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MINISTRY OF DEVELOPMENT AND INVESTMENTS
GENERAL SECRETARIAT FOR PUBLIC INVESTMENTS-NSRF
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«EUSAIR FACILITY POINT
(European Strategy for the Adriatic-Ionian Region)**»**

CONTRACT:

Technical support for the development of a roadmap for improving the capacity and effectiveness of selected stakeholders and beneficiaries and the identification of actions for strengthening their capacities

Thematic Paper

Strengthening of innovation related capacities:

Multilevel use of marine space with investigation into the compatibility of activities in the conduct of sustainable Blue Growth: RES – fisheries/fish farming – maritime governance – tourism.

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1 INTRODUCTION

With 68.000 km of coastline in 20 EU Member States, almost half of the total continental population, and over 1000 ports and shipyards, EU marine environments and coastal settlements are fundamental geopolitical components as well as a strategic economic asset. As human populations and economies grow, so do the multiple competing societal needs and interests which rely on marine ecosystems.

A vast range of commercial activities is rapidly developing in the European seas: shipping and cruise industry; fisheries and aquaculture; oil and gas extraction and pipelines; sand and mineral extraction; renewable energy production; electricity and telecommunication cables; coastal and maritime tourism, as well as multiple non-commercial uses such as coastguard and military defence, and environmental uses for the protection of marine ecosystems and biodiversity.

Along with the growth of uses, so grows the demand for ocean space and marine resources. Increasing demand for a scarce good calls for new and innovative concepts for space allocation and resource exploitation. Ocean space, as a public good of great value, should be used sparingly, in a systematically planned and coordinated way, that includes and accounts for current and future uses and needs. Concentrating uses, by promoting and planning for synergies, co-use and multi-use, allows for keeping ocean space free to the maximum extent possible.

Conserving and sustainably using oceans, seas, and marine resources constitutes one of the key Sustainable Development Goals (SDG - Goal 14) of the United Nations Agenda 2030, as well as a key objective in multiple EU policies and specific strategies (Green Deal, Blue Economy Strategy, Biodiversity Strategy, Farm to Fork Strategy, Guidelines for Aquaculture, Common Fisheries Policy, etc).

Multi-Use of marine space, as further analysed in this paper, could significantly improve the use of maritime space, help reduce related antropogenic effects on the environment, and thus contribute to achieving a more sustainable use of ocean space and resources.

This thematic paper has been commissioned by the EUSAIR Facility Point, which supports the innovation community in the Adriatic Ionian region. Its overall objectives are to strengthen innovation capacity in the Region, boosting development, cross sectoral cooperation and collaboration, and working towards the creation of value chains for the benefit of the Adriatic-Ionian sea basin.

2 INNOVATION

2.1 Innovation Definitions

The concept of innovation is difficult to define in such a way as to facilitate the identification, measurement, comparison and assessment of 'innovative' initiatives. This is particularly difficult when international co-ordination is required in collecting and comparing innovation in a range of fields in different environments. It is important, therefore, that there is a common understanding of 'innovation' among the EUSAIR partners, which can be applied by each national Innovation Expert.

Perhaps the simplest definition is that "*innovation is the use of **new ideas, products or methods** where they have not been used before*"[1]. However, according to the Community Innovation Survey (CIS), an innovation is defined in greater detail as a new or significantly improved product (good or service) introduced to the market, or the introduction within an enterprise of a new or significantly improved process. Innovation can also be relative to development (*new/endogenous*) or **to transfer in other environments and places**.

The Oslo Manual (4th Edition 2018, guidelines on how to conceptualise and measure business innovation), provides a common framework for identifying and measuring innovation in a more inclusive manner across the economy, in government, in non-profit organisations and in households. Key components of the concept of innovation include **the role of knowledge** as a basis for innovation, novelty and utility, **and value creation or preservation** as the presumed goal of innovation. The requirement for **implementation** differentiates innovation from other concepts such as invention, since an innovation must be implemented, i.e., put into use or made available for others to use.

The general definition of an innovation given by the Oslo Manual is as follows: "*An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).*" The generic term "unit" describes the actor responsible for innovations.

The minimum requirement for an innovation is that the product, process, marketing method or organisational method must be new (or significantly improved) to the firm or entity. This includes products, processes and methods that entities are the first to develop **as well as those that have been adopted from other firms or organisations.**

2.2 Typology of Innovation

The Oslo Manual for measuring innovation defines four types of innovation:

Product innovation:

A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics.

Process innovation:

A new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.

Marketing innovation:

A new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

Organisational innovation:

A new organisational method in business practices, workplace organisation or external relations.

Other types of innovation include:

A distinction can be made between Radical and Incremental innovation, where Radical innovations are new products, services or processes and involve significant change and innovation, and accordingly, have a greater immediate impact. Examples would include innovative fishing gear, unmanned ships, offshore ports. On the other hand, **Incremental innovations are the optimization and further development of existing processes, services or products** – which are more relevant to the current Paper.

2.3 Innovation Development Mechanism

Innovation process involves a series of sequential changes, linked causatively, constituting stages of development of innovation. In other words, an innovation process is a sequence of events necessary for introducing an innovation. It can be stimulated by two factors: (a) the strategic approach in its identification and in the way that it constitutes the design and implementation framework, and (b) the adoption of the quadruple(quintuple)-helix contribution to its development and validation (establishment and contribution of the innovation ecosystem).

2.3.1 Strategic approach

A strategic theme is a major "pillar" of every strategy that directly supports achievement of the vision and of the strategic objectives. Such a theme contains a linked set of specific objectives, and interventions, that touch on all four of the balanced scorecard perspectives:

a. Financial (or Stewardship): views financial performance and the use of financial resources
b. Customer/Stakeholder: views organizational performance from the perspective of the client or key stakeholders
c. Internal Process: views the quality and efficiency of performance related to the product, services, or other key processes
d. Organizational Capacity (or Learning & Growth): views human capital, infrastructure, technology, culture, and other capacities that are key to breakthrough performance

These linked objectives reveal how innovation contributes to the Vision and to the Strategic Objectives achievement, and forms the basis for communicating this cause-effect relation in a

consistent manner. Innovation becomes strategic when it is fully integrated into the fabric of the strategy design as well as of the planning and management process.

The scope of the current project is related to the above approach, seeking to explore the way innovation can be embedded in the EUSAIR Strategy Pillars linked to blue economy.

2.3.2 Quadruple (*Quintuple*)-Helix Contribution

The quadruple and quintuple innovation helix framework describes **university-industry-government-public-environment** interactions within a knowledge economy. In innovation helix framework theory, first developed by Henry Etzkowitz and Loet Leydesdorff[23] and used in innovation economics and theories of knowledge, such as the knowledge society and the knowledge economy, each sector is represented by a circle (helix), with overlapping showing interactions. The quadruple and quintuple innovation helix framework was co-developed by Elias G. Carayannis and David F.J. Campbell, with the quadruple helix being described in 2009[45] and the quintuple helix in 2010[7].

The quadruple and quintuple helix framework can be described in terms of the models of knowledge that it extends and by five subsystems (helices) that it incorporates; in a quintuple helix-driven model, knowledge and know-how are created and transformed, and circulate as inputs and outputs in a way that affects the natural environment. Socio-ecological interactions via the quadruple and quintuple helices can be utilized to define opportunities for the knowledge society and knowledge economy, such as innovation to address sustainable development, including climate change.

The quadruple helix has been applied to European Union-sponsored projects and policies, including the EU-MACS (EUropean MArket for Climate Services) project[6], a follow-up project of the European Research and Innovation Roadmap for Climate Services, and the European Commission's Open Innovation 2.0 (OI2) policy for a digital single market that supports open innovation[7].

The co-design process of the EUSAIR Strategy and in many of its initiatives reflects the above participation, mainly through the establishment and operation of formal and informal networks, learning platforms and partnerships.

2.4 Blue Growth to Blue Economy

2.4.1 European Commission Policies

In 2011 the European Commission adopted a Communication on Blue Growth[8] showing how Europe's coasts, seas and oceans have the potential to be a major source of new jobs and growth that can contribute to the Europe 2020 strategy, and improve the way we harvest the planet's resources.

