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CODEVELOP RESEARCH AND INNOVATION FOR BLUE JOBS AND GROWTH IN THE MEDITERRANEAN - THE BLUEMED INITIATIVE

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Abstract

In the framework of the European Commission Blue Growth Strategy, a joint process among European countries has been put in place since 2014 to promote and implement research and innovation actions to increase the number of jobs in the marine and maritime sectors, commonly named ‘blue’, and pursue a sustainable growth in the Mediterranean area. The process has then been extended to the non-European (non-EU) Mediterranean countries. The natural and cultural uniqueness of the Mediterranean Sea is recognized worldwide, and the opportunities for social and economic growth in the area are increasing. At the same time, natural and anthropogenic pressures as well as the need for a governance of common space and resources add complexity to the management of such area, whose countries belonging to three different continents have socio-economic differences and express a variety of cultures and political regimes. This paper provides insights on the steps that brought to the development of the BLUEMED Initiative and the progresses made from its launch and the publication of the BLUEMED Strategic Research and Innovation Agenda (SRIA) by European Mediterranean countries to its extension in non-EU ones. It highlights key activities carried out at a policy level and focuses on the tools used for engaging all relevant stakeholders, namely scientists, policy makers, private companies, and civil society, at national and international levels. Moreover, it reports recent activities towards a structured involvement of non-EU countries. Preliminary outcomes of the process indicate that the scientific approach is crucial to manage complexity, not only as a vehicle of diplomacy but also to support knowledge-based decisions.

Key words: blue economy, job creation, Mediterranean Basin, strategic research and innovation agenda, sustainable growth

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1. Introduction

The Mediterranean nations strongly depend on marine activities. In a study commissioned by the EC

(Eunetmar, 2014), the importance of the maritime activities for the economy of a country is measured in terms of gross value added (GVA) generated. In 2010, Italian GVA in coastal areas was 727 billion €, the

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53% of national GVA, with maritime economic activities impacting for 23.6 billion €. Opportunities for economic and societal development are represented by established coastal, marine and maritime economy sectors such as according to Johnson et al. (2018) fisheries, offshore oil and gas, shipping and shipbuilding, and tourism, including recreational activities. Also 'blue growth' sectors, i.e. new or more recent maritime activities like aquaculture, marine biotechnology, seabed mining, wave- and current- derived energy, and offshore wind energy offer clear opportunities in the framework of the new maritime economy (Johnson et al., 2018). Consistently, the European Blue Growth Strategy, as defined in the EC Communications (2012) and (2014) identifies the development of sustainable growth and jobs' creation in the marine and maritime economy as important drivers for Europe's welfare and prosperity. All these interlinked activities rely on the same common resource, the sea, potentially threatening the ecosystems' health as widely assessed by Micheli et al. (2013), outlining that in the Mediterranean a vast majority (60-99%) of EU member states' waters within 12 nautical miles off the coastline are subject to medium-high to very high cumulative impact of human activities. Healthy ecosystems actually represent the main prerequisite for maintaining the benefits derived from the environment, ensuring for instance the availability of biological resources in the long term, and the conservation of habitats.

Around 450 ports and terminals show to what extent people and goods circulate in the Mediterranean Basin. In 2015, 20% of the total world's maritime transport and 30% of the oil trades moved through the Mediterranean Basin, two figures that are expected to grow in the next years (OECD, 2016), posing environmental, safety, and security issues.

The European maritime industry has an annual turnover of about 31 billion € and currently counts 300 shipyards and more than 22,000 maritime equipment manufacturers and suppliers (SeaEurope, 2017).

The major environmental hazards related to maritime transport and support infrastructures are linked to the chemical emissions of CO₂, NO_x and SO_x in the air (DNV GL, 2014) and of lubricating oils from the mechanical parts of the ships polluting marine water. Concerning the physical emissions, it is well known that in the last decades the background noise of seas and oceans has increased considerably and that the main cause is the underwater-radiated noise from ships (ITTC, 2014; ITTC, 2017). Moreover, the increase in maritime traffic, if not adequately managed with a high level of safety, can lead to an increase of accidents and therefore, not only to extremely serious consequences for people, but also to ecological disasters (oil spills and leakages from wrecks at the sea floor). Finally, ballast waters of ships passing the Mediterranean have introduced a considerable number of alien species in the basin, beside those entered since the cut of the Suez Canal. A comprehensive discussion about the environmental intensity of maritime transport can be found in Nivavis et al. (2017).

The Mediterranean Basin is also characterized by a tourism-centred economy, which strongly contributes to the percentage of employed people, 13% only in Italy, according to the report by Becheri et al., (2016). Due to tourism and recreational travelling, the 150 million coastal population of the Mediterranean area almost doubles in the tourist season. Rapid growth of inhabitants in peak periods add anthropogenic pressures to the coasts resulting in negative impacts on the environment due to increased fresh water consumption, waste production, and need for infrastructural access and accommodation (ECORYS, 2013). This requires solutions to, at least partly, de-seasonalize and differentiate the offer. Coastal tourism is a clear example of impacts caused by inland human activities on the marine environment. According to the briefing from the EPA (2017), waste generation in the southern Mediterranean region has grown approximately 15% over the last decade, demanding effective waste management measures.

Fisheries and aquaculture products guarantee one of the most important sources of proteins, increasingly demanded worldwide to meet the need of feeding a population of more than 8.5 billion people by 2030, (EC, 2016; EC Conference report, 2017), as key components of the Mediterranean healthy diet. On average, a European citizen consumes 24.9 kg of fish or seafood per year. In the last two decades, a clear negative trend in total fish landings was observed in the whole Mediterranean Sea (GFCM Resolution, 2016), likely due to catch levels not balanced by the renewal capability of fished stocks. Therefore, Mediterranean fisheries are facing serious challenges, with roughly 85% of the scientifically assessed stocks considered to be fished outside biologically sustainable limits (GFCM Resolution, 2016).

Great expectations derive worldwide from recent advances in marine and maritime biotechnologies (so-called 'blue'), a promising sector where major developments are associated with research in the pharmaceutical and cosmetic industries, and with the utilization of macro and micro algae in the biofuel production. The availability of marine and maritime observations and big data in combination with advanced Information and Communication Technology tools is also opening chances for new business. This trend can be enhanced pursuing a policy of open data, data preservation and reuse in informed decision making on any issue potentially impacting the marine environment.

