator of BlueActionBANOS; a small, but dedicated funding programme, which fosters community-led action throughout the BANOS Lighthouse Area by providing a combination of financial support and relevant expertise.



Moreover, SUBMARINER is becoming a key partner within [EIT Water](#), hosting the new Co-Location Centre Central & Baltic, which covers Germany, Poland, and the Baltic States. SUBMARINER will connect with the stakeholder ecosystem in those countries across the water, marine, and maritime sectors to identify challenges and priorities that will inform EIT Water's Strategic Agenda, unlocking new funding opportunities starting in 2027.

Key Water Challenges that EIT Water will Overcome

1. Gaps in current mind and skillsets, together with skills development options in Water, Marine & Maritime sectors hinder critical collaborations, innovation and growth.
2. The Water, Marine & Maritime sectors are highly fragmented. Collaboration and collective mobilisation of resources is stifled, leading to limited breakthrough innovation reaching a challenging market.
3. Marine and freshwater ecosystem degradation and compromised water quality
4. Limited water efficiency, recycling and resource circularity
5. Vulnerability to climate-related extreme events and external threats

Against this backdrop, the purpose of this report is to take stock of SUBMARINER's achievements through the end of 2025 and to position these results in a way that supports the Network's future strategic development and contribution to emerging European initiatives. The report is written collaboratively by the SUBMARINER Secretariat, with contributions from a wide range of staff and topic leads. While minor inconsistencies of style may remain due to the plurality of its authors, the intention is to provide a broad, practice-oriented overview of progress and priorities—combining solutions-specific chapters with cross-cutting perspectives which will inform our strategic orientation and outlook for 2026 and beyond.



2 CROSS-CUTTING DEVELOPMENTS AND ACHIEVEMENTS



2.1 Stakeholder Base and Outreach

At the heart of the SUBMARINER Network — and of its impact — is its role as a connector. Across projects, sectors, and regions, SUBMARINER brings people together around shared challenges and opportunities for a sustainable blue economy in the Baltic Sea and beyond. This role is reflected not only in the breadth of activities, but also in the steady growth of the Network and its community.

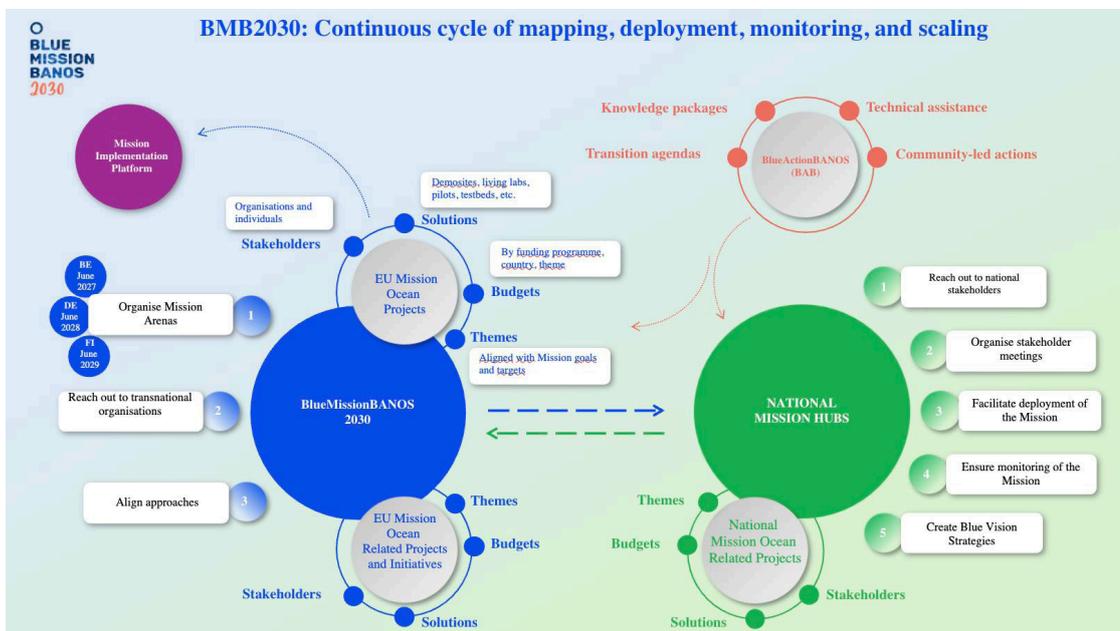
Since its establishment, SUBMARINER has been involved in more than 54 projects, with 34 currently ongoing. Beyond individual project delivery, this portfolio functions as a continuous driver for outreach and engagement. Alongside the Network's 40+ members, more than 380 organisations and 1,500+ individual experts have participated in SUBMARINER-related activities, spanning research and higher education, industry, public authorities, and civil society. This broad participation highlights SUBMARINER's role as a platform for exchange and collaboration, fostering lasting connections across sectors, disciplines, and national borders.

Through this expanding stakeholder base, SUBMARINER enables ongoing dialogue and cooperation beyond individual projects, supporting knowledge exchange, peer learning, and the co-creation of solutions across the blue economy.

This growing community is supported by a strong communication and engagement pipeline. SUBMARINER currently reaches 7,800+ newsletter subscribers, 5,000+ social media followers, and more than 8,500 stakeholders from 4,500+ organisations, the majority based in the Baltic and North Sea region.

Targeted events complement this digital outreach by creating spaces for exchange, coordination, and collective learning. Through initiatives such as the Mission Arenas, 4 flagship events that brought together ca. 300-500 key stakeholders from the Baltic and North Sea each, SUBMARINER convenes diverse actors across topics and countries in dedicated frameworks that support exchange, alignment and joint action within and across countries.

Events such as the Mission Arenas are also made possible by SUBMARINER's core engagement in continuous and extensive stakeholder mapping. This process begins with desk research, identifying the blue economy projects and initiatives active in the Baltic and North Sea regions. From there, SUBMARINER delves deeper to identify the organisations and individuals behind this project work. Our stakeholder list provides a filterable overview of the work being undertaken in our region, allowing SUBMARINER members to engage with others at a deeper level and across a variety of sectors. This list includes information on country, region, topic, budget, and individual contact information.



Beyond events, SUBMARINER increasingly invests in long-term communities of practice through dedicated platforms. A flagship example is the MPA Community Network (MPA-CN), established to reduce fragmentation among marine protected area initiatives and strengthen practitioner exchange. Hosted on BlueBioMatch, the group has become a steadily growing hub for MPA-affiliated stakeholders.

2.2 BlueBioMatch – Our Exchange Platform for Individuals

BlueBioMatch (BBM) is SUBMARINER’s open community platform that connects individuals across the blue economy and supports collaboration, matchmaking and partnership building beyond individual projects. It brings together researchers, companies, public authorities, NGOs, entrepreneurs, ocean art-ivists and other actors. BlueBioMatch not only connects people but also showcases products and supports the search for, and offering of blue raw materials, solutions and technologies, thus becoming a fundamental platform for everyone active in the blue economy.



With over **1500+ active members**, the platform gives users access to projects, products, events, working groups, mentorship, and collaboration opportunities, helping turn networking into concrete exchange. BBM also hosts topic-specific groups, such as the Algae, MPA-CN and the artist & creatives, providing a stable home for long-term communities of practice and reinforcing SUBMARINER’s role as a key connector to innovate in the sustainable blue economy across sectors and initiatives. BBM is the go-to place for the blue community to find answers and stay up to date on issues related to SUBMARINER’s nine solutions. Its Product Showcase gives any blue company the opportunity to spread the word about their products, also thanks to the BlueBioMagazine, a dedicated monthly newsletter, which informs users about what happened in the community and who is asking for support on any topics. BBM fully expresses SUBMARINER vision, to make stakeholders, projects, products and technology come together for ocean innovation.

3 MARINE GOVERNANCE



Marine governance in the Baltic Sea Region is characterised by a complex network of international, regional, and national institutions. At the EU level, directives and laws such as the MSFD, MSPD and Nature Restoration Act, as well as initiatives such as the Mission Ocean and more recently the European Ocean Pact, provide overarching frameworks for marine governance. At the sea basin level, the EU Strategy for the Baltic Sea Region (EUSBSR) and HELCOM, through the Helsinki Convention and the Baltic Sea Action Plan, are important for supporting governance efforts. The Greater North Sea Basin initiative (GNSBI), established in 2024 and supported through a DG MARE lead assistance mechanism, is gaining increasing importance.

Given the region's complex challenges, from eutrophication and competing space uses to mounting geopolitical pressures, stakeholder-informed and well-coordinated governance is urgently needed to improve the marine environment in the region and drive forward a truly sustainable blue economy.

3.1 Starting Point & Ambition

Marine Governance is closely aligned with the essence of the SUBMARINER Network as a platform for trans-national collaboration and innovation action. Since 2013, the SUBMARINER Network has been recognised as a flagship network under the EU Strategy for the Baltic Sea Region (EUSBSR) and in 2022, the SUBMARINER Network's role in marine governance in the Baltic and North Sea region greatly expanded as the coordinator of EU Mission: Restore our Ocean and Waters in the Baltic and North Sea (BANOS) Region.

The SUBMARINER Network's ambition for Marine Governance in the Baltic Sea Region revolves around three key focus areas:

- 1. Building innovative governance formats:** We aim to develop innovative governance structures that strengthen collaboration between research, policy, and society, filling gaps in current frameworks and fostering action to drive the sustainable blue economy forward.
- 2. Improving the effectiveness of marine governance:** We seek to enhance governance capacities by proposing new tools and policy ideas in areas such as marine spatial planning, marine protection, and low-trophic aquaculture, providing actionable recommendations to support effective and coordinated management.
- 3. Connecting the blue and green bioeconomy:** We strive to advance stakeholder-informed policy at both EU and regional levels, bridging the blue and land-based economies, and providing guidance on integrating sustainable practices across the bioeconomy.

3.2 Marine Governance – Projects at a Glance



3.3 Key SUBMARINER Achievements

- The [Mission Arena event](#) series brought together stakeholders, including SMEs, investors, policy makers and researchers from diverse sectors of the blue economy, to co-create blue economy action plans for their region. With our Mission Arenas we created a new specific event type including a systematic way of co-creating workshops between projects/initiatives with similar themes; crowdfunding from a large variety of projects/institutions and a democratic, inclusive form of voting on priority actions for a given region. More than 1200 relevant stakeholders attended the four Mission Arena events in the North and Baltic Sea Regions
- [WaveLinks](#): WaveLinks is an online dashboard mapping projects and initiatives across the BANOS region to create a comprehensive overview of ongoing blue-economy activities. The platform enhances visibility and fosters collaboration among a wide range of regional actors.
- [Rootlinks Primary Producers Working Group](#): The Primary Producers Working Group under the Circular BioEconomy-Joint Undertaking (CBE-JU) empowers aquaculturists and fishermen to engage in circular bio-based value chains and addresses obstacles to their participation, such as limited awareness, financing, and infrastructure. Through its action plan, the group will deliver solutions that help blue primary producers connect to existing value chains.
- [Marine Policy Coherence Recommendations](#): Policy recommendations have been developed within the Cross-Gov Project to support improved coherence across marine governance frameworks, including the MSFD, the EU Ocean Pact, and the Marine Spatial Planning Directive. These insights support more aligned and effective policy at the EU level.
- [Biodiversity Protection in MSP Policy Recommendations](#): Recommendations and tools have been developed to strengthen the integration of marine biodiversity protection into marine spatial planning as a part of the MSP-4Bio project. This work supports decision-makers in balancing ecological priorities with sustainable maritime uses. The recommendations were presented and disseminated to multiple DGs within the European Commission and to the HELCOM VASAB MSP WG

3.4 Progress Made in Marine Governance

Regional agenda-setting through Mission Arena roadmaps

The development of regional roadmaps at the BMB Mission Arenas created a powerful tool for priority-setting and policy action towards a carbon-neutral, circular Blue Economy in the Baltic and North Sea region as well as measures to improve its environment. These large-scale forums brought together diverse stakeholders to assess progress toward Mission objectives, identify critical gaps, and agree on the most urgent next steps. By demonstrating a strong collective will, the roadmaps provided compelling evidence for policymakers while outlining a clear, actionable pathway toward a sustainable blue economy in the Baltic Sea.

From Mission Ocean to the European Oceans Pact

The EU Mission: Restore our Ocean and Waters by 2030 laid the groundwork for a more integrated approach to Marine Governance by promoting regional restoration projects, innovation, and citizen engagement across European seas. Building on this foundation, the European Ocean Pact represents a new, integrated framework for marine governance. It encourages Member States, regional authorities, businesses, NGOs, research institutions, and citizens to commit to shared objectives for healthy, resilient, and productive seas. The Ocean Pact addresses several persistent governance challenges by fostering cross-sectoral collaboration, enhancing stakeholder engagement, promoting knowledge-sharing and transparency, and strengthening alignment between local, national, and EU-level initiatives.

EU Nature Restoration Law

The Nature Restoration Law, adopted by the European Union in 2024, marks a major step in reversing biodiversity loss and restoring ecosystems. Its key achievement is setting legally binding targets to restore degraded habitats, increase species populations, and improve ecosystem health across Europe's seas, coasts, and inland waters. By 2030, the EU Nature Restoration Law aims to restore 20% of degraded ecosystems, bring 10% of species and habitats to a favourable state, regenerate coastal habitats, restore wetlands and peatlands, and improve habitats for marine species, all through binding national restoration plans.

Greater Cross-border Collaboration between the Baltic and North Sea

Merging the Baltic and North Sea into one Mission Ocean 'Lighthouse Area' (BANOS) has led to enhanced cooperation between stakeholders and actions in these two sea-basins. In addition to the numerous Mission Lighthouse actions, also projects like NESBp represent a first step in promoting coherent MSP across European sea basins. By linking GNSBI with the HELCOM-VASAB MSP Working Group and building on the insights of EU Green Deal MSP projects, the collaboration aims to foster knowledge exchange, alignment of marine plans, and more integrated, ecosystem-based governance in the North Sea Region by 2027. The work focuses on reducing siloed approaches, improving coordination among authorities, and developing practical solutions for multi-use marine areas, supported by shared data and learning structures.





3.5 State of Marine Governance – Challenges & Opportunities

Due to a rich institutional landscape, marine governance in the Baltic and North Sea Region remains fragmented and faces persistent challenges. Institutional responsibilities often overlap, creating inefficiencies, while governance scales do not always match ecological realities. Policy development is frequently siloed, limiting the ability to address interconnected issues such as the environmental impact of offshore wind or the impact of agricultural runoff on the marine environment.

Whereas the Mission Ocean define the Baltic and North Sea region as one Lighthouse Area, both seas are at the same time governed by different forms of sea-basin strategies:

- The EU macro-regional strategy for the **Baltic Sea** (EUSBSR) is already operational for more than a decade by now. It is organised around various policy areas with (financial) assistance being mainly provided through INTERREG BSR project streams. The EUSBSR is by its nature not focused on the Baltic Sea as a ‘sea-basin’ only. Hence, at EU level it is mainly driven by DG Regio and not DG MARE.
- The Greater **North Sea** Basin Initiative is much younger, being only established in 2024. The GNSBI seeks to strengthen regional cooperation, support sustainable blue growth, protect marine ecosystems and coordinate cross-border maritime spatial planning. The six working tracks focus on governance, co-use of space, nature conservation, cumulative impacts and long-term perspectives for fisheries. Other than the EUSBSR, the GNSBI has been integrated into the set of ‘sea-basin assistance mechanisms’ operated by DG MARE (Atlantic-Arc, WestMed, Black Sea).

At the same time, whereas DG RTD plays an important role next to DG MARE within the Mission Ocean programming; the national ministries of research are not prominent in the context of sea-basin initiatives. In addition, other European initiatives create other types/forms of assistance layers; be it the ‘Coalition of Mission Ocean cities, regions and ports’ as part of the Mission Ocean efforts; other related Missions, such as Mission ‘Climate’ or more topical related coordination efforts, such as EU4Algae, the aquaculture, MSP and ocean literacy assistance mechanisms, BlueInvest and as of 2026 onwards EITWater; just to name a few.

The EU Ocean Pact presents an opportunity for greater collaboration and coherence, but risks remain that the initiative may create an additional layer of governance in an overly complex system.

3.6 Outlook and Next Steps for SUBMARINER

Support the implementation of European Ocean Pact and continue to position SUBMARINER as a key driver in the BANOS area.

Continual positioning of the SUBMARINER Network at the EU level as the leading network for driving efforts in realising actions to improve the blue environment and economies in the Baltic and North Sea. Continue and strengthen efforts to act as the continuous knowledge transfer gateway in both directions by making relevant innovations easily available to relevant stakeholders in the BANOS region, while acting as the collective bottom-up voice from the region towards EU wide initiatives.

Establish and expand regional Mission Ocean Hubs and governance structures in the Baltic Sea Region to foster vertical and horizontal coordination, supporting the transformation of the Blue Economy.

The follow-up CSA project 'BlueMissionBANOS 2030' was submitted in September 2025, with a proposed start date in 2026. Building on BMB and interacting systematically with activities under BlueActionBANOS, the project aims to strengthen national SUBMARINER secretariats, which act as facilitators and gate-keepers between the various stakeholders. As to streamline efforts, BMB2030 has therefore on purpose chosen the same partners (SUBMARINER members) to act as National Contact Points.

Position the SUBMARINER Network as the connector between the Baltic Sea, Mission Ocean, and the UN Ocean Decade.

Respond to the Call 'HORIZON-CL6-2026-03-GOVERNANCE-03: Empowering the UN Decade of Ocean Science for Sustainable Development' as this call aims to ensure that key processes, initiatives and structures put in place throughout the Decade continue after its end.

Continue to position the SUBMARINER secretariat as the central long-term knowledge transfer hub in future transnational funding opportunities.

Provide an open gateway to funded projects to coordinate efforts with SUBMARINER to ensure that stakeholder engagement is effectively organised within the BANOS area.

- Example: Align with the consortium implementing the project 'INSPIRI' (call: Our Blue Future – Co-designing a future vision of a restored ocean and water system in the EU by 2030 and 2050); especially in view of their stakeholder engagement in the Baltic Sea Region.

3.7 Marine Governance – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
BlueMissionBANOS Supporting the Mission Ocean Lighthouse in the Baltic and North Sea Basin	2022-2028 HEU-MISS €3 000 000	SUB, IVL, UTartu, SDU	Baltic & North Sea	Improved coordination of stakeholders, mapping of Blue Economy solutions and co-created Roadmaps for EU Mission Ocean and Waters in the Baltic and North Sea region.
Prep4Blue Preparing the Research & Innovation Core for Mission Ocean & Waters	2022-2025 HEU-MISS €5 000 000	s.Pro, SDU	Europe	Methods to promote coherent, stakeholder-co-designed solutions, on topics from governance to business support, within EU Mission Ocean and Waters.
NESBp Northern European Sea Basins project	2024-2027 DG MARE €2 500 000	SUB, GMU, UGOT	Baltic & North Sea	Strengthened collaboration between the Baltic and North Sea Basins, enabling a more strategic, integrated and efficient MSP.
CrossGov Coherent & Cross-Compliant Ocean Governance to deliver the EU Green Deal	2022-2025 HEU €2 500 000	s.Pro, NIVA, SYKE	Europe	Policy recommendations to improve the coherence and cross-compliance on marine policies in the EU – from the MSFD to sectoral policies such as REDIII and the CFP.

