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Gaps and Growth Opportunities Report

Work Package Innovation

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Description of the deliverable	This report is the main deliverable of Panoramed's Innovation Work Package. It analyses gaps and growth opportunities for the MED Area regarding innovation in the blue bioeconomy and it provides recommendations. The first part of the report focuses on the potential of blue biotechnology to drive sustainable growth in the MED Area. The second part of the report focuses on better governance of innovation policies in the MED Area.
Key words	Innovation, blue bioeconomy, blue biotechnology, governance of innovation policies, Sustainable Development Goals

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Presentation

Blue Growth is recognised at global scale as a promise for socio-economic development and human well-being. However, the UN Agenda 2030 and its Sustainable Development Goals (SDGs) challenge us to achieve "Sustainable Blue Growth", recognising present and future Planetary Boundaries and highlighting the potential incompatibility with business as usual growth.

The Mediterranean, a place where we could forecast and even dream of a Mediterranean "Blue Gold Rush", represents a live laboratory to exploit potentials, test processes and practices, monitor and evaluate results, due to its quite peculiar environmental, economic and geopolitical characteristics.

Several ongoing Policy Strategies and Initiatives, at the International, EU and national level will be further developed and implemented in the next years, designing a complex policy ecosystem that outlines both boundary conditions and key enablers. In particular, the new Programming Period (2021-2027) is being finalised in the EU and will address in the near future, among others, Cohesion, International Cooperation, Research and Innovation, Environment and Climate, Strategic Investments policies.

In this complex environment, Panoramed plays an important role representing the multi-level governance pillar of the Interreg MED Programme. Panoramed Steering Group recently proposed a new Strategic Work Package on Innovation, focusing in particular on Blue Bioeconomy. This surely was a wise and forward looking decision, complementing other streams already active under Panoramed (i.e. sustainable tourism and surveillance) and under the MED Programme as a whole (i.e. blue and green growth, sustainable tourism, energy, biodiversity protection, etc.). Nowadays, Blue Bioeconomy offers largely underexploited potentials in the Mediterranean, it is part of the overall EU Bioeconomy Strategy and Circular Economy Package and it connects, directly or indirectly, with several other sectors of the Blue Economy (e.g. fisheries, aquaculture, energy, tourism, conservation, etc.).

The Report on Gaps and Growth Opportunities (GGOR) is an essential step under Panoramed towards the identification and the implementation of strategic actions for the short and the medium-long term. The two parts on which the Report is structured complement each other, offering a more technical (Part 1) or a more governance / policy oriented (Part 2) perspective. Stemming from a thorough conceptual analysis and framework that identifies in:

i. R&I feeding value chains,

ii. New business models and

iii. Multi-actors governance models the three key drivers, the Report proposes a long list of interlinked "possible actions" or "opportunities for growth", building a complex, but conceptually well integrated, toolbox for technical/technological, socio-economic,

capacity building and policy measures. Several good practices are also presented, qualifying then the state of the art and the ongoing processes and experiences.

Among several relevant messages reported, the importance of strengthening at local level the Bioeconomy Innovation Ecosystem through Living Labs and other forms of interaction between science, SMEs/industry, policy makers, society and the proactive role that Public Administrations can play to promote R&I and emerging business models and ensure coherent (i.e. horizontal, vertical, temporal and territorial coherence) innovation policies seems particularly important.

Although Interreg MED mainly regards EU countries, a pan-Mediterranean vision and approach, promoting cooperation with non-EU countries, is highly recommended, in line with Panoramed specific objectives and with most of the ongoing regional Strategies and Initiatives (e.g. BLUEMED, WESTMED, EUSAIR, UNEP-MAP, CPMR, UfM, GFCM, PRIMA).

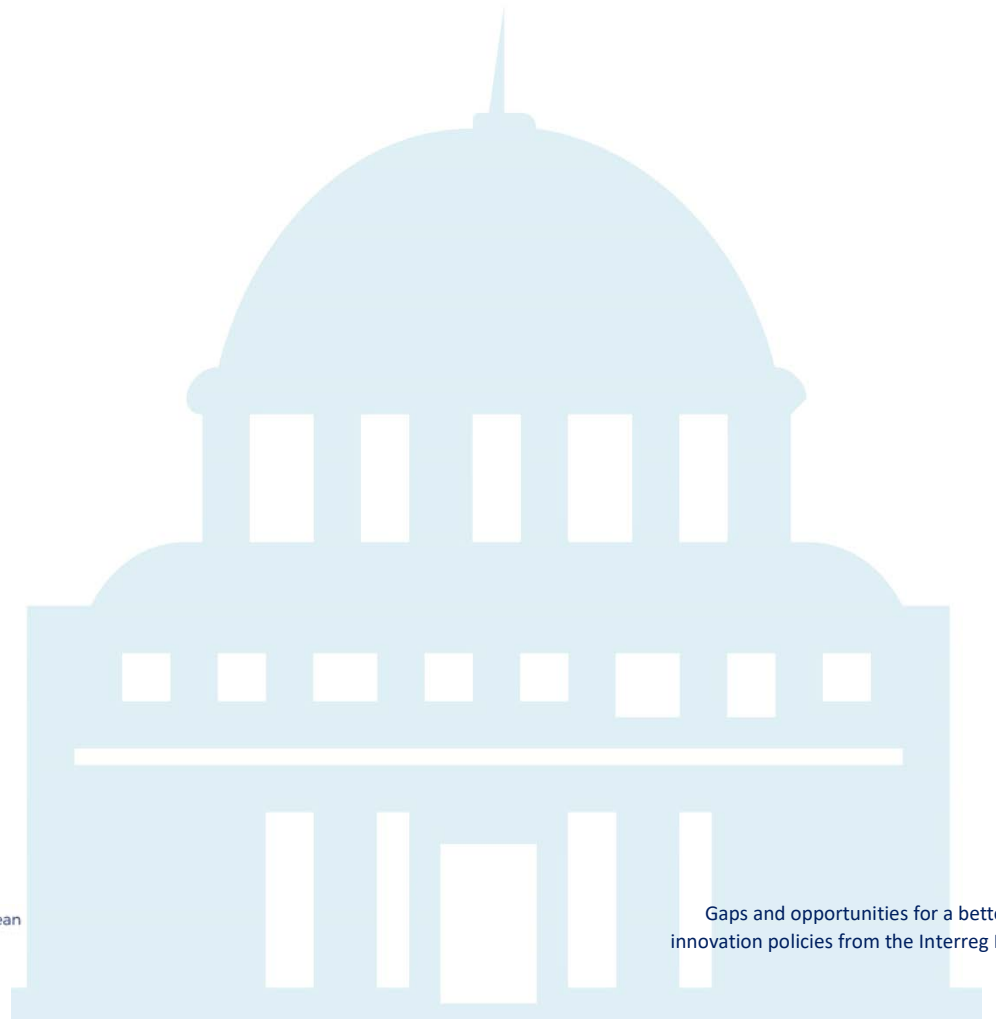
BLUEMED has identified Blue Bioeconomy and Blue Biotechnologies as one of the priorities from its Strategic Research and Innovation Agenda (SRIA) (Challenges “Innovative Blue Growth trajectories: biotechnologies, food and the deep sea resources” and “Innovative businesses based on marine bio-resources”), with the specific objectives of improving the knowledge of the Blue Biotechnologies, studying and defining their economic potential, supporting their development and implementing shared policies within the Mediterranean basin for a sustainable exploitation of marine bio-resources and/or biomasses.

Therefore, BLUEMED welcomes Panoramed Innovation on Blue Bioeconomy, and looks forward to continuing the established collaboration, towards a strategic Alliance for Blue Bioeconomy in the Mediterranean, involving in a joint effort the scientific community, business operators and administrators.

Dr. Andrea Barbanti, BLUEMED Coordination and Support Action,

Policy Platform Coordinator

PART 1



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Executive summary of Part 1

Blue Bioeconomy as a sector has an anticipated high growth rate in the upcoming years (revenue generation, new high-end jobs, employment increase, high value-added specialized products). This is because there are many societal needs for products/services that are produced by using Blue Biotechnologies (food, medicines, cosmetics, tourism/leisure, biofuels etc.). However, a certain mismatch exists between this economic potential and political, legal, R&I, educational, infrastructural framework in the Mediterranean (MED) area to harness this potential for the benefit of MED population.

Within this report, we will briefly present the gaps and opportunities for growth related to these specific application areas. The report is based on a comprehensive analysis of different types of relevant sources/data (experts' gaps analysis, EU programmes/initiatives, EU and national projects, EU documents). More than 22 big EU programmes and app. 150 EU and national projects were carefully analyzed. Experts from 8 Panoramed partner countries provided their input in gaps analysis and project selection. In our final analysis and report, our focus was on finding and presenting Blue Biotechnology MED specific findings and recommendations; corollary to that, we tried to avoid presenting very general, cliché statements and recommendations as much as possible. Most important findings are as follows.

Societal challenges - the "*umbrella*" challenge

Societal challenges are becoming increasingly important and society in general is becoming more demanding. New societal challenges have been occurring that have not been properly dealt with yet, and will require appropriate responses, e.g. people are looking after themselves and their healthy diet more, they are requesting more food supplements, healthy food and health boosting products; pharmaceutical companies are seeking new biomedicines that could help in disease treatment and pain relief; more leisure activities by the sea (due to temperature increases); increased interest in studying marine related areas; feeding a growing population and ensuring sustainable/safe food systems; micro plastics in the sea.

Policy as a driver

In political framework, there is a policy fragmentation, national policies are often not focused enough on Blue Biotech, a process of modifying policies is very slow and bureaucratic, there is a geographical discrepancy (some areas/cities are addressing Blue Biotech more intensively than others). Also, the existing strategies and EU programmes in the MED area have limited funding and impacts.

Legislation & Governmental solutions

Regarding legal framework, the legislation (also related to Intellectual Property) is also fragmented, dispersed, non-harmonized among countries. An example is Novel Food. Currently, it is possible that an innovation is legal in France yet illegal in Greece. Moreover, rules and regulations concerning sea life usage are often too complex, inefficient and unclear to many stakeholders, adopted and/or amended too slowly. Authorities should issue regulations on different topics: microalgae cultivation and quality standards of algal biomass, access and use of genetic resources and sharing of benefits, decrease in restrictions concerning novel food. A full Access and Benefit Sharing (ABS) should be implemented. There is also a need for standardization in order to set guidelines to encourage product development. There is a lack of a common licensing for the use of marine bio resources (regarding harvesting, culture and extraction of marine biomass).

Access to financing

There is a lack of funds and mechanisms to financially support Blue Biotech projects and start-ups. Projects and businesses in this sector also lack understanding of investment landscape and knowledge on how to present opportunities to potential investors. Hence, financing Blue Biotech projects is presently rather unpredictable and SMEs can therefore be very vulnerable. The existing public funding schemes are too complex, i.e. it takes a long time for projects to be evaluated and track processes from decision to payment are also somewhat slow. Access to risk finance and leveraging private finance and venture capital for R&I, experts' support and suitable insurance policies are necessary.

Challenging business models

Key stakeholders report technical logistics challenges for marine biomass processing (complex and expensive operations throughout the entire production cycle). There is also a lack of valorisation of by-products from marine origin materials (e.g. discards of fishery by-catch – up to 25%, discards in the fish processing industry up to 75%, etc.). The reasons behind the said are a lack of interest of the business community/investors and regulatory unclarity.

Education and training

Currently, there is still a mismatch in the MED area between the education/training offered (universities, VET institutions etc.) and industry and market demand in Blue Biotech sector, which hinders the development of new Blue (Biotech) businesses and products. Training is often neither specialized, specific enough, nor interdisciplinary and holistic enough to solve technological problems specific to dealing with marine organisms and the marine

environment. There is also a lack of commercialization skills. Therefore, new blue bio jobs' profiles should be defined or redefined, addressing current & future industry/market needs. There is also a shortage of qualification programmes for public administration bodies (specifically aimed at technicians/managers of funding programmes). Blue bio programmes should be developed and integrated also into the existing EDU institutions. Upskilling should address researchers, students, technicians, entrepreneurs, managers & leaders as well as industry employees.

3 Innovation Ecosystem and Infrastructure

Despite the progress enabled by the EU programmes, innovation ecosystems/infrastructure in different countries/areas are presently at different levels of development, so there is an acute need to continue to develop (or create) innovation ecosystem. Know-how innovation ecosystem services in the Blue Bioeconomy have not been well developed yet (access to R&D results, projects, know-how, data etc.). There is a need for common and easily available infrastructure network with common pilot & upscale units available to all stakeholders. Co-funded projects are required to set up pilot units close to local industries and to improve commercial connections and logistical platforms surrounding blue bioresources production centres.

Market aspects

Consumer awareness/acceptance of novel blue bio products is limited. Current key players consider sector rather 'invisible'. One of the challenges is a clear definition of advantages of blue biomass/products to enable penetration into the existing value chains.

R&D and Technology challenges

Blue Biotechnology sector is still in its formative years, but its potential to contribute to key societal challenges represents a strong driver. Improving capability to develop the whole value chain from R&D to commercialization (presently, partnerships are weak and dispersed) is essential. Business models should be based for example on the concept of biorefinery; the establishment of regional pilot plants and small biorefineries could encourage and boost further investments. Integration of expertise from currently unconnected areas of enabling technologies should also be improved. Generally, there is a need for development of new tools and approaches to find biological and environmental hotspots, to characterize the bioactive potential of marine compounds and to develop economically viable models for the commercialization of bioproducts.

Technological challenges refer mainly to the limited capability to cultivate many microorganisms in the laboratory and/or to optimize the production/downstream processes at larger scale. Successful culturing technologies will need to create larger amounts of biomass as well as increase processing know-how and biorefinery technology to transform marine biomass into marketable products. A capacity to replicate bioresources in laboratories is missing and there are difficulties in accessing ship equipment for modern bioprospection (networks and ship equipment for modern bioprospection require upgrading). Generally, it is difficult to hire specialized human resources and to access laboratory spaces.

4

Emerging technologies

The analysis identified many areas of emerging technologies, which could open new opportunities. On one side, enabling technologies (e.g. bioinformatics, advanced robotics, nanotechnology) have a big potential to improve results. On the other side, many BBT specific technologies are available yet not integrated into value chains. Last but not least, promotion of balanced land/sea usage is important.

EU Programmes/Initiatives + EU projects (Supporting mechanisms)

A review of EU programmes (and specific 104 projects within these programmes), selected by Panoramed experts, showed that they bear some kind of relevance to Panoramed, i.e. they include some policies, strategies, initiatives and projects that could be used as a reference, as a good practice, as a learning material, as a call for proposal, as help in research activities, as a pool of relevant technologies, etc. for Panoramed actors. It is important to note, however, that there is a high degree of thematic/focal overlapping among these programmes, i.e. many of them share very similar or exactly the same priorities or main areas of intervention (blue growth, cohesion, inclusion, sustainability, sustainable tourism, environmental quality, competitiveness, etc.). They are also very similar regarding desired or supported approaches on how to deal with common challenges – many of them emphasize or require integrative, cooperative, transnational and innovative approaches when proposing specific projects or measures (engaging several different types of stakeholders, 3/4 Helix). This thematic/focal overlapping could raise a question of rational/economical use of resources (people, time, equipment, tools, materials, technologies) when dealing with common pressing issues.

A common finding in reviewing these selected EU programmes (and projects) was also that majority of them have not explicitly emphasized development or usage of (state-of-the-art) Blue Biotechnologies. Although almost all programmes or initiatives explicitly or implicitly support new technology development or application, it is difficult to find specific focus on Blue Biotechnologies (the same finding is true for emerging technologies in Blue Economy). However, the latter was not the case in 43 national and EU projects, identified by national experts, where Blue Biotechnologies and emerging technologies were explicitly addressed in the great majority of selected projects.

Another common finding reviewing these programmes (and projects) was that we could not see any (huge) potential to really generate systematic social change. Even though all programmes support or call for projects which will definitely have real, tangible impacts in the affected areas (on individual and institutional level), we could not detect any major ambition of looking for really fundamental changes in attitudes and values, strategies and policies or organizational structures and processes and delivery systems and services.

5 Stakeholders

It seems there is a great potential for cross-sectoral possibilities (e.g. among ICT, health, food) on one side, but definition of realistic cooperation possibilities in the near future is remaining a challenge. The coordination along the value chain between researchers' initial product development and investors, SMEs and industry is weak and should be strengthened. What is missing is also training and skills development of personnel for offshore activities. More research is needed at the European level in order to convince industries to invest in the Blue Biotech and thus boost economy and create new workplaces.

Conclusion

Within this report, even though we stressed some good practices, we mainly focused on identification of gaps. Knowing the shortcomings in the past, we will be able to avoid them in future. We are also sure that there are interesting concepts and opportunities inside the report, which will enrich a pool of ideas for future-oriented projects and enlighten the way, where we could see what really works in the Mediterranean. This could also help us find good concepts for proposition of future-oriented strategic projects.

1. Introduction

1.1. Methodology

1.1.1. How to read the report?

Here are short instructions on how to read this long report in a short time:

- Most important findings are presented within the **Executive summary**.
- For more detailed info, we suggest reading: **Methodology and Opportunities for growth (orange fields)** and **good practices.**
- If you read the whole report, note **that important findings are presented in bold**.
- **Partial analyses** are presented **in detail at document "Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report "**[1]

1.1.2. Objectives

The aim of WP10 – Innovation is to find answers to the following questions:

- To which MED social challenges could Blue Biotechnologies[2] provide new and more effective responses (gaps and sustainable growth opportunities)?
- Identification of gaps and opportunities for shared value within Blue Biotechnologies value chain (regarding various aspects of innovative strategies, business models)?
- Can we identify R&D, technological challenges and emerging technologies with potential to tackle the MED challenges?
- How can public administrations promote the development and application of Blue Biotechnologies for the creation of shared value (through which policies/instruments)?

Within this report, we analysed the current situation and identified 2 important categories: (1) Gaps and opportunities (G&O) for growth within the Blue Biotechnology sector in the MED area; (2) Examples of good practice.

[1] Available at Panoramed Drive WP10 Innovation

[2] **Biotechnology** involves the use of living systems, organisms, or parts of organisms to manipulate natural processes in order to develop products, systems, or environments to benefit people. These may be products, such as foods, pharmaceuticals, or compost; systems, such as waste management or water purification; or environments, such as hydroponics. Biotechnology also includes genetic or biomedical engineering. Depending on the tools and applications, it often overlaps with the (related) fields of molecular biology, bio-engineering, biomedical engineering, bio-manufacturing, molecular engineering, etc.

Blue Biotechnology is in fact not a clear-cut sector as there are overlaps with other biotechnology sectors and industry sectors. As a multi-disciplinary knowledge technology needs the integration of expertise from currently unconnected areas of enabling technologies (regarding this issue, technology is mature in many cases and readily applicable, since it is already in use in other applications operating for many years now (e.g. Petrol and Gas Industry). The Panoramed addresses all aquatic environments (also fresh water).

1.1.3. Structure of Gaps and opportunities analysis

Based on a comprehensive analysis, the structure of the report is as follows. The Introduction is followed by the methodology of analysis (objectives, data sources, analytical methods, analytical framework and starting points) and then, a description of blue bio sector from an economic perspective is presented.

After that follows the crucial part of the report – analysis of Gaps and Opportunities for Growth of the blue bio sector in the MED area through the following subcategories: societal challenges (societal needs, trends, expectations), national and EU policy gaps and challenges, legislation shortcomings, questionable access to financing, challenging business models, mismatch in education and training, insufficiently developed innovation ecosystem and infrastructure, low market acceptance, R&D and technology challenges and lastly, emerging technologies.

Then, the findings of our analysis of mainly EU programmes/initiatives and EU/national projects (supporting mechanisms), which are related to Blue Biotechnologies are presented, as well as experts' opinion on how supporting mechanisms address the transformation of basic research (e.g. H2020), ideas and concepts into potential societal innovation, and later into commercialization and valorisation phase in the MED region.

At document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report "** we present the analysis of experts' answers to the Questionnaire to Identify National and International Projects and Initiatives, and then an analysis of selected projects within EU programmes is presented, as well as an analysis of relevant EU programmes (relevance for Panoramed) and documents.

1.1.4. Crucial inputs for the analysis

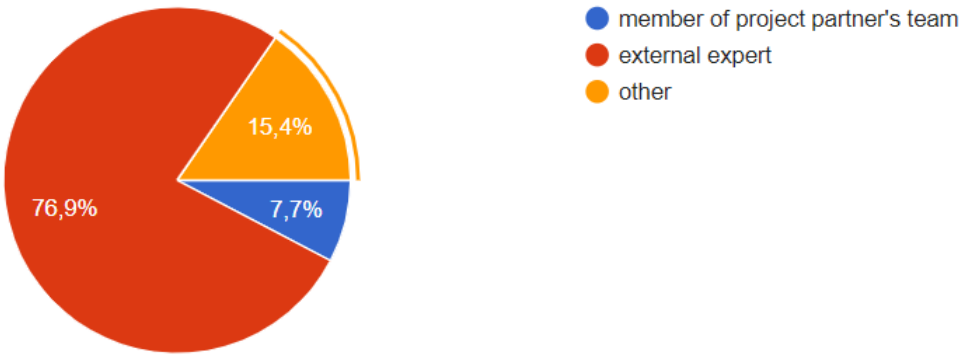
The analysis is based on 4 sources related to Blue Biotechnologies:

1. Expert's Gaps analysis;
2. Relevant EU documents;
3. Projects identified (by national experts - EU and national level);
4. EU programmes/initiatives (and selected projects within these programmes).

Expert's Gaps analysis

Within this part, we analysed responses to *Questionnaire - Gaps analysis for countries - for Experts*, where experts presented their opinion regarding the G&O analysis. The experts' answers (please see Appendix 1 of document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report"**) were analysed in detail and integrated into the G&O analysis presented in this report.

Figure 1. Analysis of expert's answers



Source: Own ellaboration

No. of filled out questionnaires: 13 by experts from Panoramed 8 partner countries, namely as follows: Cyprus 1, Croatia 4, France 1, Greece 2, Italy 1, Montenegro 2, Portugal 1 and Slovenia 1.

Experts represented the following Panoramed partner's organizations (countries):

- University of Montenegro-Institute of Marine Biology (Montenegro);
- Region Provence Alpes Côte d'Azur (France)
- Ruđer Bošković Institute - MRRFEU RH (Croatia)
- SVRK (Slovenia)
- Croatian Chamber of Economy (Croatia)
- Croatian Agency for SMEs, Innovations and Investments (HAMAG-BICRO) (Croatia)
- The Ministry of Economy, Entrepreneurship and Crafts (Croatia)
- Ministry of Science (Montenegro)
- Directorate General for European Programmes, Coordination and Development (Cyprus)
- Agency for Development and Cohesion - AD&C (Portugal)
- LESVOS LOCAL DEVELOPMENT COMPANY S.A. - ETAL S.A. (Greece)
- Hellenic Centre for Marine Research (HCMR) (Greece)
- Italian Country Coordinator (Italy).

Relevant EU documents

Within this part, we analysed relevant EU documents, reports, analyses, etc. These sources represented an additional input for the G&O analysis presented in this report (please, see Appendix 4 of document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report"**). The findings are integrated into the G&O analysis presented in this report.

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Most important sources:

- Blue Bioeconomy Forum – Draft Roadmap for the Blue Bioeconomy. Brussels, 25 June 2019.
- Blue Bioeconomy Roadmap for Portugal. OECD. The Ocean Economy in 2030.
- Blue MED Initiative – strategy to support a sustainable growth in the marine and maritime sectors in EU Member States[3]
- Blue MED SRIA - Strategic Research and Innovation Agenda (SRIA)[4].

Projects identified

Within this part, 2 categories of projects were analysed:

A. National and International Projects and Initiatives: 43 questionnaires/answers by experts. Experts' responses are presented. This is based on the *Questionnaire to Identify National and International Projects and Initiatives - for Experts*, where **experts presented the selected National and International Projects**. The selection was performed according to the basic "technical'' criteria (13 evaluation criteria), and a "common sense" criterion.

We received 43 filled out questionnaires by experts from Panoramed 8 partner countries, namely as follows: Croatia 14, France 5, Greece 7, Italy 1, Montenegro 1, Portugal 4, Slovenia 6 and Spain 5.

These answers represented an input for the G&O analysis and also for the presentation of good practices. Among 43 projects, we selected and presented 5 examples of good practice (please see Appendix 2a of document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report"**)

B. Desktop research of EU projects. We analysed 104 concrete projects within EU programmes (selected priority areas), selected by Panoramed experts, which are presented under the paragraph *4.1.1. Projects analysis.*

Among these projects, we also selected and presented 11 examples of good practice. The rationale behind the selection of these projects as examples of good practice is as follows: they tackle broader, common factual issues in the MED area, they follow 3/4 Helix approach, they have strong environmental and social impact (changing habits, values, strategies, policies), they use innovative approaches and they aim at testing and transferring project results (please see Appendix 2b of document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report"**)

For details, please see Appendix 2a and 2b of document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report"**, where partial G&O

[3] Available at: http://www.bluemed-initiative.eu/
[4] Updated version 2018 available at: http://www.bluemed-initiative.eu/wp-content/uploads/2018/12/BLUEMED-SRIA_Update_2018.pdf

analysis and projects are presented. Most important findings are integrated into the G&O analysis presented in this report.

EU programmes/initiatives related to blue growth/economy

Within this part, we analysed EU programmes/initiatives which mainly indirectly address Blue Biotechnologies. The selection of programmes/initiatives was performed in cooperation with the experts from Panoramed partners. Within each programme/initiative, we presented:

- Programme/initiative title
- Web page
- Short description
- Relevance for Panoramed

These analysis results represented an input for the G&O analysis.

