

B-Blue

*Building the blue biotechnology community in the
Mediterranean*

WP 3 - Studying

DELIVERABLE 3.2.1

Best practices for innovation in the Med BBT sector and definition of
the BBT innovation frontrunner

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List of Abbreviations and Acronyms

Acronym	
BBt	Blue Biotechnologies
PP	Project partners
BBH	Blue Biotechnology Hub
WP	Work Package
SDGs	Sustainable Development Goals
RIS3	Research and Innovation Strategies for Smart Specialization



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About B-Blue project

10 partners with proved experience in the Blue Bioeconomy field from 8 Med countries and more than 300 Med stakeholders from universities, research centres, public authorities, business support organizations and Med multilateral organizations, working together for 22 months to create the Blue Biotechnologies (BBt) community in the Mediterranean. **The exploitation of marine bio-resources through biotechnological solutions is a field with massive potential for innovation and economic growth.** This field is a relatively young discipline, so opportunities and key enabling factors need a coordination. **B-Blue project aims at gathering the key actors of the Med BBt sector and increase their innovation capacity and their coordination in order to unlock the innovation potential in the field through joint transnational initiatives, involving also organizations from the Southern Shore of the Mediterranean.** The transnational coordination framework, the project aims to create, is based on an inclusive quintuple-helix approach always including the socio-environmental perspective in the decisional process and building on a common knowledge ground selected on the basis of its potential of addressing the SGDs at Med level. The **B-Blue** work towards to the implementation of a transnational coordination mechanism for the BBt community through the mutual interconnection the digital BBt community platform and a Med network of territorial based-collaborative space on selected BBt value chains (BBt HUBs).

About Work Package 3 – Studying

BBt is a field with massive potential for innovation and economic growth, but it is a relatively young discipline, so opportunities and key enabling factors need coordination. Despite the promising prospect, BBt's development in the MED region faces **specific bottlenecks such as clear the identification of the different actors and high fragmentation of business innovation initiative:** BBt value chains move from and are linked to many different sectors and research and innovation are often developed as isolated initiatives without a coordination which could ease the access to the market. WP3 tackles all these issues **collecting, analysing and systematizing knowledge** so that it can be exploited during the project activities and in additional/future contexts as basis for innovation and business. It also allows the **definition of the so-called *innovation frontrunners* of the BBt sector which support the process of developing a community of the BBt sector in the Med area** which represents a concrete benefit for the programme area allowing future coordinated initiative. Contents and methodologies of implementation are based on:

- i) **defining best practices** of already implemented, ready to the market and pilot actions of innovative solutions in the BBt sector and **definition of the BBt innovation community,**
- ii) defining toolkits with the **most effective innovation transfer tools and methodologies** for the capacity building in the Med BBt sector
- iii) exploitation of an already existing the **Marina Platform for the activation of the BBE digital community.**



Moreover, the project shapes knowledge contents to be tested in WP4 and transferred in the WP5 also on the basis of their capacity to address SGDs and on the results of the BlueBioMED project on RIS3 and Innovation trends analysis which outlines the commonalities within RIS3 strategies for BBT and allows to pinpoint the key elements associated to better policy delivery efficiency and effectiveness, highlighting the corresponding training needs and training package.

Therefore, the overall objective of WP3 is **to create a project knowledge package in the MED Blue Biotechnology (BBt) sector** to be used to exchange knowledge among the PPs and between the B-Blue project and the BBT community which is identified and primarily established through **the valorization of knowledge and experience in the BBT sector** from previous projects and initiatives. This goal is achieved by **studying, collecting and harmonizing knowledge**, focusing on aspects having high relevance and applicability across the MED area. Through WP3 - Studying, the project

- 1) creates and develop **common ground and toolkits** for BBT sector growth and its **community building and empowerment**,
- 2) **promotes the transfer** of the acquired knowledge to be exploited in other WPs to:
 - i. support market-oriented testing activities focusing on specific BBT value chains,
 - ii. create a knowledge innovation network, to develop new tools and additional knowledge on selected BBT value chains considering their potential to support the achievement of Med SDGs and connection to RIS3 (exploiting the results on RIS3 and SDGs mapping of BlueBioMed project at M5)
 - iii. develop policy recommendations and strategic plans to identify joint initiatives, common approaches and transnational projects for the growth of the Med BBT (WP6).

Objectives of this deliverable

D3.2.1 aims at **presenting a collection of best practices (BPs)** of already implemented or ready to the market, pilot actions and research results of innovative solutions in the BBT sector. D3.2.1 also **identifies the frontrunners of the Blue Bio-technologies innovation community**. Both best practices collection and BBT frontrunner community definition is achieved through pilot actions, previous projects, networks, initiatives involving the PPs and/or valorising the outputs of previous or ongoing Med initiatives.

D3.2.1 will thus provide **an accessible and concise overview of evidence-based best practices for innovation in the BBT sector**, which exist worldwide and can be followed in MED area to accelerate the transition to resource-efficient and sustainable economies. Collection of BPs for exploitation of marine bio-resources through biotechnological solutions (D 3.2.1), **aims to bring out the innovation potential in that field and define the value chains that are better thought-out and with high market potential** (D 3.2.2).



Definition of terms

Blue Biotechnology (BBt): is a sector that explores the marine bio-resources (marine organisms and ecosystems) as potential source of innovation and major factor of economic growth.

Additional definitions for **marine biotechnology:**

OECD

The application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.

Marine Board

Marine biotechnology encompasses those efforts that involve marine bio-resources, as either the source or the target of biotechnology applications.

CIESM

Marine biotechnology is a category of products and/or tools to marine bio-resources, as either the source or target of their application. It provides goods and services for innovative industries and/or society as a whole.

Best practices (BP)

Best practices for innovation in the BBt sector may refer to standards, regulations, methods and procedures that are applied and can be followed in order to build a resource-efficient society, and promote SDGs. In addition, as BP can be considered **an implemented, ready to market project or/and a pilot action/research project with actual results.**

Frontrunners

Frontrunners are defined in B-Blue as *“stakeholders having real experience (with some activity carried out) in a given value chain and who can show their experience with the intention of helping other interested actors”* (D4.1.1). Frontrunners are thus the trend setters in the sector, i.e. companies and organizations leading the innovation in the sector on specific value chains (e.g., research centers, startups, innovative companies which are developing innovative solutions with medium to high TRL [higher than 5]).



Best practices: methodology

The following table has been used by each partner to present and organize the collection of best practices from previous experiences in the BBt field.

Following the template for best practice documentation, project partners were asked to answer as many guiding questions as possible to fill in the excel template (see Annex 1). Partners provided at least:

- (3-4) good practices for “minimum involvement” partners”
- (5-6) good practices for “medium” and “important involvement” partners

When reporting best practices, they considered the **four BBt value chains** suggested for the BBH in B-Blue, including:

- i) algae production for high-value compounds
- ii) aquaculture/fisheries discard valorisation in added value sectors
- iii) use of microorganisms and ICT tools for marine environment restoration,
- iv) sustainable integrated multi-trophic aquaculture (IMTA).