Blue careers are increasingly offering new employment opportunities in various sectors, e.g. the marine renewable energies with a potential of 680,000 direct jobs to be created internationally by 2050 (Johnson et al., 2018), gradually overcoming the skill gaps to match the requirements of present and future jobs at (or close to the) sea. In the promising areas identified by the European Union: aquaculture, renewable energies, seabed mining, and blue biotechnology, the work is mature enough to raise the investments and the level of technological readiness in order to favour a sustained growth. On the other hand,

accurately assessing the value of natural resources is a long-term process, with controversial measurability limits and high levels of uncertainty (MEA Assessment, 2005). These elements pose several regulatory concerns, for example on the sustainability of seabed mining, which impinges on essentially non-renewable materials. Therefore, knowledge-based approaches to policy-making are recognized as a fundamental component for pursuing the sustainable blue growth. Given the diversity of social, economic, and political environments and beside the general unstable political situation of the Mediterranean area, formulating adequate regulatory frameworks for sea-related activities is often complicated and requires a balance between the policies and laws intervening on the rights of exploitation and the use of resources and their conservation at different spatial scales, from local coastlines of few tenth kilometres to the whole basin. This applies for example in the case of offshore platforms in Europe, mostly used for natural gas extraction in shallow water areas, which are reaching the end of their production lifetime and are entering their decommissioning phase by 2030 and beyond. These platforms, located in waters and/or continental shelves under the jurisdiction of coastal states, could be either totally or partially dismantled, re-located, re-adapted, and re-used for different purposes, with highly diverse and potentially relevant economic and environmental impacts (Caliri et al., 2017). A deeper understanding and new knowledge needs to be achieved in order to find proper solutions or to design a new regulatory framework, where lacking.

More in general, it is recognized that the major threats to the realization of the European Blue Growth Strategy are due to the interdisciplinary knowledge gaps and fragmentation, the conflicting interests among sectors and nations, the lack of information on potential synergies and insufficient exchange of information among scientists, industries, and policy makers (Andrusaitis et al., 2016). Facilitating the cooperation between maritime business and public authorities across borders and sectors is thus fundamental to create new economic value, disclosing emerging features and ensuring the sustainability of the marine environment exploitation in the long-term.

As explained in the EC Report (2017), in order to address marine and maritime challenges, find joint solutions, and maximise common assets for the entire area, the European Commission has identified sea-basin strategies as the proper policy framework for cooperation between the European Union, the Member States and their Regions, including Third countries that are not Member States of the European Union and share the same basin. The main EU research and innovation initiatives of reference presently active in different seas are the Baltic Organisations Network for Funding Science European Economic Interest Grouping (BONUS EEIG), and the Atlantic Ocean Research Alliance, targeting the Blue Growth at basin scale through different instruments and implementation mechanisms.

Recently, the Burgas Vision Paper - A Blue Growth Initiative for Research and Innovation in the Black Sea has been launched in the framework of the European Maritime Day 2018, an event organized yearly by the European Commission, paving the way for the development of a Black Sea Initiative on Blue Growth

(https://ec.europa.eu/maritimeaffairs/maritimeday/sites/mare-emd/files/burgas-vision-paper_en.pdf).

The *BLUEMED Initiative* was born as a direct emanation of the European Blue Growth Strategy and adopted to promote research and innovation in the Mediterranean Basin. This paper presents extensively the process implemented since the origin in 2014 to build the *BLUEMED Initiative*, reporting in section 2 main activities and tools that have been developed. These led, from one side, to the political endorsement of the Initiative and, from the other side, to structure the engagement of relevant stakeholders, including those from non-EU countries, in order to raise awareness and gather additional contributes to the process. Preliminary results are then analysed in section 3, trying to answer to the following overarching question: could the integrated approaches of the *BLUEMED Initiative* be a means to reduce the fragmentation and better govern the complexity of the Mediterranean system?

2. Developing the *BLUEMED Initiative*: the process

The *BLUEMED Initiative* seeks to foster integration of knowledge and efforts of EU and non-EU Mediterranean countries to create new blue jobs and a sustainable growth in the area. Pulling together top-down and bottom-up approaches, a major engaging process is driving stakeholders in the Basin to share a common vision and commit for joint efforts. This requires an articulated structure for functioning (Fig.1) as well as long and continuous work, which is still ongoing but has already led to some significant results.

2.1. The policy initiative

The *BLUEMED initiative* seeks to promote the social well-being and prosperity of citizens now and for future generations, and to boost economic growth and jobs in marine and maritime sectors. The possible success of the *BLUEMED Initiative* relies on a strong coordination between research, industry and policy at the national, regional, European, and international levels.

Alignment is a long-term process based on mutual trust, effective collaboration as well as a sense of altruism (Amanatidou and Cox, 2015), the value of which affects in the long-term a common good. As addressed in the *BLUEMED Vision Document* (http://www.bluedmed-initiative.eu/wp-content/uploads/2017/10/BLUEMED_Vision.pdf), it is the key to plan and work with both public and private players as well as with decision makers.

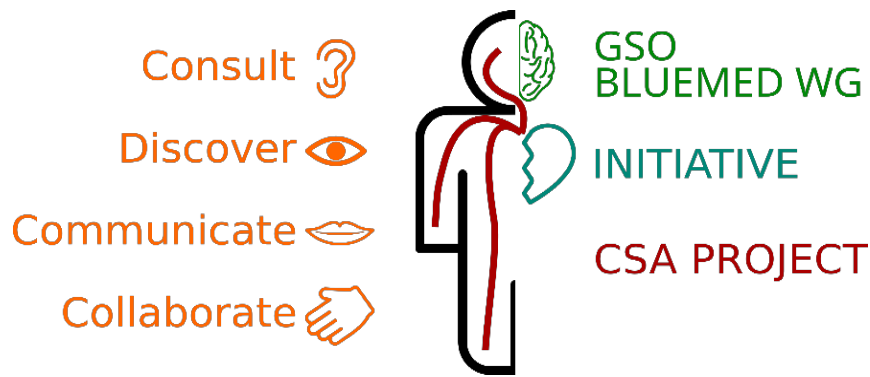


Fig. 1. General articulation and aspects of the BLUEMED Initiative (sub-section 2.1), headed by the Group of Senior Officials BLUEMED Working Group (GSO BLUEMED WG), and of the project that supports its functioning, the Coordination and Support Action (CSA, sub-section 2.2). Key targets include consultation, discovery, communication, and collaboration

The objective is to define relevant research and innovation actions that can concretely tackle social and economic challenges and ultimately boost the creation of new jobs. Raising awareness among citizens through public engagement on the importance of a sustainable prosperous Mediterranean Sea for all surrounding countries is equally important. Education and training are considered fundamental activities to improve and develop new skills to enable sea-based activities oriented towards blue growth careers, including life-long learning and vocational training.