- EU programmes/initiatives analysed:
- EUSAIR
- WESTMED
- Union for Mediterranean[5]
- BLUEMED
- PRIMA
- Interreg MED Programme 2014-2020
- Interreg Atlantic Area
- Interreg BALKANMED
- Interreg Sudoe Programme
- Interreg Baltic Sea region
- SUBMARINER Network
- Horizon 2020
- EUREKA
- LIFEWATCH
- The European Marine Biological Research Centre (EMBRC-ERIC)
- The European Network of Marine Stations (MARS)
- The Conference of Peripheral Maritime Regions (CPMR)[6]
- InnoBlueGrowth
- Smart specialisation platform
- Directorate-General for Research and Innovation7
- European Investment Project Portal
- Blue Bioeconomy Cofund

[5] UfM is an intergovernmental agreement, not strictly an EU programme or initiative.
[6] CPMR is a bottom-up association of regions, not strictly an EU programme or initiative.
[7] DGRI is a branch of EU administration dedicated to a specific field of expertise, not strictly an EU programme or initiative.

1.1.5. How various sources were used

Framework for the G&O analysis:

- It aims at establishing the dialogue on Blue Biotechnology related to societal challenges thanks to the high-level MED area partners.
- The bottom-up approach enables an in-depth understanding of the situation, definition of gaps and opportunities and setting of opportunities for growth - focused on improving the current situation.
- Within ToR (Terms of Reference) preparation, bottom-up approach will represent the basis for top-down activities (bottom-up approach means that experts and Panoramed partners analysed concrete projects, programmes and relevant documents on Blue Biotechnology). Knowing the shortcomings in the past, we will be able to avoid them in the future.
- The G&O analysis extracts important findings which are common not only to an individual country or a project, but to the whole MED region (international level).
- WP10 activities examined what other projects had done before and built upon the said to make a step further so as to have a visible impact on the policy level.

Figure 2. Concept of analysis

				
SOURCE ⇨ INPUT FOR ⇩	**Experts' Gaps analysis**	**Relevant EU documents**	**Projects identified**	**EU programmes/ initiatives**
	• 13 questionnaires by experts • 8 Panoramed countries	• Blue Bio economy Forum • Blue Med initiative • Blue Med SRIA • others	• 40 questionnaires by experts - 6 countries: national + EU projects • Desktop research of EU Project	• Interreg Mediterranean • BLUEMED • Interreg Baltic Sea • Horizon • LIFEWATCH • MARS • Bluegreen growth • S3 – Smart specialisation • Blue Bio economy Co-fund • Many others
Gaps& opportunities	♦	♦	♦	♦
Projects – best practices			♦	♦

Source: Own elaboration

Guidelines regarding the questionnaire for experts' analysis:

- Projects with a clear focus on Blue Biotechnology sector that are finished or in final stages and with a clear evidence of achieved results were regarded as more important.

- Answers which occurred two or more times were merged and emphasized.
- The most relevant were those messages, which tackle the whole MED area or that can be transferred to other MED regions as a best practice example.
- Some parts of the questionnaire/answers were merged or renamed, some answers were moved to another part.
- Some more important concepts and abbreviations were checked and explained where necessary.

1.2. Results

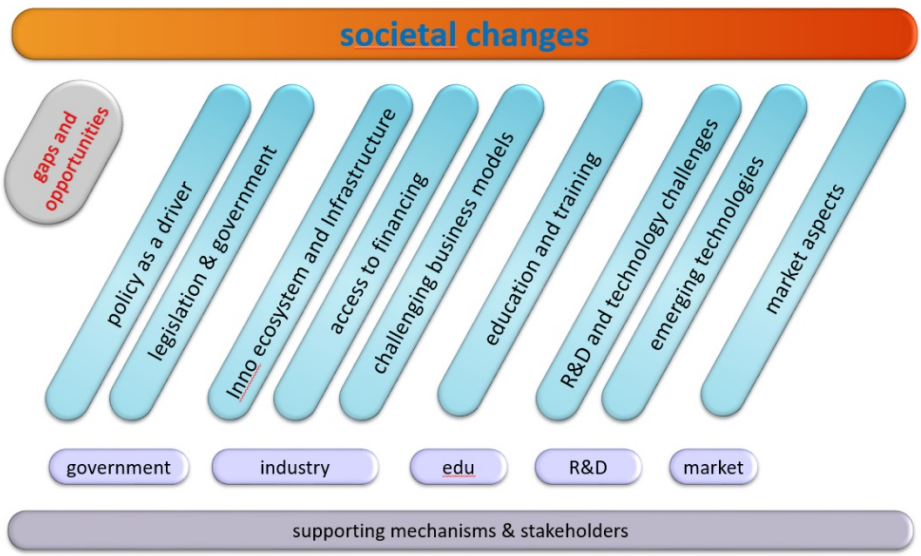
1.2.1. Structure of findings

After the analysis, the results were structured into the following categories, which are in line with the 3/4 Helix approach, namely as follows:

- Government
- Industry
- Education (edu)
- R&D
- Market

All the (sub)categories are presented in the figure below, and each subcategory is then explained separately. Within the text, the most important findings are presented in bold. Based on these findings, we proposed opportunities for growth. These represent objectives that should be set and pursued if we want to overcome the identified gaps.

Figure 3. Structure of results



Source: own elaboration

1.3. Economic perspective

Scientific breakthroughs may be considered as significant economic activities with a high impact on sustainable development and economic growth. **Currently, the European Biotechnology industry has an estimated annual revenue of €15 billion while the Blue Biotechnology sector`s higher-end revenue generation is estimated to stand at around €754 million**.[8] An estimated **annual compound growth rate is 6-8%** in Blue Biotechnology in 5 years – this could lead to an annual revenue generation of up to €1 billion.[9] This growth rate could **effectively result in an increase in demand of high-end jobs as well as an increase of end-products**.[10] The employment increase in the Blue Biotechnology sector, given the ambitious overall growth rate, could amount to up to **10,000 additional workplaces in 5 years' time**. **It would also help to boost the return on investment from previous, current and future R&D funding programmes already implemented or committed, especially through the Horizon 2020** programme.[11]

In the third stage, around 15 years from now and subject to technological breakthroughs, the Blue Bioeconomy could become a provider of mass-market products, together with a range of high value added specialised products. Accelerating this process will require a combination of basic research on ocean life and applied research on possible industrial applications with low probabilities but high rewards for success.[12]

If we address concrete application areas of Blue Biotechnology, there is **room for improvement in a number of sectors** such as: Aquaculture – seed, feed, nutraceutical, agriculture; Pharmaceuticals – novel drugs and treatments for human health and cosmetic, and chemicals; Energy – renewable energy processes, oil recovery additives, biofuels, valorization of bioproducts and waste; Environmental health – bioremediation, depollution, bio sensing, antifouling. The sustainable use and management of the seas and oceans is important, e.g. micro- and macro-algae are renewable, sustainable, and economical sources of biofuels, bioactive medicinal products, and food ingredients.

[8] MARIBE (Marine Investment in the Blue Economy). 2016. WP 4: Socio-economic trends and EU policy in offshore economy D4.1-3. Chapter 2 – Blue Biotechnology.
[9] OECD also predicted Blue Biotechnology's great long-term growth potential in its report *The Ocean Economy in 2030* (2016).
[10] MARIBE (2016) observes that the EU Blue Biotech is not living up to its full growth potential. Blue Biotech still needs to deliver a huge amount of basic research, given that Blue Biotech is a relatively new area and considering the low level of knowledge on marine biodiversity.
[11] See Gaps analysis for countries – for Experts, pp. 121. Also see Expert Group Report Review of the EU Bioeconomy Strategy and its Action Plan. 2017. Newton et al.
[12] Blue Growth opportunities for marine and maritime sustainable growth. EUROPEAN COMMISSION Brussels, 13.9.2012. https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/body/com_2012_494_en.pdf

2. Challenges and opportunities

Within this section, we briefly present crucial Blue Biotechnology topics and focus on challenges and opportunities in the MED area that require new collective responses, with the implication of shared value in Blue Biotechnologies. In addition, some identified risks and possible solutions are also presented.

2.1. Societal challenges - the "*umbrella*" challenge

In addition to purely economic aspects, societal challenges are also becoming more and more important.

Within the global society, there were some **moments which are related to blue biosector from a wider perspective.** The society in general has changed into a more demanding world environment. Therefore, new **societal challenges that call for implementation** have arisen:

- People look after themselves and their healthy diet, requesting more food supplements, healthy food and health boosting products;
- **New biomedicines**, sought by pharmaceutical companies, could help in the direction of disease treatment and pain relief;
- Other industries may find economic interest in see/water related areas;
- There is **a great potential that new jobs** could be created in marine related areas, in both offshore and inland activities;
- **More leisure activities by the sea**. Climatic changes and the increase of temperatures bring people closer to the sea;
- There is an increased interest in studying marine related areas;
- Feeding a growing population and ensuring sustainable/safe food systems.

Some other challenges:

- Global changes and CO2 control.
- Climate Change. Circular Economy. Blue Growth. (They have strong/important conceptual framework but weak capacity to deliver at local level the value added of the use of the resources – they also need more applied research).
- **Pollution challenges** – Micro plastics, Climate change challenges – demand for biofuel, Nanotechnologies.
- Smart strategies focus on:
    - valorisation and diversification of traditional segments,

- promotion of R & D in the area of marine sciences,
- Blue Biotechnology applications/tenders related to the Marine resources.

An important **strategic goal for the MED area would be capability to develop the whole value chain, from R&D to commercialisation.** So far, partnerships between researchers, SMEs, industry and final users have been very weak. If we want to address the aforementioned challenges appropriately and in time, we have to define gaps and opportunities and of course, provide appropriate answers followed by concrete activities. Within this document, we address identified areas related to 3/4 helix.

Opportunities for growth - Societal challenges

1. Scientific achievements and related development of new technological solutions.
2. Accelerating economic development based on Blue Biotechnologies (health, cosmetics, food, energy, aquaculture, environmental health, ICT, etc.).
3. Creating new jobs in this sector.
4. Providing more sustainable economic growth related to circular economy.

2.2. Policy as a driver

The **main challenge in the MED area is the preservation and sustainable use of the Mediterranean Sea**. The focus is on all economic activities related to the sea (blue economy) and not only on different specific sectors (such as the Blue Biotechnology which is still in its early years). The **policy fragmentation within the MED area is a barrier that hinders the homogeneous development of sea basin**. Specific attempts have been made on a strategy level with the implementation of strategies such as WestMed, EUSAIR, Blumed SRIA which however, do not have any additional funding and therefore limited impacts. The cooperation programmes such as MED, ADRION, Italy-Croatia and others, are funding projects aimed at overcoming fragmentation and creating a favourable collaboration environment. These projects could be used as a starting point to build and share a common governance vision for the MED basin in order to:

i. **increase the innovation level** and capacities promoting both the empowerment of the MED ecosystem and higher investments in R&D

ii. strengthen the competitiveness through a transnational cooperation;

iii. r**emove the barriers that hamper the exploitation of the innovation potentia**l, by way of creating stronger connections between the actors of the quadruple Helix;

iv. ensure the policy mainstreaming.

Other challenges and opportunities which require action:

- **Efficient and effective governance structure** for innovation of ecosystem at the highest level;
- National policies are often not focused enough on Blue Biotechnology but supported under a broader strategic network, within an overarching science and technology strategy;
- **Often there is no S3 priority on Blue Biotechnologies** – for this reason there are less government support mechanisms;
- Development of national and global agreements on access to marine bioresources;
- Process for modifying policies is very slow and bureaucratic in order to keep up with technological advancements;
- **Geographical discrepancy** - Some areas/cities (e.g. Split and Pula in Croatia) are dealing more intensively with Blue Biotechnology (mostly by institutes and the scientific community, while large entrepreneurs and SMEs are slowly increasing interest);
- **Articulation between Cohesion Policy and European Maritime and Fisheries Fund** (https://ec.europa.eu/fisheries/cfp/emff_en) in Research and Development areas;
- Teaming projects between the MED regions and reference areas and Horizon 2020 - spreading excellence and widening participation.

Opportunities for growth - Policy as a driver

5. Establishing efficient blue bio policies and governmental solutions (less fragmented, more focused, with close relation to S3, etc.).
6. Establishing policy solutions for fruitful international/regional cooperation and harmonisation (related to policies, legislation, R&D, economy, etc.).
7. Supporting policy solutions for sustainable and regionally balanced usage of natural resources.
8. Supporting R&D, SME and start-ups as crucial economic engine of development.
9. Ensuring food security.
10. Supporting jobs creation and maintaining European competitiveness.

2.3. Legislation and governmental solutions

One of the crucial challenges is to **create a common regulatory framework/legislation among different countries** (also related to Intellectual Property) and to develop synergies in the area. Authorities could issue regulations on different topics: microalgae cultivation and quality standards of algal biomass, access and use of genetic resources and sharing of benefits; decrease restriction concerning Novel Food.[13] Currently, it is possible an innovation to be legal

[13] The Spanish company, Fitoplacton Marino S.L., is the first microalgae production company in achieving the European Novel Food approval for the marine microalgae species *Tetraselmis chuii*.

in France yet illegal in Greece or there can be a regulatory gap that poses obstacles in the process of R&D.

The Convention on Biological Diversity (CBD) and the Nagoya protocol provide the basic framework for national and global agreements. **The implementation of a full Access and Benefit Sharing (ABS) remains a need for a long-term activity**[14].

Other challenges and opportunities which call for action:

- Favourable **legislative framework, also tax incentives** for innovative start-ups and enterprises;
- **Simple and efficient rules to access blue bioresources** – marine biotechnology depends upon access to marine organisms, collectively termed marine genetic resources (MGR);
- **Need for Environmental regulations on environmental impacts** of industrial activities and products, including the introduction of **common licensing systems** for harvesting marine resources (regarding the harvesting, culture and sustainable extraction of useful substances in marine biomass);
- Simpler and faster regulatory approval paths for blue bioproducts - procedures are unclear to companies;
- Procedures that ensure information on safety and solve transparency issues are not clear;
- Standardization in order to set guidelines to encourage product development;
- Remove or minimize the barriers for cooperation among researchers and high-tech companies (notably companies from the healthcare sector);
- Implement market importation barriers for non-EU suppliers;
- Faster legislation approval mechanisms for aquaculture;
- **Marine spatial planning activities** are also likely to influence marine biotechnology related activities, and open the way for new biotechnology driven opportunities;
- There is also **opportunity for smaller countries** to take the role as test-bed for pilot projects;
- A common mistake made in the economy (agriculture, forestry, fishing, etc.) is the **overexploitation** that is especially evident in the case of the fragile oligotrophic environment of the Mediterranean Sea. This mistake has to be avoided by way of adopting adequate **legislation.**

[14] The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity is an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way. It entered into force on 12 October 2014, 90 days after the date of deposit of the fiftieth instrument of ratification.

Example of not-harmonised activities

The EU priorities on i.e. *Pesca tourism* in Italy do not coincide with the national legislation. Harmonisation should be enhanced in order to be able to use the funds available.

Example of harmonised activities

As the legislation is a pillar of further activities, it is important to harmonise legislation with the EU, e.g. Cyprus' legislation is fully compliant with the European Union legislation. European Union directives are fully transposed into local legislation and European Union regulations have direct effect and full application in Cyprus. The legislation is mainly based on: · Protocol on Integrated Coastal Zone Management in the Mediterranean · Recommendation of the European Parliament and the Council concerning the implementation of Integrated Coastal Zone Management in Europe.

Opportunities for growth - Legislation & Governmental solutions

11. Creation of a common regulatory framework/legislation among different countries.
12. Establishing more favourable legislative framework (easier access to blue bio-resources, faster approval for aquacultures, ensuring safety of bio-products, standardisation, tax incentives, environmental aspects, etc.).
13. Performing spatial planning activities.
14. Removing or minimizing the barriers for cooperation among researchers and high-tech companies (e.g. healthcare sector).
15. Implementation of market importation barriers for non-EU suppliers.
16. Implementation of a full Access and Benefit Sharing (ABS).

2.4. Access to financing

Biotechnology is a hig risk field, with a strong need for investment in research and on high-technology spinoff. Access to risk finance and leveraging private finance and venture capital for research and innovation, experts' support and suitable insurance policies is absolutely necessary. Banks usually find it difficult to finance risky projects.

SMEs seem to be the most important industry partners, operating at the high-risk 'cash-burn' stage. They are generally responsible for the initial product development stage of the value chain. Due to this risk and limited cooperation among research centres, SMEs, enterprises, **financing is unpredictable and SMEs can therefore be very vulnerable**.

The following are major challenges in the field of financing Blue Biotechnology projects and activities:

- **Broaden the scope of blue funding and simplify funding schemes**, reduce time for evaluation, and implement fast track processes from decision to payment;

- Sector is considered rather 'invisible' by current key players;
- **Blue bio projects and businesses lack of understanding of the investment landscape** and how to present opportunities to potential investors (EC is establishing a Blue Economy Investment Platform (NOT bio), which can provide an advisory function;
- **Shortage of funds and mechanisms to support blue bio projects and start-ups**. To address the lack of financing for Blue Bioeconomy start-ups and SMEs, earmarked investment funds should be established (proposed within the framework of the new Blue Economy Investment Platform);
- Lack of regional public-private venture capital fund/s;
- **In the absence of easy access to investment, research funded from public funds is usually part of the financing model**, and small and medium-sized enterprises can work in collaboration with researchers at universities or institutes as well as larger industrial companies.

Opportunities for growth - Access to financing

17. Developing national/international funds and mechanisms to support blue bio projects and start-ups.
18. Developing also regional public-private venture capital fund/s.
19. Increasing understanding and developing investment landscape for blue bio projects and businesses.

2.5. Challenging business models

Many challenges have been presented in previous sections. In addition, there are some others, which require innovative business models and of course, R&D and/or market support.

- **Cost of production is particularly** high especially for SMEs, which are most important economy players.
- **Seasonality**. Difficulty in stable production of aquatic or marine biomass due to seasonality.
- **Logistics**. Logistics challenges for aquatic of marine biomass processing - 35% of consulted BBF stakeholders face logistics challenges, while for 80% of them these challenges are related to the technical rather than to the legal/policy domain. The technical challenges include complex and expensive operations throughout the entire production cycle.
- **By- products**. Lack of valorisation of by-products from marine origin materials (discards of seafood resources, namely fishery by-catch account for 25% of total volumes of marine fishery catch, while the discards in the fish processing industry reach up to 75% of the total volume of products). The reasons are: lack of interest in business community and investors as well as unclarity in regulatory areas.

- **Deep sea challenges**. Exploration of marine environment encompass technical challenges and high costs – e.g. accessing areas outside the shallow coastal zone.

Opportunities for growth - Challenging business models

20. Development of efficient and costly solutions for exploring the deep sea.
21. Development of technical solutions/business models related to seasonality.
22. Development of technical solutions/business models related to by-products.
23. Development of business models enabling cooperation of large companies and start-ups (Slovenian case: Innovating for the industry is sexy!).

2.6. Education and training

Blue Bioeconomy is an expanding knowledge-based sector with high expertise requirements.

Education programmes at different levels are not always following the economy needs. Currently, there is still a mismatch between the training offered (universities and other training entities) and industry and market demands, which hinders the development of new blue businesses and products.

Universities programmes are often providing scientific stuff, mainly specialised in narrow scientific fields. There is a need to **address entrepreneurs, managers and leaders, technicians and other practitioners** as well as **investors** to meet **current and future needs**.

Besides, **industry reality should be communicated to students better, e.g. via exchange programmes**. One of the challenges is better and more market-oriented training for scientists, students, and professionals that need updated sector knowledge.

In addition, it is important to put stress on the scientists' aptitude **to develop and participate in interdisciplinary projects** embracing skills and concepts from other disciplines. Hence, training the next generation of marine biotechnologists must focus on the application of interdisciplinary and holistic approaches to solve technological problems specific to dealing with marine organisms and the marine environment.

The changes in global economies and especially in the Blue Bioeconomy sector entail new jobs and profiles of employees the implementation of which must be accompanied by measures of training and education, i.e. we cannot discuss professional fishermen being motivated to enter tourism without proper training.

It is also important to support training actions inside the industry, e.g. with SMEs trainee vouchers.

Moreover, due to low level of education specialized in specific blue biotech fields, there is need for interdisciplinary cooperation and intersectorial training in blue bio sector industries.

Last but not least, **qualification programmes for public bodies' staff** should be promoted as well.

Opportunities for growth - Education and training

24. Defining new blue bio jobs' profiles addressing current & future needs.
25. Training programmes should address expert specific and interdisciplinary topics as well as soft skills, e.g. regarding cooperation among scientists, stakeholders, policy and decision makers, civil society.
26. Blue bio programmes should be developed and implemented into the existing EDU institutions.
27. Upskilling should address researchers, students, technicians, entrepreneurs, managers and leaders as well as industrial employees and also for public bodies.
28. Improving dialogue and experience exchange between university and industry, e.g. students' exchange, sabbaticals, etc.
29. Development of blue bio training vouchers.

2.7. Innovation ecosystem and infrastructure

Challenges presented in the previous sections can be addressed also with appropriate information/promotion/cooperation forms among all the 3/4 Helix stakeholders at (inter)national level. A clear focus on Blue Biotechnology sector and engagement of all stakeholders is essential.

Despite the progress enabled by EU programmes, there are different levels of ecosystem /infrastructure in different countries/areas. The following are some major challenges in this field:

- Acute need to continue to strengthen the innovation ecosystem - research, innovation and business infrastructure;
- **Create sectorial consortia**; **clusters, initiatives and networks**, e.g. to build the bridge between the existing biotech entrepreneurs and environmental biotechnology and bring them closer to the enormous advancement of blue biotech, form alliances and mature the biotech clusters evolution;
- Continue to build **international research networks and collaborations** to expand marine biotechnology research activity;
- **Strengthening and promoting innovation and business infrastructure** (science and technology parks, incubators, accelerators, technology transfer offices, etc.);
- Mapping, optimising and sharing infrastructures, e.g. facilities and equipment for RD purposes;
- Creation of **blue biobank infrastructure** with clear access rules;

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- Obviously, there is a need for common and easily available infrastructure network with common pilot and upscale units available to all stakeholders;
- Blue economy innovation vouchers for industry/other stakeholders;
- **Know-how ecosystem services** in the Blue Bioeconomy are not yet well developed, e.g. to develop a bank of past and current projects[15], research results and other relevant data in the domain incl. knowledge and experience exchange with other MED countries.
- Co-fund projects needed to install pilot units close to local industries, and improve commercial connections and logistical platforms surrounding blue bioresources production centres.

2.8. Good practice examples of innovation ecosystems

Here are some good practices proposed by the experts.

2.8.1. Co-LABs (a Portuguese initiative)

Collaborative Laboratories are non-profit private entities with the main goal of implementing research and innovation agendas geared at creating economic and social value. Besides creating skilled and scientific jobs in Portugal, CoLabs foster the consolidation of collaborative practices among scientific, technological, higher education entities, and the social and economic sector, https://www.fct.pt/apoios/CoLAB/index.phtml.en), and complete consortium projects through Mobilizing Programmes (Mobilizing Programmes are cross-cutting, strategic R&D projects aimed at creating new products, processes or services with a strong technology and innovation component, which can have significant impacts at a multisectoral level, in particular by enabling the endogenization and exploitation of the developed technologies, https://www.ani.pt/pt/financiamento/incentivos-financeiros-pt-2020/mobilizadores/)

2.8.2. Infrastructure from Cyprus

The **proper infrastructure for the support of Blue Bioeconomy is in place in Cyprus**. Stakeholders active in the fields of research, technology and innovation in the Blue Economy contribute to the transfer of knowledge, the development, application and dissemination of cutting-edge technologies, the exchange of best practices and the development of a critical mass of infrastructure and human capital in the Eastern Mediterranean region. The **activities are aligned with the overall Smart Specialization Strategy for Cyprus (S3Cy)** and the European priorities on specific pillars with competitive advantages to the Cypriot economy.

[15] It is important to note that European Comission is already doing this.

2.8.3. Portuguese Blue Hub16

Main characteristics:

- Implementation of the Portuguese Blue Hub portal with information on stakeholders, bioresources, and available infrastructures.
- Implementation of the Blue Demo Network to promote and enable access to a set of Portuguese infrastructures and services for startups and SMEs focused on the Blue Bioeconomy.
- Engage with the Collaborative Laboratories being created in Portugal for the Blue Bioeconomy.
- Take advantage of the **existing European research infrastructures included in the European Roadmap for research infrastructures (ESFRI)** such as European Marine Biological Research Centre (EMBRC), and transnational access opportunities for the research community and industry.

2.8.4. Case from Greece

Marine biotechnology relies upon a wide range of scientific disciplines, distributed infrastructures and analytical tools. Panoramed Greek partners report that projects such as the ESFRI European Marine Biological Research Centre (EMBRC), H2020 European Marine Biological Research Infrastructure Cluster (EMBRIC) and the European Life-sciences Infrastructure for biological Information (ELIXIR) accelerate the pace of scientific discovery and innovation from marine Bioresources, **bring together research institutions, companies, investors** debating the most important "blue challenges", share and store research data as part of an organised network.

Furthermore, ASSEMBLE PLUS activates important research resources and provides scientists from academia, industry and policy with a quality-assured programme on accessing the marine biology and ecology research infrastructure.

2.8.5. Other good practices

There are specific European clusters which each country can join, for example **European Algae Biomass Association** - EABA or **Bio-Based Industry** – BBI consortium, **European Network for Algal Bio Products**-EUALGAE. Furthermore, **European Federation of Biotechnology** - EFB is a platform that provides a forum for communication on advancements in frontline research to the benefit of society by way of supporting the Bioeconomy, the environment and health and to disseminate this knowledge to the general public. The **EU Blue Economy Business and Science Forum** also offers a forum for interconnecting academia with industry. The

[16] These are some of the "Blue Bioeconomy Roadmap for Portugal" proposed actions. Please refer to: http://blueandgreen.ciimar.up.pt/wp-content/uploads/2019/05/Roadmap_DIGITAL.pdf.

Bioeconomy Knowledge Centre of the European Commission will also enable greater sharing of information on Biotechnologies, making knowledge available to policy makers and stakeholders.

The **Knowledge Innovation Community Approach** applied on the MED basin could have a relevant impact helping the member states of the MED basin to overcome fragmentation. See the EU programme point.