However, other value chains could be selected; furthermore, this collection has been preparatory to the definition of the most promising value chains in the BBt field, which will be reported in D3.2.2

In order to avoid overlapping between contributions, each partner was asked to give priority to local (national) initiatives; however, also international initiatives could be included in the list if considered relevant to this survey.

Element	Guidelines
Name of the Best Practice identified	Please, name the best practice (i.e., a short title) so that it could be easily recognized as far as its main contents are concerned
Developer(s) of the Best Practice	Please, indicate who is/are the organization/s who developed the best practice , the initiating Country and the institutional actors (leading entities)
Funding Sources	If you are aware of any, please specify the financial sources of this best practice activity
General idea of the BP	Please, provide the general idea of the Best Practice , explaining: -how this practice aims at supporting the development of the blue economy? -what are the BBt/value chains addressed by this Best Practice?



<p>Description of the Best Practice</p>	<p>Please, provide a detailed description of the Best Practice being addressed and an info link.</p> <ul style="list-style-type: none"> - what is the aim/objective of this best practice? - what are needs/challenges addressed by this Best Practice? - what is the impact and usefulness of this best practice? - in which way has the best practice contributed to an innovation?
<p>Concerned sector/field of interest</p>	<p>Please, list BBt value chain/sector to which the best practice is referred to, for example:</p> <ul style="list-style-type: none"> - Aquaculture (algae production for high-value compounds; discard valorisation in added value sectors; sustainable integrated multi-trophic aquaculture [IMTA]); - Cosmetics - Health/pharmaceuticals - Nutraceuticals - Feed industry - Energy (biofuels) - Industrial processes (enzymes, catalyzers, etc.) - Environment (bioremediation and other use of microorganisms, use of ICT tools for marine environment restoration, CO2 mitigation, biofertilizer, soil microalgae) - Other (please specify)
<p>Category</p>	<p>In which one of the best practices categories does this practice fall? Each category is described below:</p> <ul style="list-style-type: none"> - Business creation: It corresponds to the set of processes that boost the development of an idea into a business venture (innovative start-ups) able to face the market challenges. - Technology transfer: Transfer of technology is the process of transferring (disseminating) technology from the person/organization that owns or holds it to another person or organization. These transfers may occur between universities, businesses (of any size, ranging from small, medium, to large), governments, across geopolitical borders, to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials, or services. - Technological support: offered by companies or groups to help their target audience get the most out of their products. It corresponds to means to assess and deploy the potential of a technology or know-how, in relation with target markets: find out relevant experts or data sources, support on management and product or service development, development and use of dedicated technological equipment and infrastructures. - Funding Mechanisms: It corresponds to all the financial incentives available to boost the development of BBt and guidelines and methods that proved to ease the SMEs and organisations difficulties



	<p>to access finance. There are many different types of funding mechanisms, such as awards, research grants, cooperative agreements, specialised investment platforms and operational programmes.</p> <ul style="list-style-type: none"> - Strategies and Policy Management: It corresponds to any institutional decision, directive and strategy that favors the economic development of BBT sector. - Collaborative Innovation- Networking- Clusters- Knowledge Platforms: It is any initiative gathering different entities with the objective to develop a common innovative product, technology, approach or action. It corresponds to tools and approaches to facilitate the networking opportunities, creation of platforms and development of clusters. - Marketing/ Branding: It corresponds to any action to promote an approach, an offer, a product or a skill. - Other (please specify)
<p>Technology readiness Level (1-9)</p>	<p>Does the best practice correspond to a technological innovation? Please define the Technology Readiness Level.</p> <p>The Technology Readiness Levels are:</p> <ol style="list-style-type: none"> 1. Basic principles observed 2. Technology concept formulated 3. Experimental proof of concept 4. Technology validated in lab 5. Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies) 6. Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies) 7. System prototype demonstration in operational environment 8. System complete and qualified 9. Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)
<p>Business readiness level (1-9)</p>	<p>Does the best practice correspond to an innovative business idea? Please define the Business Readiness Level.</p> <p>The Business Readiness Levels are:</p> <ol style="list-style-type: none"> 1. Initial concept 2. Value Proposition (VP) and Business Model definition 3. Identifying or defining customers and customer persona 4. Testing hypothesis and customer interviews (maybe with prototype) 5. Building venture team and actionable plan 6. Build and launch Minimum Viable Product (MVP) 7. MVP feedback loop with new iterations 8. Scale MVP to full product with managed product life-cycle 9. Fully embedded in market



Contribution to sustainable development	<i>Please, explain how this practice is contributing to the implementation of the sustainable development goals (SDGs)</i>
Contact details	<i>What is the address of the people or the project to contact if you want more information on the best practice?</i>
Sources and Related resources that have been developed	<i>Please, explain how you have collected the best practice (literature review, interview to the Best Practice developer, direct experience of the Best practice, etc.) and report the key resources and references or links. What training manuals, guidelines, technical fact sheets, posters, pictures, video and audio documents, and/or Web sites have been created and developed as a result of identifying the good practice?</i>
Duration of practice	<i>(IF APPLICABLE)</i> <i>When (year) was the best practice initiated?</i> <i>Is it still ongoing or what is the year ended?</i>
Intellectual Property Rights (Y/N) or no info available	<i>If the best practice refers to a technological or business innovation, is it protected in law? (e.g., patents, copyright, trademarks)</i>
Transferability (1-5)	<i>In case the BP is taking place outside of your country, try to evaluate the easiness to be transferred in your country, considering:</i> <ul style="list-style-type: none"> - technology capacity, research infrastructures - market opportunities, - national legislation (supporting BBt), - national resources, and - financial instruments <i>(NOTE: use a value between 1 and 5 for each parameter, considering that 1 means “low/weak” and 5 “very high/advanced”)</i>



Results from the analysis of Best practices

From the collected data, as derived from partner contribution, **107 Best Practices are described** for innovation in the Blue Biotechnology sector (Annez 1). Further analysis of the collected BPs revealed **twenty-one (21) different Countries** as initiating Country for at least one notable BP, without taking into consideration International Organizations and European consortiums. Despite the fact that the collection of data has been suggested to have a worldwide dimension and has not been restricted among B-BLUE participant Countries, priority was given to MED area countries. The countries involved in these 100 BPs are shown in Fig.1 (however not reflecting in general the dynamic of the below mentioned countries in the field of blue biotechnology).