In 2014 the EC outlined its approach to realising the potential of ocean energy, in May of that year issuing its Communication on 'Innovation in the Blue Economy: realizing the potential of our seas and oceans for jobs and growth'[9]. According to this document, **innovation across all sectors of the blue economy** is crucial for realising its growth and jobs potential. Innovation can bring about significant environmental benefits through "eco-innovations". Innovation can also help to develop cost-effective marine protection measures that can contribute to the implementation of the Marine Strategy Framework Directive (MSFD).

Although a number of initiatives support the development of innovation[10], a number of barriers are also identified. The main obstacles to innovation in the blue growth area are: gaps in knowledge and data about the state of oceans, seabed resources, marine life and risks to habitats and ecosystems; diffuse research efforts in marine and maritime science that hinders inter-disciplinary learning and slows the progress of technological breakthroughs in key technologies and innovative business

sectors; lack of scientists, engineers and skilled workers able to apply new technologies in the marine environment.

Since then, the European Commission has issued 'a new approach for a sustainable blue economy in the EU - Transforming the EU's Blue Economy for a Sustainable Future'[11], marking the transition from Blue Growth to a sustainable Blue Economy:

"*The current European Green Deal calls for a transformation of the economy into a modern, resource-efficient and competitive one where net emissions of greenhouse gases are phased out and the EU's natural capital is protected. The Recovery Plan for Europe aims to boost the green and digital transitions and make Europe's economy fairer, more resilient and more sustainable for future generations. The EU's Blue Economy can help achieve this dual challenge: if put on a more sustainable path, it will become a font of action and ideas creating innovation, spurring fast and lasting recovery and protecting our planet.*"

The communication proposes a paradigm shift from 'blue growth' to a 'sustainable blue economy', on the basis that the division between environmental protection and economy is no longer meaningful. Economic activities at sea and in coastal areas should reduce their impacts on the marine environment and value chains should transform themselves, and contribute to climate neutrality, zero pollution, circular economy and waste prevention, marine biodiversity, coastal resilience and responsible food systems.

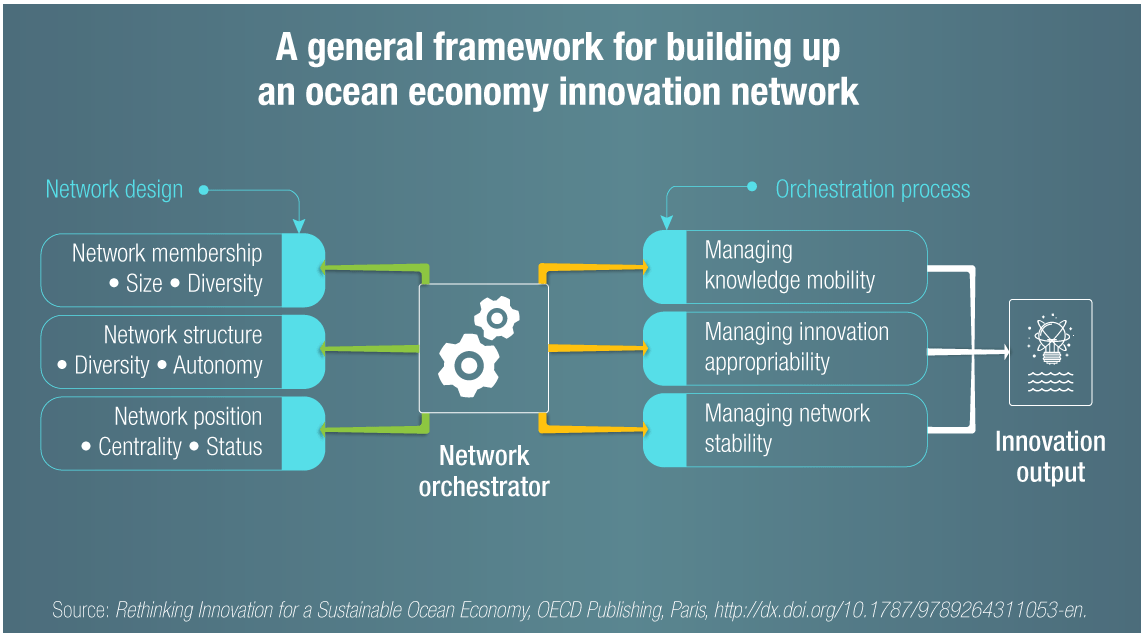
The important **role of innovation** envisaged in the Blue Economy is clear throughout the communication. The role of marine and maritime research and innovation, and innovative technologies as such, is crucial, with the Commission intending to set up a pan-European innovation ecosystem for a sustainable Blue Economy.

2.4.2 OECD-Rethinking Innovation for a Sustainable Ocean Economy

The report on the ocean economy emphasises the growing importance of science and technologies in improving the sustainable economic development of seas and ocean. Marine ecosystems sit at the heart of many of the world's global challenges: food, medicines, new sources of clean energy, climate regulation, job creation and inclusive growth. But there is need to safeguard and improve the health of marine ecosystems to support the ever-growing use of marine resources.

Innovation in science and technology can play a key role in reconciling these two objectives. Three priority areas for action can be identified, based on a number of in-depth case studies:

1. approaches that produce win-win outcomes for ocean business and the ocean environment across a range of marine and maritime applications;
2. the creation of ocean-economy innovation networks; and
3. new pioneering initiatives to improve measurement of the ocean economy.



2.4.3 Smart Specialisation Strategies and Sustainable Blue Economy

According to the EC's Smart Specialisation Platform[12], "*Smart Specialisation is a place-based approach characterised by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement. It is outward-looking and embraces a broad view of innovation including but certainly not limited to technology-driven approaches, supported by effective monitoring mechanisms*."

Smart Specialisation activities support policymakers, regional and national authorities and other stakeholders involved in research and innovation, to bridge blue growth investment platforms and regional innovation initiatives. The Blue Economy represents a niche of innovation possibilities for many regions across the EU, and in fact, one out of five EU regions are specialising in at least one domain related to the blue economy, such as green shipping and water transport including highways of the seas; blue renewable energy; marine biotechnology.

DG MARE has identified Smart Specialisation Strategies (S3) as a key tool for the implementation of the EC Communication on Sustainable Blue Economy (adopted in May 2021)[13]. In coordination with DG REGIO, DG MARE launched the **smart specialisation platform for sustainable blue economy** and a number of brokerage events were held in 2022, to promote smart specialisation interregional partnerships and blue economy value chains. The events focused on the:

- facilitation of blue economy stakeholders' networking and exchange
- promotion of the definition of stakeholders' complementarities and synergies in terms of interregional value chains/partnerships
- support of the exchange of potential partnership ideas and expression of interest
- sharing of best practices and lessons learned on S3 interregional partnerships set up and implementation.

2.5 Innovation in EUSAIR Strategy

Innovation is a key for EUSAIR and is encompassed in one of EUSAIR's Pillar 1 flagships (see below, and Annex 6.1). The theme has been explored, with the support of EUSAIR platforms and networks, and focuses on the following topics:

1. Key role of Smart Specialisation in the future EU programming period;
2. The importance of innovation ecosystems for socio-economic development;
3. How to reinforce innovation capacities and innovation ecosystems in the "widening areas";
4. The role of the networks as system integrators;
5. Funding synergies and governance of the EUSAIR Macro-region;
6. Concrete interregional cooperation initiatives and pilot projects;
7. Possible strategic priorities to focus macro-regional R&I investments;
8. How to involve the industry and SMEs in the implementation of Macro-regional Strategies;
9. How to stimulate interregional innovation investments; and
10. The role of the EU financial instruments to enhance R&I in the EUSAIR Macro-region.

2.5.1 EUSAIR Innovators-Innovation Integrators

According to the European Innovation Scoreboard[14], the EUSAIR MS countries are primarily Moderate Innovators (Slovenia, Italy, Greece), while Croatia is an Emerging Innovator. The EUSAIR Western Balkan countries are also Emerging Innovators, as can be seen in the tables below.

