



reSEArch-EU



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017454

# DIGEST ON “MATCHING RESEARCH STRENGTHS WITH SOCIETAL CHALLENGES - SEA-EU ALLIANCE”

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## Abstract

Matching research strengths of the SEA-EU alliance with societal challenges paves the road for the common long-term research agenda.

This document has the ambitions to help prioritizing the research topics with the strongest potential for synergies in regards to the research strengths observed at the scale of SEA-EU and the current European societal needs. To fulfil this task, the results of a previous analysis on SEA-EU research strengths, the 2030 agenda for sustainable development and the data from the Horizon Europe programme were matched.

The matching indicates that the SEA-EU alliance has the capacities to target environmental-related challenges, topics related to the common root (embedded in coastal ecosystems) and beyond.

reSEArch-EU Task 6.2 – Matching research resources with societal challenges – led by UBO  
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## Deliverable identification

Deliverable No. and Title	D6.2 Digest matching research strengths with societal challenges
Leader	University of Bretagne Occidentale
Dissemination level	Public
Due submission date	30/06/2023
Submission (first version)	30/06/2023
Project number	101017454
Project starting date	01/01/2021
Duration	36 months

## Versions and contribution history

Version	Date	Modified by	Reason
0	16/06/2022		Presentation of the deliverable to the IPCC



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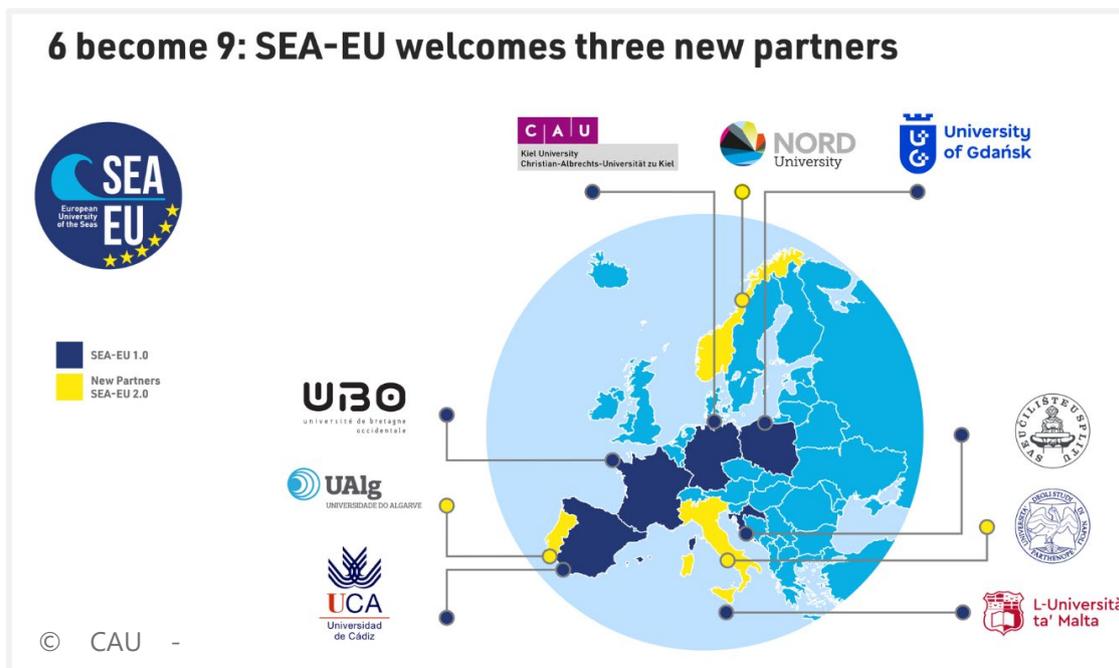
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## Introduction

International research collaboration across institutions, sectors and/or disciplines are common practices. Through international cooperation, partners can benefit from a better exchange in skills and practices, higher productivity, better access to funding or increased innovation<sup>1,2</sup>.

The world faces societal challenges spanning through countries. In this changing world, institutions need to adapt to cope with the complexity of these challenges. Higher education institutions (HEI) have a critical role as they are essential for both the industry and society through research and education<sup>3</sup>.

In an effort to boost the competitiveness, the attractiveness and the resilience of the European HEI, the European Commission (EC) launched the European Universities Initiative in 2017. With this call, the EC aims at strengthening strategic partnerships across European countries [4]. Capitalising on this opportunity, the universities of UCA (Cadiz, Spain), UBO (Brest, France), CAU (Kiel, Germany), UG (Gdansk, Poland), UNIST (Split, Croatia) and UM (Malta) formed the SEA-EU alliance in 2019. The SEA-EU alliance, originally composed of 6 coastal universities (Figure 1) has recently expanded, welcoming three new partners (UALG: Faro – Portugal, PUN: Napoli - Italy and NU: Bodo - Norway).



**Figure 1.** Map of the SEA-EU alliance. In blue, the six initial partners: UCA (Cadiz, Spain), UBO (Brest, France), CAU (Kiel, Germany), UG (Gdansk, Poland), UNIST (Split, Croatia) and UM (Malta). In yellow, the three new partners: UALG (Faro, Portugal), PUN (Naples, Italy) and NU (Bodo, Norway).

<sup>1</sup>Dusdal, J., & Powell, J. J. (2021). Benefits, motivations, and challenges of international collaborative research: A sociology of science case study. *Science and Public Policy*, 48(2), 235-245.

<sup>2</sup>Katsouyanni, K. (2008). Collaborative research: accomplishments & potential. *Environmental Health*, 7(1), 1-7.

