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INTERNAL DELIVERABLE 2.1.1
Model for the development of Public-Private Joint Research Units; Specifications for the set-up of public-private partnerships for collaborative research and related agreements

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Deliverable ID

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Abbreviations

BP	Best Practices
BBt	Blue Biotechnology
BBHub	Blue Biotechnology Hub
DS	Demonstration Site
EU	European Union
GD	Green Deal
GES	Good Environmental Status
IMTA	Integrated Multi-Trophic Aquaculture
IoT	Internet of Things
KERs	Key Exploitable Results
KPIs	Key Performance Indicators
LTA	Low Trophic Aquaculture
MedBBHub	Mediterranean Blue Biotechnology Hub
NBS	Nature-Based Solutions
PI	Performance Indicators
PPPs	Public-Private Partnerships
R&I	Research and Innovation
S3	Smart Specialization Strategies
SMEs	Small and Medium-sized Enterprises
T-Labs	Transformative Lab
WP	Work Package

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About 2B-BLUE project

The Blue Biotechnology (BBt) sector can have a significant impact on the environment, human wellbeing and economic growth, however in the Mediterranean basin it is currently in its infancy. B-Blue project has built a preliminary network of actors related to BBt and analysed best practices, key drivers, barriers and readiness factors of EuroMed companies for adopting blue biotechnologies, concluding with the most promising value chains for EuroMed area. The project allowed the establishment of 5 interactive Blue Biotechnology Hubs (BBHubs) to facilitate collaborations, knowledge transfer and spill-over effects to spur innovation and business within the marine biotechnology value chains and address the challenges detected. At once, a digital community has been developed, using an ICT tool called B-Blue MatchMaking Tool, to support new joint initiatives.

Moreover, the MedIA – Mediterranean Innovation Alliance for Sustainable Blue Bioeconomy – has been set-up in collaboration with BlueBioMed and 2 specific collaborative working groups on BBt. 2B-BLUE aims to capitalize on B-Blue positive results to:

Exemplify evidence-based best practices identified to help communities turn BBt research into practice,

Build national demonstration sites (DS) to experiment with emerging technologies or practices in local field conditions and bridge the gap between BBt research and industry for new technologies adaptation while help improve marine environment,

Establish strategic alliances of 5-helix stakeholders for the uptake of advanced BBt by Med industries and

Improve regional policies for enhancing sustainability, research and innovation capacities in Euro-Med area.

Thus, the main challenges detected in the B-Blue work – most related to funding, normative, public and private collaboration – can be transformed into opportunities in 2B-BLUE and result in more sustainable and efficient practices as well as better structuring of the BBt sector in the Mediterranean.

1. Executive summary

This deliverable intends to provide a methodological framework to the Blue Biotechnology Hubs (BBHubs) to develop their own demonstration site and pilot activities, supporting public private partnerships (PPs) developing innovative solutions or approaches to the targeted value chains. This deliverable will also provide different templates to be used notably for the selection of projects through an expression of interest call as well as a monitoring approach to measure the impacts of the various activities implemented within this activity.

2. Before starting: Context and key concepts

2.1. Work package overview

2.1.1. Activity 2.1 Methodology for BBt testing in real-life environment

Activity leaders: IRBIM-CNR and PMM-TVT

Starting Period 2, 7 - 12
End Period 3, 13 - 18

Description

CNR and PMM-TVT will define a common methodology for testing the application of BBt in target value chains within an innovative transnational scheme for Demonstration Sites. The Demo-site model developed within B-Blue project will be fine-tuned to foresee the establishment of a public-private Joint Research Unit (JRU) through the closure of Collaborative Research Agreements (CRA) for the experimentation of innovative technologies/processes in real-life environments.

Based on results of Act.1.3, PPs will prepare:

- the overall methodology for the implementation of pilot and demonstration activities (PMM-TVT);
- a CRA model with specific regulations for the protection of industrial and intellectual property in an open cooperation space (CNR);
- a development plan for the DS/pilot actions (DS coordinators);
- a monitoring and evaluation plan for pilot and demonstration activities based on the criteria set-up by T-Labs (Act.1.3) (DS coordinators)

D.2.1.1 Model for the development of Public-Private Joint Research Units (Period 3); Specifications for the set-up of public-private partnerships for collaborative research and related agreements **(M14). CNR, PMM-TVT, All**

2.1.2. Activity 2.2 Set-up of public-private Joint Research Units for testing the Demonstration-sites Activity leader: IRBIM-CNR

Starting Period 3, 13 - 18
End Period 3, 13 - 18

CNR and DS coordinators. CNR will design a common transnational Expression of Interests (EoI) for the selection of private partners in JRUs. According to CRAs private entities will contribute to the set-up of DS by hosting project pilots or by testing their solutions in pilot infrastructures. The EoI will define ToRs and challenges to be addressed according to A.1.3 results and will be launched at country level by DS coordinators. ToRs can be (but not limited to): characteristics of the hosting plant in terms of accessibility, production capacity, equipment and instruments; obligations of private partner and human resources required as collaborative contribution in experimentation; suitability with the pilot action, also for producing new business models; requisites of technical/economic capacity and environmental sustainability. After the evaluation and selection of candidates, DS coordinators will close the CRAs with all parties involved in JRUs.

No deliverable

2.1.3. Activity 2.3 Implementation of demonstration and pilot activities

Activity leader: PMM-TVT

Starting Period 3, 13 - 18
End Period 5, 25 - 30

PMM-TVT and DS coordinators. Pilot testing of BBts will be carried out according to T2.1 (development plan for the pilot actions) by JRUs within the national DS connected through BBHubs Network (France, Spain, Italy, Slovenia, Albania). A first phase will be dedicated to the preparation of the infrastructure for the BBt testing, including the purchase of dedicated equipment (when needed), and organization of JRUs according to the results and schedule adopted. DS coordinators will organize and manage research teams for experimentations, operative teams for implementation and logistics and business units for business model development. A second phase, lasting 10 months, will be fully dedicated to the testing on BBts which will be monitored and evaluated according to the common plan drafted within Activity 2.1.

The monitoring will be implemented by JRUs and shared for a continuous reviewing by T-Labs as well as for recording of the DS experience (act.2.4).

Internal Deliverable to be published in Basecamp:

D.2.3.1 Pilot Action report (period 5); 1 per demonstration site: mains results and conclusions of BBt testing in real -life environments (M27) - DS coordinators

2.1.4. Activity 2.4 Modelling for transferring of Demonstration-sites for BBt application

Activity leaders: IRBIM-CNR and PMM-TVT

Starting Period 5, 25 – 30

End Period 5, 25 - 30

At the end of the testing phase, the DS will be modelled, as well as the pilot projects hosted for its transferring. As for the pilots, the data collected thanks to the monitoring and evaluation plan will be organized in a digital report to be shared with stakeholders, within T-Labs, to identify whether, under local conditions, the new technology or practice could be transferred and tested.

To this end, a workshop will be organized for validating and evaluating the technical, environmental and socioeconomic results achieved and introduce them in the T-Labs programs (A3.1) for their upscaling/uptaking as well as disseminate them through showcase events (A3.4) Pilot actions will be organized to be integrated as best practices into the dynamic specific database (A1.2). Based on the experience gained BBHubs Network will review and shape the Demo-site model to be capitalized by identifying alternative options in real life demonstration settings and transferred into other areas.

D.2.4.1 Demo-site model based on results and analysis of testing activities: 1 deliverable gathering the results from all demonstration sites (M30) – CNR and PMM-TVT

D.2.4.2 Solutions for acceleration of BBt transfer based on innovative demonstration sites model IRBIM - CNR and PMM-TVT (M30) Tool kit of solutions

2.2. Key concepts and definitions

2.2.1. Blue Biotechnology Hubs

Innovation hubs are spaces designed to promote collaboration, creativity, and technological advancement, bringing together startups, entrepreneurs, researchers, and industry leaders in physical or virtual settings. Within the 2B-Blue project, Blue Biotechnology Hubs (BBHubs) are specialized versions of these hubs, specifically aimed at boosting blue biotechnology in the Mediterranean. BBHubs establish structured networks among key stakeholders in most promising BBt value chains, engaging them as MedBBHub members through the collection of best practices, surveys, and Transformation Labs (T-Labs). These efforts facilitate the identification and support of feasible DS in the Mediterranean, providing frameworks for their operation and evaluation.

Key Characteristics of Blue Biotechnology Hubs:

- **Collaboration:** BBHubs promote partnerships integrating academia, industry, government, civil society, and environmental stakeholders, fostering comprehensive engagement crucial for the sustainable development of marine biotechnology.
- **Resources:** These hubs provide specialized support, including access to marine bioresearch facilities, targeted funding opportunities, and expert mentorship in marine sciences and biotechnology.
- **Technology & Research:** BBHubs support cutting-edge research in areas such as algal biotechnology, waste valorisation, and integrated multi-trophic aquaculture (IMTA).
- **Networking:** They connect innovators with investors and policymakers to facilitate the commercialization of research and ensure alignment with market and regulatory needs.
- **Economic Growth:** BBHubs drive regional economic development by supporting specialized startups and established companies in the blue biotech sector, enhancing job creation and industry sustainability.

2.2.2. Demonstration sites

2B-Blue Demonstration Sites are specific tools of the BBHubs for scaling up technological solutions, supporting innovation and business development within the Mediterranean's blue economy, ensuring cross-regional collaboration, stakeholder engagement, and knowledge transfer. DS in the 2B-BLUE project are defined as designated areas where innovative BBt solutions, practices, and technologies are tested, validated, and showcased under real-world conditions.

Serving as both an extension tool and a critical bridge between research and the commercial application of new technologies, these sites facilitate the adaptation and evaluation of innovations in local field conditions on a commercial scale. They offer an opportunity to conduct short-term pilot experiments on a small scale, allowing for the collection of data and identification of potential challenges. This process enables stakeholders to evaluate and assess the feasibility, efficiency, and effectiveness of new or innovative technologies and processes.

Demonstration Sites (DS) in the 2B-BLUE project are established through mechanisms such as Joint Research Units (JRUs) and Collaborative Research Agreements (CRAs), which provide structured frameworks for collaboration and innovation scaling.

2.2.3. Joint Research Units (JRUs)

From a juridical viewpoint, the Demonstration sites will be put in place through agreements, without consideration, establishing an effective collaboration of the parties involved in the research activities.

According to the "Framework for State aid for research and development and innovation", para. 1.3, subpara. 15, let. h)[1] **"effective collaboration"** means "collaboration between at least two independent parties to exchange knowledge or technology, or to achieve a common objective based on the division of labor where the parties jointly define the scope of the collaborative project, contribute to its implementation and share its risks, as well as its results. One or several parties may bear the full costs of the project and thus relieve other parties of its financial risks.

Among the contractual forms which may be used to realize an effective collaboration, in accordance with the praxis of the European Commission, within the Project it is suggested to establish "Joint Research Units"[2] (hereinafter referred to as "JRUs").

However, it should be emphasized that the beneficiaries may use other contractual instruments different from the JRUs to implement the DS and to make effective the collaboration with other legal entities, in coherence with the National law or internal praxis regulations or policies (A non-exhaustive list of typologies of agreements is provided under paragraph 3.8 hereinafter).

According to the document "EU Grants AGA – Annotated Model Grant Agreement" (see p. 144 in the version of 1 May 2024) of the European Commission JRUs are defined as follows:

- JRUs are collaborative agreements formed by multiple stakeholders, including research institutions and industry partners;
- The purpose of a JRU is to foster close cooperation on specific research projects or technology development, facilitating the pooling of resources, expertise, and data;
- They include laboratories/infrastructures created and owned by two or more different legal entities in order to carry out research;
- The JRUs have not a legal personality different from that of its members;
- They form single research units where staff and resources from the different members are put together to the benefit of all.
- Though lacking legal personality, they exist physically, with premises, equipment, and resources individual to them and distinct from 'owner' entities and so on".
- In case of a member of the JRU participates in an EU funded program as beneficiary, it may involve the other members as affiliated entities (see the Article 190 Regulation (EU, EURATOM) of the European Parliament and of the Council of 23 September 2024 on the financial rules applicable to the general budget of the Union).

Within the context of the 2B-BLUE project, JRUs are instrumental in integrating the efforts of different actors to test, validate, and refine BBt solutions at Demonstration Sites. These units enable a focused approach to overcoming technological and market challenges, ensuring that innovations are adapted to meet commercial and environmental needs effectively.

[1] Communication from the Commission Framework for State aid for research and development and innovation (2022/C 414/01)

[2] The Joint Research Unit, provided under the documents of the Framework Programmes, make reference to the French experience of the Unité Mixte de Recherche (UMR) (Article 2 Décret n° 82-993, 24 November 1982,and the Décision n° 920520SOSI, 24-7- 1992, , concerning the "*organisation et fonctionnement des structures opérationnelles de recherche*".

2.2.4. Collaborative Research Agreements

Collaborative Research Agreements (CRAs) are formal contracts that outline the terms of cooperation between different entities engaged in JRUs.

CRAs specify:

- Objectives, scope, and responsibilities of each partner.
- Governance structure
- Intellectual property rights (IPR) management and data-sharing protocols.
- Resource allocation, funding mechanisms, and research methodologies.
- Compliance with legal, ethical, and regulatory standards.

In 2B-BLUE, CRAs provide a structured legal and operational framework for implementing and managing activities at DSs, ensuring that research efforts are translated into market-ready innovations. They also enable public-private partnerships, defining transparent rules for collaboration and investment in blue biotechnology.

2.2.5. Pilot actions

Pilot Actions within the 2B-BLUE project are designed as specific initiatives to test, validate, and demonstrate innovative BBt solutions in real-world conditions. These actions are crucial for assessing the technical aspects as well as socio-economic and environmental impacts of emerging BBt technologies and practices. Typically structured with a short to medium-term orientation, pilot actions are expertly designed and carried out within Demonstration Sites (DSs). They follow a linear and predetermined development path, focusing primarily on testing new products or services in an operational environment.

Pilot actions serve as experimental platforms that:

- Validate BBt solutions through real-world testing.
- Assess feasibility, economic viability, and environmental impact before scaling up.
- Facilitate knowledge transfer, business model development, and policy integration.
- Strengthen public-private collaboration (PPPs) and support regulatory improvements in the BBt sector.

These actions serve as critical testing grounds for innovation transfer, promoting sustainable resource use and ensuring a fair market transition. By implementing pilot actions, 2B-BLUE aims to develop and refine a toolkit of solutions that accelerates the adoption of BBt innovations, leveraging insights from the MedBBHub Repository.

2.2.6. Transformation Labs

T-Labs are key participatory mechanisms designed to facilitate knowledge exchange, co-design solutions, and accelerate the adoption of BBt innovations. These multi-stakeholder spaces bring together research institutions, industry representatives, policymakers, environmental organizations, and civil society actors to drive collaborative experimentation and technology transfer.

T-Labs play a critical role within DSs, ensuring that tested innovations are not only scientifically validated but also aligned with industry needs, policy frameworks, and sustainability goals. Their main functions include:

- Co-designing and refining pilot actions before their implementation, ensuring realistic applicability and scalability.
- Facilitating knowledge exchange and capacity building, equipping stakeholders with the expertise needed for BBt adoption.
- Enhancing industry integration through public-private partnerships (PPPs), supporting investment opportunities and commercialization strategies.

A key function of T-Labs is monitoring and evaluating pilot actions at DSs, ensuring that BBt solutions are not only scientifically sound but also economically viable and socially accepted. Their impact assessment framework includes:

- Defining Key Performance Indicators (KPIs) to measure technical efficiency, economic feasibility, environmental impact, and market readiness.
- Real-time adaptive learning, allowing continuous refinements based on real-world performance feedback.
- Stakeholder feedback mechanisms, ensuring industry and community engagement in decision-making.
- Supporting policy integration, translating pilot results into regulatory recommendations to facilitate BBt adoption.

By embedding T-Labs within DSs, 2B-BLUE ensures that BBt innovations transition beyond research into market-ready solutions, fostering long-term industry and policy integration.

3. Blue Biotechnology Pilot Action implementation plans

The implementation plans are based on local national contexts. They will be active from May 2025 to April 2026. The detailed value chains, challenges and criteria for monitoring are available in two previous deliverables D.1.2.1 PRELIMINARY STUDY TO FINE TUNE BBT PILOT ACTIVITIES and D.1.3.1 DEFINITION OF THE CHALLENGES TO BE ADDRESSED. This chapter summarized each Demonstration Sites action plans, providing a timeline for their implementation.

3.1. Pilot Actions selection process

BBHs played a pivotal role in selecting and designing pilot actions, which were analysed in Deliverable D1.2.1 and refined in D1.3.1 (Definition of Challenges to be Addressed). Following a structured selection process, based on industry needs, feasibility studies, and prior research, BBHs identified the following key BBt value chains as focal areas:

1. **Slovenia – Microalgae-Based Bioproducts and Valorisation of Fishery By-Products**

Slovenia's pilot projects will centre around three key BBt value chains: microalgae cultivation, valorisation of fisheries by-products, and sea sponge/sea cucumber aquaculture. Specifically, the initiatives focus on (1) scaling up microalgae production for nutraceutical and cosmetic applications, (2) transforming fisheries by-products into

bioactive compounds and biopolymers for biomedical uses, and (3) developing sustainable sea sponge/sea cucumber farming systems. These BBt value chains aim to promote circular economy principles, enhance resource efficiency, and deliver high-value products. Through biotechnological innovation and strong public-private partnerships, the pilots foster local industry growth while advancing environmentally sustainable and economically viable marine bioresource utilization.

Needs Addressed:

- Production of larger amounts of marine derived microalgae for biotechnological applications (e.g., cosmetics)
- Due to the fishery and aquaculture industry in the area there are unused fish discards and by-products, which can be valorised for isolation of biopolymers
- Spreading the aquaculture possibilities to several biotechnologically relevant species and searching for new marine bioresources

Identified Challenges:

- Scale up the technology for larger biomass. Need to establish public-private partnerships for potential commercial cultivations. Some technological obstacles are foreseen (upscaling of microalgal production, its adaptations, etc.); regulatory obstacles for prototyping cosmetic products.
- Non-consistent supply of biomaterial, collection and storage logistics, consumer acceptance, regulatory compliance
- Testing the cultivation and adaptation of sea sponges and/or sea cucumber.

2. Spain – Marine Bioremediation and Carbon Footprint Tokenization (CFT)

Spain's pilot project targets two key BBt value chains: macroalgae cultivation for water ports bioremediation and carbon footprint monitoring in fisheries and aquaculture. The pilot leverages macroalgae's natural capacity to enhance environmental health by removing excess nutrients and supporting coastal ecosystem balance. Simultaneously, it introduces Carbon Footprint Tokenization (CFT) systems to track, verify, and incentivize CO_2 emissions reductions within fisheries and aquaculture operations.

Needs Addressed:

- To treat denatured or polluted water in coastal and marine areas. Industrial and urban effluents often introduce harmful pollutants, such as heavy metals and excess nutrients, into coastal and marine environments. This leads to degraded water quality, disruption of ecosystems, and threats to biodiversity. There is a need to treat denatured or polluted water in coastal and marine areas and restore ecosystem health. Accurate emissions tracking and effective compensation strategies are essential for mitigating climate change. Industries, especially in the maritime and aquaculture sectors, are significant contributors to global CO2 emissions. There is the need to monitor and reduce carbon footprints, to adopt sustainable practices and meet global climate goals.

Identified Challenges:

- Bioremediation to convert waste into algae feed and close the production cycle in sustainable fish farms.
- Algae as a natural solution for water purification and pollutant removal in desalination and water purification projects.
- Work with key companies in the maritime-port industry to reduce the environmental impact generated on the coast through bioremediation with macroalgae (elimination of heavy metals and pollutants).

3. France – Algae Cultivation and IMTA Development

The pilot focuses on two interconnected value chains:

- Algae Production for High-Value Compounds targeting niche markets, this initiative emphasizes the cultivation of microalgae and macroalgae for bioactive compounds used in the health, cosmetic, and industrial biomaterials sectors, as well as inputs for the feed, food, and chemical industries.
- IMTA: Promoting the co-cultivation of fed species (e.g., finfish) with extractive species like mussels, oysters, sea cucumbers, sea urchins, and macroalgae. IMTA systems enhance sustainability by recycling organic and inorganic waste, improving nutrient efficiency and ecosystem balance.

Needs Addressed:

- Foster a strong entrepreneurial culture in BBt by encouraging PPPs that bridge research and industry.
- Facilitate effective collaboration and knowledge transfer between scientific and economic actors to support commercialization of research-driven innovations.
- Adapt aquaculture systems to Mediterranean and local conditions, ensuring efficient integration of bivalves, echinoderms, macroalgae, and finfish species.