Figure 3: Performance of EU Member States' innovation systems

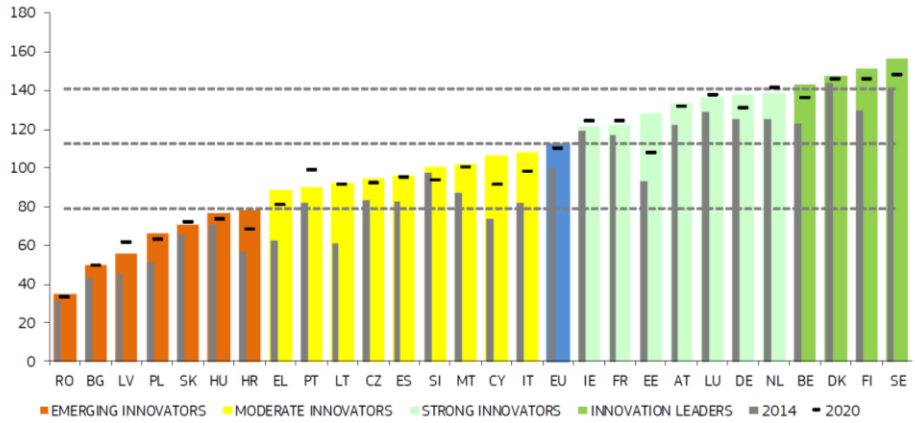
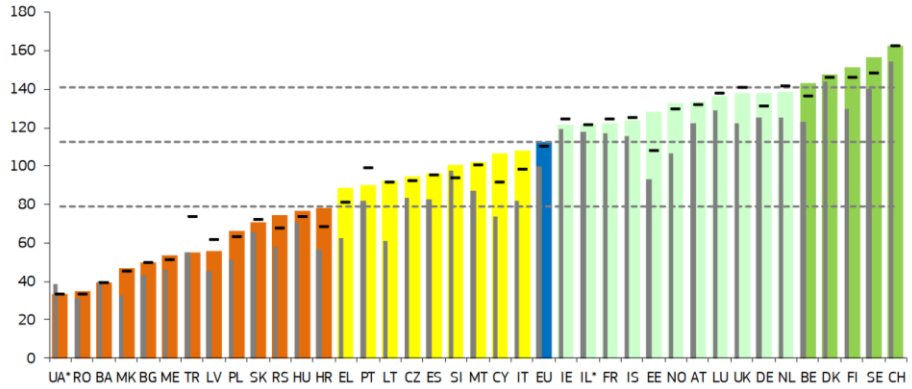


Figure 12: Performance of European and neighbouring countries' systems of innovation



Source: European Innovation Scoreboard 2021

2.5.2 Correlation to RIS Strategies- MRS3 AIR

Macro-Regional Smart Specialisation Strategy of Adriatic-Ionian Region (MRS3 AIR) was a pilot document that envisioned to set a framework for supporting and strengthening innovation system of the Adriatic-Ionian region and to design a project of a broader scope for the establishment of the Open Innovation System of the Adriatic-Ionian region (OIS-AIR).

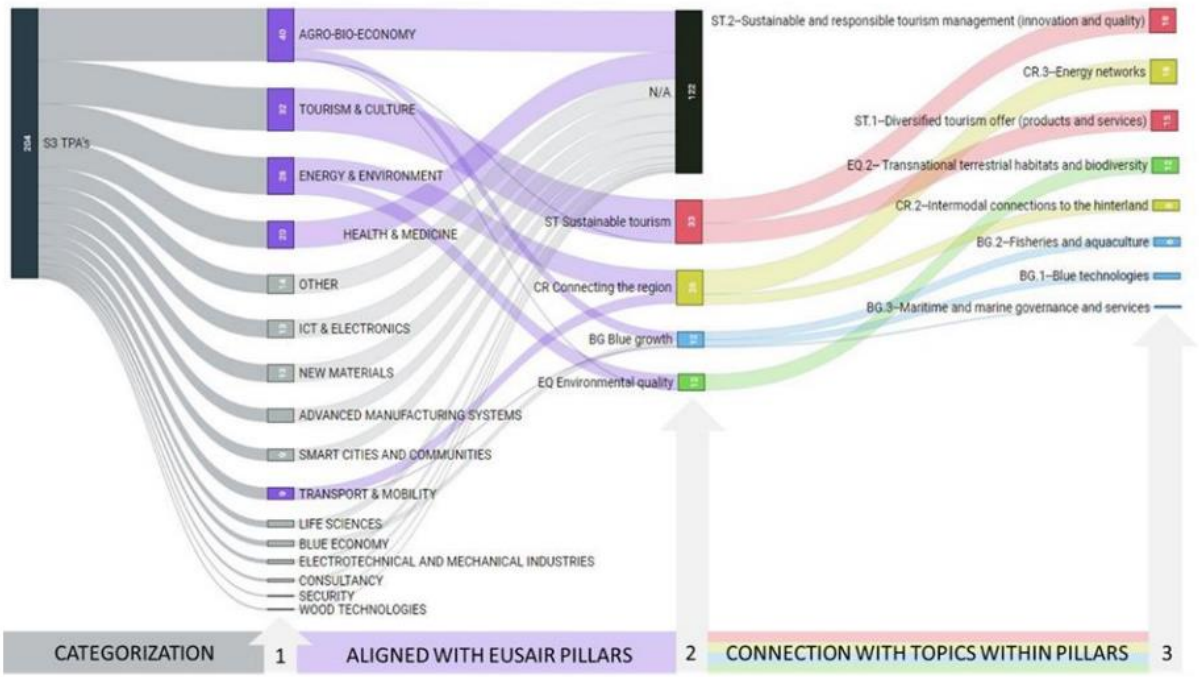
The framework of MRS3 AIR was defined by resources of partner countries and regions, outlined in their Smart Specialisation Strategies (S3) and by challenges that were recognised in EU Strategy for the Adriatic and Ionian Region (EUSAIR). By focusing on several thematic priority areas, mapping potential partners within given fields and exploring opportunities for complementarities and common R&D specialisations, this document endeavoured to set R&D directions for the Adriatic-Ionian macro-region (AIR).

The strategy framework was focused to five thematic priority areas that have emerged as strategic areas based on S3 documents' analysis and on the analysis of data available to the OIS-AIR project team. These thematic priority areas were identified as most common and most present in S3 documents and were, furthermore, interrelated with EUSAIR's pillars and identified challenges. These five proposed Macro-Regional Thematic Priority Areas (MRTPA), along with associated Macro-Regional Sub-Thematic Priority Areas (MRSTPA) were:

1. Agro-Bioeconomy – Healthy and functional food (Blue) – emphasis on seafood (including freshwater food)
2. Energy and Environment – Integration of distributed energy resources (DER)
3. Transport and Mobility – Green coastal & maritime mobility
4. Tourism and Culture – Smart and creative upgrade of cultural tourism
5. Health and Medicine – Sustainable new healthcare models.

In order to support reaching the triple objectives of smart, inclusive and sustainable growth in the Adriatic-Ionian region, the above-mentioned strategy aimed to explore the possibility of applying a mission-oriented approach to the identified MRSTPAs. Missions might come in a different shapes and sizes, and in some cases represent simply a trigger for action, still they could provide a massive opportunity to increase the impact of European research and innovation activities, to capture the public imagination and to make a real push in addressing complex challenges. Proposed MRTPAs for MRS3 AIR were based on several factors and it is the frequency of those factors as a R&D resource as well as the ability of those factors to tackle regional challenges of EUSAIR that were considered.

These identified "interrelationships" between S3 and EUSAIR, MRTPAs are shown in the Sankey diagram below.



Source: https://www.oisair.net/uploads/pages/05-21-2019-04-33-37-3239058649.pdf

2.5.3 Innovation and EUSAIR Pillar I Flagships 2021-2027

The EUSAIR Strategy encompasses four thematic areas/pillars representing key challenges as well as key opportunities in the region. For each pillar, specific topics and actions have been identified, taking into account the needs, urgency of the issue and the added value of joint actions taken in order to solve the existing challenges or build upon the future opportunities.