Opportunities for growth - Innovation ecosystem and Infrastructure:

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30. Changing the rationale: one platform, multiple uses and activities.
31. Mapping, optimisation and sharing of blue biobank infrastructure (e.g. facilities and equipment for R&D purpose, pilot and upscale units).
32. Creation of know-how ecosystem services (access to R&D results, projects, know-how, data…).
33. Implementation of innovation ecosystem/infrastructure vouchers for industry/other stakeholders.
34. Strengthening synergies among science, industry, policy-makers and civil society.
35. Building/promoting international networks and sectorial consortia; clusters, initiatives and networks, etc.
36. Installation of pilot units close to local industries and improvement of commercial connections and logistics platforms surrounding blue bioresources production centres.

2.9. Market aspects

2.9.1. Consumer acceptance

An important challenge related to final users is to ensure qualities, health benefits, functionalities and utilities of blue biomass/products. As a result, the type and amount of public support, as well as consumer acceptance of novel products is limited. To raise consumer awareness and acceptance of blue products, the public should understand the value of these products. Hence, it is proposed by the BBF to launch a study on the functionalities and application of different types of blue biomass/products, to stimulate research community to publish/disseminate findings on qualities of bio-based products[17]. We believe it may represent a strong trigger for the full functionality of quadruple Helix concept.

2.9.2. Push/pull concept

A comprehensive strategy should address the whole value chain; R&D, pilot scale, demonstration scale, and commercialization including waste management (technology push).

The first step is to map the marine environment of the EU seas and oceans and identify the existing living microorganisms that could have potential for application in Bioeconomy. Then a

[17] Blue Bioeconomy Forum – Draft Roadmap for the blue bioeconomy. Brussels, 25 June 2019.

method should be identified in order to economically extract and purify those useful substances, offering a commercial exploitation with a clear market potential. Pilot and demonstration scale applications should follow to show clear potential for a commercial application to investors.

At the same time, it will be **necessary to raise consumer awareness with publicity actions,** sectoral campaigns, and measures to encourage the adoption of blue products and technologies so that the demand stimulates the supply (market pull).

A clear driver for the up-scaling of production is the return on investment on biomolecules for medical or health markets. However, the development of marketable products, particularly for pharmaceuticals, is a long-term serendipitous process which, in the initial stages, is almost entirely based on publicly funded research. Small companies, typically attached legally or geographically to universities, may investigate promising findings. Only after further encouraging results do the larger businesses step in, i.e. those which have the means to support the lengthy clinical trials and marketing that follow.

Other gaps and challenges:

- **Commercialisation** and market entry;
- Difficulty in penetrating the existing value chains.

Opportunities for growth - Market aspects

37. Addressing the whole value chain, especially scaling-up activities and commercialization should be improved.
38. Raising consumer awareness of blue biomass/products value regarding quality, health benefits, functionalities, etc.
39. Clear definition of advantages of blue biomass/products to enable penetration into the existing value chains.
40. Promotion of advantages of balanced land/sea usage.

2.10. R&D and Technology Challenges

One of the greatest challenges is converting scientific discoveries and innovations into successful productive units. A lack of commercialization skills in the field, knowledge investors and innovative financial tools are the missing factors to capture the significant value from the Biotechnology laboratories.

Blue Biotechnology sector is still in its early years but the potential to contribute to key societal challenges provides a strong driver. However, various barriers to the development of the sector still exist and include, among others, the technological limitations associated mainly with the **limited capability to cultivate many microorganisms in the laboratory and/or to optimize the production/downstream processes at a large scale**.

Some concrete research and technological challenges

A core focus of research for the **micro-and macro-algae value chain** in Blue Biotech is to deliver innovative solutions for biomass production as well as generate cost-effective high-value products. Successful culturing technologies will need to create generous amounts of biomass as well as increase processing know-how and biorefinery technology to transform marine biomass into products: for animal feed (rich in Ω3, mainly EPA, amino acids and vitamins), in aquaculture (replace fish oil in the diets of marine species while maintaining performance as well as DHA levels in the fillets), in agricultural products, in cosmetics (natural pigments such as β-carotene, vitamin E, mycosporine like amino acids), for biofuels as a promising alternative and renewable energy, for mitigation of pressing climate change issues, achieving sustainability. A demonstration centre of this type of biorefinery is being developed by a consortia led by the University of Almeria (Spain) through SABANA H2020 project[18].

Significant progress has been accomplished on **omics[19] research in marine flora, fauna and microorganisms**, looking for natural products with high impact on chemical biology and pharmaceutical/cosmetic industry (bioprospecting). Biomedical advancements are followed by environmental and marine scientists who are somehow keeping up with the biomedical advancements; however, there is still much to be done in this field. The development of novel bioremediation agents, pipeline of new organisms to screen for novel compounds, antifouling agents, biosensors for hydrocarbon contamination, harmful algal blooms, bio-tools-molecular biomarkers and oligonucleotide high-density microarrays for predicting and monitoring marine chemical pollution and its effects as well as for marine environmental risk and ecosystem health assessment.

Other gaps and challenges that require intervention:

Blue Biotechnology is a **high-risk**, **high-reward sector** which builds on investment in "**curiosity-driven research**" and on **high-technology spinoffs**. The challenges are:

- **Earlier collaboration between researchers and industry** is needed (within funded R&D projects) which would help to ensure that products of Blue Biotechnology research are appropriate for up-scaling and commercial production;
- **Development of new tools and approaches to find biological and environmental hotspots**, characterise the bioactive potential of marine compounds and develop economically feasible models for the commercialization of bioproducts;

[18] More information at: www.eu-sabana.eu
[19] *Omics* is a rapidly evolving, multi-disciplinary, and emerging field that encompasses genomics, epigenomics, transcriptomics, proteomics, and metabolomics.

- **Implement business models that apply the concept of Biorefinery**[20]: the establishment of regional pilot plants and small biorefineries could encourage and boost further investments;
- Challenges related to harvesting, biomass production and bioprospecting[21];
- **Missing capacity to replicate bioresources in laboratory**; difficulties to access to ship equipment for modern bioprospection;
- **Development of new data mining tools** and **exploitation of research results** in terms of technology transfer and creation of spin-offs and start-ups;
- Difficulty in hiring specialised human resources;
- Difficulty in accessing laboratory spaces;
- Networks and ship equipment for modern bioprospection requires upgrading;
- Blue cutting-edge technology requires high investment and risks.

Opportunities for growth - R&D and Technology Challenges

41. Improving the access to laboratory spaces for industry and other stakeholders.
42. Addressing the challenge of replication of bio-resources in laboratory.
43. Development of new tools and approaches to find biological and environmental hotspots.
44. Improving technology regarding harvesting, biomass production and bio-prospecting (e.g. networks and ship equipment).
45. Implementing business models that apply the concept of biorefinery.
46. Development of new data mining tools and exploitation of research results.
47. Enhancing earlier collaboration between researchers and industry.
48. Improving the integration of expertise from currently unconnected areas of enabling technologies.
49. As Blue Biotechnology is not a clear-cut sector strong cooperation with other biotechnology sectors and industry sectors should be established.
50. Addressing the challenge of high investment and risks related to blue cutting-edge technology.

2.11. Emerging technologies

Here are listed identified emerging technologies, which could open new opportunities to tackle the blue MED societal challenges.

[20] A biorefinery is a refinery that converts biomass to energy and other beneficial by-products (such as chemicals). Refinery is production facility composed of a group of chemical engineering unit processes and unit operations refining certain materials or converting raw material into products of value).
[21] Bioprospecting is the process of discovery and commercialization of new products based on biological resources. These resources or compounds can be important for and useful in many fields, including pharmaceuticals, agriculture, bioremediation, and nanotechnology, among others.

Identified areas of emerging technologies:

- Technologies related to biomaterials, biotechology, biomedicine, synthetic biology, bio-sensing, etc.;
- Information technologies, bioinformatics, advanced robotics, man-machine communication, nanotechnology;
- Innovative ICT based solutions related to food security, blue growth, bio-based innovation for sustainable goods and services (combining specific scientific and innovative expertise in ICT, life sciences and ecological monitoring);
- Environmental treatment technologies.

Special emerging technologies:

- Micro and Macro Algae Farming and Extraction of their useful substances, e.g. breading of microalgae as the food for other marine organisms (mollusks, fish...), breading of sponge as resource of biomolecules for pharmaceutical use ....;
- New gene sequencing technologies for living organisms is an example of emerging technology;
- Microfluidics; sequencing; big data mining;
- Microbes and Enzymes Usage;
- Provide nutrients, nanoparticles that contain the different molecules can improve the growth of fish (aquatic food);
- Diagnose diseases in fish;
- Nano labels, which can be used in fish to detect the behaviour of swimming and feeding, as well as the state of metabolism;
- Use of fisheries and aquaculture by-products (generated from fish processing) and/or wastes (fish by-catch and/or algal proliferation) as feed streams for the development of chemical and/or biotechnological process for the production of compounds and materials to be applied in different industrial sectors;
- Technologies that deal with the use of marine organisms (other than fish and shellfish) including microorganisms (archaea, bacteria and fungi) for the production of metabolites/compounds of interest in chemical, pharmaceutical, food, nutraceutical and cosmeceutical sectors;
- Technological solutions that provide solutions for water management, such as substances that clean water from contaminants;

- Develop and optimise early warning systems for emergent toxins in the aquatic environment;
- Fast screening methods for seafood contaminants and emergent toxins;
- Innovative technology in measuring mercury in maritime sediments/ecosystem.
- Bio-monitoring and bio-remediation.

Opportunities for growth - Emerging technologies

51. Development and exploitation of emerging, often enabling technologies related to biomaterials, biotechology, biomedicine, synthetic biology, bio-sensing, etc.
52. Development and exploitation of information technologies, bioinformatics, advanced robotics, man-machine communication, nanotechnology.
53. Exploitation of innovative ICT based solutions related to food safety, blue growth, bio-based innovation for sustainable goods and services (combining specific scientific and innovative expertise in ICT, life sciences and ecological monitoring).
54. Addressing environmental treatment.
55. Development of special emerging technologies (please see the detailed description above).

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3. Supporting mechanisms, EU Programmes

3.1. EU programmes/ initiatives related to blue growth/economy

The aim of this chapter is to analyse mainly EU programmes/initiatives, which are related to blue growth/economy.

Most important findings are presented here. A more detailed presentation of programmes/initiatives can be found in Appendix 3 of document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report".**

In our review of the selected EU programmes that were considered by several experts as potentially relevant for Panoramed, we learnt that undeniably these programmes bear **some kind of relevance for Panoramed**, i.e. they include some policies, strategies, initiatives and projects that could be used as a reference, as a good practice, as a learning material, as a call for proposal, as help in research activities, as a pool of relevant technologies, etc. for Panoramed actors. In the following chapter, we described what we thought would be the relevance of each particular programme/initiative for Panoramed.

If we compare these several different programmes, we can see that there is quite a **high degree of thematic/focal overlapping** between them, i.e. many of them share very similar or exactly the same priorities or main areas of intervention (blue growth, cohesion, inclusion, sustainability, sustainable tourism, environmental quality, competitiveness etc.). They are also very similar regarding desired or supported approaches of how to deal with common challenges, issues – many of them emphasize or require **integrative, cooperative, transnational and innovative approaches** when proposing specific projects or measures (engaging several different types of stakeholders, 3/4 Helix). This thematic/focal overlapping could pose a question of rational/economical use of resources (people, time, equipment, tools, materials, technologies) when dealing with common pressing issues.

A common finding in reviewing these selected EU programmes was also that the majority of them has not explicitly emphasized **development or use of (state-of-the-art) Blue Biotechnologies**. Although almost all programmes or initiatives explicitly or implicitly support new technology development or application, it was difficult to find specific focus on Blue Biotechnologies (the same finding is true for the emerging technologies in blue economy).

Reviewing these programmes there was another common finding, namely we could not see **any (huge) potential to really generate systematic social change** through these programmes. Even though all programmes support or call for projects which will definitely have real, tangible impacts in the affected areas (on individual and institutional level), we could not detect any major ambition of looking for really fundamental changes in attitudes and values, strategies and policies or organizational structures and processes and delivery systems and services.

3.1.1. Projects analysis

A common finding in reviewing selected 104 projects within these EU programmes (please, see Appendix 2b of document **"Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report"** for more detail) as well as on our proposed methodology and its limitations) was that they **have not addressed potential development or use of Blue Biotechnologies** within these projects – corollary to that, these projects are not based on the state-of-the-art Blue Biotechnologies (including all aquatic environments).[22] It was **very rarely seen that these projects would try to engage really promising emerging technologies** which could open new opportunities to tackle blue MED societal challenges. The **majority of projects** has been based on some kind of **systemic, innovation ecosystem approach**.

In quite a few project cases, we found that there were either **potentially no (or only weak) positive impacts on economic results and competitiveness, no (or only weak) desirable impacts on people and society, or weak positive impacts on environment**, foreseen in the project design.[23]

In almost all reviewed project cases, we could not see **any (huge) potential to really generate systematic social change**, i.e. we **rarely detected major ambition of looking for really fundamental changes in attitudes and values, strategies and policies** or organizational structures and processes and delivery systems and services.

Almost all projects have aimed at some kind of **(pilot) testing or demonstration** of their foreseen project results and **transferability** of good practices.

3.2. Transformation of basic research into innovations

The aim of this chapter is to analyse mainly **experts' opinion on** how supporting mechanisms address the transformation of basic research (e.g. H2020), ideas and concepts into potential societal innovation, and later into commercialisation and valorisation phase in the MED region.

ERDF is a key fund supporting the transformation of research into innovation. ERDF currently offers financial opportunities focusing on the smart specialization strategies. However, these programmes are designed at a regional level. If we want to support a thematic sector at the Mediterranean level, this sector needs to be included in all S3.

[22] This observation, however, is not valid for 43 EU and national projects, identified by national experts (please, see Appendix 2a of document "Appendices to Gaps and opportunities for growth of the blue bio sector in the MED Area report"). In this group of projects, the majority of them have addressed development or use of Blue Biotechnologies and also promising emerging technologies.

[23] Here, we are talking about potential impacts (or lack thereof) that could be inferred from short project descriptions or project designs and not about real, long-term impacts of these projects.

Sustainability of projects without further EU financing is at low level (even though most project calls require doing that). More emphasis should be placed on sustainability of projects when evaluating them.

3.2.1. EU programmes

Even though EU programmes offer many possibilities for the development of Blue Biotechnology, there are still many opportunities to be addressed, namely as follows:

- Low focus on blue biotech in EU programmes;
- **Programmes are too complex** (demanding) for often limited resources, mainly regarding human capacities;
- EU needs to develop/apply advanced tools, platforms and infrastructures and support to Blue Biotechnology;
- Use **EU research programmes to support R&D** and create momentum for pre-commercial ventures closer to the market;
- A **dedicated innovation initiative on blue growth under the** European Institute for Innovation and Technology (**EIT) framework is still missing at the EU level**. The EIT Knowledge Innovation Community Approach applied on the Med basin might have a tremendous impact on innovation level of the area and at the same time help overcoming structural fragmentation. In **addition, the quadruple helix approach of the Knowledge and Innovation Communities (KIC within EIT) is particularly effective for fostering societal innovation**.

H2020 in this form such as exists today (big conglomerates) is not the best practice; programmes such as MED programme or Italy-Croatia or similar could have a much more significant impact but the implementation is very bad and weak; BONUS programme from the Baltic region could be a great goal (see section: Supporting mechanisms).

3.2.2. Good practices (identified by experts)

H2020 – EMFF. In recent years H2020 and European Maritime and Fisheries Fund (EMFF) launched specific calls for innovation on the blue growth. This has been very positive and it helps raising the interests and activities in this sector on the different technology areas.

STARTS. STARTS (Science, Technology & the Arts) initiative under Horizon 2020 programme supports collaborations between artists, scientists, engineers and researchers to develop more creative, inclusive, and sustainable technologies. This mechanism is a good example of addressing the transformation of basic research ideas and concepts into potential societal innovation.

CE Europe - capitalization through coordination actions. Central Europe programme: capitalization through coordination actions where 7 thematic topics were defined. Project ideas have to build on complementing results and outputs from at least 3 different projects co-financed by Interreg CENTRAL EUROPE and directly-managed EU programmes such as Horizon 2020, LIFE, Connecting Europe Facility, etc. At least two of the projects have to be Interreg CENTRAL EUROPE projects.

Knowledge Innovation Community Approach. The quadruple Helix approach of the KIC (EIT) involving policy makers, research, companies, education institutions and citizens using the open-innovation approach is particular effective for addressing the transformation of basic research, ideas and concepts and fostering societal innovation. The EIT support mechanism is very flexible and could be adapted to the specific issues of the Blue economy including societal innovation. Considering the activities implemented thanks to the strategies (WestMed, EUSAIR, Blumed SRIA) and the cooperation programme (MED, ADRION, Italy-Croatia et others), the MED area is more and more entitled to ask for the creation of a KIC on Blue Economy. As the other KICs the focus should be on blue economy of the entire EU (both North and Mediterranean Sea) on which the MED basin must have a relevant role. The more policy commitments of the MED stakeholders the more financial resources could be obtained from EIT. Crucial obstacle is the fragmentation of the MED community (in particular towards the North Sea Basin) and the short-term vision. PANORAMED could play a strategic role and help overcoming this obstacle by supporting the cohesion of the MED community and creating the framework conditions for negotiations with EIT.

3.2.3. Cases of EU programmes' results which were accepted/positively recognised

The aim of this subchapter is to present mainly **experts' opinion** regarding projects the results of which were accepted/positively recognised by individual citizens, the Government and other stakeholders.

IPA CBC programme. Institute of Marine Biology (Montenegro) participated in IPA CBC programme and has good experience with individual citizens, the Government and other stakeholders.

BONUS program. The scientific community with other local stakeholders has identified the problem and found solutions that will be accepted; it is a wide cooperation where all partners respect other partners' needs.

Interreg Baltic Sea Region. Call for applications for "project platforms", which enable projects to team up and in this way increase the impact of the Interreg Baltic Sea Region's projects and other EU-funded projects in the area. A **project platform serves as a framework for cooperation of core partners of projects funded by Interreg Baltic Sea Region and other funding programmes in a selected thematic field**. The main role of project platforms is **to contribute to institutional capacity building in the region and maximise the effects of projects' results**. The call for project platforms was open for applications in the following

specific objectives of the Programme: smart specialisation for priority 1 (Capacity for innovation); clear waters and blue growth for priority 2 (Efficient management of natural resources); as well as interoperability, maritime safety and environmentally friendly shipping for priority 3 (Sustainable transport).

Horizon 2020. EU Framework programme for Research and Innovation "Horizon 2020", including part related to the European Institute for Innovation and Technology (EIT): factors - large funds, wide partnerships, internationalization.

Knowledge Innovation Community Approach. The quadruple helix approach of the KIC (EIT) involving policy makers, research, companies, education institutions and citizens using the open-innovation approach is particular effective for fostering societal innovation. Under the EIT action I can mention the Climate-KIC which is providing valuable innovation value for the climate change issues[24]. The Climate-KIC has got common features with the Blue Economy:

- wide and fragmented community
- wide number of technologies
- high impact of environmental issues
- common matter at EU level.

EUREKA. Factors - internationalization, flexibility in the creation of partnerships, bottom-up approach, access to public funds.

COSME. Europe's programme for small and medium-sized enterprise: factor - access to finance.

The Operational Programme «Thalassa» 2014-2020. Programme Coordinator is the Department of Fisheries and Marine Research of the Ministry of Agriculture, Rural Development and Environment of Cyprus and is financed by the European Maritime and Fisheries Fund (EMFF) 2014-2020 and has a total budget of approximately € 52.6 million. The percentage of EU contribution (EMFF) amounts to 75.49% of the total public expenditure. The remaining percentage 24.51% will be allocated by the Republic of Cyprus as the National Participation.

The six (6) Priorities of the European Union express relevant thematic objectives of the Common Strategic Framework (CSF) and which are included in the Regulation for the EMFF are the following:

- Promoting environmentally sustainable, resource efficient, innovative, competitive and knowledge based fisheries.
- Fostering environmentally sustainable, resource efficient, innovative, competitive and knowledge based aquaculture.

[24] More information at: https://www.climate-kic.org/

- Fostering the implementation of the CFP.
- Increasing employment and territorial cohesion.
- Fostering marketing and processing.
- Fostering the implementation of the Integrated Maritime Policy.

The Operational Programme «Thalassa» was prepared taking into account the consultation process held with the competent Ministries, Local Authorities, social and economic partners and bodies of the wider public and private sector and also through informal dialogue with the European Commission. The OP includes the financing of projects in the fisheries sector, with an emphasis on helping the fishermen of small scale fisheries, helping the communities to diversify their economic activities and financing projects aimed at creating jobs, improving the quality of life in coastal areas, and stimulating innovation. The support provided to the aquaculture sector with investments into production facilities as well as the creation of appropriate infrastructure for the support of the offshore aquaculture units are also of great importance.

The new OP also includes measures for supervising the fishing activities, data collection and integrated maritime policy. In addition, **great importance is placed on measures for the marine environment**, while the environmental dimension is incorporated in most measures of the programme.

The programme has a great success since it is widely embraced by the fishermen and aquaculture in Cyprus.

3.2.4. Cases of EU projects' results which were accepted/positively recognised

The aim of this subchapter is to present mainly experts' opinion regarding EU projects results which were accepted/positively recognised by individual citizens, the Government and other stakeholders.

ENPI Project MED ALGAE (20011-2016). "Production of biodiesel from Algae in the selected Mediterranean Countries – MED – ALGAE" with reference number I-B/2.2/099 which was financed through the ENPI Programme. The scope of the Project, within the Blue Bioeconomy, was to examine the possibility to use, in the Mediterranean Region, **micro-algae for biodiesel production and for the production of valuable substances suitable for other applications like cosmetics, food, feed, medical**, etc. Micro-algae can be cultivated in seawater or in reclaimed water assisting its purification. They grow fast and they produce much more oil per unit area than conventional land cultivated energy plants. They can be cultivated in open ponds or in photo bioreactors. Project Coordinator was the Agricultural Research Institute of Cyprus.

The results were very encouraging but unfortunately there was no interest from the investors' side in order to proceed with commercial application. The main reasons were the relatively

high costs of the initial investment and the legislative barriers a propos the licensing of companies using seawater.

CLLD/LEADER. The CLLD/LEADER approach which is implemented on a multi-fund basis is the **most accepted and visible tool for local development strategy.** It follows the bottom-up approach and substantiates the local needs. It follows tools such as SWOT analysis and adapts geographically to the specific characteristics and local identity. It is a mechanism of self-governance of the areas and it should be recognised on a wider spectrum.

SailRouter Project. The software will enable more efficient, cheaper and "cleaner" sailing. The implementation is simple, and it can be installed on a ship via a mobile device or a computer. By exchanging information between sensors and the central software, it can select the shortest navigation route, the route with minimum sea resistance and the optimal fuel consumption with the lowest carbon dioxide emissions.

HTP-GLYCOMET (Methods for high-throughput glycoproteomic analysis)[25]**.** Project coordinated by SVEUCILISTE U RIJECI

Remake (Razvoj efikasne metodologije za analizu konstrukcije plovnih objekata metodom konačnih elemenata/ Development of an efficient methodology for the analysis of the construction of vessels by finite element method)[26]. Country/region addressed: Croatia

GDi Ensemble FloodSmart[27]. Country/region addressed: Croatia

solarCat [28]**.** Country/region addressed: Croatia

Innovative production of biodiesel from microalgae [29]**.** Country/region addressed: Croatia

Mistral [30]**.** Country/region addressed: MED area

SABANA (Sustainable Algae Biorefinery for Agriculture and Aquaculture)[31]**.** This EU project aims at developing a large-scale integrated microalgae-based biorefinery for the production of biostimulants, biopesticides and feed additives, in addition to biofertilizers and aquafeed, using only marine water and nutrients from wastewaters (sewage, centrate and pig manure). The objective is to achieve a zero-waste process at demonstration scales up to 5 ha sustainable both environmentally and economically. It represents a new market opportunity which would imply an increase in employment as social benefit. At WP2-Sustainability, a survey on social acceptance of the project has been disseminated to citizens and different stakeholders.

[25] More information at: https://cordis.europa.eu/project/rcn/110974/reporting/en
[26] More information at: https://bonum.hr/eu-projects/
[27] More information at: https://gdi.net/ensemble/ensemble-floodsmart/
[28] More information at: https://www.solar-cat.eu/
[29] More information at: http://tesla.com.hr/cherry-services/projekt-inovativnog-istrazivanja-mikroalgi/
[30] More information at: https://mistral.interreg-med.eu/
[31] More information at: http://www.eu-sabana.eu

Opportunities for growth - Supporting mechanisms

56. Emphasizing the element of generating systematic fundamental societal change and values.
57. Preparation of clearly focused programmes due to high degree of thematic/focal overlapping.
58. Emphasizing development or use of (state-of-the-art) Blue Biotechnologies explicitly.
59. Enhancing focus on blue biotech in EU programmes, especially of ERDF.
60. Enhancing development of business models addressing market needs and providing final solutions.
61. Developing more flexible and "light" EU programmes adapted to limited resources of partnership.
62. Enhancing innovation initiative on blue growth under the EIT framework.
63. Establishing stronger connection between Research Programmes (e.g. H2020) and innovation/entrepreneurial follow-ups.
64. Supporting project which include individual citizens and Government.
65. Supporting "project platforms" which enable projects to team up stakeholders (based on Baltic best practices).
66. Communities to the Blue Biotechnologies sector – emphasis on quadruple helix approach.

Project co-financed by the European Regional Development Fund

4. Stakeholders

The aim of this subchapter is to present mainly experts' opinion regarding EU programmes' results which were accepted/positively recognised by individual citizens, the Government and other stakeholders.

Firstly, experts were asked to define most important stakeholders. The answers to this question are not directly related to G&O analysis. Nevertheless, data are available in the full report, which contains experts' answers to the questionnaire. (please, see document "Gaps analysis for countries - for Experts)[32].

In addition, experts were asked to evaluate the cross-sector possibilities (e.g. among ICT, health, food, etc.). Their opinions were as follows:

It seems there is a great potential on one side but definition of realistic cooperation possibilities in the near future remains a challenge.