Identified Challenges:

- Mapping Existing Collaboration Mechanisms: Conduct a comprehensive review of current public-private collaboration frameworks to identify best practices, gaps, and areas for improvement.
- Engaging Key Stakeholders in 2B-BLUE: Mobilize industry players, research institutions, and mechanism operators through targeted engagement strategies to encourage active, long-term participation.
- Encouraging Researcher Participation: Motivate researchers to engage in applied industry collaborations by addressing institutional barriers and highlighting the value of translating research into commercial solutions.

- Bridging Public-Private Communication Gaps: Align priorities and timelines of public and private sectors through dedicated communication channels and collaborative platforms.

- Navigating Intellectual Property (IP) Concerns: Develop clear, transparent IP agreements addressing ownership, usage rights, and benefit-sharing models to foster trust and collaboration.

- Translating Industry Needs into Research Priorities: Facilitate co-creation of research agendas by supporting companies in articulating their R&D needs and organizing structured dialogue, matchmaking events, and knowledge exchange workshops.

4. Italy – IMTA Development

The Italian pilot targets the development of sustainable aquaculture value chains through the implementation of IMTA systems. By combining fish, shellfish, and macroalgae production, the pilot supports nutrient recycling and reduces environmental impact. The IMTA approach enables the transformation of waste streams into high-value products such as nutraceuticals, biostimulants, and other bio-based goods, fostering circular economy models. These value chains strengthen collaboration between aquaculture producers and research institutions, driving innovation, economic growth, and environmental sustainability within the Mediterranean aquaculture sector.

Needs Addressed:

- Adopt aquaculture practices that minimize nutrient pollution, enhance water quality, and reduce the ecological footprint through natural bioremediation.

- Develop cost-effective systems for creating new revenue streams, also through biomass valorisation (e.g., algae, shellfish).

- Adapt aquaculture systems to Mediterranean conditions, ensuring the efficient integration of species (e.g., bivalves, algae, and fish)

Identified Challenges:

- Optimizing Environmental Sustainability through Bioremediation: developing aquaculture systems that effectively reduce nutrient pollution, enhance water quality, and minimize ecological footprints, while addressing regulatory restrictions and spatial conflicts.

- Ensuring Economic Viability through Cost-Effective Systems and Biomass Valorisation: balancing high initial costs, market development for biomass products (e.g., algae, shellfish), and operational complexity to create sustainable revenue streams and scalable value chains.

- Adapting and Scaling Systems for Mediterranean Conditions: overcoming environmental variability, ensuring species compatibility, addressing technical gaps, and navigating regulatory and administrative barriers to implement integrated aquaculture solutions.

5. Italy –Nature-Based Solutions for Marine Restoration

The Italian pilot focuses on developing circular and regenerative value chains that leverage Nature-Based Solutions (NBS) to restore and renature coastal ecosystems, specifically within the La Spezia port area. Central to the pilot is the valorisation of by-products and discards from shellfish farming, transforming these materials into resources that support ecosystem restoration and biodiversity enhancement.

Needs Addressed:

- Detection of ecologic and economic potential of marine and terrestrial ecosystems
- Transition to nature-based communities towards regeneration of natural resources
- Establishment of clusters of local actors to share visions and needs generating the motivation to change
- Creation of a cooperation platform for stakeholders both at local, national and international levels, thus developing 'community lead' projects for environmental sustainability, resilience and regeneration

Identified Challenges:

- Lack of pre-existing public-private collaboration on the topic
- Scepticism in providing information, for Intellectual Property (IP) concerns (especially from private sectors)
- Difficulties to involve small and medium enterprises, the prevalent typology of Italian productive tissue
- Lack in effective collaboration research – business sector (i.e., technologies scalability)

6. Albania – IMTA for Sustainable Aquaculture and By-Product valorisation

The Albanian pilot focuses on strengthening sustainable aquaculture value chains through the development and implementation of IMTA systems in the Bay of Vlora. By integrating species from different trophic levels—such as fish, shellfish, and macroalgae—the pilot promotes nutrient recycling, reduces environmental impact, and improves water quality. This approach enhances the aquaculture products value chain by transforming waste into valuable biomass, supporting the production of high-value products for food, feed, and other bio-based sectors.

Needs Addressed:

- Implement eco-friendly aquaculture practices that minimize nutrient pollution and enhance water quality through natural bioremediation.
- Develop cost-effective systems to generate new revenue streams via biomass valorisation (e.g., shellfish and echinoderms).

- Adapt aquaculture systems to Mediterranean and local conditions, ensuring the efficient integration of species such as bivalves, echinoderms, and fish.

Identified Challenges:

- Environmental Sustainability through Bioremediation: developing aquaculture systems that reduce nutrient pollution while addressing regulatory restrictions and spatial conflicts.
- Economic Viability and Biomass valorisation: balancing high initial costs, market development for biomass products, and operational complexity to establish sustainable revenue streams and scalable value chains.
- Adaptation to Mediterranean Conditions: overcoming environmental variability, ensuring species compatibility, addressing technical gaps, and navigating regulatory and administrative barriers.
- Albania-Specific Challenges: coastal tourism expansion limits available space for aquaculture; lack of PPPs hinders collaboration between research institutions, businesses, and governments for IMTA adoption; absence of supporting schemes for the aquaculture sector, with IPARD funds permanently suspended by the European Commission.

7. Greece – Restorative and Regenerative Aquaculture

The Greek pilot targets the development of sustainable aquaculture value chains by integrating IMTA practices within existing mussel farming operations. By co-culturing mussels with benthic species such as sea cucumbers (Holothuria), the pilot enhances bioremediation, nutrient recycling, and sediment health, contributing to ecosystem restoration and biodiversity improvement. This approach diversifies the production value chain by introducing additional species with high market potential, supporting Low Trophic Aquaculture (LTA) models. The pilot also creates new opportunities for the valorisation of mussel farming by-products and the development of biotechnological applications, reinforcing circular economy principles and promoting the long-term sustainability and economic viability of the aquaculture sector in Greece.

Needs Addressed:

- Promote Sustainable Aquaculture: Develop balanced aquaculture systems that improve environmental sustainability (reducing ecological footprint, minimizing waste, enhancing water quality), economic viability (through product diversification and risk reduction), and social acceptance (via better management practices).
- Enhance the Value of LTA: Foster LTA practices, such as mussel and sea cucumber farming, recognizing their biotechnological potential.
- Implement NBS: Support environmental bio-mitigation and remediation, contributing to ecosystem goods and services.

Identified Challenges:

- Reduce Environmental Footprint of Mussel Farming: Improve sediment health and minimize organic waste impacts.

- Integration & Local Adaptation: Address challenges posed by climate variability (e.g., temperature shifts, heatwaves), ensure species welfare, and adapt technical practices to local conditions.
- Efficient Use of Space & Resources: Maximize biomass production while applying advanced monitoring and management technologies.
- Eco-Intensification: Develop eco-efficient models within the shellfish sector to demonstrate sustainable intensification.
- Increase Resilience & Competitiveness: Strengthen the knowledge base and foster innovation to build resilience in the shellfish industry.

Following the selection of strategic value chains, the BBHubs developed specific pilot actions to tackle industry challenges and address regional needs identified through BBt assessments. These pilot action proposals were subsequently reviewed and validated by T-Labs, which played a critical role in aligning activities with real-world challenges, industry feasibility, and sustainability objectives. T-Labs facilitated a co-design process that ensured pilot actions were adapted to local environmental, economic, and regulatory contexts. These multi-stakeholder workshops brought together research institutions, industry leaders, policymakers, and civil society representatives to collaboratively refine pilot initiatives, ensuring their scientific robustness, economic viability, and environmental sustainability. Through this participatory process, T-Labs not only refined the pilot actions but also reinforced the operational framework of DS, ensuring that they function as dynamic testing grounds for scalable and impactful BBt innovations.

3.2. Slovenian Pilot Action

3.2.1. BBt Solutions to be tested

The Slovenian BBt DS will focus on three key BBt solutions to unlock the potential of marine bioresources:

1. **Large-Scale Microalgae Production for Cosmetics:** The site will prioritize the upscaling of microalgae cultivation for the extraction of high-value bioactive compounds, particularly for cosmetic applications. Strategic partnerships with stakeholders (private sector companies, research institutes, etc...) possessing advanced biotechnological expertise will drive the efficient scaling of production, optimization of biomass yield, and deployment of large-scale bioreactors and extraction technologies. This collaboration aims to accelerate market entry while ensuring sustainable and cost-effective production.
2. **Valorisation of Fisheries and Aquaculture By-Products:** A core initiative involves transforming fisheries and aquaculture by-products and discards, currently underutilized resources, into high-added-value biopolymers for biomedical and cosmetic uses. This approach directly supports circular blue economy principles by reducing waste, maximizing resource efficiency, and creating new bio-based products for high-demand markets.

3. **Development of Innovative Sea Sponge and/or sea cucumber Aquaculture Systems:** Slovenia will pioneer sustainable aquaculture systems dedicated to cultivating sea sponges and/or sea cucumber, capitalizing on their rich bioactive properties with potential applications in pharmaceuticals and cosmetics. Additionally, these systems contribute to ecosystem services such as water filtration and habitat enhancement, further supporting environmental sustainability.

3.2.2. Implementation steps

1. **Site Selection and Environmental Assessment:**
   - Conduct comprehensive site evaluations to identify optimal locations for microalgae cultivation, fishery by-product collection, and sponge and/or sea cucumber aquaculture.
   - Assess key environmental parameters such as water temperature, salinity, nutrient composition, and biodiversity to ensure suitability for biotechnological applications.
   - Develop baseline studies on microalgae strains, evaluating their adaptability and growth potential for large-scale production.
   - Identify potential challenges related to marine resource availability, water quality, and ecosystem interactions for sponge aquaculture and by-product valorisation.

2. **Microalgal Biomass Cultivation and Processing**
   - Establish pilot-scale microalgae production units, incorporating advanced photobioreactors, and if possible open-pond systems.
   - Optimize growth conditions through continuous monitoring of light exposure and pH.
   - Analyse biochemical profiles, including pigment and fatty acid composition and other potential bioactive compounds, to determine the commercial potential for cosmetic, nutraceutical, and biomedical applications.
     Develop efficient harvesting and drying methods to maximize biomass yield while maintaining bioactive compound integrity

3. **Collection and valorisation of Fishery By-Products**
   - Implement a structured collection system for fishery and aquaculture by-products, including fish skin, bones, jellyfish, and exoskeletons of crustaceans.
   - Ensure sustainable storage and transport logistics to prevent material degradation and optimal quality for further processing.
   - Extract and analyse biopolymers, such as collagen, chitin, and other bioactive compounds with applications in biomedicine, cosmetics, and food industries.
   - Evaluate the feasibility of scaling up by-product valorisation technologies for commercial applications.

4. **Sponge and/or sea cucumber Aquaculture Development**
   - Conduct preliminary feasibility studies on the cultivation of marine sponges and/or sea cucumber in controlled environments.
   - Design and implement test cultivation systems in the Gulf of Trieste, assessing different rearing methods such as sea-bottom farming and suspended aquaculture.
   - Monitor sponge/sea cucumber adaptability, growth rates, and interactions with surrounding marine biodiversity.
   - Explore potential applications of sponge-derived and/or sea cucumber-derived compounds in biomedicine, pharmaceutical research, and sustainable biomaterials.

5. **Monitoring and Data Collection**
   - Implement a monitoring system to track microalgae productivity and sponge/sea cucumber aquaculture efficiency.

- Regularly measure water quality parameters, pH levels, oxygen content, and temperature.
- Use biochemical analysis techniques to evaluate the composition and bioactivity of extracted compounds from algae and fishery by-products.

6. **Pilot Testing and System Optimization**
   - Conduct controlled pilot trials for each biotechnology application, optimizing production parameters based on continuous feedback.
   - Evaluate scalability of microalgae cultivation by testing different bioreactor configurations and growth conditions.
   - Refine fishery by-product processing protocols, ensuring high-quality bioactive compound extraction while maintaining economic feasibility.
   - Adjust sponge/sea cucumber cultivation methodologies based on environmental and biological responses observed during trials.

7. **Market and Economic Feasibility Assessment**
   - Collaborate with interested stakeholders to explore commercialization potential for algae-derived bioactive compounds, fishery by-products, and sponge-based/sea cucumber-based materials.
   - Identify potential markets for biopolymers, nutraceuticals, and marine-derived bioactive compounds.

8. **Impact Assessment**
   - Evaluate environmental and social benefits of microalgae cultivation, fishery by-product valorisation, and sponge/sea cucumber aquaculture.
   - Measure KPIs related to biomass production, waste reduction, biodiversity conservation, and commercialization potential.

3.2.3. Calendar of implementation

	May-25	June-25	July-25	August-25	September-25	October-25	November-25	December-25	January-26	February-26	March-26	April-26
	1	2	3	4	5	6	7	8	9	10	11	12
Activity												
A1 - Site Selection and Environmental Assessment												
A2 - Microalgal Biomass Cultivation and Processing												
A3 - Collection and Valorization of Fishery By-Products												
A4 - Sponge Aquaculture Development												
A5 - Monitoring and Data Collection												
A6 - Pilot Testing and System Optimization												
A7 - Economic Feasibility Assessment												
A8 - Impact Assessment and Stakeholder Engagement												

3.3. Spanish Pilot Action

3.3.1. BBt Solutions to be tested

The Spanish pilot will test two integrated BBt solutions aimed at enhancing environmental sustainability and supporting climate change mitigation:

1. **Macroalgae-Based Bioremediation Systems:** The pilot will implement large-scale cultivation of macroalgae to absorb excess nutrients from port waters, improving port and coastal water quality. The process not only purifies polluted waters but also generates valuable macroalgae biomass, which can be further valorised into products such as biofuels, agricultural inputs, cosmetics, food ingredients or nutraceuticals.
2. **CO_2 Emissions Monitoring and Compensation Technologies:** Innovative CO_2 tracking systems will be deployed to monitor and manage carbon emissions in the activities carried out and promoted in fisheries and aquaculture sectors. These tools will facilitate data-driven strategies for emissions reduction and support compliance with sustainability targets.

A key feature of the pilot is the integration of macroalgae cultivation in port water bioremediation (and in the water cycle management strategies) with CO_2 sequestration strategies, enabling industries to embed macroalgae-based carbon offsetting into their operations. This combined approach provides dual environmental benefits—water purification and carbon capture—while fostering climate resilience and sustainability across the blue economy.

3.3.2. Implementation steps

1. **Site Selection and Environmental Assessment**
   - Conduct comprehensive baseline studies of the selected port environment to evaluate water quality, nutrient loads, heavy metal concentrations, and the suitability of local species for algae cultivation.
   - Gather and analyse key environmental parameters such as salinity, temperature, and water flow to determine optimal conditions for algae growth.
   - Select potential CO_2 emissions data monitoring systems to integrate with the macroalgae cultivation system.
2. **Macroalgae-Based Bioremediation and CO2 Emissions Monitoring and Compensation Technology System Design**
   - Design a tailored bioremediation system for the selected site, selecting the most effective algae species suited to the specific environmental conditions.
   - Engineer a high-efficiency system that maximizes algae growth and tests nutrients and pollutant levels while ensuring minimal infrastructure impact on port facilities.
3. **Infrastructure Setup and Installation**
   - Retrofit port infrastructure to support bioremediation technology, including algae cultivation units in land-based tanks and automated water quality sensors for monitoring.
   - Deploy a data-driven monitoring framework to track selected pollutants, CO_2 and overall system performance indicators
4. **Monitoring and Data Collection**
   - Establish the monitoring system to capture data on pollutant levels, system reliability, CO2 indicators and water quality parameters (turbidity, dissolved oxygen, nitrogen, phosphorus).
   - Integrate the digital platform to enhance data accuracy and streamline system evaluation.
5. **Pilot Testing and System Optimization**
   - Conduct pilot-scale trials under real-world conditions to assess the effectiveness of algae-biomass production and nutrients removal efficiency by tracking water indicators and data collection.
   - Define adaptive management actions to optimize algae growth and pollutant removal efficiency.
   - Define adaptive management actions to improve and validate the methodology for CO_2 monitoring, quantification, and offsetting in maritime and aquaculture activities.
   - Identify the most appropriated carbon credit systems to be integrated into the strategies for emissions reduction of the pilot.
6. **Valorisation of Algae Biomass**
   - Harvest and process algae biomass for potential commercial viability of high-value products, such as bioactive compounds for cosmetics, sustainable animal feed.

- Define scalable processing techniques to maximize product quality.
- Assess market opportunities for algae-derived biomaterials to strengthen the circular blue economy.

7. **Economic and Feasibility Assessment**
   - Partner with port authorities and aquaculture stakeholders to evaluate the economic potential of the BIOREMED ALGAE and TOKENCO2 systems.
   - Assess the scalability and market potential for algae-based solutions, guiding future commercial deployment.
   - Asses standardized protocols for CO_2 monitoring and compensation strategies to enhance the economic feasibility of tokenization of CO2 in the Carbon credit market in aquaculture and fisheries.

3.3.3. Calendar of implementation

	May 25	Jun 25	Jul 25	Aug 25	Sep 25	Oct 25	Nov 25	Dec 25	Jan 26	Feb 26	Mar 26	Apr 26
	1	2	3	4	5	6	7	8	9	10	11	12
Activity												
A1 Site Selection and Environmental Assessment												
A2 Macroalgae and CO2 Technology Systems Design												
A3 Infrastructure Setup and Installation												
A4 Monitoring and Data Collection												
A5 Pilot Testing and System Optimization					National T-Lab	Internat. T-Lab				R2G/B2G share results & fine tune model		
A6 Valorisation of Algae Biomass												
A7 Economic and Feasibility Assessment												

3.4. French Pilot Action

3.4.1. BBt Solutions to be tested

The French pilot will deploy several innovative BBt solutions aimed at optimizing algae production and advancing integrated aquaculture systems:

- **Advanced Algae Cultivation and Processing Technologies:** the pilot will test improved cultivation methods for both microalgae and macroalgae, including controlled land-based systems, optimized species selection, and sustainable growth protocols. Post-harvest processing technologies, such as efficient drying and targeted extraction techniques, will be used to obtain high-value bioactive compounds suitable for applications in food, health, cosmetics, and industrial biomaterials.
- **IMTA Optimization:** Innovative IMTA system designs will be trailed, focusing on balancing nutrient cycles by integrating fed species (e.g., finfish) with extractive species. These systems will include:

- Sea cucumbers: Implementation of hatchery and nursery technologies, alongside optimized rearing conditions to support their growth and market readiness.
- Macroalgae: Development of sustainable land-based cultivation systems tailored to Mediterranean conditions, ensuring consistent biomass production.
- Sea urchins: Hatchery development and growth optimization protocols, coupled with improved commercial processing methods to enhance product quality and marketability.

3.4.2. Implementation Steps

1. **Mapping Public Research Actors:** Identify innovation departments and platforms within public research institutions, including universities (e.g., AMU, Montpellier, Nice Côte d'Azur) and research labs (e.g., CELIMER, CNRS, IRD, IMEV, Observatoire de Banyuls, CEA). Objective: Pinpoint key contact people within these institutions to facilitate collaboration opportunities.
2. **Mapping SMEs and Startups:** Identify SMEs and startups requiring development and testing services to bridge gaps in innovation and commercialization.
3. **Analysis of Existing Mechanisms for Public-Private Collaboration:** Evaluate mechanisms such as LABCOM and on-campus company partnerships. Create an overview of available collaboration frameworks and identify mobilizable actors to foster innovation.
4. **Support collaborative public/ private projects**
5. **Support for Private Actors to Access Research Platforms and Infrastructures** to develop their project.
6. **Impact Assessment**

3.4.3. Calendar of implementation

	May-25	June-25	July-25	August-25	September-25	October-25	November-25	December-25	January-26	February-26	March-26	April-26
	1	2	3	4	5	6	7	8	9	10	11	12
Activity												
EOI Call launched												
Selection of beneficiaries												
Analysis of existing Mechanisms for Public-Private Collaboration (including mapping)												
Support collaborative public/ private projects through access Research Platforms and Infrastructures												
Impact Assessment												

3.5. Italian Pilot Actions

3.5.1. BBt Solutions to be tested

The first Italian pilot will deploy a suite of innovative BBt technologies aimed at advancing IMTA systems. Key solutions include:

1. **Bioremediation-Based IMTA Systems:** Organic waste from fish farming will be repurposed as a nutrient source for filter-feeding species (e.g., mussels, oysters) and macroalgae, creating a closed-loop system that naturally improves water quality by reducing nutrient pollution.