The onset of the *BLUEMED Initiative* dates back to 2014 when, building on the outputs of the EurOCEAN Declaration, (2014), Cyprus, Croatia, France, Greece, Italy, Malta, Portugal, Slovenia, and Spain, with the support of the European Commission, decided to jointly develop a strategic framework for promoting the Blue Growth Strategy in the Mediterranean area through research and innovation. Following the official presentation at the European Competitiveness Council on December 2014 under the Italian Presidency of the Council of the European Union, these countries agreed to work towards the advancement of a shared vision for a healthier, productive, resilient, as well as a better-known and valued Mediterranean Sea.

The top-down process occurred in successive steps, including numerous meetings and the delivery of official declarations. Technically, the starting point has been the mapping and analysis, performed by the European countries involved since the beginning, of more than 900 existing and ongoing national and European projects as well as those implemented by the Regions (e.g. funded through European structural and investment funds). At the same time, a consultation with policy makers and with major public and private stakeholders, including consortia of public and private entities promoting the development of the maritime and coastal economy, the maritime clusters, was carried out to pinpoint needs and gaps. Knowledge, technology, and innovation gaps were identified together with the boundary conditions that enable these gaps to be addressed (e.g. human resources, programmes and tools, and infrastructure and observation capacity). The following high level

objectives and benefits put forward by the European project SEAS-ERANET (Nittis, 2012), a pioneering one in addressing the need for a common Mediterranean research agenda, fed the process: improve our understanding of Mediterranean Sea functioning and evolution, support sustainable economic growth in the region, support knowledge-based policy making and management, develop new capacities and promote convergence between Mediterranean countries. Inputs gathered from constant dialogue with the Joint Programming Initiative “Healthy and productive seas and oceans” (JPI-Oceans) were taken as well into due account. Relevant European technology platforms and private associations, e.g. the European Aquaculture Technology Platform (EATiP) (<http://eatip.eu>), the former Waterborne Technology Platform now Sea Europe (www.seaeurope.eu), and the French technology cluster Pôle Mer Méditerranée (PMM) (<https://www.polemermediterranee.com>) provided other valuable contributions.

The BLUEMED Vision Document (http://www.bluedmed-initiative.eu/wp-content/uploads/2017/10/BLUEMED_Vision.pdf) was finally drafted and became the basis for developing a related Strategic Research and Innovation Agenda, which was then shared with major European marine and maritime public and private stakeholders as well as policy makers for further feedback.

The nine European countries involved in the Initiative since the beginning decided to advance the strategic marine and maritime research and innovation agenda for the blue growth, aiming in particular at:

- promoting cooperation in research and innovation among all Mediterranean countries;
- engaging with both public and private stakeholders, including small and medium enterprises;
- supporting knowledge-based policy making;
- prioritising the implementation of cross-cutting actions with high societal impact;
- ensuring the effective and efficient use of resources and infrastructures;

- developing innovative sea-related competences.

The process, steered by a group of countries' representatives and experts named Strategic Board, gradually led to a cohesion and alignment at the European level, culminating in October 2015 with the endorsement of the *Venice Declaration* (RG, 2015) undersigned by the representatives of the nine European promoters and Romania, which has a long tradition of cross-basin collaboration on marine and maritime research and innovation with the Mediterranean countries. This step marked the official launch of the BLUEMED Strategic Research and Innovation Agenda (BLUEMED, 2015).

The BLUEMED SRIA, whose cover is reported in Fig. 2, officially became the document of reference of the Initiative and the "mantra" of the BLUEMED community. It builds on three major pillars (Table 1) and addresses twelve key challenges on knowledge, economy, and technology to be tackled, reaching the targeted goals through a set of actions, which are to be continuously updated, based on the feedbacks and interactions among all involved stakeholders.

By using a building block approach, other countries were progressively engaged in the process. Eventually, on 4th May 2017 the *Valletta Declaration* (Malta Presidency of the Council of the European Union, 2017) was signed and adopted by all Member

States of the European Union and the Union for the Mediterranean (UfM); with this signature the process formally became a Mediterranean Initiative. Table 2 summarizes all the key steps from 2014 to the beginning of 2018. At governance level, the Group of Senior Officials BLUEMED Working Group (GSO BLUEMED-WG) replaced the original steering group (named Strategic Board), chaired by Italy. The GSO was set-up in the framework of the Euro-Mediterranean Research and Innovation Group of Senior Officials. The governance structure comprised of the Directorate General Research and Innovation of the European Commission/ UfM EU Co-Presidency, UfM non-EU Co-Presidency (Jordan at present), and the UfM Secretariat on a standing basis, plus one representative of the GSO BLUEMED WG member countries on a twelve-months rotation basis. The Group has been initially focused at promoting the extension of the BLUEMED SRIA and related activities to the non-EU countries that are member states of the UfM. It also continues the mandate of the Strategic Board in facilitating the adoption of the BLUEMED SRIA as a reference document for the implementation of joint actions. The same participatory process is now extended to non-EU countries that appointed official delegates to the GSO BLUEMED WG. The GSO endorses the updated version of the SRIA including the contribution from non-EU countries.



Fig. 2. Cover of the BLUEMED Strategic Research and Innovation Agenda (BLUEMED SRIA)

Table 1. The three pillars of key challenges on knowledge (left), economy (middle), and technology (right) of the BLUEMED Strategic Research and Innovation Agenda (as from the version dated April 2017)

Key enabling knowledge for the Mediterranean	Key sectorial enablers in the Mediterranean	Enabling technology and capacity creation for the Mediterranean
A. Mediterranean Sea ecosystems: services, resources, vulnerability, and resilience to natural and anthropogenic pressures B. Mediterranean Sea dynamics: developing services in the field of sustainable adaptation to climate change and plans for mitigation C. Hazards and protection of coastal areas in the Mediterranean	A. Innovative business based on marine bio-resources in the Mediterranean B. Ecosystem-based management of Mediterranean aquaculture and fisheries C. Sustainable tourism in the Mediterranean D. Maritime clusters in the Mediterranean E. Maritime Spatial Planning & Integrated Coastal Zone Management in the Mediterranean	A. Smart, greener maritime transport and facilities in the Mediterranean B. Observing systems and operational oceanography capacities in the Mediterranean C. Multi-purpose off-shore platforms in the Mediterranean D. Marine and coastal cultural heritage in the Mediterranean: discovering, protecting and valuing