Thus, Pillar I Flagships comprise:

- Fostering **quadruple helix** ties in the fields of marine technologies and blue bio-technologies for **advancing innovation**, business development and business adaptation in blue bio-economy.
- Promoting **Sustainability**, Diversification and Competitiveness in the fisheries and aquaculture sectors through education, research & development, administrative, technological and marketing actions, including the promotion of initiatives on marketing standards and healthy nutritional habits.
- Bolstering **capacity building and efficient coordination of planning** and local development activities **for improving marine and maritime governance** and **Blue Growth services**

Innovation stands for a cross-cutting issue in EUSAIR. EUSAIR Action Plan identifies the relevance of Pillar I with regard to cross-cutting issues as follows.

- Research, **innovation** and SMEs: both topics have a strong focus on research and innovation. Actions under these topics may therefore contribute to the development of SMEs in these sectors by transferring the latest R&D results to seafood processing and new products. *Moreover, the first pillar has a strong focus on the mobility of researchers and the establishment of joint R&I platforms.*

- Capacity building, including communication: actions under the second topic require strengthening capacity in relation to management, surveillance, monitoring, and skills. Actions under the third topic will strengthen the administrative and institutional capacities of the public sector and contribute to EU integration. Sharing of best practices and cooperation between countries will be fostered, with a focus on planning the coordinated actions necessary for better maritime and marine governance and services. Actions under Pillar 1 have therefore the potential to contribute to the strategic decision-making related to Blue Growth. On the other hand, communication is central for involving stakeholders and initiating awareness-raising processes.

2.6 Innovation in Fisheries & Aquaculture

Fisheries and aquaculture are sectors with special weight in EUSAIR Pillar 1. As seafood consumption grows, sustainable production is of crucial importance for the transition to a sustainable Blue Economy, and is a primary objective for related EU policies. Innovation in these fields plays a key role in enhancing sustainability, and reducing the environmental impact of both activities.

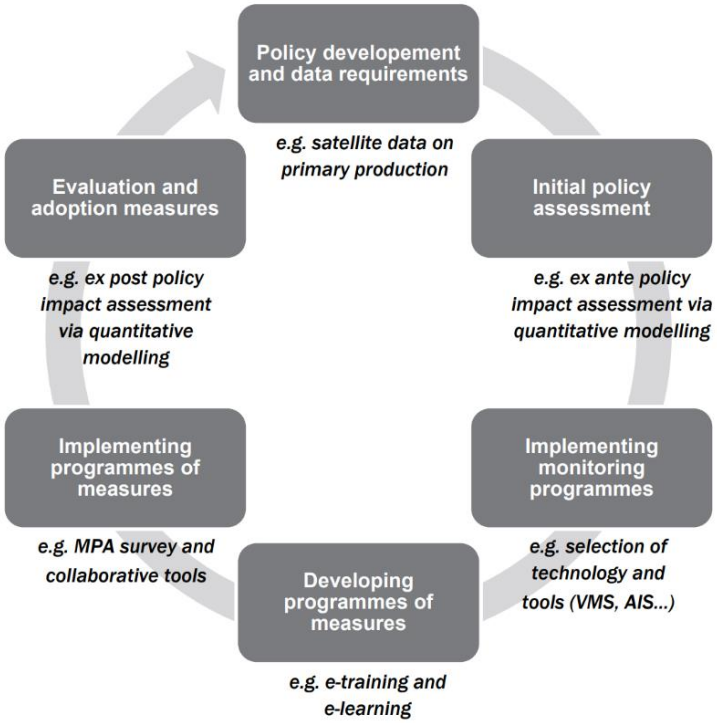
2.6.1 Fisheries

Innovation in fisheries is mainly focused on fishing gear and equipment. With sustainability being a primary policy goal, innovation is yielding multiple solutions in terms of stock preservation, protection of marine species, and energy consumption.

Technological innovation is prominent in the field. It primarily involves gear selectivity to target specific species, avoid unwanted catches and eliminate discards, in compliance with limitations imposed. Other technologies, are also been applied, such as in the FIS032 'Real-time reporting app to avoid unwanted catches' project[15] where live data and information is shared between fishers to notify of areas that should be avoided due to the presence of certain species. Technological innovation is also important in the development of methods and equipment to prevent vessel strikes and avert marine animals form the fishing gear (eg cetacean monitoring apps, acoustic devices, escape devices on nets), so as to both protect endangered species and avoid gear damages which bear a significant gear replacement cost.

Innovation featuring existing technologies from different fields and adaptation to fisheries mainly involves engine technologies in order to reduce energy consumption and cost, and related CO2 emissions. Solar power and energy storage technologies are being tried in the fisheries sector in the attempt to achieve better energy efficiency levels and minimize the environmental impact of the fleets.

Technological innovation has also played a crucial role in improving monitoring, control and surveillance. Both collaborative (VMS, AIS) and non-collaborative tools (optical or radar satellites), as well as data processing technologies (big data, block chain, smart weighing at sea, Radio-Frequency Identification (RFID), smartphones for monitoring, artificial intelligence, drones, and on-board cameras) are significantly assisting the authorities in proper stock management, Marine Protected Areas (MPA) implementation and fighting Illegal, Unreported and Unregulated fishing. Innovative monitoring technologies used at the different policy stages, enhance the design, implementation and evaluation of fisheries policy instruments[16].



Use of monitoring technologies at various policy stages, Source: Girard & Du Payrat (2017)

Following on from the typology of innovation mentioned above, other types of innovation also exist to a lower degree:

- Process innovations, referring to the development of new low impact fishing techniques promoting environmental sustainability
- Network innovations, associated to local fishing communities,
- Marketing innovations in promotion of the products of local fisheries
- Management innovations in the case of MPAs, involving relevant stakeholders (national and local authorities, fishers etc)

2.6.2 Aquaculture

The increasing demand for fish over the past decades as a result of the human population increase[17], combined with the reduction of available wild fish catch worldwide, has resulted in an increasing demand for, and production of aquaculture fish.

Moving towards a more intensified aquaculture, that at the same time needs to be both green and profitable, innovation across different phases of production proves to be of significant importance in building a more resilient and sustainable sector.

Innovation in the aquaculture sector is highly technological, due to the nature of the businesses, and includes different technologies across different stages of the production process.

The importance of animal health and hygiene in the production process constantly drives innovation in the field, in order to improve product quality and reduce costs, including stock losses from disease. Ranging from veterinary medicines, such as oral vaccines, to feeds and nutrients, such as

insect-meal based fishfeeds[18], and even genetic engineering, bio-technology is a prominent area for innovation in aquaculture.

Water circulation and waste management are also aspects of great interest for innovation, due to their importance in production, from both the environmental and financial perspective. Water circulation systems contribute to a better delivery of nutrients and more efficient waste management, which in turn is crucial for good animal hygiene and health, as well as for minimizing the environmental impact of aquaculture[19]. Different types of sensors are being used to provide valuable data (water temperature, salinity, pH) in order to assist in both better environmental management, as well as better living conditions and better growth rates for the fish. AI technologies have recently started being tested for quality control purposes such as prediction of algae blooms, monitoring of biomass size in pens, etc[20].

Innovations that reduce energy consumption in the production process or combine renewable energy production in the aquaculture facility (solar, wind, wave) are currently of the highest interest, and are also being researched in the framework of multi-level use of marine space, in off-shore platforms that combine energy production with aquaculture installations[21].

Apart from technological, other areas of innovation in the aquaculture sector include product and process innovation, related to cultivation of new marine species, and new cultivation methods for new and old ones. Also of interest is marketing innovation for the end product, as well as food technology innovation for aquaculture product processing businesses.

3 MULTILEVEL USE OF MARITIME SPACE

3.1 Rational

Marine environments and coastal settlements are fundamental components of the European geopolitical context. The EU has 68.000 km of coastline, spanning more than 20 EU Member States and approximately half of the total continental population. With over 1000 ports and shipyards, the maritime sector is a strategic economic asset. In this context, economic growth and related social wellbeing have environmental costs, while being dependent on the health of the coastal ecosystem[22].