2. **Biofilters and Microbial Reactors:** Implementation of biofilters and microbial reactors will enhance water purification and nutrient cycling, ensuring optimal conditions for species growth while minimizing environmental impacts.

3. **Biorefinery Processes:** The biomass produced within the IMTA system will be processed using biorefinery technologies to extract valuable bioactive compounds. Target products include nutraceuticals, biostimulants, cosmetics, and biofuels, supporting the development of high-value bio-based markets.

4. **Species Selection and Genetic Optimization:** The pilot will explore genetic optimization and selective breeding techniques to enhance the productivity, resilience, and quality of both filter-feeding species and macroalgae, ensuring long-term system efficiency and economic viability.

The second Italian pilot supports **NBS** for marine habitat restoration. Key innovations include repurposing mussel farming waste and natural biomaterials like hemp to develop substrates for ecosystem regeneration. The pilot will also test 3D-printed artificial reefs made from eco-friendly cement blended with shell waste, designed to enhance biodiversity. Additionally, artificial substrates will be deployed to promote the recovery of *Ostrea edulis* (European flat oyster) beds, fostering natural settlement and improving marine biodiversity. These solutions integrate circular economy principles with biotechnological innovation to restore degraded coastal habitats.

3.5.2. Implementation steps first Italian pilot action

1. **Environmental Baseline Assessment and IMTA System Design**
   - Carry out baseline environmental assessments, including the analysis of inorganic and organic nutrient loads in both water and sediment, to inform the design of an integrated multi-trophic aquaculture (IMTA) system tailored to the specific conditions of the pilot site.
   - Evaluate the ecological compatibility of candidate species, considering seasonal variations in key parameters such as salinity, temperature, and water currents.
   - Design a site-specific IMTA model, selecting and combining species based on ecological synergy and local environmental conditions, aiming to optimize nutrient recycling and system sustainability.

2. **Infrastructure Retrofitting**
   - Install cultivation systems (e.g., lantern-nets for algae, baskets for bivalves, fish cages).
   - Retrofit the site to accommodate IMTA modules with minimal environmental impact.

3. **Monitoring and Data Collection System Setup**
   - Periodic monitoring of water quality, nutrient flow, and biomass growth.

4. **Pilot System Operation and Testing**
   - Operate the IMTA system under controlled conditions to evaluate nutrient recycling, pollutant reduction, and biomass yield.
   - Optimize system operations based on data/samples collected and address potential challenges.

5. **Economic Model Assessment**
   - Conduct cost-benefit analysis with industry partners to evaluate economic feasibility.

6. **Data Analysis and Reporting**
   - Analyse data on environmental, economic, and social performance.

- Draft a comprehensive report with findings, lessons learned, and recommendations for scalability.

3.5.3. Implementation steps second Italian pilot action

The second Italian pilot is taking advantaging of ongoing project under PNRR scheme, funding the technical parts of the pilot.

1. **Preparation of the Host Area for Pilot Implementation:** Ensure the physical, technical, and regulatory readiness of the host sites to support pilot BBt activities and optimize conditions for successful implementation.

2. **Establishing a Collaborative Network and Promoting New Partnerships:** Create and coordinate a national network of stakeholders following a quintuple helix approach to foster synergies, collaborative knowledge, and innovation within the BBt value chain, including:
   - Stakeholder Mapping and Engagement
   - Multi-Stakeholder Workshops: Organize targeted networking events, roundtables, and sectoral meetings to encourage knowledge-sharing and joint project development.

3. **Knowledge Transfer and Capacity Building:** Bridge the gap between academia and the private sector by promoting the transfer of cutting-edge BBt research into commercial applications, enhancing market competitiveness and sustainability.

4. **Advocacy for Policy and Regulatory Support:** Leverage experimental results from BBt Demonstration Sites to drive policy changes and optimize regulatory frameworks.
   - Stakeholder Consultations for Policy Recommendations: Engage policymakers, legal experts, and industry representatives in structured dialogue sessions to refine recommendations and align them with policy priorities.
   - Policy Brief Development and Dissemination: Produce targeted reports and position papers outlining policy reforms necessary to enhance BBt adoption and investment incentives.
   - Leveraging Med-Alliance and EU Networks: Utilize established networks from B-Blue and other Mediterranean cooperation frameworks to advocate for regulatory reforms at the EU level.

5. **Pilot System Operation and Testing: Evaluate the effectiveness and scalability of the proposed solutions under real-world conditions, monitoring KPIs.**
   - Implementation of multi-helix T-Labs for co-design and monitoring of marine regeneration activities.
   - Development of 3D-printed artificial reefs using marine cement and wasted shells to enhance biodiversity and restore flat oyster beds.
   - Utilization of shell farming waste and biomaterials (e.g., hemp) for marine ecosystem regeneration.
   - Monitoring biodiversity restoration on 3D reefs via an IoT system.
   - Promotion of NBS as a regenerative approach for marine environments.

6. **Data Analysis and Reporting:** Synthesize key findings and draft a comprehensive report to support decision-making, inform policy development, and promote best practices.

3.5.4. Calendar of implementation first pilot action

	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
	1	2	3	4	5	6	7	8	9	10	11	12
Activity												
A1 - Environmental Baseline Assessment and IMTA System Design												
A2 - Infrastructure Retrofitting												
A3 - Monitoring and Data Collection System Setup												
A4 - Pilot System Operation and Testing												
A5 - Economic Model Assessment												
A6 - 6.Data Analysis and Reporting												

3.6. Albanian Pilot Action

3.6.1. BBt Solutions to be tested

The Albanian pilot will test a range of BBt solutions centered on the development of IMTA systems. By integrating species from different trophic levels, such as fish, bivalves, echinoderms, and potentially macroalgae, IMTA transforms organic waste from fish farming into a valuable resource, enhancing water quality through natural bioremediation processes. This approach not only reduces nutrient pollution but also generates marketable biomass—such as sea cucumbers and shellfish—which can be processed into high-value products, supporting circular economy models.

To ensure the system's adaptability to the specific conditions of the Mediterranean, the pilot will incorporate biotechnological innovations such as species selection, genetic optimization, and selective breeding. These advancements will improve the productivity, resilience, and environmental performance of the IMTA systems, particularly in addressing challenges like seasonal temperature shifts and salinity variations intensified by climate change. Through these solutions, the pilot aims to establish IMTA as a viable, sustainable aquaculture model for Albania, promoting both ecological and economic resilience.

3.6.2. Implementation steps

1. **Site Selection and Environmental Assessment:** conduct baseline studies of the selected aquaculture site to assess environmental conditions (e.g., water quality, sediment composition) and compatibility of existing species.
2. **IMTA Planning:** develop a customized IMTA system, including the selection of species (fish, bivalves, holothurians).
3. **Infrastructure Retrofitting:** install cultivation systems (e.g., baskets for bivalves and sea-cucumbers) and retrofit the site to accommodate IMTA modules.
4. **Monitoring and Data Collection:** data monitoring and collection systems for tracking water quality, nutrient flow, and biomass growth.
5. **Pilot System Operation and Testing**: operate the IMTA system under controlled conditions to monitor performance indicators, including biomass yield, nutrient reduction, and water quality improvement.

6. **Economic Model Assessment:** Collaborate with aquaculture industry partners and experts to evaluate the economic feasibility of the IMTA system, focusing on cost-benefit analysis and market potential.
7. **Data Analysis and Reporting:** Compile and analyse data from the pilot phase to evaluate environmental and economic performance and draft a report with key findings

3.6.3. Calendar of implementation

	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26
	1	2	3	4	5	6	7	8	9	10	11	12
Activity												
A1 [Site Selection and Environmental Assessment]	■											
A2 [IMTA Planning]	■	■										
A3 [Infrastructure Retrofitting]		■	■	■								
A4 [Monitoring and Data Collection]			■	■	■	■	■	■	■			
A5 [Pilot System Operation and Testing]				■	■	■	■	■	■	■		
A6 [Economic Model Assessment]						■	■	■	■	■	■	■
A7 [Data Analysis and Reporting]									■	■	■	■

3.7. Greek Pilot Action

3.7.1. BBt Solutions to be tested

The Greek pilot will implement a set of innovative BBt solutions to advance restorative aquaculture practices. Central to the approach is the integration of sea cucumbers (*Holothuria* species) into existing mussel farming systems, creating an IMTA model. This co-cultivation strategy enhances bioremediation by utilizing sea cucumbers to process organic waste from mussel farming, improving sediment health, recycling nutrients, and supporting overall ecosystem balance.

To further strengthen sustainability, the pilot will explore the use of precision monitoring tools for real-time environmental tracking, as well as bioreactors to optimize nutrient management. Additionally, the project plans to implement biorefinery processes to extract bioactive compounds from the harvested biomass, turning mussels, sea cucumbers, and shellfish by-products into high-value products. These solutions aim to diversify production, add economic value to the mussel sector, and promote circular economy principles, contributing to the long-term viability and resilience of LTA in Greece.

3.7.2. Implementation Steps

1. **Baseline Monitoring and Environmental Assessment.**
   - Environmental quality assessment of the water column (nutrients, oxygen concentration, phytoplankton biomass and diversity) and the sediment at a transect from the mussel cultivation area (redox potential, organic matter, distribution of the benthic fauna).

- Monitoring survey of the natural Holothurian population, to evaluate the compatibility of species with physico-chemical conditions (hydrodynamics, temperature, oxygen, nutrients and organic matter concentration).

2. **Site selection and design of experimental units' installation** according to the preliminary results on water quality, bottom condition, hydrodynamics security of the unit, depth and accessibility to implementation and monitoring.
3. **Construction and organization of the material needed** for the pilot activities: experimental cages, frames, polyethylene nets, anchors, chemicals etc.
4. **Installation of the in-situ Holothurian cage systems:** Rearing systems anchored to the seabed and submerged into the sediment. Appropriate placement of sea cucumbers collected with scuba diving at predefined stocking densities.
5. **Monitoring and Data Collection System:**
   - Water quality and sediment ecological assessment.
   - Holothurian biometric measures to assess growth performances and survival rates.
   - Investigate the development of supporting technologies such as 1.) Precision tools with the use of a variety of interconnected sensors to monitor mussel farm conditions and help farmers make decisions that optimize production, mussel health and economic returns, while also minimizing environmental impacts; 2.) Small scale bioreactors to study the development of microalgae species of interest; 3.) Hatchery and Nursery of sea cucumbers for market expansion and upscaling pilot activities.
6. **Economic and Feasibility Assessment:** Financial sustainability assessment for upscaling pilot activities, production costs, maintenance requirements, revenue generation, and market potential.
   - **Impact Assessment:** Assess the potential of Mediterranean Sea cucumber species for sediment bioremediation and define the critical biomass in mussel farms.

3.7.3. Calendar of implementation

	Oct 24	Nov 24	Dec 24	Jan 25	Feb 25	Mar 25	Apr 25	May 25	Jun 25	Jul 25	Aug 25	Sep 25	Oct 25	Nov 25	Dec 25	Jan 26	Feb 26	Mar 26	Apr 26	May 26	Aug 26
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Activity																					
A1. Baseline Monitoring and Environmental Assessment.																					
A2. Site selection and design of experimental units' installation.																					
A3. Construction and organization of the material needed.																					
A4. Installation of the in-situ Holothurian cage systems.																					
A5. Monitoring and Data Collection System.																					
A6. Economic and Feasibility Assessment.																					
A7. Impact Assessment																					

3.8. Public Private Partnerships for pilots' implementation

The establishment of the DS is designed to integrate real-world testing environments with industry-driven needs, facilitating the validation and adaptation of BBt solutions while ensuring their economic viability and environmental sustainability. To this end, the project promotes PPPs to offer a structured, collaborative approach that enhances the testing, validation, and transfer of advanced blue biotechnologies. Public-private research collaboration takes different forms depending on their objectives, legal framework, and the level of integration between partners. Here are the main types of structures.

Innovation Clusters are regional ecosystems that bring together universities, research institutions, startups, and large corporations. They promote knowledge exchange, R&D collaboration, and the industrial application of research. These clusters frequently receive government funding and policy support, facilitating access to shared research infrastructures and networking opportunities.

Joint Laboratories (Joint Labs) are collaborative research environments formed between one or more public research organizations and private companies. They focus on technology transfer, applied research, and accelerating innovation in industry-relevant fields. A key feature of these labs is the co-location of researchers from academia and industry, fostering close collaboration. They are typically established through long-term agreements ranging from 3 to 10 years.

Research Consortia are temporary or permanent alliances between public and private entities working on specific research projects. These consortia are often funded by national or international programs such as Horizon Europe or the National Science Foundation in the US. They operate under formalized collaborative agreements, with partners sharing intellectual property rights and research outcomes.

Public-Private Research Institutes are specialized research centres jointly financed by the public and private sectors. They focus on cutting-edge fields such as artificial intelligence, biotechnology, and nanotechnology. These institutes often operate as independent foundations or public-private entities, fostering long-term collaboration between academia and industry.

Industrial Research Chairs are university-hosted research programs co-funded by private companies. They provide financial support for PhD students, postdoctoral researchers, and dedicated research teams. Through these chairs, industries gain privileged access to cutting-edge academic research, while universities benefit from long-term funding and opportunities for real-world research applications.

Public-Private Partnerships (PPP) and Scientific Interest Groups (GIS) are structured collaborations between public and private actors with shared governance. They focus on applied research, infrastructure development, and technology transfer. These partnerships operate under formal legal agreements with defined funding structures and are often supported by government agencies.

Living Labs and Fab Labs are open innovative environments where researchers, companies, and end-users collaborate on new technologies. They encourage real-world experimentation and rapid prototyping, fostering user-driven innovation and interdisciplinary approaches. These labs provide access to shared tools, infrastructure, and testing facilities.

Joint Research Units are formal collaborations between multiple research organizations or institutions, often spanning different countries or sectors, established to pool resources, expertise, and infrastructure toward common scientific objectives. These units operate based on formal agreements that clearly define the governance structure, as well as the roles and responsibilities of each partner institution. Within a JRU, partners typically share research facilities, data, equipment, and human resources, including researchers, technicians, and administrative staff, fostering a collaborative environment that maximizes efficiency and scientific output.

4. Tools supporting the development of National Demonstration Sites

4.1. Set up of JRU

The preliminary analysis, conducted with the support of the T-Labs, laid the groundwork for identifying key partners to be involved in the JRUs. In parallel, each Hub has defined specific business models to be addressed through pilot actions, with the goal of fostering business scalability. These strategic models, recognized as priorities within the 2B-BLUE framework, will guide the selection of third parties essential for innovation uptake and industry alignment. Furthermore, the analysis clarified the roles, responsibilities, and resource contributions of each party involved in the JRUs, ensuring a balanced and effective collaboration.

During the selection phase of third-party participants, this structured framework serves as the basis for the Terms of Reference used in the call for expressions of interest (see Paragraph 4.7). It supports the evaluation of potential partners and ensures their capacity to contribute to the research, validation, and scaling of BBt solutions.

Clearly defining these elements also streamlines the drafting of CRAs (see Paragraph 4.8), aligning expectations, minimizing risks, and integrating each party's scientific, technical, and financial inputs into the implementation of pilot actions and their subsequent market transfer. This approach facilitates efficient resource allocation, enhances accountability, and reinforces the foundation for successful innovation transfer within the 2B-BLUE project.

4.2. SLOVENIAN JRU

4.2.1. Identification of Partners for JRU

By aligning the identified BBt with industrial and commercial cosmetic production models, three business models have been recognized:

Marine Microalgae-Based Model: The business model focuses on integrating marine microalgae production for cosmetic product development. Entities, active in the biotechnology sector and research institutions can collaborate to upscale microalgal production and formulate prototypes. This approach capitalizes on the growing demand for natural marine-derived cosmetics, leveraging bioactive compounds with anti-ageing, sun protection, and hydration properties. High replicability and scalability are ensured, particularly in regions like Slovenia, where market competition is lower. Regulatory compliance with the European Regulation (EC) No 1223/2009 (hereinafter – EU cosmetic regulation) is integral, while expert personnel, bioreactor facilities, and marketing strategies form the core cost structure.

Fish By-Product Valorisation Model: This business model centres on the valorisation of fish by-products and discards, converting them into high-value cosmetic ingredients or biomedical applications, such as collagen, chitin, and alkaloids. Strategic partnerships with fishers, fish markets, and restaurants guarantee a sustainable sourcing of raw materials. Research institutions and cosmetic/nutraceutical/biomedical companies play a key role in developing market-ready formulations. The model ensures environmental and economic sustainability while complying with regulations. Costs are linked to sourcing, processing, expertise, and marketing, with scalability potential depending on resource availability and partnerships.

Sea Sponge and/or Sea Cucumber Cultivation Model: Sea sponge and sea cucumber cultivation offer a high-potential business model for the cosmetics and pharmaceutical industries, as well as other advanced materials sectors such as electronics. The model emphasizes collaboration with aquaculture facilities and experts to ensure sustainable farming practices. Sea sponges and sea cucumbers, rich in collagen and silicates, serve as high-value ingredients. Investments in cultivation setup, bioactive compound isolation, prototype formulation, and regulatory compliance are crucial.

This model benefits from high replicability due to existing similar initiatives across the EU, aligning with both EU cosmetic regulations and sustainable aquaculture policies.

For testing such business models, the ideal JRU partners should meet the following characteristics:

Microalgae Cultivation Pilot Partners – Key Characteristics:

- **Technological Facilities & Infrastructure:**
  - Possess bioreactors or ponds suitable for scaling microalgal cultivation beyond 10L capacity.
  - Facilities capable of operating with salt media and replicating environmental conditions (e.g., salinity, temperature, light).
  - Ready access to natural environments for environmental culture studies.
- **Monitoring & Technology Readiness:**
  - Equipped to monitor microalgae growth parameters (physico-chemical,).
  - Open to implementing advanced monitoring tools as part of the project.
- **Human Resources Contribution:**
  - Availability of skilled personnel to manage cultivation, monitor growth and perform biomass harvesting.
  - Commitment to allocate dedicated staff for pilot operations and data reporting.

Fish By-Product Valorisation Pilot Partners – Key Characteristics:

- **Sourcing & Supply Capacity:**
  - Operate shellfish cultivation (ensuring consistent supply of discards/by-products for extraction.
  - Collaboration with fish markets, fisheries, and restaurants to provide fish discards and by-products.
- **Market & Processing Connections:**
  - Existing relationships with stakeholders using extracted compounds (e.g., cosmetic/biomedical industry for collagen, chitin, pigments, fatty acids; agri-food sector for chitin applications).
- **Human Resources Contribution:**
  - Willingness to support with discards and by-products, data collection on species, etc...

Sea Sponge and/or Sea Cucumber Cultivation Pilot Partners – Key Characteristics:

- **Existing Aquaculture Operations:**
  - Possess established aquaculture/mariculture facilities and relevant technology for sea sponge/sea cucumber cultivation.
  - Capable of integrating pilot-scale sponge/sea cucumber farming activities within current operations.
- **Human Resources Contribution:**

- Availability of trained aquaculture personnel to perform setup, maintenance, and monitoring of sponge/sea cucumber cultivation.

- **Environmental & Commercial Commitment:**
  - Located in suitable marine environments for sponge/sea cucumber growth.
  - Interested in expanding product diversification toward sustainable marine bio-resources.

4.2.2. Roles, Responsibilities, and Resource Contributions to the JRU

1. Contributions of Industry Partners (Aquaculture, Fisheries, Biotechnology Operators)

Industry partners provide the operational platforms necessary for real-world testing and implementation of the pilot actions, focusing on microalgae production, valorisation of fishery by-products, and sponge/sea cucumber aquaculture.

- **Scientific Contributions:**
  - Provide empirical data on aquaculture and fisheries by-product streams.
  - Facilitate testing of innovative applications (bioactive compounds, cosmetics, food additives).
  - Assist in site-specific environmental and operational studies.
- **Technical Contributions:**
  - Implement pilot infrastructures (microalgae cultivation systems, storage equipment for by-products, sponge/sea cucumber farming setups).
  - Ensure day-to-day operation, including raw material sourcing and maintenance.
  - Facilitate workforce training for efficient operation.
- **Operational Contributions:**
  - Provide access to aquaculture and fishery processing facilities.
  - Ensure compliance with EU and national regulatory frameworks for food, feed, and cosmetic applications.
  - Contribute workforce and expertise in processing and product development.
  - Support market validation and integration into existing commercial channels.

2. Contributions of NIB (Scientific Partner)

NIB provides research, analytical, and methodological expertise, guiding the design, optimization, and environmental sustainability of pilot actions.

- **Scientific Contributions:**
  - Lead environmental assessments and site selection.
  - Analyse bioactive compound extraction, and regulatory compliance.