Table 2. Key steps of the BLUEMED Initiative process

Time frame	Activity	Key steps
October-December 2014	Defining needs and gaps	Set-up of the working roadmap by nine European countries, eight of which border the Mediterranean Sea plus Portugal, and the European Commission. Mapping of relevant research and innovation projects and initiatives carried out at national level. Merging of information and identification of gaps and needs, opportunities, and boundary conditions. Sharing of findings with relevant scientific communities, public authorities, and industrial associations at national and European levels.
December 2014	Vision document	The BLUEMED Vision Document is endorsed by the Italian Presidency of the European Council and presented at the Competitiveness Council on 4-5 December 2014.
January-October 2015	<i>Venice Declaration</i> and Strategic Research and Innovation Agenda	Identification of key challenges, goals, and actions according to the following drivers: boosting blue jobs and growth, knowledge transfer, and SMEs participation. Preliminary draft of the BLUEMED SRIA shared with national, European, and international public and private stakeholders as well as with the Regions that represent the concrete needs of local communities. Signature of the <i>Venice Declaration</i> on 16 October 2015 (RG, 2015). Launch of the BLUEMED SRIA.
November 2015	Declaration “Towards a roadmap for Blue Investment and Jobs in the Mediterranean”	Member States of the Union for Mediterranean adopt the <i>UfM Declaration</i> , (MHD, 2015), during the Ministerial Meeting on the Blue Economy held in Brussels on 15 November 2015. The Declaration acknowledges among other things the work done by partners to develop the <i>BLUEMED Initiative</i> and to identify common key challenges for marine research and innovation in the region. It welcomes the proposal to include the Member States of the UfM in the implementation of the <i>BLUEMED Initiative</i> on a voluntary basis and to support the networking amongst maritime clusters in the Mediterranean. It calls Ministers of UfM Member States to consider the possible inclusion of UfM Southern and Eastern partners in the implementation of the <i>BLUEMED Initiative</i> .
April 2017	BLUEMED high-level conference and first update of the SRIA	With the BLUEMED conference “A basin of Research and Innovation for sustainable growth” organized in Sliema, Malta, on 18-19 April 2017 under the auspices of the Maltese Presidency of the Council of the European Union, the <i>BLUEMED Initiative</i> officially opens to non-European countries stimulating the connection with Mediterranean key players and organisations. The first update of the SRIA is released (BLUEMED, 2017).
May 2017	<i>BLUEMED Initiative</i> endorsed by EU and UfM Member States	Signature of the <i>Valletta Declaration</i> (Malta Presidency of the European Council, 2017) welcoming the <i>BLUEMED Initiative</i> as a means to promote a healthy, productive, and resilient Mediterranean Sea and stressing the importance of structuring Euro-Mediterranean cooperation in marine and maritime sectors to encompass a broad range of objectives comprising the creation of new, blue jobs and social well-being.
February 2018	Group of Senior Officials BLUEMED Working Group	The governing body of the <i>BLUEMED Initiative</i> is set up, joined by official delegates appointed by EU and non-EU countries. It is agreed to carry out consultations in non-EU countries towards the publication of a co-owned update of the BLUEMED SRIA.

Finally, the Group promotes cooperation and alignment with the two key sub-regional Mediterranean initiatives in place, the EU macro-regional strategy EUSAIR: “European Strategy for the Adriatic Ionian Region” (European Council, 2014, <https://www.adriatic-ionian.eu/>) and the WESTMED: “Western Mediterranean Initiative” (EC Communication, 2017) implemented by the UfM (<http://www.westmed-initiative.eu/>).

The BLUEMED governing body liaises with relevant public and private organisations and with management authorities of relevant programmes for research and innovation, and disseminates the BLUEMED achievements in high-level policy events and towards major framework programmes. To cooperate for the joint adaptive implementation of agendas is crucial (Gauci Borda and Bujeia, 2017) and requires interacting with key organisations of the area. These include the Mediterranean Science Commission (CIESM), the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), the Inter-Mediterranean Commission of the Conference of Peripheral Maritime Regions (CPMR-IMC), the General Fisheries Commission for the Mediterranean (GFCM), the Mediterranean Action Plan of the United Nations Environment Programme (UNEP-MAP), and the managing authority of the Interreg-MED Programme. Many of them have been engaged in the preparatory phase and in the key steps of the process (see Table 2). Nevertheless, other relevant organizations will be engaged and consulted on *ad hoc* basis.

2.2. Connecting transnational communities for a shared R&I agenda

Research and innovation strategies shall be designed to drive effectively sustainable and socially inclusive economic growth. Efficient and fair transfer of information among all stakeholders and across different sectors must accompany the generation of new knowledge.

As pointed out by Amanatidou and Cox (2015), developing a research and innovation agenda is not a trivial task. This needs to pursue an inclusive and transparent process as a basic feature for producing consensus. In line with this principle, the *BLUEMED Coordination and Support Action (CSA)*, a 3 million € EC funded project coordinated by the National Research Council of Italy leading a partnership of 9 EU countries started in 2016 to build the “legs” of the political Initiative, setting-up a flexible mechanism to favour a virtuous relationship among the research, industry, policy, and society. A constant dialogue with national stakeholders is essential for implementing the objectives of the *BLUEMED Initiative* and in particular for monitoring and updating the SRIA.

Four interconnected thematic working platforms have been created as a tool to ensure

constant and broad consultation at the Mediterranean level. Joined at first by representatives of the EU partner countries and then by non-EU experts, the platforms on knowledge, economy, technology, and policy are conceived as *fora* where representatives of nations, the “national pivots,” interact and convey the general messages from their own countries’ communities, addressing needs and priorities. The BLUEMED platforms allow a cross-national communication flow and interplay among the research organizations, private companies, public administrations, and civil society. In the long term, by a gradual broadening of the participation of experts from the non-EU Mediterranean countries, they are expected to act as a transnational operative network that will continuously monitor, prioritize, update, and make tangible the SRIA in the whole Mediterranean.

The BLUEMED national pivots animate the process. Appointed at the highest possible level, they represent the CSA partner countries in the four platforms. They can be members of national public administrations, research institutions or other stakeholders’ bodies, and are competent on their subject, experienced in participating to networks, and/or international organizations and/or projects, and belonging to public and/or private entities. Acting as a main interface between the Consortium and the national communities, the BLUEMED pivots contribute to increasingly mobilize other relevant national stakeholders by collecting and transmitting their messages and bringing the feedbacks to their own countries. The platforms’ scheme (Fig. 3) mirrors the three pillars of the SRIA with the addition of a transversal platform dedicated to policy, which has been conceived to take into account the transversal (across pillars) policy dimension of the SRIA actions, and to support the operative engagement of relevant players and organisations acting on the area.