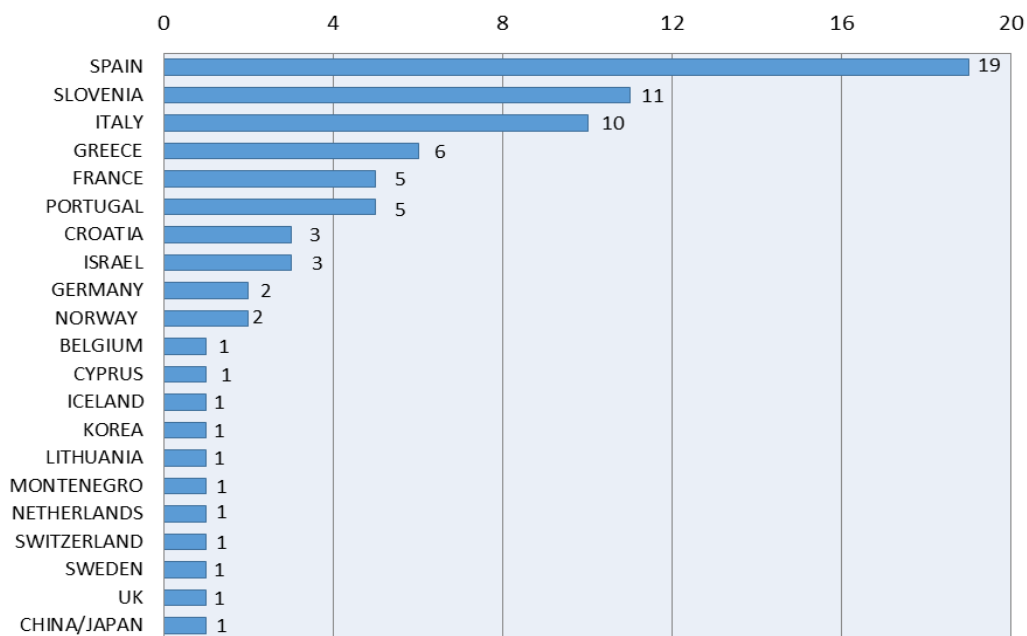


Fig 1. Repartition of the collected BPs by initiating country

Further analysis of the distribution of BPs by category revealed that the categories **Technological support** and **Technology Transfer** are represented by the highest percentage (31 and 23% respectively), followed by **Collaborative innovation – Networking-Clusters-Knowledge Platforms** (22%) and **Strategies-Policy Management** (11%). Lowest percentage (<5%) was recorded in categories Business creation, Funding Mechanisms and Marketing Branding. The allocation of BPs by category is shown in Fig 2.



Best practices by category (%)

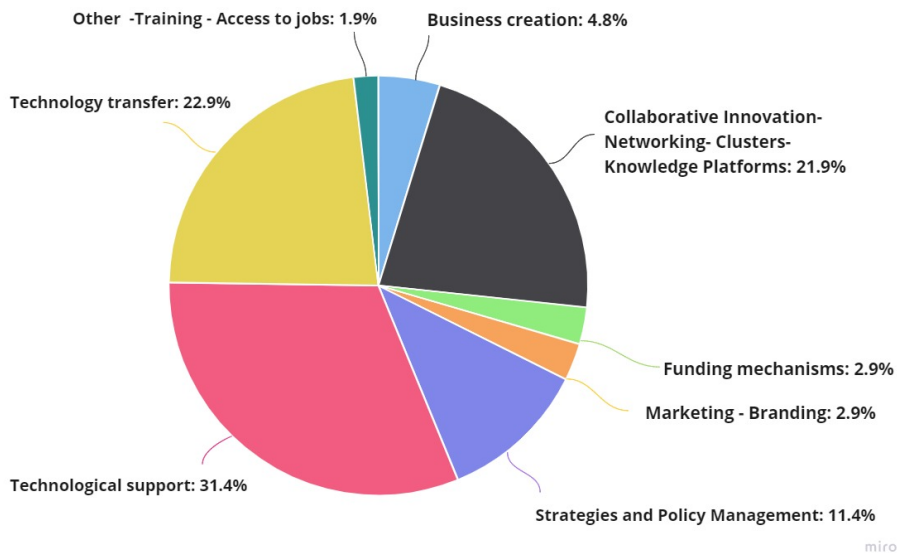


Fig 2. Percentage of Categories of the total collected Best Practices (BPs)

A sector analysis of the collected BPs (Fig.3) shows that **Aquaculture** is the most selected sector among the BPs, while BPs refer to **Environment, Food and Feed Industry** as well as **Cosmetics** with a percentage of 9-16%. The aquaculture sector includes activities for the provision of the marine resources biomass needed for BBT applications (micro-macroalgae cultures, fisheries/aquaculture discards valorisation, integrated multitrophic aquaculture-IMTA). Many BPs mainly from the categories Policy, Funding, Marketing and Business creation refer to all sectors.

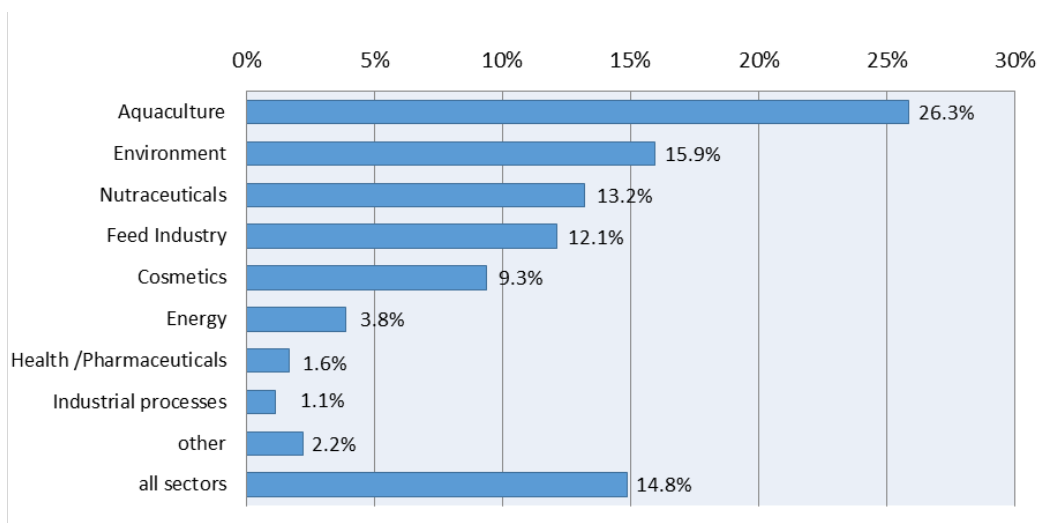


Fig 3. Sectors of interest of the BPs according to the collected data.



Best Practices in the Technological Field

From the BPs selected, 52% fall within the technological category. Fig.4 gives the projection of the estimated number of BPs that refer to technological applications by sector/field of interest. In total, about 1/4 of the identified applications refer to the sector of Aquaculture (28%), followed by Nutraceuticals (17.8%), the Feed Industry (16.1%), Environmental Conservation/Restoration Techniques (15.3%) and Cosmetics (15.3%).