<sup>3</sup>Binagwaho, A., Bonciani Nader, H., Brown Burkins, M., Davies, A., Hessen, D. O., Mbow, C., ... & Tong, S. (2022). *Knowledge-driven actions: transforming higher education for global sustainability: independent expert group on the universities and the 2030 agenda*. UNESCO Publishing<sup>4</sup>European Union: European Commission, *Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions on a European strategy for universities*, 18 January 2022, COM(2022) 16 final, available at: <https://education.ec.europa.eu/education-levels/higher-education/european-universities-initiative> [accessed 01 February 2023]

The 9 partners share “a common vision of education as a key catalyst for the future with the ambition to build a unique and diverse interdisciplinary institution” (Mission commitment, [https://sea-eu.org/wp-content/uploads/2019/12/MStat\\_SEA-EU.pdf](https://sea-eu.org/wp-content/uploads/2019/12/MStat_SEA-EU.pdf)). To achieve such ambitious vision, both education and research activities need to be structured. Alongside with the initial funding and to support research structuration within the alliance, an additional grant (reSEArch-EU project) from the EC was captured under the framework program for R&I H2020, call “Science with and for society”. With this project the alliance aims at boosting its research and innovation capacities, thriving through topics such as resilience, sustainability, open science policies, innovation, engagement with stakeholders and long-term collaborations across and beyond SEA-EU. The alliance also benefits from an inter-alliance cooperation agreement with EU-CONEXUS (other European alliance) as the two alliances share similar strategies in research structuration through an H2020-SWAFS grant.

### Why matching research resources & societal challenges?

In an effort to build coherent and meaningful long-term research collaborations in line with the current needs of our societies, the SEA-EU partners join forces to develop a common research agenda. This strategic document will build on the activities of all Work Packages activities of reSEArch-EU including innovation practices, stakeholder involvement, digitalization, open sciences, sustainability, state of the art of research resources... **This digest aims at matching SEA-EU’s research strengths with societal challenges. This document will help identify the collaboration opportunities both in regards to the potential synergies observed at the scale of SEA-EU and the current societal needs. Ultimately, the digest, and therefore, the long-term research agenda, will (1) help matching research groups, (2) guide researchers from SEA-EU towards the most suitable European calls or even (3) promote the share of infrastructures.**

The digest is intended for the SEA-EU researchers and more precisely for the Task Force members who are committed to build a common long-term strategic research agenda (reSEArch-EU, WP6 lead by UBO).

## Societal challenges

The world is facing many challenges including (but not exclusively) climate changes, the loss of biodiversity, digitalization, inequalities (social, economic, access to food and water, energy, health care...), or more recently the outbreak of a pandemic. These challenges have a major impact on our society altering both resilience and economic development. Institutions, in particular universities have a critical role to play in mitigating these societal challenges by both contributing to the innovation sector and educating the future generation. To help stakeholders take a stand, main organisations and institutions (United Nations, European Commission) pave the road, providing the framework for actions in this matter. Here, both the 2030 agenda for sustainable development and the Horizon Europe programme, highly relevant for the SEA-EU alliance, are used to match research strengths of our universities and societal challenges.

On the international stage, the strategy organizes around the Sustainable Development Goals (SDGs, <https://sdgs.un.org/>). The 2030 agenda for sustainable development, provided by the United Nations, focuses on sustainability across three pillars: social, economic & environmental. 17 ambitious goals are set to be addressed (Figure 2) with 39 key topics.



Figure 2. Sustainable Development Goals. ©United Nations.

On the continent, the EC deployed a strategy to implement the SDGs' 2030 agenda across six main priorities: (1) the European Green Deal, (2) the economy that works for people, (3) Europe fit for the digital age, (4) European way of life, (5) a stronger Europe in the world and (6) a European democracy ([https://commission.europa.eu/strategy-and-policy/international-strategies/sustainable-development-goals/eu-holistic-approach-sustainable-development\\_en](https://commission.europa.eu/strategy-and-policy/international-strategies/sustainable-development-goals/eu-holistic-approach-sustainable-development_en)). To fulfil the ambitious goal of a climate neutral continent by 2050<sup>4</sup> (European Green Deal), the EC emphasises on the Green Transition within the Horizon Europe programme. 35% of the budget is set to be allocated to the theme over the full period of the programme. Similarly, the Digital Transition and the concept of Open Science are two core notions in this framework.

Overall, Horizon Europe is divided in three main pillars together with horizontal actions. The 2<sup>nd</sup> pillar, “Global Challenges & European Industrial Competitiveness”, is mainly dedicated to the fulfilment of the 2030 agenda for sustainable development with six clusters. Tackling societal challenges is a priority of the EC. Over half of the total budget over 2021-2027 will be dedicated to the pillar<sup>5</sup> (e.g. 66.5% for Horizon Europe 2021-2022 period).

To support its priorities, the EC developed five Mission-oriented policies assimilated to the 2<sup>nd</sup> pillar of Horizon Europe: (1) Restore oceans, seas, coastal and inland waters, (2) Adaptation to climate change including societal transformation, (3) Climate-neutral & smart cities, (4) Soil health & food and (5) Cancer. These five Missions aim at orientating research and innovation actions towards addressing some of the biggest current societal challenges. For the 2023-2024 period of Horizon Europe, €600 million will be directed towards these missions ([https://ec.europa.eu/commission/presscorner/detail/en/IP\\_22\\_7404](https://ec.europa.eu/commission/presscorner/detail/en/IP_22_7404)).

In regards to the SEA-EU alliance, the SDGs, the six EC's priorities and therefore the five Missions are relevant. They can serve as roadmaps in prioritising research topics for long-term collaborations.