This is also useful to establish a connection with the dense and evolving environment of the legislation and programmes dealing with the Sea. Indications of ongoing and emerging policy measures and regulatory frameworks, such as EU and international Regulations, Directives, Protocols, Conventions, Agreements, and legal constraints to businesses and market operators, have to be constantly updated. Besides the Blue Growth Strategy, the main frameworks of reference for the *BLUEMED Initiative* are the Barcelona Convention (BC, 2004); the Marine Strategy Framework Directive (EC Directive, 2008); the Integrated Maritime Policy (CPCEEU, 2012); the Common Fisheries Policy (EU Regulation, 2013) and the Maritime Spatial Planning Directive (EC Directive, 2014). Any initiative in place at macro-regional and sea-basin scale has indeed to take into due account programmes, strategies, binding Regulations, and policy documents, also in order to support the implementation of relevant regional seas, European, national, and international policies.

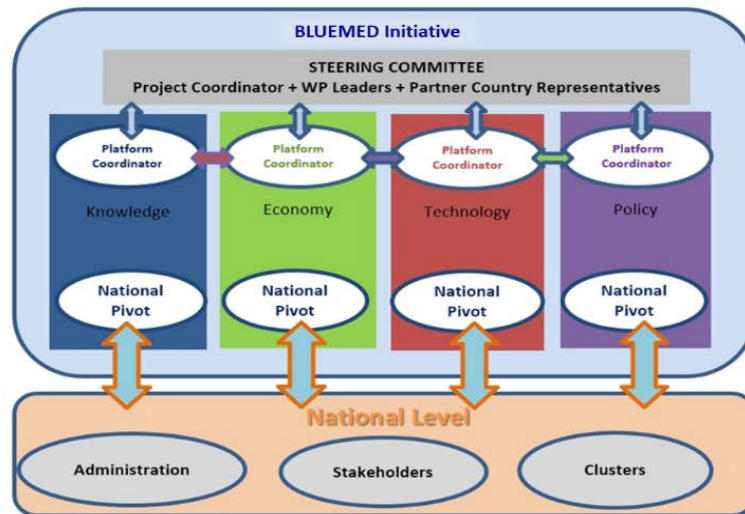


Fig. 3. The BLUEMED platforms, their connections, and their relations to the national communities

For instance, the Maritime Spatial Planning is one of the key sectorial enablers of the BLUEMED SRIA and represents a practice to inject science-based information into decision-making on the uses of marine environments, trying to reconcile existing conflicting interests and avoid new conflicts that may arise among stakeholders that use the same marine space, and between different administrations.

Considering the international dimension of the Initiative, it is important to recall and enhance links with the European International Ocean Governance policy (EC Communication, 2016), addressing some actions in line with the BLUEMED vision at a global level. Equally important is the United Nation Sustainable Development Agenda (UN Resolution, 2015), addressing 17 Sustainable Development Goals (SDGs) to be reached by 2030. The SDG number 11 on sustainable cities and communities, number 12 on responsible consumption and production, 13 on Climate Action, 14 on life below water, and 16 on peace justice and strong institutions are all of direct relevance for the *BLUEMED Initiative*.

When recognizing the differences among the Mediterranean sub-basins and among the stakeholders, alignment is the key to overcome the complexity. The first activities undertaken by the BLUEMED platforms have been devoted to the consolidation of national communities through bottom-up consultations for updating the SRIA.

2.2.1 Consultation tool, the *BLUEMED Survey* “Share your view on the Research and Innovation agenda for the Med!”

The *BLUEMED CSA* launched a dedicated online survey with the purpose of gathering inputs for updating the BLUEMED SRIA. It consisted of a first section with general information on the persons answering, including their affiliation, the sector of expertise, and the level of knowledge of the BLUEMED SRIA. Then, for each key challenge of the

SRIA, a set of four open questions asked: (i) if the user felt the need to modify the challenge itself and/or its related goals; (ii) to propose possible new challenges/goals; (iii) to describe possible barriers and bottlenecks for achieving them; (iv) to motivate the reason why investigating a specific theme would be of particular relevance for the Mediterranean Basin. Finally, at a deeper level of detail, the user could also examine the actions related to each goal, proposing possible additional inputs and/or revisions. For each challenge, each responder also had the chance to suggest related policy actions and/or recommendations.

The survey was disseminated in the nine European countries that are partners of the *BLUEMED CSA* project and via the website of the *BLUEMED Initiative*.

The online survey overall counts 161 answers. Graphics of Figs. 4a-c provide a visual description of some features of the survey audience: 76% of responders were already familiar with the *BLUEMED Initiative*; 34% of them were female, and the prevalent age of responders was between 41 and 60 years old.

Given the vast variety of aspects involved in the *BLUEMED Initiative*, and considered that survey as a tool has become increasingly over-utilised, we designed the survey so that users could answer all or parts of it, providing inputs only where they deemed necessary, according to their interest and/or competence, thus minimizing the effort required.

In order to measure how much of the survey was filled by each user and understand how the users perceived the survey, we gave each pillar an overall score of 33% if the related questions were completed entirely. For each pillar, we allocated a half score to the answers to the four initial open questions, and the other half to the detailed inputs possibly provided for each goal (at the level of action). Therefore, we gave a score of 4% for each answer to one of the four

questions on top of each pillar, and a score of 2% for each input on one of the goals (Table 3). We filtered out some spurious answers and few compilation errors and then computed for each survey the completion ratio, and finally arranged them in a Spider Graph with a 5% bin width. The Spider Graph (Fig. 5) shows the number of answers against the completion percentage. As we expected, none of the answers had more than

55% of completion (purple line). The section related to the pillar on knowledge, which appeared first, has the higher ratio of completion, while the economy pillar, which appeared last in the survey, has the most 0% of completion. From this consideration, we infer that users probably perceived the survey as too long and “left” it before the end.