The coordination along the chain between conducting researchers' initial product development and investors and the SMEs and industry should be strengthened. Possible triggers can be the following:

- Implementation of actions that promote cross-sectoral interconnection and knowledge sharing, learning and cross-fertilization. Also related to technology transfer, open innovation and acceleration of entrepreneurship.
- **More research** is needed at European level **in order to convince industries to invest** in the sector of marine bio technology and thus boost economy and create new work places.
- There are many activities entailing the provision of scientific achievements appropriate for R&D phase and operation. What is missing is training and skills development of personnel providing offshore activities.

It seems there is room for a wide spectrum of cross-sector possibilities among health, cosmetics, food, energy, aquaculture, environmental health, ICT:

- Health – pharmaceuticals, biomaterials, etc.;
- cosmetics – functional ingredients, raw materials, etc.;
- food – functional food, nutraceuticals, food ingredients, etc;
- energy – renewable energy processes, oil recovery additives, etc.;
- aquaculture – seed, feed, disease treatment, etc.;
- environmental health – bioremediation, depollution, bio sensing, antifouling, etc.;
- IT – measurements, sensors, data transfer, etc.

32 Questionnaire available at: Available at Panoramed Drive WP10 Innovation

Example 1: Algal value chain can make an important contribution towards meeting challenges in food, energy and climate change. The use of microalgae for blue bioenergy could be merged with the blue energy sector for the sustainable production of renewable and clean energy. Moreover, other commercialized products from microalgae (solutions, dry or frozen biomass) can be used as feed for small farmed marine organisms, supporting the aquaculture sustainability, product quality and production efficiency. Blue biotech supports the introduction of new species for aquaculture.

Example 2: Applications in the marine environment include environmental monitoring and bioremediation. Environmental biotechnology transcends typical sectoral industries and creates a multi-layer approach integrated at all levels of spatial planning, ensuring the compatibility of economic activities, characteristically of tourist activities, fisheries and aquaculture, with biodiversity conservation, as well as decision-making processes before or at initial step during contamination events.

Opportunities for growth - Stakeholders

67. Policy solutions which support inter-sectoral cooperation.
68. EU programmes and funds motivating to fruitfully merge inter-sectoral cooperation.
69. Training programmes should address also inter-sectoral cooperation – providing general knowledge on interdisciplinary topics + soft skills related to management of cooperation.
70. Innovation ecosystem supporting cooperation oriented activities of different branches and 3/4 Helix stakeholders, e.g. specialised services related to blue bio bank, Vouchers, Know-how ecosystem services, etc. (related to the Chapter: Innovation ecosystem and Infrastructure).
71. Extension of marketing opportunities (Unique value proposition) related to inter-sectoral cooperation.
72. Transfer of technological solutions from other sectors.
73. Supporting “project platforms” which enable projects to team up inter-sectoral stakeholders (extended Baltic best practice).
74. Implementation of actions that promote cross-sectoral interconnection and knowledge sharing, learning and cross-fertilization – regarding R&D, technology transfer, open innovation and entrepreneurship.
75. Addressing a wide spectrum of cross-sector possibilities among health, cosmetics, food, energy, aquaculture, environmental health, ICT (concrete examples within text).

5. Verification of identified opportunities

5.1. Methodology

The aim of the Barcelona Innovation camp (Oct. 17-18th, 2019) was to verify identified opportunities and their ability to be developed into strategic project elements, a basis for Terms of Reference (ToR). The work was based upon the Gaps and Opportunities Report. A brief version of this Report was provided to the participants prior to the workshop.

Participants, mainly experts from Panoramed partner countries and some other stakeholders, formed 4 workgroups, 4-8 participants/group. The names were: Jellyfish, Dunaliella, Spirulina, Chrolella.

The approach was based on the state-of-the-art Design thinking methodology consisting of the following tasks:

Task1 – Selection of opportunities

a) Determination/selection of app. 10-20 most important Opportunities for growth

b) Based on the previously selected Opportunities under a), workgroups performed one more selection cycle. For this final group of Opportunities (app. 5 – 10), groups had a task to create a strategic project that will focus on addressing these most important Opportunities.

Task2 – Designing a Strategic Project

Groups tried to integrate selected Opportunities into a future-oriented project with the following features:

- The opportunities related to the Blue Bioeconomy/Technology
- Societal challenges and innovations, with a character of shared value for the MED area, bringing sustainable and systemic change
- Improvement of participative governance, industry, education, R&D and supporting technology, market aspects and supporting mechanisms & stakeholders

Each group had a task to define the main objectives of the strategic project and 3-5 specific objectives for the strategic project. Basically, they were encouraged to use 3 sources:

- Gaps and Opportunities Report
- Additional Specific objectives based on their expertise
- A short brainstorming session.

Task3 – Feedback from potential users

Aim of this step was to present the workgroup results to the other group, which was in the role of potential users and to get their Feedback.

Half of the Group 1 (owner of the idea/proposal) went to Group 2 (users) and presented their proposal. The Group 2 had the role of users. Group 1 observed all the reactions and comments and noted down the remarks of Users.

Task4 – Strategic project optimisation

When presenters went back to their group, they tried to integrate comments into their proposals and optimised it.

When time permitted, groups also discussed sustainability aspects of the proposal and the aspect of Integration of the proposal with MED Horizontal projects.

We also encouraged groups to discuss possibility to merge their proposals.

Task5 – Final Panel work

The final task was a presentation of their work to all the groups within the panel session.

5.2. Results

Within this part, we are presenting the most important findings.

During the workshop, groups Spirulina and Chrolella realised, they have similar ideas and they merged their proposals.

5.2.1. Opportunities identified:

Following opportunities in the section: Challenges and opportunities were identified by the groups:

- Jellyfish: 2, 6, 12, 17, 28, 31, 37, 49, 59, 73.
- Dunaliella: 2, 4, 6, 8, 23, 25, 26, 35, 37, 39, 47, 53, 62, 65, 70.
- Spirulina + Chrolella together: 2, 3, 5, 8, 9, 12, 14, 17, 28, 25, 34, 38, 40, 43, 47, 53, 63, 64, 72, 74, 75.

5.2.2. Proposed objectives of the Strategic project

The following proposals have already been optimized (Task 4 in Methodology of this chapter, see above):

JELLYFISH

- Main objective: To enhance the economic development.
- Specific objectives:
  - Mapping of the results of the existing projects: RR including level of TRL;
  - Identifying up to 5 case studies on relevant field;
  - Creating an alliance gathering all the key actors: researchers, academics, industries, SMEs and start-ups, young entrepreneurs, policy makers;
  - Proposing funding mechanisms, (European, national, regional), including public and private funds.

DUNALIELLA

- Main objective: To improve the capacities of public actors on innovation policies, strategies and actions in BBE.
- Specific objectives:
  - Cooperation in Blue Bioeconomy
  - Analysis of existing BBE actions within the territories involved
  - Assessment of complementarity of Blue Bioeconomy in different territories
  - Improvement or development of metrics and indicators
  - Identification of BBE projects at local level and support the scale-up
  - Mutual learning, exchange of good practices and setting up networks;
  - Identifying key common technology areas for innovation investment;
  - Synergies with on-going projects and initiatives dealing with RIS3 and innovation (such as s3platform, CTE projects, H2020, KIC RIS, Vanguard…);
  - Creation of supporting framework (platform, community);
  - Tools supporting administration for funds integration /RIS3;
  - Support of the transnational dimension of regional innovation projects.

SPIRULINA + CHROLELLA

- Main objective: Inclusive exploitation of all BBT/BBE potentials in the MED.
- Specific objectives:
  - Identifying training and capacity building needs;
  - Mapping of state-of-the-art BBT/BBE and potentials - Blue MED Observatory;
  - Promoting transfer from research to innovation to business through living labs (local hubs) and other forms;
  - Identifying policy and legislation needs and provide recommendations;
  - Developing appropriate metrics to address priorities and evaluate performances of processes, policies and R&D activities;
  - Establishing a permanent mechanism to promote coordination among countries/actors;
  - Developing case studies' demonstrations of BBT/BBE potentials (approaches, tools, technologies, solutions) on specific sectors/products/biomass.

5.3. Conclusions

We can conclude that the Innovation Camp proved to be an important element of the Gaps and Opportunities analysis and Terms of Reference preparation. Workgroups verified the identified opportunities, selected crucial ones and gave relevant proposals. We are proud to conclude that they are coherent with the guiding principles (European Territorial Cooperation, Interreg V – B. Mediterranean (MED) Cooperation Programme 2014-2020, p. 96) and reflect the goals of Panoramed.

5.3.1. Coherence with MED and Panoramed

Based on the presentations of all groups within the panel session in Barcelona we realised that the proposals were positively accepted and reflect identified challenges and offer reasonable proposals. They represent also a high-quality base for the preparation of ToR, which should be in coherence with the **Panoramed guidelines**, namely**:**

- the opportunities related to the Blue Bioeconomy/Technology,
- societal challenges and innovations, with a character of shared value for the MED area, bringing sustainable and systemic change,
- improvement of participative governance, industry, education, R&D and supporting technology, market aspects and supporting mechanisms & stakeholders.

5.3.2. Coherence with MED (European Territorial Cooperation, Interreg V – B. Mediterranean (MED) Cooperation Programme 2014-2020)

Specific objective 4.1: To support the process of strengthening and developing multilateral coordination frameworks in the Mediterranean for joint responses to common challenges.

Guiding principles of Interreg MED (quality criteria)

European Territorial Cooperation, Interreg V – B. Mediterranean (MED) Cooperation Programme 2014-2020, p. 96:

- The coherence of the project with the strategy of the programme, the content of the investment priorities and specific objectives.
- The coherence of the project with national and regional policies and measures implemented to create synergies and avoid overlapping.
- The complementarity with other EU policies, thematic programmes and initiatives in the sector tackled.
- The complementarity with other Mediterranean initiatives in the sector tackled.
- The transnational dimension of the project with the demonstration that partners share common needs and common objectives.
- The innovative dimension of projects, their concrete impact on socioeconomic development and their effects in the mid-term.
- The attention paid to mid and long-term direct and indirect environmental effects of the Project.
- The coherence of the partnership, the relevance and competencies of partners according to the objectives of the project.
- The coherence of the activities with the objectives and results.
- The relevance of the financing plan and the coherence of the budget with the objectives set.

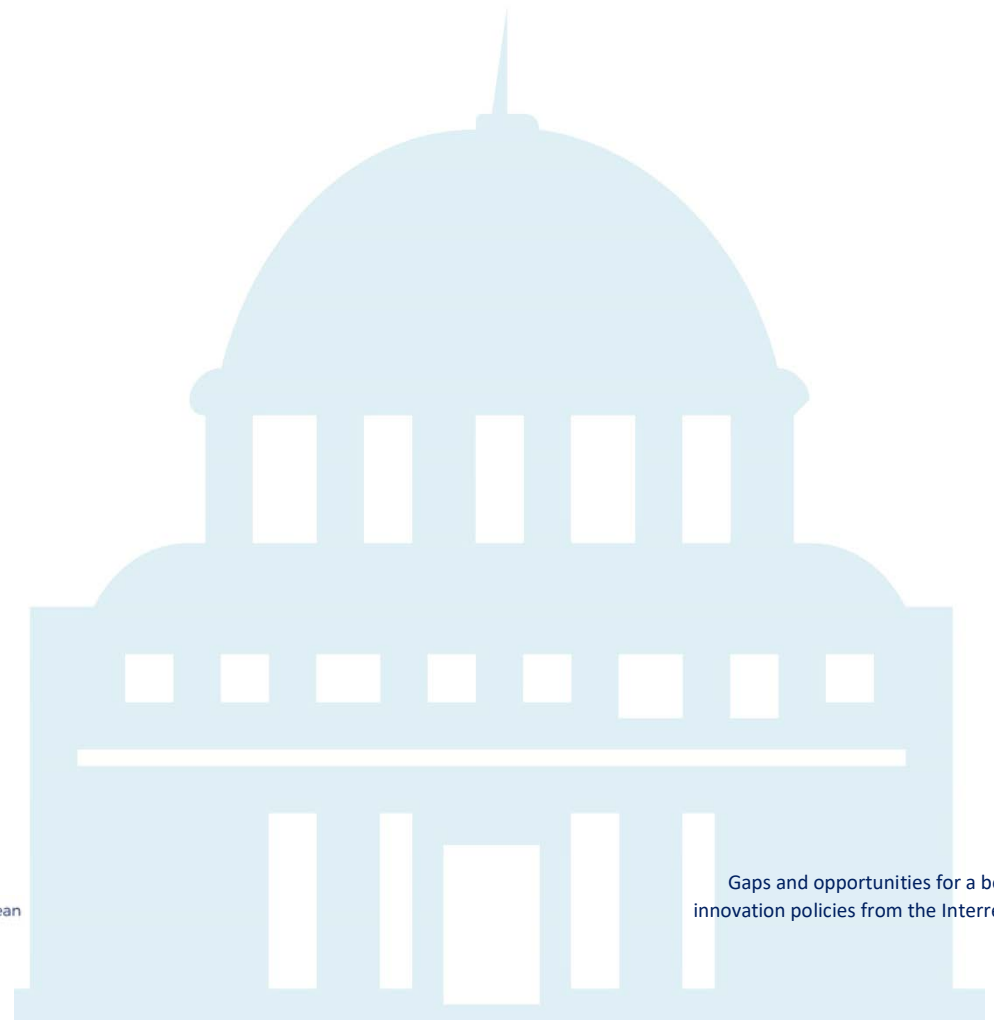
Figure 4. Coherence of Inno-Camp conclusions (based on the Gaps analysis) with reference documents (MED Cooperation Programme 2014-2020 and Panoramed objectives) was verified.

Source: own elaboration

We can conclude that the work at Innovation Camp was well prepared and the input of workgroups was highly valuable.

All the proposals represent the base for the ToR preparation, which were upgraded with some other elements of previous activities, ToR workgroup and JS suggestions.

PART 2



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Executive summary

This second part of the report focuses on the identification of gaps and opportunities for a better governance of innovation policies in the Mediterranean Area to promote sustainability transitions and to advance towards the sustainable development goals (SDGs), from the Interreg MED perspective.

The conceptual framework to identify and analyse the gaps and opportunities identifies three drivers to advance towards the sustainable development goals (SDGs): Research and innovation to support transitions; new business models for shared value (social, economic and environmental value); and multi-actor governance models.

The document presents the main programmes and strategies implemented in the MED Area and their interaction, together with the main objectives in the Interreg MED Programme and Panoramed. The conceptual framework to identify and analyse the gaps and opportunities identifies three drivers to advance towards the sustainable development goals (SDGs). These are:

- Research and innovation to support transitions
- New business models for shared value (social, economic and environmental)
- Multi-actor governance models

It also discusses some findings from the analysis of the work done by the Interreg MED horizontal projects and thematic transnational communities and it identifies opportunities to improve the governance of innovation policies in the MED Area and possible lines of action to address them and the related gaps, from the Interreg MED perspective.

The report is complemented by the following documents:

- Analysis of the blue bioeconomy innovative good practices, provided by experts
- Participatory governance for the development of the blue bioeconomy in the Mediterranean Region
- How clusters can contribute to social and environmental challenges through the creation of shared value
- Marine biotechnology as a tool for creating shared value in the Mediterranean

1. Introduction

This part of the report analyses gaps and opportunities for better governance of innovation policies in the MED Area from the perspective of the Interreg MED Programme and the Panoramed project.

By better governance of innovation policies in this report we mean enhanced coherence of innovation policies from four different but complementary perspectives:

- **Horizontal coherence** refers to the need for individual objectives, instruments and projects developed by different entities to be mutually reinforcing. It means strengthening the inter-connectedness of policies and actors and promoting shared perspectives and roadmaps focused on societal challenges. Horizontal coherence also means identifying and correcting misalignments in policy mixes (European Environment Agency, 2019) and considering social, environmental and economic value on the same footing.
- **Vertical coherence** refers to actions designed and implemented at different scales of multilevel governance, i.e. international, national and sub-national levels of government, and to the need to ensure that the different approaches and policy choices of these different actors reinforce each other.
- **Temporal coherence** is about ensuring that policies and initiatives contribute to longer-term commitments and continue to be effective over time, without being contradicted by short-term decisions.
- **Territorial coherence** is ensured when initiatives are connected with the dynamics of territories, in terms of direction, space and time.

The gaps and opportunities analysis is the result of months of work on five different lines:

1. Review of academic literature, policy papers from the European Commission and other strategic documents to define a conceptual framework for the gaps and opportunities analysis.
2. Analysis of MED strategies, projects and practices to identify gaps and opportunities in the Mediterranean Area (MED Area) using this conceptual framework. The white papers and the strategic papers produced by Interreg MED communities were a valuable source of information.
3. Identification and analysis of innovative good practices that generate new shared value based on the blue bioeconomy. The good practices are related to: the use of technologies and R&I infrastructures; participatory governance and co-management models; the participation of clusters; opportunities for social entrepreneurship; and opportunities for the Southern Mediterranean.
4. Experts' contributions. Three experts drafted reflections based on analysis of both existing academic literature and projects and initiatives.
5. Focus groups and interviews and discussions with Panoramed partners and experts and other Interreg MED actors. The preliminary results from the gaps and opportunities

analysis were shared and discussed at the Panoramed innovation camp organised in Barcelona on 17 and 18 October 2019. Five opportunities were identified by which Interreg MED and Panoramed could contribute to improving the governance of innovation policies in the MED Area. They are as follows:

- Reinforcing the common understanding of MED societal challenges
- Optimising the use of R&I infrastructures and the synergies among R&I programmes and projects
- Recognising and enhancing the contribution from local communities to MED societal challenges
- Increasing support from public administrations to emerging business models for shared value
- Increasing the impact of innovation policies by taking into account social needs

The structure of this part of the gaps and growth opportunities report is the following: after this introduction, Section 2 presents the main programmes and strategies implemented in the MED Area and their interaction, together with the main objectives in the Interreg MED Programme and Panoramed. Section 3 defines a conceptual framework to identify and analyse the gaps and opportunities. The framework identifies three drivers to advance towards the sustainable development goals (SDGs). These are:

- Research and innovation to support transitions
- New business models for shared value (social, economic and environmental)
- Multi-actor governance models

Section 4 analyses innovative good practices generated by Panoramed experts in the field of the blue bioeconomy. Section 5 presents the main conclusions from the three experts' reports. Section 6 discusses some findings from the analysis of the work done by the Interreg MED horizontal projects and thematic transnational communities. Finally, Section 7 identifies opportunities to improve the governance of innovation policies in the MED Area and possible lines of action to address them and the related gaps, from the Interreg MED perspective. This analysis is the result of months of discussions with MED experts and actors.

This second part of the report is complemented by the following documents:

- Analysis of the blue bioeconomy innovative good practices, provided by experts
- Participatory governance for the development of the blue bioeconomy in the Mediterranean Region
- How clusters can contribute to social and environmental challenges through the creation of shared value
- Marine biotechnology as a tool for creating shared value in the Mediterranean

2. Map of strategies and programmes in the MED Area

The **Mediterranean Strategy for Sustainable Development (MSSD) 2016-2025** provides a strategic policy framework and a common vision for the Mediterranean, which as follows (UNEP/MAP, 2016):

"*A prosperous and peaceful Mediterranean region in which people enjoy a high quality of life and where sustainable development takes place within the carrying capacity of healthy ecosystems. This is achieved through common objectives, strong involvement of all stakeholders, cooperation solidarity, equity and participatory governance*"

The MSSD is an ambitious strategy that aims to harmonise the interactions between socio-economic and environmental goals, adapt international commitments to regional conditions, guide national strategies for sustainable development, and stimulate regional cooperation between stakeholders in the implementation of sustainable development. Moreover, as shown in table 1, its six objectives are aligned with the sustainable development goals (SDGs)[33]. It is important in this context to mention that the European Union, as shown in the communication on the next steps for a sustainable European future (European Commission, 2016), is committed to sustainable development and aims to be a frontrunner in implementing the 2030 Agenda and thus the MSSD goals.

Table 1. Linking the objectives of the Mediterranean Strategy for Sustainable Development 2016-2025 (MSSD) to the Sustainable Development Goals (SDG)

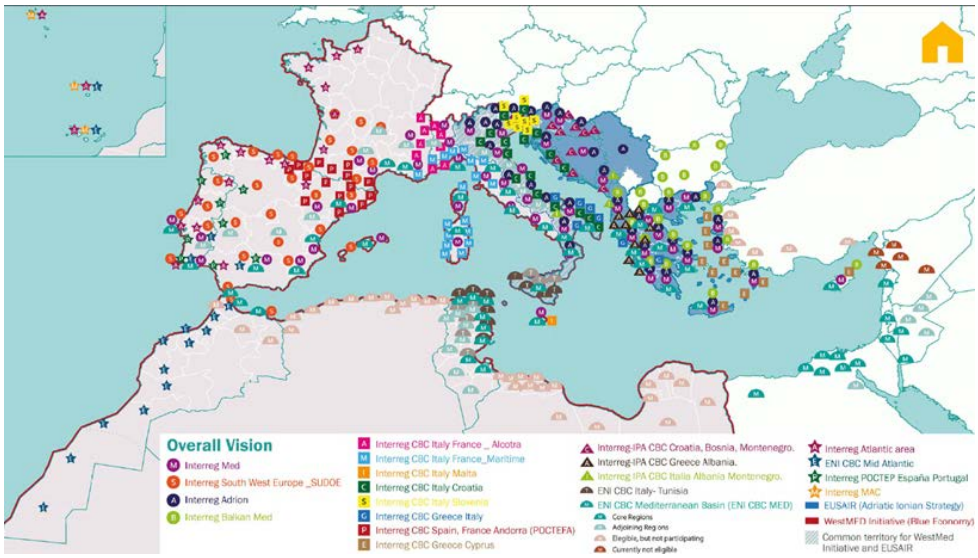
Mediterranean strategy for sustainable development 2016-2025 objectives	Sustainable development goals (SDG)
1. Ensuring sustainable development in marine and coastal areas	SDG 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
2. Promoting resource management, food production and food security through sustainable forms of rural development	SDG 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture SDG 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss SDG 6. Ensure availability and sustainable management of water and sanitation for all
3. Planning and managing sustainable Mediterranean cities	SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable SDG 7. Ensure access to affordable, reliable, sustainable, and modern energy for all.

[33] SDG1. No poverty, SDG2. Zero hunger, SDG3. Good health and well-being, SDG6. Clean water and sanitation, SDG7. Affordable and clean energy, SDG9. Industry, innovation and infrastructure, SDG10. Reduced inequalities, SDG14. Life below water, SDG17. Partnerships for the Goals

Mediterranean strategy for sustainable development 2016-2025 objectives	Sustainable development goals (SDG)
4. Addressing climate change as a priority issue for the Mediterranean	SDG 13. Take urgent action to mitigate climate change and its impacts
5. Transition towards a green and blue economy	SDG 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all SDG 9. Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation SDG 12. Ensure sustainable consumption and production patterns
6. Improving governance in support of sustainable development	SDG 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels SDG 17. Strengthen the means of implementation and revitalise the global partnership for sustainable development
7. Cross-cutting sustainable development goals related to social issues	SDG 1. End poverty in all its forms everywhere SDG 3. Ensure healthy lives and promote well-being for all at all ages SDG 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all SDG 5. Achieve gender equality and empower all women and girls SDG 10. Reduce inequality within and among countries

Source: Mediterranean Strategy for Sustainable Development 2016-2025

Figure 1. EU Cooperation Territorial Coverage in the MED



Note: The BLUEMED Initiative (2019), which is not included in the map, involves 16 countries: Italy, France, Malta, Portugal, Spain, Greece, Croatia, Slovenia, Algeria, Morocco, Cyprus, Egypt, Israel, Jordan and Turkey.

Source: Interact (2019b).

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At operational level, the Mediterranean is a very heterogeneous cooperation area with a great diversity of geographical, socio-economic and political contexts. In this area, many EU and internationally funded programmes, projects, networks, organisations and platforms coexist, albeit sound common or coordinated governance is lacking to a certain extent.

Table 2. Main objectives and thematic focuses of the main EU Programmes related to the Mediterranean

EU Program	Main objective	Thematic focus
Interreg MED	To promote sustainable growth in the MED Area by fostering innovative concepts and practices and a reasonable use of resources and by supporting social integration through an integrated and territorially based cooperation approach.	• Innovation • Low carbon economy • Natural and cultural resources • Governance
BLUEMED Initiative	To tap the full potential of the marine and maritime sectors, structuring transnational cooperation to create new 'blue' jobs and to improve social wellbeing, sustainable prosperity and the environmental status of the region and its surroundings.	• Key enabling knowledge for the Mediterranean • Key sectoral enablers in the Mediterranean • Enabling technology and capacity creation for the Mediterranean • Cross-cutting enablers for blue jobs and blue growth
WestMED Initiative	To foster sustainable blue growth and jobs, improve safety and security and preserve ecosystems and biodiversity in the western Mediterranean region.	• A safer and more secure maritime space • A smart and resilient blue economy • Better governance of the sea
ENI CBC-MED	To foster fair, equitable and sustainable economic, social and territorial development, which may advance cross-border integration and valorise participating countries' territories and values.	• Business and SMEs development • Technological transfer & innovation • Social inclusion & fight against poverty • Environment & climate change
PRIMA	To achieve, support and promote integration, alignment and joint implementation of national R&I programmes under a common research and innovation strategy to address the diverse challenges in water scarcity, agriculture, food security.	• Management of water • Farming system • Agro-food value chain
EUSAIR	To promote economic and social prosperity and growth in the region by improving its attractiveness, competitiveness and connectivity.	• Blue growth • Connecting the region • Environmental quality • Sustainable tourism • Strengthening R&D, innovation and SMEs • Capacity building, including communication • Mitigating and adapting to climate change effects • Managing disaster risks

Source: Own elaboration, based on Interreg Mediterranean Programme, BlueMed, WestMed, EUSAIR, ENI CBCMED, and PRIMA (2019).