## Research strengths in the SEA-EU alliance: main results from the analysis on research thematic

### A thorough methodological approach

In the reSEArch-EU's task 6.1, the alliance identified, as a first step, the research forces of the partners. A bibliometric analysis among other analyses was performed. Data from international (Web Of Sciences), national (e.g. CROSBI in Croatia) and internal databases (provided by the partners) were analysed over a five year period 2017-2021. Information on publications (articles, books, proceedings papers...), conferences, PhDs, Smart Specialisation Strategies (S3) and projects were collected. Over 58 000 documents were extracted for the bibliometric analysis. In addition, and over the same five-year period for all universities, 3747 PhD theses, 1263 conferences, over 2000 funded projects and regional/national S3 were used for this statistical analysis performed using R software and VOSviewer. Although each approach separately was not sufficient to describe the research strengths of the alliance partners, altogether, they bring a consistent overview of the research forces.

The 3 newly arrived partners (universities of Algarve, Bodo and Parthenope Napoli) were included within the analysis of research forces as soon as they joined in the alliance; however, the collect and analysis of research resources was limited to the use of international databases. Their description may therefore be incomplete, especially towards humanities.

<sup>4</sup> European Union: European Commission, *Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions on The European Green Deal*, 11 December 2019, COM(2019) 640 final, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN> [accessed 19 January 2023]

<sup>5</sup> European Commission, Directorate-General for Research and Innovation, *Horizon Europe, budget: Horizon Europe - the most ambitious EU research & innovation programme ever*, Publications Office of the European Union, 2021, <https://data.europa.eu/doi/10.2777/202859>

Once the research strengths detected, research areas in which SEA-EU partners share similarities can be identified. Cross talks focusing on the similarities may help develop potential synergies.

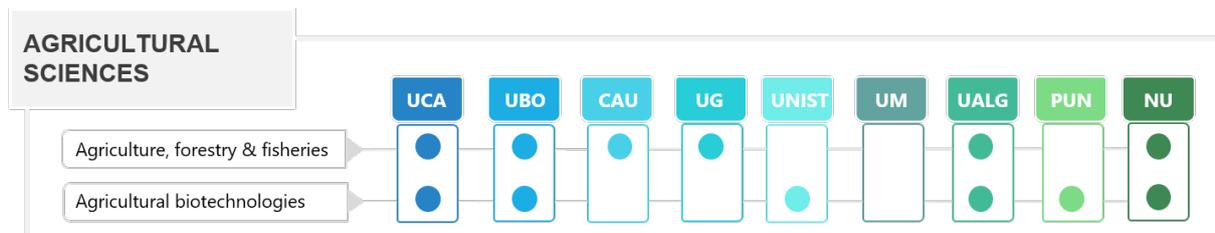
It is worth noting that the research areas described below are strictly based on the results of the report. The research forces identified for each partner were validated by members of a Task Force. This Task Force is composed of researchers from various disciplines and across universities (except for the new partners).

The results presented here indicate the research areas in which partners of the SEA-EU alliance may develop potential synergies. Research areas are depicted using the Organisation for Economic Co-operation and Development Fields Of Research & Development classification<sup>6</sup> (OECD FORD). This classification, used throughout the analysis of research forces, has also previously been utilized by the SEA-EU alliance ([https://research.sea-eu.ug.edu.pl/research-groups?items\\_per\\_page=25](https://research.sea-eu.ug.edu.pl/research-groups?items_per_page=25)). A total of 23 research areas for potential synergies across various disciplines have been identified within the alliance.

For a given university the absence of a research topic as a strength in the report indicates that it is not a theme in which the university may generate wide collaboration within the alliance. Nonetheless, any theme may still be of interest for the aforementioned university, whether or not it appears in the results, and any opportunity for future collaboration should be seized. With a trans-national and multidisciplinary alliance, no common threshold could be defined as communication and visibility differs between disciplines and/or countries. Instead of setting a cut-off, the appearance of a specific research area within the report on research strengths was considered by itself as a tangible strength to explore within the alliance. Overall, the results are representative of the research strengths which are more likely to have an international exposure.

Any topic for which the research forces aligned for two or more SEA-EU universities was identified as a potential synergy area. All are summarized following the six main disciplines of the OECD FORD classification: agricultural sciences, engineering & technology, humanities, medical & health sciences, natural sciences and social sciences. The strength of the potential synergy is defined according to the number of universities that share similarities on a research area. The more they are, the stronger the potential synergies can be expected for the alliance. A research area was considered as a strong topic to develop potential synergies in the alliance if at least half of the partners (4.5 here), therefore four or more universities, shared common research strengths in the topic.

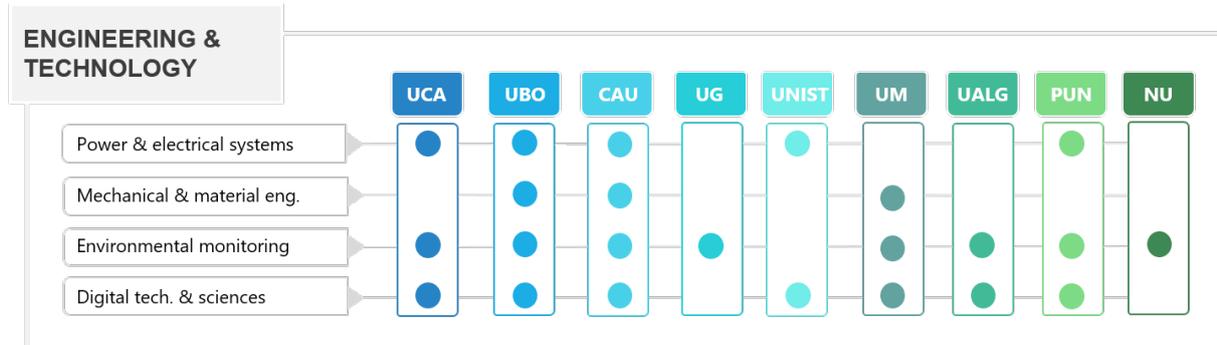
In the **field of agricultural sciences**, two main research areas emerged (Figure 3) as fields of high visibility and were SEA-EU partners may develop potential synergies: agriculture, forestry & fisheries (aquaculture, farming, plant diversity and diseases, soil health) and agricultural biotechnologies (micro-organisms, algae, natural antioxidants e.g. phytochemicals). For both research areas, six out of nine SEA-EU universities share, therefore they can be considered as strong topics to develop potential synergies (i.e. potential strengths for the alliance).