Table 3. Survey evaluation score to measure the filling progress

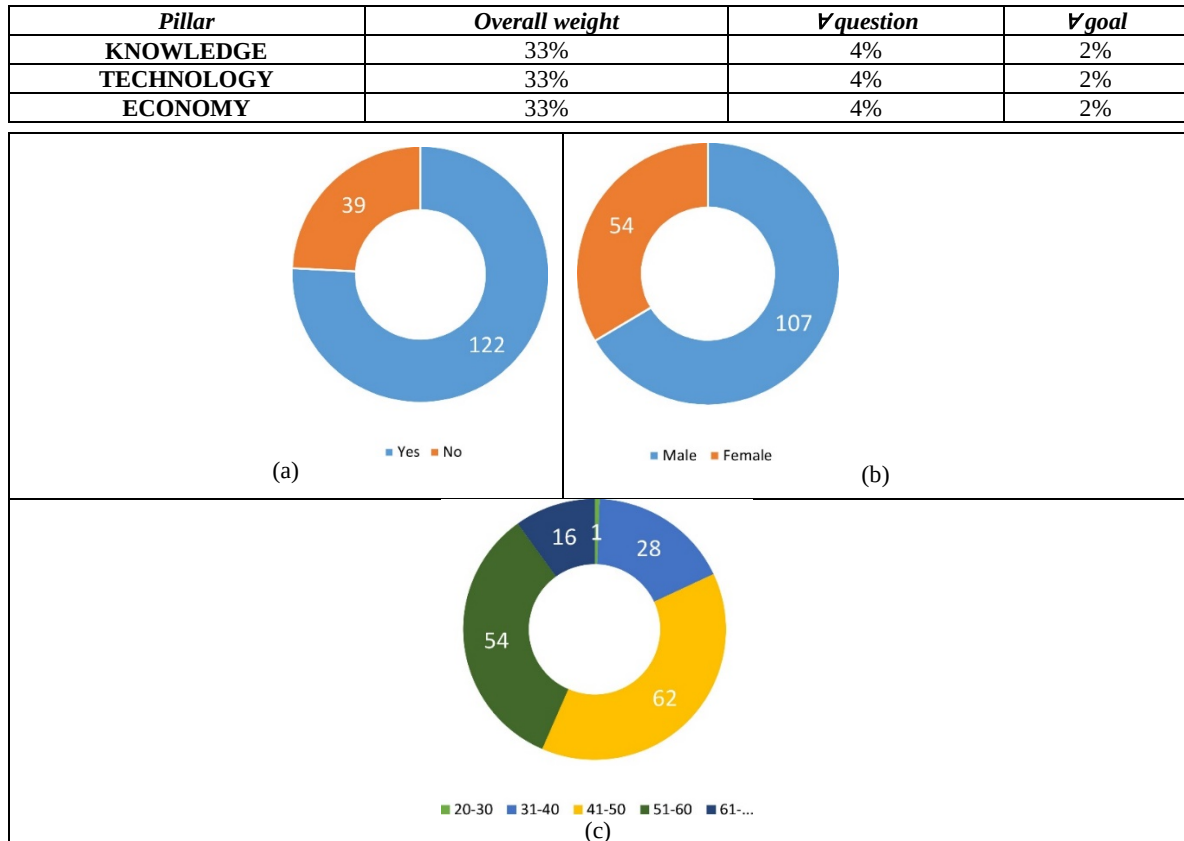


Fig. 4. Features of survey audience: (a) Familiarity with the BLUEMED Initiative; (b) Gender of responders; (c) Age range of responders

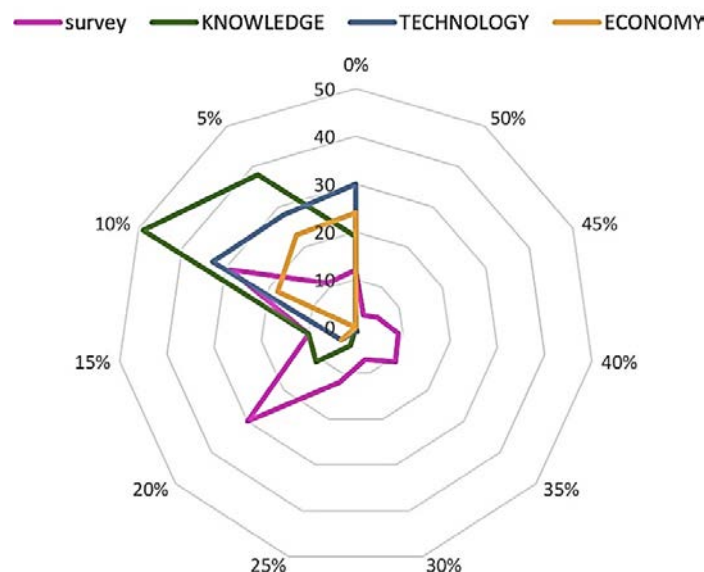


Fig. 5. Rate of completion of the overall survey in percent

Each *BLUEMED* CSA partner also had the opportunity to further engage national actors in the process with different approaches (e.g. through dedicated meetings as reported in the following paragraph 2.2.2), in order to ensure the most effective involvement of national stakeholders and collect meaningful information, as explained in the next paragraph. In addition, partners managed the results of the survey independently and included them in their proposal for updating the SRIA. For example, in most partner countries a translation of the survey in national languages was circulated in order to increase the number of answers, while Slovenia gathered inputs for updating the SRIA through two different surveys and channelled the resulting collective analysis. All contributions have been compared and merged to feed the next updated version of the agenda that is shared at the Mediterranean level. While the graphics of Fig. 4a-c, and Fig. 5 are based only on comparable data collected through the on-line survey; outputs of independent contributions are not included.

2.2.2 Complementing the inputs

Dedicated events and consultations with experts were carried out at the national level, engaging the public at large, targeted Ministries, and Regions. A more complete collection of inputs was gained, complementing the information collected through survey as described above. The coordinators of relevant projects and initiatives active on the Mediterranean Basin were also invited to convene to share relevant inputs, not only from a thematic point of view but also with regard to the supporting instruments they are using for developing actions that are of interest for the Mediterranean blue growth.

The operative perspective of ongoing projects allowed to gather some suggestions on recent achievements that could possibly imply the fulfilment of a goal of the *BLUEMED* SRIA and/or point out one or more gaps not filled yet. Identification of missing topics included:

- for the knowledge pillar: micro-biodiversity; dynamics of rivers' deltas (mostly anthropogenic); the application of bioremediation measures for sustainable aquaculture;
- for the economy pillar: marine protein; ocean literacy and citizen science; actions dedicated to innovative approaches to solution of different marine hazards (ecosystem recovery, mitigation of anthropogenic impacts, coastal eutrophication and human health, reduction of pollutant inputs at sea, decommissioning of oil and gas platforms, etc.); aquaponics;
- for the technology pillar: measuring impact of pollution in ports on human health and ecosystems; integration of offshore renewable energy; improvement and impacts of desalination processes; enabling the internet of things, i.e. the interconnection of devices embedded in physical objects capable to transmit and receive data, as a solution for marine observation and monitoring;

- for the policy pillar: regulatory framework lacking on unmanned vehicles.