The most mature technologies with TRL>6 refer to the aquaculture and food industry, the animal feed sector and the cosmetic industry, while there are patented products and processes in BBT sector for algae cultivation, pharmaceuticals products and cosmetics (Fig.5)

Sectors addressed by the identified technological applications in Blue Biotechnology

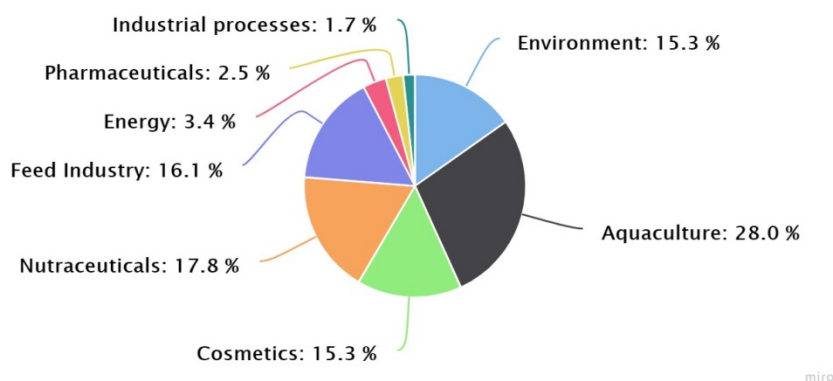


Fig 4. Categories percentage of the total collected Best Practices (BPs)

Sectors addressed by the identified technological applications in commercialization stage (TRL>6)

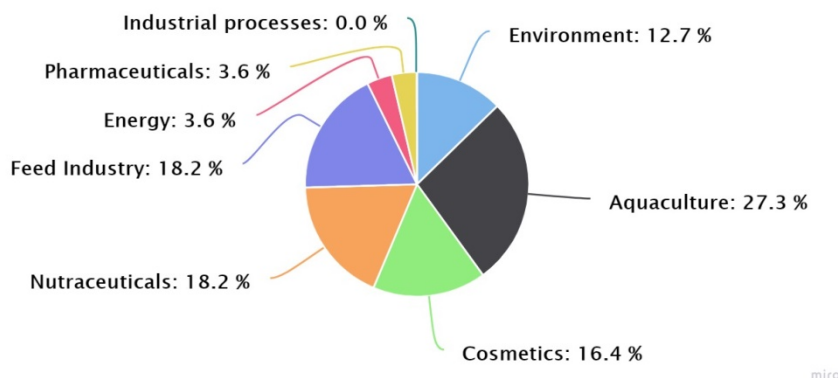


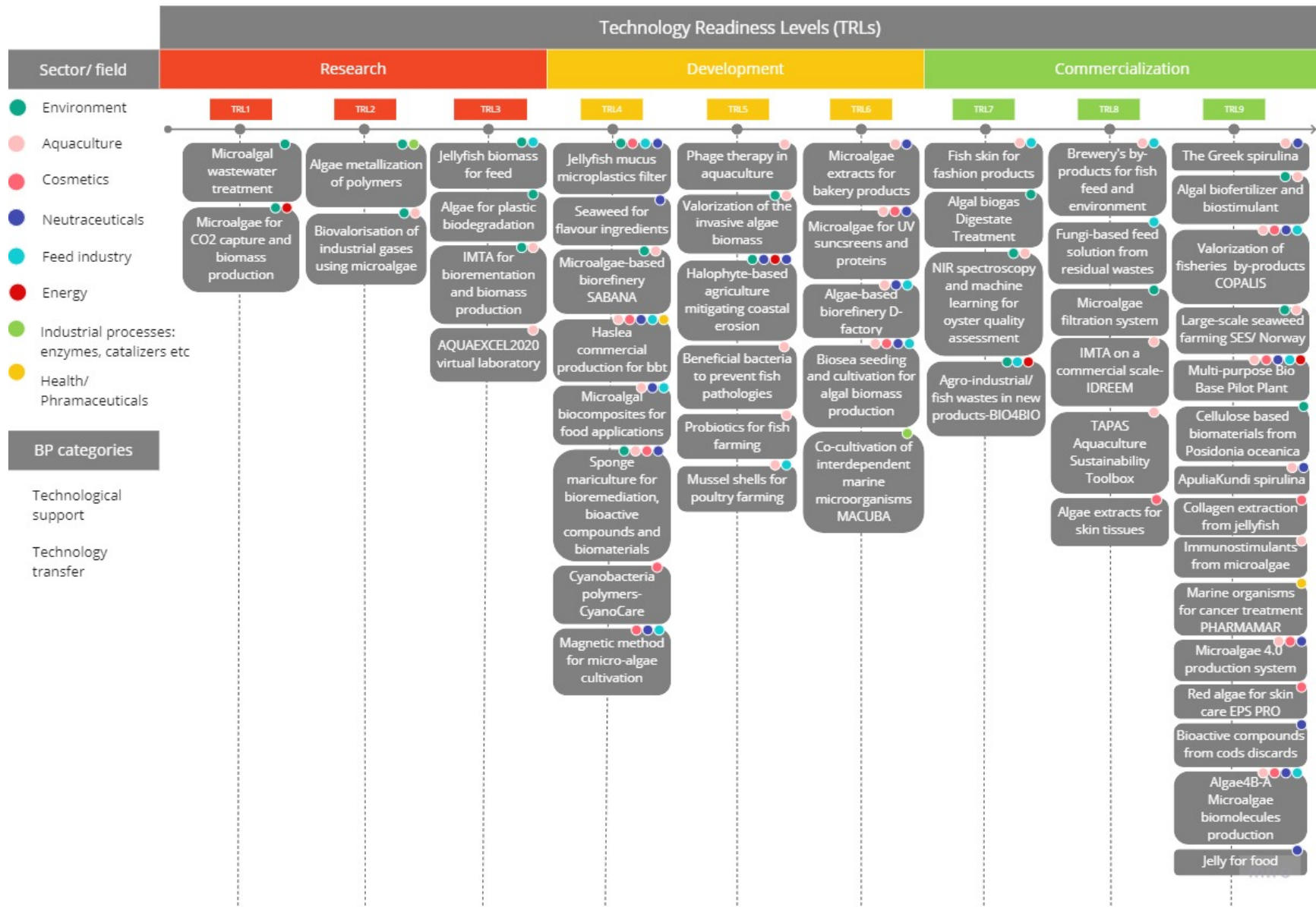
Fig 5. Categories percentage of the total collected Best Practices (BPs) with Technological Readiness Level (TRL)>6



The diagram below describes the relative thematic fields, the economic sectors addressed, and the technology maturity of these practices. About 30% percent of the identified practices mention mature, ready-to-market technologies and qualified systems (TRL 9), while 48% of these mentioned technologies and validated systems are in the commercialization stage.