BlueGreen Governance Land-sea governance schemes for changing physical conditions	2024-2027 HEU €5 800 000	NIVA, UTartu	Europe	Land-sea governance schemes based on scientific evidence and societal choices that link marine policies with the management of the land and inland waters.
MSP4BIO Improved Science-Based Maritime Spatial Planning to Safeguard and Restore Biodiversity in a Coherent European MPA Network	2022-2025 HEU €2 500 000	s.Pro, UTartu, CORPI, GMU, SYKE	Europe	An integrated Ecological-Socio-Economic (ESE) management framework to safeguard and restore marine ecosystems and policy recommendations to improve marine protection in EU level policies.
BLUE CONNECT Strict protection, restoration and co-management of Marine Protected Areas	HEU-MISS 2024-2028 €8 900 000	SUB, UTartu, NIVA	Europe	Planning tools for marine conservation and connectivity that strengthen biodiversity protection and ecological coherence across marine areas.
ROOTLINKS Enabling Primary Producers to Thrive in the Bioeconomy- Strengthening Roots, Creating Links	2025-2029 CBE-JU €3 000 000	s.Pro	Europe	Co-designed solutions for aquaculturists and fisheries to better connect to bioeconomy value chains, developed by the CBE-JU's Blue Primary Producer Working Group.
ShapingBio Accelerating European bioeconomy innovation	2022-2025 HEU €4 000 000	SUB	Europe	A comprehensive mapping and analysis of initiatives, structures, policy instruments and key gaps in the European Bioeconomy ecosystem. With recommendations on governance, applied R&D, collaboration and financing.
BalticMUPPETS Baltic Mussel Products for Pet-foods	2022-2026 I3 €7 200 000	UTartu, Blue Research, Ecopelag	Baltic Sea	Integration of blue and green bioeconomy value chains, overcoming siloed governing approaches.

4 ALGAE CULTIVATION, PROCESSING & PRODUCTS

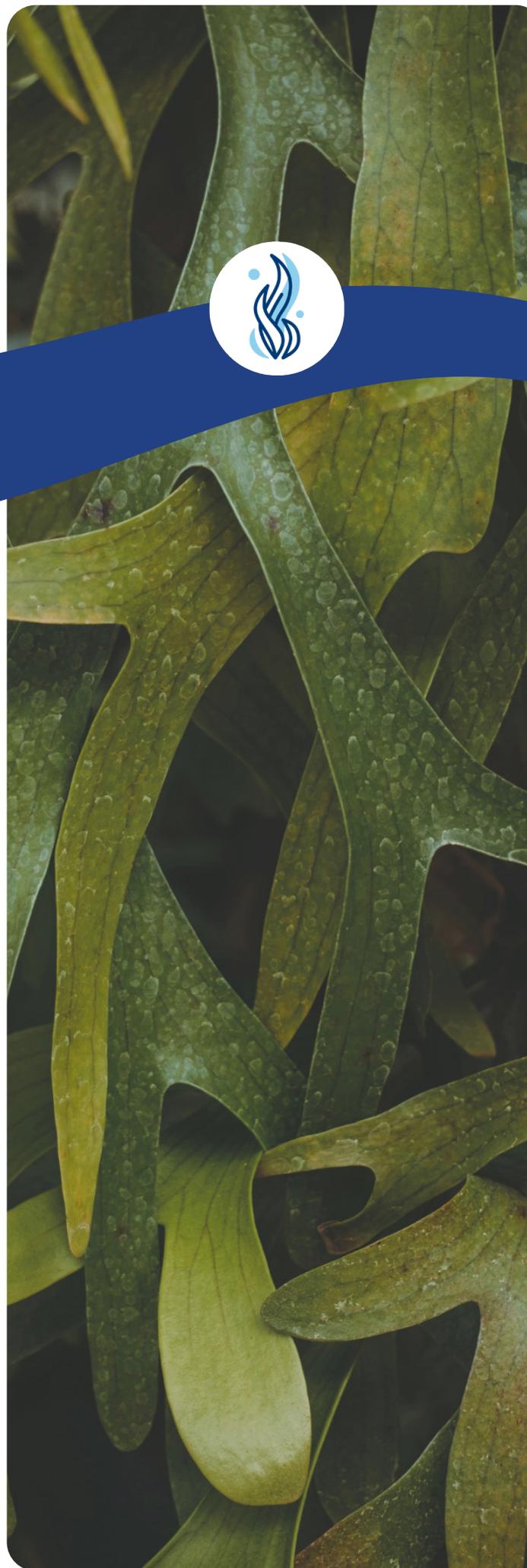


Algae represent a broad and rapidly evolving topic for the SUBMARINER Network, with most members involved in projects related to them, whether in terms of cultivation, monitoring or policy advocacy. SUBMARINER's original field of interest included so-called "beach cast", i.e. a mixture of seagrass and seaweeds washed up on Baltic beaches (e.g. GRASS, COASTAL Biogas projects). Beach cast is still an issue for public authorities and has since become a viable business case (e.g. Seegrashandel, Baltic Materials). However, since then, the potential of algae cultivated in Europe (both micro- and macro-) has received much more recognition and is now a core element of European policy (e.g. EU Algae Initiative). While microalgae were previously covered under blue biotechnology, they are now subsumed under the topic of algae as a whole.

4.1 Starting Point and Ambition

For the Baltic, algae (including IMTA constellations) represent a mitigation measure for eutrophication via excess nutrient uptake and good potential for circular economy by combining it with agriculture in the form of seaweed-based biostimulants and feed source. In the North Sea, they represent a bioremediation measure for offshore energy and multi-use projects (e.g. ULTFARMS).

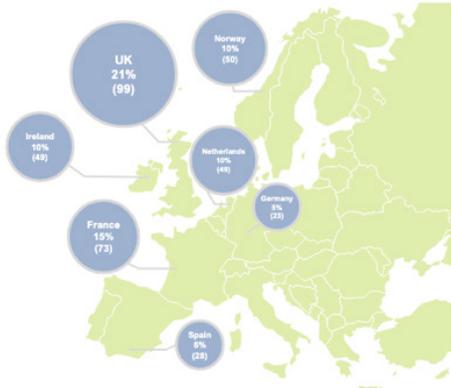
When the original SUBMARINER Compendium (2012) and Roadmap (2013) were published, some harvesting activities of wild macroalgae were already taking place within the Baltic Sea Region; however, not one single macroalgae farm yet existed. The ambition was to establish macroalgae cultivation first at pilot and then demonstration level, to drive the establishment of commercial macroalgae cultivations throughout the Baltic Sea Region, including also the Baltic proper. At that time, SUBMARINER scope did not yet reach to the North Sea, where macroalgae cultivation sites were also few and far between. Since then, there has been a significant increase in the number



of European macroalgae enterprises, with the following enterprises (both commercial and non-commercial or community-driven) operating in the Baltic and North Seas. While a lot of investment has gone into the establishment of new farms, these remain, however, typically small-scale, operating independently and with an under-developed market for product exploitation.

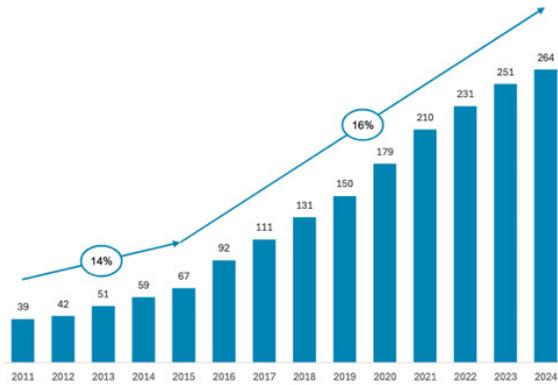
EUROPE'S SEAWEED PIPELINE INCLUDES ~480 COMPANIES AND IS GROWING AT 15%+ EACH YEAR

Geographic distribution of 479 European companies



Note: Founding year data only available for 264 out of 479 organisations

Cumulative number of European seaweed organisations

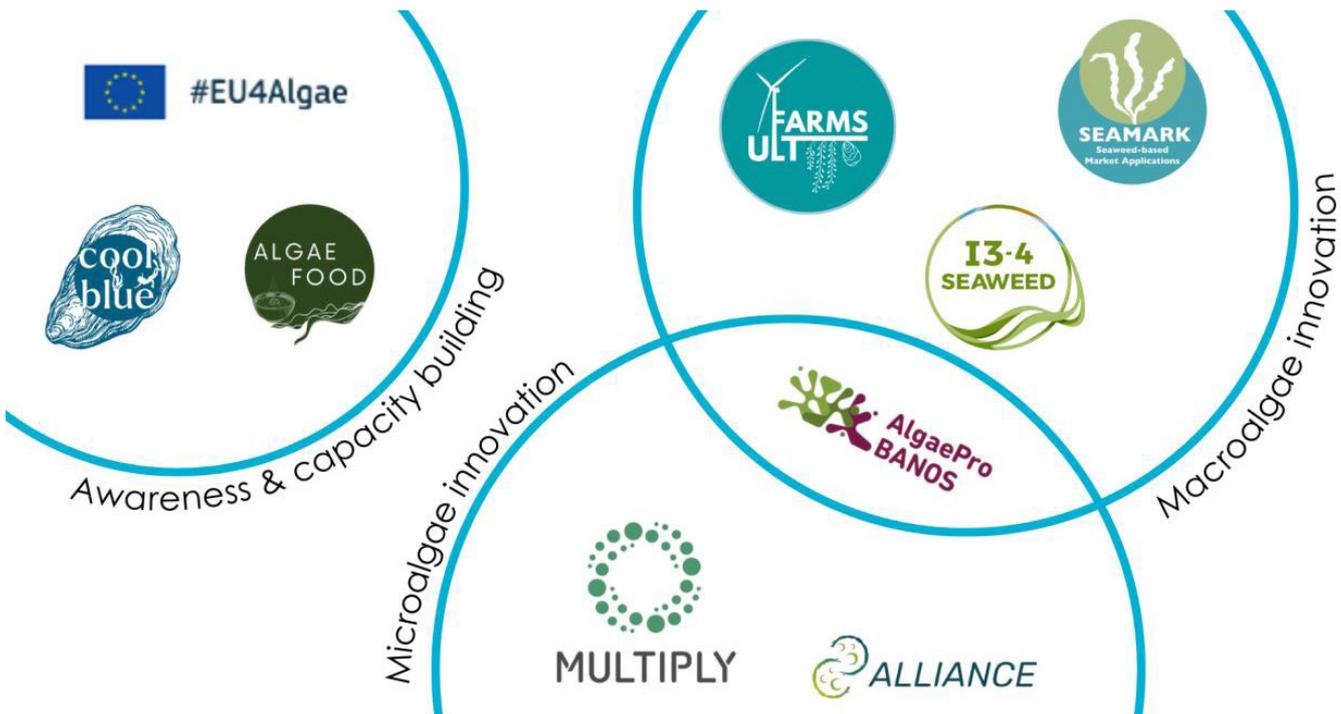


SYSTEMIQ

Source: *"Financing regenerative seaweed and aquaculture"* Systemiq, Global Seaweed Coalition 2025

The current ambition of SUBMARINER extends beyond the establishment of new macroalgae cultivation sites in the Baltic to the professionalisation of the sector. This includes horizontal and vertical integration of both micro- and macroalgae enterprises, to create new value chains and governance structures not only in the Baltic and North Seas but also in partnership with enterprises in the Atlantic, Mediterranean, Adriatic and Black Seas.

4.2 Algae – Projects at a Glance



4.3 Key SUBMARINER Achievements

- **The Algae Declaration**, through which EU Member States highlight their shared commitment to advance the EU algae sector, has been signed by Germany, France, Greece, Finland, with more EU MS expected to join.
- **The long-term EU4Algae service contract** for DG MARE running until 2028, places s.Pro and by extension the SUBMARINER Network Members at the table with decision-makers at the EU level, providing input for funding priorities and the scoping of new calls. A key achievement was the [2nd Algae Awareness Summit](#) from 16-17th October in Berlin, which hosted over 250 stakeholders and was attended by Commissioner Costas Kadis and the German Minister Alois Rainer.
- **Novel food approval** was achieved for many algae species via the EU4Algae project and efforts from EABA, meaning that species interesting for the Baltic Sea such as *Ulva intestinalis* can now be commercially cultivated and marketed.
- **Support to German national authorities** through stakeholder engagement and expert advice as part of the BSH MU study and related projects such as ULTFARMS and UNITED.
- **The 2025 EU algae industry study** finds that Europe’s algae sector is still a small, fragmented niche with strong potential for low-carbon food, feed, fertilisers and climate services, but its growth is held back by high costs, small scale, fragmented regulations, financing and skills gaps—so a more coherent EU framework and targeted support are needed to scale it sustainably.
- **Two projects are running accelerator programmes** (AlgaeProBANOS and i3-4SEAWEED) with financial support for third parties (FSTP) and digital tools which will help famers and authorities alike in site selection as well as business planning.
- **Launch of Cool Blue Future**, a platform for blue community enterprise
- **New European Bauhaus Awards of 2024** awarded a runner-up prize to the blue community garden in Gothenburg, called “Flytevi”.
- **The BlueBioTechPreneurs MOOC** was a cross-project collaboration (MSP4BIBO, SeaMark, AlgaeProBANOS, COOL BLUE, COOL BLUE BALTIC), with over 2.000 visits on the FutureLearn e-learning platform.
- **MULTIPLY and ALLIANCE** are two new projects on the topic of microalgae and have therefore strengthened SUBMARINERs position in this field.

4.4 Progress made on Algae Cultivation, Processing & Products

Innovative stakeholder engagement and cross-border collaboration

New online spaces such as BlueBioMatch and the EU4algae stakeholder platform.

Regulatory advancements

Via the updates to the Novel Food regulation and inclusion of new algae species.

Technological advancements

Automated direct seeding and upscaled biorefinery capacity in SeaMark, alongside new product developments in food and biomaterials.

Education and capacity building

Through public-facing projects such as AlgaeFood and COOL BLUE and the co-development of the BlueBioTechPreneurs MOOC.

Policy influence

Via the EU4Algae platform and BSH study

4.5 State of Algae – Challenges & Opportunities

Despite increasing policy recognition and a growing number of projects and enterprises, progress in algae cultivation, processing and product development remains slow in terms of regulation, market uptake and social acceptance.



Challenges

Precarious funding environment

Algae producers across Europe largely depend on short-term European research and innovation grants, creating a structurally fragile and project-driven business environment rather than stable, long-term production systems.

Lack of structural recognition and support

Unlike agricultural products, algae lack comparable policy recognition and support mechanisms, resulting in fragmented regulatory frameworks, limited market protection and exposure to well-established global competition, particularly from Asia.

Production costs and price competitiveness (land- and sea-based systems)

Land-based micro- and macroalgae cultivation face high energy and water costs as well as scalability constraints, comparable to those observed in RAS systems.

Sea-based cultivation, remains capital-intensive and difficult to scale due to permitting, infrastructure and operational constraints. In the absence of structural production support and mature markets for algae products, economies of scale cannot be justified in either system, locking the sector into a “chicken-and-egg” circle. As a result, European cultivated algae are currently unable to compete on price with Asian cultivated algae or wild-harvested alternatives without government intervention to create a more level playing field.

Insufficient governance recognition

Transnational bodies such as HELCOM have yet to acknowledge algae cultivation as an active solution to eutrophication, often prioritising passive conservation measures and regulatory restrictions over nature-based, production-oriented interventions.



Opportunities

Growing Member State recognition

The Algae Declaration was a significant step towards political recognition at Member State level and has helped raise awareness within relevant ministries and authorities. To translate this recognition into durable national action, **continued and structured engagement with these ministries and political decision-makers** will be essential, supporting administrative champions and strengthening their position within national decision-making processes.

Algae in MNSPs

This momentum is further reflected in the **inclusion of algae in the Multi-annual National Strategic Plans (MNSPs) of Sweden, Finland, Lithuania and Estonia**, and in the promotion of low- or multi-trophic aquaculture in countries such as Germany and Denmark. However, as these commitments remain non-binding and follow the open method of coordination, **sustained dialogue and coordination at EU and sea-basin level will be required** to move from policy acknowledgement to consistent implementation.

- This shows promise; however low- or multi-trophic is often framed as a bioremediation or compensatory measure (e.g. uptake of excess nutrients) rather than as a commercial measure for product development in its own right.

Emerging regulatory opportunities at EU level

[Recent updates to the Common Market Organisation \(CMO\)](#) extend mandatory information requirements to seaweeds and algae, creating opportunities for stronger integration of algae products into EU market frameworks. Member States should be encouraged to recognise algae products under the CMO in the same way as fruit & vegetables, wine, protein crops olive oil etc. Similar to these crops, greater recognition of algae under the CMO could improve access to producer organisations, subsidies and market stabilisation measures. This is however unlikely to be addressed in the upcoming CFP revision — though POs, marketing standards and financial aid to small-scale coastal fishers are specifically mentioned in the [current legislative proposal](#).

Promising regional frontrunners

Within the Baltic Sea Region, **Estonia** stands out as a particularly promising case, where low-trophic aquaculture is already applied as a bioremediation measure and the first small-scale open-water seaweed farms are in operation (e.g. **Aqua Verde Ltd**). As a significant producer of the red seaweed *Furcellaria lumbricalis*, companies such as **Vetik** and **EstAgar** (now operating internationally) illustrate the potential for downstream processing of red algae extracts (e.g. carrageenan) for food and cosmetic applications as part of a smart specialisation strategy. **Denmark, Sweden and Germany** are also well positioned to continue playing leading roles, while in the **North Sea**, algae cultivation is increasingly being explored in connection with multi-use developments overseen by the CPMR North Sea Commission.

Flexible production and processing pathways

Despite high production costs in both land- and sea-based systems, emerging flexible production and processing models offer pathways to improve economic viability. For land-based cultivation, smaller, **modular “add-on” systems integrated into industrial symbioses** (e.g. using excess heat or nutrients from wastewater) can significantly reduce operating costs and scalability constraints, as demonstrated by **Algiecel** and **Pure Algae** in Denmark.

At the same time, algae processing and biorefinery activities are not geographically tied to cultivation, **enabling value creation across regions** and allowing any BANOS Member State to participate in algae value chains. Examples of so-called “**inward processing**,” such as **Origin by Ocean** in Finland processing imported Sargassum from the Caribbean, illustrate how cultivation and processing can be **spatially decoupled**, enabling shared economic benefits, specialised processing hubs, and a gradual strengthening of the competitiveness of European algae products.



4.6 Outlook and Next Steps for SUBMARINER

Strengthening engagement with national authorities

Building on the political momentum created by the Algae Declaration and SUBMARINER's established role in EU-wide initiatives, SUBMARINER should further strengthen direct, structured engagement with relevant ministries and authorities at national and regional level, particularly within the BANOS region. This includes maintaining regular dialogue with administrative focal points, understanding national implementation challenges and priorities, and providing targeted evidence, coordination support and project-based inputs to reinforce algae-related agendas within national decision-making processes.

Community building and cross-sector cooperation

SUBMARINER should continue to act as a convening platform for the algae sector, strengthening trust-based cooperation across cultivation, processing, research, policy and market actors. Building on collaboration with European-wide networks (e.g. EABA, NorthSeaFarmers, Seagriculture, Seaweed for Europe), concrete efforts should focus on the BANOS region by working through national contact points and clusters, supporting locally anchored cooperation, strengthening sector representation towards funders, and facilitating targeted transnational exchange.