The six most relevant EU programmes and strategies related to the Mediterranean are **Interreg MED, ADRION, BlueMed,** the **WestMED Initiative, EUSAIR, ENI CBCMED** and **PRIMA**. When considering the objectives and thematic focuses of each of these initiatives (table 2), it can be stated that the first five cover all 6 MSSD objectives, while PRIMA covers 4 of them (2, 3, 4 and 6), because it is not focused on either marine and coastal areas (MSSD Objective 1) or on the marine blue economy (MSSD Objective 5). Accordingly, then, they all are aligned with the SDGs.

The Governing Document of the Interreg Mediterranean Programme (2016) states that the objective for the 2014-2020 period is to improve the basis for enhanced cooperation in the Mediterranean Region and to establish a wider strategy covering the whole programme space with sub-areas such as the Adriatic/Ionian macroregion and the Western and Eastern Mediterranean areas. To achieve this goal, certain actions were recommended for implementation:

- Joint data sharing
- Research into complementarities among projects
- Joint capitalisation events for specific themes

The Panoramed project was created as a pilot in 2017 in order to enhance cooperation within Interreg MED and with the other EU cooperation programmes and initiatives.

2.1. The Interreg MED and Panoramed

The Interreg MED Programme is a European transnational cooperation programme adopted by the European Commission and co-financed by the European Regional Development Fund and the Instrument for Pre-Accession Assistance Fund. It provides funds for cooperation projects developed and managed by public bodies – and in some cases by private entities – in the European regions of the Mediterranean. Its territory covers 57 regions in 13 European countries. For 2014-2020, the total budget of the programme is 275.905.320 euros, of which 233,678,308 euros come from ERDF and IPA funds from the European Union, and 42,227,012 euros from national counterparts (national public and private funding) (Interreg Mediterranean Programme, 2016). As stated above, Interreg MED addresses all 6 MSSD objectives and the SDGs through – at the time of drafting this report – around 100 (co)funded projects.

The Interreg MED Programme is articulated by 4 axes, 7 thematic objectives, 8 MED thematic communities and one governance platform (see table 3 and figure 2).

Table 3. The Interreg MED Programme 2014-2020

Axis	Thematic objectives	MED Communities (Governance Platform in axis 4)
1. Innovation	1.1. To reinforce the joint work between clusters and networks across Mediterranean countries trying to create innovative solutions to unlock the potential of a healthy and productive sea	Blue growth
	1.2. Aims to a greener development model built on an environmentally friendly use of resources	Green growth
	1.3. To improve the innovation capacities of public and private stakeholders from cultural and creative industries and social innovation	Social & creative
2. Low carbon economy	2.1. To increase capacity for better management of energy in public buildings at transnational level	Efficient buildings
	2.2. To increase the share of renewable local energy sources in energy mix strategies and plans in MED territories	Renewable energy
	2.3. To increase capacity to use existing low carbon transport systems and multimodal connections among them	Urban transport
3. Natural and cultural resources	3.1. To enhance the development of a sustainable and responsible coastal and maritime tourism in the MED area	Sustainable tourism
	3.2. To maintain biodiversity and natural ecosystems through strengthening the management and networking of protected areas	Biodiversity protection
4. Governance	4.1. To support the process of developing multilateral coordination frameworks and strengthening the existing ones in the Mediterranean for joint responses to common challenges	Panoramed

Source: own elaboration

Through the articulation of **MED communities** around diverse thematic objectives, Interreg MED provides spaces to experiment in new forms of collaboration and practices among public administrations, academia, companies and civil society from different regions to tackle common challenges, focusing on the articulation of new shared expectations and visions, the building of new networks and the shaping of new markets which eventually will challenge dominant current practices (see section 6 for more information).

In this context, under axis 4, the Panoramed project is the governance platform of Interreg MED that supports the process of strengthening and developing multilateral cooperation frameworks in the Mediterranean region for joint responses to common challenges and opportunities. Its specific objectives are (Panoramed, 2019a):

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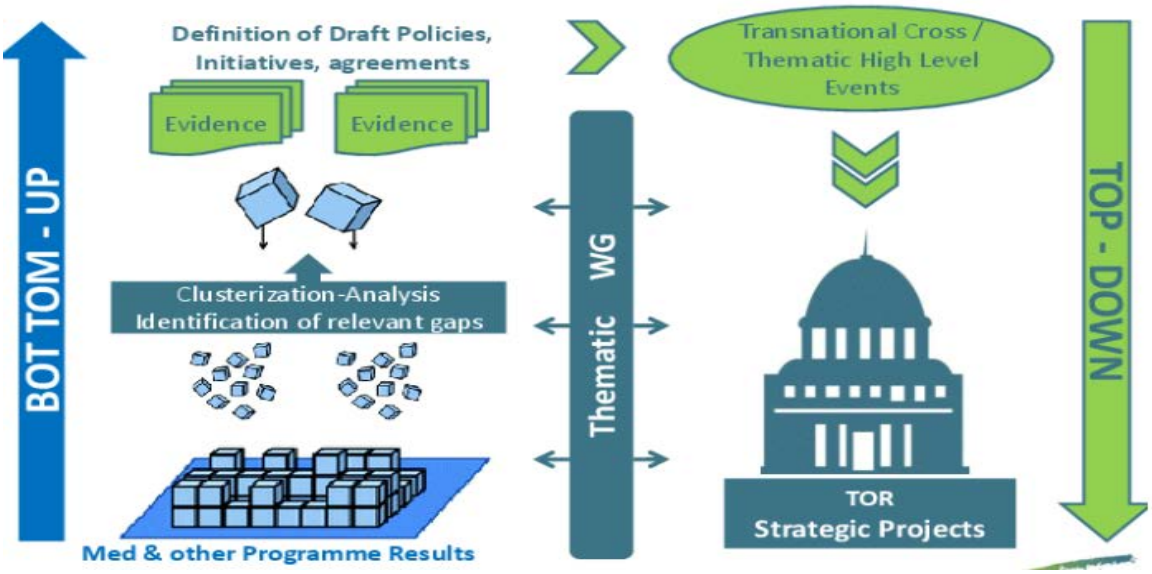
- Enhancement of the institutional capacity of public authorities to ensure the maximum impact of MED project results through efficient implementation of EU/national public funds and mainstreaming actions;
- Reinforcement of the institutional capacity of public authorities in transnational and national policy definition and strategic planning;
- Contribution to coordinated synergies and dynamics among initiatives and strategies active in the Mediterranean;
- Contribution to the improvement of a reinforced cooperation with the South shore of the Mediterranean.

Figure 2. Panoramed's working path



Source: Panoramed (2019b).

The associate partners of Panoramed include Interreg programmes, INTERACT, sub-regional strategies, the CPRM, the Union for the Mediterranean and the UNEP/MAP, and also the involvement of Directorates-General of the European Commission. They have been involved in Mediterranean programmes, initiatives and strategies, such as BLUEMED Initiative, WestMED Initiative, EUSAIR and PRIMA. They often share challenges, work together in groups or gather in meetings related to relevant regional strategies.

As mentioned above, Panoramed's role is to establish a permanent dialogue among national and regional public authorities and stakeholders for the definition of shared approaches, policies and strategic projects. Transnational thematic working groups have been set up involving strategic key actors to identify shared policy approaches and strategic top-down projects, which should constantly seek synergies and complementarities with the main institutions and initiatives active in the Mediterranean (figure 2).

3. Conceptual framework for the analysis of gaps and opportunities related to the governance of innovation policies in the Mediterranean Area

The framework for the analysis of gaps and opportunities is based on the literature on sustainability transitions and transformations, which has acquired growing importance in the academic literature over the last two decades and is being gradually integrated into European policy framework and debate. As we will show, this framework based on sustainability transitions towards the SDGs enables advances to be made in the four coherences referred to earlier: horizontal, vertical, temporal and territorial.

3.1 Interreg MED and Panoramed

3.1.1. Moving towards a sustainable Europe by 2030

The reflection paper "**Towards a sustainable Europe by 2030**" published by the European Commission in January 2019 provides the key elements to frame the gaps and opportunities analysis for better governance of innovation. According to the European Commission, "***Sustainable development*** *is about upgrading people's living standards by giving people real choices, creating an enabling environment, and disseminating knowledge and better information. This should lead us to a situation where we are living well within the limits of our planet through smarter use of resources and a modern economy that serve our health and well-being. We should therefore continue on the path that we set ourselves: a* ***transition*** *to a low-carbon, climate-neutral, resource-efficient and biodiverse economy in full compliance with the United Nations 2030 Agenda and the 17 SDGs. This transition needs to be for the benefit of all, leaving no one behind, ensuring equality and inclusiveness. Our economic growth must depend less on non-renewable resources so that we maximise the use of sustainably managed renewable resources and ecosystem services*."

Further, the European Commission defines **bioeconomy** as "*those parts of the economy covering all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services*" (European Commission, 2018). In particular, the **blue bioeconomy** is any activity associated with the sustainable use of renewable aquatic biological resources to generate new economic and social value. Aquatic biomass (both wild and cultured) from the seas and oceans, rivers and lakes has, for instance, great potential to ensure future food, feed and nutrition security. It is also a potential source of raw materials for use in value chains of high value, products and

processes, such as pharmaceuticals, food ingredients, bioprocessing, chemicals, and novel materials and cosmetics while factoring in environment and climate change risks.

In line with the above concept of sustainable development, "*a **sustainable European bioeconomy** supports the modernisation and strengthening of the EU industrial base through the creation of new value chains and greener, more cost-effective industrial processes. By capitalising on unprecedented advances in life sciences and biotechnologies, as well as innovations merging the physical, digital and biological worlds, the European industrial base can maintain and enhance its global leadership. Research and innovation and the deployment of innovative solutions for the production of new and sustainable bio-based products (such as bio-chemicals, bio-fuels, etc.) will also enhance our capacity to substitute fossil raw materials in very significant parts of European industry (e.g. construction, packaging, textiles, chemicals, cosmetics, pharma ingredients, consumer goods)"* (European Commission, 2018).

The transition to a circular economy, including to a circular bioeconomy, is seen by the European Commission and the Member States as a huge opportunity to create competitive advantages on a sustainable basis, therefore the bioeconomy is placed at the centre of EU priorities (European Commission, 2019b). In particular, the European Commission recognises that "***for the blue bioeconomy to be managed sustainably**, better knowledge and scientific research is required, to better understand the impacts of maritime activities on marine ecosystems to underpin sound policies*" (European Commission, 2019a).

3.1.2. Promoting sustainability transitions in the EU and in the Mediterranean Area

The European Commission urges all actors in the EU to prioritise the sustainability transition, "*further developing the cross-cutting policy agendas that have been adopted at EU level in recent years (…), building bridges and increasing coherence between different agendas at all levels (…) **Policy coherence is a critical condition to ensure that we can deliver on the SDGs and ensure long-term green and inclusive growth for the EU***" (European Commission, 2018).

In the EU, the document of reference for sustainability transitions is the report produced by the European Environment Agency and published in September 2019, *"Sustainability transitions: policy and practice".* Drawing on historical evidence and case studies, the document explains that "*transitions emerge through **interactions among multiple actors**, including businesses, users, scientific communities, policymakers, social movements and interest groups. They are **evolutionary processes,** meaning that they are typically based on searching, experimenting, reflecting and learning. They also depend critically on interpretations and social acceptance. Transitions are therefore fundamentally **uncertain and open-ended**. Surprises and unintended outcomes are to be expected. Transitions are also **conflictual and deeply political**, producing trade-offs, winners and losers, and related struggles, as politically influential and well-resourced incumbents often resist change*" (European Environment

Agency, 2019). Thus, sustainability transitions aim at achieving horizontal, vertical, temporal and territorial coherence.

The **role of governments in this context evolves** towards acquiring the role of **enablers of society-wide transformation processes** rather than acting as "*pilots*" of society on its path towards sustainability. Governments continue to implement the usual environmental policy tools, such as regulations and market-based instruments, as a means to drive efficiency improvements, stimulate innovation and steer in the direction of change; however, tackling the core drivers of environmental degradation requires a **much broader policy mix**, one aimed at enabling innovation, experimentation, dissemination and networking, as well as facilitating structural economic change. Moreover, governments have a key role to play in ensuring horizontal coherence across policy areas, as well as vertical coherence between the local, national and international levels (European Environment Agency, 2019).

Finally, the report also highlights that "*sustainability transitions also imply **normative choices between alternative visions** of the future and how to get there, pointing to the importance of public engagement to foster consultation and deliberation*" (European Environment Agency, 2019).

"*In line with the strong evidence base of the key sustainability challenges and opportunities for the EU, it is important to focus on production and consumption in the areas of materials and products, food, energy, mobility and the built environment, taking into account the social implications of the changes in these areas. This is where sustainability changes are most needed and are potentially most beneficial for the EU economy, society and natural environment, with strong positive global spill-over effects. **These areas do not operate in isolation, but are strongly interlinked and mutually reinforcing***" (European Commission, 2018).

The document drafted by the European Environment Agency contains key messages for policy regarding system innovation and the coordination of systemic change processes towards long-term sustainability goals. They are the following:

Table 4. Sustainability transitions: policy and practice. Key messages for policy.

Key message	
1. Promote experimentation with diverse forms of sustainability innovation and build transformative coalitions	The emergence of new technologies, practices and business models requires a culture of experimentation. This implies supporting diverse innovative activities, from publicly funded research and development (R&D) projects to local social movements, as well as creating new networks of actors. Research and firms are crucial, but open innovation policy should also target users, civil society, communities and other actors. Innovation policy should also stimulate organisational innovations and new business models, which are important in determining the commercial feasibility of sustainability innovations.

Key message	
2. Stimulate the dissemination of green niche innovation	To achieve sustainability transitions, radical innovation needs to move beyond experimentation and become more widely disseminated. Novel technologies, social practices and infrastructure systems pose different challenges and disseminate in varied ways, requiring different kinds of policy support (financial and non-financial incentives, regulations, infrastructure investment, new narratives to promote social acceptance, horizontal coordination of policy areas, stimulation of knowledge, dissemination, etc.)
3. Support the reconfiguration of whole systems, phase out existing technologies and alleviate negative consequences	Sustainability transitions can involve disruption and conflict when the diffusion of new technologies and practices affects existing systems and businesses. Impacts on particular sectors or regions can be severe, implying a role for public policy in offsetting inequalities and facilitating structural change. Ensuring a just transition requires measures to alleviate negative consequences and help firms, employees and regions to reorient (e.g. compensation, retraining and regional adjustment).
4. Promote clear direction for change through ambitious visions, targets and missions	Sustainability transitions are purposeful and oriented towards defined sustainability outcomes (SDGs). This creates a difficult governance challenge, as the complexity and uncertainty of societal change means that transitions cannot simply be planned and implemented from the outset. To make long-term visions concrete and to incentivise supporting actions it is important to translate these visions and missions into sectoral and cross-sectoral policy strategies, programmes and instruments, and it is also very relevant to guarantee consistence between short, medium and long-term targets.
5. Align policies between different domains to improve policy coherence for transitions	The multidimensional nature of transition processes means that they are influenced – positively or negatively – by multiple policies (environment, innovation, sectoral, fiscal, education), creating significant risks of inconsistencies and incoherence. Therefore, contrasting objectives across policy areas and actors, policy coordination and policy integration are essential.
6. Promote coherence of actions across EU, national, regional and local governance levels	Sustainability transitions necessarily involve actions at multiple levels of governance, as they are multi-actor processes that cannot be steered by any actor on any level of governance on its own. They require coordinated policy action at all levels of governance. Promoting both top-down and bottom-up processes of governance requires new mechanisms to promote dialogue and increased flows of information and resources. Thematic working groups crossing different governance levels and including industry and civil society actors can be a useful tool to facilitate this coordination.
7. Monitor risks and unintended consequences and adjust pathways as necessary	Transitions processes are highly unpredictable, open-ended, complex and non-linear processes that often produce unintended consequences and trade-offs between social, economic and environmental sustainability outcomes. It is essential to continuously identify and evaluate risks associated with transitions using anticipatory governance approaches. Ex ante approaches must be complemented with adaptive governance approaches based on iterative cycles of policymaking and planning, implementing, evaluating and learning.

Source: European Environment Agency (2019).

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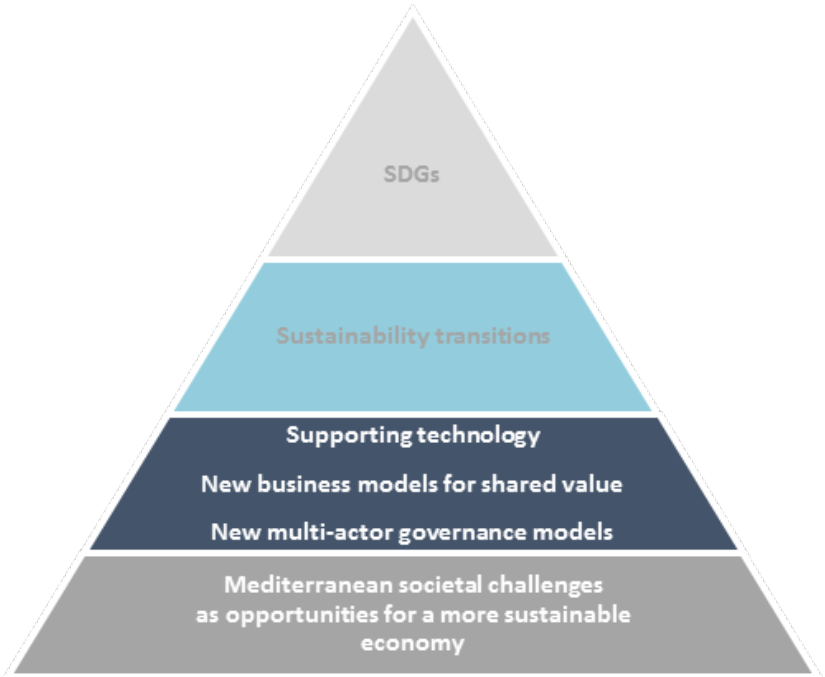
3.2. Conceptual framework

In the above described policy context, figure 3 shows the proposed framework for analysing gaps and opportunities related to the governance of innovation policies in the MED Area. This conceptual framework supports greater horizontal, vertical, temporal and territorial coherence of innovation policies in the MED Area, which is a main focus of this report. Thus, the starting point are the huge challenges the MED Area is facing, challenges that require urgent, better coordinated and more effective responses and actions from all MED actors. These societal challenges can also become an opportunity if the "*right policies*" are put in place in the "*right manner*". The ambitious Bioeconomy Strategy and the Circular Economy Package at EU level and the BlueMED strategy and the Partnership for Research and Innovation in the MED Area (PRIMA) are all good examples of how challenges can also be drivers for sustainability transitions, that is, for change towards a more sustainable and inclusive society (SDGs). For this to happen, public policies should support:

- The orientation of R&I and technology to support sustainability transitions and to address the SDGs.
- The emergence of new business models for shared value, that is, business models that are sustainable in economic, social and environmental terms and that contribute to achieving the SDGs.
- New multi-actor governance models to align the efforts of all actors towards the SDGs.

Figure 3. Conceptual framework for the analysis of gaps and opportunities



Source: Own elaboration.

Project co-financed by the European Regional Development Fund

3.2.1. Orientation of R&I and technology to support sustainability transitions and to address the SDGs

Sustainability transitions aim to address environmental and societal challenges (the SDGs), therefore they are purposeful and directional. To transform production-consumption systems and advance towards the SDGs there is a need for much greater investment in sustainability-oriented R&I and experimentation. This was highlighted by the United Nations in 2015, when the organisation noted the urgent need to guide R&I to meet the SDGs. The European Union has been explicit in that the priorities of science and technology must be reoriented to respond to the great challenges, such as climate change, social inequality and other "*persistent*" societal challenges.

It can thus be argued that **sustainable innovation** is one that takes into account the SDGs without threatening one while trying to achieve the other (Berkowitz, 2020). Sustainable research and innovation can be defined as a "*transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)*" (Von Schomberg, 2011, p. 9, as in Berkowitz, 2020). Furthermore**, sustainable innovations can be considered as** *"(1) innovations [that] avoid harming people and the planet, (2) innovations [that] 'do good' by offering new products, services, or technologies that foster sustainable development, and (3) global governance schemes [that] are in place that facilitate innovations*" (Voegtlin & Scherer, 2015, p. 1, as in Berkowitz, in press). This emphasises the importance of governance frameworks that allow the development of such sustainable innovation, i.e. that allow interactions among "*societal actors and innovators*" (Berkowitz, 2020).

Missions have long been used as a mechanism to direct and coordinate R&I towards societal challenges and goals (European Environment Agency, 2019). According to Mazzucato (2018), R&I missions offer a solution, an opportunity and an approach to address the challenges that matter to society, setting clear and ambitious targets that are measurable and time-bound. Indeed, there are no purely scientific and technological solutions that can solve the complex problems of poverty and hunger: there is a need to combine understandings of sociology, politics, economics and technology to solve these problems, as well as to make the conscious decision to point innovation towards them. This is exactly what well designed missions can achieve.

3.2.2. New business models for shared value

The business-as-usual strategy of maximising economic value and externalising social and environmental costs cannot lead to a sustainable future. Therefore, public policies should promote the emergence of new business models that contribute to addressing SDGs. The concept of shared value can be defined as policies and operating practices that enhance the

competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which they operate. Shared value creation focuses on identifying and expanding the connections between societal and economic progress (Porter and Kramer, 2011). **Shared value** is considered a way for companies to achieve economic success, and as such is considered a management strategy in which companies find business opportunities that emerge from social and environmental challenges. Going beyond social responsibility, philanthropy or sustainability, creating shared value (CSV) is a cross-company strategy that focuses on maximising the competitive value of solving social and environmental challenges through serving new customers and markets, saving costs and retaining talent, among other areas of activity. This is a vision that is perfectly aligned with many development goals (Porter and Kramer (2011) as in Amores (2020)).

The concept of shared value requires **entrepreneurs to link business success to social progress** by incorporating social issues at the heart of the matter, without overlooking the focus that business continues to act as business and without a simple or solely social perspective. It is therefore a question of adding new variables to a company's competitiveness and productivity equation, such as the impact on the environment, the use of resources, occupational safety, supplier access and viability and employee skills and health. Indeed, shared value sees societal value as part of the whole: the societal component ceases to be a restriction, a limitation or a secondary aspect of the project and becomes a further goal that the company includes within the performance to be maximised.

According to the Shared Value Initiative (2019) and Porter and Kramer (2011), there are three levels of CSV:

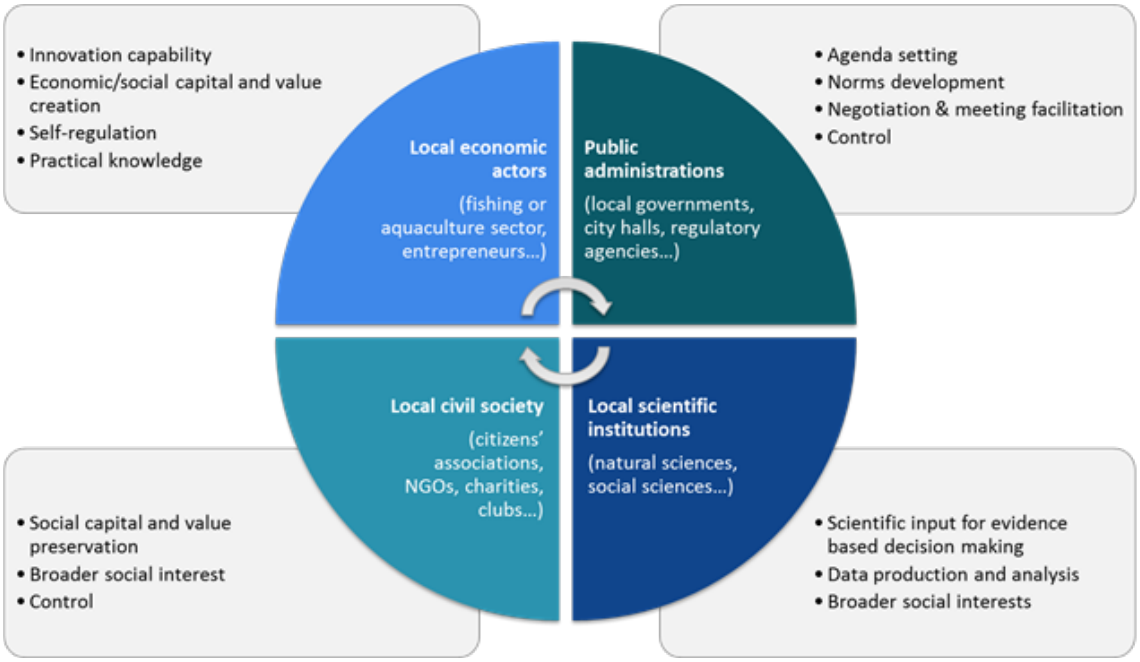
1. **Reconceiving products and markets**. Meeting societal needs through products and addressing unserved or underserved customers.
2. **Redefining productivity in the value chain**. Changing practices in the value chain to drive productivity through better utilising resources, employees, and business partners
3. **Enabling local cluster development**. Improving the available skills, supplier base, and supporting institutions in the communities where a company operates to boost productivity, innovation, and growth.

The third level of CSV reinforces the idea that CSV requires an ecosystem. This means that a cluster can naturally form part of that ecosystem since, by definition, it is made up of companies, research centres, business demand, government agencies and institutions for a particular business. At the same time, a cluster can provide a cross-sector vision through the collaborative dynamics themselves between clusters of various sectors that can come together in major challenges.

3.2.3. New multi-actor governance models to align the efforts of all actors towards the SDGS

The alignment of the efforts of all actors towards the SDGs requires new participative multi-actor governance models to enable the development of new collaborative solutions to address the SDGs in more effective ways (sustainable innovation). Based on works on transitions literature (Geels, 2002; Schot & Steinmueller, 2018), Berkowitz (2020) proposes a model of **locally-embedded participatory, multi-stakeholder governance** for sustainable innovations that take into account local or regional specificities in terms of geography, culture, social capital, etc. In this model, the contributions of each of the four helixes are essential: economic actors, public administration, science, and civil society.