In addition, 37% of these practices refer to applications of blue biotechnology that have been validated in laboratories or relevant environment (development phase), while giving emphasis to the cultivation of marine organisms and the valorization of fisheries and aquaculture by-products to produce high-added-value products, as well environmental conservation/restoration activities





Blue Biotechnology value chains

Blue biotechnology covers a complex network of activities linked to research and product development. The various sectors can be structured differently depending on the BBT value chain. A full value chain from the marine habitat to the biotechnology product includes all aspects from collection of the marine organisms or preservation in culture collections, the extraction, purification, structure elucidation and characterization of natural products, optimisation of production conditions, patent/publish results in order to safe intellectual property rights for possible industrial application and scale up to a pilot scale for biotechnological production of bioactive natural products.

The starting point of all activities or input to the process of extracting value from aquatic bio-resources is the collection/culture and harvesting of available biomass. Aquatic biomass is composed of many forms, including e.g. whole fish or parts, micro and macro-algae, sponge, fungi, marine invertebrates, microbiomes that may derive from near shore/offshore, aquaculture activities, integrated multi-trophic cultures (IMTA), discards from fisheries or aquaculture products. This biomass is the main source for the production of high value products, principally, as food and nutritional supplements, animal feed, bioactive compounds, prebiotics/probiotics, fine chemicals/enzymes, biofuel/biogas and used in commercial applications for the development of nutri-cosme-pharmaceuticals, in agriculture, energy and environmental conservation and remediation.

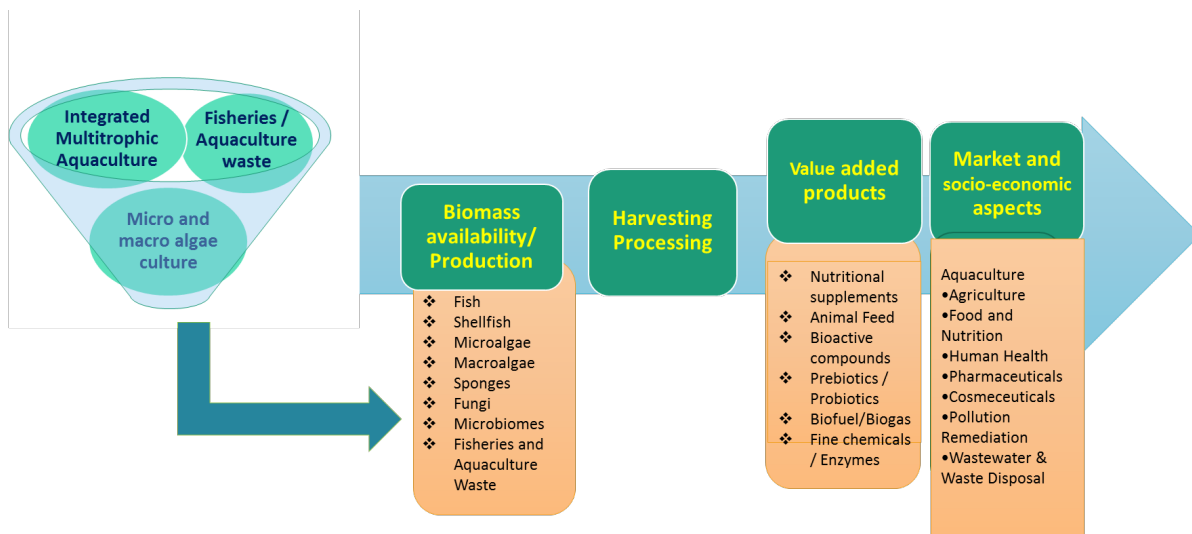


Fig 6 Different sectors of Blue Biotechnology value chain/s

All the above constitute different components, economic subsectors with different associated business models and in diverse technological stages of development. However, they are all interdependent and should be considered as complementary field of activities within the long BBT value chain/chains.

The information collected through the BPs identification and the sectors of interest support the four value chains as initially described.

1. *algae market (micro and macro-algae production for high-value compounds)*
2. *aquaculture/fisheries discard valorisation in added value sectors,*
3. *sustainable aquaculture and integrated multi-trophic aquaculture (IMTA)*
4. *marine environment conservation/restoration with the use of use of microorganisms and ICT tools*

From the selected BPs, mainly considering the technological field, **41% refer to the algae market value chain** and **22% to the aquaculture/fisheries discard valorization** in added value sectors. **Marine environment conservation and restoration refers to 15%** of the selected BPs, **sustainable aquaculture to 16%** of the BPs while **IMTA is less than 3%**. Finally, collection and exploitation of natural resources corresponds to 4% of the innovative technological applications described.

Identification of frontrunners: methodology

Frontrunners are defined in B-Blue as “*stakeholders having real experience (with some activity carried out) in a given value chain and who can show their experience with the intention of helping other interested actors*” (D4.1.1). As for stakeholders, in B-Blue they are considered as those actors who have an interest or a gain in a given value chain using BBT or who can affect the application of BBT into a value chain. Project partners decided to apply the so-called **quintuple helix approach** that, including the environmental dimension, sets the following stakeholder categories:

1. **Academia/Research**
2. **Business**
3. **Governance**
4. **Environment,**
5. **Society/End-users**

Frontrunner identification is *mandatory* for those partners involved in BBH development and *optional* for the other partners. Frontrunners has been defined as a result of a stakeholder analysis, as detailed in the attached excel file (see Annex 2). The analysis consisted of the following steps:

- 1- listing of the **value chains** characterised by the application of a BBT according to the information collected through the Best Practices identification - D 3.2.1 (e.g., the four value chains already suggested within B-Blue - *algae production for high-value compounds, aquaculture/fisheries discard valorisation in added value sectors, use of microorganisms and ICT tools for marine environment restoration, sustainable IMTA- or others, to be specified*);

- 2- selecting the **category of actors**, based on the quintuple helix approach (i.e., *Academia/Research, Business, Governance, Environment, Society/End-users*), that have an interest or a gain in the concerned value chain from the use of BBt or who can affect the application of BBt into such value chain;
- 3- identifying the **stakeholders** belonging to the concerned category by addressing a short list of questions:
 - *Does the actor play an active role in the value chain?*
 - *If not, does the actor benefit from the value chain?*
 - *If not, does the actor provide an external benefit to the value chain?*
- 4- addressing further questions aimed at defining whether a stakeholder (those actors for whom one of the previous questions has been addressed positively) is also **potential frontrunner**:
 - *Does the actor play an active role in the value chain?*
 - *If yes, is the actor in charge (or directly involved) in the application of the BBt in the concerned value chain?*
- 5- Shortlisting the value chains and related stakeholders/potential frontrunners by ranking the **Technology Readiness Level** of the BBt applied (it should be higher than 5). *NOTE: those stakeholders/potential frontrunners linked to a BBt with a TRL higher than 5 are automatically considered, for the purposes of this analysis, as Identified Frontrunners since such indicator proves a real experience on activities already carried out. Nevertheless, those stakeholders/potential frontrunners linked to a BBt with a TRL lower than 5 (or NA) can be included the same in group of Identified Frontrunners if their experience is considered relevant by the partners involved in BBH development.*

Project partners were also invited to consider that the identification of best practices should guide them in the identification of frontrunners (i.e. the promoters of such best practices). Moreover, this collection has been organised as complementary to D3.2.2 and likely propaedeutic to the identification of the **Sherpa Groups** (D4.1.1). The Sherpa Group works as an advisory board: its members can be **local PPs, frontrunners and key stakeholders**, but must be **involved in the project as advisers or experts and thus have a great knowledge of the sector in the territory**. Indeed, such role implies to:

- help identifying the stakeholders who could benefit from the pilot activities of the local BBH;
- use his/her expertise in the field to express his/her opinion on the choice of value chain, type of activities tailored to local needs, etc.