Integration into MSP & MPA planning

Despite growing interest, algae farms remain largely disconnected from Marine Spatial Planning and Marine Protected Area processes. There is no European-wide alignment on their acceptability in MPAs or how they may be seen as measures in nature restoration laws or within related environmental frameworks. Thanks to our many projects & initiatives across both sectors, SUBMARINER is well positioned to build a shared understanding of the environmental functions/benefits of macroalgae cultivation. Targeted dialogue between researchers, producers and authorities, supported by concise position papers and guidance, can help clarify when and how algae farming contributes to biodiversity, nutrient reduction and climate objectives, and facilitate its integration into nature-inclusive planning.

Innovative financing and market uptake

To reduce reliance on short-term R&I funding, SUBMARINER should promote diversified and sustainable financing pathways that support long-term algae production, processing and restoration-oriented activities. This includes linking enterprises to scale-up instruments under EIT Water and BlueActionBanos, supporting access to blended finance, cascade funding and accelerator schemes, and strengthening the visibility of micro- and macroalgae applications as cross-sector solutions to **EU-wide** challenges such as developing climate resilience and sustainable food systems.

4.7 Algae Cultivation, Processing & Products – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
EU4Algae Accelerating the development of a sustainable and innovative algae sector in Europe.	2022-2028 DG MARE €4 500 000	s.Pro	Europe	Builds an EU-wide algae stakeholder community and resource hub, supporting coordination, knowledge sharing and sector guidance (e.g., summit outputs, practical toolkits).
AlgaeProBANOS Accelerating algae product development in Baltic and North Sea	2023-2027 HEU €12 500 000	SUB, UTartu, OceanBASIS, ALGIECEL, EUROFISH, SYKE, Nofima, KTH, LIAE, SDU, INOVA+, OBO, POWER ALGAE, VETIK	Baltic & North Sea	Accelerates algae innovation by supporting business pilots and bringing algae-based products closer to market through an accelerator and targeted support.
Cool Blue Nordic COmmunity Ocean farms and Local Business cLUstErs	2023-2026 HEU CSA €1 000 000	s.Pro, UGOT	DK, SE, FI	Establishes regenerative sea-farming through community ocean farms with shared tools for monitoring, business models, and local cluster development to enable replication.
Cool Blue Baltic COmmunity Ocean farms and Local Business cLUstErs	2023-2025 EMFAF €700 000	SUB, UGOT, GMU, KSTP, LIAE, UTartu, Ecopelag	Baltic Sea	Builds a Baltic regenerative sea-farming community with practical start-up support (incl. community funding approaches) and an online platform to connect farms, partners and buyers.
AlgaeFood Integrating algae into regional food culture	2023-2026 Interreg DE-DK (EPCO) €3 200 000	oceanBASIS, SDU	DE, DK	Increases acceptance and everyday use of algae foods through practical education formats (materials, “sea garden” approaches) and public-facing events.
i3-4SEAWEED Investing in seaweed innovation across Europe	2024-2027 i3 €7 000 000	N/A	Europe	Supports companies to scale seaweed value chains via demonstrations, business support and cascading funding, strengthening go-to-market readiness especially for the food industry, biofertilisers, and cosmetics.
SeaMark Seaweed-based Market Applications	2022-2026 HEU-IA €10 000 000	Nofima	Europe	Upscales seaweed cultivation and processing and delivers 12 validated products plus guidance (incl. sustainability and ecosystem-service recommendations) to help scale the sector.
ULTFARMS Circular Low Trophic Offshore Aquaculture In Wind Farms And Restoration Of Marine Space	2023-2026 HEU-MISS €9 500 000	SUB, FuE	Europe	Demonstrates low-trophic offshore cultivation concepts (incl. seaweed/IMTA) integrated with offshore wind, generating evidence on feasibility, impacts and replicable models.
MULTIPLY microalgae-derived ingredients for a variety of bio-based industries	2025-2029 CBE €7 500 000	SUB, Fraunhofer, Nofima	Europe	Proves scalable microalgae cultivation and biorefinery routes and delivers 10 improved microalgae-based products for multiple markets (food/feed/material uses), made from 5 microalgae species.
ALLIANCE Innovative, safe and sustainable multiproduct biorefineries for a blue biobased economy	2025-2029 CBE €7 500 000	SUB, SDU, NIVA	Europe	Demonstrates environmentally friendly food (ex: meat alternatives, beverages), natural pesticides and sustainable fish feed through near-zero-waste microalgae biorefinery routes.

5 MUSSEL CULTIVATION, PROCESSING & PRODUCTS



Mussel cultivation can be a unique measure to tackle existing eutrophication, improve water clarity and enhance biodiversity. Mussels also provide a sustainable biomass source for a diverse range of applications supporting the protein shift for food and feed, while their shells offer valuable raw materials for soil enhancers, paints, construction materials, and other applications.

For mussels, particularly in the Baltic Sea, the main challenge is their small size, which calls for the development of new high-value products.

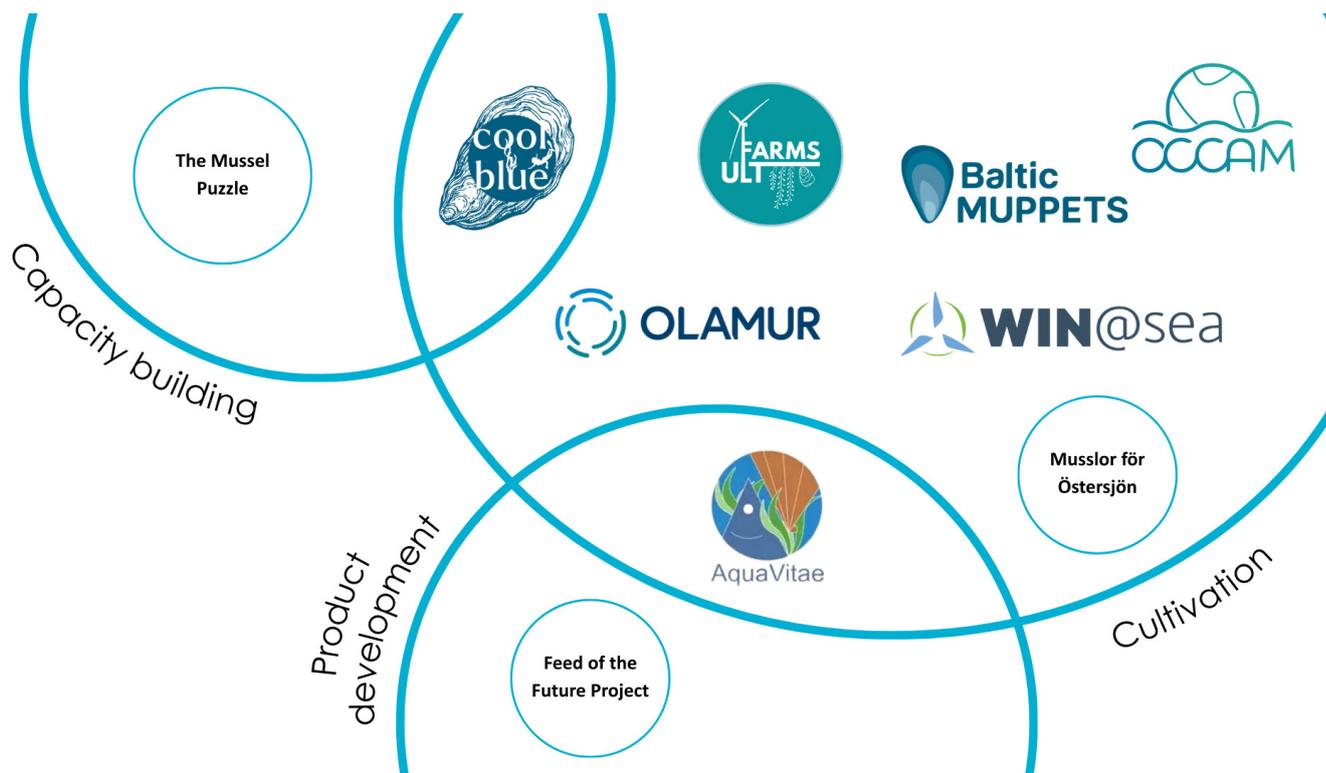
5.1 Starting Point and Ambition

The initial project [Baltic Blue Growth](#), which ended in summer 2019, had paved the way and demonstrated the potential of mussel cultivation in the Baltic Sea as a eutrophication mitigation measure, the positive effects on local biodiversity, the nutritional value comparable to “conventional” blue mussels, and the application as a feed.

The ambition was to build on these results, to expand mussel cultivation in the Baltic Sea and create a valid business model, including high-value products and recognise their potential as an ecosystem service provider.



5.2 Mussels – Projects at a Glance



5.3 Key SUBMARINER Achievements

Through [Baltic MUPPETS](#):

- **Product development:** Products made from small Baltic Sea blue mussels on the market in two different market segments: pet food and gardening products (Ecopelag and Grobruket). Feed incorporating mussels are being further developed.
- **Processing enabled:** Processing line built up for small mussels by Ecopelag/Östersjöfabriken.
- Ecopelag **farm expansion** and cultivation capacity.
- **Monitoring and modelling:** Monitoring of biodiversity-friendly concrete blocks shows preliminary positive results, ROV technology developed for monitoring biomass/growth (Blue Research). Data on ecosystem services provided available BlueBioSites together with modelling tools (Tartu University).
- **Technology development:** Submerged farm technology developed and optimised with harvesting technology and biodiversity friendly concrete blocks. Systems for holding small mussels alive developed.

In CoolBlueFuture, Aktion Österbotten successfully piloted the cultivation of duck mussels (a freshwater species). A common licensing framework has been developed to help low-trophic hobby farmers, and an overview of permitting processes for SE, DK and DE (also in Baltic MUPPETS).

Demonstrated potential for multi-use within offshore wind farms. EU projects such as [UNITED](#), [OLAMUR](#) and [UL-TFARMS](#) have shown that mussel cultivation can, and in some cases should, be integrated into offshore wind parks due to space availability. Pilots have demonstrated successful mussel farm deployment in multi-use settings both in the North and Baltic Sea, including successful harvests (FUE, UTartu).

5.4 Progress Made in Mussel Cultivation, Processing & Products

Typically, mussels follow the same path as LTA, as there is a consensus that it is a sustainable resource which should be prioritized. General development has been seen in:

- Product development
- Farm replication and new species piloted (see above). First farm established in Belgium.
- More solid business models for Baltic cultivation, including progress on ecosystem service valorisation concepts.
- Site selection knowledge and environmental impact analysis improvement.
- Policy evolution (acknowledged by policy documents as a sustainable biomass, e.g. HELCOM's "BAT/BEP", BSAP, EU "Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030", etc.) making cultivation prioritized, which could speed up expansion.
- Farm in Åland established (Under Ytan), farm in Estonia coming in 2026 (Aqua Verde).
- Proof that mussel cultivations can be integrated into multi-use settings with OWPs.

5.5 State of Mussels – Challenges & Opportunities

The cultivation of mussels in the low salinity parts of the Baltic Sea is still in the early stages but does see progress. Development of new, high value products have created more financially interesting business models for cultivators, and a more accepted view of mussel cultivation as an ecosystem enhancer promotes cultivation further. The positive impact on biodiversity has been shown for both small and large farms using different techniques tile ROV and eDNA monitoring.

However, to make Baltic Sea cultivation a financially sustainable industry, further valorisation is needed, including the valorisation of side streams, cascade valorisation approaches, increased capacity for bulk biomass processing (e.g. feed), and ecosystem service offers. These developments are making progress but are still to be commercialised. The combination of multiple applications is key to ensure enough biomass it produced to achieve measurable environmental effect, without wasting biomass and still generating an income.

An obstacle is the legal requirement that production areas be designated for food production, and access to this market would be a key industry enabler. Further, complicated permitting and licensing procedures and monitoring requirements limit market entry.

The above-mentioned initiatives have shown that multi-use is technically feasible and can support broader marine space optimisation objectives. However, commercially viable large-scale systems have not yet been established, and significant challenges remain. As wind farm development progresses farther offshore, the technological complexity of mussel production increases. Exposure conditions, infrastructure stability, logistics and maintenance requirements still limit the scalability of such operations, which currently remain at the pilot and demonstration stage.

Using small mussels as an asset is being explored outside the Baltic Sea too. Due to climate change, mortalities are high and cultivators look for alternative methods and applications.



5.6 Outlook and Next Steps for SUBMARINER

- High-value products from shells.
- Production area establishment for food production.
- Further piloting/upscaling of freshwater species.
- High costs of farm establishment and product development due to lack of available infrastructure or service offers.
- Competition with substitutional products available at a lower price (e.g. feed).
- Production in Poland, Lithuania and Latvia.

5.7 Mussel Cultivation, Processing & Products – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
EMFAF Studies: algae/shellfish/nutrients; scaling EU cultivation)	Completed EMFAF Study € 550 000	N/A	Europe	Provided EU-level evidence and practical guidance on shellfish/algae cultivation potential and environmental effects to support scaling decisions.
Baltic MUPPETS Baltic Mussel Products for Pet-foods	2022-2026 I3 €7 200 000	UTartu, Blue Research, Ecopelag	Baltic Sea	Develops mussel-based product value chains (e.g., pet-food) and improves cultivation/processing approaches, strengthening commercial pathways in the Baltic.
Musslor för Östersjön - “Mussels for the Baltic Sea”	2024-on-going	Under Ytan	Åland	Operates/advances mussel farming as an ecosystem-service solution in Åland, demonstrating local implementation and benefits.
The Mussel Puzzle Applied R&D project on environmental benefits of mussel farming.	2024-2027 FORMAS (SE) €280 000	IVL, KTH	Sweden	Quantifies environmental performance of mussel farming and develops models to reduce footprints and improve sustainability of production systems.
Feed of the Future The Feed of the Future for poultry, fish and pork	2023-2026 Vinnova	Ecopelag	Sweden	Research project that develops and tests mussel-based feed concepts, moving towards market-ready feed applications.
ULTFARMS Circular Low Trophic Offshore Aquaculture In Wind Farms And Restoration Of Marine Space	2023-2026 HEU-MISS €9 500 000	SUB, FuE	Baltic & North Sea	Tests bivalve cultivation within offshore wind settings, generating evidence on technical feasibility and ecological potential for offshore mussel farming.
OLAMUR Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas	2023-2026 HEU €9 100 000	UTartu, UKlaipeda, Kerteminde Seafarm	DK North Sea & Baltic Sea	Establishes and evaluates offshore low-trophic pilot farming in multi-use settings, generating practical knowledge for deployment in BANOS seas.
Cool Blue Nordic COmmunity Ocean farms and Local Business cLUstErs	2023-2026 HEU CSA €1 000 000	s.Pro, UGOT	DK, SE, FI	Builds community ocean farming capacity with practical tools (monitoring, business models, training) to enable low-trophic farming uptake.
Cool Blue Baltic COmmunity Ocean farms and Local Business cLUstErs	2023-2025 EMFAF €700 000	SUB, UGOT, GMU, KSTP, LIAE, UTartu, Ecopelag	Baltic Sea	Strengthens Baltic regenerative farming networks with practical support tools and mechanisms that lower barriers for new low-trophic farms.

Aquavitae Solutions for increasing the cultivation of low-trophic species, such as seaweed and sea urchins	2019–2023 Horizon €8 750 000	Nofima, IVL	Europe	Delivered exposed-site production approaches and hatchery protocols, plus market and feasibility insights for low-trophic aquaculture scaling.
BlueMusselFeed To establish blue mussels as a commercial, sustainable feed ingredient	2022-2025 Norwegian Research Council €2 300 000	N/A	NO	Tested and validated mussel-based feed ingredients, supporting circular feed development.
OCCAM Operationalizing Climate Change Adaption and Mitigation in European Aquaculture	2025-2029 HEU-MISS €4 500 000	SUB, Nofima, IVL	NO	Develops and validates 13 climate adaptation/mitigation solutions for aquaculture through 9 case studies, including approaches relevant to low-trophic production.
MUSCHEL Multi-use Shellfish Cultivation for High-Energy Locations	2025-2027 BMEL/BLE (DE)	N/A	DE	Optimises cultivation infrastructure by analysing biological and hydrodynamic site conditions and improving the Shellfish Tower concept for more efficient operations.
Win@Sea Wind energy and Nature-based solutions integrated at sea	2023-2026 VELUX, OLAMUR, AVJ Nature Foundation €2 500 0000	Kerteminde Seafarm	DK	Demonstrates safe co-use of offshore wind areas with low-trophic aquaculture/nature-based solutions.

6 OYSTER CULTIVATION & RESTORATION



European flat oysters (*Ostrea edulis*) are a key measure for habitat restoration, and cultivation methods have developed a lot in recent years but compete with the spread of the invasive Pacific oyster (*Magallana gigas*).

Oyster Cultivation, Restoration, or Reef Development have so far not been an explicit part of the SUBMARINER topics, as the initial focus was on species, which are home to the Baltic Proper. With the expansion of SUBMARINER interests across the entire BANOS area, this topic is gaining increasing attention and has also been part of the various SUBMARINER projects focusing on Multi-Use solutions. Hence, we have decided to include this as a separate chapter to this progress report.

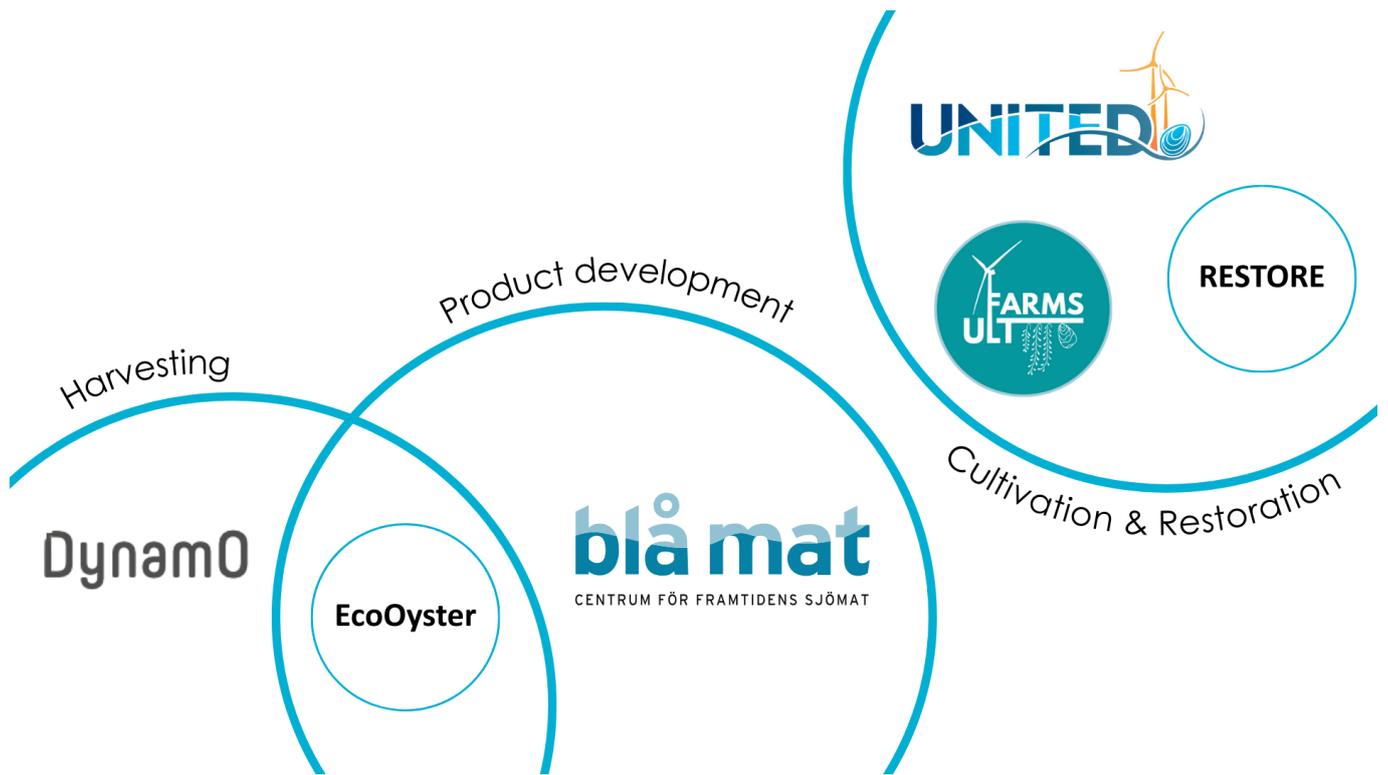
6.1 Starting Point and Ambition

European flat oysters (*Ostrea edulis*) are receiving increasing attention as a marine-based measure for their reef-forming properties, serving as habitat restoration. Native reef recovery is a high priority for biodiversity conservation. However, farming of flat oysters for economic purposes remains minimal. Cultivation trials focus on restoration, including those in OFW settings. A limitation for cultivation of flat oysters has been infection with the parasite *Bonamia*, but parasite-free breeding stocks have now been demonstrated.