- Conduct fish-waste waste reduction evaluation.
- Disseminate results through scientific publications and stakeholder engagement.

- **Technical Contributions:**
  - Develop optimized protocols for microalgal growth, bioactive compound extraction and sponge/sea cucumber growth
  - Provide expertise in species selection and cultivation methodologies.
  - Analyse collected data and evaluate scalability.
  - Advise on infrastructure adaptations, ensuring compatibility with sustainability goals.
- **Operational Contributions:**
  - Deploy researchers (marine biologists, chemists, biotechnologists, environmental scientists) to supervise pilot implementation.
  - Manage data collection and analysis for scientific validation.
  - Organize workshops and training sessions for stakeholders.
  - Facilitate engagement with policy makers, investors, and market actors.

3. Resources Provided by Each Partner

Resource Type	**Industry Partners**	**NIB (Scientific Partner)**
Physical Infrastructure	Aquaculture/fisheries facilities, logistics, pilot setups	Research labs, analytical tools, processing equipment
Human Resources	Technicians, processing staff, farm managers	Marine biologists, biotechnologists, chemical analysts
Equipment	Cultivation systems, processing units	Monitoring instruments, analytical software
Data & Monitoring	Provide operational data	Develop monitoring framework, analyse and interpret data
Financial Contribution	Cover operational costs	Cover costs for research activities through project funding

Regulatory Support	Ensure compliance with industry internal, national and EU regulations	Assist in regulatory permits and engagement
Training & Knowledge	Provide operational training	Conduct workshops on methodologies and sustainability

Role of Each Partner in Key Pilot Activities

Activity	**Industry Partners**	**NIB (Scientific Partner)**
A1 - Site Selection & Assessment	Provide site access, operational data	Conduct baseline studies, analyse environmental suitability
A2 - Pilot Planning	Implement pilot strategies, source materials	Develop methodologies, select species/processes/protocols
A3 - Infrastructure Setup	Install cultivation systems, processing units	Advise on system design, ensure sustainability
A4 - Monitoring & Data Collection	Collect operational data, maintain equipment	Develop monitoring protocols, analyse data
A5 - Pilot Operation & Testing	Manage daily operation	Refine models
A6 - Economic Feasibility Assessment	Provide operational and market insights	Evaluate market potential and conduct economic feasibility evaluation
A7 - Reporting & Knowledge Transfer	Share operational insights	Draft scientific reports, disseminate findings

4.3. SPANISH JRU

4.3.1. Identification of Partners for JRU

By aligning the DS with a bioremediation-focused business model, the JRU strategically integrates port authorities and marinas as key operational partners. The UMU pilot in Spain leverages the cultivation of macroalgae within port environments to deliver dual benefits: enhancing water quality and generating sustainable marine biomass. This structured business model addresses critical environmental challenges, nutrient removal, heavy metal accumulation, and microplastic filtration, while offering economic opportunities through the valorisation of cultivated biomass. The JRU partners foreseen should have the following characteristics:

- **Location:**
    - Operates within the port of Alicante and marina facilities, with reliable access to marine waters and logistical infrastructure.
    - Provides secured, regulated areas suitable for pilot installations and research activities.
- **Existing Macroalgae Water Bioremediation facilities in the Port/Marina Operations:**
    - Actively manages port or marina activities with capacity to integrate macroalgae and cultivation modules.
    - Offers operational flexibility to accommodate pilot-scale bioremediation structures in line with BIOREMED scenario conducted by Mediterranean Algae without major disruptions to regular port/marina activities.
- **Monitoring & Technology Readiness:**
    - Possesses basic environmental monitoring systems (e.g., water quality sensors, pollutant measurements) or is open to enhancing monitoring capacity through project-provided equipment.
    - Shows openness to implementing innovative technologies for environmental management and pollution reduction.
- **Human Resources Contribution:**
    - Employs trained Mediterranean Algae personnel capable of assisting in pilot setup, basic maintenance, and monitoring activities.
    - Willing to allocate staff to support bioremediation system operation, environmental data collection, and stakeholder coordination.
- **Market & Stakeholder Networks:**
    - Maintains established relationships with local stakeholders (e.g., municipalities, environmental agencies, maritime businesses), facilitating stakeholder engagement and social acceptance.
    - Demonstrates interest in integrating sustainable environmental practices into port management strategies.
- **Environmental Commitment:**
    - Located in coastal areas with suitable conditions for macroalgae growth (e.g., appropriate salinity, temperature, and water quality).
    - Committed to improving water quality, reducing nutrient emissions, and enhancing environmental sustainability, fully aligning with the objectives of the bioremediation pilot.

4.3.2. Roles, Responsibilities, and Resource Contributions to the JRU

1. Contributions of Industry Partners (Mediterranean Algae and Port Authorities, Marinas, Local Stakeholders)

Industry partners provide the physical and operational platforms for the demonstration of macroalgae cultivation systems within port environments.

- **Scientific Contributions:**
  - Provide empirical data on water quality parameters and baseline contamination levels.
  - Facilitate testing of pollutant removal efficiency and environmental monitoring.
  - Assist in site-specific studies by offering operational data and historical records.
- **Technical Contributions:**
  - Implement pilot infrastructures (macroalgae cultivation structures ports).
  - Ensure day-to-day maintenance, ensuring operational stability of bioremediation systems.
  - Facilitate workforce training for port workers to assist in system setup and basic monitoring.
- **Operational Contributions:**
  - Provide access to port/marina facilities and infrastructure for pilot installation.
  - Ensure compliance with port regulations and support permitting processes.
  - Contribute workforce (Mediterranean Algae staff, marina operators) to support system management.
  - Support stakeholder engagement, including local businesses and community actors, to validate feasibility.

2. Contributions of UMU (Scientific Partner)

UMU leads the research, analytical, and methodological aspects of the bioremediation pilot, ensuring scientific rigor and environmental sustainability.

- **Scientific Contributions:**
  - Lead environmental assessment and site selection, ensuring suitability of ports/marinas for bioremediation.
  - Develop customized bioremediation models integrating macroalgae cultivation and ICT technologies.
  - Analyse pollutant removal efficiency (nutrients, heavy metals, microplastics) and overall ecological impact.
  - Conduct social and economic impact assessments, ensuring replicability and scalability.

- Publish scientific results and ensure stakeholder dissemination.

- **Technical Contributions:**
  - Design and develop monitoring protocols (nutrient levels, biodiversity indicators, pollutant concentration).
  - Provide expertise in macroalgae species selection, ensuring local ecosystem compatibility.
  - Analyse collected environmental and operational data, supporting technical optimization.
  - Support infrastructure adaptation and offer technical guidance for retrofitting ports for bioremediation systems.

- **Operational Contributions:**
  - Deploy researchers (marine biologists, environmental scientists, technical experts) to oversee pilot setup and monitoring.
  - Manage data collection, analysis, and reporting with scientific rigor.
  - Organize training sessions and workshops for port authorities and local stakeholders.
  - Facilitate engagement with policymakers, regulators, and investors to ensure long-term adoption.

3. Resources Provided by Each Partner

Resource Type	**Industry Partners (Aquaculture Macroalgae operator in the Port of Alicante)**	**UMU (Scientific Partner)**
Physical Infrastructure	Bioremediation infrastructure in the port and marina facilities of Alicante, logistics for pilot setup	Research labs, analytical tools, monitoring equipment
Human Resources	Mediterranean Algae staff, marina operators, local workers	Marine biologists, environmental scientists, analysts
Equipment	Cultivation structures and bioremediation facilities	Water quality sensors, data analysis software
Data & Monitoring	Provide operational data, baseline environmental records	Develop monitoring framework, analyse and interpret data

Financial Contribution	Cover operational costs (installation, maintenance)	Support research activities via national/EU funding
Regulatory Support	Ensure compliance with port regulations and environmental permits	Assist in research permits
Training & Knowledge	Provide operational support and participate in training	Conduct workshops on bioremediation methodologies and technologies
Market & Stakeholder Access	Facilitate stakeholder engagement and local acceptance	Support economic modelling and social impact assessment

4. Role of Each Partner in Key Pilot Activities

Activity	**Industry Partners (Aquaculture macroalgae operator in the port of Alicante)**	**UMU (Scientific Partner)**
A1 - Site Selection & Assessment	Provide access to port areas, historical environmental data	Conduct baseline studies, analyse pollutant levels
A2 - Pilot Planning	Implement pilot integration strategy	Develop bioremediation model, select species/structures
A3 - Infrastructure Setup	Install cultivation systems and structures	Advise on system design, ensure environmental compatibility
A4 - Monitoring & Data Collection	Assist in routine data collection, maintain basic monitoring	Develop monitoring protocols, analyse water and species data
A5 - Pilot Operation & Testing	Support daily operation of cultivation systems	Evaluate pollutant removal efficiency, refine methodologies
A6 - Economic & Social Feasibility	Provide operational insights, engage local stakeholders	Conduct economic feasibility and social acceptance studies

A7 - Reporting & Knowledge Transfer	Share operational experience	Draft scientific reports, disseminate to stakeholders

4.4. ITALIAN JRU

4.4.1. Identification of Partners for JRU

The Italian IMTA business model focuses on integrating modular and scalable IMTA systems within existing aquaculture infrastructures. It combines fish farming (e.g., sea bass, sea bream) with extractive species like shellfish and macroalgae, promoting nutrient recycling and reducing environmental impact. Core activities include biomass valorisation into high-value products such as nutraceuticals, biostimulants, cosmetics, and animal feed additives, alongside providing environmental services like bioremediation. Revenue streams are diversified through product sales, ecosystem service credits, technology licensing, and consulting. The model requires initial investments in infrastructure and R&D, balanced by reduced operational costs and regulatory compliance. Strategic partnerships with aquaculture operators, biotech firms, research institutions, and local authorities ensure scalability and market integration.

This requires selecting a JRU partner with the following key characteristics:

- **Location & Accessibility:**
  - Operates an aquaculture facility on the Italian coast with access to marine infrastructure.
  - Offers reliable site access for researchers, stakeholders, and equipment
- **Existing Aquaculture Operations:**
  - Currently farm species like sea bass or sea bream.
  - Have the potential to integrate mussel and algae cultivation using lanterns and lines, without disrupting existing activities.
- **Monitoring & Technology Readiness:**
  - Have vessels and logistics capacity for at least 24 sea outings to collect samples (mussels, algae).
  - Supports additional sampling of water and sediments at 6+ stations
- **Human Resources Contribution:**
  - Employs qualified aquaculture technicians capable of operating and maintaining the IMTA pilot.
  - It is willing to allocate personnel to support installation, monitoring, sampling, and data collection.
- **Market Integration & Environmental Commitment**
  - Maintains commercial channels for seafood and aquaculture products.
  - Demonstrates a strong interest in sustainable and circular aquaculture approaches.
  - Located in environmentally suitable marine waters for IMTA (salinity, temperature, current).

- Committed to reducing emissions and improving sustainability.

4.4.2. Roles, Responsibilities, and Resource Contributions to the JRU

1. Contributions of Aquaculture Operator (Industry Partner)

The aquaculture operator will provide the physical platform and logistical support for the pilot and will carry out the following tasks:

- **Technical - Scientific Contributions:**
  - Install the IMTA pilot system (32 mussel lines and 32 algae lanterns).
  - Select and prepare mussels (3.0–3.5 cm) from either commercial stock or natural settlement on ropes.
  - Supply and position 64 lanterns for macroalgae cultivation.
  - Provide 60 fish specimens from farming cages.
  - Support monitoring activities with equipment and staff.
- **Operational Contributions:**
  - Provides access to aquaculture facilities for installation and research purposes.
  - Ensures compliance with relevant aquaculture regulations, supporting permitting processes.
  - Allocates skilled personnel (technicians, site managers) to assist in pilot operation.
  - Conduct at least 24 sea outings for sample collection (algae, mussels)
  - Conduct 3–4 outings for mussel monitoring and sediment/water sampling at ≥6 stations.
  - Ensure compliance with aquaculture regulations and permit access.
  - Provide logistics and boat for a stakeholder visit (approx. 10 people).
  - Deliver detailed operational cost and revenue data (investment, maintenance, personnel, permits, etc.) for cost-benefit analysis.

2. Contributions of Research Body (CNR)

The research body (CNR) will provide scientific, analytical, and technical expertise to design, optimize, and monitor the IMTA system.

- **Scientific Contributions:**
  - Leads environmental assessments and supports site selection based on IMTA suitability.
  - Develops a customized IMTA model, selecting appropriate species and system structure.
  - Conducts environmental impact studies, focusing on nutrient recycling, water quality, and biodiversity enhancement.
  - Evaluates economic feasibility through cost-benefit analysis.

- Publishes scientific results to ensure knowledge transfer and uptake by broader stakeholders.

- **Technical Contributions:**
  - Designs monitoring frameworks to track key indicators (nutrient flow, biomass growth, water quality improvements).
  - Provides expertise in species compatibility, system design, and infrastructure adaptation.
  - Processes and analyses operational and environmental data using modelling and analytical tools.
  - Offers technical guidance for retrofitting aquaculture infrastructure to accommodate IMTA modules.
- **Operational Contributions:**
  - Deploys marine biologists, aquaculture specialists, and data analysts to oversee pilot implementation.
  - Manages data collection protocols, ensuring quality and scientific rigor.

3. Resources Provided by Each Partner

Resource Type	**Aquaculture Operator (Industry Partner)**	**Research Body (Scientific Partner)**
Physical Infrastructure	Aquaculture facility, access to marine waters, logistics support (boats)	Research laboratories, analytical equipment, office facilities
Human Resources	Aquaculture technicians, site staff	Marine biologists, aquaculture experts, data analysts
Equipment	Longlines, bivalve baskets, anchoring systems, basic monitoring tools	Advanced sensors, data logging systems, modelling software
Data & Monitoring	Provides data on fish, shellfish, and site-specific conditions	Develops monitoring framework, processes and analyses collected data
Financial Contribution	Covers operational costs (feeding, maintenance, energy)	Supports research activities through national and EU project funding
Regulatory Support	Ensures aquaculture compliance and permits	Assists in securing research permits, engages with regulators

Training & Knowledge Transfer	Supports operational knowledge transfer	Conducts workshops on scientific methodologies and sustainable practices
Market Access	Provides data for cost/benefit analysis	Conducts economic modelling

4. Role of Each Partner in Key Pilot Activities

Activity	**Aquaculture Operator (Industry Partner)**	**Research Body (CNR)**
A1 - Site Selection & Environmental Assessment	Provides site access, historical aquaculture data	Conducts baseline environmental studies, analyses water/sediment conditions
A2 - IMTA Planning	Implements system integration within facility	Develops IMTA model, selects species and system design
A3 - Infrastructure Retrofitting	Installs longlines, baskets, anchoring systems, and monitoring devices	Provides guidance on system design and retrofitting
A4 - Monitoring & Data Collection	Collects operational data (growth rates, nutrient levels, water quality)	Develops monitoring framework, processes and analyses data
A5 - Pilot System Operation & Testing	Manages IMTA daily operations, harvests species	Evaluates system performance, refines models and methodologies
A6 - Economic Model Assessment	Shares data (e.g., estimated initial investment costs, operational and maintenance costs, personnel costs, potential health-related costs, and costs for permits/authorizations, as well as estimated revenues from product sales) for the development of a cost-benefit analysis of the IMTA facility.	Conducts cost-benefit analysis, evaluates scalability and market potential

A7 - Data Analysis & Reporting	Provides operational insights	Analyses results, prepares final report

4.5. ALBANIAN JRU

4.5.1. Identification of Partners for JRU

By aligning the DS with the IMTA business model, a key component of the JRU is the selection of an **aquaculture operator** capable of integrating IMTA modules into its existing infrastructure. This strategic approach will enable the 2B-BLUE pilot in Albania to accelerate the adoption of sustainable aquaculture solutions. The structured business model ensures that the economic, environmental, and technological dimensions of IMTA are effectively addressed, while the selected JRU partners will play a crucial role in driving innovation uptake and industry alignment. To achieve this, the ideal JRU partner should meet the following characteristics:

- **Location:**
  - Operates an aquaculture plant along the Albanian coast, with access to marine and logistical infrastructure.
  - Provides reliable access for project teams, researchers, and equipment.
- **Existing Aquaculture Operations:**
  - Actively cultivates species such as sea bass or sea bream with the capacity to integrate bivalves (mussels, oysters) and sea cucumbers.
  - Has the ability to scale operations without major disruptions.
- **Monitoring & Technology Readiness:**
  - Possesses basic monitoring instruments (e.g., water quality, nutrient levels) or is willing to install advanced sensors as part of the project.
  - Is open to adopting innovative technologies to improve efficiency.
- **Human Resources Contribution:**
  - Employs trained aquaculture operators and technicians capable of assisting in IMTA setup, maintenance, and monitoring.
  - It is willing to allocate personnel to support pilot implementation, data collection, and reporting.
- **Market & Commercial Networks:**
  - Has existing market connections for seafood and aquaculture products, ensuring a commercial pathway for IMTA-derived outputs (e.g., shellfish, sea cucumber).
  - Demonstrates interest in sustainable and circular economy-based aquaculture practices.
- **Environmental Commitment:**

- Located in a region with suitable water conditions (e.g., salinity, temperature, flow rates) for the growth of target species.
- Committed to reducing nutrient emissions and improving environmental performance, aligning with IMTA objectives.

4.5.2. Roles, Responsibilities, and Resource Contributions to the JRU

5. Contributions of Aquaculture Operator (Industry Partner)

The aquaculture operator provides the operational platform for the IMTA pilot, ensuring real-world testing, data collection, and market integration of IMTA-derived products.

- **Scientific Contributions:**
  - **Provides empirical data** on fish growth rates, water quality, and species interactions within IMTA.
  - **Supports research on biomass valorisation**, including testing potential market applications of **sea cucumbers and bivalves**.
  - **Assists in site-specific environmental studies**, offering long-term data on nutrient cycles and aquaculture performance.
- **Technical Contributions:**
  - **Implements IMTA system integration** within its existing aquaculture facility.
  - **Manages the day-to-day operation** of the pilot system, ensuring correct feeding schedules, water quality maintenance, and system functionality.
  - **Installs and maintains IMTA infrastructure**, including **baskets for bivalves, anchoring systems, and water quality sensors**.
  - **Facilitates training** for farm workers to ensure efficient monitoring and maintenance of the IMTA system.
- **Operational Contributions:**
  - **Provides access to aquaculture facilities**, allowing for system installation and research activities.
  - **Ensures compliance with aquaculture regulations**, supporting permitting and environmental approvals.
  - **Contributes workforce** (aquaculture technicians, site managers) to manage system operations.
  - **Supports market validation**, testing demand for IMTA-derived products and integrating findings into commercial distribution strategies.

6. Contributions of Research Body (Scientific Partner)

The research body provides scientific, analytical, and methodological expertise to design, test, and optimize the IMTA system.

- **Scientific Contributions:**
  - **Leads environmental assessment and site selection**, ensuring suitability for IMTA operations.
  - **Develops a customized IMTA model**, selecting species and designing an optimal system structure.
  - **Analyses environmental impact**, evaluating nutrient recycling, carbon sequestration, and biodiversity effects.
  - **Studies economic feasibility**, conducting market research and cost-benefit analysis.

- **Publishes scientific reports**, ensuring knowledge transfer and broader industry uptake.

- **Technical Contributions:**
  - **Develops monitoring frameworks** for tracking **nutrient flow, biomass growth, and water quality improvements**.
  - **Provides expertise in species selection**, ensuring compatibility between fish, bivalves, and sea cucumbers.
  - **Analyses collected data** using **data visualization and financial modelling tools**.
  - **Supports infrastructure adaptation**, advising on site retrofitting for IMTA integration.
- **Operational Contributions:**
  - **Deploys experts** (marine biologists, data analysts, and aquaculture specialists) to oversee pilot operations.
  - **Manages data collection and analysis**, ensuring consistency and scientific rigor.
  - **Organizes training sessions** for aquaculture operators on IMTA best practices.
  - **Facilitates stakeholder engagement**, including policymakers, investors, and market stakeholders.

7. Resources Provided by Each Partner

Resource Type	**Aquaculture Operator (Industry Partner)**	**Research Body (Scientific Partner)**
Physical Infrastructure	Aquaculture facility with access to marine waters, logistics for IMTA setup.	Research laboratories, analytical tools for environmental assessment.
Human Resources	Aquaculture technicians, site managers for daily operations.	Marine biologists, data analysts, aquaculture specialists for research.
Equipment	Baskets for bivalves, ropes, anchoring systems, basic monitoring instruments.	Water quality sensors, data logging systems, analytical software.
Data & Monitoring	Provides real-time data on fish and shellfish growth, site-specific environmental conditions.	Develops monitoring framework, processes and interprets collected data.
Financial Contribution	Covers operational costs (energy, feeding, maintenance).	Supports research activities through national/EU project funding.
Regulatory Support	Ensures compliance with aquaculture permits and industry regulations.	Assists in securing research permits, engages with policymakers.