To this end, the analysis added some further steps:

- 6- addressing further questions aimed at defining whether a stakeholder or frontrunner (those actors for whom one of the previous questions has been addressed positively) is also a **potential SHERPA GROUP member**:
- *Is the actor willing to participate in the project [pilot]?*
 - *Does the actor have a potential [low, medium, high] impact in the project pilot?*

According to the methodology described here above, those stakeholders who are in charge (or directly involved) in the application of a BBT, possibly with TRL higher than 5, in the concerned value chain have been considered as **Identified Frontrunners**. Those frontrunners or stakeholders who are willing to participate in the project [pilot], with a *potential impact from medium to high*, have been considered as potential **Sherpa Group Members**.

Results from the analysis for the identification of frontrunners

Stakeholder analysis for frontrunner identification resulted in a collection of about **180 stakeholders**, with several of these being involved in more than one value chain. Most of the stakeholders reported in the documents obtained from the partners ENEA, HCMR, CNR, UMU, PMM and HAMAG-BICRO were represented by Academia or Research bodies (48%) and Business (31%), followed by Society/end users (9%), governance (6%) and environment-related stakeholders (5%) (Figure 7, left panel). A remaining 2% of the total collected stakeholders belonged to other categories including producer organization, non-profit association or technological platforms (Figure 7, left panel).

The analysis of stakeholder produced within this deliverable highlighted that **algae (or microalgae) production** (mainly to obtain high-value compounds) **and aquaculture or fisheries discard valorisation** were the most represented (30% and 25%, respectively) (Figure 7, right panel). IMTA (21%) and other value chains connected with aquaculture sustainable solutions and farming, including ecotoxicological and monitoring tools (7%) were also present in the analysis, together with a 7% related to the use of microorganisms and ICT. Sectors dealing with health-care applications (i.e., nutraceuticals, medical compounds) and marine environment (e.g., marine environment promotion, sustainable exploitation of resources, detection of pollution, recycling,) (10%) were also represented in the stakeholder list (Figure 7, right panel). Per each BBH, mostly local (i.e., national e/o regional) stakeholders were presented.

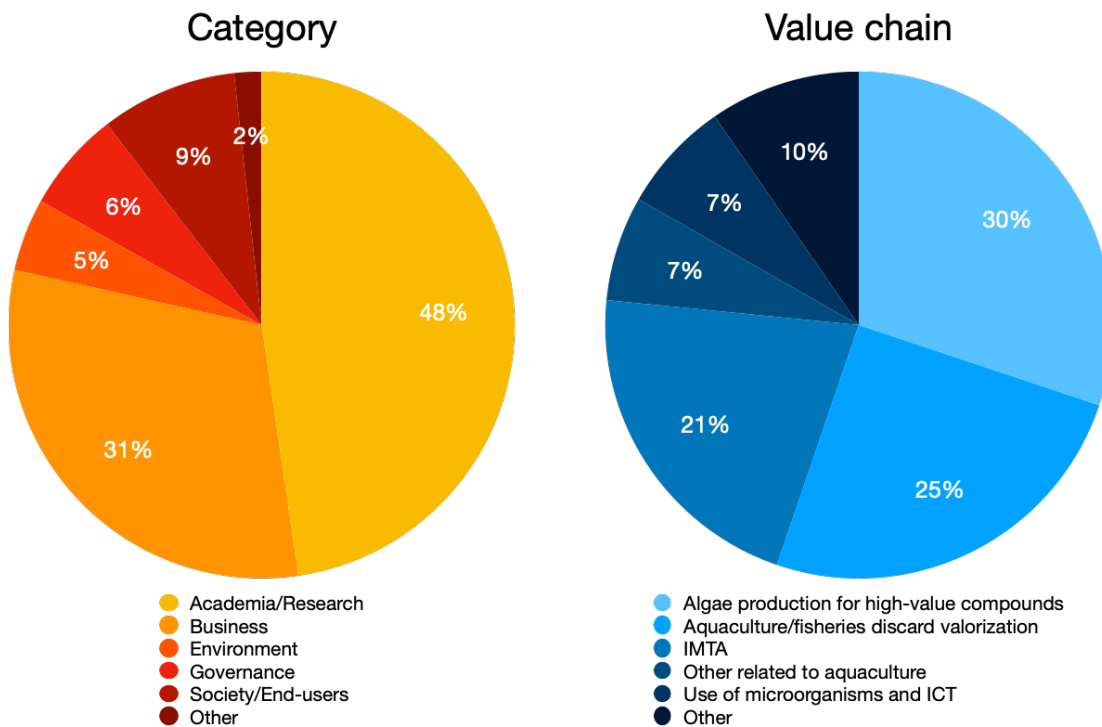


Fig. 7. Pie-chart showing categories and value chains represented in the stakeholder analysis for frontrunners identification.

Based on the analysis performed following the criteria detailed above, we here **suggest those stakeholders who could be considered as *Identified Frontrunners*** for each of the partners involved in B-Blue BBHs and also those who could likely be part of the *Sherpa Groups*:

1 - BBH ITALY

Stakeholder	Category	Value chain	Identified Frontrunners	Frontrunners/ Stakeholders suggested to be involved in the Sherpa Group
Algesiro	Business	(micro)algae production for high-value compounds	X	X
Apulia Kundiş	Business	(micro)algae production for high-value compounds	X	
Gargano Shell Fish Farm	Business	aquaculture/fisheries discard valorisation in added value sectors	X	X
SouthAgroş	Business	algae production for high-value compounds	X	X
Suf Fish Mariculture Ltd	Society/End-users	sustainable IMTA	X	
Università Federico II di Napoli	Academia/Research	aquaculture/fisheries discard valorisation in added value sectors		X
University of Foggia	Academia/Research	algae production for high-value compounds		X
Vitalab S.R.L. Italy _ Naples	Society/End-users	algae production for high-value compounds	X	

Viking Fish Farm*	Society/End-users	sustainable IMTA	X
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§ possibly willing to participate in the project pilot

*company outside Italy

Frontrunners identified for the BBH in Italy (n=7) are mainly related to business and society/end-users, with active roles in the algae production and aquaculture/fisheries discard valorisation and potentially gaining or affecting the application of BBT in these value chains. One of the selected companies is, however, located and operating outside Italy, and thus likely not included for BBH implementation activities. Most of the identified frontrunners are located in Apulia Region, where the pilot activities will be performed. Two Universities, with scientific expertise in both the selected value chains, were also identified as potential additional members of the Sherpa Group.

