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European University of the Seas

**Policy paper with recommendations to fit
regional priorities**

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Introduction

In order to be able to advance the knowledge economy towards socio-ecological transition, it is crucial to build partnerships and capacity for collaboration of diverse actors coming together in quintuple helix partnerships including universities, business, public authorities and civil sectors.

In accordance with its mission, the SEA-EU alliance is deeply committed to creating value for its students, staff and regions where it is embedded. We recognized the need to align our education and research with our smart specialization strategies to increase our capacities for innovation partnerships.

As an alliance, we also recognized that we share both global and local challenges and similarities, like our geographically peripheral position, great population density in coastal zones and massive tourism, pollution, overfishing, and human migratory crisis in the Mediterranean... Exchanging the experiences and best practices, as well as connecting our local stakeholders, can help us to create synergies and boost the competitiveness of our regions. Collaboration enhances knowledge generation and diffusion among actors facilitates access to complementary resources and knowledge and enables the co-creation of new knowledge and new value. As an alliance, we are open to collaboration in education/teaching, research and innovation or community engagement.

Having the sea as uniting factor, our first focus was on contributing to the sectors of the blue economy, which is especially important for all of our regions. According to the Blue Economy report 2022, this comprises traditional sectors Marine living resources, Marine non-living resources, Marine renewable energy, Ports activities, Shipbuilding and repair, Maritime transport and Coastal tourism and the emerging ones Ocean energy, blue bioeconomy and biotechnology, Desalination, Maritime Defence, security and surveillance, Research and Education and Infrastructure (submarine cables, robotics, etc.).

Two of our regions have been highlighted as having smart specialization strategies targeting emerging sector specializations of the blue economy. The Brittany region has identified marine biotechnology focused on macro and micro-algae, invertebrates, bacteria, and viruses as one of its innovation priorities. Their RIS3 identifies the potential in industries operating in the domains of food, health, cosmetics, biofuels and green chemistry. The strategy has also identified the close connection between research in this area and the development of new business models of marine living resources, mostly fisheries and fish farms. RIS3 process, which included inclusive dialogue with all relevant actors in the Schleswig-Holstein, identified the "maritime economy" as one of the five domains with innovation potential. Policy interventions and funding were committed in the areas of maritime technologies, specialized ship construction, offshore energy, and maritime biotechnology and production facilities, among others.





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An additional important aspect is boosting the forward-looking competences and skills of our students and researchers working on subjects related to S3 priorities. It contributes to creating effective research agendas and developing the job force that can increase the company's innovation capacities. Developing a long-term vision of future developments is crucial for strategy development and policy design.

Within this task, we have organized a set of interdisciplinary workshops (WS), a futures Bootcamp (FB) and a series of Blue Talks (BT) webinars to discuss and present future opportunities for advancing education, research and innovation, which also consider the sustainability of the alliance. This report summarizes and builds on these discussions.

It also considers the analysis of smart specialization strategies performed in parallel within the alliance.





Analysis of RIS3

The team from the University of Gdansk analyzed the Smart Specialization Strategies of the alliance universities' regions in the period 2014-2020 and produced a report: Comparing the national Smart Specialization Strategies (S3) of the SEA-EU countries - Report in the best practices of cooperation within the socio-economic sector.¹

Based on the analysis, the Report further focused on five areas Maritime and Blue Growth, Health, Energy, Advanced technologies/High-tech/ICT and Tourism/Mobility, which were found to be relevant for the SEA-EU regions. The report then provides the analysis of the Policy priorities in the given areas. We here cite the final main recommendation of the Report:

"1. Closing gaps (areas to develop) in each sector between leaders (Germany and France) and the rest of the consortium members – For Spain, it will be the Tourism/Mobility sector; For Poland, the main gaps concern Maritime and Blue Growth and Tourism/Mobility; For Croatia, it is Energy and Health sector; For Malta, it will be increased potential in the Energy sector and Maritime and Blue Growth;

2. Supporting sectors with high developing potential: Health, Energy and Advanced technologies/High-tech/ICT for Germany and France; Maritime and Blue Growth for Spain; Tourism/Mobility for Malta and Croatia; Croatia has also high developing potential in Maritime and Blue Growth;