Training & Knowledge Transfer	Provides training on IMTA system operation and maintenance.	Conducts workshops on scientific methodologies and sustainable practices.
Market Access	Tests market feasibility for IMTA products, integrates them into commercial seafood supply.	Analyses economic viability, develops financial models.

8. Role of Each Partner in Key Pilot Activities

Activity	**Aquaculture Operator**	**Research Body**
A1 - Site Selection & Environmental Assessment	Provides site access, historical data	Conducts baseline studies, analyses water/sediment conditions
A2 - IMTA Planning	Implements system integration strategy	Develops IMTA model, selects species
A3 - Infrastructure Retrofitting	Installs baskets, anchoring systems	Provides guidance on system design
A4 - Monitoring & Data Collection	Collects on-site data, operates sensors	Develops monitoring framework, analyses data
A5 - Pilot System Operation & Testing	Manages IMTA operations, harvests species	Evaluates performance indicators, refines models
A6 - Economic Model Assessment	Provides cost and sales data, explores new markets	Conducts cost-benefit analysis, evaluates scalability
A7 - Data Analysis & Reporting	Shares operational insights	Analyses results, drafts final report

4.6. GREEK JRU

4.6.1. Identification of Partners for JRU

The Greek Pilot adopts a restorative aquaculture model designed to Implement a small demonstration pilot in a selected production site, as a tool for remediating enriched sediments which will allow to identify species potential for organic waste recycling, open pathways for new products

in biotechnologies and add value in the mussel culture sector and in general Low Trophic Aquaculture (LTA). This integrated approach combines shellfish farming (e.g., mussels) with native detritivores benthic species such as *Holothuria tubulosa*, *H. mammata*, and *H. poli*, commonly known as sea cucumbers, as bio-remediation candidates, which contribute to reducing seabed organic load, increasing sediment bioturbation and oxygenation, and altering sediment biota and carbonate dynamics. In addition to its ecological benefits, the project investigates the commercial potential of sea cucumber cultivation across global markets—including food, nutraceuticals, pharmaceuticals, and cosmetics. The initiative also explores the development of precision monitoring tools, small-scale bioreactors for microalgae cultivation, and biorefinery applications for extracting high-value bioactive compounds. Collectively, these efforts aim to diversify aquaculture production and strengthen environmental and economic resilience, aligned with the principles of a circular economy. This Nature-Based Approach (NBA) can provide a protocol for monitoring and community engagement, sustainable resources use, preventing Holothuria species overexploitation. Finally set the basis for a larger grant proposal to implement this NBA across similar sites in the country, creating a scalable model for low-cost habitat restoration towards sustainable aquaculture.

To implement these innovations effectively, the ideal JRU partner should meet the following criteria:

- **Location & Accessibility:**
  - Operates an aquaculture plant along the Greek coast, ensuring easy access to marine environment and logistical infrastructure.
  - Provides reliable access for project teams, researchers, and equipment delivery.
- **Existing Aquaculture Operations:**
  - Actively cultivates species such as mussels, with readiness to integrate sea cucumber co-culture and microalgae systems.
  - Has the ability to scale operations and incorporate IMTA modules without major disruptions to existing activities.
- **Monitoring & Technology Readiness:**
  - Equipped with basic water and sediment quality monitoring tools or open to installing precision sensors.
  - It is willing to engage in piloting new monitoring technologies, including bioreactors and data-driven decision tools.
- **Human Resources Contribution:**
  - Employs trained mussel farmers, fishers experienced in Echinodermata, professional divers, data and site managers capable of supporting pilot implementation and ongoing monitoring.
  - It is willing to allocate staff for system setup, data collection, reporting, and stakeholder engagement activities.
- **Market & Commercial Networks:**
  - Established market connections for aquaculture products and services, ensuring a commercial pathway for IMTA-derived outputs (e.g., Sea cucumber).
  - Demonstrates interest in sustainable, circular economy-based aquaculture practices.
- **Environmental Commitment:**
  - Located in a region characterized by physical conditions—such as appropriate salinity, temperature, and flow rates—conducive to the cultivation of target species
  - Committed to reducing environmental impacts and adopting nature-based aquaculture innovations.

4.6.1. Roles, Responsibilities, and Resource Contributions to the JRU

1. Contributions of Aquaculture Operator (Industry Partner)

The aquaculture operator will function as the implementation platform for the Greek pilot trials, enabling system validation under real-world operational conditions, comprehensive data acquisition, and market assessment of derived products and value-added services.

- **Scientific Contributions:**
  - Provides data on mussel growth and health, along with water samples for comprehensive water quality assessment.
  - Facilitates in situ sampling to monitor sea cucumber growth, assess sediment quality, and evaluate waste recycling processes.
- **Technical Contributions:**
  - Facilitates the integration of new cultivation systems into existing mussel farm infrastructure.
  - Oversees daily operation of the pilot system, including maintenance tasks.
  - Offers dedicated spaces for pilot installations, equipment storage, and meetings.
- **Operational Contributions:**
  - Grants access to farming infrastructure for pilot installation and research.
  - Allocates technical personnel to support pilot system operations.
  - Ensures compliance with aquaculture regulations and supports permitting processes.

2. Contributions of Research Body (HCMR)

The research body (HCMR) will contribute scientific, analytical, and technical expertise to support the design, optimization, and continuous monitoring of the pilot system.

- **Scientific Contributions:**
  - Leads baseline assessments of water column and sediment quality.
  - Develops a customized regenerative aquaculture model, selecting appropriate species, and system structure.
  - Assesses the bioremediation potential, biomass yield capacity, and economic feasibility of the system.
  - Evaluates the safety and suitability of the biomass for human consumption.
  - Evaluates economic feasibility through market research, cost-benefit analysis
  - Publishes scientific results to ensure knowledge transfer and uptake by broader stakeholders.
- **Technical Contributions:**
  - Designs monitoring frameworks to track key indicators (biomass growth, sediment and water quality improvements).
  - Provides expertise in species compatibility, system design, and infrastructure adaptation.
  - Processes and analyses operational and environmental data
  - Offers technical guidance for retrofitting aquaculture infrastructure to accommodate Low-Trophic-Aquaculture (LTA) modules.
- **Operational Contributions:**
  - Deploys researchers, technical scientists, data analysts, and aquaculture experts to oversee pilot implementation.

- Manages data collection and analysis using scientific methodologies.
- Organizes training activities and knowledge-sharing events with stakeholders.
- Facilitates stakeholder engagement, involving policymakers, investors, and market actors.

3. Contributions of Research Body (International Hellenic University-IHU)

The research body (IHU) will provide technical expertise to guide the design, facilitate the implementation and enhance the optimization.

- **Scientific Contributions:**
  - Provides comprehensive long-term data on environmental and biological conditions.
  - Supports ecosystem health assessments.
  - Publishes scientific results to ensure knowledge transfer and uptake by broader stakeholders.
- **Technical Contributions:**
  - Guides species compatibility, system structure, and studies for hatchery development.
  - Implements tools for productivity tracking.
- **Operational Contributions:**
  - Deploys researchers, and technical scientists to oversee pilot implementation.
  - Conducts analysis of the regulatory framework and offers recommendations to strengthen aquaculture standards and streamline permitting procedures.
  - Supports community engagement, mainly local actors
  - Supports data analysis using scientific methodologies.

4. Resources Provided by Each Partner

Resource Type	**Aquaculture Operator (Industry Partner)**	**Research Body (HCMR)**	**Research Body (IHU)**
Physical Infrastructure	Mussel farming facility, marine access, on-site logistics	Laboratories, analytical tools, research facilities	Laboratories, research facilities
Human Resources	Farm operators, site manager	Researchers, technical scientists, aquaculture experts, data analysts	Researchers, technical scientists
Equipment	In situ material needed, nets, anchors etc.	Sensors, cages, bioreactors, software, lab instruments and consumables, expert divers	In-situ material needed, and consumables. Use of a boat, support for work on board.

Data & Monitoring	Provides site-specific data on mussels and environmental quality	Designs frameworks, processes and analyses monitoring data	Provides site-specific data on mussels and environmental quality
Financial Contribution	Covers pilot operational costs and logistics (maintenance, energy)	Supports research activities through national and EU project funding	Supports research activities through national and EU project funding
Regulatory Support	Ensures compliance with farming regulations and permits	Supports research permitting, liaises with authorities	Analyses regulations and recommends improvements for standards and permitting
Training & Knowledge Transfer	Supports hands-on training in new system operations	Conducts training workshops on scientific methodologies and sustainable practices	Supports training workshops on scientific methodologies and sustainable practices
Market Access	Supports market feasibility of new systems	Analyses commercial potential and economic models	Supports the analysis of commercial potential and economic models

5. Role of Each Partner in Key Pilot Activities

Activity	**Aquaculture Operator**	**Research Body (HCMR)**	**Research Body (IHU)**
A1 - Site Selection & Environmental Assessment	Provides site access, baseline aquaculture data	Conducts environmental surveys and habitat suitability analysis	Provides historical environmental and biological data
A2 - Planning	Implements system integration strategy within facility	Develops the co-cultivation model, selects species, and system structure	Guides the selection of species and system structure
A3 - Infrastructure Retrofitting	Installs rearing systems	Provides technical design and support for system adaptation	Provides guidance on system retrofitting, supports activities on board

A4 - Monitoring & Data Collection	Supports field measurements and on-site observations	Develops monitoring protocols, analyses and interprets data	Supports the analysis and data interpretation, activities on board
A5 - Pilot System Operation & Testing	Manages day-to-day farm operations, co-culture maintenance	Evaluates system performance, adjusts methodologies	Supports and guides the development of adjustment methodologies, activities on board
A6 - Economic Model Assessment	Shares operational costs	Conducts feasibility studies and market potential assessment	Provide market insights
A7 - Data Analysis & Reporting	Provides operational insights	Leads reporting, prepares deliverables, disseminates results	Facilitate the provision of feedback to stakeholders

4.7. Expression of interest

The participation of third parties within JRUs offers significant benefits, including privileged access to strategic know-how to enhance their activities and increased national and international visibility through the project's dissemination and communication efforts. Therefore, the selection of these third parties must adhere to key principles ensuring fair, transparent, and equitable participation:

- **Transparency:** Clearly document and publicly communicate the entire selection process, including guidelines, eligibility criteria, and evaluation procedures, to ensure equal information access for all potential applicants**.**
- **Equal Treatment:** Assess all applications consistently using objective criteria, supported by standardized evaluation grids and structured review processes, preventing preferential treatment**.**
- **Proportionality:** Align selection requirements with the project's scale and objectives to avoid unnecessary administrative burdens, ensuring criteria reflect the anticipated project impact.
- **Non-discrimination:** Exclude no applicant based on irrelevant characteristics such as nationality, gender, or disability.
- **Objectivity and Impartiality:** Evaluate applications strictly on merit, free from personal or political influence.
- **Accountability:** Maintain thorough documentation of all decisions, applications, evaluations, and outcomes, ensuring availability of mechanisms for appeals or feedback to uphold transparency and compliance with EU regulations**.**

Within the 2B-BLUE context, applying these principles begins with launching a transnational call for interest at each DS, aiming to identify third-party partners interested in hosting and participating in pilot activities.

Though the selection procedures are exempt from the typical public procurement rules under EU Directive 2014/24/EU and corresponding national laws, due to the collaborative nature of these agreements, they must nevertheless align with the general principles of EU law, particularly transparency, impartiality, proportionality, and publicity.

Specifically, to comply with the principles of impartiality, transparency, and free competition, any exclusive scientific collaboration with private companies must result from a competitive selection process, ensuring equal treatment and genuine contestability among interested economic operators. This requires preparing a public notice clearly detailing the selection process, to be

widely publicized through appropriate digital and traditional communication channels, including at least the following essential contents: all the information relating to the research project in question, in order to allow the identification of the subject of the research, as well as the related implementation modalities and objectives;

a) the expected duration of the contractual relationship;
b) the obligations to be fulfilled by the private partner and, in particular, of the activities to be performed by the latter;
c) the requisites of morality of the private participant (i.e., in order to prevent the participation of the persons/legal entities that have been committed certain criminal offences or have not fulfilled certain contribution or tax obligations or, again, who have been subjected to jurisdictional or administrative measures of a disqualifying nature from exercising entrepreneurial or professional activities;
d) the technical and professional capacity requirements to be possessed by the private operator, with particular regard to experience in the target value chain, its "credibility", as well as the carrying out, preferably, of previous collaborative research activities
e) the economic capacity requirements of the private participant;
f) the minimum characteristics that the demonstration site must possess, in terms of accessibility, production capacity and related equipment and instruments
g) the predetermination of appropriate criteria for the selection of the contractor, aimed at favouring the contractor with the best technical and experiential profile, as well as having the most suitable site for carrying out the research, to which certain scores must be correlated, to be attributed on the basis of the greater or lesser level of technical, professional and economic capacity of the tenderer.

An example of an Expression of Interest is provided in Annex 6.1 of this document. Given the diverse nature of the activities proposed at each site and the different forms of collaboration, the EoI model must be adapted by each Hub to best address its specific needs.

The Terms of Reference (ToRs) of the Expression of Interest (EoI) should clearly define the objectives and scope of the collaboration, as well as specify the activities involved in the research collaboration, detailing the roles and responsibilities of each partner and their resource contributions to the Joint Research Unit (JRU), as described in paragraphs 4.2 to 4.6 for each demonstration site (DS).

Furthermore, the ToRs of the EoI must establish clear participation criteria, including:

- Moral requirements;
- Technical suitability requirements relevant to BBT solutions, as detailed in paragraphs 4.2 to 4.6 for each DS. These requirements should specify the minimum necessary characteristics of the demonstration sites, including accessibility, production capacity, and availability of related equipment and instruments;
- Economic capacity requirements for the private participant, particularly the capability to provide the minimum resources required for the effective implementation of the project, as described in paragraphs 4.2 to 4.6 for each DS;
- Commitment to knowledge-sharing to facilitate technology transfer.

To provide full transparency and clarity to all stakeholders involved, the process of selecting and engaging third-party partners through the EoI follows a clearly structured sequence of steps:

1. **Publication of the EoI**: A public notice is issued through partners' official communication channels, mainly its institutional website, detailing eligibility criteria, requirements, selection procedures, and collaboration terms.

2. **Appointment of an Evaluation Committee**: A selection panel composed of experts from the consortium is established to ensure impartiality, transparency, and adherence to project objectives.

3. **Evaluation of Applications**: All submitted expressions of interest are assessed based on predefined technical, professional, environmental, and economic criteria, as detailed in the Terms of Reference (ToRs).

4. **Drafting and Publication of the Ranking List**: Based on the evaluation outcomes, a provisional ranking of applicants is prepared and made publicly available, subject to any appeal or clarification procedures.

5. **Communication with Selected Candidates**: Top-ranked candidates are officially notified and invited to engage in further discussions.

6. **Proposal and Negotiation of Collaborative Research Agreements (CRAs)**: The selected applicants are provided with a draft CRA. Upon mutual agreement on responsibilities, resources, and implementation timelines, the CRAs are finalized and signed, formalizing the Joint Research Units (JRUs).

This process ensures an open, fair, and merit-based approach to identifying the most suitable partners for co-developing and testing innovative Blue Biotechnology solutions, while also enabling Demonstration Sites (DSs) to support business model development, attract investment in sustainable BBt, and bridge the gap between research and industry to foster the commercialization of research-driven innovations within the 2B-BLUE framework.

4.8. Collaborative Research Agreements (CRA)

In the framework of the 2B-BLUE project, the Collaborative Research Agreement (CRA) serves as a key legal and operational instrument to formalize cooperation within the JRUs and to structure partnerships at each DS. These agreements are essential for ensuring the smooth implementation, governance, and monitoring of pilot activities in the BBt domain.

Following the selection of third-party partners through a transparent EoI process, the CRA outlines the terms of cooperation between the parties engaged in the JRUs, thereby setting the legal foundation for the effective operation of the Demonstration Sites.

The CRA promotes mutual trust and accountability by defining the following core elements:

- **Objectives and Scope -** The CRA sets out the shared objectives of the JRU and specifies the scope of the research, experimentation, and validation activities to be carried out at the DS. *Example: A JRU focused on Integrated Multi-Trophic Aquaculture (IMTA) may define its objective as optimizing co-cultivation techniques adapted to Mediterranean conditions and the generation of data and protocols for wider use in the aquaculture sector.*

- **Partner Responsibilities -** Each partner's contributions are clearly defined and cover technical, scientific, and financial inputs, including infrastructure, equipment, human resources, and data. *Example: A private shellfish farmer may contribute pilot infrastructure and daily monitoring data, while the research partner provides scientific supervision, analytics, and dissemination of the outcomes.*

- **Governance and Decision-Making -** The CRA establishes the governance structure of the JRU, including coordination mechanisms, decision-making rules, reporting obligations, and dispute resolution procedures. *Example: A coordination committee composed of one representative per partner may be responsible for monthly technical reviews and protocol adjustments.*

- **Intellectual Property Rights (IPR) -** The CRA specifies ownership of pre-existing knowledge (background) and joint ownership of new knowledge (results), including provisions for managing confidential information. Crucially, in accordance with 2B-BLUE objectives, it also foresees the strategic transfer of joint results to third parties through controlled dissemination and licensing mechanisms, to support the uptake of innovations across the BBt ecosystem. *Example: A co-developed bioprocess for valorising fishery by-products is jointly owned by the SME and the research institute. It is made available through an open-access technical brief on the BBt portal and, upon request, can be licensed for replication by other operators within the BBHUB network under non-exclusive, royalty-free conditions for non-commercial use.*

- **Resource Allocation and Funding Mechanisms -** The agreement defines how costs are distributed among partners, distinguishing between in-kind contributions and direct financial commitments. Where eligible, these direct financial contributions may be covered by 2B-BLUE funds under the broader Interreg Euro-MED funding scheme. *Example: Laboratory consumables or monitoring equipment purchased for the pilot phase may be reimbursed through project funds, while personnel time is contributed in-kind by the partners.*

- **Legal and Ethical Compliance -** The CRA ensures that all activities comply with relevant EU and national laws, including those related to environmental protection, data privacy, and ethical standards. It also addresses permit obligations and stakeholder engagement.

Within 2B-BLUE, the CRA is a **cornerstone of public-private collaboration**, creating a secure and structured space for co-developing and validating innovative BBt solutions. The model is aligned with the **EU Framework for State aid for research and development and innovation (2014/C 198/01)**, which defines "effective collaboration" as involving jointly defined objectives, shared risk and results, and mutual contributions. It is also consistent with **Article 16** of the **Horizon Europe Annotated Model Grant Agreement (AGA)** and related commentary (e.g., p. 144), which provides guidance on ownership, joint results, and affiliated entities within JRUs.

Furthermore, by adopting a standardized but adaptable structure, the CRA:

- Supports the **replication and scalability** of Demonstration Site models across the Mediterranean.

- Enhances **transparency** in data sharing, authorship, and benefit-sharing mechanisms.

- Mitigates **legal and operational risks** associated with sensitive data and proprietary information.

- Facilitates **technology transfer**, ensuring that outputs are usable beyond the JRU.

It is particularly important to note that, in order to scale up BBt applications tested at the Demonstration Sites to real industrial environments, the collection of sensitive data and proprietary information is essential to align the pilot activities with specific business models and industry needs. Therefore, protecting the background knowledge contributed by each party, while generating new jointly owned results suitable for external outreach and transferability, is critical. This must be planned from the outset and embedded in the structure of both the JRU and the DS to which the CRA applies.

An example of a Collaborative Research Agreement is provided in Annex 6.2 of this document. Given the diverse nature of the activities across the different Demonstration Sites and the variability in

forms of collaboration, each Hub is required to adapt the CRA model to best address its specific operational, legal, and technical needs.

5. Monitoring and evaluation plan

5.1. Pilot's monitoring and evaluation plan

The monitoring and evaluation plan for the pilot actions in the 2B-BLUE project is a cornerstone of the project's strategy to ensure that the innovative blue biotechnology solutions tested are not only scientifically valid, but also environmentally sustainable, economically viable, and socially acceptable. The primary objective of the monitoring and evaluation plan is to provide a structured and **harmonized framework to assess the performance and impacts of each pilot**. To this end, the plan defines a set of expected **Impacts and KPIs covering technical, environmental, socio-economic, and regulatory dimensions**. These were co-developed by project partners and stakeholders during the T-Lab co-design process.