**Figure 3:** SEA-EU Universities that can potentially develop synergies in the field of agricultural sciences. In this research field, the SEA-EU partners which share similarities are represented by dots. Two research areas have been identified.

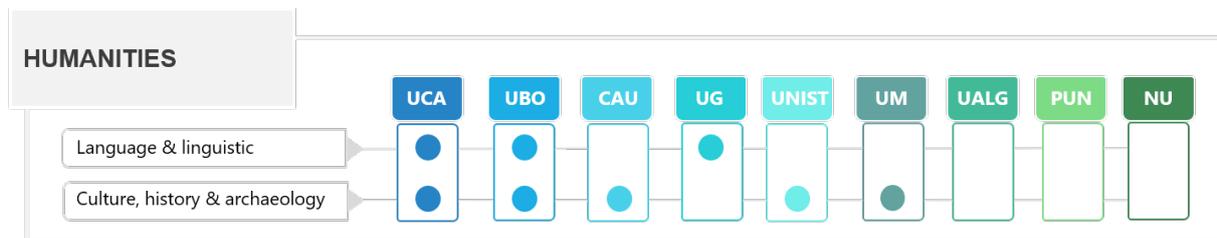
<sup>6</sup>OECD (2015), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264239012-en>

In the **field of engineering & technology**, four research areas emerged as fields of high visibility (Figure 4): power & electrical systems (new energy sources, renewable energies...), mechanical & material engineering (composites, mechanical properties of materials), environmental monitoring (remote sensing e.g. marine env., aquaculture management, climate change, chemical engineering) and digital sciences (medicine, education, env. monitoring...).



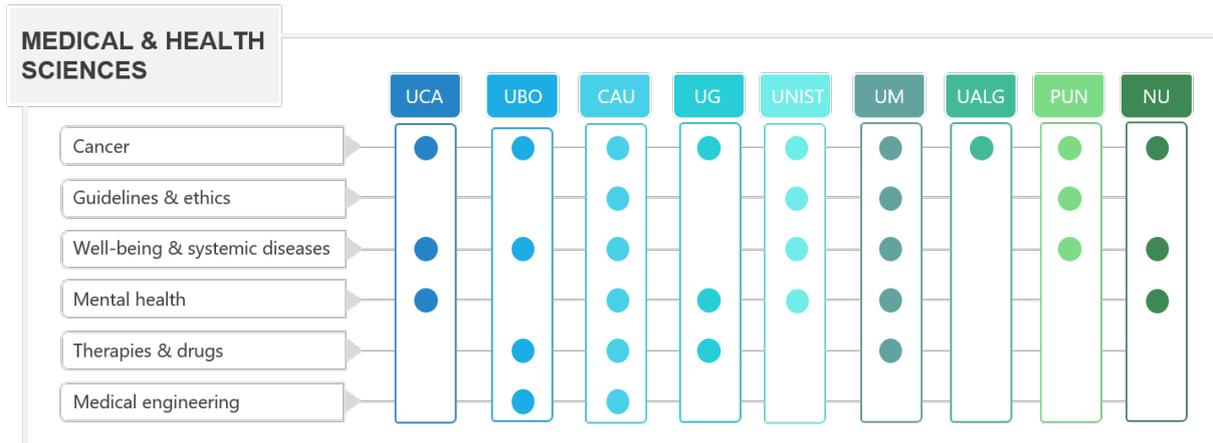
**Figure 4:** SEA-EU Universities that can potentially develop synergies in the field of engineering & technology. In this research field, the SEA-EU partners which share similarities are represented by dots. Four research areas have been identified.

In the **field of humanities**, two main research areas emerged as fields of high visibility as several SEA-EU partners share similarities (Figure 5): language & linguistic (sociolinguistic, language teaching...) and culture, history & archaeology (literature, Neolithic, Bronze Age, Middle Age, geoarchaeology).



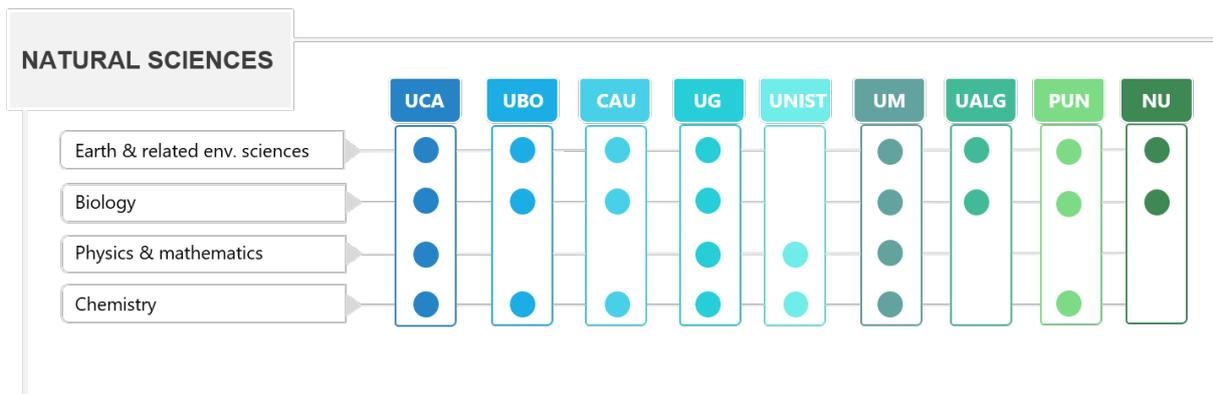
**Figure 5.** SEA-EU Universities that can potentially develop synergies in the field of humanities. In this research field, the SEA-EU partners which share similarities are represented by dots. Two research areas have been identified.