At the same time, the Pacific oyster is getting more established along North and Baltic Sea coasts and is considered invasive in the entire area. However, the Pacific oyster remains the main species for economic purposes. Pacific oysters enjoy good market consumer acceptance as a delicacy, e.g. in Denmark, but being invasive, they cannot be farmed in the BANOS area; recently, sterile Pacific oysters produced in the lab (triploid) are being tested for farming.

The ambition for the future is to establish European oyster farming practices supporting both ocean regeneration and economic revenue and enable use of Pacific oysters without farming.

6.2 Oysters – Projects at a Glance



6.3 Key SUBMARINER Achievements

Through its involvement in ULTFARMS, SUB has contributed to demonstrating the feasibility of oyster aquaculture within offshore wind farms in Belgium, and previously, through UNITED, highlighted how aquaculture and oyster restoration can be combined. An expert study on multi-use in German waters further clarified how oyster aquaculture can be designed and integrated into offshore wind parks, offering spatial insights and policy recommendations that help move this topic forward in policy discussions.

6.4 Progress Made on Oyster Cultivation & Restoration

- Bonamia parasite-free breeding stocks have now been demonstrated.
- Multi-use cultivation has been demonstrated in multiple projects.
- Demonstration of pilot-scale reef restoration in Natura 2000 area.
- First large-scale offshore reef restoration demonstrated.
- Investigations on processing and alternative uses of Pacific oysters started.



A close-up photograph of numerous oyster shells, some open and some closed, scattered across the surface. The shells are in various shades of white, grey, and brown, with some showing signs of weathering and barnacle growth. The background image is a dense field of these shells, creating a textured, natural setting for the text.

6.5 State of Oysters – Challenges & Opportunities

- With parasite-resistant spat development, hatchery and cultivation methodology and technology, cultivating European flat oysters could be a viable option combining nature restoration and bioeconomy.
- In combination with e.g. wind farms, reef establishment has good restoration potential, which could be better than commercial farming, as it would require less need for access.
- Harvesting of Pacific oysters could be a management tool combining economic and environmental gain. However, due to the big size they might need to be processed, and there are regulatory barriers that must be investigated, including novel food and harvesting of invasive species.
- Cultivation for restoration in combination with commercial production would result in higher production costs, and further biomass valorisation might be needed for a sustainable business case.
- The above-mentioned initiatives have shown that multi-use is technically feasible and can support broader marine space optimisation objectives. However, commercially viable large-scale systems have not yet been established, and significant challenges remain. As wind farm development progresses farther offshore, the technological complexity of oyster production increases. Exposure conditions, infrastructure stability, logistics and maintenance requirements still limit the scalability of such operations, which currently remain at the pilot and demonstration stage.

6.6 Outlook and Next Steps for SUBMARINER

- Ecosystem service valorisation schemes for oyster restoration or harvest are not available. Monitoring of current pilots will support the development of these schemes.
- Create an overview of Pacific/flat oyster harvesting/cultivation and commercialisation rules.
- Recommendations and guidance for producers should be created based on country, location and main purpose (restoration/cultivation).
- Guidance for seed choice should be investigated depending on the main goal of the cultivation, and established cultures need to be genetically monitored.
- Pilots need to be upscaled, and business models validated.
- Investigate alternative market opportunities and uses and valorisation for both species, including combinations of restoration and commercial use. demonstration stage.

6.7 Oyster Cultivation & Restoration – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
UNITED Multi-Use offshore platforms demoNstrators for boosting cost-effective and Eco-friendly proDuction in sustainable marine activities	2020-2023 HEU € 11 500 000	FuE, SDU	Europe	Delivered and tested multi-use offshore concepts (incl. aquaculture) with practical blueprints, policy outputs and baseline evidence from pilots.
ULTFARMS Circular Low Trophic Offshore Aquaculture In Wind Farms And Restoration Of Marine Space	2023-2026 HEU-MISS €9 500 000	SUB, FuE	Baltic & North Sea	Demonstrates offshore bivalve cultivation and restoration concepts in wind farm environments, generating transferable technical and environmental evidence.
EcoOyster Innovation and Ecosystem Restoration through Oyster Fisheries	2025-2028 Jordbruksverket & EMFAF €440 000	IVL, Ecopelag	Sweden	Develops harvesting and product pathways for oysters alongside environmental assessment to support sustainable utilisation.
DYNAMO Dynamic management of Pacific oyster	2024-2027 FORMAS (SE) €280 000	IVL, KTH, UGOT	Sweden	Model for sustainable management of the invasive Pacific oyster in Sweden.
RESTORE Restoration of European oyster stocks in the German North Sea	2016-2025 Federal Agency for Nature Conservation (BfN)	N/A	Germany	Established and monitored oyster reef restoration pilots for <i>Ostrea edulis</i> , in the German North Sea, generating evidence for restoration practice.
PROCEED Establishment of a sustainable oyster seed production for a long-term restoration program	2016-2025 Federal Agency for Nature Conservation (BfN)	N/A	Germany	Developed and tested 3D reef structures for <i>Ostrea edulis</i> , plus standardised methods and guidance to improve restoration effectiveness.
BELREEFS First Offshore Pilot Project for large-scale oyster reef restoration in the Belgian part of the North Sea	2023-2026 Jan De Nul Group, RBINS, Shells & Valves and Mantis Consulting	N/A	Belgium	Implements and monitors large-scale offshore oyster reef restoration in the Belgian North Sea to test scalable restoration models.
Swedish Blue Food Centre Developing innovative feed sources	2024–2028 FORMAS (SE) € 8 600 000	IVL, KTH, Innovatum, Nordic Seafarm, UGot	Sweden	Satellite project: Develops pathways to valorise oversized Pacific oysters as a seafood resource within Swedish food systems.
Flat Oyster Breeding Line Bringing flat oysters back to the North Sea	2018 - ongoing The Rich North Sea	N/A	NL	Advances parasite-free flat oyster larvae to support resilient cultivation and restoration supply.
Remote Setting Displacing oyster onto hard substrate	2018 - ongoing The Rich North Sea	N/A	NL	Validates remote setting techniques to improve oyster restoration/cultivation efficiency and scalability.

7 FINFISH AQUACULTURE & PRODUCTS



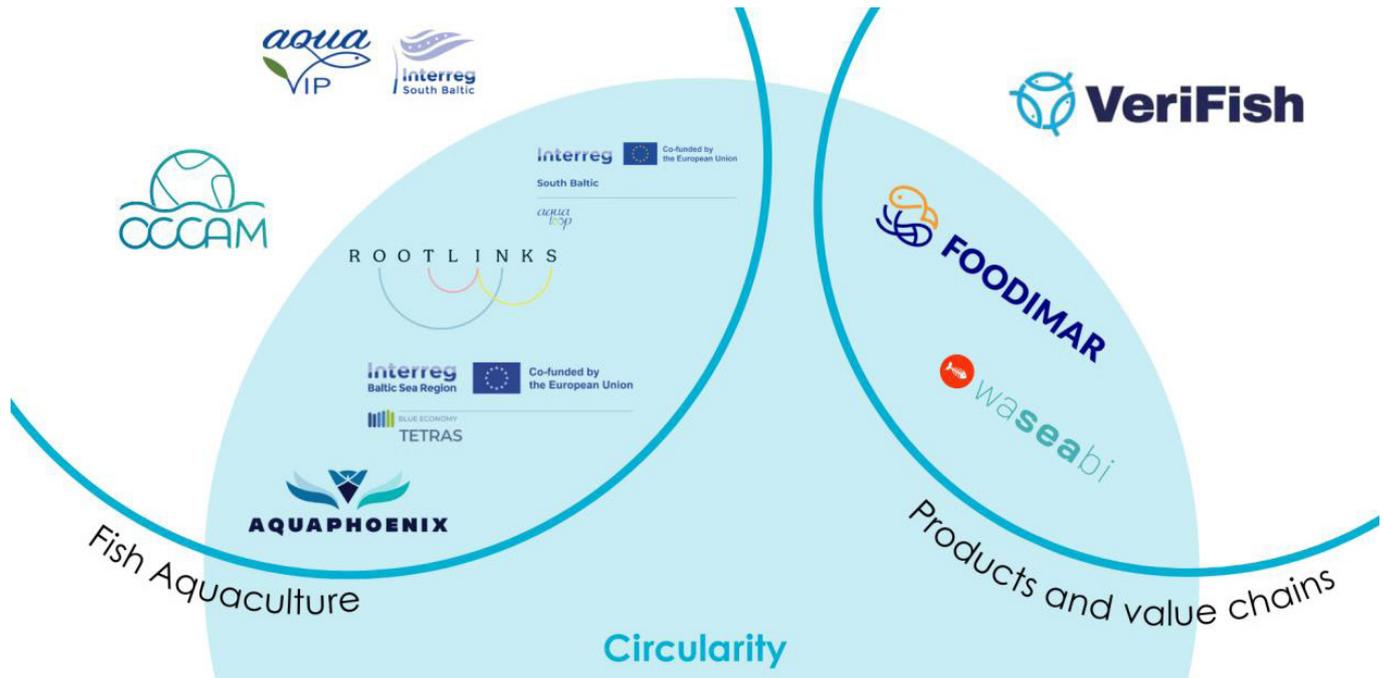
Fish-based aquaculture in the Baltic focuses on species such as trout, pikeperch, and carp, operating under strict nutrient restrictions due to the region’s limited water exchange and ecological sensitivity. Sustainable development in this area requires production methods that minimise emissions while supporting regional food supply and economic opportunities. In the North Sea, where environmental conditions differ and water exchange is higher, marine finfish farming—especially salmon—remains more established, enabling a broader range of production technologies.

7.1 Starting Point and Ambition

Finfish aquaculture in the Baltic remains constrained by strict nutrient limits, ecological sensitivity, and spatial pressures, despite growing demand for sustainable seafood and progress in research and pilot projects. The SUBMARINER Roadmap previously highlighted the need for modern systems such as RAS, IMTA, and circular solutions, along with better feed supply, improved legislation, and waste valorisation. However, development remains uneven, and the region still faces regulatory complexity, limited production volumes, and slow uptake of innovative technologies.

SUBMARINER aims to accelerate the transition toward low-impact, circular, and climate-smart aquaculture by advancing sustainable feed and breeding, improving waste valorisation, strengthening digitalisation and energy efficiency, enabling IMTA where viable, and reinforcing vocational skills and sector coordination. The ambition is to support the development of a sustainable, resilient finfish aquaculture sector that fits the Baltic’s environmental conditions while contributing to regional food security and economic activity.

7.2 Finfish Aquaculture – Projects at a Glance



7.3 Key SUBMARINER Achievements

- TETRAS Policy Recommendations for Innovation and Market Access Barriers in the Recirculating Aquaculture System Sector within the Baltic Sea Region
- TETRAS Portfolio of solutions with recommendations for decision-makers
- Through the AquaVIP project six different aquaculture online courses are available for self-learning

7.4 Progress Made on Finfish Aquaculture & Products

Innovative stakeholder engagement and cross-border collaboration

Fish-based aquaculture in the Baltic focuses on species such as trout, pikeperch, and carp, operating under strict nutrient restrictions due to the region's limited water exchange and ecological sensitivity. Sustainable development in this area requires production methods that minimise emissions while supporting regional food supply and economic opportunities. In the North Sea, where environmental conditions differ and water exchange is higher, marine finfish farming—especially salmon—remains more established, enabling a broader range of production technologies.

Feed and waste valorisation

Progress has been made in developing regionally sourced, low-impact feed ingredients, including trials using Baltic small pelagics, micro- and macroalgae, and mussel-based meals as partial fish-meal replacements. Recent studies from the EU Algae Initiative industry assessments also support algae's potential in commercial aquafeeds for fish.

Capacity Building

Establishment of new vocational training programmes for aquaculture operators, and hands-on training modules supporting skills development and reskilling from traditional fisheries. Initiatives such as the AquaVIP and AquaLoop project, which expanded vocational training, digital learning tools, and hands-on practical experience for students and professionals in aquaculture.

The [TETRAS Portfolio of Solutions](#) delivered a comprehensive set of policy recommendations, technical assessments, and market-access insights for advancing RAS in the Baltic Sea Region. It consolidates lessons from the four pilots, identifies barriers to scale-up, and provides actionable guidance for regulators, investors, and industry—positioning the region to accelerate sustainable, competitive RAS development.

7.5 State of Finfish Aquaculture– Challenges & Opportunities

The status of finfish aquaculture in the Baltic Sea Region remains constrained by strict nutrient-emission limits, complex licensing procedures, and limited availability of suitable sites. While several countries (Finland, Denmark, Germany) have expanded their land-based RAS capacity, overall production growth remains modest, and commercial viability is challenged by high energy costs and slow permitting. IMTA concepts are advancing mainly through pilots rather than commercial uptake, and formal nutrient-offset recognition is still limited.

Some progress is visible: improved national guidance on licensing (e.g., Denmark and Finland), growing interest in sustainable feed innovations, and increased collaboration between research and industry. However, setbacks such as farm closures, long permitting delays, and uneven administrative capacity across countries continue to limit momentum.

In the North Sea region, spatial competition with offshore wind, shipping, and conservation areas adds further complexity, although regulatory frameworks can be more flexible compared to the Baltic.

7.6 Outlook and Next Steps for SUBMARINER

With one of SUBMARINERs core projects in this field ‘TETRAS’ having come to its end, but building on the opportunity of the EU-wide projects OCCAM, FOODIMAR and ROOTLINKS; the broadening of the EU4Algae initiative towards a BlueBioEconomy partnership as well as potential new initiatives to be submitted/funded under BlueActionBANOS, the SUBMARINER secretariat and its members are well positioned to use new funding opportunities at national and transnational scale to develop new projects in the following specific areas:

- **Selective breeding and feed development** – Limited regional breeding programmes for Baltic-relevant finfish species and insufficient scaling of sustainable feed ingredients (algae, mussels, microbial proteins). Stronger industry–research partnerships and cross-border testbeds are needed to accelerate adoption.
- **Climate change, energy efficiency, and digital technologies** – Few aquaculture farms have integrated automated monitoring, predictive tools, or energy-efficient systems at scale. Dedicated pilots on low-emission RAS, heat recovery, and renewable-energy integration remain underdeveloped.
- **Technology development and industrial symbioses** – building on the results of the TETRAS project, further develop the positioning and expansion of RAS and RAS-based technologies in the Baltic sea region, especially in the context of industrial symbiosis where RAS can be positioned with other industrial processes to utilise corresponding waste streams.
- **Waste valorisation** – Despite strong R&D, practical pathways for converting side streams into market-ready, high-value products are still missing. More work is needed on regulatory approval, business models, and logistics for regional circular value chains.
- **Training and vocational education** – Current programmes remain limited in hands-on, practical training for modern aquaculture systems, including RAS, IMTA, and digital monitoring; expanding vocational courses, apprenticeships, and industry–research collaborations could better equip new entrants and reskill workers from traditional fisheries.
- **Sustainable and innovative product development and consumer uptake** – Limited consumer awareness, fragmented market development, and insufficient product innovation from underutilised species and side streams hinder competitiveness. Coordinated branding efforts, sensory studies, and chef/retail engagement could accelerate uptake of sustainable Baltic aquatic foods.

7.7 Finfish Aquaculture & Products – Projects Overview

Project	Key Facts	SUBMARINERS Members	Geographic Coverage	Key project actions as related to the topic
OCCAM Operationalizing Climate Change Adaption and Mitigation in European Aquaculture	2025-2029 HEU €4 500 000	SUB, Nofima, IVL	Europe	Develops and validates 13 climate adaptation/mitigation solutions for aquaculture through 9 case studies, including approaches relevant to fish aquaculture.
ROOTLINKS Enabling Primary Producers to Thrive in the Bioeconomy- Strengthening Roots, Creating Links	2025-2029 CBE-JU €3 000 000	s.Pro	Europe	Working Group of Primary Producers. Action plan to support the development of circular bio-based activities for primary producers
TETRAS Technology transfEr for Thriving Recirculating Aquaculture Systems in the Baltic Sea Region	2023-2025 INTERREG BSR €3 000 000	SUB, KU, KSTP, GMU, Blue Research	Baltic Sea	Worked with 4 pilots that helped operators improve recirculating aquaculture performance, resource efficiency and viability, to deliver the practical “TETRAS Portfolio of Solutions.”
AquaLOOP Aquaculture expert platform for circular economy practice	2023-2026 INTERREG €1 700 000	UGdansk, KSTP, UKlaipeda	Baltic Sea	Builds a practitioner exchange and learning platform that shares workable circular aquaculture practices (resource efficiency, reuse, waste reduction).
BlueBOOST Culture of a wide range of low trophic species to boost sustainable production of Blue Food and reduce environmental footprint	2024-2027 SBEP	N/A	Europe	Technologies for the culture of low trophic species together with established fed species to increase aquaculture production.
SAFE – SmartAqua4FuturE Reducing the environmental impact of freshwater aquaculture by applying circular economy approaches.	2022-2026 HEU €4 500 000	N/A	Europe	Circular economy model that reduces emissions, minimizes impacts on biodiversity, supports local production of sustainable feed ingredients, improves profitability and creates new jobs.
AQUAPHOENIX Innovative solutions to reduce AQUAculture emissions and valorise sludge through PHOsphorus and Nitrogen eXtraction.	2025-2029 HEU €13 550 000	LUKE	Europe	Develops systems to capture and valorise nutrients/emissions from aquaculture, improving resource recovery and lowering environmental impacts.
AquaVIP Aquaculture virtual career development platform for the South Baltic region	2019 - 2023 INTERREG South Baltic €1 000 000	UGdansk, UKlaipeda	Baltic Sea	Provides structured online training for aquaculture careers (RAS, larviculture, health, algae culture, feeds, and business skills) to strengthen workforce readiness.
FOODIMAR Sustainable climate-Friendly quality fOOD Ingredients from MARine side-stReams	2024-2027 SBEP €1 750 000	SUB, SDU	Europe	Demonstrates 3 pilots that turn marine side-streams into high-value food ingredients (ex: marine-based collagen, gelatine and glycosaminoglycans), supporting circular value chains and market uptake.