A distinctive feature of the plan is the involvement of JRUs, which are responsible for implementing monitoring activities. JRUs will oversee continuous data collection, evaluate the performance of the tested BBt solutions, and ensure compliance with technical protocols and sustainability criteria, as outlined in the pilot-specific monitoring plans.

The data collected will be compiled into a **digital report,** which will be shared with stakeholders and reviewed within the T-Labs. Through regular workshops and engagement activities, stakeholders representing the five-helix model will critically assess the technical, environmental, and socio-economic results of the pilots. These participatory sessions will serve to identify bottlenecks, co-create solutions, and refine strategies for replication and scaling-up.

The **final evaluation by the T-Labs** will aim to determine whether the new technologies or practices can be transferred and further tested under local conditions. To support this, a dedicated workshop will be organized to validate and assess the results achieved. These results will be integrated into the T-Lab programs (Activity A3.1) to support their upscaling and uptake and further promoted through showcase events (Activity A3.4). Finally, pilot actions will be incorporated as best practices into the project's dynamic, sector-specific database (Activity A1.2).

5.1.1. Slovenian monitoring and evaluation plan

1. Impacts and KPIs

Impact Area	Description	KPIs
Technical Impact	Testing large-scale microalgae production for cosmetics/nutraceuticals, valorisation of fishery by-products and sponge/sea cucumber aquaculture feasibility.	• Microalgal biomass production (g/batch), • Bioactive compound yield (%), • Sponge/sea cucumber growth/survival rates (%).
Economic Impact	Evaluate market potential and conduct economic feasibility evaluation	• Number of results that have potential to be developed into new products
Environmental Impact	Waste reduction.	• % of fishery by-products valorised.

Operational Scalability Impact	Evaluation of system operability, production scalability, and maintenance needs.	• Number of technical adjustments, • number of protocols written, • TRL improved: by 1 (not higher than 5)

2. Partners Involved

- Scientific Lead & Environmental Monitoring: National Institute of Biology (NIB) – Coordinator
- Technical Operations & Production: Private partners (microalgae producers, fishery by-product processors, aquaculture SMEs) via CRA
- Advanced Analysis: Academic partners, marine research institutions

3. Monitoring Tools & Technologies

- Environmental Monitoring: Water quality sensors (salinity, nutrients, oxygen levels)
- Bioreactor Monitoring: systems tracking light, growth rates of microalgae
- Biochemical Analysis: Chromatography (HPLC, GC-MS) and spectroscopy techniques
- Operational Logs: Monitoring system stability and production performance
- Economic Assessment Tools: Cost tracking, market assessment for potential new products

4. Planned Actions to Implement KPIs

Action	Responsible Partner(s)	Tools/Methods	KPIs Addressed
Baseline Environmental Assessment	NIB + Private Partners	Analysis	Baseline water quality
Microalgae Cultivation Installation & Operation	Private Sector + NIB oversight	Bioreactors, monitoring systems	Microalgal biomass production, bioactive yield, scalability
Fishery By-Product Collection and Processing Setup	Private Industry Partner + NIB		% of by-products valorised
Sponge/sea cucumber Aquaculture Installation & Monitoring	NIB + Aquaculture Partner + Academic Partners	Growth monitoring	Sponge/sea cucumber survival and growth rates
Biochemical Analysis of Biomass and bioactive compound extracts	NIB + Academic Partners	HPLC, GC-MS, FTIR analysis	No. of protocols for extracted bioactive compounds
Economic feasibility assessment	Private Partners + NIB	Market insight potential analysis	Evaluate market potential
Environmental Monitoring & Data Collection	NIB + Academic Partners	Sampling protocols, Sample analysis	Water quality, waste valorisation
KPI Data Consolidation & Reporting	NIB + All JRU Partners	Digital Reports, periodic reviews by T-Labs	All KPIs consolidated
Final Pilot Evaluation & Reporting	NIB + All JRU Partners	Consolidated datasets, final evaluation report, Final validation workshop (T-Lab),	Comprehensive feasibility, scalability assessment

		Pilot Action report (D2.3.1)	

5. Key Monitoring Timeline

Period	Key Activities
Months 1-5	Baseline environmental assessment, system installation (microalgae, sponge/sea cucumber aquaculture, fishery valorisation)
Months 4-12	System operation, environmental monitoring, pilot development trials
Months 5-12	Economic feasibility assessment, continuous data collection
Months 9-12	Final KPI evaluation, reporting on pilot scalability and feasibility

5.1.2. Spanish monitoring and evaluation plan

1. Impacts and KPIs

Impact Area	Description	Key Performance Indicators (KPIs)
Technical Impact	Testing macroalgae-based bioremediation systems in port and aquaculture environments; evaluating water quality improvement and pollutant removal.	• Nutrient removal efficiency (%), • Algae biomass production (tons/year), • CO_2 sequestration efficiency (tons/year).
Economic Impact	Assessment of market viability for algae-derived products, operational costs of bioremediation system, and business opportunities.	• Revenue from algae products (€), • Operational cost reduction (%), • Number of business partnerships established.
Environmental Impact	Measurement of pollutant reduction, CO_2 emissions mitigation, and overall water quality enhancement.	• Reduction of pollutants (kg/year), • Water quality improvement indicators, • CO_2 emissions offset (tons/year).
Operational Scalability Impact	Evaluation of system stability, scalability, and maintenance requirements in industrial settings.	• Downtime periods, • Number of technical adjustments, • TRL achieved (target: min TRL 7).

2. Partners Involved

- Scientific Lead & Environmental Monitoring: University of Murcia (UMU) – Coordinator
- Technical Operations & Production: Private partners in algae cultivation, wastewater treatment, and CO_2 monitoring (via CRA agreements)
- Advanced Analysis: Academic research partners, marine environmental institutes

3. Monitoring Tools & Technologies

- Environmental Monitoring: Water quality sensors (nutrients, heavy metals, oxygen levels, turbidity)
- Bioremediation System Monitoring: IoT systems for real-time algae growth, pollutant absorption, and CO_2 sequestration
- Biochemical Analysis: Lab techniques to assess biomass composition and pollutant removal efficiency
- Economic Assessment Tools: Cost analysis, market viability assessment

4. Planned Actions to Implement KPIs

Action	Responsible Partner(s)	Tools/Methods	KPIs Addressed
Baseline Environmental Assessment	UMU + Private Port/Aquaculture Partners	Water quality sensors, baseline pollutant load assessment	Pollutant baseline, water quality indicators
Installation & Operation of Bioremediation System	Private Sector + UMU oversight	Algae cultivation systems, IoT monitoring	Nutrient removal efficiency, biomass production, scalability
CO_2 Monitoring and Tokenization Setup	Private CO_2 Monitoring Partners + UMU	Digital CO_2 monitoring platforms	CO_2 emissions monitored and tokenized
Biochemical Analysis of Biomass & Pollutant Removal	UMU + Academic Partners	Lab analyses of nutrient and pollutant absorption	Pollutant removal efficiency, biomass composition
Economic Viability & Market Assessment	UMU + Private Partners	Market assessment, financial analysis	Revenue potential, operational cost reduction
Operational Scalability Review	UMU + Private Sector	System logs, maintenance records	System scalability, downtime, TRL progression
KPI Data Consolidation & Reporting	UMU + All JRU Partners	Digital Reports, periodic reviews by T-Labs	All KPIs aggregated for analysis
Final Pilot Evaluation & Reporting	UMU + All JRU Partners	Consolidated datasets, final evaluation report, Final validation workshop (T-Lab), Pilot Action report (D2.3.1)	Comprehensive assessment of technical feasibility, scalability

5. Key Monitoring Timeline

Period	Key Activities
Months 1-3	Baseline environmental assessment, bioremediation system installation, operational readiness
Months 3-12	System operation, pollutant monitoring, CO_2 tracking, biomass harvesting, continuous monitoring
Months 7-12	Biomass valorisation trials, economic viability assessment
Months 13-14	Final KPI evaluation, final reporting on pilot scalability and feasibility

5.1.3. French monitoring and evaluation plan

5.1.4. Italian monitoring and evaluation plan (1st Pilot)

1. Impacts and KPIs

Impact Area	Description	KPIs
Technical Impact	Evaluate the technical feasibility of IMTA in an industrial setting: nutrient recycling, multi-species integration, biomass scalability	• Nutrient recycling efficiency (%), • Biomass production (tons/year), • IMTA module implementation (#),
Economic Impact	Assess cost-efficiency and product viability of the IMTA model.	• Operational cost reduction (%), • Number of new products prototyped. • Preliminary revenue potential (€)
Environmental Impact	Quantify reduction of aquaculture waste and nutrient pollution in the pilot site.	• Reduction in nitrogen/phosphorus (kg/year), • Water quality improvement (%), CO_2 sequestration (tons/year), • Biodiversity increase (%)
Operational Scalability Impact	Assess system stability, maintenance requirements, and readiness for scaling.	• Number of technical adjustments required, • Downtime periods, • TRL achieved (target: min TRL 7).

2. Partners Involved

- Scientific Lead & Environmental Monitoring: CNR-IRBIM – Coordinator
- Technical Operations & Production: Private aquaculture operators (via CRA),
- Advanced Analysis: Academic and Research Institutions

3. Monitoring Tools & Technologies

- Environmental Monitoring: Water quality sensors (nutrient concentration, oxygen levels, turbidity)
- IMTA System Monitoring: Regular biometric and growth performance monitoring of fish, bivalve, macroalgae growth
- Biomass & Biochemical Analysis: Laboratory analysis to track yields and nutrient absorption
- Operational Logs: Recording system stability, adjustments, maintenance downtimes
- Economic Assessment Tools: Financial tracking of operational costs

4. Planned Actions to Implement KPIs

Action	Responsible Partner(s)	Tools/Methods	KPIs Addressed
Baseline Environmental Assessment	CNR + Private Aquaculture Partners	Water quality sensors, habitat survey	Baseline nutrient levels, water quality indicators
IMTA System Installation & Operation	Private Sector + CNR oversight	Fish cages, bivalve baskets, macroalgae lanterns	IMTA operability, nutrient recycling efficiency, biomass production

Biomass Processing & Product Development	Private Sector Partners + CNR	Processing units, biochemical analysis labs	New product prototypes, preliminary revenue potential
Economic Viability & Market Assessment	CNR + Private Partners	Cost analysis	Operational cost reduction, marketability of biomass
Environmental Monitoring & Data Collection	CNR + Academic Partners	Sensors, periodic sampling protocols	Reduction in nutrient pollution, water quality improvement
System Scalability & Technical Review	CNR + Private Sector	Operational logs, system performance reports	Maintenance adjustments, TRL assessment, downtime periods
KPI Data Consolidation & Reporting	CNR + All JRU Partners	Digital Reports, periodic reviews by T-Labs	Aggregation of technical, environmental, economic KPIs
Final Pilot Evaluation & Reporting	CNR + All JRU Partners	Consolidated datasets, final evaluation report, Final validation workshop (T-Lab), Pilot Action report (D2.3.1)	Comprehensive assessment of technical feasibility, scalability

5. Key Monitoring Timeline

Period	**Key Activities**
Months 1-4	Baseline environmental assessment, IMTA system installation, pilot operational readiness
Months 4-12	Continuous system operation, environmental monitoring, operational adjustments
Months 6-12	Biomass processing trials, economic viability assessment, ongoing data collection
Months 12-13	Final technical and environmental KPI evaluation, final reporting on pilot scalability and feasibility

5.1.5. Albanian monitoring and evaluation plan

1. Impacts and KPIs

Impact Area	**Description**	**Key Performance Indicators (KPIs)**
Technical Impact	Testing the IMTA system integrating fish, shellfish, and sea cucumbers in Albanian conditions to evaluate nutrient recycling and biomass production.	• Additional biomass production (kg/year), • Reduction in organic load (%), • IMTA module operability (#).
Economic Impact	Assessment of cost-efficiency, revenue potential,	• Revenue from shellfish/sea cucumbers (€),

	and new partnerships from IMTA implementation.	• Operational cost reduction (%), • Number of new partnerships.
Environmental Impact	Quantification of water quality improvement and waste reduction through IMTA activities.	• Reduction in nitrogen/phosphorus (kg/year), • Improvement in key water quality indicators.
Operational Scalability Impact	Assessment of system stability, maintenance requirements, and scalability readiness.	• Downtime periods, • Number of technical adjustments • TRL achieved (target: min TRL 7).

2. Partners Involved

- Scientific Lead & Environmental Monitoring: ACEPSD – Coordinator
- Technical Operations & Production: Private aquaculture operators (via CRA agreements)
- Advanced Analysis: Research institutions, aquaculture and marine environmental experts

3. Monitoring Tools & Technologies

- Environmental Monitoring: Sensors for nutrient concentration, oxygen levels, sediment parameters
- IMTA Systems Monitoring: Regular sampling and biometric monitoring of fish, shellfish, and sea cucumbers
- Socio-Economic Monitoring: Financial tracking, stakeholder surveys, partnership tracking

4. Planned Actions to Implement KPIs

Action	Responsible Partner(s)	Tools/Methods	KPIs Addressed
Baseline Environmental Assessment	ACEPSD + Private Aquaculture Partners	Water quality and sediment monitoring, habitat survey protocols	Baseline nutrient levels, water quality indicators
IMTA System Installation & Operation	Private Sector + ACEPSD oversight	Fish cages, bivalve baskets, sea cucumber farming systems	IMTA operability, biomass production, nutrient recycling efficiency
Biomass Valorisation & Market Assessment	ACEPSD + Private Partners	Processing and marketing systems, business model templates	Revenue potential, new partnerships
Environmental Monitoring & Data Collection	ACEPSD + Research Institutions	Sensors, periodic sampling protocols	Reduction in nutrient load, water quality improvement
System Scalability & Technical Review	ACEPSD + Private Sector	Operational logs, system performance reports	Maintenance adjustments, TRL assessment, downtime periods
KPI Data Consolidation & Reporting	ACEPSD + All JRU Partners	Digital Reports, periodic reviews by T-Labs	Aggregation of technical, environmental, economic KPIs
Final Pilot Evaluation & Reporting	ACEPSD + All JRU Partners	Consolidated datasets, final evaluation report, Final validation	Comprehensive assessment of technical feasibility, scalability

		workshop (T-Lab), Pilot Action report (D2.3.1)	

5. Key Monitoring Timeline

Period	Key Activities
Months 1-3	Baseline environmental assessment, IMTA system installation, operational readiness
Months 3-10	Continuous system operation, ongoing monitoring and data collection
Months 6-12	Biomass valorisation trials, economic viability assessment,
Months 10-12	Final KPI evaluation, final reporting on pilot scalability and feasibility

5.1.6. Greek monitoring and evaluation plan

1. Impacts and KPIs

Impact Area	Description	KPIs
Technical Impact	Assess the technical feasibility of co-cultivating mussels and holothuria focusing on organic waste recycling, multi-species system integration, and scalable biomass production.	• NBS structures deployed (#). • Growth and survival rate of cultivated organisms (%). • Biomass yield (kg/m²/month). • Tissue Concentration of Heavy Metals in Holothuria (mg/kg dry weight).
Economic Impact	Evaluate commercial prospects and local business sustainability.	• Cost per kg of biomass (€ /kg). • Revenue potential for Holothuria (€ /kg). • Circular Economy Metrics– % of organic waste reused. • Community Acceptance Index – Based on surveys, stakeholder engagement sessions
Environmental Impact	Evaluate enhancements in water and sediment quality indicators, as well as improvements in biodiversity and overall ecosystem health.	• % of organic waste recycled. • Sediment oxygenation
Operational Scalability Impact	Assess production capacity expansion, infrastructure scalability, and cost efficiency metrics.	• System installation, operation, maintenance effort (hours/month). • % of Modular or Expandable System Components. • Scalable biomass output (kg/month or year).

		• Unit Cost Reduction with Scale-Comparison of cost per unit at pilot vs. industrial level (€ / kg).

2. Partners Involved

- Scientific Lead & Environmental Monitoring: HCMR (Hellenic Centre for Marine Research)-Coordinator.
- Technical Operations & Production: Private aquaculture operators (CRA), divers, underwater fishermen
- Advanced Analysis: Academic institutions, Techno-economic experts.

3. Monitoring Tools & Technologies

- Biodiversity and Ecosystem Monitoring: Sensors, ecological surveys, and laboratory analysis for the assessment and monitoring of biodiversity, water and sediment quality parameters.
- Biomass Safety: Laboratory assessment of heavy metals and other toxic elements in cultured organisms.
- System Performance Monitoring: Deployment and maintenance tracking logs.
- Socio-Economic Assessment Tools: Economic feasibility assessment, social impact assessment.

4. Planned Actions to Implement KPIs

Action	**Responsible Partner(s)**	**Tools/Methods**	**KPIs Addressed**
Baseline Monitoring & Environmental Assessment.	HCMR	Ecological surveys, CTD, Sediment sensors.	Baseline conditions for water quality, sediment characteristics, and biodiversity.
Installation and Operation of Systems.	HCMR, Aquaculture Operator, Divers.	Seabed pilot systems, Control baskets, Sediment grabs, Dive team deployment and maintenance protocols.	Assessment of co-cultivation system operability and scalability indicators.
Ecosystem Monitoring & Data Collection.	HCMR, Research Institutions, Divers.	CTD, Water sampling, Sediment sampling and sensors.	Assessment of environmental impact through the measurement of changes in physico-chemical parameters within the water column and sediment.
Biomass Growth, Survival Rate, and Heavy Metal and Other Toxic Elements Accumulation Tracking.	HCMR, Research Institutions, Divers.	Biometric measurements, Biomass sampling, Tissue selection, and Laboratory Analysis.	Evaluation of technical impact based on growth and survival performance, alongside biochemical analysis of heavy metals and toxic element accumulation in aquaculture species.

Assessment of Socio-Economic Feasibility.	HCMR, Research Institutions, Techno-economic experts.	Economic feasibility assessment, Stakeholders surveys or interviews.	Evaluation of economic impact based on production cost analysis, projected revenue streams, and stakeholder acceptance within the target community.
System Scalability Review.	HCMR & All JRU partners.	Deployment and maintenance tracking logs, Stakeholders interviews, Operator feedback.	Assessment of operational scalability impact based on system deployment and performance, required maintenance efforts, the presence of modular or expandable components, scalability of biomass production, and cost-efficiency improvements at increased operational scales.
Final Evaluation & Reporting.	HCMR, Research Institutions.	Consolidated datasets, final evaluation report, Final validation workshop (T-Lab), Pilot Action report (D2.3.1)	Comprehensive assessment of technical feasibility, scalability

5. Key Monitoring Timeline

Period	**Key Activities**
Months 1–6	Baseline assessment, Co-cultivation system design, construction of experimental units.
Months 4–8	Organization of material needed, installation of in-situ pilot systems
Months 8–20	System operation, Environmental monitoring, ongoing monitoring and data collection
Months 20–21	Pilot System Decommissioning.
Months 18–22	Assessment of socio-economic feasibility.
Months 18–22	Final evaluation of KPIs, reporting and recommendations for scaling up.

5.2. Demonstration Sites' monitoring and evaluation plan

The monitoring and evaluation plan for the Demonstration Sites (DS) is a key instrument to ensure that the Demonstration Sites not only serve as platforms for testing innovative blue biotechnology solutions, but also effectively showcase, validate, and accelerate the adoption of these solutions across the Mediterranean region. The primary objective of the plan is to provide a **structured framework to assess how each Demonstration Site facilitates the demonstration, stakeholder engagement, and transferability of the tested technologies**.

Unlike the pilot-level monitoring, which focuses on evaluating the technical feasibility of individual BBt solutions in industrial settings, the DS monitoring and evaluation approach emphasizes systemic impacts. It addresses the ability of each DS to integrate pilot actions, foster collaboration through Joint Research Units (JRUs), engage stakeholders, and support the replication of successful models. To this end, a set of **expected impacts and KPIs** have been identified, covering:

- demonstration effectiveness,
- stakeholder uptake,
- capacity building,
- governance,
- policy alignment
- replication potential.

These indicators have been developed collaboratively with project partners and stakeholders during the T-Lab co-design sessions.

A distinguishing feature of the DS monitoring and evaluation plan is its focus on stakeholder involvement and continuous learning. The JRUs, established within each DS, are responsible for implementing the monitoring activities, ensuring operational consistency, and facilitating data consolidation. The evaluation process is supported by the project's T-Labs, which provide a **participatory platform for reviewing results and validating outcomes.** Through regular workshops, stakeholder dialogues, and feedback loops, actors from across the five-helix spectrum critically assess the demonstration results, co-design strategies for scaling, and identify conditions for successful transfer to other regions.