2 - BBH GREECE

Stakeholder	Category	Value chain	Identified Frontrunners	Frontrunners/ Stakeholders suggested to be involved in the Sherpa Group
Agroinvest§	Business	aquaculture/fisheries discard valorisation in added value sectors	X	
CMFO	Business	aquaculture/fisheries discard valorisation in added value sectors	X	
Fish from Greece§	Producer Organisation	aquaculture/fisheries discard valorisation in added value sectors	X	
PEPMA §	Business	aquaculture/fisheries discard valorisation in added value sectors	X	
APIVITA§	Business	algae production for high-value compounds	X	
Kefalonian Fisheries§	Business	algae production for high-value compounds - IMTA	X	
LAMAR-Blutopia Marine Park§	Business	algae production for high-value compounds - IMTA	X	
MicroPHYCOS	Business	algae production for high-value compounds	X	X
HCMR	Academia/Research	aquaculture/fisheries discard valorisation in added value sectors+algae production for high-value compounds	X	X
NKUA-PHARM	Academia/Research	aquaculture/fisheries discard valorisation in added value sectors	X	
Agricultural University of Athens	Academia/Research	algae production for high-value compounds		X
Hellenic Agricultural Organization	Academia/Research	algae production for high-value compounds		X
"Demeter" -INALE§				
NTUA- School of Chemical Engineering / Laboratory of Biotechnology§	Academia/Research	algae production for high-value compounds		X
Univ. of Patras- Depart. of Biology§	Academia/Research	algae production for high-value compounds		X

UoC-Depart. of Biotechnology and Applied Biology	Academia/Research	algae production for high-value compounds + IMTA			X
Directorate General of Fisheries, Ministry of Rural Development & Food	Governance	aquaculture/fisheries discard valorisation + algae production for high-value compounds	X		
GSRI(Associate Partner)	Governance	aquaculture/fisheries discard valorisation +algae production for high-value compounds	X		X
HATIP-Hellenic aquaculture Technology and Innovation Plattform	Technological Platform	aquaculture/fisheries discard valorization + algae production for high-value compounds	X		
Ministry of Environment	Governance	aquaculture/fisheries discard valorisation + algae production for high-value compounds	X		
Region of Attica§	Governance	aquaculture/fisheries discard valorisation in added value sectors+ algae production for high-value compounds	X		
Region of Central Macedonia§	Governance	aquaculture/fisheries discard valorisation in added value sectors+ algae production for high-value compounds	X		
Hellenic Initiative MicroViokosmos§	Non Profit Association	algae production for high-value compounds	X		X

§ possibly willing to participate in the project pilot

For the BBH in Greece, identified frontrunners (n=22) are largely linked to algae production and discards -fish residual bio-resources Cat-3 valorisation from aquaculture/fisheries and represent potentially impacting stakeholders in the application of BBt within these two value chains. Several companies, Academia/Research and Governance bodies, are part of the innovation frontrunners for this BBH, including a Producer Organisation and a technological platform. Additional 3 Universities/Research Centres, a company, a non-profit research association and a governance body, were also identified as potential additional members of the Sherpa Group.

3 - BBH SLOVENIA

Stakeholder	Category	Value chain	Identified Frontrunners	Frontrunners/ Stakeholders suggested to be involved in the Sherpa Group
AlgEN	Business	algae production for high-value compounds	X	X
Aquafil	Business	other*	X	X
BioApp	Business	algae production for high-value compounds and use of microorganisms + ICT tools for marine environment restoration		X
GoJelly	Business	aquaculture/fisheries discard valorisation in added value sectors + use of microorganisms and ICT tools for marine environment restoration		X

*plastic waste recycling included production of bioNylon starting from fermentation processes-derived products

For the Slovenian BBH, two stakeholders were identified as frontrunners and dealing with algae production for high-value compounds and plastic waste recycling. Both frontrunners are business-related stakeholders, i.e., companies, with a high potential to strengthen the application of BBt. Two additional companies working with microorganisms and ICT tools for marine environment restoration and with the use of fisheries/aquaculture discards have also been indicated as potential members of the Sherpa Group.

4 - BBH SPAIN

Stakeholder	Category	Value chain	Identified Frontrunners	Frontrunners/ Stakeholders suggested to be involved in the Sherpa Group
A Coruña University	Academia/Research	algae production for high value compounds	X	
Alevines de Guardamar	Business	aquaculture/fisheries discard & IMTA	X	
ANDROMEDA IBERICA	Business	aquaculture/fisheries discard & IMTA	X	X
ASN LEADER	Business	algae production for high value compounds	X	X
Biodiversity Foundation	Governance	aquaculture/fisheries discard / algae production for high-value	X	X
BIONOS BIOTHEC	Business	algae production for high value compounds	X	X
BUGGYPOWER	Business	algae production for high value compounds	X	X
C.I.F.P. Marítimo Zaporito	Academia/Research	aquaculture/fisheries discard & IMTA	X	
Catholic University of Valencia	Academia/Research	aquaculture/fisheries discard & IMTA / algae production for high-value/ use of microorganisms and ICT / others *	X	X
CENAVISA	Business	aquaculture/fisheries discard & IMTA	X	
CETMAR FOUNDATION	Academia/Research	aquaculture/fisheries discard & IMTA / algae production for high-value	X	X
Cluster Acuiplus	Business	aquaculture/fisheries discard & IMTA & algae production	X	X
CONSERVA TECHNOLOGY CENTER	Business	algae production for high value compounds	X	X
CSIC-CIB (Margarita Salas Center for Biological Research) / Environmental Biotechnology	Academia/Research	use of microorganisms and ICT	X	X
CSIC-UIB-IMEDEA / Marine Microbiology	Academia/Research	use of microorganisms and ICT	X	X
Ctaqua	Business	aquaculture/fisheries discard & IMTA	X	X
CULMAREX	Business	aquaculture/fisheries discard & IMTA	X	X
DIBAQ aquaculture	Business	aquaculture/fisheries discard & IMTA / algae production for high-value/ use of microorganisms and ICT / others*	X	
Doramenor Acuicultura, S.L.	Business	aquaculture/fisheries discard	X	