Mr Goodfish 3.0 Co-creating Solutions for Sustainable Seafood Consumption	2024-2027 HEU €2 000 000	N/A	Europe	Quarterly sustainable seafood recommendations and digital tools like a website and app for consumers to make responsible choices.
Verifish The sustainability indicator framework to communicate responsible aquafood production and consumption patterns.	2024 - 2026 HEU €1 800 000	EUROFISH	Europe	Framework of 84 verifiable indicators to assess seafood sustainability and a prototype mobile app for consumers and retailers
Waste2Taste From waste to taste: exploring innovative food applications of postharvest fish losses.	2024 - 2027 SBEP	N/A	Europe	Scalable bioprocesses like spray drying for flavouring ingredients, creating new culinary applications for marine by-products, and promoting a circular blue economy
WaSeaBi Valorisation of seafood side-streams through the design of new holistic value chains	2019 – 2023 BBI JU €4 150 000	FBCD	Europe	Sustainable technologies to transform underutilized fish processing side-streams into high-value food and feed ingredients, validating methods for producing protein-based food ingredients, bioactive peptides, savoury compounds, and mineral supplements.

8 LOW-IMPACT FISHERIES & PRODUCTS



Both the North and Baltic Seas have a rich history of fishing and are popular fishing grounds and productive ecosystems. However, both sea basins face significant challenges from overfishing, climate change, and ecological degradation, especially the Baltic Sea. Nonetheless, there is a growing movement to support small-scale, low-impact fisheries that operate within environmental limits and sustain coastal communities.

8.1 Starting Point and Ambition

Although not previously part of the SUBMARINER Roadmap, fisheries remain one of the most important sectors in the European Blue Economy and an important food system alongside aquaculture. In both the Baltic Sea and the North Sea, overfishing and unsustainable fishing practices such as large-scale trawling remain serious challenges for political actors and coastal communities to overcome. Nevertheless, there is a growing movement advocating for more support to small-scale, low-impact coastal fisheries using selective and passive gear, enabling fishing that stays within the environmental boundaries and promotes flourishing coastal communities.

SUBMARINER will contribute to and collaborate with this movement, and is currently engaged in projects, which focus developing, testing and implementing innovative fishing gear as well as strengthening fishing monitoring. SUBMARINER also promotes increased resilience in coastal communities by providing business opportunities and strengthening value chains for underutilised species and sustainable fishing practices. To achieve this, future activities should also focus on capacity building for the next generation of low-impact fishers.

8.2 Low-impact Fisheries – Projects at a Glance



8.3 Key Submariner Achievements

Until recently, the SUBMARINER Network has not been overly involved in projects concerning the fisheries sector, but based on its current fisheries projects, the following achievements are expected:

- A range of innovative and sustainable round goby products, including pet snacks
- A range of adapted and sustainable fishing gear to catch round goby and other valuable species but avoid by-catch of vulnerable species such as eel
- Increased consumer awareness of novel fish species and sustainable fishing

8.4 State of Low-impact Fisheries – Challenges & Opportunities

Fisheries in the Baltic and North Sea are dominated by large pelagic and demersal trawlers, which account for almost all catches but also contribute significantly to environmental degradation and long-term declines in valuable fish stocks. In recent decades, total landings have fallen in both regions: Baltic Sea herring and sprat catches have dropped from around one million tonnes in the 1980s–90s to roughly 700,000 tonnes today, while North Sea landings have decreased from about two million tonnes in 2005–2019 to 1.6 million tonnes since 2020.

The ecological situation is especially alarming in the Baltic Sea, with major stocks such as herring, sprat, plaice, flounder and cod at historically low levels. Environmental stressors, including warming waters, eutrophication, habitat degradation, and recurring algal blooms, further weaken ecosystem resilience and hinder stock recovery.

Despite representing most of the EU fleet, small-scale, low-impact fisheries play a marginal role in total landings and receive only limited financial support from EU funds such as EMFAF. In the Baltic, small-scale coastal fisheries are rapidly disappearing as a small number of large vessels harvest most of the Baltic's herring and sprat. Moreover, only 11% of herring landings in Sweden are processed into products for human consumption. The rest is processed into feed products.

While the EU's Common Fisheries Policy aims to achieve economic, environmental, and social sustainability, the an-

nual process of setting total allowable catches remains politically contentious and poorly coordinated for the Baltic Sea. As a result, quotas are often set above scientific advice, reinforcing unsustainable exploitation patterns and increasing the risk of further depletion or collapse of ecologically and economically critical species such as herring and sprat.

8.5 Progress Made on Low-impact Fisheries & Products

Despite these barriers, numerous initiatives support a transition toward low-impact fisheries. Projects such as RoundGoby demonstrate the social, economic, and environmental benefits of low-impact coastal fishing and developing value chains for underutilised species, offering new opportunities for local small-scale fisheries. Through the development of human food products and pet snacks, RoundGoby shows that increasing consumer awareness and establishing value chains with novel species is possible.

Ecosystem-based fisheries management, that is integrating ecological, social, and economic considerations into fisheries policy and management, is gaining support among policymakers and researchers. Projects such as SEAWISE advance ecosystem-based fisheries management in the Baltic Sea, whilst Fish-X shows that you can work together with small-scale fishers to promote monitoring of catches.

More specifically, these key outputs have contributed to promote sustainable fisheries in the Baltic and North Sea:

A stronger focus on the importance of small-scale fisheries as a sustainable alternative to large-scale trawling. Increasing consumer awareness through campaigns such as the Swedish initiative Forgotten Fish and RoundGoby tasting events.

Ongoing trials in projects such as MeCCAM, Infinifish and H2SEAS to increase fishing gear efficiency and sustainability by decreasing bycatch and discard as well as mitigating effects on the seabed and reducing vessel fuel consumption.

8.6 Outlook and Next Steps for SUBMARINER

Future fisheries projects should focus on:

- Small-scale, low-impact coastal fisheries using passive, environmentally friendly gear such as adapted fyke and trap nets. In the Baltic Sea, there are still opportunities to develop and test low-cost digital solutions that reduce fuel use and monitor catches.
- Shifting fishing activity toward catches for human consumption and away from fishmeal production to support resilient stocks of herring, sprat, and sand eel.
- Addressing persistent shortcomings in fisheries monitoring. Collaboration with small-scale fishers is particularly important for improving traceability and catch monitoring.
- Increasing consumer awareness of novel fish species and food products such as round goby, both for humans and pets. Especially focusing on marketing strategies / campaigns.
- Expanding skills and capacity-building programmes to make fishing a more attractive and stable career for younger generations through supportive legislation, regulation, and funding.
- Promote the diversification of the 'fishing' profession; i.e. by promoting alternative, additional activities of 'fisher-people'; i.e. as "Sea Rangers" (building on the German initiative); passive fishery and low-trophic aquaculture – with supporting also carbon-friendly, multi-purpose boats, which can also be used for such purposes.
- Better integrating fisheries management with Marine Protected Areas and the EU Nature Restoration Law and embed ecosystem-based fisheries management more strongly in EU and national policy frameworks.
- Promote projects, which integrate MPA and nature restoration ambitions; low-trophic and low-impact aquaculture and products together with fisheries.

8.7 Low-impact Fisheries & Products – Projects Overview

Project	Key Facts	SUBMARINERS Members	Geographic Coverage	Key project actions as related to the topic
RoundGoby Promoting commercial fishing of round goby in the Baltic Sea	2023-2026 Interreg BSR €3 000 000	SUB, GMU	Baltic Sea	Tests targeted round goby fishing methods and develops marketable products (food and pet snacks) to build value chains for this invasive species.
SEAWISE Shaping ecosystem-based fisheries management	2021-2025 H2020 €8 000 000	s.Pro, SDU	Europe	Delivered guidance for ecosystem-based fisheries management, supporting better decisions on ecological and socio-economic impacts. Created the open online course on EBFM modelling methods SEAWise EBFM Toolbox
Infinifish Climate-friendly and resilient fisheries through innovation and co-learning	2025-2029 HEU F2F €4 500 000	N/A	Europe	Develops innovations in gear, decision support (Open decision support system [DSS] framework) and processing to strengthen climate-resilient fisheries and co-learning across Europe Innovative technologies in fish processing.
Re:Fish Addresses the problem of plastic pollution and ghost fishing in the Central Baltic Sea.	2023-2026 INTERREG €1 800 000	LUKE, UTartu,	Baltic	Reduces fishing-gear losses through training (videos) and practical collection campaigns, supporting cleaner seas and safer fisheries operations.
MeCCAM Measures for Climate Change Adaptation and Mitigation in European Fisheries	2025-2029 HEU-F2F €4 500 000	SUB	Europe, Smartrawl in North Sea	Designing and implementing decision-support tools for more climate efficient fisheries, including testing the technological solution “Smartrawl” for reducing bycatch and discard in North Sea. Creating value chains for underutilised and invasive species.
Fish X Digital innovations for sustainable EU fisheries	2022-2025 HEU-F2F €4 500 000	N/A	Europe	Developed digital fisheries innovations including data/traceability solutions and insight platforms to strengthen monitoring and transparency, incl. the “Fisheries Dataspace” – a traceability app.
H2SEAS Coastal Fishing Vessels Powered by Zero Emission Hydrogen Fuel Cel	2024-2026 HEU-MISS € 3 400 000	N/A	Baltic & North Sea	Designs and demonstrates a hydrogen-electric small fishing vessel to reduce emissions in coastal fishing operations.
ECO-CATCH Business-smart innovations for sustainable fishing in the Baltic and North Sea	2025-2030 HEU-MISS € 8 800 000	N/A	Baltic & North Sea	Brings 10 bycatch and gear innovations to high readiness levels (TRL7-8) and supports wider uptake through testing and capacity building in BANOS seas.

9 MARINE PROTECTION, RESTORATION & MANAGEMENT



Marine protection, ecosystems restoration and effective management are essential to safeguard biodiversity and strengthen the resilience of marine ecosystems in the Baltic Sea and beyond. Marine Protected Areas (MPAs) remain a cornerstone of these efforts, supporting ecosystem recovery, protecting vulnerable species, and ensuring the long-term health of marine resources amid increasing pressures from human activities and climate change. When integrated with Maritime Spatial Planning (MSP), MPAs become part of a broader, strategic framework that coordinates sectors, reduces conflicts, and promotes an integrated approach to reconciliation of economic, environmental, and social priorities.

9.1 Starting Point and Ambition

As of 2024, approximately 12.3% of EU marine areas are designated as MPAs, though many lack (effective) management plans and enforcement. The Baltic Sea stands out among European sea basins, with over 20% designated as MPAs by 2025. Yet it faces persistent challenges, including insufficient funding, poor alignment with MSP processes, and limited on-the-ground protection, which hinder the efficient preservation of biodiversity and ecosystem services.

By 2030, the ambition is to achieve 30% MPA coverage, with 10% of this area under strict protection, in the Baltic Sea and across Europe. MPAs should be ecologically meaningful, well-connected, monitored, and embedded within MSP frameworks, thereby ensuring rigorous management. This includes integrating MPAs into multi-use planning processes, enabling large-scale restoration, and enhancing resilience to climate change.



9.2 Marine Protection – Projects at a Glance



9.3 Key SUBMARINER Achievements

- **Strategic leadership in Mission Ocean Blue Parks projects**, serving as a cross-sea basin connector, knowledge broker and communicator, while aligning with Baltic Sea priorities and ensuring long-term legacy in the region and beyond.
- **Launch of the MPA Community Network (MPA-CN)**, a central hub bringing together projects and initiatives working on marine protection, restoration and management, supported by a toolbox of best practices, guidelines and emerging tools. A dedicated MPA-CN networking group now facilitates exchange among MPA managers and stakeholders in the Baltic Sea and beyond.
- **Strengthening MSP–MPA integration** through projects such as MSP4BIO, supporting biodiversity- and climate-smart MSP and addressing governance gaps (see also Ocean Governance chapter).
- **Support to German national authorities** in developing the national marine restoration plan, through stakeholder engagement and expert advice.
- **Advancing nature-enhancing multi-use approaches** by driving research and innovation in low-trophic aquaculture and oyster restoration in offshore wind parks, demonstrating benefits such as carbon sequestration, habitat creation, and links to wider reef-building measures.
- **Promoting synergies between regenerative aquaculture and MPAs**, highlighting opportunities for complementary conservation objectives, and emphasising how MPAs can serve as platforms for education, nature-based tourism, and socio-economic enablers, enhancing community stewardship involving Sea Rangers (former fishers) and other trained local actors.
- **Very active local MPA presence throughout Europe**, with 36 project sites run across 21 countries through the projects in which SUBMARINER is a partner.



Marine Protected Areas

-   **Demonstration Sites**
-   **Living Labs**
-   **Demonstration Sites**
-   **Test Sites**
-   **Demonstration Sites**



9.4 Progress made on Marine Protection, Restoration and Management

Innovative stakeholder engagement

Tools developed by BLUE4ALL and BioProtect have improved stakeholder involvement, ensuring that the concerns and needs of local communities and industries are incorporated into MPA management.

Technological advancements

The use of cutting-edge monitoring technologies, such as eDNA and acoustics (SEAMPHONI and BioProtect), greatly enhances adaptive management of MPAs.

Improved cross-border collaboration

The establishment of the MPA-CN and the integration of MPAs into broader MSP frameworks (through MSP4BIO) have fostered better regional cooperation, facilitating a more coordinated approach to marine conservation.

Collaborative restoration

By engaging citizens and stakeholders in restoration planning and execution, BLUE CONNECT advances co-management approaches and enhances local acceptance.

Education and capacity building

In cooperation with the BlueBioTechpreneurs project, SUBMARINER developed a Massive Open Online Course (MOOC) supporting early-career professionals with key MSP, MPAs and multi-use topics.

Policy influence

MSP4BIO presented its policy coherence solutions to the European Commission and developed a Baltic-focused Policy Brief to drive action towards a nature-inclusive MSP.

Strategic communication and legacy

Joint dissemination across projects and establishment of the MPA-CN support long-term legacy creation.

9.5 State of Marine Protection – Challenges & Opportunities

MPA status in the Baltic Sea

Despite high coverage, many Baltic MPAs lack strict protection, management plans or adequate funding. Weak enforcement and insufficient integration into MSP remain significant barriers to ecological effectiveness.



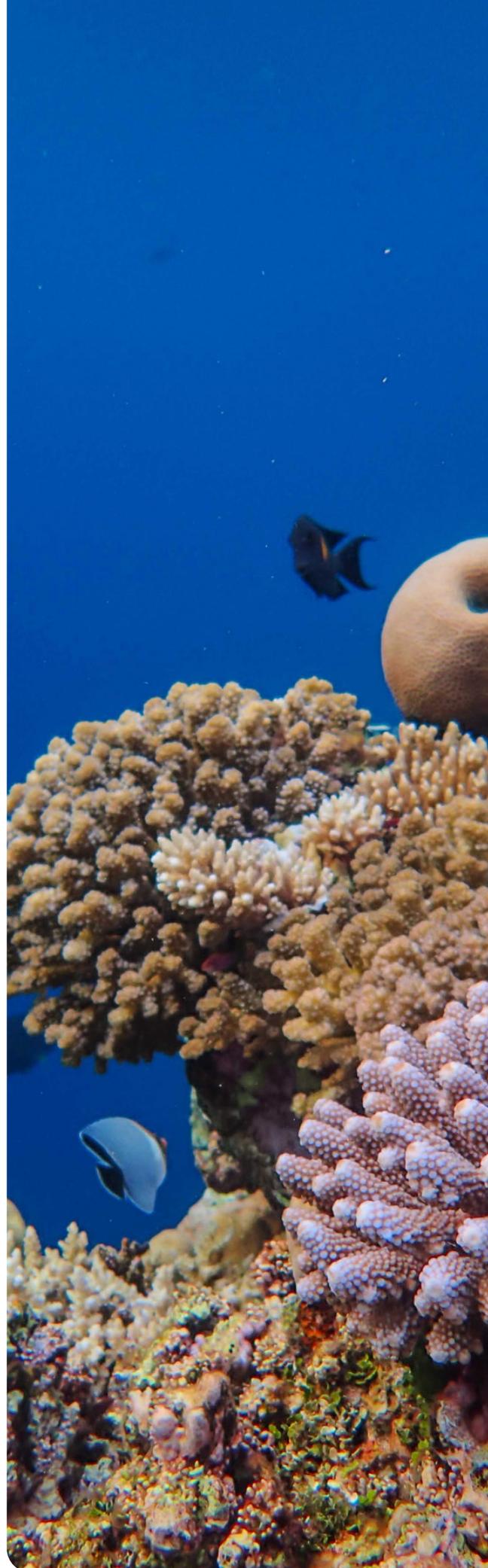
Challenges

- Weak enforcement mechanisms and inadequate funding for MPA management.
- Fragmented MPA networks with limited ecological connectivity.
- Cross-sectoral misalignment and conflicts between conservation and economic activities, such as fisheries, tourism, and energy.
- Limited incorporation of MPA needs into MSP and vice versa.
- Bottom trawling remains a significant problem in Baltic Sea MPAs, as the activity continues in many of them despite the strong evidence on how harmful it is for ecosystems. While some countries are trying a ban out to 12 nautical miles from the coast, a full-scale ban is needed. The EU has the goal to ban bottom trawling in all MPAs by 2030, but current enforcement is inconsistent across member states.
- Some countries face [major challenges](#) when it comes to [fisheries control](#), not complying with [current EU legislation](#). Effective control is a prerequisite for long-term sustainable fishing.



Opportunities

- Political momentum from EU Biodiversity Strategy 2030, Mission Ocean and EU Ocean Pact.
- Increasing attention to MPA–MSP integration, with early progress enabling future alignment of conservation measures and sustainable multi-use.
- Growing interest in nature-based solutions and restoration-linked uses (e.g., LTA, oyster reefs) that can complement MPA objectives.



Stakeholder needs in the Baltic and across the EU sea-basins

The MPA Community Network (MPA-CN) was established in response to the fragmented nature of marine conservation efforts and the lack of a shared platform connecting projects with actual practitioners. Before its launch, SUBMARINER explored the possibility of building a joint platform with the Blue Parks Community, but the EC did not support this approach. As a result, SUBMARINER, through the BLUE4ALL project, established the MPA-CN as a practical, user-driven network that goes beyond Mission Ocean and Horizon Europe projects by actively involving MPA managers, local communities and marine sectors and acting as a centralised place where practitioners can find all relevant tools developed for them by the different initiatives. The network has since grown rapidly, gathering more than 100 stakeholders and now brings together 12 projects and initiatives. Members of the SUBMARINER Network are engaged in 5 of the 12 projects that comprise the MPA-CN, collaborating with 42 MPA sites across Europe.



Challenges

- Ensuring long-term sustainability and maintenance of the platform
- Maintaining active engagement of local communities via mostly digital tools.
- Creating quality content which is meaningful and useful to be applied



Opportunities

- Becoming the central hub uniting MPA projects, initiatives, expertise, tools and knowledge.
- Promoting best practices and supporting the uptake of project outputs.
- Building on SUBMARINER services such as BlueBio-Match to strengthen community building.
- Expanding scope to nature-based solutions and ocean regeneration and rewilding.
- The European Commission's current interest in bridging MPA-CN with the Blue Parks Community.