5.2.1. Evaluation Criteria and KPIs

Evaluation Dimension	**Description**	**Key Indicators**
Demonstration Effectiveness	Effectiveness in showcasing BBt solutions and their environmental, economic, and social benefits.	• Number of demonstration events, • Stakeholder participation rate, • Demonstration visibility metrics.
Stakeholder Uptake and Transferability	Level of interest and readiness of third-party actors to adopt solutions demonstrated at the DS.	• Feasibility studies, • Transfer scenarios developed, • Number of third-party adoption agreements
Capacity Building	Capacity-building activities and skills enhancement for stakeholders engaged in DS operations.	• Number of stakeholders trained, • Number of workshops/events held, • Stakeholder satisfaction rate.
Governance and Collaboration	Functionality of JRUs and public-private partnerships within the DS.	• Number of partnerships formalized, • Functionality of governance mechanisms,

		• Stakeholder engagement feedback.
Policy Alignment and Influence	DS influence on regional/national strategies and enabling regulatory frameworks.	• Number of policy recommendations issued, • Number of policies influenced, • Uptake in strategic documents.
Replication Potential	Identification of alternative demonstration scenarios and readiness for transfer to other regions.	• Number of replication scenarios developed, • Readiness assessments completed, • Stakeholder endorsement level.

5.2.2. Evaluation Process

The project includes dedicated evaluation processes, whose ultimate goal is to develop a ***Demo-site model* (D.2.4.1)**, based on the results and analysis of the experiences gained across the different national BBHubs. To be capitalized for the acceleration of blue biotechnology (BBt) transfer, the Demo-site model will be assessed both in terms of impact, using the previously identified KPIs, and in terms of its capacity to explore and validate alternative options in real-life demonstration settings, with a view to enabling transferability to other areas.

Accordingly, the evaluation processes will be organized as follows:

a) **Data Collection and Digital Reporting**
During the implementation phase (A2.3), the JRUs will apply the KPIs to monitor Demo-site performance. The data collected will be structured into a **digital report** and shared with stakeholders within the T-Labs to enable continuous assessment of transferability under local conditions. At the end of the implementation phase (M29–M30), the JRUs will consolidate the data and generate specific metrics for the final evaluation of Demo-site operations and their related impacts.

b) **T-Labs Monitoring and Validation**
During the T-Labs dedicated to monitoring pilot actions (see Paragraph 5.1), performance data and related outcomes of the Demo-sites will be shared for continuous stakeholder review. The submission of the digital report (see previous point) to the T-Labs will support the collection of feedback on knowledge transfer, alignment of project results with emerging market opportunities, access to financial channels, and innovation policy integration. This process will also contribute to the co-design of **replication pathways.**

A final **Validation Workshop** involving the T-Labs is strongly recommended to validate technical, environmental, and socio-economic results, for upscaling and disseminating them through showcase events (A3.4), to support upscaling and dissemination through showcase events (A3.4), and to produce a **Feasibility Study** assessing whether the demonstration activities are viable, sustainable, and replicable under real-life conditions.

c) DS Modelling and Scenario Development
As previously mentioned, at the end of the testing phase, the BBHUB will consolidate the experience gained during the pilot phase into standardized Demo-site models to support future replication. To this end, a set of **alternative demonstration scenarios** will be identified through the BBHUB Network. These will be evaluated using the feasibility studies and previous assessments conducted by the JRUs, with the support of the T-Labs, to determine

the capacity of each model to address specific transfer and replication scenarios. This will enable the assessment of their **readiness for transfer** to other regions.

It is strongly recommended that each Demo-site model and scenario is completed and complemented by **policy briefs** and **replication guidelines** to facilitate uptake (see next point).

5.2.3. DS Enablers

INTEGRATION WITH T-LABS PROGRAMME - To strengthen the capacity and effectiveness of Demo Sites and improve performance against KPIs such as *Demonstration Effectiveness*, *Stakeholder Uptake & Transferability*, and *Policy Alignment & Influence*, further synergies with T-Labs Programmes (Activity 3.1) are strongly encouraged. Activities such as co-creation workshops and B2B/B2C/R2G/B2G matchmaking events will support the market scouting and penetration of BBt solutions and their integration into R&I policies, enhancing the overall potential of DS for dissemination, transfer, and adoption.

A strategic action to boost the transferability of the DS model will be offered by the organization of a transnational event (Activity 3.3) bringing together all BBHubs to showcase the results achieved by the Demo Sites. The event will be held back-to-back with a major Thematic Community event under the INTERREG Euro-MED framework.

TRANSNATIONAL STUDY VISITS - To support KPIs related to *Demonstration Effectiveness*, *Stakeholder Uptake & Transferability*, and *Replication Potential*, each BBHub will organize transnational visits to 2B-BLUE Demo Sites (Activity 3.2) for delegations of international stakeholders. These visits will be complemented by technology transfer workshops involving external experts. The workshops will help identify replication opportunities and contribute to the development of Demo Site Readiness Assessments.

TRANSNATIONAL CAPACITY-BUILDING - To enhance KPIs linked to *Capacity Building*, a dedicated training programme for SMEs (Activity 3.3) will be implemented. This will strengthen the capacity of third-party actors to adopt the demonstrated BBt solutions and lay the groundwork for the replication of Demo Site models through new collaborations with private-sector partners.

MEMORANDUM OF UNDERSTANDING (MoU) - To boost KPIs related to *Stakeholder Uptake & Transferability* and *Governance & Collaboration*, the signing of a Memorandum of Understanding (Activity 3.4) for the formal establishment of the BBH Network will ensure the long-term sustainability of project results. The MoU, signed by national BBHUUB members, will provide a structured framework for the adoption of DS models by third-party actors through new partnerships and cooperation agreements.

BEST PRACTICES INTEGRATION - Demo Sites will play a key role in converting pilot experiences into best practices to be integrated into the dynamic 2B-BLUE Knowledge Database (Activity 1.2), supporting knowledge transfer and the wider uptake of BBt solutions. This action will contribute substantially to the evaluation of *Demonstration Effectiveness*.

To support this, a Good Practice Assessment Matrix has been developed (Annex 6.3), measuring practices in terms of innovation potential, feasibility, scalability, and replicability. The use of this matrix during the Demo Site evaluation process is strongly encouraged, as it will enhance the DS capacity to promote the uptake and transfer of BBt solutions.

5.2.4. Evaluation Outputs

The outputs of the DS evaluation process will provide critical evidence on the viability, scalability, and impact of the tested blue biotechnology solutions. These outputs include:

- **Digital performance reports**, generated by the JRUs and enriched through continuous feedback collected in T-Labs;
- **Finalized KPIs**, covering demonstration effectiveness, stakeholder uptake, capacity building, governance, policy alignment, and replication potential;
- **Feasibility Studies**, assessing the real-life applicability, sustainability, and transferability of each DS model;
- **DS Models and Transfer Scenarios**, developed through cross-national analysis of pilot outcomes and tested against replication-readiness criteria;
- **Policy Briefs and Replication Guidelines**, supporting broader adoption and integration of BBt innovations into relevant strategies and funding frameworks;
- **Stakeholder Endorsements**, Memoranda of Understanding, and new cooperation agreements, confirming the commitment of third-party actors to scale and sustain project outcomes;
- **Validated Good Practices**, documented and integrated into the 2B-BLUE Knowledge Database, leveraging a dedicated assessment matrix (Annex 6.3) to ensure quality, innovation, and replicability.

Together, these outputs will serve as both a legacy and a launchpad, ensuring that the results of the DSs extend beyond the pilot phase and contribute meaningfully to the long-term advancement of sustainable blue biotechnologies across the Mediterranean and beyond.

6. Annex

6.1. Expression of Interest model

PUBLIC NOTICE FOR THE EXPRESSION OF INTEREST FOR THE PARTICIPATION IN A JOINT RESEARCH UNIT UNDER THE PROJECT 2B-BLUE

PART I – RATIONAL AND CONTEXT OF THE SELECTION OF THE PARTNERS OF JOINT RESEARCH UNIT

1. Introducing the Project 2B-BLUE

The 2B-BLUE project is designed to accelerate the adoption and transfer of Blue Biotechnology (BBt) solutions across the Mediterranean, ensuring that innovations transition effectively from research to industry. Recognizing the sector's vast potential in areas such as marine bioremediation, sustainable aquaculture, bio-based industries, and carbon sequestration, the project addresses the key barriers that have historically slowed the integration of BBt into blue economy sectors. These challenges include technological and financial constraints, regulatory fragmentation, and the need for effective knowledge transfer mechanisms.

To overcome these barriers, 2B-BLUE has established an integrated framework centred around Demonstration Sites (DS), Blue Biotechnology Hubs (BBHubs), and Transformation Labs (T-Labs). These mechanisms serve as testing grounds, collaboration platforms, and innovation accelerators, ensuring that BBt applications are refined, validated, and aligned with industry and policy needs. DSs allow for real-world testing of pilot actions, enabling the collection of Key Performance Indicators (KPIs) to assess the technical, economic, environmental, and social impact of each BBt innovation. Meanwhile, T-Labs bring together key stakeholders, including researchers, industry representatives, policymakers, and civil society actors, fostering an environment of continuous learning, adaptation, and co-creation.

A crucial outcome of the project has been the identification and deployment of pilot actions that target high-priority BBt applications. These include macroalgae-based bioremediation, Integrated Multi-Trophic Aquaculture (IMTA), carbon footprint tokenization, and biorefinery models. Each pilot is evaluated using a structured set of KPIs, ensuring that solutions are not only scientifically viable but also financially sustainable and environmentally beneficial. The alignment of BBt solutions with regional market needs and sustainability goals is a key priority, ensuring that pilot outcomes can be scaled and transferred across different blue economy sectors.

...[short description of the pilot action in the DS concerned]...

2. Establishing Joint Research Units.

DSs in the 2B-BLUE project are designated areas where BBt solutions, practices, and technologies are tested, validated, and showcased in real-world conditions. These sites serve as experimental platforms that allow for the controlled assessment of feasibility, efficiency, and impact, facilitating the transition from research to applied solutions. By integrating into the BBHubs network, the DS ensures cross-regional collaboration, stakeholder engagement, and knowledge transfer, supporting innovation and business development in the Mediterranean's blue economy.

Located in France, Spain, Italy, Slovenia, Greece, and Albania, the DSs focus on testing and validating the most promising BBt solutions, assessing their technological performance, economic viability, and environmental impact. Each DS will implement pilot activities, guided by rigorous monitoring and evaluation plans to assess their outcomes. The results will be documented, analysed, and modelled to ensure effective knowledge transfer and replication in other regions. These efforts will generate key outputs, including solutions to accelerate BBt uptake, pilot studies on sustainable aquaculture and algae-based products, strategic policy recommendations, and capacity-building initiatives.

To foster effective industry collaboration, each DS will be established through a Joint Research Unit (JRU), bringing together research institutions, businesses, policymakers, and civil society in structured partnerships. JRUs provide a framework for co-design, testing, and validation, aligning innovations with market needs and regulatory frameworks. They also support business model development and investment in sustainable BBt. By bridging research and industry, JRUs help apply research-driven innovations in real industrial settings, enabling the scale-up of validated technologies and strengthening Euro-Mediterranean leadership in blue biotechnology.

...[short description of the JRU in the DS concerned]...

PART II – PUBLIC NOTICE

Within the context as above mentioned, by means of the present notice, ...[the name of the Legal Entity publishing the Public notice] intends to proceed with the selection of the partners with the appropriate technical and economic capacity requirements which can form part of the JRU.

This notice is for exploratory purposes only and does not create any legal position or obligation with respect to the ...[the name of the Legal Entity publishing the Public notice], which reserves the right to suspend, modify or cancel, in whole or in part and at its sole discretion, the procedure initiated, without the participants being entitled to any claim whatsoever.

It should also be noted that this procedure is not subject to the public procurement rules set out in Directive 2014/24/EU, as no consideration and/or other forms of compensation are envisaged in favour of the private partner, who will be identified at the end of the procedure and who will therefore be required to provide its collaboration entirely free of charge.

1. OBJECTIVE

The purpose of this notice is to set up, as part of the research activities provided for in the Public notice for the selection of partners for Joint Research Units (JRU) under the research Project 2B-BLUE.

The JRU will be led by ...[the name of the Legal Entity publishing the Public notice]

In particular, the JRU will establish an effective collaboration between the parties carry out the activities as follows:

-...

-...

2. DURATION.

The duration of JRU will be 5 years from the date of signature of the agreement.

3. NO CONSIDERATION.

The Applicant will receive no fee or other prices in consideration of the activities described in the paragraph 1. The partner of the JRU will be requested to participate in such activities mobilizing own proper resources.

Considering that the JRU is funded under the INTERREG EURO-MED programme as part of the 2B-BLUE project, the actual costs incurred by the partners for the implementation of the activities described in paragraph 1 may be reimbursed in accordance with the rules established by INTERREG EURO-MED, as outlined in the Programme Manual on eligibility of expenditures and reporting, available at: https://interreg-euro-med.eu/en/documents-tools-project-implementation.

4. PROPOSALS BY THE APPLICANTS

The Applicant submits a proposal to participate in the JRU which provides the details as follows:

- Possession of the requirements as provided by the paragraph 5 hereinafter;
- Description of the experiences in the fields covered by the JRU;
- List of the key staff;
- Material and immaterial resources which may be mobilized for the benefit of the JRU
- Any other relevant information.

5. REQUIREMENTS FOR PARTICIPATION.

The Applicant has to comply with the following requirements for admission to the procedure.

A. MORAL REQUIREMENTS

Absence of one or more of the situations as follows:

(a) The Applicant is bankrupt or is the subject of insolvency or winding-up proceedings, where its assets are being administered by a liquidator or by the court, where it is in an arrangement with creditors, where its business activities are suspended or it is in any analogous situation arising from a similar procedure under national laws and regulations;

(b) The Applicant is guilty of grave professional misconduct, which renders its integrity questionable;

(c) The Applicant has shown significant or persistent deficiencies in the performance of a substantive requirement under a prior contract with ...[the name of the Legal Entity publishing the Public notice] or other Beneficiaries of the 2B-BLUE Project, which led to early termination of that prior contract, damages or other comparable sanctions.

B. TECHNICAL SUITABILITY REQUIREMENTS:

[SPECIFY THE MINIMUM CHARACTERISTICS THAT THE FACILITY MUST HAVE];

...

C. ECONOMIC AND FINANCIAL CAPACITY REQUIREMENTS

- Total turnover of the company over the last three years (as shown by the last three filed balance sheets) of not less than [-] or, alternatively, appropriate references from a banking institution.

6. APPLICATIONS

The applicant must submit the application for participation in ...language, duly completed and signed by the legal representative or by a person with power of attorney with electronic signature.

The application must be sent exclusively by R.E.M. (registered electronic mail) to the following address [...] and must be received no later than midnight on [-].

Applications received after this date and/or sent by other means shall not be accepted.

The application is sent at the sender's own risk. The ...[the name of the Legal Entity publishing the Public notice] shall not be held responsible in the event of non-delivery due to causes, including those of an electronic nature, not attributable to the ...[the name of the Legal Entity publishing the Public notice] or its digital equipment.

7. PROTECTION OF PERSONAL DATA

The Applicant shall give consent to the ...[the name of the Legal Entity publishing the Public notice] to process any personal data (i.e., name, family name, contact details, data contained in the CV and the related documentation).

...[the name of the Legal Entity publishing the Public notice] acting as controller, shall process such personal data exclusively for the purpose to carry out the activities concerning present selection procedure and to manage the contract with the successful Applicant.

Personal data shall be considered as confidential. Nevertheless, such a data may be shared with the evaluators involved in the selection process (to be identified within the members of the consortium), as well as with any competent authority as provided by the law.

The data subject shall have the rights set out by the European Union Law, and in particular by Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of natural persons with regard to the processing of personal data and on the free movement of such data. Especially, the data subject shall be entitled to obtain from ...[the name of the Legal Entity publishing the Public notice] the rectification, erasure or blocking of data the processing of which does not comply with the provisions of the Regulation (EU) 2016/679, in particular because of the incomplete or inaccurate nature of the data.

8. OTHER PROVISIONS

The selection shall be carried out in a discretionary manner by the ...[the name of the Legal Entity publishing the Public notice], that will organize an adequate selection panel. The panel will be composed by experts on the topics concerning the selection procedure.

If considered necessary, the Applicant may be convened for an on-line interview. The lack of response of the Applicant may be considered a refusal to be involved in the procedure of establishing the JRU.

This procedure may be revoked at any time and it cannot generate any legitimate expectations for Applicants that their proposal is accepted.

No reimbursement of costs or payment of fees are foreseen for the Applicants for the sole reason of participation in the selection procedure.

The present procedure is subject to the.. Law and any controversy which may arise shall be subject to the exclusive competence of the Court of ...

9. FURTHER INFORMATION

This notice will be published on the ...[the name of the Legal Entity publishing the Public notice] website .... from the date of publication.

For further information, please contact [-], tel. [-], e-mail: [-].

6.2. Collaborative Research Agreement model

AGREEMENT ESTABLISHING A JOINT RESEARCH UNIT ON

...

This Agreement is concluded between

[fill in with the data of the Project Partner]...., represented for the signature of this Agreement by .... (hereinafter referred to as "..."), domiciled for the purposes of this Agreement at ....,

and

[fill in with the data of the Legal Entity selected through the Public notice]..., represented for the signature of this Agreement by ... (hereinafter referred to as "..."), residing for the purposes of this Agreement at ...,

- WHEREAS the Parties have been identified on the base of the Public notice issued by...on...;
- WHEREAS the Parties are cooperating in research activities relating to [fill in with a description of the Demonstration Site/Pilot Action]...,...;
- WHEREAS the Parties intend to improve their cooperation by setting up a research unit which will combine the resources devoted to experimental activities in the above field;
- CONSIDERING that the Parties have capabilities and resources appropriate to the research activities
- WHEREAS, the Parties intend to regulate their mutual relations within the framework of the Grant Agreement,
- "[Add any other introductory remarks necessary to define the general, legal, and technical framework in which the collaboration takes place]

NOW, THEREFORE, IT IS AGREED AS FOLLOWS

The Preamble and the Annex attached hereto shall be deemed to form an integral part of this Agreement.

Article 1. - Scope of the Agreement

1.1 The purpose of this Agreement is to establish a Joint Research Unit (hereinafter referred to as "JRU") to establish a collaboration in the following field(s)... [fill in with a description of the Demonstration Site/Pilot Action]

1.2 In particular the Joint Research Unit shall carry out the research activities as follows: [fill in with a description of the activities foreseen by the Pilot Action]

...

...

The above-mentioned activities are described in detail in the Annex A herein enclosed.

1.3 Subject to the further decisions of the Steering Committee under the Article 3 hereinafter, each party contributes with the resources initially described under the Annex B herein enclosed.

1.4 This Agreement does not create any association, partnership, company or other legal entity autonomous from the Parties and from third parties. Each Party shall remain legally and fiscally autonomous.

Article 2. - Duration of the agreement

2.1 This Agreement shall enter into force on the date of signature by the last Party and shall remain in force for 5 years. [Given that the Demonstration Site is one of the expected outputs of the project, the collaboration should have a duration of at least five years]

2.1 The duration of this Agreement shall be extended by the decision of the Steering Committee as under the Article 4 hereinafter.

Article 3. - Governance

3.1 A Steering Committee shall be established, which shall be responsible for taking all decisions concerning the activities covered by this Agreement.

3.2 The Steering Committee shall be composed of two members appointed by each Party. Decisions shall be taken by consensus. The Steering Committee shall be chaired by the person identified by the body in its first meeting.

3.3 The Steering Committee shall be the ultimate decision-making body of the JRU. In particular, the Steering Committee shall be responsible for the decisions concerning the following tasks:

- drawing up the JRU regulations and any other regulations;
- identifying, defining and approving programs of activities or proposals to be submitted to a Funding Body in accordance with the Article 4 hereinafter;
- amending the Annexes herein enclosed;
- ensuring the correct and coordinated implementation of the above-mentioned programs and pilot actions, solving any problems that may arise and supervising all technical and operational aspects;
- verifying the technical and operational feasibility of the pilot actions and proposed activities;
- evaluating and approve proposals for new partners to join JRU;
- identifying and evaluating further initiatives that are of interest to JRU;
- proposing the amendments to this Agreement, which will be signed by the legal representatives of the Parties in accordance with the Article 11.1 hereinafter.

3.4 The Steering Committee meets at least once a year and when it is convened by the chairperson, also on request of a party.

3.5 The meeting shall be convened by the chairperson giving fifteen days' notice, identifying the place or the electronic platform of the meeting. The terms of fifteen days as above mentioned should be derogated in a urgent case or when all the members of the Steering Committee are present.