ESTERLLA DE LEVANTE	Business	aquaculture/fisheries discard & IMTA	X	X
FARM Asociación de Empresas de Acuicultores de la Región de Murcia	Business	aquaculture/fisheries discard	X	
Fisheries and aquaculture Service. DG Agriculture, Livestock, Fisheries and aquaculture	Governance	aquaculture/fisheries discard & IMTA	X	X
HEALTH TECH BIO ACTIVES	Business	aquaculture/fisheries discard	X	
IAMZ Instituto Agronomico Mediterráneo de Zaragoza	Academia/Research	aquaculture/fisheries discard & IMTA	X	X
ICMAN-CSIC	Academia/Research	aquaculture/fisheries discard	X	
ICSEM	Business	aquaculture/fisheries discard & IMTA	X	X
IFAPA - Andalusian Regional Government / Blue Growth Associated Unit	Academia/Research	aquaculture/fisheries discard & IMTA / algae production for high-value	X	X
IMIDA/ Region of Murcia Government	Academia/Research	aquaculture/fisheries discard & IMTA	X	X
INNOAPAT: Food and Agriculture Research and Technology	Academia/Research	aquaculture/fisheries discard & IMTA & algae production	X	X
Instituto Tecnológico Agrario de Castilla y León	Academia/Research	aquaculture/fisheries discard	X	
IRTA: Recerca i Tecnologia Agroalimentàries / aquaculture Department	Academia/Research	aquaculture/fisheries discard & IMTA / algae production for high-value/ use of microorganisms and ICT	X	X
KARMA MICROALGA	Business	algae production for high value compounds	X	X
LIFE BIOENCAPSULATION	Business	aquaculture/fisheries discard	X	
MEALFOODEUROP	Business	aquaculture/fisheries discard & IMTA	X	
Miguel Hernández University / Institute for Research, Development and Innovation in Healthcare Biotechnology of Elche (IDiBE)	Academia/Research	other *	X	X
PESCADOS DE ACUICULTURA DE MURCIA	Business	aquaculture/fisheries discard	X	X
PHARMAMAR	Business	use of microorganism & other (BBT health applications)	X	X
PISCIALBA	Business	aquaculture/fisheries discard	X	
Polytechnic University of Cartagena	Academia/Research	aquaculture/fisheries discard & IMTA / algae production for high-value/ use of microorganisms and ICT	X	X
Sociedad Española de Acuicultura	Academia/Research	aquaculture/fisheries discard & IMTA	X	X
Spanish algae Bank	Academia/Research	algae production for high value compounds	X	
Spanish Institute of Oceanography / Murcia Center	Academia/Research	aquaculture/fisheries discard & IMTA / algae production for high-value/ use of microorganisms and ICT	X	X
Spanish Society of Ficology	Environment	algae production for high value compounds	X	
TILAMUR	Business	aquaculture/fisheries discard & IMTA & algae production	X	X

University of Almeria / Chemical Engineering Department	Academia/Research	algae production for high value compounds	X	X
University of Malaga / Blue Biotechnology Institute	Academia/Research	aquaculture/fisheries discard & IMTA / algae production for high- value	X	X
Xarxa Marítima d'R+D+I de Catalunya (BlueNetCat)/	Academia/Research	aquaculture/fisheries discard & IMTA	X	X
CEBAS - CSIC	Academia/Research	use of microorganisms and ICT		X
CEEIM: European Innovation Center for Enterprises in Murcia Region	Business	aquaculture/fisheries discard & IMTA & algae production		X
CETENMA	Business	algae production for high value compounds		X
Naval and Sea technology center	Academia/Research	IMTA		X
The Biomedical Research Institute of Murcia (IMIB)	Academia/Research	other *		X

*health care

For the BBH in Spain, 47 frontrunners were identified, with about half of them belonging to companies (dedicated to the valorization of discards from aquaculture and fisheries as well as to algae production and IMTA) and another half belonging to Academia and Research bodies specialized in the same value chains. Being also Governance and Environment included in the list of frontrunners, BBH in Spain can potentially take advantage of a large, highly specialized and impacting group of frontrunners for the development of BBt. Several additional Universities and Research Centres and companies working in the same value chains as for frontrunners, were also identified as potential additional members of the Sherpa Group.

5 - BBH FRANCE

Stakeholder	Category	Value chain	Identified Frontrunners	Frontrunners/ Stakeholders suggested to be involved in the Sherpa Group
Inalve°	Business	algae production for high-value compounds	X	X
Greensea°	Business	others*	X	X
ImmuneRise Biocontrol France °	Business	algae production for high-value compounds	X	X
Microphyt°	Business	algae production for high-value compounds	X	X
Fermentalg°	Business	algae production for high-value compounds, other*	X	X
Manros therapeutics°	Business	others*	X	X
MEUROSES°	Business	others*	X	X
Roquette°	Business	algae production for high-value compounds	X	X
Watch frog°	Business	others*	X	X
U Marinu CPIE Bastia Mediterranee	Governance	others**		X
CPIE Bassin de Thau	Governance	others**		X

Ministère de la Mer	Governance	others**	X
CEPRALMAR	Governance	others**	X
Institut de la Mer de Villefranche (Sorbonne Université)	Academia/research	(micro)algae production for high-value compounds, others**	X
IFREMER	Academia/research	others**	X
EMBRC-Europe (ERIC)	Academia/research	others**	X
IES Montpellier	Academia/research	others§	X
Institut Fédératif de Recherche - Ressources Marines (MARRES)	Academia/research	others**	X
Observatoire Océanologique de Banyuls	Academia/research	others**	X
Station Biologique de Roscoff	Academia/research	(micro)algae production for high-value compounds	X

°Possibly interested in the project pilot

*Nutraceuticals and medical (anti-cancer molecules and orphan diseases; endocrine disruptors on embryos, study on cell regeneration; Alzheimer molecules, Parkinson, multiple sclerosis)

**Territorial ecological transition, activities related to the promotion of lagoon and maritime areas, marine exploitation, marine resources, European Marine Biological Resources, marine bacteria and study on cell regeneration, biotechnology

We have identified 9 highly-specialized and qualified companies as frontrunners for the BBH in France, mainly dedicated to algae production and to several other applications including medicals and nutraceuticals, all possibly interested in the project pilot. Several additional governance and academia/research bodies have been also proposed as potential members of the Sherpa Groups; although mostly interested in value chains other than those mainly referred to in B-Blue, their contribute still might be stimulating possible synergies among different areas of expertise in biotechnologies bringing to novel BBt applications.

Finally, although being not directly involved in the implementation of a territorial BBH, HAMAG-BICRO and ANI have provided a short list of stakeholders; HAMAG-BICRO reported two additional stakeholders (Grad hrane d.o.o., a food producer company; Benco Baltic d.o.o., an oyster farming company) as high TRL (>6) and actively involved in the respective value chains; ANI reported three stakeholders (two research bodies, i3S - Institute for Research and Innovation in Health and CIIMAR - Interdisciplinary Centre of Marine and Environmental Research of the University of Porto; one company, Green Colab) with low TRL (4), with CIIMAR and Green Colab being actively involved in the relevant value chains.