9.6 Outlook and Next Steps for SUBMARINER

Community building and strengthening cross-sector cooperation

The MPA-CN can further evolve into a central hub that involves different marine sectors working together towards improving the Ocean's health and supports trust-building and coordination with the Blue Parks Community.

Restoration, rewilding and nature-based solutions

These topics are gaining increasing relevance in the context of the EU Ocean Pact, where restoring ocean health is one of the six core priorities. The MPA-CN will aim to strengthen the link between marine protection and restoration by facilitating expert exchange and developing online materials such as webinars and briefs. It will promote marine restoration developments starting in the Baltic Sea region, while fostering cross-sea basin exchange and discussion.

Support the Ocean Pact

SUBMARINER and the MPA-CN can contribute to the implementation of the Ocean Pact through targeted briefs and position papers on marine protection and restoration, translating project outcomes and lessons learned into actionable recommendations that support marine protection and restoration, a sustainable blue economy and community well-being.

Full MPA-MSP integration

MPAs remain isolated from broader MSP processes; SUBMARINER can push for further alignment with nature-inclusive planning, including better coherence between MSP objectives, legal frameworks, monitoring requirements and mitigation measures.

Innovative and sustainable financing

There is a need for diversified and sustainable funding mechanisms to ensure long-term MPA management and restoration efforts. The first step SUBMARINER is taking to support this issue is through the MPA-CN's publication on "[Guidelines or applying a business approach to the financial management of MARINE PROTECTED AREAS](#)".

Stakeholder needs in the Baltic and across the EU sea-basins

Cross-border data sharing remains fragmented; accessible, interoperable platforms are still needed for "on-the-ground" stakeholders such as MPA managers.

Monitoring harmonisation: Despite technological advances, standardised, harmonised monitoring frameworks are still needed for MPAs across the Baltic Sea.

Lack of coherent restoration planning across borders: The Baltic still lacks a basin-wide, coordinated restoration strategy - approaches differ significantly across countries, and restoration is often implemented through isolated, project-based efforts.

Cross-border data sharing

remains fragmented; accessible, interoperable platforms are still needed for "on-the-ground" stakeholders such as MPA managers.

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Despite technological advances, standardised, harmonised monitoring frameworks are still needed for MPAs across the Baltic Sea.

Lack of coherent restoration planning across borders

The Baltic still lacks a basin-wide, coordinated restoration strategy - approaches differ significantly across countries, and restoration is often implemented through isolated, project-based efforts.



9.7 Marine Protection, Restoration and Management – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
Blue4All Blueprint demonstration for co-created effective, efficient and resilient networks of MPAs	2023-2026 HEU-MISS €8 400 000	SUB, SDU, UTartu, SYKE,	Europe	Co-creates, practical tools to help MPAs design, manage, and restore marine ecosystems more effectively and resiliently, including a step-by-step financial management guideline that supports MPA managers in securing sustainable funding and improving operational effectiveness across 25 European sites.
MSP4BIO Improved Science-Based Maritime Spatial Planning To Safeguard And Restore Biodiversity In a Coherent European MPA Network	2022-2025 HEU €3 400 000	s.Pro, UTartu, CORPI, GMU, SYKE	Europe	Delivered an integrated socio-ecological framework and decision-support tools, including the ESE Framework , providing step-by-step guidance for integrating ecological, social, and economic dimensions into MSP and strengthening ecosystem protection and restoration across six European pilot sites.
BioProtect Safeguarding Europe’s Seas Through Advanced Area-Bases Biodiversity Management	2024-2028 HEU-MISS €8 100 000	SUB, Nofima	Atlantic-Arctic	Develops and validates innovative monitoring tools, indicators, and data workflows to assess biodiversity, ecosystem functioning, and human pressures, strengthening science-based management and protection of European marine ecosystems.
BLUE CONNECT Strict protection, restoration and co-management of Marine Protected Areas	2024-2028 HEU-MISS €8 900 000	SUB, UTartu, NIVA	Europe	A scalable, ecosystem-based MPA Blueprint tested across 12 European sea-basin sites to strengthen ecological connectivity, enhance collaborative MPA management, and empower coastal communities to help achieve EU and global biodiversity targets by 2030.
SEAMPHONI Strengthening Ecosystem-based Assessment and Monitoring for Protected Habitats in Offshore areas and Newly Identified MPAs	2025-2029 HEU-MISS €11 000 000	SUB, SDU, GEOMAR		A cost-effective, continuous offshore biodiversity monitoring system by validating and integrating eDNA, acoustic, and imaging technologies into an Intelligent Marine Digital Twin, improving visibility, protection, and decision-making for Europe’s largely unprotected offshore seas.
PROTECT BALTIC Working to preserve, revive and help the Baltic Sea thrive.	2023-2028 HEU-MISS €8 500 000	UTartu, UKlaipeda, SYKE		Focused on accelerating marine biodiversity protection and restoration in the Baltic Sea, closing protection gaps, and building a regionally agreed protection framework aligned with 2030 biodiversity targets.

10 OCEAN MULTI-USE



10

Ocean multi-use (MU) refers to the intentional combination of different maritime activities—such as offshore wind energy, low-trophic aquaculture, biodiversity enhancement, research, and tourism—within the same marine space. MU represents a shift from exclusive, single-use rights toward a more inclusive, coordinated sharing of marine space and infrastructure.

Although SUBMARINER understands MU more broadly (i.e., the integration of LTA with MPAs or Fisheries/Aquaculture with tourism), it is currently mainly understood as opening the space within OWFs. For the Baltic Sea Region, and especially the North Sea, MU is gaining relevance as offshore wind is currently expanding rapidly, while MPA requirements are becoming increasingly stringent (see the preceding chapter). The demands for ocean defence services are also gaining rapid prominence. Competition for space has therefore increased dramatically since the formation of SUBMARINER. MU offers a solution by providing an open space for newcomers in areas already occupied by other marine users, while retaining the space necessary for others, such as shipping, the military, and fisheries.

Although policy recognition is increasing, regulatory integration and systematic support to new solutions remain incomplete, which continues to slow practical uptake.

10.1 Starting Point and Ambition

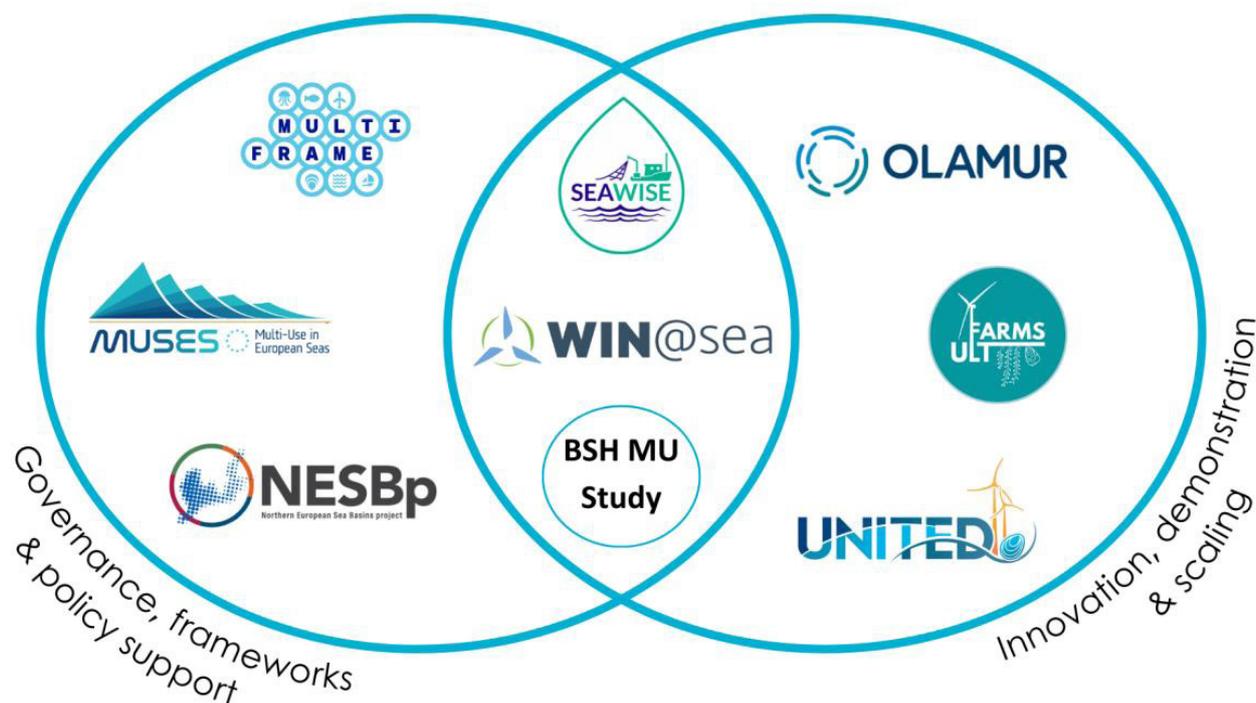
Over the past decade, MU has evolved from a conceptual idea into an increasingly operational topic across Europe. Early projects such as MUSES and MULTI-FRAME established analytical foundations, including the global Multi-Use Assessment Approach (MUAA). More applied efforts, such as UNITED and ULTFARMS, have delivered real demonstrations in Baltic and North Sea sites of co-located offshore wind, aquaculture, biodiversity restoration, tourism and research.

Despite this progress, implementation remains uneven. The Netherlands (North Sea) are most advanced in view of pro-active regulatory support having introduced the concept of ‘Area Passports’. In the Baltic Sea Region, political interest is rising - especially in Germany, Denmark - yet all those countries still lack clear permitting procedures, safety concepts, or long-term governance arrangements for MU. The rapid expansion of offshore wind—toward 60 GW by 2030 and 300 GW by 2050 EU-wide—makes the need for multi-functional spatial solutions increasingly urgent. MU provides an opportunity to optimise space use, reduce sectoral conflict and create ecological and social co-benefits.

SUBMARINER’s ambition for 2030 is to establish MU as a mainstream, operational component of the sustainable blue economy. This means harmonised governance approaches, standard operating models, functioning regulatory pathways, and scalable demonstration sites. The goal is to move MU from a “promising concept” to routine practice in the Baltic and North Sea and potentially beyond.



10.2 Ocean Multi-Use – Projects at a Glance



10.3 Key SUBMARINER Achievements

- **Coordination and knowledge leadership globally** in MULTI-FRAME, including development of the global MU Assessment Approach (MUAA).
- **Practical multi-use demonstration through UNITED**, enabling the first full-scale pilots combining OWF, aquaculture, restoration, tourism and research.
- **Strategic co-leadership in ULTFARMS**, advancing low-trophic aquaculture within offshore wind farms, including work on stakeholder engagement, communication and engagement.
- **Active engagement in Mission Ocean / Blue Mission BANOS Arenas**, positioning MU as a core element of European sea-basin strategies.
- **Implementation of the German BSH MU Study**, the first national-level assessment directly informing MSP revision.
- **Co-leadership of the MU pillar in NESBp**, aiming to develop jointly agreed guidelines on how to apply MU in MSP to be adopted by Baltic and North Sea MSP authorities.



Demonstration Sites Multi Use Sites

Sea Sites



Pilot Site



Case Study



Synergies between ULTFARMS, OLAMUR, and sea-basin governance initiatives (Blue Mission BANOS Arenas, 5th Baltic MSP Forum) are accelerating MU mainstreaming. ULTFARMS contributes technical, environmental and production evidence from offshore wind–aquaculture sites, while OLAMUR adds insights into social acceptance, ecosystem services and co-management approaches. Their combined outputs—supported by SUBMARINER—feed directly into Mission BANOS actions and scenario development, harmonised monitoring discussions, and governance dialogue with permitting authorities.

10.4 Progress Made on Ocean Multi-Use

Operationalisation of MU

Several pilots (ULTFARMS, UNITED) demonstrate feasible OWF–aquaculture integration, with TRL increases for low-trophic systems under offshore conditions.

Governance & permitting advances

The BSH study and NESBp developed/will be developing draft permitting concepts, safety concepts, and cross-border governance scenarios.

Policy mainstreaming

MU is part of the NL ocean policy since 2020; MU is also referenced in the Offshore Renewable Energy Strategy, Mission Ocean, and is increasingly being discussed also in other national MSP developments (DE, DK, PL).

Capacity & knowledge tools:

Standardised MU assessment methods (MULTI-FRAME MUAA), new monitoring templates, and cross-sector workshops.

10.5 State of Ocean Multi-Use – Challenges & Opportunities

Despite significant conceptual and research progress, the practical deployment of MU in the Baltic Sea remains limited. The Netherlands is the only EU country where MU is systematically embedded into local OWP plans (Gebietsplannen) as well as into subsequent OWP tenders. In Germany, the MSP authority is actively exploring the inclusion of MU concepts in the upcoming revision of the German MSP for the EEZ. The spatial planning law has been revised to allow MU and the s.Pro study has shown its feasibility for LTA and reefs. However, implementation is hindered by institutional reluctance, differing priorities among agencies and political interests. Denmark is exploring operational options but lacks formal permitting arrangements. Other Baltic states (Poland, Sweden, Estonia) show interest but have not yet translated MU into binding frameworks.

Small improvements include growing acceptance of aquaculture in wind parks, early-stage biodiversity enhancement concepts, and increasing cross-border MSP discussion through NESBp. However, key barriers persist: missing permitting procedures, unclear liability and insurance terms, limited long-term monitoring data, and cautious investor attitudes.

Despite the EU4Algae initiative (see relevant chapter), the main barrier to offshore MU solutions is clearly the lack of economic pressure, i.e. the lobbying of big companies to policymakers, to enable such solutions.

OWP Operators have shown increasing interest, with the ‘Vattenfall promo spot’ being the most prominent example. However, the face

The fast adoption of suitable laws for i.e. Carbon Capture and Storage (CCS) show how much less environmentally friendly and less researched solutions for the European Seas can pass political resistance with almost no effort, as soon as traditional industries on land are concerned.

10.6 Outlook and Next Steps for SUBMARINER

With the two major Mission Ocean multi-use projects **ULTFARMS** and **OLAMUR** entering their final phase in 2026, SUBMARINER is well positioned to build on the substantial groundwork already established. This includes earlier work undertaken for the German government, as well as the development of guidance on how to realise MU in the BANOS region within the **NESBp** project, which is followed by **GNSBI / HELCOM-VASAB**. Together with SUBMARINER’s long-standing coordination role and the active engagement of its members, this provides a strong basis to continue driving MU uptake across the Baltic and North Seas.

At the same time, it must be acknowledged that further progress will require **new funding pathways** beyond Horizon Mission instruments, as MU development now needs to move decisively towards **on-the-ground demonstration and implementation**. Promising starting points include funding under **EIT Water**, the large-scale cascade funding initiative under **Horizon Cluster 5**, as well as **national funding schemes**, such as German **DBU** funding.

Despite the progress achieved to date, several **structural gaps and barriers** continue to hinder the wider uptake of multi-use approaches across the region. These include:

- The absence of a **strong and coordinated business lobby** representing fisheries and aquaculture (notably algae and mussel sectors), as well as a nature restoration lobby from environmental agencies capable of advocating jointly for multi-use solutions.
- Persistent **differences and barriers in permitting models** for multi-use across the Baltic and North Seas.
- **Unclear liability, insurance and contractual frameworks**, which continue to deter private investment.
- A lack of **large-scale demonstration zones** that allow for systematic testing of different multi-use configurations under real conditions.

- The need for **integrated monitoring frameworks** covering biodiversity impacts, nutrient removal and socio-economic benefits, which still require standardisation and long-term data generation.

Building on its extensive experience and network, the **SUBMARINER Network holds a uniquely strong position** to address these challenges. Through its coordination of **MULTI-FRAME, UNITED, ULTFARMS, NESBp** and the **BSH study**, SUBMARINER combines scientific credibility, policy influence and a broad regional partnership base that spans the Baltic and North Sea regions.

Over the coming years, SUBMARINER should therefore focus on **facilitating the development of new integrated multi-use demonstration areas**, with a particular emphasis on advancing technologies for aquaculture, monitoring systems and multi-use logistics. To this end, SUBMARINER, together with regional partners, should develop **integrated concept papers and project proposals** for specific priority areas (e.g. Germany, Denmark, the Netherlands and Belgium). These concepts should present concrete, place-based multi-use projects that can be showcased to national funding bodies (such as DBU), aligned with the **EIT Water strategic agenda**, and positioned for relevant calls. Initiatives such as **BAB/BMB20230/EIT Water CLC** should be used strategically to convene stakeholders within clearly defined national or cross-border areas.

Based on such concrete demonstration efforts, SUBMARINER can continue to deliver value across several key areas:

- Policy advice and government support
- Supporting MSP revisions, offshore wind tendering frameworks, and MU-friendly permitting systems.
- Knowledge brokerage and capacity building
- Providing synthesised guidance, MUAA-based tools, and tailored training to authorities and operators.
- Support for demonstration and innovation
- Facilitating new Baltic MU demonstration areas; advancing technologies for aquaculture, monitoring, and multi-use logistics.
- Cross-sector cooperation and finance mobilisation
- Convening energy, aquaculture, conservation and investment actors to co-create business models and financing schemes.
- Strategic communication and advocacy
- Ensuring MU remains visible in EU and national agendas and communicating the benefits of multi-use to policymakers and the public.

10.7 Ocean Multi-Use – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
MUSES Multi-Use in European Seas	2016-2018 HEU €2 000 000	SUB, GMU	Europe	Delivered concrete multi-use combinations, business models, and policy recommendations that demonstrated how compatible maritime activities can share space and infrastructure, reducing conflicts and increasing the economic and environmental efficiency of marine uses across Europe.
MULTI-FRAME Assessment framework for successful development of viable ocean multi-use systems	2020-2023 Belmont €1 350 000	s.Pro, KTH	Europe plus Global	Developed and tested a flexible governance and decision-support framework that enabled coexistence and multi-use of maritime space, helping planners and stakeholders balance environmental protection with fisheries, energy, transport, and tourism across European sea basins.

UNITED Multi-Use offshore platforms demoNstrators for boosting cost-effective and Eco-friendly production in sustainable marine activities	2020-2023 H2020 €11 500 000	SUB, FuE	Baltic & North Sea	Developed and demonstrated real-life multi-use offshore solutions, combining renewable energy, aquaculture, and environmental monitoring to reduce spatial conflicts and improve the economic and environmental efficiency of offshore wind farms across Europe.
ULTFARMS Circular Low Trophic Offshore Aquaculture In Wind Farms And Restoration Of Marine Space	2023-2026 HEU-MISS €9 500 000	SUB, FuE	Baltic & North Sea	Develops innovative offshore multi-use concepts that integrate low-trophic aquaculture with offshore wind farms, delivering scalable technical, environmental, and business solutions for sustainable food production and shared use of marine space.
NESBp Northern European Sea Basins project	2025-2027 EMFAF €2 450 000	SUB, GMU, UGOT	North & Baltic Sea	Developing a transnational framework and practical guidelines that advanced multi-use and cross-sectoral coordination in the Baltic Sea, supporting better alignment between maritime spatial planning, blue economy activities, and environmental protection.
BSH MU Study Study on Ocean Multi-Use in the German EEZ	2023-2025 BMWK (DE Ministry) €450 000	s.Pro, FuE	Germany	Comprehensive assessment of feasible ocean multi-use options in the German Exclusive Economic Zone (EEZ) of the North and Baltic Sea
OLAMUR Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas	2023-2026 Mission Ocean €9 100 000	UTartu, Kerteminde Seafarm, UKlaipeda	Denmark North & Baltic Sea	Develops scalable offshore aquaculture solutions that enable multi-use of marine space by combining low-trophic aquaculture with existing offshore activities, supporting sustainable food production, ecosystem services, and efficient use of maritime areas.
Win@Sea Wind energy and Nature-based solutions integrated at sea	2023-2026 VELUX, OLAMUR, AVJ Nature Foundation €2 500 0000	Kerteminde Seafarm	Denmark	Demonstrations and practical knowledge showing how offshore wind farms can be safely and sustainably co-used with aquaculture and nature-based solutions, supporting scalable multi-use models for future offshore development.
SEAWISE Shaping ecosystem-based fisheries management	2021-2025 H2020 €8 000 000	UTartu	Europe	Developed innovative planning tools, governance models, and stakeholder-driven solutions that enable safe, sustainable multi-use of marine space, balancing renewable energy, nature conservation, fisheries, and maritime activities while reducing conflicts and improving decision-making across European seas.