Article 4. - Participation in projects funded by the European Union and other funding bodies

4.1 In accordance with article 3, paragraph 3, as above, the Steering Committee may decide that the Parties may submit proposals to the funding bodies in which one Party acts beneficiary and the other one participates as affiliate entity on the ground of the present Agreement.

4.2 Considering that the JRU is funded under the INTERREG EURO-MED programme as part of the 2B-BLUE project, the actual costs incurred by the Parties for the implementation of the activities described in Annex A may be reimbursed in accordance with the rules established by INTERREG EURO-MED, as outlined in the Programme Manual on eligibility of expenditures and reporting, available at: https://interreg-euro-med.eu/en/documents-tools-project-implementation , up to a maximum amount of EUR [insert amount]. The resources made available by the Party and for which reimbursement will be requested are specified in Annex B.

Article 5. - Reimbursement of expenses and methods of payment

5.1 Considering the collaborative nature of the relationship between the Parties, which involves the exchange of roles and expertise as well as the sharing of resources, financial transactions between the Parties shall be strictly considered as reimbursements of actual costs incurred for the implementation of the activities set out in this Agreement. These are to be understood as mere reimbursements of real costs, as no payments including profit margins are foreseen.

5.2 For the recognition of expenses related to the implementation of the Agreement, reference shall be made to the rules established by the INTERREG EURO-MED programme, as outlined in Article 4, paragraph 2.

5.3 [fill in with the data of the Legal Entity selected through the Public notice]...,shall submit to [fill in with the data of the Project Partner]...., appropriate and detailed reporting, based on a separate analysis of the costs incurred, including:

- personnel costs (including any Research Grants),
- travel and accommodation expenses,
- technical, tangible and intangible assets purchased,
- documentation or reproduction of materials, and
- any tax payments where applicable.

These costs must be clearly linked to the activities carried out and must comply with the project implementation timeline.

5.4 [fill in with the data of the Project Partner]....,undertakes to pay [fill in with the data of the Legal Entity selected through the Public notice]...,the amount of EUR [insert amount], after validation of the related expenses, in accordance with the rules and procedures set out in the Programme Manual on eligibility of expenditures and reporting of the INTERREG EURO-MED programme. Failure to comply with these procedures may result in non-eligibility and non-recognition of the reported expenses.

5.5 The maximum amount that may be reimbursed by [fill in with the data of the Project Partner]....,to cover the costs incurred by [fill in with the data of the Legal Entity selected through the Public notice]...can be reported within the following expenditure categories:

- Personnel, including Research Grants;
- Missions (travel, accommodation, meals);
- Equipment, excluding capital cost items.

The project will not fund activities that provide significant private benefit that each Party is asked to contribute to the cost of the activities detailed at ANNEX A.

5.6 The reporting of eligible expenses incurred shall consist of the submission (in paper or digital format) to [fill in with the data of the Project Partner]….,of certified copies of original documentation, or of equivalent documents with the same evidentiary value. These must be properly received and issued within the eligibility period of the INTERREG EURO-MED programme and the relevant operations.

5.7 All financial reports must be accompanied by a narrative report describing:

- a summary of the activities carried out,
- the products delivered, and
- a short description of the administrative procedures followed.

The timing and modalities for submitting the reports shall be defined by the Steering Committee.

5.8 As this constitutes a transfer of resources in the form of a research contribution, the reimbursement is not subject to VAT, and no invoice shall be issued. Upon verification of the submitted documentation, the payment of the approved amount will be made against the issuance of debit notes by [fill in with the data of the Legal Entity selected through the Public notice]…, according to the progress of the activities and the reporting deadlines indicated above.

Article 6. Liability of the parties

6.1 Each Party shall be liable for any damage caused to the other Party by the performance of the activities provided for herein.

Article 7. - Withdrawal and termination

7.1 Either Party may withdraw from this Agreement by giving six months' written notice. In any case, the withdrawing Party shall complete the activities in progress and shall fulfil its obligations, in particular those provided for the execution of project in case of joint participation in a project.

7.2 In the event of a serious breach of the obligations laid down in this Agreement the non-defaulting Party may terminate this Agreement by giving fifteen days' notice to the defaulting Party.

Article 8. – Rights on background and Results

8.1. Each Party shall remain the sole owner of the material (e.g., materials, prototypes, etc.) and immaterial (e.g., data, software, patents, etc.) resources made available for the activities of the JRU (the “Background”).

Each Party may communicate to the other(s) the Background over which they may grant access rights to the other Parties, if that know-how is needed for carrying out the activities of the JRU.

8.2 The Results arising from work carried out under the JRU shall be shared between the Parties and considered as jointly owned. Where needed, they shall agree among themselves in a further agreement on the allocation and the terms of exercising the ownership of said Results. Such results, as far as the Parties are concerned, may be used for outreach purposes and activities which may include press events and releases, publications, site tours, and presentations at webinars or conferences. [fill in with the data of the Legal Entity selected through the Public notice]…, is required to collaborate with [fill in with the data of the Project Partner]….,should they prepare any press release or plan any news conference related to the JRU and/or Demonstration Site. fill in with the data of the Project Partner]…is authorized to use photographs of the Demonstration Site in brochures, on its website, and in other print materials.

Article 9. - Confidentiality

9.1 Confidential Information shall be disclosed by one Party (the "Disclosing Party") to the other Party (the "Receiving Party") under the following terms and conditions.

9.2 "Confidential Information" shall mean any information for which the following conditions are met: a) it relates to the scientific or business conditions of the Party; b) it is clearly marked (e.g., "Confidential" or "Proprietary") at the time of disclosure; c) it is not in the public domain prior to disclosure by the Disclosing Party.

9.3 The Receiving Party shall not disclose the Disclosing Party's Confidential Information to any unauthorized person without the prior express written consent of the Disclosing Party or unless required to do so by law, court order or regulatory authority. If a party is required by law, court order or regulatory body to disclose Confidential Information of the other party, it shall promptly notify the disclosing party of such requirement so that an appropriate protective order or other relief may be sought.

9.4 The receiving Party shall at all times take and maintain reasonable and appropriate measures to protect the Confidential Information received. Disclosure of Confidential Information shall be limited to those officers, employees, agents and consultants directly involved in the discussions contemplated by this Agreement, and then only to the extent necessary and appropriate. The Parties shall inform their officers, employees, agents and consultants of the confidential nature of the information disclosed hereunder and shall be fully responsible for ensuring that all such officers, employees, agents and consultants comply with the terms of this Agreement.

Article 10. – Relationship between Intellectual Property and Confidential Information

10.1 The provisions regarding the ownership of *Background* and *Results* under Article 8 shall apply without prejudice to the confidentiality obligations set out in Article 9. In particular:

- The Parties agree that any information related to the Background or the Results that has not yet been made public or officially disclosed by mutual agreement shall be treated as Confidential Information.
- Any external use of the Results (e.g., for public events, press releases, publications) must respect any existing confidentiality obligations and, where required, be subject to prior authorization or agreement between the Parties.
- The Parties undertake to ensure that the use of jointly owned Results does not compromise either the confidentiality of received information or the intellectual property rights associated with the Background.

Article 11. - Communication

11.1 The communication between the Parties shall be made through email with the acknowledgment of receipt to the following addresses:

...

...

Article 12. - Applicable law and Competent Court.

12.1 This Agreement shall be governed and interpreted by the ...Law.

12.2 In case of dispute, the competent Court shall be exclusively the Court of ....

Article 13. - Final provisions

13.1 Any change to this Agreement shall be the subject of a written supplementary agreement concluded between the Parties. No verbal agreement may bind the Parties to this effect.

13.2 Should any provision of this Agreement prove to be invalid or incapable of fulfilment, or subsequently become invalid or incapable of fulfilment, whether in whole or in part, this shall not affect the validity of the remaining provisions of this Agreement. In such a case, the Parties shall be entitled to demand that a valid and practicable provision be negotiated which most nearly fulfils the purpose of the invalid or impracticable provision.

13.3 None of the Parties shall assign or otherwise transfer any of his rights and obligations in the frame of the present Agreement without the prior decision of the Steering Committee.

Article 14. - Enclosures

14.1 The following Annexes and its amendments shall be considered as substantial part of this Agreement:

Annex A: Description of the activities of the JRU

Annex B: Resources made available by the Parties.

Signatures

AS WITNESS:

The Parties have caused this Agreement to be duly signed by the undersigned authorized representatives in two or more counterparts the day and year first above written.

_____ _____

Place, Date Place, Date

, ,

6.3. Good Practice Assessment Matrix

Name of GP	
Country/countries involved	
Time/duration of GP	
Partnership (project consortium, research organization, company, NGO, etc.)	
Description of GP	
Sector	
Organism	
Results available (Y/N)	
Link to results, if available	
Market search done (Y/N)	
Type of outreach activities (e.g., conference presentations, poster, brochure, marketed product, report, article, etc.)	
Type of GP (lower TRL, higher TRL)	

Inovativeness Score	97
Feasibility Score	66
Scalability Score	75
Replicability Score	75
Final Score	78

INOVATIVENESS ASSESSMENT	97

	Factor	Question	Scoring guide	Allocated score	Identified score	MAX SCORING	SCORING	Effectiveness ratio	Importance	Scoring weights	Scalability index
Technical	1. Innovativeness	To what extent is the solution itself innovative? Please indicate whether this is a novelty at a national level and/or at a European level as well.	High	3	3	7	6	86	1	0,20	17
			Medium	2							
			Low	1							
		What is the state of the art considered?	Novel methodology and source organisms/biomass	4	3						
			Novel methodology	3							
			Use of existing methodology on untested organisms	2							
			Adaptation of existing methodology	1							
	2. Design	Challenge (e.g., pollution, societal demands, waste, etc.) and need for the solution are clear	Yes, clearly evident and currently relevant	3	3	11	11	100	4	0,80	80
			Yes, but not evidently indicated as a top societal priority	2							
			Not fully evident	1							
		The solution is designed for discovery (e.g., screening, extraction), durability (for long-term maintaining of results/biomass, etc.) or productivity (increase yield, optimize protocols)?	Mostly productivity	3	3						
			Mostly durability	2							
			Mostly discovery	1							
		Sustainability (environmental and social) has been addressed	Fully/adequately addressed	3	3						
			Partially addressed	2							
			Not yet considered	1							

		Circularity of components (e.g., reuse of chemicals, biomass, biorefinery, greener protocols) is an integral part of the solution	Yes	2	2							
			No	1								

FEASABILITY ASSESSMENT	66

Technical	1. Technology evolution	Technological conditions allow increasing the solution size/yield without significant impact on the environment/price (e.g., considering environmental sustainability)	Fully/adequately addressed	3	3	6	5	83	2	0,08	7
			Partially addressed	2							
			Not addressed at all	1							
		The results can be realistically achieved	Yes	3	2						
			Risky achievement - high risk, high gain	2							
			Not likely but they represent a game changer	1							
	2. Existing infrastructure	Existing infrastructure is available and can be used	Yes	3	2	6	5	83	3	0,13	10
			Partially	2							
			No	1							
		There are sufficient existing competences among the involved personnel for technical development and infrastructure use	Yes, fully	3	3						
			Partially	2							
			Not yet	1							
	3. External Constraints	The location and initial logistics for the solution have been considered already	Yes, fully	3	2	3	2	67	5	0,21	14
			Partially	2							
			Not yet considered	1							

Economic	4. Economy of scale	Is the solution a valorisation of previously conducted research?	Yes, from other/concluded financial sources/projects	3	3	7	5	71	6	0,25	18
			No, this is the first financing round - funds obtained	2							
			No, this is the first financing round - funds not yet obtained	1							
		Are there any economic barriers with respect to innovativeness that could affect the solution?	No	4	2						
			Yes, minor	3							
			Yes, some	2							
			Yes, major	1							
	5. Profitability	The economic indicators indicate that the solution can be financially viable enough	Yes	3	2	3	2	67	7	0,29	19
			Not yet considered	2							
			No	1							
Regulatory	6. Regulatory issues	Are there any regulatory/ legislative barriers/ consideration with respect to Replicability that could affect the solution?	No barriers	4	3	8	6	75	8	0,33	25
			Yes, minor barriers	3							
			Yes, some barriers	2							
			Yes, major barriers	1							
		Are intellectual property and ethical considerations managed?	Yes, both have been fully considered	4	3						
			The intellectual property management is set up	3							

			Ethical considerations (e.g., Nagoya protocol) are implemented	2							
			To some extent / not fully/finalized	1							
Stakeholders	7. Level of acceptance	Was/ is the solution being developed in collaboration with/ considering the feedback from external stakeholders?	Yes, documented feedback as basis for improvements	3	2	7	4	57	9	0,38	21
			Yes, informally	2							
			Not yet considered	1							
		Did you conduct awareness raising/ communication/ dissemination campaigns?	Yes, along with major (nontechnical/external) stakeholders	4	2						
			Yes, mostly only within the team/consortium	3							
			Yes, only in scientific circles	2							
			Not yet	1							

SCALABILITY ASSESSMENT 75

	Factor	Question	Scoring guide	Allocated score	Identified score	MAX SCORING	SCORING	Effectiveness ratio	Importance	Scoring weights	Scalability index
Technical	1. Modularity	Can the solution be divided into interdependent components/independent functional units/independent processing steps?	Independent functional steps clearly defined	3	2	7	5	71	3	0,07	5
			Component division somewhat clear	2							
			Not clear if the solution could be divided	1							
		Would it be possible to (technically) easily modify the solution to increase its size / adapt the protocol to increase yield/volume?	Yes, with minor change	4	3						
			Yes, with some change	3							
			Yes, with major change	2							
			No, not considered yet	1							
	2. Technology evolution	Technological conditions allow increasing the solution size	Fully/adequately addressed	3	3	6	6	100	1	0,02	2
			Partially addressed	2							
			Not addressed at all	1							
		Do you foresee technological advances in the short to medium term that will mitigate a possible performance reduction/make this solution obsolete?	No	3	3						
			Not of importance	2							
			Yes	1							
	3. Design	Readiness for scalability. Is sustainable sourcing/aquaculture/fermentation considered to provide industrially relevant quantities/yield?	Yes, and already tested	3	2	10	8	80	2	0,04	4
			Yes, but not yet tested	2							
			Not yet considered	1							
		From a scalability point of view how is the impact of the solution described in the study case: national/regional/ local...?	International	4	3						
			National	3							
			Regional	2							

			Local	1							
		Designed so that new improvements can be added (improved methods, new components, etc.)	Fully/adequately addressed	3							
			Partially addressed	2							
			Not addressed at all	1	3						
	4. Existing infrastructure	Physical size limitations	No	3		6	6	100	4	0,09	9
			Not of importance	2							
			Yes	1	3						
		Existing infrastructure is available and can be used	Yes	3							
			Partially	2							
			No	1	3						
	5. External Constraints	Is the scalability of the solution influenced by the specific location of your demo?	No influence	4		4	3	75	5	0,11	8
			Yes, minor influence	3							
			Yes, certain influence	2							
			Yes, major influence	1	3						
Economic	6. Economy of scale	If the size of your solution increases, how do you think the cost and benefit of your solution would increase (economies of scale and cost effectiveness)?	Yes, cost and benefit would increase	3		19	12	63	6	0,13	8
			No, cost and benefit would not increase	2							
			Not yet considered	1	2						
		Do you foresee evolutions in the short to medium term which will have a positive influence on the cost-benefit ratio of your solution from scalability point of view?	Yes, evolutions with major influence	4							
			Yes, evolutions with some influence	3							
			Yes, evolutions with minor influence	2							
			No	1	3						
		Are there any economic barriers with respect to scalability that could affect the solution?	No	4							
			Yes, minor	3							
			Yes, some	2	3						

			Yes, major	1							
		The business model can be scaled up	Yes	3							
			No	2							
			Not yet considered	1	2						
		Are financial resources for scaling already secured?	Yes	2							
			Not yet	1							
		The supply chain is already elaborated and tested	Yes	3							
			Partially	2							
			Not yet	1	2						
	7. Profitability	The economic indicators of the demo case show that the business model is viable enough to scale up	Yes	3							
			No	2							
			Not yet considered	1	2	3	2	67	7	0,16	10
Regulatory	8. Regulatory issues	Are there any regulatory barriers with respect to Scalability that could affect the solution?	No barriers	4							
			Yes, minor barriers	3							
			Yes, some barriers	2							
			Yes, major barriers	1	3	4	3	75	8	0,18	13
Stakeholders	9. Level of acceptance	Is the stakeholder acceptance (future end-users or buyers) important regarding the scalability potential for this GP?	Yes, of major importance	4							
			Yes, of some importance	3							
			Yes, of minor importance	2							
			No importance	1	3	4	3	75	9	0,20	15

REPLICABILITY ASSESSMENT 74

	Factor	Question	Scoring guide	Allocated score	Identified score	MAX SCORING	SCORING	Effectiveness ratio	Importance	Scoring weights	Replicability index
Technical	1. Standardisation	Is the solution standard compliant? If yes, with which type of standards (mandatory or voluntary)	Yes, mandatory standards (an impose choice)	3	2	3	2	67	2	0,04	2
			Yes, voluntary standards (a free choice)	2							
			No standard	1							
	2. Design	Readiness for replicability: How will the dependency of your solution organised: Centrally (depending on one region/organism), Decentralised/independent on the geographical source or both?	Centralised	3	2	7	5	71	1	0,02	1
			Both	2							
			Decentralised	1							
		From a replicability point of view how is the impact of the solution considered: national/regional/ local…?	International	4	3						
			National	3							
			Regional	2							
			Local	1							
	3. External Constraints	Is the replicability of the solution influenced by the specific infrastructure or the location/site?	No influence	4	3	4	3	75	3	0,06	4
			Yes, minor influence	3							
			Yes, certain influence	2							
			Yes, major influence	1							
Economic	4. Business model	Based on the own experience, do you think that solution could easily deployed in other environment	Yes, with minor investment	4	3	7	5	71	6	0,11	8
			Yes, with some investment	3							

		without additional investment (time/money)?	Yes, with major investment	2							
			No	1							
		The economic indicators of the demo case demonstrate that the business model is viable enough to replicate	Yes	3							
			No	2							
			Not yet considered	1	2						
	5. Economy of scale	Have you evaluated different options (locations, methodology, biomass) before the implementation?	Yes, with good results	3		18	14	78	5	0,09	7
			No	2							
			Yes, with bad results	1	3						
		Do you foresee evolutions in the short to medium term which will have a positive influence on the cost-benefit ratio of your solution from replicability point of view?	Yes, evolutions with major influence	4							
			Yes, evolutions with some influence	3							
			Yes, evolutions with minor influence	2							
			No	1	3						
		Are there any economic barriers with respect to replicability that could affect the solution?	No	4							
			Yes, minor	3							
			Yes, some	2							
			Yes, major	1	3						
		Have you performed some analyses to study the influence of economic factors on the replicability capacity of the adopted solution in your country	Yes, with good results	3							
			No	2							
			Yes, with poor results	1	2						
		From replicability point of view do you think the solution would be profitable in your country?	Yes, with minor effort	4							
			Yes, with some effort	3							
			Yes, with major effort	2							
			No	1	3						
	6. Market design		Yes, with minor change	4	3	4	3	75	4	0,07	5

		Do you think that you could make the study case solution easily (economically and technically) compliant with a defined different set of standards?	Yes, with some change	3							
			Yes, with major change	2							
			No	1							
Regulatory	7. Regulatory issues	Are there any regulatory/ legislative barriers/ consideration with respect to Replicability that could affect the solution?	No barriers	4		8	6	75	7	0,13	10
			Yes, minor barriers	3							
			Yes, some barriers	2							
			Yes, major barriers	1	3						
		Are intellectual property and ethical considerations managed?	Yes, both have been fully considered	4							
			The intellectual property management is set up	3							
			Ethical considerations (e.g., Nagoya protocol) are implemented	2							
			To some extent / not fully/finalized	1	3						
Stakeholders	8. Level of acceptance	Is the stakeholder acceptance important regarding Replicability potential for your solution?	Yes, of major importance	4		4	3	75	10	0,18	14
			Yes, of some importance	3							
			Yes, of minor importance	2							
			No importance	1	3						
Relevance	9. Level of relevance	To what extent has the solution demonstrated that the approaches used are an effective way to overcome the main challenges of the sector/area/organism?	Yes, great extent	4		4	3	75	9	0,16	12
			Yes, some extent	3							
			Yes, minor extent	2							
			No extent	1	3						
	10. Level of transferability	To what extent can the case be adapted and transferred to	Yes, great extent	4		4	3	75	8	0,15	11
			Yes, some extent	3	3						

		other regions of the same country or regions in other countries, particularly regions with low development?	Yes, minor extent	2								
			No extent	1								