2.3. Engaging non-EU countries

The engagement with non-EU countries is a key aspect of the *BLUEMED Initiative*, i.e. the extension. Non-EU members of the GSO *BLUEMED* Working Group (paragraph 2.1) are mandated to promote the implementation of the *BLUEMED* SRIA and its continuous upgrade at national levels in order to develop a cohesive agenda for the Mediterranean Sea at the national, macro regional, European, and Mediterranean levels by nurturing a robust partnership, social inclusion, and access to research infrastructures. The *BLUEMED* CSA, in collaboration with the UfM Secretariat, is supporting the gradual engagement of non-EU stakeholders in the discussion and work of the *BLUEMED* platforms, to deliver joint recommendations for the consolidation of the SRIA and its implementation plan. A preliminary opportunity to share the strategic agenda with non-EU Mediterranean countries has been given by the workshop "Building a shared research and innovation agenda for blue jobs and growth across the Mediterranean", organized in the framework of the first UfM Regional Stakeholders' Conference on Blue Economy, held in Naples on 29-30 November 2017. On this occasion, Tunisia, Turkey, Egypt, and Lebanon provided a first view of the actual strategies in the field of marine and maritime research and innovation. The following common points were highlighted among others: the importance of fisheries activities, including the tendency to fish in increasingly deep water; the need to design new offshore aquaculture plants; the partial understand of factors that facilitate the entrance and the spreading of alien species in Mediterranean waters; the impact of the plastic debris and garbage patches on marine ecosystems; the necessity to develop plans of maritime space in connection with coastal zone management, considering the Barcelona Convention, the WESTMED Initiative and the joint EC-DG MARE (Directorate General Maritime Affairs and Fisheries of the EC) and IOC-UNESCO (Intergovernmental Oceanographic Commission of the UNESCO) roadmap on Maritime/Marine Spatial Planning for sustainable use of seas and exploitation of resources (EC DG MARE, IOC UNESCO, 2017). A more structured consultation process with non-EU stakeholders carried out in different countries contributing with specific inputs to the SRIA led to the release of a new update version co-owned by all Mediterranean countries (Barbanti et al., 2018).

Non-EU countries were also asked to appoint national pivots to the *BLUEMED* Platforms (see paragraph 2.2). A continuum from critically processing inputs to producing relevant outputs guarantees the equilibrium and feedback process between the *BLUEMED* and the external environment (Fig. 6).

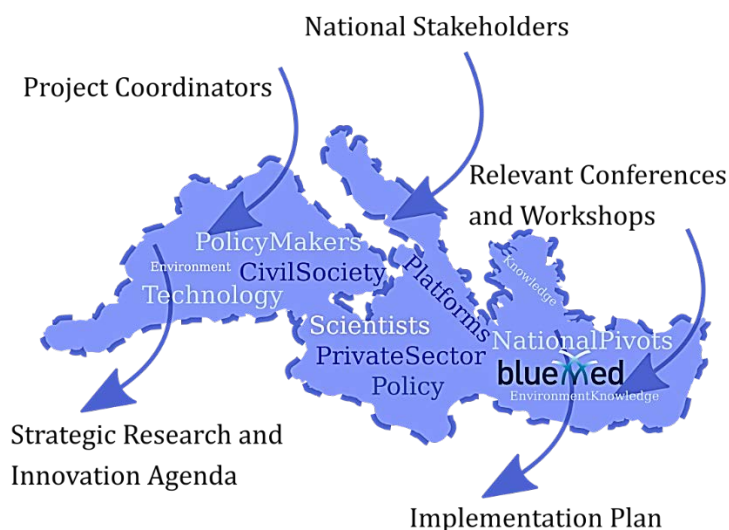


Fig. 6. The pan-Mediterranean BLUEMED input-output mechanism: the key deliverables of the project in support to the process, the updated SRIA and the Implementation Plan, are reached through continuous consultation. The system relies on a structure open to feedbacks.

The coming phase will lead to prioritisation of actions based on agreed criteria and to their implementation, in order to reach targeted goals.

3. Results and discussion

3.1. Preliminary impact at the European and national levels

As first tangible consequence of the initial joint work described in sub-section 2.1 that brought to the endorsement of the BLUEMED SRIA in 2015, the European Commission Directorate General Research and Innovation (EC – DG R&I) and Directorate General Maritime Affairs and Fisheries (EC - DG MARE), adopted some BLUEMED SRIA key priorities in major research and innovation programmes. In particular, six calls for proposals of research and innovation projects were included in the Work Programme 2016-2017 of the European Commission Research and Innovation Framework Programme Horizon 2020, Societal Challenge 2 on “Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research, and the Bioeconomy” for a total budget of about 43 M€. The call for proposals entitled “Blue Labs - innovative solutions for maritime challenges & Blue Careers in Europe” launched by the EC DG-MARE in May 2016 and the one entitled “Blue Technology - transfer of innovative solutions to sea basin economies” in September 2016 added to this, allocating overall 8 M€ to the blue growth in the area.

The following year, two additional calls on “Blue networks in the Mediterranean” and on “Restoring marine ecosystem in the Mediterranean” were launched by the EC-DG MARE in November 2017, with a budget of 3 M€ and 1.5 M€ respectively. Almost all projects granted are presently active. Only an analysis of the achievements will make it possible

to establish if these projects had an impact on the blue growth and to what extent.