11 BUSINESS SUPPORT



Business support and acceleration are central to scaling a sustainable blue bioeconomy across the Baltic and North Sea. Across the spectrum — from early-stage startups to SMEs targeting higher TRL deployment — persistent barriers remain: fragmented support services, regulatory complexity, limited access to capital for scale-up, and insufficient access to infrastructure, technology and markets. A coordinated business support ecosystem that links mentorship, funding, pilot/test sites, and market-readiness instruments is essential to convert innovation into competitive, sustainable businesses.

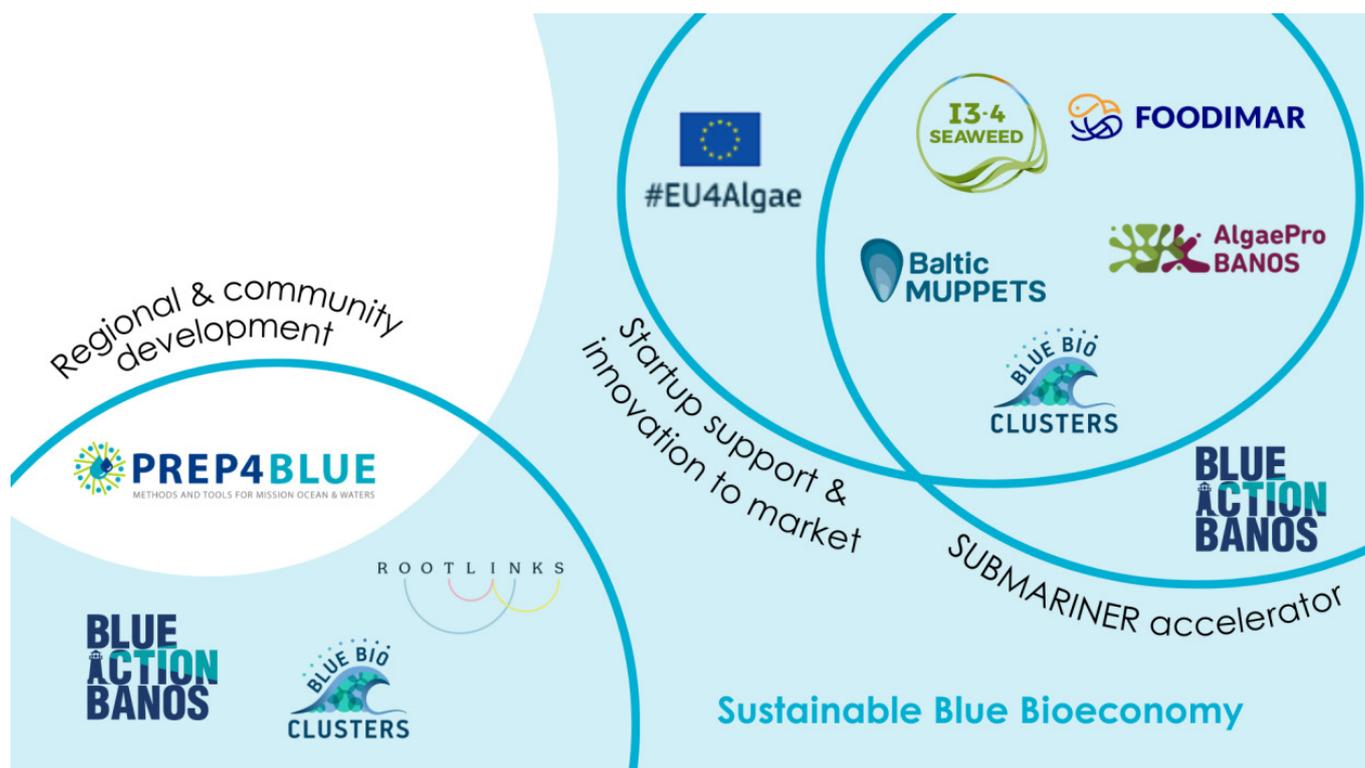
11.1 Starting Point & Ambition

The SUBMARINER Network delivers business support and acceleration activities that connect early-stage companies with tailored mentorship, resources, and networks. Our flexibility and early engagement enable rapid identification of firm-level needs and the delivery of seed funding, mentoring, knowledge brokerage, and matchmaking. By facilitating cross-border collaboration and creating targeted support instruments, we aim to help startups and SMEs navigate regulatory and financial complexity, access test sites and infrastructure, and advance innovations to higher Technology Readiness Levels (TRLs).

In the coming years, SUBMARINER will scale these activities through third-party funding, enhanced platform services and deeper integration with European funding and investment instruments to boost the commercialisation and resilience of blue bio-based ventures.



11.2 Business Support – Projects at a Glance



11.3 Key SUBMARINER Achievements

SUBMARINER has mobilised a portfolio of projects and services that deliver matchmaking, accelerators, business pilots, and tailor-made mentorship.

- Blue Bio Clusters ran regional and transregional bootcamps and matchmaking across Estonia, Sweden, Lithuania, Norway and Belgium, selecting 40 companies for tailored mentorship and producing case studies and Ecosystem Approach business tools.
- AlgaeProBANOS runs an Algae Accelerator (6-month mentorship) and supports six pilots to bring eight algae products to market (TRL7–9), offering innovation vouchers for expert mentorship and exclusive training and networking.
- BlueActionBANOS will fund Community-led Actions and Transition Agendas, also in the field of business development and innovation.
- Baltic MUPPETS provides matchmaking and mentorship targeted at mussel value chains and ran six Blue Entrepreneurship workshops to generate sustainable business ideas.
- I3-4 Seaweed focuses on market readiness for macroalgae ventures, combining capacity-building, demonstrations and a cascade funding programme expected to support ~30 SMEs (first open call attracted ~50 finalised applications).
- RootLinks creates a Working Group on Primary Producers and co-develops an Action Plan to integrate primary producers across European circular bio-based value chains.
- FOODIMAR (SBEP) pilots' valorisation of fisheries, aquaculture and jellyfish bycatch into marine collagen, gelatin and GAGs and will issue policy recommendations (expected April 2026) and a go-to-market strategy (December 2026).

- Prep4BLUE published [a critical assessment and key recommendations for Interregional financing](#), a set of [business model blueprints, de-risking recommendations](#) and [case studies of successful interactions between businesses, public entities, and other organisations contributing to Mission Ocean's goals](#).

Furthermore, SUBMARINER hosts [BlueBioMatch](#), a unique community matchmaking platform for startups, SMEs, funders, researchers, and many others to connect, exchange and discuss business solutions. On the platform, stakeholders can find projects, products, job opportunities, and mentorship opportunities in the fields of the blue economy, the blue bioeconomy, and marine conservation.

11.4 Progress Made on Business Support

SUBMARINER has advanced business support by combining hands-on acceleration, cross-border matchmaking, and resources for market entry.

- Regional and transregional bootcamps and matchmaking that selected ~40 companies for tailored mentorship.
- Operational Algae Accelerator and innovation vouchers supporting pilots to market (TRL7–9).
- Development of business model blueprints and interregional financing recommendations (Prep4BLUE).
- A 1500-member-strong matchmaking platform (BlueBioMatch) connecting stakeholders across blue value chains.

11.5 State of Business Support – Challenges & Opportunities

European Context

Across Europe, the blue economy ecosystem is benefiting from increasing policy recognition and the emergence of dedicated support instruments for blue innovation. Initiatives such as SBEP, BlueInvest and EIT Water are strengthening collaboration, improving access to finance and supporting the development of new partnerships. Together, these frameworks offer important opportunities to scale innovative solutions beyond early development stages.

Nevertheless, significant structural challenges persist. Fragmented regulatory frameworks, long and complex permitting processes, and limited investor familiarity with sector-specific risk profiles continue to slow down investment at higher technology readiness levels (TRLs) and hinder pan-European scaling. While innovation pipelines are well populated, derisking instruments and coordinated market-readiness support remain insufficient to convert promising solutions into commercially viable business models.

Baltic and North Sea Regional Context

At regional level, the Baltic and North Sea benefit from a dense landscape of projects, clusters and innovation hubs that provide targeted local support, including bootcamps, accelerators and pilot demonstrations. These initiatives have proven effective in supporting early-stage innovation and fostering cross-sector exchange.

However, access to test and demonstration infrastructure, the lack of harmonised permitting approaches, and limited availability of long-term financing for capital-intensive pilots continue to constrain scale-up. Cross-border coordination, infrastructure sharing and clearer pathways from pilots to market deployment remain critical priorities for strengthening the regional business support ecosystem.

Systemic Barriers

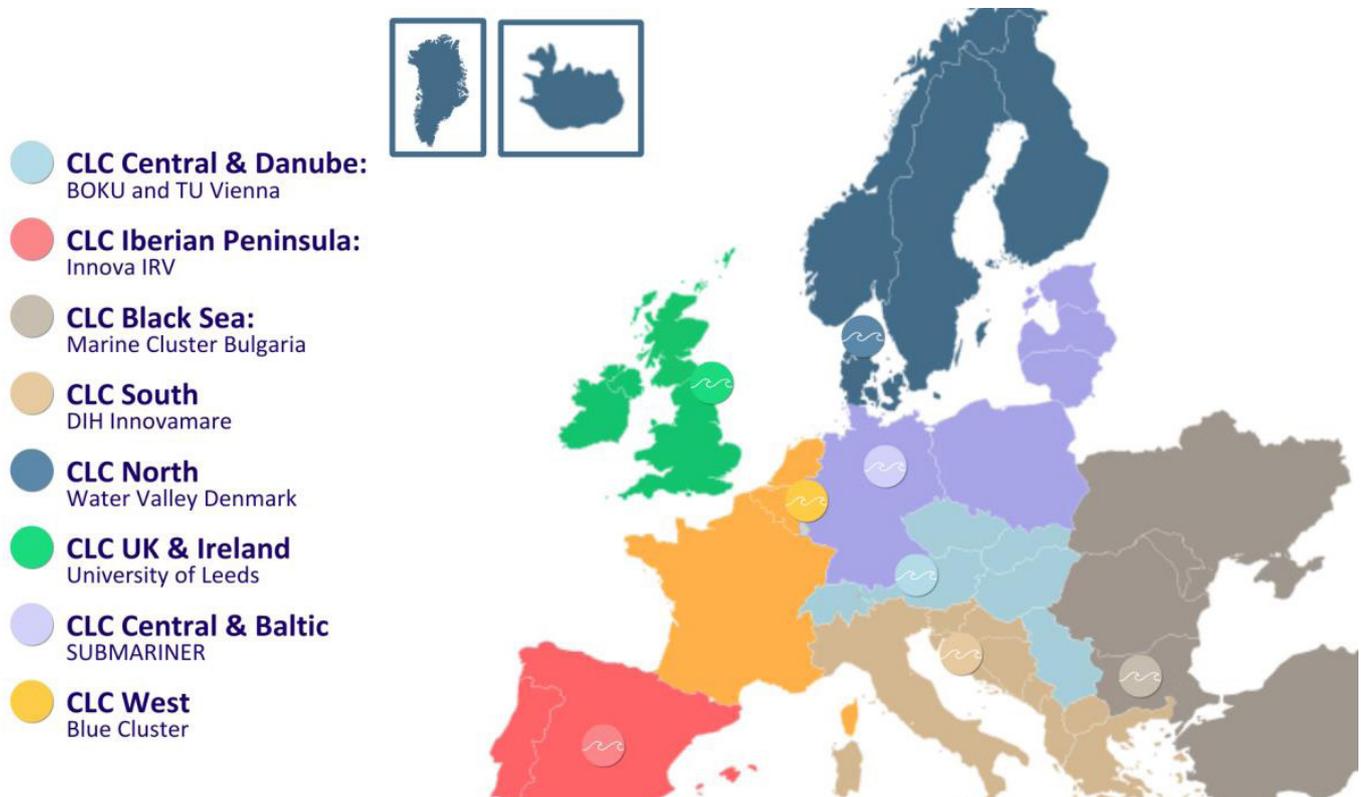
Despite clear project-level impacts, several systemic barriers continue to limit business development and scaling in the blue bioeconomy:

- **Regulatory fragmentation and slow permitting** characterised by inconsistent rules and multi-authority approval processes for sea-based activities.
- **Insufficient funding for higher TRLs**, with most instruments still focused on ideation or proof-of-concept rather than scale-up, testing and infrastructure (TRL 4–7).
- **Limited access to shared infrastructure**, including laboratories, ports, pilot sites and logistics facilities.
- **Immature markets and weak demand-side pull**, combined with low consumer awareness and recognition of blue bio-based products.
- **Valorisation gaps for side streams**, driven by underinvestment in processing and high-value utilisation of fisheries and aquaculture by-products.
- **Capacity and skills shortages**, particularly in relation to scale-up-oriented business development and regulatory expertise.

Addressing these barriers is essential to unlock the full potential of the blue bioeconomy in the Baltic and North Sea regions.

11.6 Outlook and Next Steps for SUBMARINER

Building on its extensive portfolio of completed and ongoing projects, SUBMARINER is uniquely positioned to **close the scale-up gap** and consolidate a coordinated business support ecosystem across the Baltic and North Sea regions. This role is further strengthened from 2026 onwards by the opportunity to host the **Co-Location Centre Central & Baltic within EIT Water**, providing long-term (12+ years) access to pan-European incubation, training and funding services for startups and SMEs.



This strategic position enables SUBMARINER to move beyond isolated project support and act as a **connector between innovation, policy, finance and markets**, while providing tailored assistance to initiatives funded under Blue-ActionBANOS and related programmes.

Strategic priorities

To maximise impact, SUBMARINER should prioritise actions that directly address scale-up constraints and reinforce systemic coherence

Legal and regulatory alignment

Advocate for more harmonised permitting and licensing procedures within and across sea basins and promote the integration of multi-use zones in Marine Spatial Planning to enable the co-location of blue bio-based activities.

Funding and investment facilitation

Increase literacy, guidance and matchmaking around innovative financing instruments, including blended finance, project finance, crowdfunding and targeted equity. Promote derisking mechanisms, co-funding approaches and simplified administrative access, while supporting investment in shared infrastructure, nature-positive production systems and valorisation technologies.

Strengthening cooperation and innovation hubs

Reinforce regional innovation hubs and Co-Location Centres as anchors for shared test infrastructure, mentoring capacity and tailored scale-up services. Leverage interregional instruments (e.g. SBEP, TSSPs, I3) to catalyse co-funded pilots and cross-border scale-ups and facilitate structured technology matchmaking and transnational bootcamps.

Market development and demand creation

Support demand-side measures through product promotion, consumer education and increased visibility of blue bio products (e.g. via BlueBioMatch), and assist go-to-market strategies emerging from pilot projects such as FOODI-MAR.

Environmental and circularity safeguards

Ensure that all business support activities are aligned with environmental safeguards and promote circularity, including nutrient and carbon-positive outcomes and improved valorisation of side streams.

Recommended actions & next steps for the SUBMARINER Network:

1. Targeted scale-up support

Further develop incubator tracks, mentorship schemes and training programmes tailored to higher TRLs, addressing regulatory compliance, field demonstrations, infrastructure access and scaling readiness.

2. Enhanced matchmaking and networking

Systematically connect startups with investors, mentors and infrastructure providers through innovation hubs, focused events and transnational bootcamps, building on proven formats such as Blue Bio Bootcamps and the Blue Bio Value Chain Facilitation Tool.

3. Funding facilitation and pilot support

Promote cascade funding, innovation vouchers, blended finance and crowdfunding models that directly support pilots and de-risk demonstration activities, drawing on experiences from initiatives such as Prep4BLUE, AlgaeProBANOS and I3-4 Seaweed.

4. Replication of good practices

Continue and scale targeted technology matchmaking and value-chain-oriented events that clarify scaling needs and accelerate pilot deployment.

5. Thematic and geographic expansion

Use the broader EIT Water agenda—covering water efficiency, recycling, resource circularity and climate resilience—to expand SUBMARINER's thematic scope and outreach within its core regions and across the wider European network.

By pursuing these priorities, SUBMARINER can strengthen its role as a **central hub for business support, innovation and investment** in the blue bioeconomy, enabling the transition from pilot initiatives to market-ready solutions across Europe.

11.7 Business Support – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
BlueActionBANOS Supporting the Mission Ocean Lighthouse in the Baltic and North Sea Basin	2025-2029 HEU MISS €12 000 000	SDU, UTartu, UKlaipeda, GMU, Innovatum, NIVA, IVL, FBCD	Baltic & North Sea	Third party funding for community-led actions that scale Mission Ocean solutions and transition agendas.
ROOTLINKS Enabling Primary Producers to Thrive in the Bioeconomy	2024-2029 CBE-JU €4 000 000	s.Pro	Europe	Builds a primary-producers working group and practical support pathways that help producers access circular bio-based opportunities and partnerships.
AlgaeProBANOS Accelerating algae product development in Baltic and North Sea	2023-2027 HEU €12 500 000	SUB, UTartu, OceanBASIS, ALGIECEL, EUROFISH, SYKE, Nofima, KTH, LIAE, SDU, INOVA+, OBO, POWER ALGAE, VETIK	Baltic & North Sea	Runs accelerator-style support, innovation vouchers that help algae ventures overcome scale-up barriers, helping scale pilots to market (TRL7–9).
Baltic MUPPETS Baltic Mussel Products for Pet-foods	2022-2026 I3 €7 200 000	Ecopelag, Blue Research, UTartu	Baltic Sea	Provides matchmaking and entrepreneurship support (ex: mentorship, entrepreneurship workshops) that helps mussel-based ventures and value chains move from concept to commercial collaboration
FOODIMAR Sustainable Climate-Friendly Quality Food Ingredients from Marine Side-Streams	2024-2027 SBEP €1 750 000	SUB, SDU	Europe	Supports pilots with side-stream valorisation and supports go-to-market outputs and pathways.
i3-4SEAWEED Scaling, demonstrating, and ensuring market readiness of business ventures within the macroalgae/seaweed sector.	2024-2027 i3 €7 000 000	N/A	Europe	Provides scale-up support, demonstration and cascading funding to strengthen SME market readiness in the European seaweed sector.
Blue Bio Clusters Coastal Regions in Transition to the Blue Bioeconomy	2022-2025 Horizon CL6 €3 000 000	SUB, Tartu Bio Park, UKlaipeda, Innovatum, UTartu	Europe	Developed practical tools (Value Chain Facilitation Tool, Ecosystem Approach Tool) and case-based methods that help regions build blue bioeconomy clusters and strengthen value-chain collaboration.
Prep4BLUE Preparing the Research & Innovation Core for Mission Ocean, Seas & Waters	2022-2025 Mission Ocean €5 000 000	s.Pro, SDU	Europe	Produces finance guidance and business-model blueprints that help Mission Ocean solutions and actors move from concept to investable, scalable action.
EU4Algae Accelerate the Development of a Sustainable and Innovative Algae Sector in Europe	2022-2028 DG MARE €4 500 000	s.Pro	Europe	Strengthens sector coordination by connecting algae actors and consolidating resources that support investment readiness, business models, and market development.