In the **field of medical & health sciences**, six research areas emerged as fields of high visibility (Figure 6): cancer (therapies, diagnosis, detection...), guidelines & ethics (health & medical ethics e.g. treatment of personal data, guidelines), well-being & systemic diseases (hormonal disorders, epidemiology), mental health (at all life stages and during transition periods); therapies & drugs (development of treatments, trials...), medical engineering (diagnostic tools, detection tools).



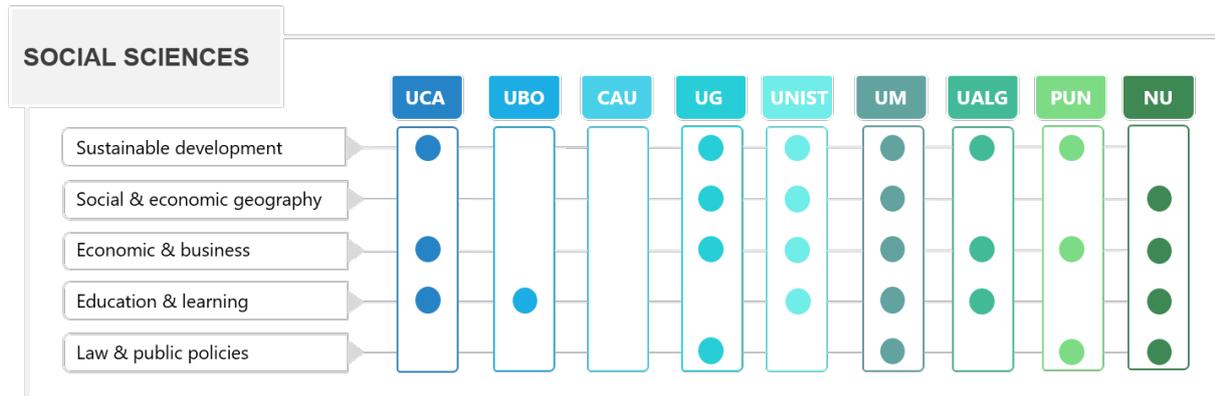
**Figure 6.** SEA-EU Universities that can potentially develop synergies in the field of medical & health sciences. In this research field, the SEA-EU partners which share similarities are represented by dots. Six research areas have been identified.

In the **field of natural sciences** Four main research areas emerged as fields of high visibility as several SEA-EU partners share similarities (Figure 7): earth & environmental sciences (marine ecology, geosciences, oceanography), biology (molecular biology e.g. genetics, cell biology, diversity, evolution), physics & mathematics (quantum physics, particle physics, statistics, chemometrics, geophysics...) and chemistry (electro-chemistry, physical chemistry, organic chemistry...).



**Figure 7.** SEA-EU Universities that can potentially develop synergies in the field of natural sciences. In this research field, the SEA-EU partners which share similarities are represented by dots. Four research areas have been identified.

In the **field of social sciences**, five research areas emerged as fields of high visibility as several SEA-EU partners share similarities (Figure 8): sustainable development (industry 4.0, sustainable tourism, smart cities, circularity...), social & economic geography (migration, local well-being and local economy), economic & business (tourism development, industry, entrepreneurship, circular economy...), education & learning (education at different levels, ICTs, learning...) and law & public policies (local and European policies e.g. sustainability, legal regulations...).



**Figure 8.** SEA-EU Universities that can potentially develop synergies in the field of social sciences. In this research field, the SEA-EU partners which share similarities are represented by dots. Five research areas have been identified.

23 research areas across various disciplines for which potential synergies can be developed have been identified as topics within the alliance. Out of these 23 research areas, 20 are shared by four or more partner universities: **agriculture, forestry & fisheries, agricultural biotechnologies, power & electrical systems, environmental monitoring, digital tech., culture, history & archaeology, cancer, guidelines & ethics, well-being & systemic diseases, therapies & drugs, mental health, earth & related env. sciences, biology, physics & mathematics, chemistry, sustainable development, social & economic geography, economy & business, education & learning and law & public policies.** Matched with societal challenges, these topics represent a reliable starting point to build a common research agenda.

Although it does not appear as a strength within the report of research forces, it is worth noting that UCA, UBO, CAU, UG, and UM all produced patents in water treatments (Patent landscape report, reSEArch-EU) which is a goal in itself within the SDGs (SDG 6). Similarly, the document indicates that all initial partners (except UNIST) actively produce patents in the fields of medical preparation (active ingredients, antigen/antibodies, chemotherapy drugs). These two examples highlight the importance to fully exploit the research results in our alliance, especially in domains which support innovation.