Figure 4. Model of locally-embedded participatory, multi-stakeholder governance for sustainable innovation



Source: Berkowitz (22020)

This model of participatory governance relies on four key parameters to develop sustainable innovation:

- **Embeddedness in local context**, i.e. geographies, regulations, economies, cultures, organisational configuration, etc.),
- **Multi-stakeholder approach,** more precisely quadruple helix governance, i.e. four spheres being represented: economy, science, public administration, civil society,
- **Collective and bottom up** decision making process, i.e. whether or not it results from local, voluntary decision to set up governance, and all actors are involved in the decision-making process, and

- **Self-regulation** by economic actors, resulting from voluntary association and voluntary compliance with and collective control of decided rules.

A large part of the success of sustainable innovation within the framework of a model of participatory governance depends on the cohesiveness of people, economies, environments and territories, in other words of having a **shared goal** (Berkowitz, 2020). The breadth of activities across policy areas and across scales of governance creates the need for coordination and **directionality** (European Environment Agency, 2019), which refers to a shared vision and direction-guiding design and implementation of policy interventions towards a desired transformative change (Weber and Rohracher, 2012; Reichardt and Rogge, 2016, as in European Environment Agency, 2019). Directionality can be introduced into a policy mix by **identifying major challenges** in policy visions and by setting specific policy goals, milestones and targets, as well as translating those goals into concrete criteria that guide prioritisation of investment and policy implementation (Miedzinski, Mazzucato and Ekins, 2019).

To make long-term visions and missions concrete and to incentivise supporting actions, it is important to translate them into sectoral and cross-sectoral policy strategies, programmes and instruments at the most appropriate territorial level. Ambitious and consistent short-, medium- and long-term sectoral, cross-sectoral targets and a shared agenda (Fernández, Romagosa, 2020) are needed to make the vision and related policy strategies credible and to measure progress.

In this context, public institutions have a key role to play in ensuring the necessary **horizontal coherence** across policy areas, as well as **vertical coherence** between local, national and international levels. In order to maximise the impact of public policies on SDGs, **temporal** and **territorial** coherence of public policies, initiatives and actions is also required.

4. Analysis of innovative good practices

Through an online template, Panoramed experts have provided 16 innovative good practices that generate new shared value based on the blue bioeconomy. In this context, innovative good practices are understood to be the application or use of ideas or methods:

- which are relatively new
- whose application has not yet been systematically reviewed and researched
- where there is some solid evidence of good outcomes from particular experiences
- which could be transposed to other contexts

The interest was in identifying innovative good practices that could contribute to increasing the environmental, social and economic impact of European projects in the MED Area. These good practices are related to:

- the use of technologies and R&I infrastructures
- participatory governance and co-management models
- participation of clusters
- opportunities for social entrepreneurship
- opportunities for the Southern Mediterranean

In general terms, the innovative good practices in MED analysed include a **holistic approach**, which means that they take into account not only the environment or the economy as differentiated silos, but also seek to develop integrative approaches (Berkowitz, 2020). However, the social strand seems in general weaker, with loose references to subsidiary potential employment creation for vulnerable groups of persons. In particular, the template to support the collection of good practices by Panoramed experts included a section devoted to migration, but experts have not reported on any such initiatives. Some notable exceptions with social impact, such as the Biolab Ponent project, which focuses on improving living conditions in rural areas, are highlighted.

The 16 innovative good practices identified by experts generate **environmental, social and/or economic value** (see table 6). On average, out of the three strands assessed by experts, the economic value is the most relevant, with 3.7 out of 10 points distributed among the three kinds of added value; the environmental value is rated second, with 3.5 points; and social value ranks the lowest, with 2.9 points. It is remarkable also that, whereas the minimum score given to social value was 0, it was 2 for environmental and economic value; on the contrary, the maximum score given to social value was 4, while much higher scores were given to environmental (6 points) and economic value (8).

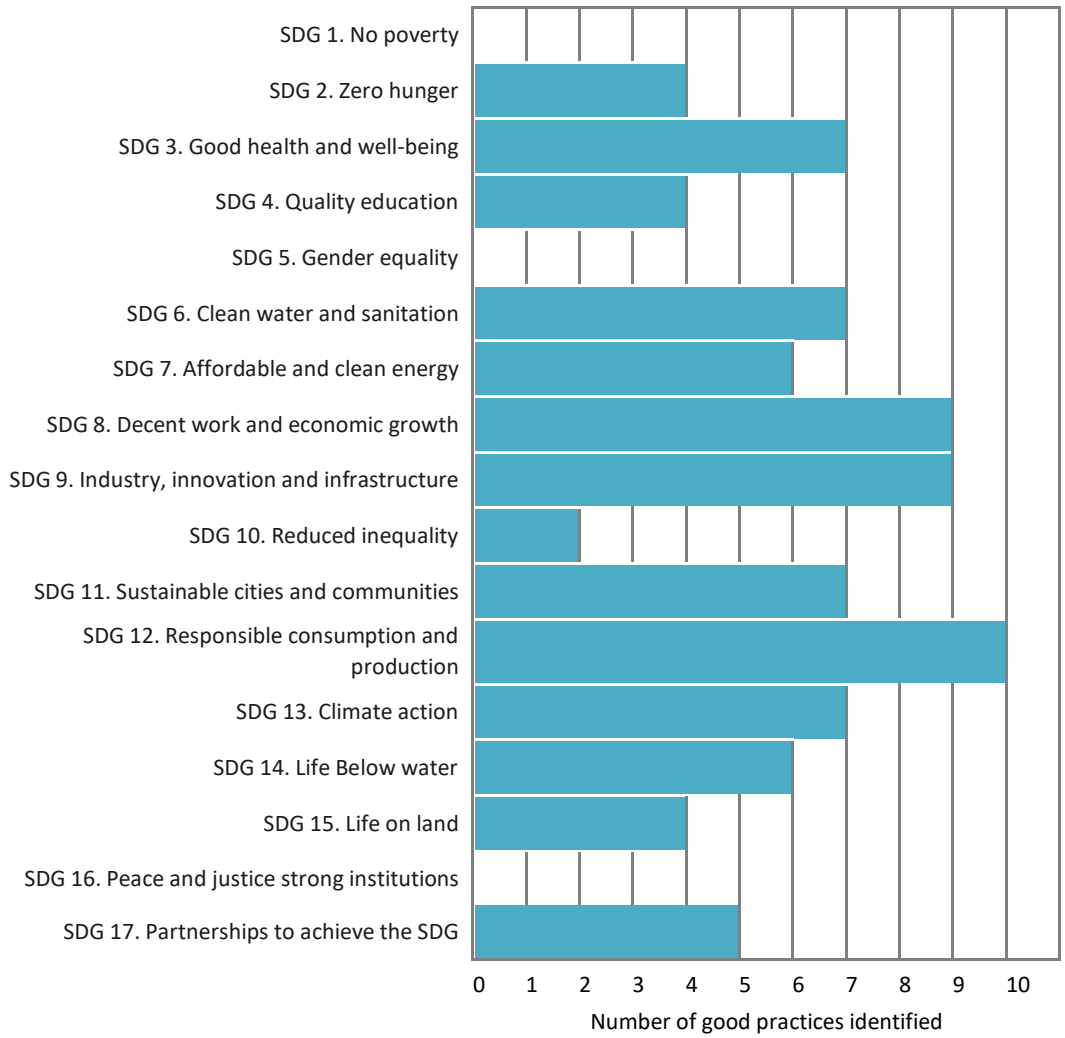
Table 1. Economic, environmental and social value

Key message	Average	[Minimum-Maximum]
Economic value	3.7	[2-8]
Environmental value	3.5	[2-6]
Social value	2.9	[0-4]
Total	10	

Source: Own elaboration.

The SDGs most frequently addressed by the innovative good practices identified are Responsible consumption and production, followed by Industry, innovation and infrastructure and Decent work and economic growth (figure 5).

Figure 5. SDGs addressed by innovative good practices identified



Source: Own elaboration

These three first goals are mostly related to the generation of responsible economic value. The other SDGs addressed by the innovative good practices refer to environmental value, such as Climate action, and to a mix of environmental and social value, such as Sustainable cities and communities and Clean water and sanitation.

Four out of the 16 innovative good practices analysed included *Partnerships for the goals,* as mentioned above, a key principle of our conceptual framework.

It is remarkable that only two or three of the innovative good practices in our sample address pure social goals, such as *Zero hunger* or *Reduced inequalities*, and none of them is devoted to the goals of *No poverty*, *Gender equality* and *Peace, justice and strong institutions*.

Our small sample of is, no doubt, not representative of all good practices in the Mediterranean, but it was selected by experts who looked for innovative practices promoting all three strands of sustainability transitions, that is, economic, environmental and social shared value. The weaker representation of innovative good practices that address social challenges may be a sign, not that these challenges are not addressed at all in the MED area, but that **innovation, and technologic innovation in particular, is not applied to solve social challenges as much as it is applied to economic and/or environmental challenges.**

4.1. Collaboration of stakeholders and governance models

Collaboration among different stakeholders (government, research and innovation agents, companies, civil society) is considered by all the experts a key element for the success of innovative good practice and the creation of shared value in all 16 innovative practices analysed. With various degrees of involvement, **the stakeholders are**: transnational governments, regional governments, local governments, universities, research centres, technology centres, innovation centres, labs, large companies, SMEs, social enterprises, clusters, trade unions, vocational training schools, port authorities, associations, NGOs, and individual citizens. Thus, all representatives of the quadruple (quintuple) helix participate in the innovation initiatives.

The reasons behind this assessment made by experts of collaboration practices among stakeholders are that:

- Nowadays it is increasingly important to take into consideration the societal impact of research and innovation activities. The **integration of RRI aspects into regional policies** could help to establish a new way of approaching societal challenges in the policy planning of regional governments.
- Changes of paradigms oriented at solving a societal problem are only possible if they are the result of a **consensus acknowledged by everybody concerned with the problem, the solution or both**. Radical changes of perception cannot be imposed or forced, but must be agreed. Everybody concerned must discuss on the same level, and then, once an

agreement is achieved regarding perception of the problem and what to do next, everybody moves on, taking different actions according to their different responsibilities. For instance, the public administration produces a new regulation, academia reports that the negative economic, social and/or environmental impact diminishes after actions are taken, local economic actors promote their activities. It is all about **establishing a non-hierarchical collaboration among diverse stakeholders around a shared agenda.**

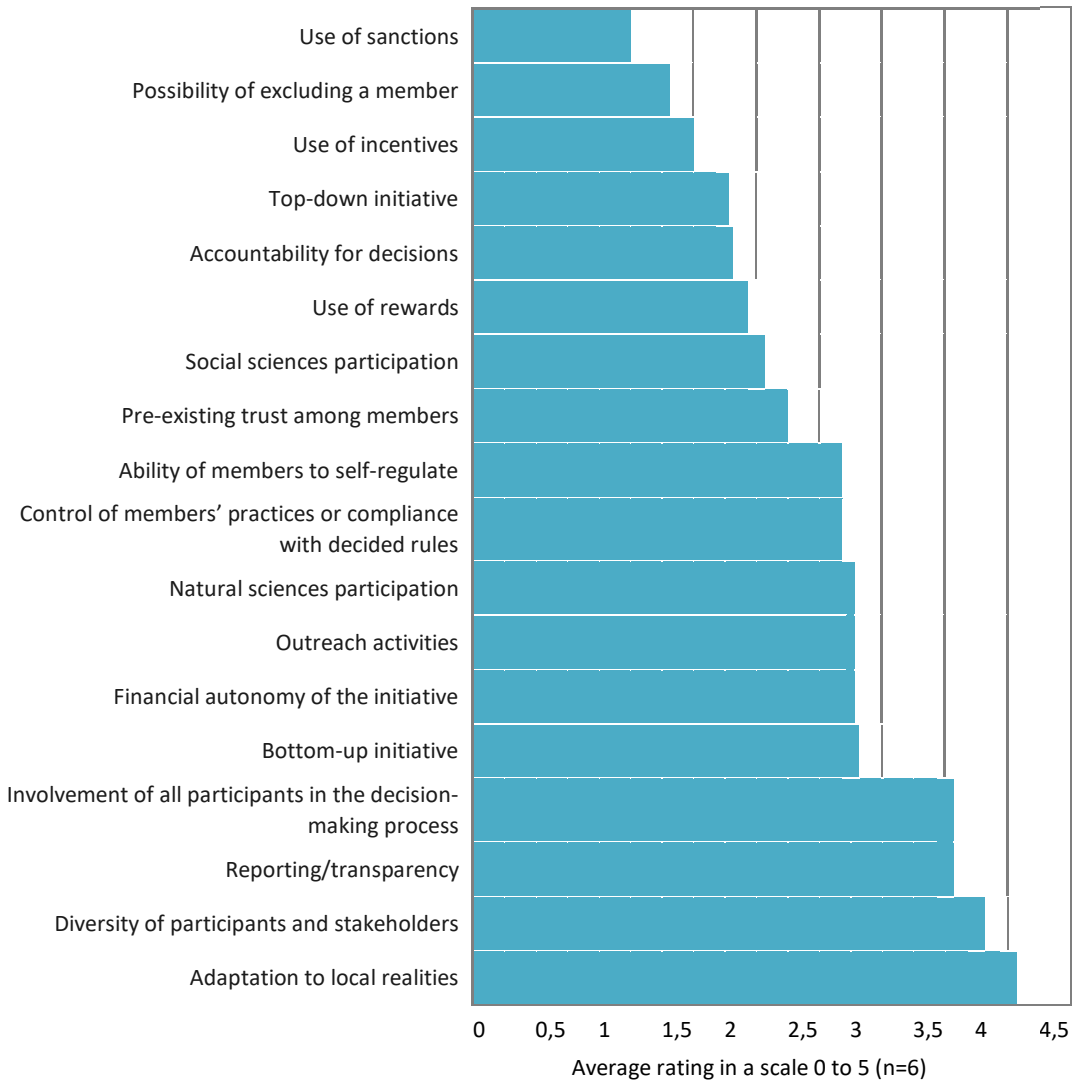
- The collaboration of different stakeholders is key **when facing fragmented structures**, for instance, when there is a large number of unconnected small-scale family-based producers. Moreover, these economic actors are usually unrelated to innovation processes, whether or not these processes are related to their main activity. Deploying business models which capture and share the added economic, social and environmental value of the blue bioeconomy requires technological, organisational, policy and social innovations that can generate new value chains. These innovations can only be co-identified, co-developed and co-implemented if the different system actors (economy, society, research and policy) work in a collaborative way.

- For the creation of new shared value, it is important to ensure **transparent and responsible communication, dissemination, knowledge transfer and operation of outcomes** by the different stakeholders in order to ensure the maximum impact of the innovation action and thus maximise European blue growth potential.
- A close articulation between the Cohesion Policy and the Maritime and Fisheries Fund in research and innovation areas may be important in addressing relevant Mediterranean challenges.

The experts also assessed the key elements for the governance of the initiatives. On a scale from 0 to 5 (figure 6):

- Adaptation to **local realities** is assessed as the most important governance element with a 4.3 score;
- This is followed by the **participation of diverse stakeholders** (rated 4.1), such as economic actors, scientists, civil society, government, etc. This participation is closely linked, according to the assessment of the experts, to their **involvement in decision-making processes** (3.4)**.**
- The participation of natural science experts is considered more important on average than the participation of social science experts (with ratings of 2.9 and 2.4, respectively). This is consistent with the higher value given to environmental issues than to social value in the initiatives described in Table 6.
- The participation of non-local stakeholders on co-management boards also appears appropriate when it comes to local initiatives aimed at expanding the market for new products or services.

Figure 1. Importance of key elements for the governance of the innovation initiative



Source: Own elaboration.

- In this context, to engage and maintain the interest and commitment of participants may be a challenge worth taking into account when analysing the concerns of potential stakeholders and how an initiative can shape solutions through multilevel collaboration. In particular, strong commitment to policy is key to ensuring good governance and the continuity of the initiative beyond the project's specific duration.
- Finally, participants need to have a set of capabilities to participate in this type of governance mechanisms: trust, transparency, honesty, transversality, empathy, community benefit, thinking of the key to territory, avoiding exclusively personal interests, thinking globally and acting locally, inclusive. Not everybody can be part of these initiatives.

- **Transparency and reporting** seem essential to good governance (3.4), which may be linked to some extent to outreach activities (raising awareness among consumers, economic actors…) (2.9).
- **Bottom-up approaches** can coexist with **top-down approaches**, but they are clearly rate differently: bottom-up approaches get a score of 3.3, top-down just 2.1.
- **Financial autonomy** is also key to providing a good structure to the entity that takes on the function of governance as it responds to all the challenges the initiative may face.

- The elements rated lowest in their importance for governance are **coercive measures**, such as the use of sanctions (1.1 score) and the possibility of excluding members (1.6). Interestingly, the **use of incentives** (1.9) **and rewards** (2.3) were also rated among the lower positions.

Additionally, the experts highlighted three elements for the achievement of common goals:

- **Adaptive management**, which enables continuous changes needed to achieve long term sustainability goals (e.g. fishing quotas)
- **Regular scientific monitoring**, which allows the assessment of measures adopted related to environmental conservation (e.g. fish population)
- **Involvement of directly affected population** (e.g. fishermen) in the decision-making process on a level playing field with other sectors, which gives them a sense of ownership of the initiative.

Further, it needs to be taken into account and accepted by stakeholders that this type of initiatives is very slow in producing tangible outcomes, since this is about the cohesion of people, economies, environments, territories and so on. This requires a new management model that cannot be implemented quickly.

Finally, a key figure in the governance of these initiatives emerges: the manager, often responsible not only for financial and accounting management of projects, but also for understanding and applying the new governance models associated with multi-stakeholders' initiatives. The competences these managers need to possess, to name a few, are: social, public relations mediation skills; good financial and accounting skills; technical knowledge in all sectors involved (economy, environment, social); knowledge of the territory; knowledge of various languages...

4.2. New shared value: environmental, social and economic value

The experts highlighted the environmental, social and economic value of the initiatives.

4.2.1. Environmental value of the initiatives

- Awareness raised among communities on the environmental damage of discharging plastic-based products in the sea.
- Improvement in waste management in the agri-food sector that contributes to reducing soil and water contamination.
- When the blue crab is removed, the environment returns to its former state.
- Strengthening of the environmental impact of regional research and innovation projects.
- Reduction of the environmental footprint of production and processing industries; reduction of seafood waste; greater protection of marine resources; better sustainability of the sector; contribution to management of coastal areas.
- Contribution to climate change, energy transition, land use planning and the circular economy.
- Emergence of new business models based on services and sharing renewable energy production locally, improving energy efficiency.

4.2.2. Social value

The main social value, as assessed by the experts, is the empowerment of communities in order to drive initiatives for common benefit. Promoting responsible, participative and innovative small communities based on shared knowledge and new skills by **empowering local communities** to become the main actors in the management of their own natural resources and become responsible for their local economy. Local stakeholders become the owners of their own future. Encouraging collaboration to achieve targets in a collective way builds trust over time, an invaluable condition for ecological transition. This can be also an answer **to pressing and urgent societal challenges**: using collective intelligence to find new and innovation solutions. This helps to avoid the culture of the dependence on subsidies that has proven fatal for European rural areas, and contributes to reinvigorating and supporting the local economy and employment, often new green job opportunities.

Other remarkable sources of social value is awareness raising among **citizens** about energy transition and climate change and food security and nutrition.

Figure 7. SEAFOODTOMORROW project

The seafood sector plays a key role towards achieving food security and nutrition, employment and economic development. Sea food tomorrow Project creates social value by:

- **increasing seafood consumption; increasing the availability of healthier food;**
- **strengthening food security by offering safe and high quality seafood to consumers; creating positive health effects for consumers;**
- **reaching specific segments of the population with tailored products to overcome nutritional deficiencies (e.g. pregnant women, elderly people and young people);**
- **improving consumer protection;**
- **educating seafood industry workers;**
- **creating stable jobs in the seafood production, processing and associated sectors.**

Source: Own elaboration`based on project's website.

4.2.3. Economic value

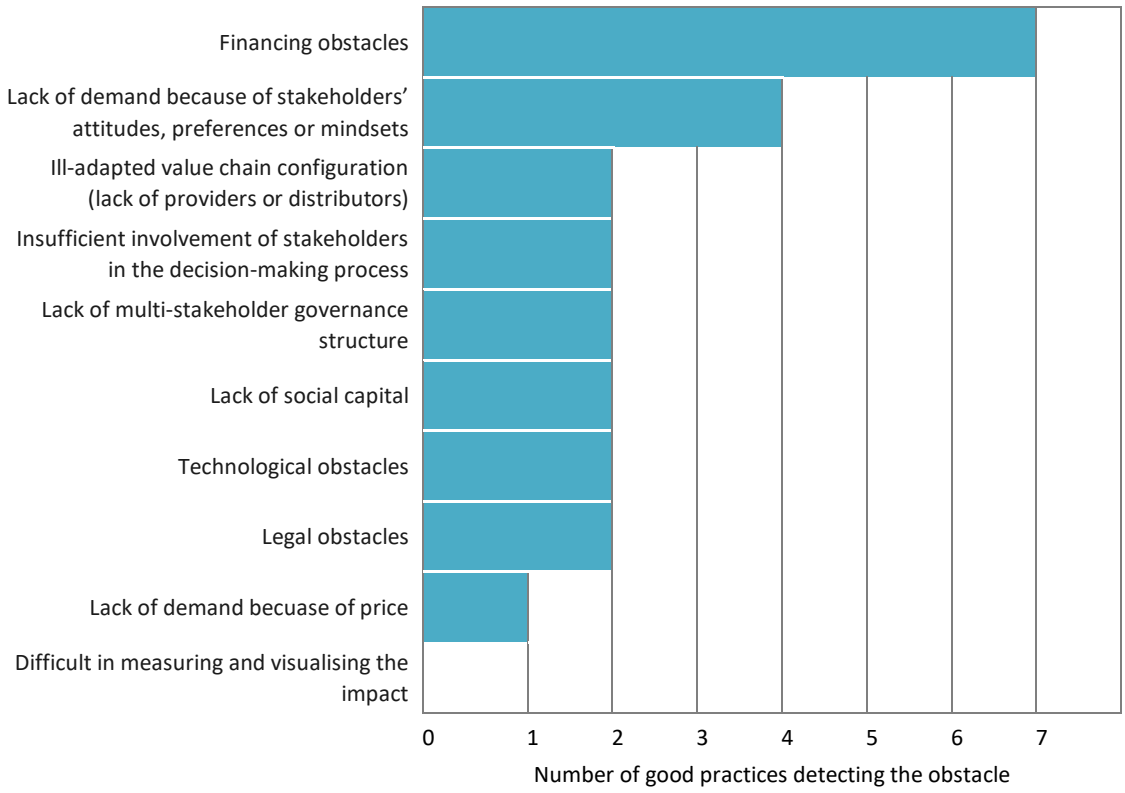
- Sectors, and new products or services, in part from new natural resources (e.g. new fishes), that reach higher values and generate competitiveness among companies, new markets (ecogoods, "social marketing", which also forms part of the CSR of other companies), creation of new jobs.
- The emerging bio-based industry is the most important source of economic value.
- There is an indirect economic value that coordination tools of these projects (e.g. platforms) can generate through the network effect. Bringing together different actors to find new solutions to societal challenges can generate various economic opportunities for participants.
- Promotion of new energy business models based on services and "prosumers". This means also the creation of new jobs.

4.3. Obstacles to scaling up innovative good practices, and alternatives to overcome them and accelerate transfer

According to the experts, when it comes to scaling innovative practices financial obstacles are the most important ones, followed by lack of demand due to stakeholders' attitudes,

preferences or mindset (figure 8). At the other extreme, lack of demand due to price was not mentioned as a particularly important obstacle.

Figure 8. Obstacles to scaling up innovative good practices



Source: Own elaboration.

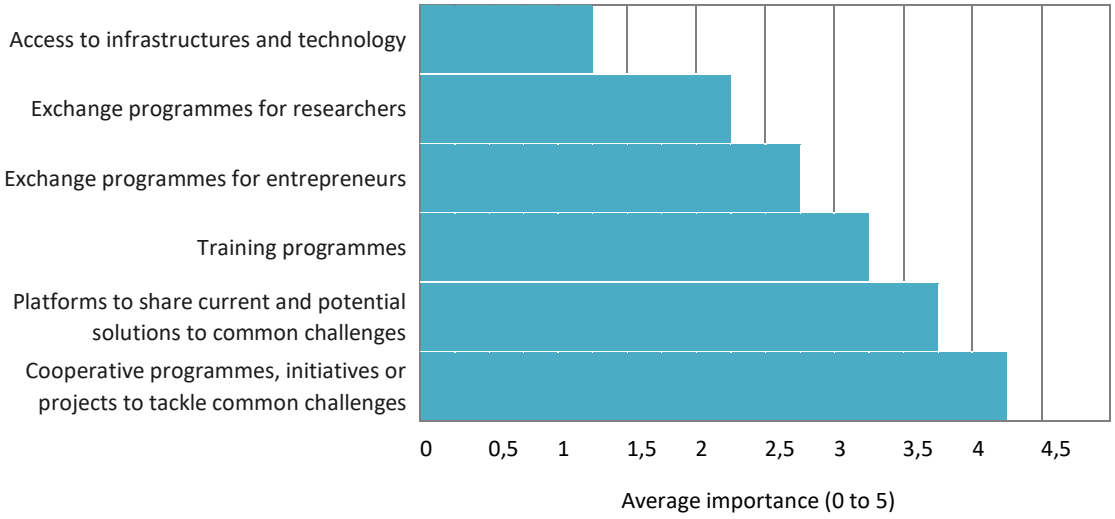
As alternatives to overcome these obstacles, the experts suggest (figure 8):

- Collaborative projects with agents from the quadruple helix.
- Adaptive management.
- Fiscal or other green economic incentives that support the competitiveness of more expensive ecologic products.
- Training activities, good practice visits and more target-focused dissemination activities.
- Medium-term (2021-2025): simpler, more efficient and faster regulatory approval paths for blue bioproducts and blue intellectual property protection
- Lobbying actions at national and international level to incentivise private and public investment through tax bonuses in order to find adequate financing.
- Building a network of ambassadors and supporters of the initiative in order to incentivise stakeholder engagement.