3. Promoting dialogue between SEA-EU members in closing gaps and supporting sectors with high developing potential;

4. Focusing policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development;

5. For SEA-EU Universities:

- invite stakeholders fully involved and encourage innovation and experimentation in gaps to fill in and excellence areas;
- Including identified gaps in research agendas;
- Including identified gaps in educational program with specific courses. ""

¹ <https://sea-eu.org/wp-content/uploads/2021/11/OP-2.8-Comparing-the-national-S3-of-the-SEA-EU-Countries-Gdansk-2021.pdf>



Summary of the detected opportunities

The interdisciplinary workshops listed in Annex 1, along with the eight Blue Talks webinars and Futures Bootcamp gathered researchers, students, entrepreneurs, and representatives of the public and private sector institutions. Through the presentations and discussions, a series of research and innovation opportunities for the SEA-EU alliance and the regions it encompasses was detected. In many cases in order to advance the research or innovation and development of the sectors the need for trained professionals was expressed, which we will in the following highlight as training needs and proposals. Futures Bootcamp participants additionally explored and prioritized research and innovation trends that will shape the future of the blue economy sectors.

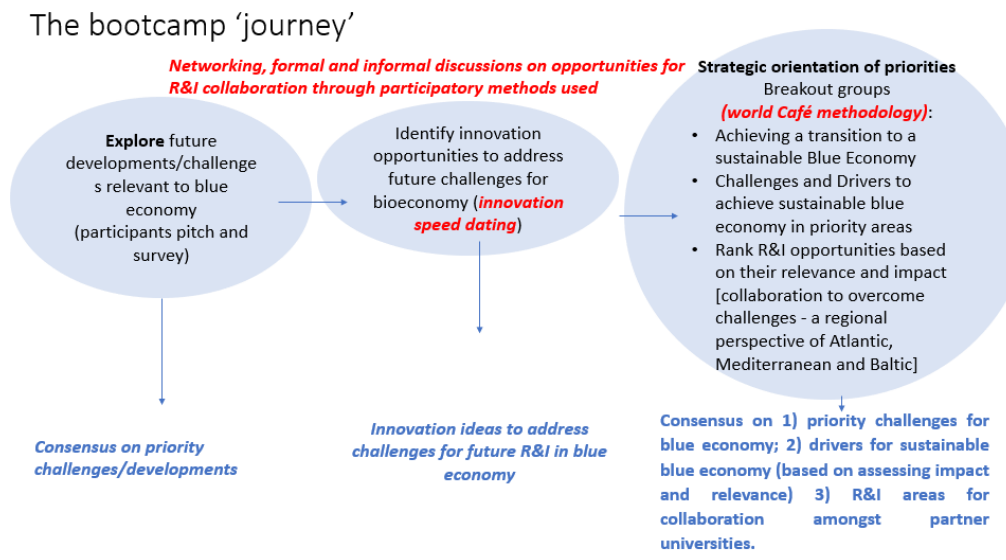


Image 1. Defining a Bootcamp journey with international group of experts at the beginning of the journey

Research and innovation opportunities

Interdisciplinary workshops have detected the following topics of interest as research and innovation opportunities for the universities in the alliance.

HORIZONTAL ACTIONS:

- Transferring from primary research to data-driven research in blue economy (WS1)



- recognized as a big trend that needs to tackle general lack of skills and human capital, funding models and related challenges
- Developing and using "living labs" for innovation in instrumentation and methods for marine observation and modelling (WS1)
 - represents a huge potential for the SEA-EU alliance in the framework program of Horizon Europe and particularly through digital twin of the Mission ocean.