## Matching research strengths of the SEA-EU alliance with societal challenges

Undeniably, climate change and environmental-related challenges are key areas for SEA-EU. As previously stated, a third of Horizon Europe’s budget is directed towards tackling climate change. Within the 2023-2024 programme, over 42% of the budget (€5.67 billion) will be dedicated to climate actions. Similarly, €4.5 billion (out of the 13.5 billion budgets for the 2023-2024 programme) will help support the Digital Transition ([https://ec.europa.eu/commission/presscorner/detail/en/IP\\_22\\_7404](https://ec.europa.eu/commission/presscorner/detail/en/IP_22_7404)). Both the green and digital transitions are visible within the 20 research areas with the highest potential for synergies identified at the scale of the alliance and may therefore be prioritized in the long-term research agenda. Several examples, listed in Table 1, may help in decision making.

For example, SEA-EU’s research strengths could align with the EC’s priority “Europe fit for the digital age” as **digital sciences** cover various topics (data management, security, medicine, education, environmental monitoring, energy, industry...) and are widespread across the alliance. Seven partners from SEA-EU share research forces in this area (Table 1). In the context of the SDGs, digital technologies are relevant for all the goals as it can fasten the progress made for any of them. As a priority of the EC,



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017464

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the digital transition is largely represented within Horizon Europe. For example, during the first programming period of Horizon Europe (2021-2022), 54 calls for proposal (grants and tenders) which contained the term “modelling” were made. At the time of the writing, 31 new ones are already open for submission or forthcoming on this topic (see [here](#)). Although digital sciences can be seen as a transversal topic across the different pillars of Horizon Europe, it is well integrated to the 2<sup>nd</sup> pillar within cluster 4 “Digital, Industry & Space”.

In the area of **power & electrical systems**, five partners of the alliance share research strength. This research area is highly relevant for SDG 7 – “Affordable & clean energy” and for others (e.g. SDG13 – “climate actions”). Within pillar 2 of Horizon Europe (2021-2027), topics such as energy supply, energy systems & grids or energy storage are represented as areas of intervention to prioritize in cluster 5 “Climate, energy & mobility”. It is also worth noting that the research area can also fall within the scope of three of the five Missions: adaptation to climate change, healthy oceans, seas & inland waters and climate neutral & smart cities. During the first programming period of Horizon Europe (2021-2022), there were 152 calls for proposals which included the term “energy” (see [here](#)). To this date and during the current programming period (2023-2024) 158 calls are already open for submission or forthcoming on this topic. SEA-EU researchers have the potential to create synergies on this topic as for the previous example.

**Table 1.** Matching some of the research strengths of the SEA-EU alliance with societal challenges using SDGs and Horizon Europe. Links are available to access the number of calls (grants and tenders) for the topics described in the column ‘number of calls’. The portal of “funding and tender opportunities” was visited on the 23/03/2023 and the number of calls strictly reflect the figures available at this specific date.

Research area	SEA-EU	Main SDGs	Horizon Europe		
			Number of calls	Integration to pillar 2	Five Missions
<b>Digital sciences</b>	7 partners	All SDGs	<a href="#">Modelling</a> 54 calls 2021-2022 period 31 calls open or forthcoming	Cluster 4 « digital, industry & space » Cluster 3 « civil security for society »	Transversal area for all 5 missions
<b>Power &amp; elect. systems</b>	5 partners	SDG 7 – Affordable & clean energy	<a href="#">Energy</a> 152 calls 2021-2022 period 158 calls open or forthcoming	Cluster 5 « Climate, energy & mobility »	Adaptation to climate change Healthy oceans, seas & inland waters Climate neutral & smart cities
<b>Agricultural biotechnologies</b>	6 partners	SDG 9 – Industry, innov. & infra. SDG 14 – Life below water SDG 15 – Life on land	<a href="#">Biotechnologies</a> 61 calls 2021-2022 period 29 calls open or forthcoming	Cluster 6 « Food, Bioeconomy, Natural Resources, Agriculture & Env. »	Healthy oceans, seas & inland waters Soil health & food
<b>Environmental monitoring</b>	8 partners	SDG 13 – Climate actions SDG 14 – Life below water SDG 15 – Life on land	<a href="#">Earth observation</a> 139 calls 2021-2022 period 14 calls open or forthcoming	Cluster 5 « Climate, energy & mobility »	Adaptation to climate change Healthy oceans, seas & inland waters Soil health & food
<b>Culture</b>	5 partners	All SDGs	<a href="#">Culture</a> 24 calls 2021-2022 period 12 calls open or forthcoming	Cluster 2 « Culture, creativity & inclusive society »	Transversal area for all 5 missions
<b>Cancer</b>	All 9 partners	SDG 3 – Good health & well-being	<a href="#">Cancer</a> 16 calls 2021-2022 period 6 calls open or forthcoming	Cluster 1 « Health »	Mission Cancer
<b>Education &amp; learning</b>	6 partners	SDG 4 – Quality education	<a href="#">Education</a> 88 calls 2021-2022 period 34 calls open or forthcoming	Transversal area for all pillars	Transversal area for all 5 missions

These two examples, alongside with the others from Table 1, indicate that the task force need to refine their approach at an individual-based level when matching research forces and societal challenges.

Societal challenges are complex, and therefore require a transdisciplinary approach. Together with the main objectives of reSEArch-EU, (digitalisation, open sciences, co-creation, innovation, sustainability), inter/transdisciplinarity should be integrated as cross-cutting area within the common Research Agenda.