Project co-financed by the European Regional Development Fund

The experts also suggested possible ways to overcome the obstacles to transferring good practices to Southern countries through cooperative projects and platforms for sharing current or potential solutions to common challenges; training programmes; and exchange programmes for entrepreneurs and researchers. Access to infrastructures and technologies is also important.

Figure 9. Importance of mechanisms that could help increase the transfer and impact of good practices to the South



Source: Own elaboration.

5. In-depth analysis by experts

This section presents the main findings of three papers by experts containing more in-depth analyses of specific issues that are important for the governance of innovation policies in the field of the blue bioeconomy in the MED Area and, therefore, for this report.

The paper by Heloïse Berkowitz focuses on participatory governance for the development of the blue bioeconomy in the Mediterranean region. The one by Xavier Amores discusses how clusters can contribute to resolving social and environmental challenges through the creation of shared value. Finally, the paper by Pablo Bou centres on the role of marine biotechnology in the creation of shared value in the Mediterranean.

5.1. Participatory governance for the development of the blue bioeconomy in the Mediterranean region (Berkowitz, *In Press*)

Berkowitz identifies a series of gaps or obstacles in sustainable innovation projects in the MED region, in relation to locally-embedded participatory, multi-stakeholder governance model for sustainable innovation. She also proposes a set of solutions or opportunities to overcome these gaps.

A first set of obstacles are related to the participation of the quadruple helix actors, that is, local economic actors, public administrations, local scientific institutions and local civil society. Accordingly, the lack of commitment by all four groups of stakeholders is highlighted as one main obstacle, accompanied by lack of trust and resistance to change among established actors. All this may be due to a lack of the general capabilities needed for the governance, either in business, science, policy or civil society, or, in particular, to the lack of entrepreneurial skills in lagging regions and the immaturity of business models in emerging sectors. All this has to do with horizontal and vertical coherence.

A second set of obstacles is linked to the difficulties in designing and implementing projects that guarantee territorial (and temporal) coherence, i.e. that connect with the dynamics of territories. Regulatory inconsistencies in the MED region present an obstacle to wider systemic projects, since multi-layered and multi-level governance instruments often clash with each other or cancel out the efforts of others. Indeed, not all countries have a tradition of autonomous self-organisation at local or regional level and, as a consequence, local collective action is often absent or difficult. Variability in cultures, geographies, economy, migration risks, climates, etc., and even geopolitical tensions, can further hamper the design and implementation of sound sustainable innovation initiatives.

A final obstacle to the development and scaling-up of sustainable innovation is the lack of financial and human resources, as well as social capital.

Some additional findings regarding certain conditions for the success of sustainable innovation projects in the MED are as follows:

- The **committed involvement of local and regional administrations** is crucial, particularly in rural areas. These local authorities are responsible for commissioning analysis of the potential resources of each one of their municipalities, taking into account economic activities and natural capital. This knowledge is the basis for launching the entrepreneurial discovery process that will enable the identification and validation of new business models.

- All participants must be involved, and this requires **developing buy-in or commitment for all** and ensuring that the responsibility does not fall onto one single person, usually the manager, who must deal with everyone. Actionability of the governance model, joint actorhood and joint responsibility are key conditions for ensuring not only the implementation of the model but also the accountability of participants.

- Success also depends to a large extent on the cohesiveness of people, economies, environments and territories, in other words, on **having a shared goal**.

- It is necessary **to improve the capabilities of the participants in governance**, by enhancing values such as trust, transparency, honesty, transversality, empathy, community benefit, focusing on key aspects of the territory, avoiding exclusively personal interests, and thinking globally and acting locally, in an inclusive manner. According to one member of an initiative "*Not everybody could be part of this initiative*".

- As noted from the projects analysed, certain individual actors, including particularly managers, who act as **innovation spanners, play a central role in mediation**. Conditions for acting as mediators may include having good technical knowledge of all the sectors involved, as well as familiarity with the territory and, potentially, speaking several languages.

Finally, Berkowitz also identifies opportunities for sustainable innovation projects in the MED:

- A **twinning strategy** between a North more advanced region and a South region or a lagging region and a more advanced region could be implemented. This could facilitate the development of joint projects or simply enable knowledge transfers through workshops and exchange programmes.

- Facilitating and encouraging the development of **innovation brokers** may constitute a crucial vector of experimentation emergence in territories. This, however, requires capacity building. Training workshops could be designing and implemented in the Mediterranean region, drawing on existing brokers' experience.

- It could be fruitful to facilitate and encourage the development of **boundary meta-organisations** which would have responsibility for the multi-stakeholder governance of experimentations and be accountable for decisions taken.

5.2. How clusters can contribute to the social and environmental challenges through the creation of shared value (Amores, *In Press*)

Clusters are the ideal ground for identifying and implementing shared value projects. Clusters can create shared value and contribute to developing responses to territorial social challenges at three levels:

- Enabling local cluster development through improving the available skills and supplier base, and supporting institutions in the communities where a company operates to boost productivity, innovation and growth.
- Redesigning products and markets by promoting innovative solutions, products and services related to the creation of shared value.
- Redefining productivity in the value chain by changing practices in it with the aim of driving productivity through better utilising resources, employees and business partners.

Clusters provide a good tool for identifying and disseminating collective corporate social opportunity, understood as a value creating activity when utilised with an appropriate strategy, and different from Corporate Social Responsibility or simply a charitable gesture. Instead of "*good*" corporations, "*smart*" corporations can be understood as collaborating in value chains and society or communities as a whole, or, as specifically stated: "*Society should also recognise that corporations are the organisations that create collaborative values rather than simply giving away part of their profits to society. When corporations and society both realise this mutually beneficial role, a virtuous cycle of increased benefits can be developed for both corporations and society*." (Moon (2019), as presented in Amores (2020)). Eventually clusters also implement projects or engage public funding to develop projects of creation of shared value (CSV).

However, few existing clusters have CSV as strategic area in their organisation; rather, improving competitiveness is the main goal of all clusters nowadays, and CSV is not a core topic in most cluster organisations' agenda. Rather exceptionally, some clusters promote many projects that could be considered as CSV, especially in the cleantech, social, health, children and silver sectors. Some of these CSV projects could be useful for achieving Panoramed objectives. Most of them use European public funding (calls such as INNOSUP, COSME, H2020, Interreg and so on).

Almost all examples of CSV in websites, studies, academic articles, etc., are focused on large companies. They seldom have a perspective from which a cluster, as an entity, or a government drives a CSV policy through a cluster. It is important to highlight this factor because it is, in turn, a handicap for identifying success stories and good practices with a view to promoting the policies and actions of a cluster.

Nowadays public administrations focusing on promoting CSV by clusters are very limited and still incipient. Sweden and Catalonia are two good cases, but they are too recent or hampered by a lack of resources to ascertain their real long-term impact. They take two different approaches:

- Sweden: strategy focused on connecting SDGs and CSV through public funding, strategy and leadership of the project.
- Catalonia attempts to promote and systematise CSV in cluster initiatives through pilot project and new policies.

New agendas and more incentives must be introduced by governments in order to consolidate CSV and release its full potential, and this requires strategic alignment with territorial challenges. At the moment, "*project logic*" in CSV is more usual than alignment to real territorial needs, regional smart specialisation or global strategies as SDGs.

There is a need to develop new KPIs on the impact of CSV in clusters and companies. The current measurement of cluster performance based on the number of members, budget increase, projects implemented or visibility in press needs to take into account how these CSV projects or initiatives impact on their community or members.

CSV policies require coordinated, long-term effort by European, national and regional authorities. Clusters could be a valuable instrument for promoting these policies because of the presence of different stakeholders and for the show effect these initiatives could have.

5.3. Marine biotechnology as a tool for the creation of shared value in the Mediterranean (Bou, *In Press*)

The European Commission defines **bioeconomy** as those parts of the economy that use renewable biological resources from land and sea, such as crops, forests, fish, animals and micro-organisms, to produce food, materials and energy. Aligned with this definition, the European Commission **defines the sector of marine biotechnology (MBT)** as a "*provider of high value added and specialised commercial products from these renewable biological resources*". Marine biotechnology is considered one of the five specific European activities or focus areas of the blue growth strategy (European Commission, 2012) with greatest potential for job creation and for innovation to be transferred to society, with an expected turnover in Europe of 1,000 M $ and 10,000 new jobs by 2020 if the market continues to grow at the rate of 6-8% (ECORYS, 2014).

According to the blue ocean economic theory (Kim & Mauborgne, 2017), **the ideal business model** for a company or sector must be based on innovation as a differentiating driver for competition. This theory raises an economic "***red-ocean***" situation when there is high competition for a product or service with a low or zero presence of entry barriers to potential

competitors. This situation means that companies end up competing for price and not for value, maximising the resources of companies devoted to achieving market share without any ability left to invest benefits in technological developments. In this theory, the red of the ocean represents the blood of the members of this ecosystem in this struggle, in a metaphorical sense. As opposed to the "*red-ocean*", the concept of **"*blue ocean*"** consists in the creation of new market niches with strong barriers to entry, which generate a decrease in competition. These barriers may be technological, related to industrial protection (patent, industrial secret, utility model, etc.) or legal. **Innovation is the main driver for the creation of economic blue oceans and the evolution of the leading industries in these markets**.

On the other hand, marine biotechnology presents high potential for the **creation of shared value (CSV),** where new businesses act as transforming agents in their environment, generating environmental, social and economic value.

Table 7. SWOT analysis of marine biotechnology (MBT)

Strengths	Weaknesses
• MBT in constant growth (Collins, Broggioato , and Vanagt 2018) • Culture of collaboration with other disciplines (e.g. engineering and robotics). • Impact on at least 9 of the 17 SDGs. • Impact of MBT in sectors of high economic potential (e.g. pharmaceutical industry). • MBT or blue biotechnology linked to many other more mature biotechnologies, being able to promote them technologically (Kafarski 2012). • Existence of successful MBT projects with potential to be transferred to other Mediterranean regions with similar problems.	• Lack of KPI indicators for CSV initiatives. • Lack of MBT cluster organisations to serve as CSV facilitators. • Weak research-company collaboration (OECD 2013). • Lack of identification and structuring of agents of blue biotechnology (research, industry, civil society and government) in the Mediterranean • Lack of technological centres and specialised infrastructures in MBT.
Opportunities	**Threats**
• Ongoing reorientation of public subsidies and incentives from those with harmful impacts to those with beneficial impact. • Existence of vast unexplored marine areas. • Existence of aquaculture techniques able to provide organisms with biotechnological potential without harmful impacts on environment. • Existence of logistics for the collection of waste potentially applicable to marine waste, which is a key element for the promotion of blue business and initiatives of circular economy.	• Current legislative framework hinders the exploitation of the MBT potential. • Existence of subsidies and incentives with harmful impact on environment and that diminish potential for progress in areas such as MBT.

Source: Bou, P. (2020)

Bou argues that marine biotechnology contributes to at least nine out of the seventeen SDGs[34] and, therefore, plays a relevant role in CSV, since each of the nine SDGs identified refers to at

[34] SDG1. No poverty, SDG2. Zero hunger, SDG3. Good health and well-being, SDG6. Clean water and sanitation, SDG7. Affordable and clean energy, SDG9. Industry, innovation and infrastructure, SDG10. Reduced inequalities, SDG14. Life below water, SDG17. Partnerships for the Goals

least one of the areas of shared value (social value, economic value and environmental value). Table 7 presents a summary of a SWOT analysis of the MBT, as developed by Bou.

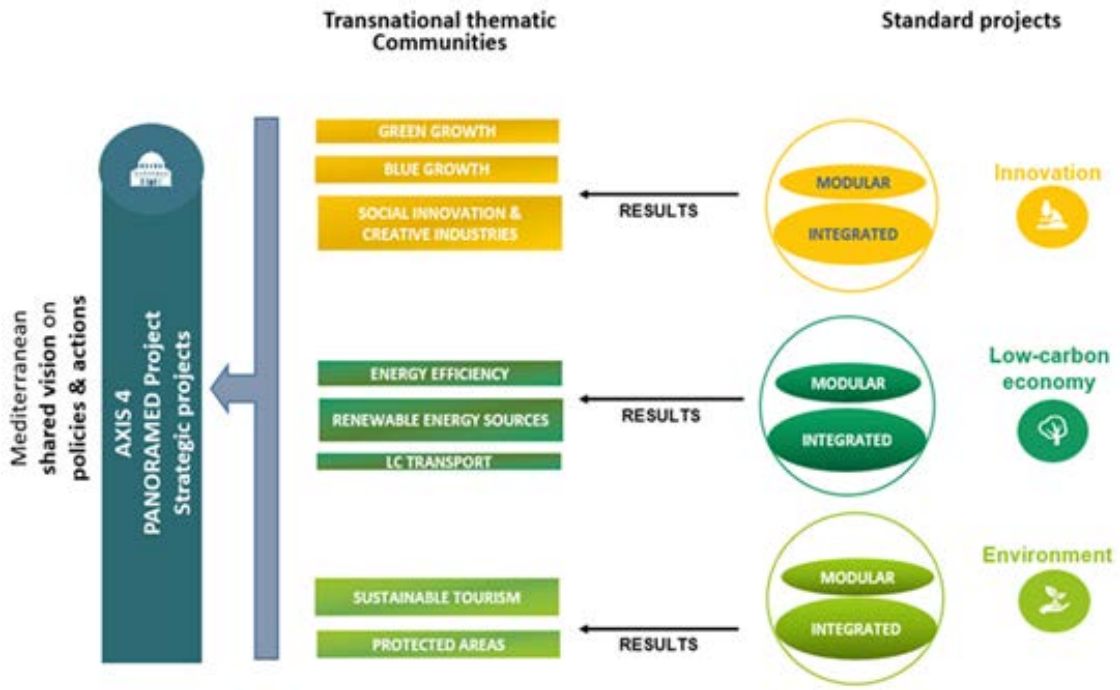
Project co-financed by the European Regional Development Fund

6. Main findings from horizontal projects and Med Communities

As advanced in Section 1.1, Interreg MED focuses on four priority axes, three thematic and one devoted to governance. The three thematic priority axes (axes 1, 2 and 3) target innovation, low carbon and energy efficiency strategies, as well as the conservation of natural and cultural resources, and promote a two-tier approach to cooperation (figure 10):

- On the one hand, a series of **modular (or integrated) projects** where partnerships cooperate on the ground (field cooperation) within their own project;
- Additionally, **horizontal projects**, established to connect and support modular projects that address similar thematic topics: **eight thematic communities** have been set up, each revolving around a group of modular projects, to share views and methodologies, upscaling cooperation dynamics, with the overarching aim of helping to meet capitalisation targets. Processing through thematic cooperation, the horizontal projects therefore generate thematic capitalisation. A comprehensive cooperation scheme is accordingly framed, where no project is left to operate alone. This is indeed one of the main innovation elements featured in the Interreg MED Programme.

Figure 10. Interreg MED architecture and Panoramed



Source: MED Programme.

The governance axis (Axis 4) targets better governance in the Mediterranean through multilateral cooperation. Exchanges in governance modalities have been set up at programme level, within a single-platform project, Panoramed, to empower territorial actors and trigger governance cooperation dynamics. Panoramed is a top-down governance initiative whose goal

is to reinforce the capacity of national and public authorities to contribute in a coordinated way to current and future strategies and initiatives at Mediterranean basin level. In so doing, Panoramed is building bridges between MED projects and high level international strategies, initiatives and agendas, through improved multilevel governance and the involvement of national and regional governments (Daraio, 2019). One of the specific aims of Panoramed is to identify and promote strategic projects in three key sectors for the MED Area: coastal and maritime tourism, maritime surveillance, and innovation in the blue bioeconomy.

Horizontal projects are the essential element of transnational thematic communities. These horizontal projects **cooperate with both the Interreg MED programme and individual projects**, concentrating and developing information and deliverables per each of the three priority axes, producing summaries and qualitative analysis, gathering results and facilitating transnational dissemination and transferability from modular projects to other thematic programmes, European Commission, member states, thematic or institutional networks.

They act as **facilitators of synergies**, exchanging and sharing between individual projects in order to foster the overall impact of the projects. Horizontal projects also promote modular projects' **communication and capitalisation actions** within a joint framework, in order to better highlight the interests of the Interreg MED programme as well as of the transnational projects themselves.

Thus, through a comprehensive remit focused on capitalisation, horizontal projects are conceived as **'capitalisation companions'**: an interface crossing over individual modular projects' limitations to unleash transfer and capitalisation potentials. Cooperating at 'thematic community' level, they foster knowledge sharing, convey skills and creativity and set the framework for stronger cooperation perspectives[35].

Horizontal projects contribute effectively with their work to meeting the following needs[36]:

- to structure better the research of common solutions for joint problems and priorities in the territory of Interreg MED;
- to define better the added value of the transnational work;
- to communicate and to develop jointly the main results of the programme;
- to manage a process of community building mixing bottom-up and top-down approaches (between thematic and governance priority axis);
- to contribute to the creation of the unique identity of the MED cooperation area

Horizontal projects effectively manage processes of community building, mixing bottom-up and top-down approaches, as they cooperate both with individual projects (bottom-up) and

[35] Concept Note Interreg MED Capitalisation Event Athens, 24 October 2019: "MED FOR YOU A Strong Narrative for Policy Change"
[36] As established originally in the Terms of Reference for Horizontal Projects in July 2015

the Interreg MED Programme (top-down). In so doing, horizontal projects are already starting to **work in a way similar to mission-oriented roadmaps**, exploring complementarities and synergies among projects to address common challenges. Thus, the eight transnational thematic communities, as bottom-up coalitions of diverse actors gathering mission-projects (as in figure 11, which describes mission-oriented roadmaps), aim to contribute to common challenges.

Figure 11. Mission Oriented Research & Innovation in the European Union

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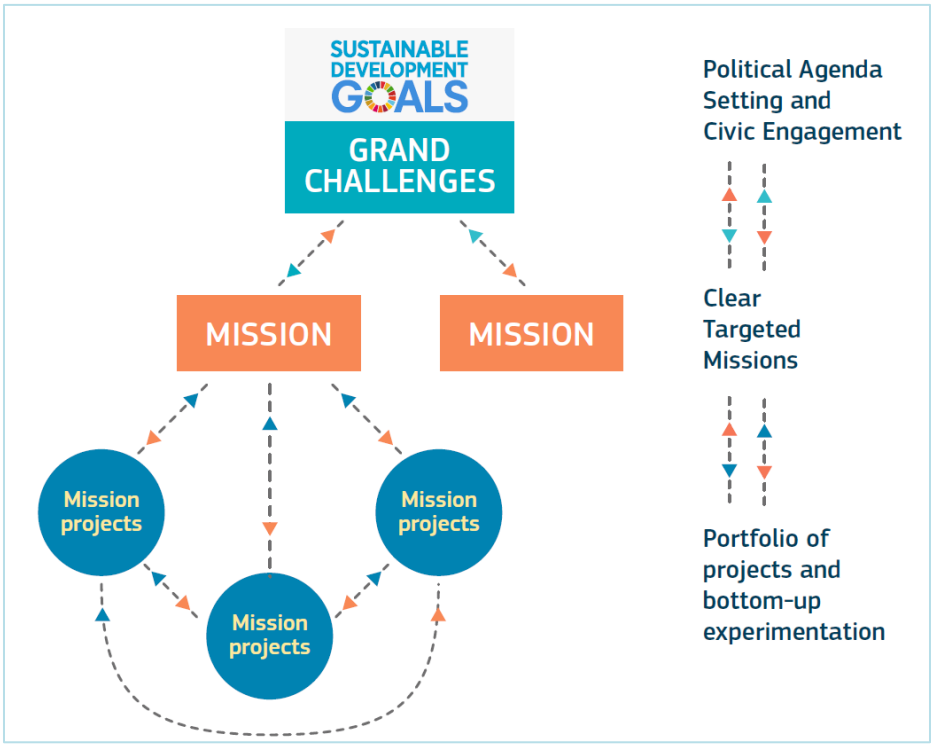
The report Mission Oriented Research & Innovation in the European Union (Mazzucato, 2018) identifies mission-oriented policy as the key instrument to reframe Europe's approach to tackling grand societal challenges. While the SDGs are useful to ensure focus, they remain for the most part too broad to be actionable. On the other hand, research and innovation projects have clear objectives and are actionable, but they remain isolated in their impacts if not clearly linked to their ability to address global challenges and to achieve societal impact. Here, missions set clear and ambitious objectives that can only be achieved by a portfolio of research and innovation projects (see mission projects at figure 12**).**

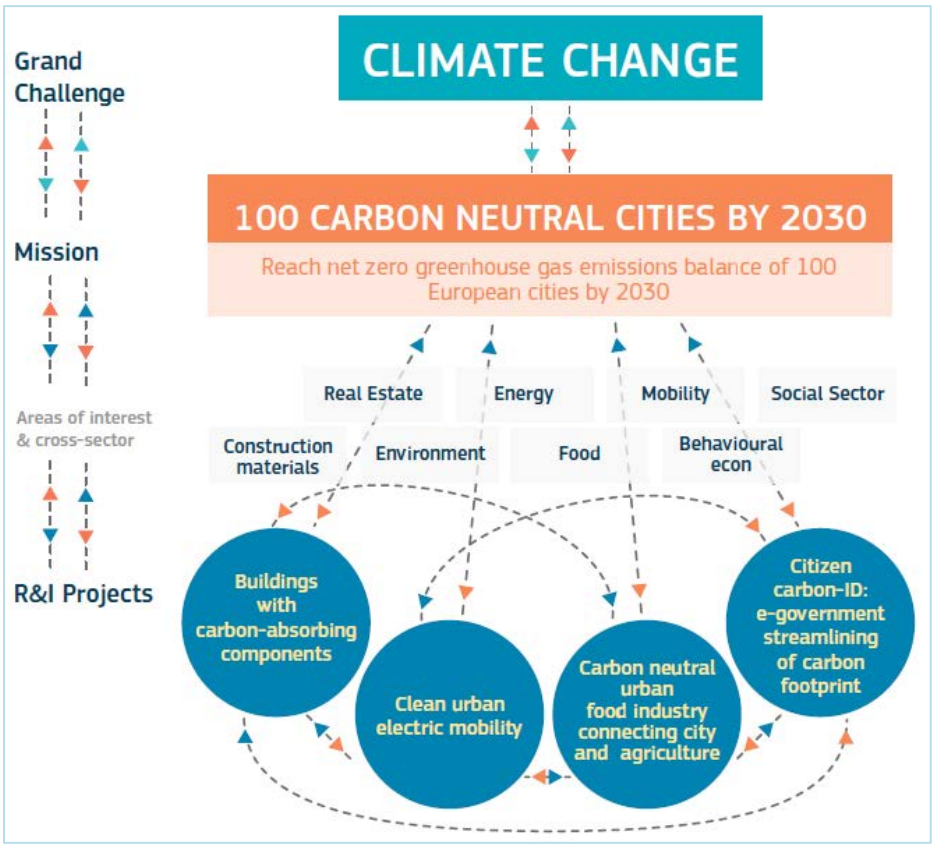
Source: Own elaboration based on Mazzucatto report (2018)

As examples, the Green Growth Community aims to promote a greener development model and a circular economy, while the Renewable Energy community seeks to increase the share of renewable local energy sources in energy mix strategies and plans in MED territories. Furthermore, the agendas of each of the eight thematic communities are clearly aligned with some of the specific objectives of the SDGs (missions in figure 12): in the examples mentioned, the Green Growth Community is aligned particularly, though not only, with SDG 15,[37] and the Renewable Energy Community with SDG 7.[38] Finally, in the cooperation architecture of Interreg MED, the eight communities interact so as not to remain isolated in their efforts to address and achieve societal impact (in the example on the bottom figure 12, the Grand Challenge of Climate Change).

[37] SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and help biodiversity loss.
[38] SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Figure 12. Grand challenges, missions and mission projects: the example of climate change

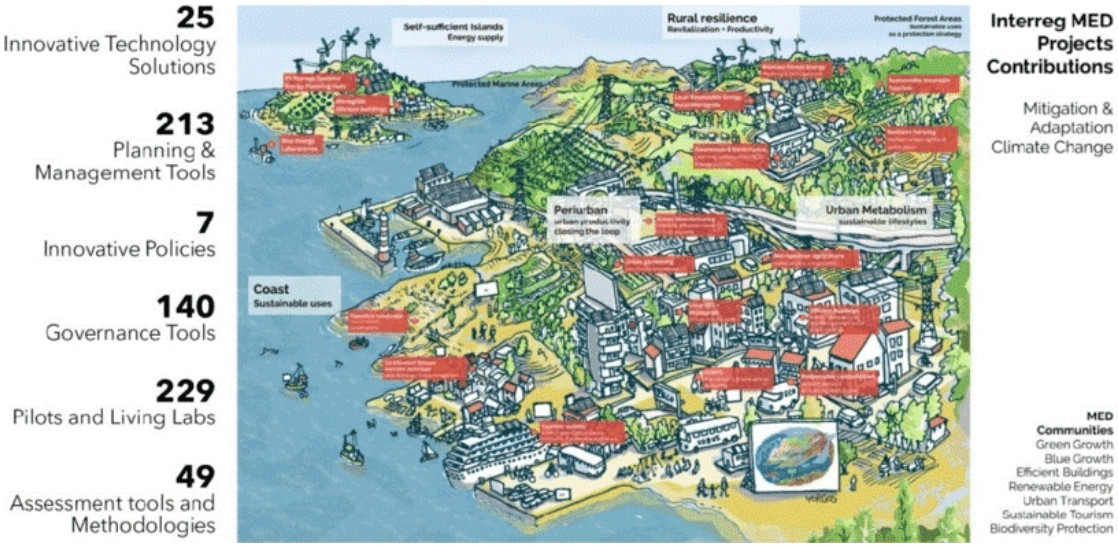




Source: Mazzucato (2018).