FISHING, AQUACULTURE, PROCESSING INDUSTRY AND MARINE BIOPRODUCTS:

- Aquaculture
 - sustainable aquaculture
 - nutrition (e.g. insects as meals)
 - stress, reproduction, fish development, pathology, physiology...
 - the New Aquaculture Assistance Mechanism to support EU sustainable aquaculture ² was announced; it became operational in July 2023
 - development of tools to study water ecosystems
 - design of facilities, testing, inspection and product certification
- Marine bioproducts
 - There is great potential in algae and other aquatic species (such as sea sponges) for several applications: cosmetics, drugs, human and animal food, plastic removal, and wastewater treatment. Moreover, they could be used as third fossil fuel.
 - From the sustainability point of view, algae have the potential to replace non-sustainable products in some of the applications mentioned, as well as to capture CO2 in sustainable buildings.

NAVAL CONSTRUCTION, OFFSHORE AND MARINE RENEWABLE ENERGIES:

- One of the trends identified in WS3 was the additive manufacturing applied to the naval construction sector. The UCA, in collaboration with the major shipyard company in Spain, Navantia, has developed additive manufacturing lines of huge pieces (for instance, cabins) and medium pieces, as well as spare parts manufacturing on board.
- Multipurpose floating platforms (WS2)
 - sustainable construction and reuse of offshore platform
- The challenges of offshore renewable energies include the study of offshore wind potential, risk management, the control of energy generation, and the transformation

² https://cinea.ec.europa.eu/news-events/news/new-aquaculture-assistance-mechanism-support-eu-sustainable-aquaculture-2022-07-29_en



of offshore wind energy. Moreover, the maritime spatial approach is essential to make offshore fishery areas compatible with offshore renewable facilities.

- There is an expected increase if all types of offshore renewable energies (wind, wave and tidal), stimulated by the European Green Deal and the Recovery and Resilience Plans
- Poland has a particular boost in offshore wind power through an Agreement between the Government and the sector. Offshore wind power in Poland has the potential to cover the third part of its energy demand.
- R&D is needed for new solutions to build and maintain offshore wind
- WS3 pointed out the need for areas where the technologies developed in the sector of offshore renewable energies of waves, tides and currents could be tested. The Strait of Gibraltar has the oceanographic conditions to perform prototype tests, particularly in relation to wind and wave power. Some close areas are also ideal to test tidal power devices and other ocean currents.
- The design, development, manufacturing, and commercialization of oceanographic tools that facilitate the study of seas and oceans is also an activity with great potential in view of the development expected of offshore renewable energies. The trend in this sector is the autonomy of devices and sensors, as well as their capacity to communicate data.

PORTS AND LOGISTICS:

Throughout the workshops, particularly WS3, the challenges and opportunities for R&D&I were:

- the improvement of the efficiency of logistic processes (ad hoc software design, application of artificial intelligence to make predictions, etc.).
- the digitalization of transport services (smart containers, etc.)
- energy efficiency (optimization of maritime routes to reduce fossil fuel consumption and emissions, etc.)
- sustainability (port waste management, sensor integration to measure pollution in ports and noise impact, etc.)
- the new ways of port governance
- the improvement of port connection with other means of terrestrial or air transport
- staff rejuvenation
- the renovation of port equipment

The ports of Cadiz and Split mentioned their plans to grow, to build new terminals, so the maritime traffic of passengers and goods is presented as a growing sector.





TOURISM RELATED TO THE SEA:

- Research as support for decision-making models to achieve tourism compatible with the environment, space and resources
- The future trends identified in the cruise ship sector are digital connectivity (apps, smart bracelets, etc.), well-being (healthy food, spa, and gymnasiums), mindfulness, unique experiences, and sustainability. Apart from travelling in groups, the number of travellers working on board or travelling alone is increasing.
- In tourism, innovation includes gastronomy, history, culture, the revival of artisan professions, and sustainable development.