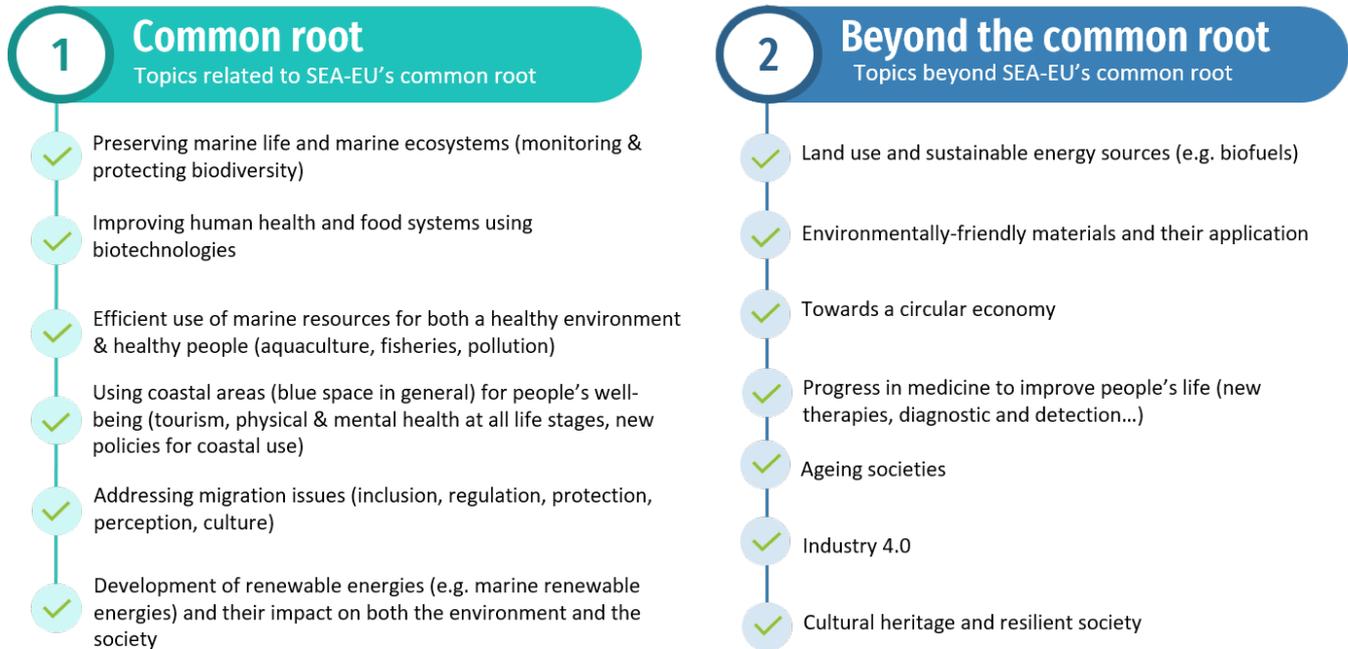
To help the decision-makers when prioritizing focus areas within the common Research Agenda, Table 2 summarizes key information on the 2<sup>nd</sup> pillar of Horizon Europe. Specifically, the table describes the six clusters, the focus areas of the 2023-2024 programming period called “Destination” in the table, and the provisional budget for 2023 and 2024. The full areas of intervention for the duration of the programme (2021-2027) and the specific Missions they are related to are described in the Annexe.

**Table 2.** Description of the six clusters in the 2<sup>nd</sup> pillar of Horizon Europe during the 2023-2024 programming period. Focus areas (i.e. destination) and provisional budgets are provided for the two years.

	Destination 2023 - 2024	€ 2023	€ 2024
<b>Cluster 1</b> Health	<b>Staying</b> healthy in a rapidly changing society <b>Living &amp; working</b> in a health-promoting environment <b>Tackling</b> diseases & reducing disease burden <b>Partnership</b> in health (e.g. rare diseases) <b>Ensuring</b> access to innovative, sustainable & high-quality health care <b>Unlocking</b> the full potential of new tools, tech. & digital solutions for a healthy society <b>Maintaining</b> an innovative, sustainable & globally competitive health industry	€1010,45M	€521,20M
<b>Cluster 2</b> Culture, creativity & inclusive society	<b>Innovative</b> research on democracy & governance <b>Innovative</b> research on European cultural heritage & cultural & creative industries - building our future from the past <b>Innovative</b> research on social & economic transformations	€284,88M	€260,15M
<b>Cluster 3</b> Civil security for society	<b>Better</b> protect the EU and its citizens against Crime and Terrorism <b>Effective</b> management of EU external borders <b>Resilient</b> infrastructure <b>Increased</b> Cybersecurity <b>Disaster-resilient</b> society for Europe <b>Strengthened</b> security research & innovation	€171,40M	€161,49M
<b>Cluster 4</b> Digital, Industry and Space	<b>Climate</b> neutral, circular & digitised production <b>Increased</b> autonomy in key strategic value chains for resilient industry <b>World-leading</b> data & computing technologies <b>Digital &amp; emerging</b> technologies for competitiveness & fit for the green deal <b>Open</b> strategic autonomy in developing, deploying and using global space-based infrastructures, services, applications & data <b>A human</b> centered and ethical development of digital and industrial technologies	€1677,02M	€1118,00M
<b>Cluster 5</b> Climate, Energy & Mobility	<b>Climate</b> sciences & responses for the transformation towards climate neutrality <b>Cross-sectoral</b> solutions for the climate transition <b>Sustainable</b> , secure & competitive energy supply <b>Efficient</b> , sustainable & inclusive energy use <b>Clean &amp; competitive</b> solutions for all transport modes <b>Safe</b> , resilient transport & smart mobility services for passengers and goods	€1648,47M	€1114,88M
<b>Cluster 6</b> Food, Bioeconomy, Natural Resources, Agriculture and Environment	<b>Biodiversity &amp; ecosystem</b> services <b>Fair</b> , healthy & environment-friendly food system for primary prod. to consumption <b>Circular</b> economy & bioeconomy sectors <b>Clean</b> environment and zero pollution <b>Land</b> , ocean & water for climate actions <b>Resilient</b> , inclusive, healthy & green rural, coastal & urban communities <b>Innovative</b> governance, env. observations & digital solutions in support of the green deal	€1056,39M	€903,90M

Although a large portion of the digest targets the 2<sup>nd</sup> pillar of Horizon Europe, researchers should keep in mind that “white-calls” are also available within Horizon Europe, especially within the 1<sup>st</sup> pillar. For example, in 2023, the indicative budget for the European Research Council (Pillar 1) is €2.17 Billion while €889.10 Million are to be directed towards the Marie Skłodowska-Curie Actions.