As human populations and economies grow, so do the multiple competing societal needs and interests which rely on marine ecosystems. The numerous social, economic, environmental, and cultural values that must be taken into account in planning, inevitably lead to disputes about prioritizing and sharing of – finite and increasingly scarce - marine spaces and resources. This is further complicated by the multidimensional nature of the marine environment, including the sea surface, the air above it, the water column, the seabed, and the subsoil beneath it. Land-sea interactions comprise a range of highly complex interdependencies of fragile ecosystems, valuable natural resources, economic interests, social aspects, and identities at various geographical levels. Handling these interdependencies – also in the interest of future generations – requires policy integration and sound governance[23].

Conserving and sustainably using oceans, seas, and marine resources constitutes one of the key Sustainable Development Goals (SDGs) of the United Nations Agenda 2030. There are three basic concepts underpinning the sustainable development of seas and oceans: economic development, environmental responsibility and social progress.

In the EU marine context, economic development is attributed to the concept of blue growth, defined as 'smart, sustainable and inclusive economic and employment growth from the oceans, seas and coasts'. The Marine Strategy Framework Directive (MSFD), which aims to achieve a Good Environmental Status of the EU's seas and oceans[24], provides the element of environmental responsibility. The social sustainability of maritime spatial development is only partially and indirectly addressed through the EU Marine Spatial Planning (MSP) Directive[25], which encourages the participation of various stakeholders in the MSP process and emphasizes the importance of co-existence.[26]

Governance of different sectors that make use of maritime space (transport, fisheries, tourism, energy, marine environmental protection, marine research, surveillance and policing) has developed on separate tracks.[27] Therefore, various issues that arise are, in general, addressed in a monosectoral manner, leading to inefficiencies, incoherencies and conflicts of use, and ultimately reducing potential for Blue Growth and innovation. MSP presents as a tool that and be used to resolve conflicts between maritime uses by improving decision-making, and thus support a more sustainable use of maritime space.[28]

The many **potential benefits** from the adoption of marine spatial planning include[29]:

- Application of an ecosystems approach to the management of human activities through safeguarding important marine ecological processes and the overall resilience of the marine system
- Provision of a strategic, integrated and forward-looking framework for all uses of the sea which takes into account environmental as well as cultural, social and economic objectives
- Identification, conservation or restoration of important components of coastal and marine ecosystems
- Allocation of space in a rational manner which minimises conflicts of interest and maximises synergies across sectors
- Management of cumulative impacts over space and time
- Provision of greater certainty for marine users.

MULTI USE as a tool for Maritime Spatial Planning

Multi Use of marine space emerged as an option for MSP, that allows for more efficient use of maritime space and resources. A common definition of MU has yet to be agreed upon, however, the definition proposed by *Zaucha et al.(2016)*[30] in the MUSES project has been generally accepted and widely used.

Definition of multi-use, as developed in the MUSES project

In the realm of marine resource utilisation Multi-Use should be understood as **the joint use of resources in close geographic proximity**. This can involve either a single user or multiple users performing multiple uses. It is an umbrella term that covers a multitude of use combinations and represents a radical change from the concept of exclusive resource rights to the inclusive sharing of resources by one or more users.

A **user** is understood as the individual, group or entity that intentionally benefits from a given resource. If a business creates a separate legal entity to exploit an additional resource, this entity is then considered another user.

A **use** is understood as a distinct and intentional activity through which a direct (e.g. profit) or indirect (e.g. nature conservation) benefit is drawn by one or more users. For the purpose of this definition, a clear distinction is made between different types of uses.

A **resource** is understood as a good or service that represents a value to one or more users. Such a resource can be biotic (e.g. fish stocks) or abiotic (e.g. ocean space) and can be exploited through either direct (e.g. fishing) or indirect (e.g. nature conservation) uses.

Kyvelou and Ierapetritis (2019)[31] propose a more elaborate definition of MU, as:

> **a complex, multidimensional and context-specific process of marine management between multiple users**, driven by technological, financial, socio-economic, cultural, environmental and governance related factors — that should be fed by both planning, engineering, governance and management disciplines — so as to achieve an integrated, adaptive, transparent, coordinated, innovative and coherent spatial planning process with limited exclusive rights, in the sea and the oceans.

Although more complex, this definition summarizes the essence of the relevant literature of MU as to both defining terms and incorporating principles for MU development.

Connectivity of users and uses, as analysed by *Schupp et al (2019)*[32]*.,* results in a **typology for MU** based on four dimensions:

The **Spatial** Dimension refers to the three-dimensional sea space. The **Temporal** Dimension refers to the timeframe in which the uses in question take place. The **Provisioning** Dimension encompasses all activities and processes servicing and supporting the main function of a use. A connection of uses in this dimension usually takes the form of sharing of those services or their associated costs in order to reduce the financial burden of operating in a marine environment. The **Functional** Dimension refers to the main function of a use. A connection of uses in this dimension implies a direct linkage of one use function to the other. This can take the form of shared infrastructure, e.g., multi-purpose platforms designed to accommodate different uses and users. Four types of MU are derived from these dimensions: multi-purpose/multi-functional, symbiotic, co-existence/co-location, and subsequent use/repurposing (see table below).

Type	Dimensions				Description
	Spatial	Temporal	Provisioning	Functional	
Type 1: Multi-purpose/multi-functional	✓	✓	✓	✓	Takes place in the same area, at the same time, with shared services and core infrastructure
Type 2: Symbiotic use	✓	✓	✓		Takes place in the same area, at the same time, and peripheral infrastructure or services on sea or land are shared
Type 3: Co-existence/co-location	✓	✓			Takes place in the same place and at the same time
Type 4: Subsequent use/repurposing	✓				Takes place in the same ocean space but subsequently

Source: Schupp et al. (2019)

Depellegrin et al.(2019)[33], propose a typology based on combination of uses. They have identified ten MU combinations in Euro-Mediterranean countries, either as existing or with future development potential, according to the definition of MU Potentialities developed in the MUSES project.[34]

Combinations are grouped in three main sectors: Tourism-driven, Renewable Energy-driven, and Oil&Gas-driven. All combinations are presented in the following table:

MU Potentialities: The degree of opportunity of a sea area to develop or strengthen MU. This includes (1) existing MU - sea areas where present or past MU combinations in form pilot sites take place and (2) potential MU - sea areas where MU combinations were developed on a conceptual or design level.

	MU	ES	FR	IT	SL	HR	GR	MT	CY
Tourism driven	Fishery & Tourism & Env. Protection	●	●	●	●	●	●	●	●
	Aquaculture & Tourism			●	●	●	●	●	●
	UCH & Tourism & Env. Protection	●		●	●		●	●	●
Renewable-Energy driven	FOW & Aquaculture		●						
	FOW & Env. Protection		●						
	Wave & Aquaculture							●	
	RE & Aquaculture*						●		●
	OW & Desalination**						●	●	
O & G driven	O&G & OW			●					
	O&G & Tourism & Aquaculture			●					

Existing (green) and potential (yellow) MU combinations identified in the eight EU countries of the Mediterranean Sea basin.

UCH – Underwater Cultural Heritage
FOW – Floating Offshore Wind
RE – Renewable Energy (Wind/Wave/Solar)
OW – OffshoreWind
O&G – Oil and Gas infrastructure

Source: Depellegrin et al.(2019)

The tourism-driven MU consists of tourism activities combined with other soft-uses of the sea space such as fishery, environmental protection, aquaculture, and Underwater Cultural Heritage (UCH).

The renewable energy-driven MU refers to the combination of offshore renewable energy production (wind, wave and/or solar) with uses such as aquaculture or environmental protection. Oil and Gas (O&G)-driven MU refers to the re-purposing of structures built for the hydrocarbon industry (near-shore or offshore) that become obsolete and require decommissioning.