MISCELLANEOUS:

- Marine robotics and autonomous vehicles were mentioned as a need for persistent monitoring, maintenance of infrastructure and digitalization of seas and oceans
- Sustainable materials which are not going to be wasted are required by a range of businesses
- Artificial intelligence and other advanced digital technologies

Training needs and proposals

Through the mentioned activities we have identified a non-exhaustive list of potential trainings:

- marine species in recirculating aquaculture systems, animal plant productions in aquaponics systems, algae harvesting and production
- aspects of life cycles assessment, carbon and water footprints, aspects of circular demonstration activities (aquaponics)
- data management (the way to access it, share it in an open way, turn it into knowledge, combine and analyze multidisciplinary data) was highlighted by all universities as a pressing issue
- following the workshop several working meetings were held by the relevant academics resulting in the Marine Data Literacy module which was successfully delivered in the 2021/22 academic year and has launched a call for 2022/23
- knowledge and skills needed for offshore renewable energies
- enable students to experience challenges from interdisciplinary perspectives
- such an approach was demonstrated in WS4, "The Challenges Facing the "Blue Economy" in a Small Island State", where students have experienced how competing interests in Malta increase the pressures on the island's blue economy and its already finite natural resource base





Policy recommendations

Throughout the SEA-EU project, shared knowledge and best practices were used to better design the subsequent actions and stimulated a series of previously unplanned activities, such as the Marine Data Literacy module or the continuation of the Blue Talks webinars in the new panel format. These activities have also helped in building the community of interested individuals that have been used as a point of reference for all future actions. The community of individuals mapped in this process numbers 320 contacts from all alliance partner universities.

In forming the recommendations are made for the alignment of education, research and innovation of the SEA-EU alliance to regional priorities it is important to consider not only the activities of this task but also other achievements of the alliance in the period of three years:

- creation of database of research groups and research infrastructure,
- establishment of seed funding for small research projects,
- establishment of the Observatory for Sustainable Blue Economy with the accompanying portal dedicated to all the blue economy stakeholders,
- establishment of the virtual project and technology transfer office and with a means to communicate using the Discord platform,
- ongoing work in the establishment of study programs at all levels that address the needs of the blue economy,
- establishment of the opportunities portal where stakeholders have the possibility to post job and internship offers, as well as collaboration opportunities; part of the portal is dedicated to the network of doctoral students, alumni and company representatives in marine, maritime and coastal sciences which was established through the SEA-EU DOC project.

Based on all of the above, it is recommended for the SEA-EU alliance to:

- consider the detected research and innovation opportunities in the formation of the SEA-EU long-term research plan which is being developed through the research-EU project
- foster the creation of international and interdisciplinary teams of research groups and their connection to companies and other relevant stakeholders and assist them in attracting additional funding by:
 - creating physical and virtual networking opportunities, such as info sessions with possibilities for bilateral and multilateral meetings; good examples are DIPUACTIVA virtual workshops and Innovazul





- providing timely and advanced information and project preparation support through SEA-EU virtual offices
- actively building consortia for interregional cooperation
- continuing seed funding opportunity, prioritizing the projects with identified calls for R&D funding in accordance with regional priorities
- foster collaboration as a means of building capacities in emerging areas of the blue economy, particularly for building competencies for innovation activities and activities related to the commercialization of research
- expand the networking opportunities of the portals developed within the alliance devoting sufficient resources for their continuous moderation and assurance of content relevance
- continuously monitor and anticipate the need for skills (through the Observatory of Sustainable Blue Economy), when needed adjust existing and develop appropriate life-long learning programs
- continue developing the study programs at all levels (BSc, MSc and PhD) to address the needs of the blue economy
- continue developing co-creation approaches, such as mission-based hackathons or Living Labs as means to solve challenges and allow students to gain valuable competences
- continue exchanging information and expertise and build joint delivery of services for specific fields
- continue establishing presence in other relevant networks and disseminate the achieved results and opportunities for collaboration with SEA-EU
- create synergies with other projects that the partners are involved with; a good example of such actions involving companies is combining Enterprise Europe Network with Innovazul and SEA-EU
- measure the effectiveness of actions and transfer the good practices to other sectors of smart specialization

Public administration can significantly assist the development of regions in accordance with the RIS3 strategies. Some of the means that have proved effective or that were suggested throughout the workshops are:

- supporting efficient connection and cooperation of companies and research institutions by co-funding the joint research, mobility of researchers, joint workshops and events with bilateral meetings
- supporting the exchange of knowledge and good practices in the training of professionals in the important sectors



- predict financial support for the development of the sustainable blue economy sectors (e.g. Spain has such support)
- enabling fast permissions for testing the new offshore technologies outside marine protected areas and areas that are important for fisheries
- spatial planning to take advantage of the potential of each location.