Indeed, the MED communities have been already exploring their complementarities and synergies to address climate change in the MED Area from a cross-cutting and ecosystem-related approach (figure 13). Also, four MED communities are working together to boost the revitalisation of rural areas as a resilience strategy in the Mediterranean Region, using a cross-cutting approach that stresses the relation between the environment, society and economy (table 8).

Figure 13. Interreg MED communities' contribution to climate change



Source: MADE in MED Conference (April 2018).

In addressing common challenges from a cross-cutting perspective, as discussed at the Panoramed Innovation Camp organised in Barcelona on 17 and 18 October 2019, the communities face certain **challenges for which several proposals were discussed**:

- The projects gathered around thematic transnational communities are **very heterogeneous** in nature, which is the result of lack of directionality towards common challenges in the calls for projects. Instead of challenges, a thematic approach prevails in the calls for projects. This heterogeneity and lack of common challenges hampers joint communication, governance and capitalisation, in particular monitoring with common indicators.
    - A proposal to enable better convergence of projects and communities towards common grand challenges, in the terminology of figure 13, could be to add **capitalisation projects devoted to MED challenges** to the Interreg MED structure. These projects would add to and be fed, among others, by the eight current thematic communities, capitalising on and monitoring progress towards the specific challenge they refer to by using common indicators.
- MED communities multiply the individual impact of projects enormously and deliver initially unexpected results. However, **communities would not be what they are without**

leaders, horizontal projects. It is key that partnerships behind horizontal projects are strong and that a wide set of skills is adequately gathered, since this is essential for the community.

  - To ensure this, **appropriate training** should be designed, in network management, communication, leadership, conflict management, etc. Also, a basic structure needs to be ensured to allow their potential impact to be actually developed.

- The projects and the communities are mainly focused on economic and environmental value **and less on social value**, at least not at the same level. Indeed, lack of knowledge about how to take social aspects into account and how to incorporate them into projects has been identified as a challenge to be addressed by communities. Similarly, there is a lack of knowledge on what to include and how to incorporate the gender dimension into projects and communities.

  - Therefore, a proposal would be to **promote training in social needs and impact and in gender equality** throughout the entire programme (not only in innovation). Similarly, guiding consortiums/partnerships to incorporate relevant and knowledgeable stakeholders (local entities, NGOs...) also seem to be needed.

Table 8. MED communities' contribution to rural revitalisation

MED Community	Model objectives	Research & developement	Policies
GREEN GROWTH	Transformation of livestock waste into organic high-value commercial fertilizers Water & energy efficient greenhouses Zero-km agri-food marketplaces	62 research entities 871 SME 7 planning and assessment tools 40 pilots	2 fiscal policies 280 local authorities 4 governance tools
RENEWABLE ENERGY	Rural Microgrids management based on local RES Community Storage system improvement	8 research entities 7 SME 25 planning and assessment tools 56 pilots	3 innovative policies 66 local authorities 4 governance tools
EFFICIENT BUILDINGS	Public Sector energy efficiency	30 research entities 10 SME and LE 35 planning and assessment tools 36 pilots	384 local authorities 17 governance tools & guidelines. Strong linkage with the EU DG Energy
SUSTAINABLE TOURISM	Smart Destinations Water Monitoring Tools	39 research entities 9 SME 88 instruments for enhancing the development of sustainable and responsible tourism 177 regions and subregions engaged in implementing sustainable tourism plans	72 strategies 150 number of tourist destinations covered by a sustainable tourism evaluation tool 57 local authorities

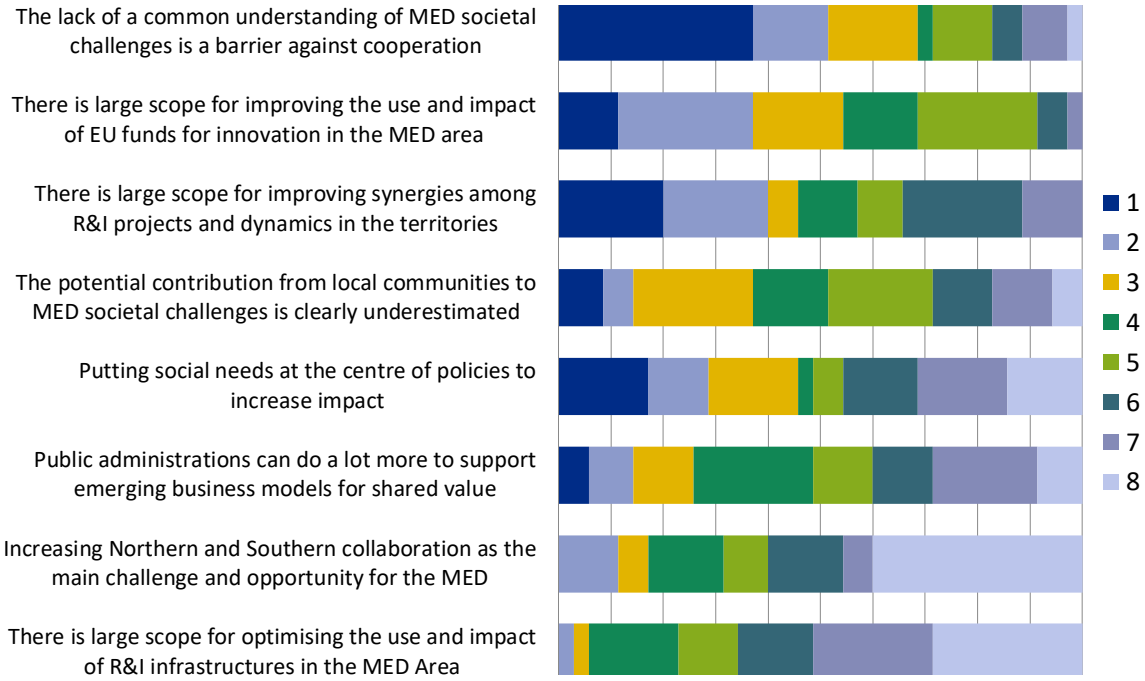
Source: Echave, C. et al (2019).

7. Analysis of the main gaps and opportunities for a better governance of innovation policies in the MED Area

The discussions and debates with experts and MED actors in the process of elaboration of this report have been the basis for the identification and analysis of the main gaps and opportunities for a better governance of innovation policies in the MED Area. Before the Panoramed Innovation Camp held in Barcelona (17 and 18 of October 2019), 8 gaps and opportunities had been identified. They were presented and discussed in the Innovation Camp.

The figure 14 shows the eight challenges presented in the Innovation Camp, which were the starting point for the discussion. Experts and MED actors participating were asked to classify them from 1 (the most important one) to 8 (the least important).

Figure 142. Assessment of relevance of initially identified 8 challenges



Source: Own elaboration.

As a result of the two days of discussion at the Innovation Camp, the eight challenges were merged into five, which are expressed and analysed as gaps, opportunities and recommendations to improve the governance of innovation policies in the MED Area through the Interreg MED Programme and Panoramed. The recommendations are focused on strengthening the horizontal, vertical, temporal and territorial coherence of innovation policies in the MED Area:

- Reinforcing the common understanding of MED societal challenges
- Optimising the use of R&I infrastructures and the synergies between R&I programmes and projects

- Recognising and enhancing the contribution from local communities to MED societal challenges
- Increasing the support from public administrations to emerging business models for shared value
- Increasing the impact of innovation policies by taking into account social needs

In the following sections each one of these five points is analysed in more detail, and possible options for action in the MED Area are proposed, as discussed at the Innovation Camp. By promoting these lines of action, Interreg MED could contribute to improve the horizontal, vertical, temporal and territorial coherence of innovation policies in the MED Area; that is, to improve the governance of innovation policies.

7.1. Reinforcing the common understanding of MED societal challenges

The lack of a common language and understanding of MED Area societal challenges makes it difficult to develop shared visions and to agree on cooperative solutions. Whereas at an abstract level there is probably agreement about the main challenges for the MED, when working in more specific fields and/or with various multidisciplinary partners, differences in languages, focus, diagnoses and resulting proposals for action make real cooperation difficult. This, in turn, makes decisive progress towards common challenges difficult, since potential successful initiatives remain isolated with little chance of being escalated or transferred to national or regional policies aimed at achieving common goals.

Indeed, among the many policy and programme/project documents related to the MED Area, there are varied lists of challenges for MED that differ from each other in the focus or intensity of actions demanded (see Section 2), depicting a blurred picture of what is needed in MED, what is being done, how to capitalise it and how to transfer the results of individual strategies and programmes to national and regional thematic policies. This blurred picture becomes confusion when it comes to challenges common to the Northern and Southern Mediterranean shores. Certainly, the various shapes of the “Mediterranean region”, with EU and non-EU countries, Northern and Southern banks, different specific goals and means (financial and regulatory), individual countries and also groups of countries, also add to this confusion over a common policy vision.

Possible options for actions

In response to this context, shared, ambitious and positive long-term visions for the Mediterranean are needed, with shared narratives or storylines among the multiple actors (policymakers, business, civil society organisations, citizens) so as to increase acceptability and to promote effective cooperation to advance towards common goals. The SDGs could be a valid common reference for MED, since they are largely agreed upon and used as a reference

by many stakeholders. However, the SDGs would need to be adapted to the MED's specific policy vision, challenges, goals, milestones and targets (directionality) so as to translate the goals into concrete criteria that can guide the prioritisation of investment and policy implementation.

This adaptation of SDGs to MED, or the identification of clear common societal challenges to MED, would need to be made at forums where different actors meet and develop shared visions and alternatives to meet societal needs in more effective ways. Policymakers, business, civil society organisations and citizens, also from Southern countries, should all participate. In addition to reinforced multidisciplinary and multidimensional dialogue, there is a need to integrate diverse perspectives to co-create alternatives for a better future, including cross-department public and private actors who agree on the mutually reinforcing roles of various policies that need to be directed at and aligned with the common societal challenges.

As a result, there is also a need for coordination mechanisms between MED and national and regional policies (vertical coherence), and a need for coordination between the various stakeholders (horizontal coherence): security, demography, climate change, trade, economic factors, social protection, migration policies and so on all need to be directed towards and aligned with the common societal challenges and be mutually reinforcing. For vertical and horizontal coherence addressed at the common societal MED goals to be effective in the territories, a strong focus on capacity building needs to be included in the next programming period, which should also include Southern countries.

A relevant issue that can promote shared understanding of the challenges and alternatives to meet societal needs are metrics and indicators to measure the (comparative) extent of the challenges and the impact of intertwined environmental, social and economic policies and projects on the issues that matter most to society. Traditional indicators do not provide the kind of information needed to understand the complexity and dynamics of the real world nor the impact of policies and projects in a coherent manner. Some of the SDGs' KPIs could be used to set common criteria for assessment and monitor progress, but academia and policymakers should devote greater efforts to developing new metrics and indicators to understand the reality, the interactions between phenomena and the way policies and projects impact on (un)expected outcomes. An Observatory on the progress towards specific MED shared visions and goals could also be an option as a first step towards a kind of Open Method of Coordination for MED.

Furthermore, efforts to harmonise language among actors engaged in different disciplines could be pursued so as to facilitate common understanding of terms often used with different meanings. A glossary of terms could be prepared and regularly updated, defining and explaining new concepts, establishing correspondences between the way of naming a concept in one discipline and in another. These efforts should be complemented by improved communication among all stakeholders ensuring that they address and are aligned with the shared vision and goals, including companies that translate research to the market.

Finally, more budget seems needed for Northern-Southern projects and also specific programmes. Calls for twinning projects, with partners from North and South and with a double development path suggest an interesting option.

7.2. Optimising the use of R&I infrastructures and the synergies between R&I programmes and projects

There are many EU funded initiatives and cooperation programmes among Mediterranean innovation projects, but there is agreement that the use and impact of EU funds for innovation in the MED Area have much scope for improvement, both at EU level and in each country and region. One reason behind this are the limited synergies and complementarities resulting from R&I projects and dynamics in the territories, meaning that, as stated by local policy makers, transnational R&I projects tend to have more a project logic rather than a territorial one, what is often called “projectisation”. These projects, promoted by universities or technological and research centres, are often disconnected from the dynamics in the territories, and from national, regional and local strategies and policies. As a consequence, the results of the projects are not translated into national, regional or local strategies and policies, many resources and efforts are wasted, and many opportunities are lost. In this same vein, many current R&I infrastructures and equipment in the MED Area, especially pilot plants to test and develop new uses of available resources, are key to developing new value chains and new business models based on the circular economy and have been financed by EU funds yet a systemic mapping to visualise existing capacities is lacking, and this severely hampers the coordination and generation of complementarities and synergies.

To try to overcome these limits, many repositories and platforms have been set up to collect and visualise projects, although largely with only partial views so that the whole picture of EU funded projects is missing. Without this big picture, it is difficult to optimise the use of funds, since actors cannot detect complementarities, gaps or duplications and it is difficult for them to build coalitions to work in collaborative networks. Policy makers should take informed decisions and practitioners should improve their working effectiveness and efficiency.

Possible options for actions

In this context, a possible option for action could be to articulate **challenge-driven missions or alliances** to encourage multiple actors to join their efforts and work together using different types of funds to achieve common goals. There are examples of international experiences of this kind of coalitions (figure15). In this context, the valuable experience of Interreg MED communities could usefully be harnessed to explore possibilities of collaboration aimed at jointly addressing common challenges, such as climate change or the revitalisation of rural areas, as briefly presented in Section 5.

Figure 15. Examples of challenge-driven alliances

PPCA Powering PastCoal Alliance	In 2015, the governments of Finland, the Netherlands, Quebec and the United Kingdom decided to phase out coal. In November 2017, 19 countries created the 'Powering Past Coal Alliance', which pledged to phase out coal use.
ALLIANCE for Urban Sustainability	In 2016, the Alliance for Urban Sustainability network was created, bringing together five French and five Swedish cities seeking to develop knowledge about successful and unsuccessful sustainability solutions and, in the longer term, to provide opportunities to develop joint proposals for the financing of projects from the EU.

Source: own elaboration based on PPCA and AUS network information.

Therefore, new mechanisms are needed to guarantee better alignment and synchronisation of projects with the **dynamics and needs of the territory**. Here again, a common language and shared narratives and visions are key elements to identify potential complementarities and synergies and to improve the synchronisation of different strategies and programmes. The option of articulating multi-stakeholder challenge-driven missions, alliances or coalitions seems highly necessary.

As a tool to push forward challenge-driven missions, **comprehensive maps of existing projects and R&I capacities and gaps** in the MED Area should be drawn up, together with an evaluation of necessary infrastructures for the future. In particular, there is huge need to showcase the experiences in **prototyping**. These tools should not be a library/catalogue, but a results-oriented tool that allows:

- policy makers to make informed decisions at local, regional and suprarregional level
- us to raise citizens' awareness
- possible partners for projects to be identified
- the promotion of transferability
- the visualisation of better investments
- the simplification of access to R&I infrastructures and the elimination of duplications

A **protocol** could be agreed upon to **exchange relevant information** among stakeholders about funding, strategies, programmes and projects, possibly complemented by open data, such as the RIS3-MCAT Platform in Catalonia (http://ris3mcat.gencat.cat), which links projects with SDGs. Further development of this idea, i.e. which institution(s) should lead this process, which information should be exchanged, whether it should be a platform of platforms, who are the

potential users – policy makers, partners/researchers – formats, etc., could be an issue for a future Panoramed policy paper.

To enable advancement towards common goals, **new forms of governance** and **new business models for R&I infrastructures and equipment** are much needed, so as to promote open research and innovation, to facilitate SMEs access to them and to optimise their use. The Enterprise Europe Network[39] could be used to engage local stakeholders, to support new business models and to improve synergies.

7.3. Recognising and enhancing the contribution from local communities to MED societal challenges

According to the academic literature on sustainability transitions, many innovations that are shaping our future society are happening at the local level, frequently promoted by self-organised social networks and by communities of interest promoted by individuals. These initiatives often meet the needs of local policy networks and are participated in to various degrees by municipalities and/or SMEs and grassroots organisations. There are many examples in the fisheries sector of participative governance and co-management models that could be applied to other fields.

Yet, all too often, local initiatives with significant impact for some collectives or communities in the territory are neglected, because they tend to have a low technological component (or no technological component at all) and, due in part to this, attention is usually drawn to larger transnational and technological projects.

As a consequence, very valuable knowledge stemming from local communities is wasted and many opportunities are missed. The aggregation of projects and cumulative learning from local communities' projects are not easy, since each project is different and is embedded in a specific territorial context.

Possible options for actions

In response, **intermediary actors** are needed to collect, aggregate and disseminate information and knowledge among projects and (potential) stakeholders. In Interreg MED, the horizontal projects are already performing this intermediary role to capitalise the results of Interreg MED projects. The lessons from this valuable experience could be applied to local community-based initiatives so as to allow knowledge sharing, replication, adaptation to other territories and/or up-scaling.

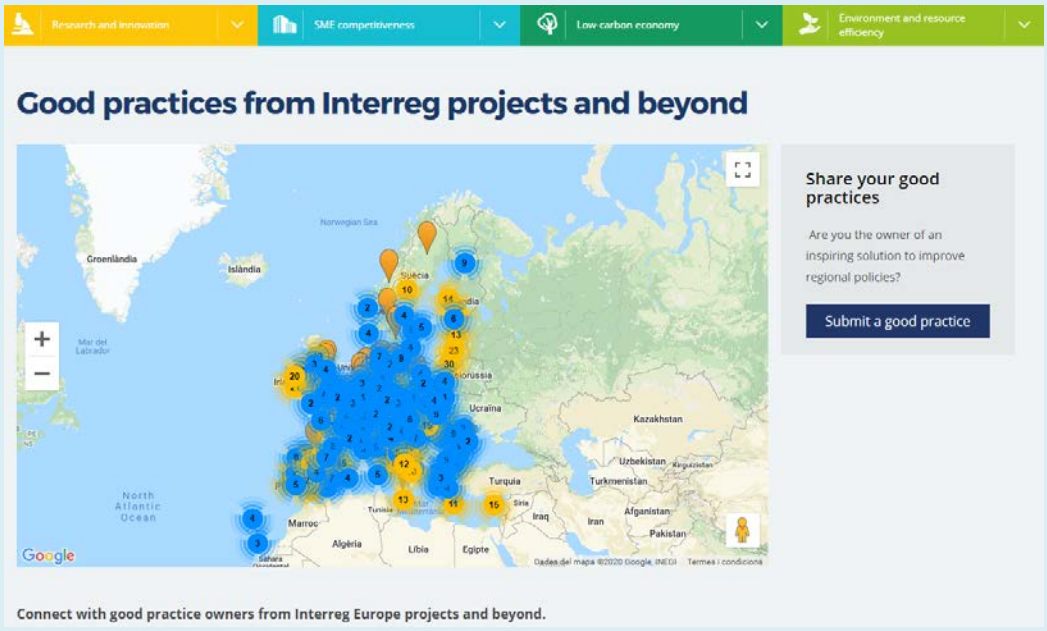
The following is needed:

[39] More information at: https://een.ec.europa.eu/

- Mechanisms to identify and collect good practices stemming from local communities;
- Methodologies to codify the good practices;
- Mechanisms and training capacity building to facilitate the adaptation of the good practices to other territories, and mechanisms to promote knowledge exchange and cumulative learning processes;
- Mechanisms to replicate and scale up good practices that provide answers and solutions to common MED challenges.

In this context, the Interreg Policy Learning Platform[40] (figure 16) could be also a reference for building up a pool of good practices and expertise related to experiences stemming from local communities.

Figure 16. The Interreg Policy Learning Platform



The Policy Learning Platform is the second action of the Interreg Europe programme, established to boost EU-wide policy learning and capitalisation on practices from regional development policies. The platform is a space for continuous learning where the policymaking community in Europe can tap into the knowhow of experts and peers. As the community of like-minded stakeholders grows, so does the pool of good practices and expertise in the four Interreg Europe topics:

- Strengthening research, technological development and innovation
- Enhancing the competitiveness of SMEs
- Supporting the shift towards a low-carbon economy in all sectors
- Protecting the environment and promoting resource efficiency

Source: Own elaboration based on The Policy Learning Platform website

[40] Available at: https://www.interregeurope.eu/policylearning/what-is-policy-learning-platform

The impact of community-based projects could be increased through the **application of technology**. Thus, researchers could work more closely with local communities to develop technological solutions to respond to communities' needs and to improve communities' innovations, promoting a shift of boundaries, e.g. scientists working with fishermen, learning from them and teaching them how to collect data and take advantage of local resources. Also, initiatives should be built upon the specific knowledge of members of the community – "***Citizens science***" for instance – promoting student internships in local governments departments.

The articulation of alliances or coalitions of local actors to achieve common goals through bottom-up shared agendas and the connection of these local strategies to Mediterranean and European strategies and missions are key to adequately addressing the SDGs. As stated above (see Section 4.1), a large part of the success of sustainable innovation within the framework of a model of local participatory governance revolves around the cohesiveness of people, economies, environments and territories, in other words of **having a shared goal** (Berkowitz 2020). The need for coordination and directionality of local actors or alliances of local actors could also be met by the proposed **capitalisation projects devoted to MED challenges** within the structure of Interreg MED, as a complement to the thematic transnational communities.

7.4. Increasing the support from public administrations to emerging business models for shared value

The challenges the Mediterranean is currently facing are huge and increasingly severe and complex. Governments have many powerful tools to become drivers of change towards a more sustainable development pattern, the most important of which are legislation, public grants and public procurement. Official narratives are also an effective means to promote change.

Yet, there are too many examples of ineffective legislation with severe side-effects harming social and/or environmental and/or economic values, even subsidies promoting economic sectors that impact negatively on some of the SDGs. Indeed, as addressed in Challenge 1, a common understanding of "shared value" is largely lacking, even within governments.

Moreover, despite the powerful tools available to governments, they cannot do it alone. Governments lack the capacity and the financial resources to address the challenges by themselves.

Possible options for actions

Guidelines could contribute to providing solid support for changes in public procurement practice, legislation and public subsidies that aim to guarantee the coherence between short-

and long-term objectives, taking the social, environmental and economic dimensions into account. These guidelines could address:

- The **understanding of "shared value"** by public authorities and personnel
- **Public procurement of innovative solutions to open up new opportunities for SMEs to generate new products and services that generate shared value.**
- **Subsidies and incentives to promote business models for shared value**, for example by introducing shared value as a criterion to support business.
- **Integrating shared value in entrepreneurship policies**, eliminating the current duality between economic entrepreneurship (focused on economic issues and usually promoted by economic departments of governments) and social entrepreneurship (focused on social issues, usually promoted by employment or social welfare departments).
- In this context, Horizon and SME instruments should reinforce the focus on delivering shared value with social impact. The experience of B-Corps movement, with over 3,000 companies in 71 countries supported by the United Nations,[41] could also be a reference to learn from. A new online platform under development will leverage B Impact Assessment to enable companies around the globe to manage their impact through performance on the United Nations SDGs. **Entrepreneurial associations and clusters associations** should also become a driver for this change.
- A **change of current official narratives** to translate societal challenges into new opportunities for new business models, based on new value chains and on the principles of the circular economy.

7.5. Increasing the impact of innovation policies by taking into account social needs

Consistently considering the social needs, i.e. those of the most vulnerable persons (older, younger, low skilled, persons with disabilities, migrants…) or territories (deprived rural or coastal areas and so on), can contribute to enhancing the impact of research and innovation, for example, if a technical innovation needs to be used by consumers and citizens in deprived urban or rural areas. As stated above, tackling MED societal challenges requires holistic strategies, projects and actions that integrate the social, environmental, economic and technological dimensions, maximising synergies and counterbalancing trade-offs. Achieving complex social challenges, for example, as regards ageing in rural or coastal areas, gender inequality, increasing migration flows and so on, can indeed also be a specific goal of socio-

[41] More information at: https://bcorporation.net/

technical innovation. There are examples in Interreg MED of experiences that entail sound approaches towards meeting the needs of vulnerable persons and/or territories.

Yet, socio-technical innovation in Interreg MED projects tends to focus on governance and/or technological innovation aimed at addressing environmental challenges, very often with an approach based on economic sustainability, aimed at promoting new business models. In this approach, resolving social challenges – the needs of vulnerable persons, groups of persons or territories – is rarely the main goal of innovation. The actual or potential side effects on social issues (migration flows, creation/destruction of jobs, and also for groups at risk, such as persons with disabilities, low-skilled women and young and older persons) are in general given little consideration, either at the moment of designing the innovation or at the implementation phase. Whereas hard technical innovation tends to focus on environmental challenges, it is soft governance innovation that will focus on the challenges faced by the most vulnerable persons or territories. Some outstanding social challenges in the Mediterranean, such as migration flows, are almost absent in Interreg MED projects.

Possible options for actions

Addressing SDGs requires reorienting research and innovation to the values, real needs, challenges and expectations of society, its communities and territories. The **social dimension in innovation calls and projects, including horizontal projects,** needs to be included at the same level as the economic and environmental dimensions. Technological innovation projects should always evaluate the potential (positive, neutral or negative) impact of technology on vulnerable groups and territories; they should also always consider how to improve the lives of the communities or territories they are impacting on, and how to prevent or address the negative effects, for instance on job destruction and resulting increased migration flows. Also, calls to address specific pre-identified communities' needs through technology (e.g. affordable high-speed internet in rural areas) should be promoted.

Interreg MED and other programmes promote technological and social experimentation at the local level, in close collaboration with local stakeholders and citizens, very often in living labs. It is necessary to continue **promoting these spaces for experimentation**, connecting them with technological developments and research and innovation projects. As an example, some Interreg MED projects are focused on the needs of rural (coastal) areas, in which, for instance, high-speed Internet connection is lacking, which is both a result and a cause of insufficient technological development. Academics must work closer with users, communities and governments in order to anticipate the impacts of new technologies, especially on vulnerable groups and territories.

Importantly, there is also a need for **developing and adopting new quantitative and qualitative indicators, metrics and evaluation methodologies for that social impact** of research and innovation that, among other things, contribute to better understanding the intertwined impacts of the environmental, social and economic strands of sustainability.

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