Overall, the diversity of Multi Use types indicates that MU is a wide concept with multiple possibilities when applied in Maritime Spatial Planning. As relevant literature points out, there is no one single management approach that can accommodate all possible projects, but rather a need for flexibility and transparency in the application of the framework of MSP for each individual MU proposed, in an open and adaptive manner that will not add to bureaucracy and further complicate procedures, focused on minimizing conflicts and achieving high benefits for society. [35] [36]

3.2 Involved stakeholders

There are many stakeholders involved in the multilevel use of maritime space, as there are in addressing the issue of climate change. A brief list of these actors would include the following, along the lines of the quadruple/quintuple helix mentioned elsewhere in this paper:

- **Government authorities**: public authorities at regional and local government levels, but also at national level as regards the development and implementation of trans-national and inter-national initiatives dealing with marine-related activity management.
- **Academic institutes and research bodies** contributing to the body of theoretical knowledge and policy development in the littoral countries.
- **Private enterprises**, including industry but also SMEs (eg large- and small scale fisheries, individual fishers, as well as private sector enterprises active in non-directly related sectors, such as tourism).
- **NGOs and grass-roots organisations** representing the littoral populations, actively protecting marine space, and so on.
- **Other regional initiatives/international projects and transnational working groups** that contribute to the adaptation of policies to specific circumstances, leading to improved coordination of action across all governance levels (eg the Interreg ADRION Programme[37]; the Interreg AdriAdapt platform[38]; the Interreg MED Programme[39]; the Union for the Mediterranean[40]; Plan Bleu, one of the Regional Activity Centres of the Mediterranean Action Plan (MAP) of United Nations Environment Programme (UNEP)[41]; the Center for Mediterranean Integration (CMI)[42], and many more).

3.3 Key challenges and identified needs

There is a need to build strong relationships between scientists studying the use of maritime space and Europe's aquaculture and marine-related industries, which will lead to actionable science and innovation(s) which can be used by policymakers and the marine-related industrial sectors. An overview of the main challenges identified in the literature, includes the following:

- There is a need to strengthen/support **collaborative and cooperative governance,** focused on innovation. Collaboration should be facilitated across all relevant governance levels,

within and beyond the borders of the governable territory - in cooperation with non-government stakeholders.

- Closely linked to the above point, is the fact that when human activities are planned independently, even when their individual impacts on the environment are assessed, their interactions with each other and their **cumulative effects on the environment** may not be examined[43] [44]. The results of this management approach can be inadequate.

- Particularly at local level, **multiple jurisdictions** of regional, national, EU and other legislation and entities **meet and overlap**. At the same time, as each sector functions on its own legal framework, the **lack of dialogue** between public institutions creates further bureaucracy and difficulties in identifying the administrative offices responsible, especially for issuing permits[45]. EU level policy influence is often limited at local level due to the hierarchical distance between the EU and local governments. Due to the subsidiarity principle and national state decision-making, in many cases EU interventions are limited to the dissemination of best practices and action guidance.

- There are a **great number of stakeholders' needs** to be reconciled, when planning multilevel use of marine space. Land-sea interactions cannot be addressed by one policy or one stakeholder and given the complexity of the task it is important to involve all relevant marine and coastal stakeholders directly. Stakeholders seem to be, in principle, agreeable to co-locating activities[46] [47] [48], however, each stakeholder comes with their own bias due to individual knowledge, interests, goals, resources (e.g., financial, political, legal, informational, education), and the capacities to mobilise these resources. Marine and coastal territory governance requires the engagement of all relevant stakeholders and their resources on all levels of governance and beyond – on all levels of socioeconomic structures. For this, appropriate and adaptive capacity should be embedded[49] .

- Planning for the multilevel use of marine space, and the realization of such plans and strategies is of increasing importance and has gained widespread acceptance in many regions globally. However, it remains a **continuously developing** area of research, which still faces **many conceptual and practical challenges**, for example, shortcomings in political and institutional frameworks; stakeholder engagement; encompassing human and social dimensions; balancing economic development and marine ecosystem conservation, and adapting to global environmental change.

  Two crucial issues that also need to be taken into account when planning for MU are the **technical aspects and the management scheme** of the various possible developments. Immature technologies for energy conversion, local storage and mooring pose a great challenge for the design of offshore Renewable Energy MU sites[50]. Effective operational **management** of MU sites is also subject to multiple challenges, ranging from coordinating transport, sharing equipment and organizing an efficient maintenance plan, to defining clear duties and rights in the shared site.[51] Both these issues need to be addressed and carefully designed in order to avoid high costs that would render the projects unviable.

- Offshore installations face a number of logistic difficulties due to restricted accessibility, with consequently raised costs compared to similar near-shore or onshore sites. Research shows that operations, including daily and periodic tasks such as harvesting, and maintenance, are both **cost-intensive** and time consuming, and calculations put the related costs at 5-10 times higher than similar on/near-shore operations[52]. Uncertainty regarding

accidents on such sites poses an additional economic obstacle as to **insurance costs**[53]. Investments in MU might therefore be discouraged and financial instruments should be considered to support and promote such activities.

3.4 SWOT Analysis

The Strengths, Weaknesses, Opportunities and Threats related to the multilevel use of maritime space are presented below.

Strengths:

- Over the past years, there has been an **increasing alignment of multiple policy priorities** between regional, national and local level authorities, including for instance the growth or marine-related sectors, conservation of the marine ecosystem and biodiversity, consideration of issues such as equity and inclusivity.
- High-level policy intent and investment increasingly support a shared understanding of the **need for co-development** and evidence-based planning in the multilevel use of marine space.
- The **interdisciplinary focus** of the approach to multilevel use of marine space, and its increasing acceptance as a framework for conservation and sustainable development are key strengths, generating cross-fertilisation of innovative ideas and initiatives.

Weaknesses[54]**:**

- **Insufficient understanding** about coastal processes and **lack of common internationally adopted vision.**
- Insufficient and inadequate **inclusion of stakeholders**.
- Inappropriate, short-sighted, uncoordinated **sectoral legislation** - creating long term unsustainability and increasing the difficulties caused by the operational complexity of the approach.
- **Bureaucracy** and lack of administrative coordination blocking local, tailored and creative solutions.
- **Lack of resources** for this resource-intensive approach **and political support** for local initiatives and actions.

Opportunities:

- The **use of digital technology and spatial data** to summarize patterns of human use and environmental processes in the land-sea space. By overlaying these data, it is possible to identify potential conflicts within and between marine uses and ecological values. A digital collection of spatial data (marine atlas) would inform decision-making for marine space use and environmental sustainability. Sophisticated digital tools and online platforms enable users to work collaboratively and support unified management, allowing for better planning.
- Given the need for transnational collaboration and wide stakeholder involvement in the development of multilevel planning, **established mechanisms for cooperation** provide a

sound basis for extension into the preparation and implementation of maritime spatial plans. Sustainable and efficient multi-use of maritime space and natural resources has already been explored in Europe, on the project level, via numerous EU-supported projects and initiatives.

Threats:

- The inability to achieve **institutional coordination** is a major challenge to the coordinated multilevel use of maritime space.
- Similarly, the difficulties in achieving **operational synergies** between institutions and authorities at regional level further prevent an integrated approach to multilevel use of maritime space, where the **difficulty of integrating disciplines** in any case hinders development.
- **Specific measures for cooperation** on the multilevel use of marine space **do not exist,** since there are differences between marine and coastal areas in the various geographical regions. This means that relevant authorities are often left to develop the most appropriate mechanisms of cooperation alone. This is likely to mean that one authority circulates a draft version(s) to neighbouring authorities, with the feedback being incorporated into the final transnational set of measures. There is the danger that not all stakeholders will be engaged in this process, and that the measures will fall short of the complex interdisciplinary plan which would ideally be proposed.
- The wide and varied nature of the barriers which must be addressed (eg inappropriate regulations, operational, environmental, health and safety, technology, societal and legal difficulties and differences) hinder the transition of multilevel usage **from a concept to real life recognition** and practical implementation.

4 RECOMMENDATIONS

4.1 Recommendations

1. Enhancing the collection and sharing of data and knowledge

In all countries of the Region, there is ongoing collection of a wide range of data, resulting in national databases, for multiple activities relevant to the MU concept, forming the national data bases: data on fisheries, aquaculture, meteorologic, oceanic and other environmental data, tourism-related data, data about energy facilities in coastal areas and electrical interconnections, marine traffic etc. Additional data are collected by the private sector, academia and research institutes, as well as NGO's and international organisations.