Image 3. A sketch made by a UNIST student on the topic of brainstorming between academics and stakeholders at a meeting held in April 2022 in Split (the part related to university-business cooperation)

Funding mechanisms

In the following, we give the list of available funding mechanisms for advancing the research, development and innovation in the blue economy

- [Horizon Europe](#) 2021-2027
- The European Climate, Environment and Infrastructure Executive Agency of the European Commission (CINEA) 4 launches calls designed by the Directorate-General for Maritime Affairs and Fisheries (DG MARE) of the EU, as well as other calls, and they use as tools:
- the [Connection Europe Facility](#) (CEF): a fund to promote growth, employment and competitiveness through investments in infrastructures at a European level.
- European Maritime, Fisheries and Aquaculture Fund (EMFAF). Most of the budget is directly managed by countries, where [workprograms](#) for 2021-2027 have in November

⁴ https://cinea.ec.europa.eu/index_en



2022 been adopted for Italy and France. One of the programs financed by EMFAF is [BlueInvest](#) which aims at boosting innovation and investment in sustainable technologies for the Blue Economy, thus supporting financing preparation and access for companies in their initial stage, SMEs and companies in expansion (through loans).

- Recovery and Resilience Facility: sizeable investments are planned in RRF's of Belgium, Cyprus, Greece, France, Italy, Poland, Portugal and Spain⁵
- [WestMED](#) initiative uniting 5 EU countries (France, Italy, Portugal, Spain and Malta) with Algeria, Libya, Mauritania, Morocco and Tunisia launches regular calls for supporting blue economy
- [Atlantic regional initiative](#) with topics:
 - Blue economy: Innovation Clusters, Atlantic Natural Resources Management and Maritime Spatial Planning
 - Renewable Energy: Offshore Wind
 - Atlantic cities: Smart, Sustainable and Secure Ports and Protecting the Ocean
- other opportunities for businesses are presented in the Blue Economy report 2022
- other opportunities for R&D&I are available in DG MARE work programme⁶
- Interreg Euro-MED (relevant for Spain, Malta, Italy and Croatia) although not only concerned with sectors of blue economy has a range of interesting topics:
 - Strengthening an innovative sustainable economy
 - Protecting, restoring and valorizing the natural environment and heritage
 - Promoting green living areas Enhancing sustainable tourism

For projects on the use of algae in the EU, there are other programmes apart from Horizon Europe and EMFAF:

- [EIC Accelerator](#), support for SMEs (particularly, start-ups and spin-outs) to develop disruptive innovations.
- [LIFE Program](#), a financing tool for environment and action against climate.
- [Results of the public consultation on the algae sector.](#)
- Furthermore, an assistance mechanism will shortly be launched for [Sustainable Aquaculture](#).

Marine renewable energies also have a specific [financing mechanism](#).

Finally, sustainable tourism linked to the sea is another line of the Blue Economy, and the EU has a [search for tourism grants](#).

⁵ The EU blue economy report 2022

⁶ https://ec.europa.eu/oceans-and-fisheries/funding/annual-work-programme-grants-and-procurement_en





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One should not overlook the programs that support digitalization, particularly [Digital Europe](#), with the network of (European) [Digital Innovation Hubs](#), some of which offer subsidized services for companies in the blue economy.





ANNEX 1. List of interdisciplinary workshops and events

WS1: 2 sessions within the SEA TECH WEEK in Brest (virtual):

- **Commitment of European Universities in marine observation** (14th October 2020) with presentations from: Yves-Marie Paulet (UBO), Alfredo Izquierdo (UCA), Mariusz Sapota (UG), Aldo Drago (UM), Leandra Vranješ Markić (UNIST), Hrvoje Mihanović (IOR), Fred Jean (IUEM-UBO), Ralph Schneider (CAU).
- **Uses of images and instrumentation in observatory** (15th October 2020) with presentations from: Marion Jaud (UBO), Gabriel Navarro-Almendros (UCA), Iwona Pawliczka vel Pawlik (UG), Adam Gauci (UM), Joel Azzopardi (UM), Žarko Kovač (UNIST), Ivan Racetin (UNIST), Romina Barbosa (UBO), Stéphane Bertin (UBO), Jens Schneider-von Deimling (CAU),