In parallel, the work carried out since 2014 and structured more recently within the platforms designed by the *BLUEMED* CSA (sub-section 2.2) have started to produce some impact, leading to an increased cohesion of national blue growth communities, often experienced for the first time. This allowed the alignment of entities such as Ministries, Regions, and maritime research and innovation clusters. In some cases, it brought to the inclusion of the *BLUEMED Initiative* within national research plans and strategies. For example, in Italy the BLUEMED is targeted as a key initiative of the “National Research Programme 2015-2020” adopted by the Ministry of Education, University, and Research (MIUR, 2015). While the “National Bioeconomy Strategy” (Italian Council, 2017) identifies the *BLUEMED Initiative* as the framework of reference for promoting the blue bioeconomy in the Mediterranean. The National Board on Coastal Erosion established by the Ministry of Environment in 2016 (MATTM, 2016) aims at: promoting cooperation in research and innovation among all Mediterranean countries; supporting knowledge-based policy making; and ensuring the effective and efficient use of resources and infrastructures through Member States cooperation and implementation of joint actions. All these objectives are in line with the BLUEMED vision. At more practical level, the Italian Inter-ministerial group on the Blue Growth has been set-up in 2017 to coordinate under the BLUEMED umbrella the work of different Ministries that have decision-making power on Sea activities. The expectation is that the *BLUEMED Initiative* contributes also to the update of the Smart Specialization Strategies (S3, EC Communication, 2017), thus realizing the objective of aligning the Mediterranean Blue Growth Strategy with the one of Regions. S3 are the research and innovation

policies outlined and implemented by the Regions under national coordination in the framework of the EU cohesion policy (EU Treaty, 2007) aimed at creating jobs and boosting competitiveness. The alignment can be facilitated by reinforcing collaborations with relevant authorities. In Italy, despite the 8000 km of coastline, Regions are differently sensitive to marine and maritime themes, one of the more active being the Campania Region. Since 2017, it hosts the National Technology Cluster on Italian Blue Growth (CTN-B.I.G.). As it happened for other sectors, the Cluster became the platform of reference of the national marine and maritime public and private stakeholders' working together to attract investments and funds. To favour alignment and possibly leverage new opportunities, the person responsible for the Internationalization activities of the Campania Region has been directly engaged in the BLUEMED Initiative and participated to a technical workshop organized with the perspective of building an operational network of funders. Indeed, the *BLUEMED CSA* started to support the creation of a network of research and innovation funders from public and private sectors that is expected to provide the operational counterpart of the engagement process, addressing and possibly committing relevant Organizations to jointly implement the selected actions. In addition, given the National Smart Specialization Strategy as overarching policy put in place to create value chains combining interests and funds of regions and nations, a contribution has been asked to the Italian Agency for the Cohesion of Territories to the national position on the SRIA update (see the paragraph 2.2). Besides technical aspects, the Agency affirmed the necessity to further involve Regions and the variety of productive knowledge expressed by the territories. A good premise is represented by the work carried out by the Emilia-Romagna Region. At the European level, its active role led to the publication in 2013 of the European regions Charter for the promotion of a common framework for strategic actions aimed at the protection and sustainable development of the Mediterranean coastal area, the Bologna Charter (www.bolognacharter.eu). At national level, a study (Barbanti, 2018) was implemented with the National Research Council of Italy proposing possible measures for planning the marine space use in front of the Region's coasts, based on the assessment and the analysis of the sea and coastal uses.

3.2. How *BLUEMED* could reduce the fragmentation to reduce the complexity

The *BLUEMED Initiative* was initially promoted with the aim of increasing the attention of the European and national governing Institutions and funding agencies on the relevance of the policy agenda for the marine and maritime research and innovation in the Mediterranean Sea. Sub-sections 2.2 and 2.3 detail the *BLUEMED's* great effort in raising awareness and promoting dialogue and cooperation.

This might lead to overcome some critical factors underlying this type of initiative, such as: multiple stakeholders often addressing contrasting priorities; the strong need of interactions counterbalanced by the competition for the use of the same resource and/or of a common space; the gap of knowledge and adequate skill leading inevitably to decisions undertaken under conditions of unawareness on the consequences and implications. To give an example, while some countries started to define zones of ecological protection to ensure the sustainability of fisheries resources, part of the basin is legally open to free use and exploitation by all states (art. 87 of UNCLOS, 1982). The added value of *BLUEMED* can be sought in its support to defragment this complexity, providing knowledge-based solutions, possibly trans-national, to optimize management processes.

Persisting in favouring alignment is fundamental considering not only the cultural diversity, social and economic developments, and geopolitical complexity of the Mediterranean area, but also the sophisticated interaction between research, stakeholders and policy makers. Effective participatory mechanisms and analysis of the interactions among all actors involved can enable the transformation of desirable goals into feasible and measurable actions. This process will be accompanied by the identification of suitable framework conditions that enable the activation of these actions, represented by technology capacity, observation and data, and skills development. A metrics providing quantitative and qualitative indicators of their impacts is also necessary.

Establishing common research and innovation trajectories for implementing actions pursuing a sustainable marine and maritime growth within dedicated policy frameworks does not mean solely to apply and exploit newly achieved knowledge, it implies instead multiple connections and continuous adaptation to create new value, extend knowledge frontiers, and support innovative solutions (Roux et al., 2006). To share objectives is the precondition: the four *BLUEMED* platforms are conceived to work towards this goal.

4. Conclusions

Research and innovation can contribute significantly to sustainable blue growth in the Mediterranean Region, a unique asset of natural and cultural value. A multidisciplinary approach linking economy, environment, and humans is required. This implies the continuous engagement of diverse communities often with markedly different interests, objectives, and even languages, in a delicate equilibrium between the inputs that are brought into a broad participatory process and the outputs produced, raising awareness and moving forward to the implementation of joint actions. Research and innovation activities on key economic drivers such as food, transportation, tourism, chemicals and materials, energy, security, and ecosystem health, have to be

carried out by tackling relevant thematic objectives once they are jointly identified by the scientific community, policy makers, stakeholders from the private sector, and civil society, looking at the potential impact also in terms of societal and environmental benefits.

A clear indication of common priorities, narrowing the list of actions of the BLUEMED SRIA, needs to be addressed to implement durable actions in support to sustainable development, from their realization to the monitoring of possible impacts. The opportunity of witnessing a paradigmatic change envisioning the Mediterranean Basin as a hub for innovation is not far away. In practice, once the policy framework has been set-up, the integration of efforts by managing authorities of relevant research and innovation programmes, at least at the European and EU national levels, to jointly cooperate in this direction has already started. The Mediterranean area is variously exploited by several countries that belong to three different continents taking advantage of its resources including culture, food, and tourism. A broader intervention in designing research and innovation actions to provide knowledge-based solutions to the policy makers for managing the variety of human activities affecting the Mediterranean Sea is the key to guarantee the future well-being of citizens.

The *BLUEMED Initiative* is aiming to structure a suitable science-to-policy feedback mechanism, relying on the scientific environment also as vehicle of diplomacy. In order to face the complexity of such an Initiative, a mechanism has been built as precondition to enable the research community to offer its support to the decision-making process, influencing future policies and the adoption of knowledge-informed strategies at different levels: European, national, regional, international, and, in particular, trans-Mediterranean. Sustainable growth in the Mediterranean Sea is a grand challenge requiring a solid governing capability.

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