The information gathered is currently being used – or potentially could be used – in analysing:

- the parameters needed for the operations and further development of aquaculture (water temperature, pH, currents, etc.), and their relations with the physiology and pathology of farmed organisms;
- the necessary parameters for the development of (offshore) Renewable Energy Sources (met-ocean conditions: wind velocity and direction, wave height, tidal range, etc);
- the parameters needed to determine the environmental status and impose area or season restrictions on fishing, assign MPA status, etc

Various spatial data related to maritime uses are also available through different sources. Data related to shipping routes (commercial, recreational, military, etc), data on the location of energy uses (RES sites, cables, substations), data related to fisheries (fishing sites for small-scale fisheries, open-sea fishing sites, various control data collected by authorities), to aquaculture sites – coastal & offshore – (ocean data collected on site), data on tourism, environmental data (MPAs, ocean data, data on marine species), etc.

All these data are being collected and used by different stakeholders: government authorities (international, national, regional and local), academia and research institutes, private sector, various NGOs, etc. Combining the data already available, and further enhancing the collection and processing, could significantly benefit the policy-making process regarding MSP, and especially in the decision-making process regarding MU (selection of MU type, location, etc).

The **consolidation** of these data in a uniform type that would allow for exchange between stakeholders, and even the creation of a single platform that would gather all MSP and MU essential data, which would be openly available, could significantly assist the advance of research on the MU topic, as well as potential investments. It could also encourage **data-related innovation** on the subject, which could, in turn, greatly benefit future MU projects.

Data-sharing platforms for MU could also be a first step in a process of greater exchange of knowledge on the subject, as technologies and policies mature and more MU projects develop. Knowledge-sharing on an international level, could prove to be catalytic in accelerating technological progress in the field, and moving faster towards a more sustainable and efficient use of marine space.

To further enhance the collection and sharing of data, at national and international level, innovative approaches to the following are required:

- **Agreements** on the type of data which need to be gathered, which should be regularly reviewed, updated and ratified: the type, format and size of data and databases, comparability of the data collected, what data and how are they used in different analyses on MU planning projects, etc

- Sharing and exchange of data gathered by various stakeholders should be **pro-actively facilitated** (eg through national policy and inter-national agreements): academic and research institutions, private sector enterprises, and other organisations, should be actively encouraged – and even rewarded – to share the data they collect.

- The development and dissemination of relevant **IT systems and tools** able to process Big Data should be a priority for national authorities.

Drafting national frameworks and international agreements for data collection and sharing, is a necessary step towards the development of an integrated data and knowledge sharing platform for MU.

2. Governance and Stakeholder Participation

2.1 Creating a policy framework

When addressing the issue of Multi Use governance, one critical issue that all literature points to is the need of a framework to govern MU process, from planning and design, to full operation.

MU includes a number of different activities, governed by different legislations that should all feed into the overall framework, as well as the MSP and other policy frameworks of each country, in order to create a comprehensive framework to act as a guide to MU development.

It is important for this framework:

-to be clear as to the licensing/permit process and provide a pathway for potential investments.

-to eliminate bureaucracy and complexity, by appointing responsibility for the different steps of the process to the relevant authorities, while at the same time eliminating unnecessary overlaps between authorities.

-to simplify the process of each individual use licensing

- to introduce site specific and type specific environmental studies as for the potential cumulative effect of different uses

-to establish a mechanism for financial support for MU developments

The MU framework needs to be flexible enough so as to accommodate the multitude of potential developments, but at the same time firm regarding the regulation of environmental and societal outcomes of MU activities.

2.2 Stakeholder Involvement

MU is a very versatile tool that can offer solutions in MSP, especially in locations where marine space is either scarce, or crowded by many different uses.

The range of options that MU offers, is directly related to the versatility of different potential sites for MU developments. Therefore, all steps in the development process, as well as in the operational phase, have to be site-specific. Furthermore, the specificity of each site combined with the particularities of stakeholders in each case, create a very unique framework for every single project.

It is therefore highly recommended and supported by all relevant literature, that stakeholders should be involved in every step of the process in order to contribute their specific knowledge and achieve the best solutions in each case.

Stakeholder participation is highly advised from the very first phases of MU development, starting with **policy-making**. The contribution of sectorial knowledge of different stakeholders (policy-officers, local government, research institutes & academia, fishers & aquaculture business, energy sector, tourism, maritime transport etc) can yield important results in identifying barriers in the licensing process and offer experience-based and sector-specific suggestions that can greatly improve the process in terms of required effort and time.

In the **planning** phase of single MU developments, early and active involvement of a set of identified stakeholders with varied roles, objectives and resources, can assist site selection and type selection, by offering their views and knowledge of the site under consideration, its situation and conditions: oceanic parameters, energy production capacity and applicable technologies, possible conflicts with other uses, potential outcomes of different uses, financial viability of different combinations, etc.

In project **design**, even though in the initial technical scoping phase it is advisable to only involve relevant experts, in later stages stakeholder engagement in decision-making regarding specific design aspects can offer creative solutions to improve the design and solve difficulties, to avoid implementing sub-optimal solutions.

In the **operational** phase of the MU site, it is also important to involve stakeholders in drafting a co-management scheme. This participative approach in MU management is necessary as the financial viability of a project combining different uses heavily relies on the sharing of costs such as transportation and maintenance. Additionally, a co-management scheme is imperative to ensure the compatibility between uses of the different operations taking place in each section/use of the site, and avoid disturbances caused by one use to others. For example, it makes sense to carefully plan site maintenance at a time convenient to all users involved and share costs of specialised vessels and equipment.

What is crucial in stakeholder participation is to be realised in a manner that will retain participant involvement. Relevant literature shows that traditional methods of participation (eg questionnaires distributed at a neutral time) seem to have poorer results compared to a more active involvement strategy. It is thus recommended that the creation of a **stakeholder consultation mechanism** is considered. This mechanism has to be broad enough to include all possible stakeholders, as well as flexible and modular to reflect each step in the development process and separately involve relevant stakeholders to each proper stage.

Developing **innovative solutions for participation** might provide an answer to the challenging case of MU stakeholder involvement which needs to be continuous throughout the whole process, and, thus, should be an **objective for policy-making**. Innovative digital tools should be sought in the

design of the mechanism, in order to make it efficient, resource-wise and as to the outcomes. The basic parameters of such a mechanism would be: to correctly identify and categorize all relevant stakeholders, to allow for remote and asynchronous participation, to avoid time-consuming proceedings, to only involve people relevant and necessary to each case, to allow for exchange between participants and collaboration, rather than just collecting different opinions, etc.

3. Innovation Supporting Initiatives

In order to foster innovation in the field of MU, different initiatives could be undertaken:

- Initiatives related to data innovation, for the collection and sharing of data, and for the use of data in the various decision-making phases of the projects (planning, design, operations etc), and also for the dissemination of knowledge gathered throughout a MU project development.

- Initiatives for process innovation, regarding the establishment of a stakeholder consultation mechanism, as well as for the policy design of processes of the MU life-cycle: preliminary site and type selection, licensing, participatory design, and coordinated operations of different uses

- Initiatives for management innovation in the different phases of a single MU project, especially for establishing a co-management scheme for operations and maintenance, between separate uses in a single site.

- Initiatives to support technological innovation in MU, not only in the different technologies in the fields involved, but also combined cross-sectoral collaborations for joint technological innovations specifically for MU developments.

4.2 Innovation Secretariat

The setting up an international 'Innovation Secretariat' in the EUSAIR Region is proposed, in order to pro-actively support the planning and implementation of transborder cooperation, representing all the participating countries and coordinating a joint, innovative approach to monitoring and recording climate change.

- It will have an important role in **coordinating**
  - the alignment of legislation/regulations impacting transborder cooperation in all relevant fields;
  - the collection and sharing of data;
  - the exchange of best practices and experiences within the fisheries and aquaculture industries;
  - the effective operation of international experts' working groups

- It will facilitate the **communication** between all stakeholders, who will need to work together in addressing the impacts of climate change, assisting in the collection and dissemination of accurate and reliable information in an effective way, facilitating the creation of a common understanding of the problems and proposed solutions.