12

BLUE SKILLS, LIFELONG LEARNING AND OCEAN LITERACY FOR A SUSTAINABLE BLUE ECONOMY



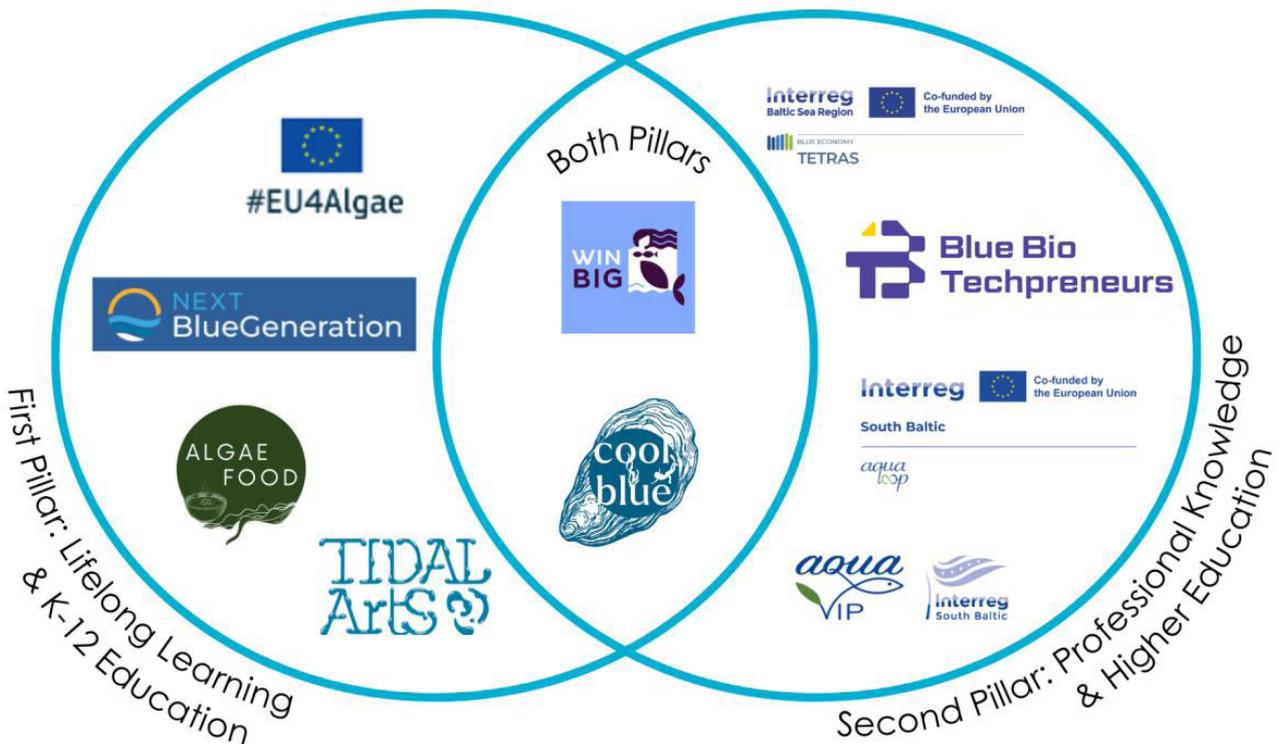
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12.1 Starting Point and Ambition

Education and ocean literacy are foundational for Europe’s and the BANOS region’s transition towards a sustainable, climate-neutral, and innovation-driven blue economy. Across two education pillars – Lifelong Learning and K-12 Education and Professional Knowledge and Higher Education – common challenges persist, including fragmented learning opportunities, slow curriculum adaptation, limited awareness of blue careers, and weak links between education pathways and labour-market needs.

The SUBMARINER Network contributes to addressing these challenges through education initiatives that foster a skilled workforce and an informed public. Activities span K12 education, ocean literacy, professional training, and citizen engagement. By strengthening knowledge and skills across the Baltic and North Sea regions, SUBMARINER aims to support innovation, resilience, and collective action for the sustainable use and protection of marine resources.

12.2 Blue Skills and Ocean Literacy – Projects at a Glance



Since the publication of the 2021 Roadmap, SUBMARINER's education-related activities have been organised under two education pillars, addressing different target groups and learning pathways.

The first pillar, Lifelong Learning and K-12 Education (Type 1), focuses on strengthening ocean literacy from early education through adulthood. It supports the integration of ocean-related topics into school education, teacher training, and outreach activities, complemented by lifelong learning approaches such as citizen engagement and community-based initiatives that foster environmental awareness and stewardship.

The second pillar, Professional Knowledge and Higher Education (Type 2), addresses skills development for students and professionals in the blue economy through higher education and upskilling initiatives. Projects under this pillar provide specialised training and capacity building in areas such as marine biotechnology, sustainable aquaculture, and blue economy innovation, strengthening links between education and industry needs.

12.3 Key SUBMARINER Achievements

The state of play of *Lifelong Learning and K-12 Education*, SUBMARINER pillar 1, demonstrates that methods and materials have been developed for teachers and pupils, for example, in [Next Blue Generation](#) to support teachers in presenting careers in the blue economy. Additionally, through initiatives such as [AlgaeFood](#) and the [EU4OCEAN Coalition](#), SUB is engaged in Ocean Literacy campaigns and the Blue Schools network to target the general public. In the **TIDALArts project**, SUBMARINER connected artists and designers with scientists and communities to co-create creative projects that support the connection between citizens and the ocean, increasing awareness of the ocean and waters' challenges and significance.

In the second pillar, *Professional Knowledge and Higher Education*, SUBMARINER closes the gap between industry and academia, for example, through its EMFAF education flagship project **Blue Bio Techpreneurs**. Through BBT, [Blue Economy Hackathons](#) were launched, bringing together real-world challenges faced by companies in the Blue Economy with young talent from academia. The event insights, as well as inspiration stories of blue economy role models from multiple disciplines and with diverse backgrounds, were combined in a comprehensive, one-of-a-kind [Blue Economy Entrepreneurship Massive Open Online Course](#) (MOOC) Series, fostering the transversals and entrepreneurial skills set aligned with European Competence Frameworks ([DigComp](#), [GreenComp](#), [EntreComp](#) and the later [BlueComp](#)), enabling a self-paced, interactive, peer-to-peer learning environment.

12.4 Progress Made on Blue Skills and Ocean Literacy

Progress has been made in strengthening blue economy education and public engagement, as reflected in new digital learning formats, community initiatives, and practical training concepts that expand access and deepen ocean awareness across the Baltic and North Sea regions.

SUBMARINER key achievements since 2021:

Blue Economy Massive Open Online Courses

- Blue Bioeconomy Hackathon Concept
- Ocean Arts Community & Direct Funding for Artists
- Ocean Literacy repository



12.5 State of Blue Skills and Ocean Literacy – Challenges & Opportunities

European Context:

Education for the blue economy in Europe faces persistent structural gaps across both lifelong learning and K-12 education on the one hand, and professional and higher education on the other. Public awareness of ocean issues is increasing, but still low, especially in regions such as the Baltic Sea, where marine challenges are pressing but not always visible to inland populations.

In recent years, Europe's policy and competence landscape has undergone significant advancement. Clear frameworks now exist to define and structure the skills needed for the blue economy. The [BlueComp Framework](#), launched under the European Blue Economy Observatory, provides a comprehensive competence model that employers, educators, and training providers can use to design targeted programmes and assess skill needs. The European Ocean Pact and the [Union of Skills](#) move blue-skills development beyond isolated projects, embedding it within long-term EU competitiveness and sustainability agendas. The foundation is set, but sustainable implementation strategies are necessary to ensure a lasting impact. Implementation success will only be measurable within one decade or even longer, because it is the young generation of today who will make the effects of actions taken today visible.

Baltic Sea Regional Context:

In addition to these EU-level efforts, several Baltic Sea regional initiatives play a pivotal role, including the [Policy Area Education](#) of the EU Strategy for the Baltic Sea Region (EUSBSR), the **Baltic Sea Skills Agenda**, HELCOM's education-related outreach on marine protection, and regional networks such as SUBMARINER that strengthen capacity building across marine biotechnology, aquaculture, and many other blue economy sectors. Together, these European and Baltic Sea frameworks form a growing ecosystem of support. Nevertheless, the persistent gaps highlight the need for more coherent integration, stronger pathways from early education to careers, and accelerated curriculum innovation to fully meet the ambitions of Europe and the Baltic Sea region for the blue economy.

12.6 Outlook and Next Steps for SUBMARINER

While Europe has made significant steps through frameworks such as BlueComp, the European Ocean Pact, and the Union of Skills, their full impact will only materialise if they are translated into long-term, coordinated, and well-resourced implementation strategies. The same applies to the Baltic Sea region, where numerous initiatives provide a strong foundation, yet coherent integration, cross-border collaboration, and sustained investment remain essential.

SUBMARINER has already demonstrated its ability to bridge gaps between industry, academia, civil society, and policymakers, as shown through the BlueMissionBANOS Arenas, as well as through education-targeted actions such as hackathons, MOOC development, artist- and community-led ocean literacy projects (TIDALArts), capacity-building activities (BlueBioClusters, AlgaeProBANOS), and initiatives. However, to secure the future talent pipeline and foster a society both connected to the ocean and knowledgeable of the challenges it faces, more systemic alignment between early education, vocational training, higher education, and industry-driven innovation is needed. Strengthening pathways, ensuring inclusivity, and accelerating the integration of ocean-related knowledge into formal and informal education are essential steps in meeting Europe's and the Baltic Sea region's ambitions for the protection, restoration, and sustainable use of marine resources.

Activities Suggested:

Building on its established role as a connector across industry, academia, civil society, and policy, the SUBMARINER Network is well positioned to further strengthen a coordinated and future-proof education ecosystem across the Baltic and North Sea regions. Its role as co-location centre of the Baltic EIT Water KIC opens additional opportunities to align efforts and reinforce blue skills development at regional and European levels.

A central strategic opportunity is the gradual development of a **SUBMARINER Academy or Campus as a long-term, transnational framework**. The Academy would consolidate the wide range of resources, tools, and outputs generated through SUBMARINER projects and initiatives, providing a shared and permanent gateway to high-quality blue economy education. This would encompass materials for K-12 education and citizen science, as well as professional

training, sector-specific modules, and advanced digital learning formats. Many of these assets are already accessible via the SUBMARINER website; the Academy would enhance their coherence, visibility, and long-term usability.

A key building block of the Academy would be a **Blue Economy MOOC ecosystem**. MOOCs offer significant advantages for blue skills development by enabling scale, international reach with local relevance, rapid deployment, and lower barriers to entry for diverse learner groups. Through facilitated partnerships among network members from universities, businesses, and other stakeholders, MOOCs could also support the issuance of micro-credentials, for example in cooperation with initiatives such as EU-CONEXUS. To strengthen practical learning pathways, online modules could be complemented by apprenticeships, company placements, fieldwork opportunities, and living labs offered by network members, ensuring closer alignment with industry needs. Capacity-building formats such as “MOOCs for trainers” could further support educators, industry mentors, start-ups, and university staff. Emerging AI tools may additionally support multilingual delivery and sea-basin-specific content tailored to regional contexts.

The **SUBMARINER Academy should be co-created with network members and aligned with Water KIC activities**, serving as a central Baltic Sea hub for education and training at the Co-Location Centre Baltic. By coordinating project results under one umbrella, facilitating structured learner journeys, and strengthening cooperation across sectors, the Academy can become a long-term driver of blue skills development and talent pipeline formation in support of Mission Ocean objectives.

Activities Suggested on Ocean Literacy:

In parallel, the SUBMARINER Network should continue to explore innovative approaches to strengthen ocean literacy and reconnect communities with their marine environments. Building on experiences from initiatives such as TIDAL ArtS, this includes further integrating arts and science to inspire engagement, creativity, and innovation. Strengthened collaboration with EU4Ocean, the EU’s flagship ocean literacy network, will remain essential to amplify outreach, foster cross-sector exchange, and support engagement across diverse audiences, from youth and scientists to blue economy professionals.

12.7 Blue Skills & Ocean Literacy – Projects Overview

Project	Key Facts	SUBMARINERs Members	Geographic Coverage	Key project actions as related to the topic
Blue Bio Techpreneurs Blue careers for a sustainable blue economy	2023-2026 EMFAF €1 200 000	SUB, SDU, UGdańsk	Europe	Delivers a structured learning pathway (to date: 5 MOOCs, 3 hackathons, 6 webinars) that builds entrepreneurial and transversal skills and promotes blue bioeconomy careers.
Next Blue Generation Navigating Opportunities in the Blue Economy	2023-2026 EMFAF €1 000 000	s.Pro	Europe	Creates engaging tools for teachers and pupils (incl. game-based learning: the “BlueGeneration Game,” and pathway tools: the “Blue Careers Pathway Tool”) to improve awareness of blue careers and options.
WinBIG Women in Blue Economy: Intelligence Gathering and Capacity Boosting	2023-2026 EMFAF €1 300 000	s.Pro	Europe	Produces guidance (e.g., policy outputs – “WIN BIG Policy Brief”) to strengthen women’s participation and visibility in the blue economy.
Cool Blue Nordic COMMunity Ocean farms and Local Business cLUstErs	2023-2026 HEU CSA €1 000 000	s.Pro, UGOT	DK, SE, FI	Provides learning resources and community formats that support skills development for regenerative ocean farming and local sea-farming clusters, through an online platform, business models, and other educational materials.

Cool Blue Baltic COmmunity Ocean farms and Local Business cLUstErs	2023-2025 EMFAF €700 000	SUB, UGOT, GMU, KSTP, LIAE, UTartu, Ecopelag	Baltic Sea	Strengthens practical know-how and community learning around regenerative sea farming through shared tools, outreach and network building, through an online platform, crowdfunder, and network.
TIDALArTS Bring Our Ocean & Waters to Life Through Art	2024-2027 Mission Ocean €2 000 000	SUB	Europe	Funds and showcases arts–science collaborations that engage citizens and communities and raise ocean awareness through public-facing works.
AlgaeFood Integrating algae into the regional food culture	2023-2026 Interreg DE-DK (EPCO) €3 200 000	oceanBASIS, SDU	DE, DK	Builds food literacy around algae through events, the Sea Garden concept, teaching materials and hands-on formats that encourage everyday use and acceptance.
EU4Algae Stakeholder platform for European algae	2022-2028 DG MARE €4 500 000	s.Pro	Europe	Creates a European stakeholder platform to share knowledge, products, and sector resources that raise awareness and support skills development.
TETRAS Technology transfEr for Thriving Recirculating Aquaculture Systems in the Baltic Sea Region	2023-2025 INTERREG BSR €3 000 000	SUB, UKlaipeda, KSTP, GMU, Blue Research	Baltic Sea	Converts Baltic RAS experience into structured training and transferable solutions that strengthen practical competence in modern aquaculture systems.
AquaLoop Aquaculture expert floor for circular economy practice	2023-2026 Interreg South Baltic €1 700 000	UKlaipeda, KSTP, UGdańsk	Baltic Sea	Connects experts, businesses, and institutions to share knowledge on resource efficiency and sustainability.
AquaVIP Platform for aquaculture professionals and those ready to launch their career	2023-2027 Interreg South Baltic €1 000 000	UKlaipeda, KSTP, UGdańsk	Baltic Sea	Provides modular online courses covering core aquaculture topics and business basics, supporting upskilling and career entry. Courses include: (1) Recirculating aquaculture systems, (2) Larviculture, (3) Fish diseases and parasites, (4) Algae culture, (5) Aquafeeds, nutritional requirements, feed additives, (6) Aquaculture business, marketing, product development

13 CONCLUSION AND OUTLOOK



This report provides evidence of the many positive steps taken to date to realise our vision of using innovation to support sustainable development of our oceans and waters, driven by the 50+ international projects implemented by SUBMARINER and its members.

As shown in this report, progress increasingly reaches beyond the Baltic and North Sea region. This is partly because many SUBMARINER projects operate at European scale, but also because SUBMARINER's approach to collaboration, stakeholder engagement, and knowledge transfer is gaining recognition outside our 'home base'. We are therefore receiving more requests to apply these methods with stakeholders beyond the region and to serve as a good-practice example of a transnational, multi-stakeholder interface elsewhere.

We are very grateful that our work to strengthen our EU-wide MPA, algae and blue bioeconomy communities is financially secured for the next three to four years. This provides us with a strong opportunity to deepen our stakeholder work across Europe and to accelerate the uptake and application of knowledge and solutions developed within projects.

At the same time, the report also shows that – whereas new evidence and good practices have been achieved in all SUBMARINER solution areas – real progress on the ground is not as fast as we would wish.

Reflecting on our four 'Action Areas' aiming to Get Pilots to the Next Level, Increase Company Involvement, Show the Blue on Land, and Synthesise and Transfer Knowledge in Continuous Working Groups, we are proud that we have been able to operationalise all of them. But we are far from having reached the goals that underpin these four action areas.

In particular, developing systematic, integrated strategies and demonstrations requires a strongly place-based approach.



Hence, we see our role still strongly connected to the Baltic Sea Region and, increasingly, also to the North Sea. Even though the Mission BANOS Lighthouse governance structure is politically young, we already see more integrated approaches emerging through countries with stakes in both regions (Germany, Denmark, Sweden, Norway) and through specific cross-border connections (Belgium, Netherlands, Germany).

Our coordination roles within BlueActionBANOS, BlueMissionBANOS2030 and the EITWater Co-Location-Centre Central & Baltic provide us with a unique opportunity to work more intensively with stakeholders across the science, business, policy, and society in our Lighthouse Area. We are very curious about the ideas, actions, and proposals that local stakeholders will submit in the coming months under the BAB funding scheme, and we are happy that many of our long-term members are strategically positioned to support and coordinate efforts as national hubs. Together with the substantial funding expected via EITWater, they will play a central role in ensuring that solutions can be applied and mainstreamed.

This also implies that we must increase our efforts to diversify funding sources, moving beyond public research budgets towards public-private investments and partnerships, while recognising that such investments need to demonstrate value over time. This does not mean that we can know all the best solutions today; rather, it requires room for learning, acceptance of failure, and continuous alignment, adaptation and improvement.

With that in mind, we also expect that SUBMARINER topics will evolve over the coming years. In the context of the Ocean Act and the Water Resilience Strategy, the report points to an expanding range of innovation fields – many focused not only consumer products, but also on solutions for industry and public-sector challenges, including equitable access and availability of blue resources..

In that spirit, building on long-term, trusted cooperation, while remaining agile and open, we look forward to 2026, as an exciting year to apply our joint experience and knowledge to shape strategic pathways for the years ahead.



Thank you for reading!

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