As previously indicated, the alliance has the ability to tackle environmental-related challenges. Among the general topics that SEA-EU may address, one can also identify subjects related to the SEA-EU’s common root (embedded in coastal ecosystems). In this domain, the alliance has the potential to target several topics (Figure 9). In addition to these specific topics, the alliance also has the capacity to address challenges through topics beyond SEA-EU’s common root (Figure 9).



**Figure 9.** Lists of potential focus areas to explore within the long-term research agenda based on: the state of the art of research forces within SEA-EU, the societal challenges and the 2021-2027 Horizon Europe programme.

The topics listed above are examples of some of the research areas that the alliance may pursue in the common long-term research agenda. As digital sciences applications take various forms in the alliance and appears as a strong area where potential synergies could be developed, the discipline may be integrated as a transversal area. Similarly, education and learning may appear as a transversal area.

Economic valorisation of research results should not be disregarded as it is part of the goals of the alliance when building a long-term research agenda. Patents, spinoffs (company creation), job creations, incubators or technology platforms are opportunities to increase research groups’ financial independence and thereof generate positive economic impacts for the SEA-EU ecosystem.

Given the topics listed above and the information within tables 1 and 2, decision-makers may select few themes to prioritize within the common long-term research agenda. This task falls within the activities of the WP6 Task Force. When building the future research agenda, members should consider that potential research synergies across partners are primarily oriented towards societal challenges the Missions “Healthy oceans, seas, coastal and inland waters 2030” and “Adaptation to climate change including societal changes” in Horizon Europe. Nevertheless, the three other missions (“Cancer”, “Climate-neutral and smart cities”, “Soil health & food”) as well as all the clusters within pillar 2 should not be neglected as they are relevant to the SEA-EU alliance.



## Conclusion

Through an objective oriented approach, the digest lists some of the promising research topics on which SEA-EU researchers can developed stronger synergies as a kick-off in building long-term collaborations. Both research themes related to the SEA-EU's common root (*i.e.* set in costal ecosystem) and more general topics can be addressed using an interdisciplinary, multi-stakeholders and trans-cultural approach. To facilitate the Task Force members' activities, a survey (bottom-up approach) investigating the position of researchers on the key issues will be distributed to principal investigators of SEA-EU's research units. This survey will also help bringing together researchers and research teams that share common interests within the alliance. The digest together with the survey aims at guiding the Task Force in prioritizing the most meaningful topics within the common strategic research agenda.

## Annex. Complementary information on Horizon Europe’s 2<sup>nd</sup> pillar

**Table 3.** Areas of intervention and Missions related to the different clusters in Horizon Europe’s 2<sup>nd</sup> pillar for the 2021-2027 programming period.

	Areas of intervention 2021 – 2027	Five Missions
<b>Cluster 1</b> Health	<b>Health</b> throughout the life course <b>Env. &amp; social health determinants</b> <b>Non-communicable &amp; rare diseases</b> <b>Infectious</b> diseases including poverty-related & neglected diseases <b>Tools, tech. and digital solutions</b> for health & care including personalised medicine <b>Health care systems</b>	<b>Mission cancer</b>
<b>Cluster 2</b> Culture, creativity & inclusive society	<b>Democracy</b> <b>Cultural heritage</b> <b>Social &amp; economic transformations</b>	-
<b>Cluster 3</b> Civil security for society	<b>Disaster-resilient societies</b> <b>Protection &amp; security</b> <b>Cybersecurity</b>	-
<b>Cluster 4</b> Digital, Industry and Space	<b>Key digital technologies</b> including quantum technologies <b>Emerging enabling technologies</b> <b>Advanced computing &amp; Big Data</b> <b>Manufacturing technologies</b> <b>Advanced materials</b> <b>Next generation internet</b> <b>Circular industries</b> <b>Low carbon &amp; clean industries</b> <b>Space</b> including earth observation	-
<b>Cluster 5</b> Climate, Energy & Mobility	<b>Buildings</b> and industrial facilities in energy transition communities & cities <b>Industrial</b> competitiveness in transport <b>Clean, safe &amp; accessible transport &amp; mobility</b> <b>Climate science &amp; solutions</b> <b>Energy supply</b> <b>Energy systems &amp; grids</b> <b>Smart mobility</b> <b>Energy storage</b>	<b>Adaptation</b> to climate change <b>Climate-neutral &amp; smart cities</b>
<b>Cluster 6</b> Food, Bioeconomy, Natural Resources, Agriculture and Environment	<b>Environmental</b> observation <b>Biodiversity &amp; natural resources</b> <b>Agriculture, forestry &amp; rural areas</b> <b>Seas, oceans &amp; inland waters</b> <b>Food systems</b> <b>Bio-based</b> innovation systems in the EU's bioeconomy <b>Circular systems</b>	<b>Adaptation</b> to climate change <b>Healthy oceans, seas &amp; inland waters</b> <b>Soil health &amp; food</b>