- It may be authorized to **represent** the Region as it participates in international platforms, fora, programmes, initiatives, etc., addressing relevant issues on an international level.

- **Other activities** it may undertake include workshops and training seminars, hosting events bringing together experts in a particular field, publishing findings/recommendations on an ad hoc or regular basis, linking academia, public bodies, private institutions, NGOs, grassroots organisations, through facilitating stakeholder meetings.

The first steps to be undertaken in the establishment of an Innovation Secretariat are:

1) To establish a common vision for its role and reach agreement on its creation and the scope of its activities/responsibilities
2) To discuss and agree upon its structure, settle management arrangements (eg proposing a rotation between the participating countries) and operational issues, as well as joint sources of funding
3) To agree upon an initial strategy (a 24-month and 48-month plan of action, including a timetable of activities, deliverables, monitoring and evaluation procedures and available budget)
4) Accompany the establishment of the Innovation Secretariat with a region-wide communication campaign signaling the commitment of the participating countries to the aims of the Secretariat and the need to engage with all stakeholders.

4.3 Sources of funding

Sources of financing for the adoption of processes and methods (innovation transfer), as well as technological tools, can be found at international level as well as national level for initiatives undertaken (fully or in part) by each individual littoral country.

A list of potential sources of finance follows below:

International level	
EU financial instruments	Programmes such as • European Maritime, Fisheries, and Aquaculture Fund EMFAF (ESIF),now delegated to the European Climate, Infrastructure and Environment Executive Agency CINEA • Interreg (for cooperation across borders), • Horizon Europe (for research and innovation), • InvestEU (for investment, innovation and job creation), • COSME (for SME competitiveness), • LIFE programme,

	• EaSI (for employment & social innovation) • etc.
European Investment Bank EIB	
National level	
Government grants	Incl. via the Structural Funds
Private funds	• Academic grants, bursaries, research scholarships, etc • Funding by private enterprises (eg prizes, research funds, financing via CSR initiatives, etc) • Business Angels, Venture Capital
Banking system, financial institutions	Debt, Equity, Business Angels, Venture Capital
Fund raising, donations, crowdfunding	

5 CONCLUSIONS – NEXT STEPS

In conclusion, Multi Use can prove to be a valuable tool in the use of Maritime Spatial Planning, that can provide solutions to address a more sustainable use of ocean resources. Important research has already been done and continues, and technological advances could soon provide us with solutions for even more uses than those applicable today. However, there is a lack for a sufficient framework that would facilitate and encourage MU developments and investments, and should thus be rendered as a priority.

Stakeholder participation is a necessary condition for a successful MU development, and should thus be a major factor in the design of policy. An initial stakeholder identification could be a first step in establishing a stakeholder consultation mechanism, that could either be on the national level, or extend to a trans-national, aiming to further strengthen the exchange of knowledge, experience and expertise.

Furthermore, enhancing the collection and sharing of data between different actors at national and international level, could further advance relevant research and innovation and accelerate the evolution of MU technologies and applications. An initial agreement on the relevant and necessary data and data-sharing process would be the primary step in establishing a data and knowledge sharing framework.

6 ANNEX

6.1 EUSAIR STRATEGY

The EU Strategy for the Adriatic and Ionian Region is one of the four EU macro-regional strategies, besides the EU Strategy for the Baltic Sea Region (2009), the EU Strategy for the Danube Region (2011) and the EU Strategy for the Alpine Region (2016).

The EUSAIR covers ten countries: four EU Member States (Croatia, Greece, Italy, Slovenia) and six non-EU countries (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, San Marino, Serbia).

The general objective of the EUSAIR is to promote economic and social prosperity and growth in the region by improving its attractiveness, competitiveness and connectivity. With four EU members and four non EU countries the strategy will contribute to the further integration of the Western Balkans.

The participating countries of the EUSAIR agreed on areas of mutual interest with high relevance for the Adriatic-Ionian countries, being it common challenges or opportunities. The countries aim to create synergies and foster coordination among all territories in the Adriatic-Ionian Region in **four thematic areas/ pillars** representing key challenges as well as key opportunities in the region. For each pillar, specific topics and actions have been identified, taking into account the needs, urgency of the issue and the added value of joint actions taken in order to solve the existing challenges or build upon the future opportunities.

6.1.1 Pillars

PILLAR 1: BLUE GROWTH

The specific objectives for this pillar are:

- To promote research, innovation and business opportunities in blue economy sectors, by facilitating the brain circulation between research and business communities and increasing their networking and clustering capacity.
- To adapt to sustainable seafood production and consumption, by developing common standards and approaches for strengthening these two sectors and providing a level playing field in the macro-region.
- To improve sea basin governance, by enhancing administrative and institutional capacities in the area of maritime governance and services.

To achieve the abovementioned objectives, Pillar 1 will focus on three topics:

Topic 1 – Blue technologies

Topic 2 – Fisheries and aquaculture

Topic 3 – Maritime and marine governance and services

PILLAR 2: CONNECTING THE REGION

The specific objectives for this pillar are:

- To strengthen maritime safety and security and develop a competitive regional intermodal port system.
- To develop reliable transport networks and intermodal connections with the hinterland, both for freight and passengers.
- To achieve a well-interconnected and well-functioning internal energy market supporting the three energy policy objectives of the EU – competitiveness, security of supply and sustainability.

To achieve the abovementioned objectives, Pillar 2 will focus on three topics:

Topic 1 – Maritime transport

Topic 2 – Intermodal connections to the hinterland

Topic 3 – Energy networks

PILLAR 3: ENVIRONMENTAL QUALITY

The specific objectives for this pillar are:

- To ensure a good environmental and ecological status of the marine and coastal environment by 2020 in line with the relevant EU acquis and the ecosystem approach of the Barcelona Convention.
- To contribute to the goal of the EU Biodiversity Strategy to halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restore them in so far as feasible, by addressing threats to marine and terrestrial biodiversity.
- To improve waste management by reducing waste flows to the sea and, to reduce nutrient flows and other pollutants to the rivers and the sea.

Two topics are identified as pivotal in relation to environmental quality in the Adriatic-Ionian Region:

Topic 1 – The marine environment

Topic 2 – Transnational terrestrial habitats and biodiversity

PILLAR 4: SUSTAINABLE TOURISM

The specific objectives for this pillar are

- Diversification of the macro-region's tourism products and services along with tackling seasonality of inland, coastal and maritime tourism demand.
- Improving the quality and innovation of tourism offer and enhancing the sustainable and responsible tourism capacities of the tourism actors across the macro-region.

To achieve the abovementioned objectives, Pillar 4 will focus on two topics:

Topic 1 – Diversified tourism offer (products and services)

Topic 2 – Sustainable and responsible tourism management (innovation and quality)

6.2 List of related projects

PROJECT TITLE	LINK
MUSES	https://cordis.europa.eu/project/id/727451
TROPOS	https://cordis.europa.eu/project/id/288192
MERMAID	https://cordis.europa.eu/project/id/288710
H2OCEAN	https://cordis.europa.eu/project/id/288145
ORECCA	https://cordis.europa.eu/project/id/241421
MARINA	https://cordis.europa.eu/project/id/710566
MUSICA	https://cordis.europa.eu/project/id/862252
ADRIPLAN	http://adriplan.eu/index.php
SEANERGY2020	https//maritime-spatial-planning.ec.europa.eu/key-words/seanergy-2020

European Maritime and Fisheries Fund

The European Maritime and Fisheries Fund has allocated funds totalling 133 mil Eur, to 153 projects involving 39 countries, and a total of 481 partnering organisations.

Specifically on the topics: Blue Economy, Blue Careers, Common Information Sharing Environment (CISE), Environmental Monitoring and Restoration, Sea Basin Cooperation, it has funded 60 projects; involving 224 partners, 54 coordinators, 31 countries, and a total of 38 mil Eur in funds:

Horizon 2020 Environment and resources data hub

Under the topic 'Climate Action' funded by the Horizon 2020 programme, a total of 80 projects were allocated a total of 487 mil Eur, distributed between 831 partners in 81 countries.

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