WS2: Building a vision for future research and innovation in the blue economy, SEA-EU session within the WIRE conference in Split, online 5th November 2020, including the speakers: Tanja Šegvić Bubić (IZOR - UNIST), Pilar Blanco (Navantia - UCA), Jérémie Bazin (Campus Mondial de la Mer – UBO), Hanna Łądkowska (UG).

WS3: Virtual event for the presentation of capacities and opportunities of the SEA-EU universities, associated members and territories to the Blue Economy SMEs of the Province of Cadiz (28th and 29th September 2021).

- Structured in the form of introductory and four parallel sessions
 - NAVAL AND OFFSHORE CONSTRUCTION AND MARINE RENEWABLE ENERGIES
 - PORTS AND LOGISTICS
 - FISHERY, AQUACULTURE, PROCESSING INDUSTRY AND MARINE BIOPRODUCTS
 - TOURISM RELATED TO THE SEA
- Uniting almost 50 presenters, including researchers, experts from the public administration and SME representatives. The participants came from 5 SEA-EU countries (Spain, Poland, France Croatia, and Malta).

WS4: The Challenges Facing the "Blue Economy" in a Small Island State (29th October – 30 October 2021), organized by the University of Malta, including the speakers: Godfrey Baldacchino, Ritiene Gauci, Andrea Pace, John Ebejer (UM), students from UCA and students and professor Vinko Muštra from UNIST.

FB: Futures Bootcamp:





- virtual workshop on June 24th 2021
- physical workshop at the University of Malta, 15th-17th September 2021
- discussing which future paths could lead to a sustainable blue economy, what type of interdisciplinary science will enable us to achieve these sustainable paths and how can we collaborate to foster an interdisciplinary science and innovation agenda for sustainable growth of the blue economy

BT: SEA-EU Blue Talks Webinars:

- a series of short online events focused on the topic of a blue economy organized by the SEA-EU
- Seven of them were held in a form of a one-hour webinar focused on the topic of a blue economy with one presenter in a period from October 2020 – June 2021 and two additional in a form of a panel discussion with four expert's discussion on one blue economy topic (in a period of October 2022 – November 2022).

List of all Blue Topic webinar topics and presenters:

- The Blue bioeconomy – experiences from the Baltic Sea Region – Angela Schultz-Zehden, Managing Director @SUBMARINER Network (15/10/2020 @ 13:00)
- Experience of the Blue Mediterranean Implementation Plan – Margherita Cappelletto, BlueMed (12/11/2020 @ 13:00)
- How COVID-19 is affecting tourism– Anabela Marques Santos and Karel Haegeman from JRC (15/12/2020 @ 14:00)
- The Operational Oceanography– Aldo Drago from the University of Malta (21/01/2021@ 13:00)
- Potential for Blue Growth - Hanna Ladkowska and Konrad Ocalewicz, University of Gdansk (18/02/2021@ 13:00)
- Sustainability of oceans - Avan Antia, Kiel University (31/03/2021@ 13:00)
- Fucosan Project - Alexa Klettner, SUBMARINER Network (09/06/2021@ 13:00)
- Maritime Transportation - Luka Vukić from UNIST, Ernest Czermanski from University of Gdansk, Nele Matz Lück from Kiel University and David Gomez-Ullate Oteiza from University of Cadiz (27/10/2022 @ 14:00)
- Citizen Science and Blue Economy - "Coastwards" from Kiel University, "Deep-Sea Spy" from IFREMER, UBO partner, "ECOFish" from the University of Cadiz and Malta's innovative cases from the University of Malta (25/11/2022 @ 10:00)





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This report was approved by the RDI Subcommittee of the SEA-EU Alliance at the meeting held on 21st November 2022.

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